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The Three Failures Threatening America's Clean Energy Industrial Strategy and How to Fix Them

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Key Takeaways

- The case for building domestic clean energy industrial capacity is stronger than ever, given shifting climate, security, and competitiveness motivations, but that opportunity is held back by interrelated failures of capital markets, labor markets, and government institutions. Combined, these failures undermine the US's industrial commons: the technical knowledge, manufacturing capabilities, supply chain infrastructure, and supplier networks that sustain innovation and productivity.
- Capital markets have failed to preserve or expand strategically important productive capacity in the US, and the state has not acted as a stopgap. Labor markets have failed to retain or develop the skill mastery that is needed for industrial competitiveness, and

state training interventions have actually made the problem worse. The private sector's short-term profit and cost-cutting impulses are corrosive to the industrial commons.

- This report identifies 15 policy changes that could put the US on a trajectory to a high-road, resilient clean energy economy. These include specific incentives, regulations, technical assistance, clarifying existing statutes, and improving coordination both within and beyond government. Underpinning all is attention to building the high-road advantage the US will need to succeed, and supporting broad distribution of the gains it delivers.

Introduction

US industrial strategy has a long arc. Robust public infrastructure and research institutions supported economic growth and broad-based prosperity throughout most of the 20th century. After World War II, the US layered on an extraordinary research and development (R&D) architecture, including national laboratories, research universities, and defense procurement systems that excelled at technological breakthroughs.¹ This was followed by policies that helped channel federal R&D into commercial inventions and venture-backed innovation ecosystems.²

While the US has been highly effective at inventing technologies, in recent decades it has been less effective at translating innovation into durable productive capacity, skills mastery, and a competitive industrial ecosystem. These are all necessary to maintain broadly shared prosperity in a globalized economy.

Now is the time to close this gap. The era of globalization supported by unfettered trade is over.³ The COVID-19 pandemic, the climate crisis, geopolitical conflict, and intensifying strategic competition are reshaping how governments and firms think about supply chains, energy systems, and industrial capacity.⁴ Many firms are shifting from supply chain models optimized for efficiency toward strategies that prioritize resilience, redundancy, and security.⁵ When deciding where to locate new factories, manufacturers with global operations are weighing geopolitical exposure, supply chain concentration, energy reliability, and policy stability.⁶ These recent changes create new economic opportunities in the US.

Added to the opportunity is a security imperative: The advanced technologies now crucial for energy, economic, and national security—semiconductors, clean energy products, and batteries—and their critical mineral inputs are dangerously concentrated,⁷ largely in China, with unparalleled efficiency and scale.⁸ David Autor and Gordon Hanson warn that an emerging “China Shock 2.0” is coming, built not on low-cost production labor but on dominance in the high-wage innovation sector.⁹

At the same time, slowing productivity growth, stagnating wages,¹⁰ and rising economic insecurity—caused in part by deindustrialization—have intensified political polarization and economic nationalism across advanced economies. Both the Biden and Trump administrations joined the global surge in industrial policy activity,¹¹ deploying numerous industrial policy tools: tax credits, grants, loans, domestic content requirements, tariffs, equity stakes, export controls, and strategic stockpiling.¹² Despite this flurry of activity, the US government’s support for commercializing and scaling domestic production of advanced energy technologies—and the critical minerals and materials necessary to build them—

remains piecemeal, inadequate, and politically volatile.¹³ A sustained, coherent, and apolitical strategy is necessary.

The US has real assets. It is the world's second-largest manufacturing nation by output¹⁴ and is rich in critical minerals, energy in many forms, and other natural resources. It also has the human capital and talent to drive the next generation of innovation and high-value production—capacity that could strengthen domestic supply chains and secure critical inputs for national security, economic resilience, and climate goals. Most industrial policy proposals focus on how to deploy the tools of statecraft to restore American leadership, be it economic, technological, climate, or military. But leadership will not be restored if the US does not also tackle the underlying failures that have made the US economy structurally incapable of converting its inventive capacity into industrial strength and broadly shared prosperity.



Structural reform is needed, aimed at the root of the problem: failures in capital markets, labor markets, and government institutions that keep locking the US industrial base into a low-road path.

Much of what should be included in an industrial policy agenda is now being discussed.¹⁵ High upfront costs, permitting complexity, policy uncertainty, and uncertain revenue projections make it difficult to secure private financing to scale production of new energy technologies and their inputs.¹⁶ Such domestic investments demand a level of patience that US capital markets are not designed for. Industrial policy has to consider and address these very real constraints. But industrial policy will fall short if it stops there. If not actively discouraged, the habits resulting from short-termism and cost-cutting—and the policies that reinforce those habits—will undermine industrial policy success. Structural reform is needed, aimed at the root of the problem: failures in capital markets, labor markets, and government institutions that keep locking the US industrial base into a low-road path. This paper, the third in a series,¹⁷ argues that future industrial and climate policy success requires more than larger appropriations, better-designed programs, or improved distribution of benefits. The US economy is caught in a self-reinforcing low-road equilibrium produced by compounding failures in capital markets, labor markets, and government institutions. The ultimate question is whether the next iteration of industrial policy will produce economic resilience and deliver broadly shared prosperity—or subsidize low-wage, low-productivity facilities that neither strengthen the industrial commons nor close the gap with strategic competitors. A new high-road¹⁸ industrial equilibrium could produce not only minerals and advanced technologies but also skills mastery and diverse supplier ecosystems. Establishing a new equilibrium will require restructuring the incentive environment for long-term investment, reforming the management practices that suppress skill mastery and wages, and building a nationwide coordination infrastructure.

A Note on Framing

This paper uses clean energy manufacturing and climate as its primary lens, but the structural arguments and recommendations are applicable beyond climate to a national and economic security agenda, and beyond clean energy to any sector where the US seeks to build resilience and competitive productive capacity. To contribute meaningfully to global decarbonization, the US must foster integrated systems¹⁹ capable not only of invention but also of commercialization and deployment. The US built an innovation economy optimized for discovery, but equitable economic growth requires an economy capable of deployment and production at scale.

My reasons for focusing on climate are threefold:

1. The industrial policy tools advanced during the Biden administration shifted decarbonization away from a political economy of sacrifice toward a politics of abundance, production, and shared economic gain.²⁰ This approach secured broader political support than previous climate efforts. More progress can be made from improving these tools than abandoning them.²¹
2. While climate change poses an existential long-term threat, its most immediate impacts are distributional²² and compounding.²³ Industrial policy tools can either deepen or ameliorate those distributional harms and compounding threats, which means that the design of industrial policy as a solution to the climate crisis matters immensely.
3. The geopolitics of decarbonization increasingly reward countries that can manufacture, deploy, and continuously improve low-carbon technologies at scale. This means that competition over clean energy supply chains, industrial capacity, and technological leadership has become inseparable from climate policy itself.²⁴ US productive capacity, technological leadership, and the interplay between them are essential parts of the decarbonization infrastructure.

The Three Failures Diagnosis

The structural problems facing the design and implementation of successful industrial policy reflect three compounding failures—in capital markets, labor markets, and government institutions. Together, they have produced a low-road equilibrium that holds back US climate, industrial, and economic leadership.

Capital Market Failures

First, on capital market failures, in response to the failure of private industry to adequately invest in innovation and R&D to serve the national interest, the US created incentives. The federal government began directing large-scale public investment in science and adopted policies to encourage the private sector to commercialize publicly funded research. For example, the 1980 Bayh—Dole Patent and Trademark Act allows universities and nonprofit research institutions to patent and commercialize inventions created through federally funded research.²⁵ But while the government helped invent and derisk technology innovation, another capital market failure materialized. Commercialization and scaled production migrated to wherever costs were lowest. Over time, the offshoring of

manufacturing eroded domestic industrial capabilities, weakened workforce ecosystems, suppressed wages, and undermined the foundations required for sustained industrial leadership. The government has not developed a robust response to this.

It is particularly notable that private capital markets have made no efforts to retain strategically important facilities. This can produce cascading losses. For example, the closure of the US Steel mill in Pittsburg, California, contributed to the subsequent closure of the nearby Del Monte cannery. This will likely, in turn, disrupt agricultural supply chains by reducing market access for peach and tomato farmers in the Central Valley.²⁶ Capital has generally proven unwilling to retain, restructure, or patiently reinvest in marginally profitable industrial assets even when doing so would preserve strategically important productive capacity.²⁷

This problem has become especially acute in the post-COVID era. Firms and governments increasingly recognize the need to shift from “just-in-time” supply chains optimized for efficiency toward “just-in-case” systems optimized for resilience and security. However, a single buyer willing to pay more is not enough to move capital markets. These markets are poorly structured to support the higher costs, longer time horizons, and coordinated investments required to rebuild resilient domestic production systems—particularly in sectors facing aggressive state-backed competition from China.

Investors seeking market-rate financial returns do not capture the full social returns of commercializing advanced energy technologies or scaling domestic production in the US. The social benefits of industrial investment—supply chain development, workforce capabilities, regional economic stability, innovation spillovers, and national security—accrue broadly across the economy and build the industrial commons. But investors bear the full cost and risk of that investment themselves. Because their potential return doesn’t reflect the broader social value their investment creates, the risk-adjusted return often falls short of what private capital requires, even when the social return would clearly justify the investment. As a result, markets systematically underinvest in shared productive capacity—suppliers, skilled workers, institutional knowledge—that no single firm has an incentive to build but all depend on.²⁸ A robust industrial commons is necessary to sustain an industrial advantage over time, but building and maintaining it has largely been left to market forces that are not equipped to do so. Government must, therefore, assign that responsibility through regulation and incentives that align private investment with the public interest.

Profit-maximizing strategies such as stock buybacks, offshoring production and R&D, and low-road management practices have generated strong private returns while steadily weakening the productive foundations of the US economy. At the same time, economic activity has become financialized, which increasingly rewards speculative and extractive forms of value creation over long-term productive investment. Today’s venture and growth capital markets favor scalable digital platforms, surveillance-based advertising models, and short-term financial engineering over the slower, more capital-intensive work of building industrial capacity.

Left to existing incentives and institutional norms, capital markets will not rebuild the productive systems required for economic security, technological leadership, and decarbonization. Industrial policy is therefore necessary not simply to correct isolated market failures but to restructure the incentive environment itself to channel capital toward long-term national capabilities. Without such intervention,

the United States will struggle to build secure and resilient critical minerals, advanced manufacturing, and energy supply chains—let alone outcompete countries whose industrial systems are supported by far more coordinated state action.

Labor Market Failures

Building competitive industrial capacity requires not just addressing capital market failures. It also requires building and retaining skills mastery—but the labor market is unequipped to deliver that retention. There are three distinct and reinforcing labor market failures.

The first mechanism is **firms' chronic underinvestment in workforce development**.²⁹ In fluid labor markets, many firms rationally reduce training investments because it is cheaper to poach skilled workers than to develop them internally, less risky to rely on publicly funded workforce systems, and easier to externalize the long-term costs of outsourcing and offshoring. Yet the evidence increasingly suggests that the shortage of skilled workers is not the primary problem. Rather it is the absence of management and HR strategies to develop, utilize, and retain skill, coupled with employers' monopsony power to suppress wages.³⁰

The second mechanism is the **persistence of management models that organize work around narrow, routinized tasks designed to minimize skill requirements**. This approach emerged most prominently through Taylorism³¹ and early-20th-century scientific management, which decomposed production into the smallest constituent tasks, stripped workers of discretion, and let management control the production process. Combined with mass production systems such as the assembly line, this model dramatically increased output per worker in many industrial settings.³²

But management practices optimized for standardized mass production have persisted well beyond the contexts in which they are most effective. In many sectors—including advanced manufacturing—firms continue to organize work in ways that limit workers' discretion and reduce opportunities for them to develop their skills. They also treat high turnover and unfilled openings as a normal feature of production. When these practices generate high attrition or skill shortages, firms often respond by simplifying jobs even further, lowering hiring standards, or advocating for additional public training investments rather than redesigning the work itself and addressing the root issue.³³

The empirical case against this model is now substantial. A body of research spanning 25 years consistently finds that firms that organize work around skill mastery and worker involvement outperform those that don't, on both productivity and compensation.³⁴ Bureau of Labor Statistics (BLS) research finds that productivity is driven not just by what workers know, but also by *how the firm deploys and organizes skills*.³⁵ Firms that deploy workers in comprehensive, less routinized roles see the strongest productivity increases. This effect is especially pronounced in advanced manufacturing, where technological sophistication increases the value of worker judgment, coordination, and adaptive problem-solving.³⁶

Other academic studies have found high productivity returns on high-road work structures, and such practices also improve employee retention.³⁷ Additionally, the bottom-line benefits of more comprehensive task bundling extend beyond the

production line to support innovation. When production workers and engineers coordinate, they can share observations and potential remedies to inefficiencies, which in turn drives nimble process and design improvements that help keep firms at the frontier.³⁸

The third mechanism is that **firms' wage-setting power allows them to pay workers less than their productive contribution warrants**. This is partly an economic concentration story,³⁹ but that is not the only cause of this monopsony power over wages. The cost of searching for a new job, the primacy of informal hiring networks, and the simple fact that the degree to which workers value their job depends on their personal circumstances all give employers room to reduce wages below what we expect from competitive market logic.⁴⁰ In the absence of countervailing institutions (unions, sectoral bargaining, and supportive labor standards), real-world realities mean that market dynamics do not generate broadly shared benefits or sustained wage growth.⁴¹

The results of these intersecting failures are a diminished industrial commons—a reduced base of industrial skill mastery, limited productivity, and stagnant wages. These are the predictable outcomes of a system that has optimized for short-term labor flexibility and profitability at the expense of long-term productive capacity. Together, these labor market failures create a self-reinforcing low-road equilibrium: Firms that narrow jobs and suppress worker power do not merely pay lower wages; they structurally undermine the learning, coordination, and skill development that generate high productivity.⁴² As a result, the US labor market is increasingly incapable of producing the skilled, adaptable, and innovative workforce required for industrial renewal, economic resilience, and technological leadership.

Government Failures

Third are the government failures: public institutions' inability to correct capital and labor market failures, coordinate long-term industrial development, and protect the national interest. In many cases, government policy has not merely failed to counteract destructive market dynamics; it has actively reinforced them.

Government failures take several forms. **Policy choices** accelerated the offshoring of industrial production in ways that disproportionately benefited global firms while weakening the domestic industrial commons.⁴³ Trade agreements such as NAFTA deepened these dynamics by facilitating the relocation of production capacity without preserving the institutional foundations necessary for long-term industrial competitiveness at home.

These policies achieved some of their touted promises: They did increase American purchasing power by decreasing the cost of goods, and they used global markets to promote global cooperation and relative peace. They also largely succeeded at their implied objectives to weaken labor unions and discipline domestic policy. But they failed to eradicate poverty or level the global economic playing field for workers and consumers. Rather, they entrenched global disparities and allowed firms to capture advantages from moving production to places with weaker labor, wage, health and safety, and environmental protections.

Other government failures are **judicial**. Over decades, courts and administrative decisions steadily narrowed the scope and effectiveness of the major labor laws adopted during Franklin D. Roosevelt's administration. Courts have weakened both the National Labor Relations Act (NLRA) and the Walsh—Healey Public Contracts Act. The NLRA explicitly recognizes that unequal bargaining power depresses wages,

weakens purchasing power, destabilizes labor markets, and harms commerce. Despite this, courts have ruled in employers' favor to limit the rights of workers and weaken labor unions. While still on the books, the Walsh—Healey Act is effectively impotent in terms of establishing wage and labor standards in manufacturing. (In contrast, the Davis—Bacon Act in the construction industry has helped stabilize and sustain workforce capacity for complex infrastructure development for almost 100 years.) The erosion of labor laws has reduced workers' ability to bargain collectively over wages, training, work organization, and long-term employment stability. This compounds the challenges brought on by firms' restructuring production in ways that have fragmented labor markets and weakened skill formation.

There have also been **regulatory failures**. Policymakers have tolerated the financialization of the economy, allowing short-term shareholder returns, stock buybacks, and speculative bets to displace long-term productive investment. As with globalization and free trade, there are arguments in support of this financial market deregulation, such as lower-cost capital and ease of investing. But it has gotten wasteful, produces systemic risks, and has harmed long-term economic capacity.⁴⁴

The United States has also failed to build the institutional architecture necessary to support commercialization and domestic production at scale. While public policy successfully helped catalyze scientific research and technological innovation, it largely failed to coordinate the downstream investments, workforce systems, supplier networks, and regional production ecosystems necessary to sustain industrial leadership.

Coordination failures are especially visible in workforce policy. For decades, the public workforce system has funded training programs that are often disconnected from employer needs, occupational structures, wage progression, and long-term industrial strategy. Metrics prioritize enrollment, credential attainment, and occasionally placement rather than skill mastery, retention, career advancement, or increased earnings. When markets fail to produce adequate skill formation, the public system steps in with funding for more credential offerings, more modular training, and systems to better navigate the myriad education and training opportunities. Such investments, however, do not increase productivity, raise wages, or stabilize a fractured industrial system. In fact, such interventions don't just fail to correct the labor market failure but exacerbate and perpetuate it. Adding more options and complexity increases the risk that job seekers and students will fail to see a return on their investment of time and, often, money. The complexity, fragmentation, and idiosyncrasies of the workforce development system has created a robust industry with heavy competition between and among for-profit and public providers. Some individuals successfully navigate the system to life-changing effect, but the success of a few masks the deeper systemic failures, visible in the erosion of skills and wages across the American workforce. Training systems like the joint labor-management registered apprenticeships, by contrast, consistently deliver results for workers due to the disciplined coordination that matches training standards to industry demand, provides portable credentials, and standardizes wages and wage progression.

Taken together, these three failures—in capital markets, labor markets, and government institutions—reinforce one another in ways that make isolated interventions insufficient. The recommendations that follow propose interventions aimed at commercialization and rebuilding the institutional foundations of productive capacity itself: unlocking long-term investment, supporting skill formation through improved management practices and skill

retention through collective bargaining agreements, and conditioning federal investments to strengthen the high-road industrial commons.⁴⁵

Interventions to Establish a New Equilibrium

15 Policy Reforms to Help Industrial Policy Deliver Visible Public Benefits

Unlock long-term industrial finance

1. Incorporate long-term and public-interest criteria into capital-allocation decisions.
2. Bridge the capital-risk gap and unlock institutional investment.
3. Clarify that fiduciary responsibility permits appropriate long-term investments.
4. Allow pension funds to consider high-road practices as project-risk factors.
5. Create a full stack of public project-financing tools.
6. Use financing and technical assistance to retain and modernize productive assets.

Build and retain manufacturing skill

7. Establish national, portable manufacturing and supply-chain credentials.
8. Restore and expand the Manufacturing Extension Partnership.
9. Facilitate collective bargaining in manufacturing and supply-chain projects.
10. Reform workforce funding and measure job placement, retention, and wage progression.

Improve government conditions and coordination

11. Tie federal assistance to labor standards, high-road practices, and community benefits.
12. Fund the institutional capacity required for coordination and meaningful partnership.
13. Create High-Road and Industrial Commons indices to guide federal financing.
14. Reform the Export-Import Bank to reward high-road production systems.
15. Design industrial policy to deliver visible public benefits and secure public upside.

Cluster 1: Fixing the Capital Market Failures—Unlocking Finance

Private investors cannot capture the full social returns of successful commercialization, particularly in an era that requires optimizing for resilience rather than efficiency. The government must derisk the types of patient investments that are needed. We need strong market integrity, more capital going to companies that produce *real* things, and an industrial policy that unlocks financial resources to establish a high-road industrial equilibrium.

1. Legitimize long-term financial criteria in capital allocation.

Policymakers' stated motivations for industrial policy include broad-based prosperity, equitable regional development, resilient supply chains, emission reductions, and high-wage jobs. Yet in private capital markets and most state-backed financial instruments, such concerns are treated as distributional outcomes rather than risk-mitigating inputs. The Biden Department of Energy's community benefits framework treated equitable regional development, social license, and high-quality jobs as risk-mitigating project inputs; scored them; and allocated grants and loans accordingly.⁴⁶ That framework should be codified and expanded.

The Biden administration's Investing in America agenda more broadly conditioned access to public funds on domestic content, domestic production capacity, emission-reducing technologies, and high wages and training investments, and established the investment criteria to meet those goals.⁴⁷ Each of these contributes to the broader goals of industrial policy. However, except for 2024 Securities and Exchange Commission (SEC) adoption of rules (since challenged) requiring public companies to disclose certain climate-related risks and material climate impacts, there is next to no data infrastructure to support this work and embed broader criteria into investment decisions.⁴⁸ In its absence, the institutional norms around what makes a sound investment will remain dangerously constrained.

In contrast to the US, Europe is creating the data infrastructure⁴⁹ for nonfinancial⁵⁰ (sustainability) scoring and capital allocation,⁵¹ showing that it is institutionally feasible to embed nonfinancial criteria into state-backed finance.⁵² Disclosure rules are beginning to include not just climate and environmental criteria but also social criteria, including around wages, workforce composition, business model, and key performance indicators.⁵³ Researchers have found that such disclosures usefully inform and steer private investment.⁵⁴

2. Bridge the capital risk gap to unlock institutional capital and lower the cost of capital.

Investments in resilient supply chains and domestic manufacturing generate revenue on a timeline and with a predictability that don't match what secondary capital markets typically require. That mismatch creates a risk gap that locks trillions of dollars of institutional capital out of the investments needed for clean energy manufacturing, supply chain development, and infrastructure expansion.

Closing that gap requires new financial infrastructure, and government has two complementary tools available. The first is a "Fannie Mae" for industry (with stronger guardrails and more taxpayer upside than in the housing market) that would derisk venture- and growth-stage investments, turning project risk into portfolio risk by standardizing underwriting, aggregating projects into pools, developing the asset class, and securitizing the pooled loans. The second is a sovereign or public wealth vehicle funded by equity stakes or excise taxes with an explicit mandate to deploy catalytic capital toward strategic investments.⁵⁵ Government-backed financing, particularly when there is transparency and due diligence behind it, sends a strong credibility signal for new technologies and processes. Neither tool works in isolation, though. Both depend on consistent policy signals. Without durable rules of the road, even well-designed financial instruments won't lower risk enough to move institutional capital off the sidelines.

3. Provide more explicit guidance on the types of investments allowed within the parameters of fiduciary responsibility.

Private pension plans, including Taft–Hartley union plans, are formally governed by the Employee Retirement Income Security Act (ERISA), under which prudent decision-making is a central fiduciary tenet. Public pension funds, governed by state law rather than ERISA, face analogous constraints shaped by political scrutiny⁵⁶ and trustee exposure. In both cases, conforming to conventional wisdom is considered prudent, even if those standards limit returns or fail to insulate funds from financial crises. No one gets sued or questioned by the legislature for following convention, so convention, rather than regulatory intent, shapes investment patterns. Broader interpretations of fiduciary duty are structurally disincentivized. Clarifying fiduciary rules to expressly allow longer investment horizons would enable trustees to focus on a more diverse asset mix. Safe harbors and specific guidance allowing longer-term or specific types of investments would be valuable.

The Canadian model is proof of what can be done within a fiduciary framework: Canadian funds interpret fiduciary duty in terms of long-term value creation for beneficiaries, which justifies infrastructure, private equity, and mezzanine debt positions with long horizons and strong ultimate returns. These are exactly the capital stack positions US clean energy manufacturing and supply chains need and currently cannot access. Reforming US pension governance toward that standard with a 10 percent capital allocation to infrastructure, including clean energy infrastructure, would unlock trillions of dollars.

4. Clarify that pension investments can consider high-road practices to build the industrial commons.

A second ERISA-related reform would allow broader consideration of sustainability inputs. ERISA requires that fiduciaries act with the “exclusive purpose” of providing benefits to participants and beneficiaries. Any consideration of social or policy goals risks violating that rule if it comes at any material cost to participants. The result is that fund managers default to investments with no labor (wage, skill, training, retention, labor peace), management, or environmental standards attached—not because such standards are prohibited but out of concern that they would be characterized as external benefits rather than risk-mitigating inputs.

As the *Cambridge Handbook of Institutional Investment and Fiduciary Duty* argues, prevailing financial theories offer “an impoverished and deeply skewed view of financial value that is focused too much on short-term gains at the expense of sustainable growth over the longer term” and that “financial industry participants have also focused too much on the individual company, forgetting that companies are interdependent.”⁵⁷ Low-road management practices impose costs not just on individual firms but on the entire industrial ecosystem—eroding the commons of suppliers, skilled workers, and institutional knowledge that all firms depend on. Pricing the systemic risk of eroding commons could unlock capital to rebuild that commons, creating a flywheel effect: Stronger standards lead to better projects and stronger industrial ecosystems, thus reducing systemic risk while expanding the future pool of investible assets.

In addition, legislation should clarify that fair labor practices, work organization standards, wage progression, and noncoercive retention strategies are project-specific risk-reducing measures. This would allow pension funds to set investment standards that counter the structural race to the bottom that limits growth, productivity, and innovation. The Department of Labor (DOL) has issued guidance

on this question,⁵⁸ related to environmental, social, and governance (ESG) criteria more broadly. But it has reversed with each administration—a durable legislative fix is overdue.⁵⁹ Labor and workforce criteria explicitly tied to US competitiveness and opportunity could be strengthened as investment considerations, even without a full ESG package.

5. Adopt a full stack of public project-financing tools to support projects from permitting to production.

Several individuals interviewed for the second paper of this series spoke about the need for a more robust and coordinated suite of policy tools to facilitate project deployment.⁶⁰ Project developers and investors face risks and obstacles at each phase, but government tools could reduce those risks and remove those obstacles, all of which would reduce the cost of capital and unlock investment:

1. **Permitting reform** can accelerate deployment without steamrolling community concerns.
2. **Concessional loans and grants** can derisk early-stage and growth investments.
3. **Production tax credits** can crowd in private capital.
4. **Demand-anchoring procurement, strategic stockpile purchases, and offtake agreements** derisk the private investment that is needed to scale.

Each of these tools⁶¹ can be tied to community benefits or taxpayer returns to ensure political legitimacy and strengthen the role of the state in correcting for market failures.

6. Use financing to retain industrial assets and productive capacity

Through the lens of the industrial commons, it is as important to maintain existing capacity as it is to build new, and it's far less resource intensive to protect existing capacity.⁶² Shuttering a single industrial facility can trigger ripple effects throughout the region or industry, leading facility after facility to close slowly in a way that is hard to see except in retrospect. Losing industrial capacity of any sort could stymie green innovation and industrial expansion—suppliers disappear, workers move away, and useful infrastructure is no longer maintained. Without intervention, too many facilities slip through the capital market cracks.

Federal and state governments should therefore replicate in other regions the decades-long work of the Steel Valley Authority in western Pennsylvania—retaining small and medium manufacturing facilities and the jobs they provide through restructuring support, turnaround financing, and stabilization tools.⁶³ Additionally, flexible tools are needed to modernize and decarbonize existing facilities. To help firms overcome their risk aversion and capital constraints, governments should support facility technology upgrades and provide technical assistance to train workers and design work systems to take advantage of and compensate higher skills.⁶⁴

Procurement standards like Buy Clean and the Build America, Buy America requirements support the domestic industrial ecosystem, as can strategic uses of tariffs and carbon border adjustment tools.⁶⁵

Cluster 2: Fixing the Labor Market Failures—Unlocking Skill Mastery by Reforming Management Practices

The following recommendations describe the structural conditions that would build and retain the skill mastery required for advanced manufacturing.

A Note on Training as a False Solution

First, a note on what won't work. A common response to the green industrial policy challenge is to ramp up vocational training.⁶⁶ Training solutions seem obvious because they are familiar—but the familiar tactics of the past half century produced wage stagnation, job loss, and the erosion of the deep industrial knowledge we now urgently need.

Training alone, dropped into broken work systems, doesn't deliver. Research dating to the 1980s has found that significant training investment is wasted because firms pay too little attention to whether training transfers to job performance, and training only improves firm performance if the firm has built a broader competitive strategy around higher skills.⁶⁷ A comprehensive review of training program evidence found that returns on training programs fade quickly, that productivity gains from training are frequently captured by employers rather than passed to workers as wages, and that the success of training programs depends far more on worker representation and institutional design than on skills content.⁶⁸

Competitive industrial capacity requires that workers not just accumulate skills but also build mastery. This requires fixing strategic flaws in industrial management, including how work is organized, how skill mastery is developed, and how workers are compensated. Scaling advanced industries requires stable labor pipelines, skilled trades, robust supplier networks, operational expertise, and mechanisms for retaining and building upon repositories of industrial knowledge.

Vocational training that is disconnected from high-road work organization and wage progression will not build the capacity or mastery required. Climate and industrial workforce strategy must tie training to more complex jobs that bundle tasks. There must be a renewed focus on redesigning production processes to capture the productivity gains of higher-skilled workers and sustaining those gains through higher wages and collective bargaining. The answer is not more training to close the ostensible “skills gap.”⁶⁹ It's not creating a new class of green jobs⁷⁰ that will magically lift people out of poverty, and it's not relying on the promise of technology to enhance productivity and fairly distribute the gains.⁷¹ Until the work systems that training feeds into are redesigned, more investment in training will continue to subsidize the problem rather than solve it.

See “10. Reform public workforce investments and the metrics of success,” at the end of this section, for recommendations for training programs that *will* work.

7. Establish a national credentialing framework for manufacturing and supply-chain workers.

The federal government should create and fund a national, standards-based credentialing system for the manufacturing and supply-chain workforce. Federal funding for workforce development should be tied to industry-recognized, nationally portable credentials, ending the proliferation of regional and state-level

certifications that fragment the labor market, undermine worker mobility, and weaken the industrial commons. A joint initiative spanning the Departments of Labor, Education, Energy, and Commerce should convene employers, unions, and community colleges to understand training needs for emerging and growing technologies and their production processes, such as critical mineral processing, battery recycling, battery manufacturing, and microelectronics manufacturing. Based on this work, the initiative should develop national training standards for both high-quality training and the work organization and management practices that tie training to productivity and wage progression.

Industry-wide job task analysis is the foundation of this system: systematically mapping what workers actually do across facilities and firms to identify the knowledge, skills, and competencies required. Next is producing consensus training standards and DOL-certified apprenticeship guidelines that serve individual employers, workers, and the broader industrial ecosystem. The National Skill Standards Act of 1994 created the architecture for exactly this kind of system, but the federal government failed to fund it, and the national approach was abandoned in the 2000s in favor of regional initiatives that produced the fragmented landscape we have today.⁷²

The Battery Workforce Initiative at the Department of Energy (DOE) piloted this model.⁷³ The project convened battery manufacturers to learn how they recruit employees, train them, organize production jobs, and manage turnover. But it also went beyond that: visiting factory floors and conducting job task analysis across enough facilities to identify the 85 to 90 percent of knowledge, skills, and abilities needed across the industry. That information was converted into national training standards, certified through DOL for registered apprenticeships, and then turned into curricula shared with employers, community colleges, and union training programs. The initiative funded small pilots to test the curricula with workers before releasing the public good more broadly to community colleges and union training programs in places where battery manufacturing investments were taking root. The result was industry consensus on training standards for an emerging industry.

This national sector strategy model should be expanded to other emerging and growing industries or technologies. Another successful example is the Electric Vehicle Infrastructure Training Program (EVITP), which also established national, industry-recognized training standards. Federal funding to encourage firms to create registered apprenticeships, form labor-management training partnerships, and tie training to wage progression would further enhance this approach. As with EVITP, training standards and curricula should be periodically updated as technology and production processes evolve to ensure ongoing relevance.

8. Restore and expand the Manufacturing Extension Partnership.

High-road practices don't spread on their own, even when they lead to higher productivity.⁷⁴ Firms suboptimize management practices due to lack of information and time constraints.⁷⁵ This is precisely why policy intervention and support is necessary. The Manufacturing Extension Partnership (MEP) has the institutional infrastructure the US needs—a nationwide network of trusted technical advisors embedded in local manufacturing communities, working directly with firms to improve processes, adopt technology, and develop the workforce.⁷⁶ MEP helps individual firms improve processes and deliver training on demand.⁷⁷ If its mandate was expanded, however, MEP could provide the technical assistance firms need to restructure work processes for enhanced productivity and

skill mastery.

The precedent already exists: IMEC, the Illinois MEP affiliate, embedded job quality strategies alongside lean manufacturing and process improvement through its Genesis initiative—and the results were mutually reinforcing.⁷⁸ Participating firms were more likely to report increased sales, cost savings, and reduced turnover. Workers gained clearer advancement pathways, safer conditions, and improved wages.

The lesson is not that MEP should become a workforce program but that both operational improvement and people strategy are needed to maximize productivity gains. As economist Susan Helper observes, Germany's medium-size firms benefit from integrated support for innovation, finance, and training, which collectively strengthens the manufacturing system.⁷⁹ MEP's 51 state centers can anchor that kind of coordination in the US—but only if their mandate explicitly includes it.

9. Facilitate collective bargaining in manufacturing and supply-chain projects.

Collective bargaining has been a reliable mechanism for translating productivity gains into wages and working conditions that sustain the wage gains. This is also the structural element most consistently absent from US clean energy manufacturing and supply-chain activities. Policy should actively reduce barriers to organizing in new facilities and explore extending prehire collective bargaining authority beyond the construction industry. If collective bargaining is tied to occupational training in manufacturing, the way it is in construction, it could support the skills mastery the next phase of US industry requires.

Eos Energy is one recent example demonstrating that unions bring more than wage demands to the table: They bring institutionalized industry knowledge, safety skills, and a long-term stake in firm success. And, in the CEO's own words, they help make the company "grow and become more professional."⁸⁰ Policy should treat collective bargaining not as a cost of doing business but as a productivity input and a signal of management quality.

10. Reform public workforce investments and metrics of success.

Federal and state workforce dollars are too oriented toward enrollment and certification metrics rather than job placement and wage progression. The overemphasis on skill development has not closed the ever-widening wealth gap and cannot be expected to. Public workforce funding should be based on careers—tied to broader occupational training, with both classroom- and work-based components that connect wage progression to skill acquisition. Public funds should not be used to develop customized training for individual firms but rather should be invested in transferable, industry-recognized credentials that support worker mobility and career growth. Wraparound and supportive services are needed to help workers who face barriers to training and employment.

We must recognize that such individuals might only have one opportunity in their lives to invest in education and training, so it's irresponsible to offer trainings that don't lead to employment and higher earnings. Formal partnerships with employers to facilitate job placement are paramount.

Public funds should not be used to develop customized training for individual firms but rather should be invested in transferable, industry-recognized credentials that support worker mobility and career growth. Wraparound and supportive services are needed to help workers who face barriers to training and employment.

Cluster 3: Fixing the Government Failures—Using Conditions, Incentives, and Coordination

The federal government has deployed an unprecedented suite of financing instruments for clean energy manufacturing and supply chains. But it has not attached the conditions that would make those investments structurally durable or built the coordination infrastructure that would allow firms, workers, training providers, and communities to move together toward a high-road equilibrium. Part of the problem is that different federal agencies define industrial policy in different ways with different goals. The US government needs a consistent set of goals for industrial policy. The following section includes recommendations for those goals.

11. Tie federal assistance to labor standards, high-road practices, and community benefits.

Fair labor standards, inclusive hiring practices, and community benefits agreements should be standard conditions for major place-based projects receiving federal financial assistance. The Biden DOE demonstrated that embedding these requirements in project implementation is tied to project success and reduced execution risk.⁸¹ That lesson should be codified. If the implied social contract isn't working, make it explicit. For construction projects, project labor agreements, prevailing wages, and apprenticeship standards are already widely known and understood, and the legal and practical infrastructure supports implementation. Another tool is to streamline the permitting process for firms who negotiate and sign bona fide community benefits agreements.

The manufacturing sector also requires attention. Grants, loans, and other policy instruments should reward firms that commit to labor peace, invest in skill mastery and worker retention, meet wage floors, and maintain strong safety records. Significant federal financial assistance should be conditioned on the receiving firm's commitments to site-wide neutrality on union organizing. The government should promote investments in training, health and safety, attractive wages, and noncoercive retention because of their importance in supporting the accumulation of advanced production skills the next iteration of American industry requires. To get there, industrial policy design and implementation must be adequately staffed by experts in labor, manufacturing processes, and industrial systems as well as experts in project finance and technology assessments.

As with construction projects under the IRA, tax credits for production should have wage standards, training requirements, and incentives for collective bargaining or neutrality. Such practices reinforce the conditions the US needs to develop to be competitive. As with the prevailing wage and apprenticeship (PWA) incentives, the additional cost of complying with such conditions is likely small relative to the reward for the individual firm. These standards would also help ensure that tax incentives do not subsidize low-productivity work environments or facilities.⁸²

Domestic content standards and robust long-term supplier relationships should reinforce the same logic: Federal dollars should build a high-road industrial commons, not just support individual facilities. This has possible bipartisan support. Former Senator Marco Rubio's framework for industrial policy explicitly calls for standards focused on "*what* companies must accomplish . . . and *whom* those accomplishments must benefit (i.e., the American people)" and notes that "without a stable, rewarding career, it's almost impossible to achieve the American Dream."⁸³

12. Fund the capacity that makes coordination and meaningful partnership possible.

The US industrial commons cannot be rebuilt firm by firm, federal program by program, or agency by agency—and it cannot be solved by requirements alone. Community benefits requirements are only meaningful if community and labor organizations have the capacity to negotiate them. Work organization standards are only actionable if firms have the technical assistance to implement them. Neutrality commitments only function if unions have the resources to organize. Each of these conditions is currently unmet.

Labor unions should be supported to develop training for emerging technologies and advanced industry practices and to work with employers on deploying those practices to support productivity, innovation, and profitability. Unions' incentive to do so is structural, since their success is inextricably linked to their employers' success. Community-based organizations and local governments need stable, multiyear funding to engage productively in project development, workforce partnerships, and community benefits negotiations—not the volatile grant cycles that have characterized federal investment in this space to date.

The Community Workforce Readiness Accelerator for Major Projects (RAMP) was a 2024 DOE pilot with nationwide demand. The pilot was designed to fund two-year fellowships for midcareer individuals in regions receiving large and concentrated energy investment. The fellows were provided support, training, technical assistance, and stipends to develop workforce partnerships to connect local workers to the demand created by new investments. The program saw major cuts, but the fellows who remained delivered community support and workforce continuity on many energy, housing, and industrial projects in northern Nevada and Texas. They also expanded pre-apprenticeships, supportive services, apprenticeships, and job placement for scores of local workers.⁸⁴

13. Establish a High-Road Index and Industrial Commons Index as differential pricing mechanisms.

The federal government currently has no systematic way to distinguish high-road and low-road firms when allocating financing. Establishing two complementary indices—one measuring firm-level workforce and management practices, one measuring contributions to the industrial commons—would allow federal financing instruments to reward the firms most capable of sustaining the US competitive advantage over time.

The High-Road Index would measure wages relative to sectoral benchmarks, neutrality and card-check commitments, demographic distribution of workers, wage distribution and employee advancement, apprenticeship ratios, attrition rates, and compliance with collective bargaining agreements.

The Industrial Commons Index would measure insourcing and onshoring of value chain activities, ratio of long-term to short-term investments, internal training investments, safety records, and noncoercive employee retention and advancement.

Higher scores would unlock preferred financing terms—lower guaranteed fees, better coverage ratios, and priority access to grant programs. This would help high-road firms and those contributing to the industrial commons access capital faster, streamline permitting, and scale more quickly. It would also create structural incentives for management to transform their practices to make all other industrial policy tools more effective.

14. Reform the Export-Import Bank to reward high-road production systems.

The Export-Import Bank (EXIM) exists to support US export competitiveness through project finance, export credit insurance, loans, and loan guarantees. A more expansive reading—consistent with the demands of the current industrial policy moment—would use EXIM’s financial tools to reward the production systems most capable of sustaining the US competitive advantage over time. For overseas projects, EXIM already requires environmental and social impact assessments and compliance with the International Finance Corporation (IFC) performance standards, which state that “through a constructive worker-management relationship, and by treating the workers fairly . . . clients may create tangible benefits, such as enhancement of the efficiency and productivity of their operations” and that clients “will not discourage workers from electing worker representatives, forming or joining workers’ organizations of their choosing, or from bargaining collectively.”⁸⁵ The same standards should be applied in the domestic context.

Expanded EXIM authority could also provide loan assistance and access to patient capital for small and medium-size enterprises (SMEs) facing competition from subsidized foreign competitors, supporting the domestic manufacturing ecosystem and job retention.⁸⁶

15. Design for political legitimacy.

Industrial policy cannot survive politically if its benefits appear narrow, opaque, or captured by a small set of firms and regions. Durable industrial strategy requires broad constituencies, visible public benefits, and mechanisms that reinforce trust that public investment is serving the public interest. I recommend the following.

- **Provide support beyond a handful of charismatic end products**—heat pumps, battery packs, electrolyzers—to include the broader industrial ecosystem that makes advanced manufacturing possible. The industrial commons required to produce the next generation of clean technologies depends on dense networks of small and medium-size suppliers producing the “boring” but indispensable inputs: screws and gaskets, adhesives and lubricants, machine tools, refined metals, graphite, steel, aluminum, and countless intermediate components. A less prescriptive approach to eligible industries and products is important not only for retaining broad productive capabilities and skills across the industrial commons, but also for building a more politically durable industrial policy. Just as broad-based public support for R&D helped generate today’s leading clean technologies, broad support for commercialization, production capacity, and supply chains will help ensure the efficient deployment—and domestic production—of the technologies that

follow.

- **Ensure that public finance delivers legible and material public benefits.** This is another element of political legitimacy. Stronger conditions for public finance are needed, such as rules around how companies can use federal investments—like the IRA's prohibitions on stock buybacks—and stronger rules prohibiting firms from opposing union organizing efforts or hiring anti-union influencers.
 - Even more proactively: **Require a clean record on labor and environmental law violations** and minimal investigations, and require community benefits and labor peace agreements as a condition of funding.
- **Secure the public upside of public investments.** Designing new government tools to unlock private capital—for example, establishing a Fannie Mae for industry—requires both more guardrails to protect against rent seeking and excessive risk taking, as well as more taxpayer upside than is realized in the housing market. Equity stakes, with clearer rules and far greater transparency than offered by the Trump administration, strengthen public trust and political legitimacy by demonstrating that industrial policy is producing widely shared gains rather than privatized rewards.

Structural inequality perpetuated by a low-road equilibrium threatens to derail the promise of industrial policy. The recommendations here are about rebuilding a foundation for long-term industrial competitiveness and economic resilience.

Conclusion

In 1945, Walter Reuther, then vice president of the United Auto Workers, wrote in an op-ed on abundance in the *New York Times* that competition “must be founded upon the relative efficiency of management techniques, productive skills, technological improvements and the resulting superiority of product.”⁸⁷ That argument was prescient, and what followed was a period of shared prosperity. Now, 80 years later, we are again talking about abundance and economic security, and while the technology and opportunities have evolved, the path to success requires the same commitment he spoke about in the mid-’40s. Reuther understood that a competitive advantage in manufacturing and supply chains is not primarily a function of cheap inputs, low-cost labor, or favorable exchange rates. It is a function of what workers know, how work is organized, and whether the gains are shared.

The reforms we require now are sweeping: strengthening the rights of workers,⁸⁸ rebalancing bargaining power, unrigging the tax code, and reimagining the social safety net.⁸⁹ But this paper focuses on a narrower set of structural interventions that could plausibly secure bipartisan support so that US industry can begin to emerge from the structural damage created by decades of habits and practices that have reached the end of their useful life. These are practical first steps toward rebuilding the foundations of long-term industrial competitiveness: systems that reward productive investment, develop workforce capability, and strengthen the high-road industrial commons.

The US can deploy tax credits or underwrite loans, it can reform permitting and invest in workforce training, and it can stabilize demand signals to crowd in private capital and jump-start, support, and scale new industries. But we also need deliberate structural intervention to establish a new high-road industrial equilibrium. Over most of the 20th century, the US built an innovation economy optimized for discovery. Climate and industrial policy require not only innovation, but also an economy capable of deployment and production at scale. Once commercialization is solved, reaching competitive maturity requires accumulating skills and retaining mastery. Both demand more than workforce development programs. They require fixing structural flaws in how capital is allocated, how work is organized, how skills are built, and how workers are compensated.

Structural inequality perpetuated by a low-road equilibrium threatens to derail the promise of industrial policy. The recommendations here are about rebuilding a foundation for long-term industrial competitiveness and economic resilience.

Policy and regulation need to correct for, not exacerbate, capital and labor market failures. We need long-term and expansive investments that rebuild the US industrial commons. We need a labor market that builds the skill depth, organizational sophistication, and shared prosperity that advanced manufacturing and energy supply chains require. We need government policy that establishes the right rules and protects the national interest. These fixes are foundational; they will determine whether industrial policy works at all.

Footnotes

1. Since World War II, US industrial strategy has operated, albeit with low visibility, through federally supported R&D, channeled primarily through the Departments of Defense and Energy's network of national laboratories. The primary goal was to maintain military and technological supremacy, and supporting commercial uses for that R&D was largely instrumental—a way to keep the private sector engaged. The first paper in my three-part series details this. See Betony Jones, *Tying Labor Standards to Clean Energy Incentives* (Roosevelt Institute, 2025), <https://rooseveltinstitute.org/publications/tying-labor-standards-to-clean-energy>, 10–12. The US did not ensure domestic commercial production of the products based on that R&D, and for decades private investment followed market signals, increasingly offshore—accelerated by the North American Free Trade Agreement (NAFTA) and by China's entry into the World Trade Organization. See also Doug Calidas and Chris Li, *Beyond Rhetoric: The Enduring Political Appeal of U.S. Industrial Policy for Critical and Strategic Technologies* (Belfer Center for Science and International Affairs, Harvard Kennedy School, 2025), <https://belfercenter.org/research-analysis/beyond-rhetoric-us-industrial-policy>. ↩
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4. “Fragility in today’s energy markets is a reminder of the abiding importance of energy security . . . and the ways that more efficient, cleaner energy systems can reduce energy security risks.” *World Energy Outlook 2024* (International Energy Agency, 2024), <https://iea.org/reports/world-energy-outlook-2024>. ↩
 5. Rana Foroohar, “From ‘Just in Time’ to ‘Just in Case,’” *Financial Times*, May 4, 2020, <https://ft.com/content/f4fa76d9-aa11-4ced-8329-6fc8c250bc45>. ↩
 6. The second paper in my three-part series reports industry perspectives from interviews. See Betony Jones and Joe Peck, *The Receipts: The Untold and Underappreciated Outcomes of Biden’s Clean Energy Strategy* (Roosevelt Institute, 2026), <https://rooseveltinstitute.org/publications/the-receipts-the-untold-and-underappreciated-outcomes-of-bidens-clean-energy-strategy>, 43–60. ↩
 7. *Making Critical Minerals Bankable: Policy Tools to Unlock Investment*, White Paper (World Economic Forum and Columbia University Center on Global Energy Policy, 2026), https://weforum.org/publications/making-critical-minerals-bankable-policy-tools-to-unlock-investment/https://reports.weforum.org/docs/WEF_Making_Critical_Minerals_Bankable_2026.pdf; Tae-Yoon Kim et al., “Regional Composition of Rare Earths and Permanent Magnet Production, 2024,” IEA, last updated October 17, 2025, <https://iea.org/data-and-statistics/charts/regional-composition-of-rare-earths-and-permanent-magnet-production-2024>. ↩
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13. Jones and Peck, *The Receipts*, 62–63. ↗
14. Institute, (2026), <https://rooseveltinstitute.org/publications/against-manufacturing-doomerism>; and Adams B. Nager and Robert D. Atkinson, *The Myth of America's Manufacturing Renaissance: The Real State of U.S. Manufacturing* (Information Technology and Innovation Foundation, 2015), <https://itif.org/publications/2015/01/12/myth-america%E2%80%99s-manufacturing-renaissance-real-state-us-manufacturing>. On the inextricable relationship between manufacturing and innovation, see Cherif and Hasanov, "The Return of the Policy That Shall Not Be Named." They synthesize Berger's argument that the next wave of technological innovation is tied to production processes, and they quote Andrew Liveris as saying that "if you have the shop floor, if you *make* things, you have the prototype for the next thing, so you can innovate." Knowledge@Wharton, "DowDuPont's Andrew Liveris: How America Can Bring Back Manufacturing," October 12, 2017, <http://knowledge.wharton.upenn.edu/article/dowduponts-andrew-liveris-america-can-bring-back-manufacturing>. See also Suzanne Berger, "Why Manufacturing Matters," *MIT Technology Review*, July 1, 2011, https://web.mit.edu/pie/Why_Manufacturing_Matters.pdf; and Gary Pisano and Willy Shih, "Restoring American Competitiveness," *Harvard Business Review*, July–August 2019, <https://hbr.org/2009/07/restoring-american-competitiveness>. ↗
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16. WEF, *Making Critical Minerals Bankable*. ↩
17. Jones, *Tying Labor Standards to Clean Energy Incentives* details the history of the US Department of Energy and US industrial policy, and how the implementation of the Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) was designed to minimize friction and maximize benefits. Jones and Peck, *The Receipts* illustrated funding recipients' neutral to positive views on tying community and workforce benefits to project implementation, as well as the benefits that were delivered. ↩
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19. The IEA's *Energy Technology Perspectives 2024* report focused on the top six mass-manufactured clean energy technologies: solar photovoltaics (PV), wind turbines, electric cars, batteries, electrolyzers, and heat pumps. IEA Executive Director Fatih Birol said, "The market for clean technologies is set to multiply in value in the coming decade, increasingly catching up with the markets for fossil fuels. As countries seek to define their role in the new energy economy, three vital policy areas—energy, industry and trade—are becoming more and more interlinked." IEA, "Global Market for Key Clean Technologies Set to Triple to More Than \$2 Trillion Over the Coming Decade as Energy Transitions Advance," news release, October 30, 2024, <https://iea.org/news/global-market-for-key-clean-technologies-set-to-triple-to-more-than-2-trillion-over-the-coming-decade-as-energy-transitions-advance>. ↩
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22. Distributional impacts include the loss of jobs and economic security in fossil sectors and in climate-sensitive sectors like agriculture and fishing; the geographically disparate impacts of climate change (sea-level rise, ocean current changes); climate-exacerbated events (extreme storms, extended droughts, more damaging fires, more frequent floods, more intense heat waves, arctic freezes); and the human extension of each (food and housing insecurity, rising costs of energy, health hazards, displacement, etc.). ↗
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27. Some investment firms, such as those associated with Heartland Capital Strategies Network, do make these investments, and the investments prove sound. ↗
28. Pisano and Shih, "Restoring American Competitiveness." ↗
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42. Nelson, Wilmers, and Zhang, “Work Organization and High-Paying Jobs.” ↩
43. Pisano and Shih, “Restoring American Competitiveness.” ↩
44. Oren Cass, “The Finance Industry Is a Grift. Let’s Start Treating It That Way,” *New York Times*, February 6, 2026, <https://nytimes.com/2026/02/06/opinion/capitalism-industry-financialization.html>. ↩
45. As Joel S. Yudken, Tom Croft, and Andrew Stettner note, the high-road industrial commons is an industrial ecosystem that strengthens advanced manufacturing and globally competitive industries while also expanding economic opportunity through family-sustaining jobs and building a more resilient and equitable economy. Yudken, Croft, and Stettner, *Revitalizing America’s Manufacturing Communities* (Century Foundation, 2017), <https://tcf.org/content/report/revitalizing-americas-manufacturing-communities>. As Gary Pisano and Willy Shih have argued, decades of outsourcing, offshoring, underinvestment, and short-term management practices have eroded the dense networks of skills, suppliers, production capabilities, and institutional knowledge that constitute the industrial commons. Individual firms often treated these decisions as isolated and reversible, but collectively, they have eroded the broader productive

ecosystem on which industrial competitiveness depends, unraveling what once held American industrial competitiveness together. Pisano and Shih, "Restoring American Competitiveness." ↩

46. For a description, see Jones, *Tying Labor Standards to Clean Energy Incentives*. For results, see Jones and Peck, *The Receipts*. ↩
47. See Jones, "Tying Labor Standards to Clean Energy Incentives." ↩
48. SEC Adopts Rules to Enhance and Standardize Climate-Related Disclosures for Investors," press release, March 6, 2024, <https://sec.gov/newsroom/press-releases/2024-31>. ↩
49. "EU Taxonomy for Sustainable Activities," European Commission, March 17, 2026, https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en. ↩
50. The EU determined that because "nonfinancial information" does have financial relevance, the description is a misnomer and therefore changed the terminology to "sustainability information" in "Directive 2022/2464 of the European Parliament and of the Council on Corporate Sustainability Reporting," *Official Journal of the European Union*, December 14, 2022, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022L2464>. ↩
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52. Directorate-General for Financial Stability, Financial Services and Capital Markets Union, "Strategy for Financing the Transition to a Sustainable Economy," European Commission, July 6, 2021, https://finance.ec.europa.eu/publications/strategy-financing-transition-sustainable-economy_en. ↩
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55. Bernie Sanders, "Bernie Sanders: A.I. Is a Public Resource. You Should Own Half of It," *New York Times*, June 1, 2026, <https://nytimes.com/2026/06/01/opinion/artificial-intelligence-bernie-sanders.html>. ↩
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have gone further, barring ESG considerations from public pension investment decisions entirely. Whatever the merits of ESG investing specifically, the episode illustrates the broader point: Trustees who deviate from convention, even when they believe it serves beneficiaries, risk becoming political targets. ↩

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59. Karen N. Brandon and Carly E. Grey, “New DOL Guidance Raises Legal Risk of ESG Investments,” Ogletree Deakins, April 17, 2026, <https://ogletree.com/insights-resources/blog-posts/new-dol-guidance-raises-legal-risk-of-esg-investments>. ↩
60. Jones and Peck, *The Receipts*. ↩
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