

DECEMBER 2022

OPPORTUNITIES TO DIVERSIFY THE U.S. RENEWABLE ENERGY MANUFACTURING SUPPLY CHAIN

A GUIDE FOR THE UTILITY-SCALE SOLAR,
WIND AND BATTERY STORAGE INDUSTRIES




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Acknowledgements

This report was prepared by the American Council on Renewable Energy (ACORE) and BW Research Partnership (BW Research).

ACORE is a 501(c)(3) national nonprofit organization that unites finance, policy, and technology to accelerate the transition to a renewable energy economy. BW Research Partnership, a full-service research firm, has designed and conducted more than 500 studies for public, private, and not-for-profit organizations globally.

This report would not have been possible without the collaboration of companies in the solar, wind, and battery storage industries. Special thanks to Apex Clean Energy, FirstLight Power, IberSun North America, Invenergy, Johnson Controls, Longroad Energy Partners, National Grid Renewables, Silicon Ranch Corporation, Sol Systems, and Vestas North America for participating in interviews for this study.

We also express our gratitude to Amazon Web Services, who generously commissioned this study.



Photo by Invenergy

Acronyms

Abbreviation	Definition
ACORE	American Council on Renewable Energy
BIPOC	Black, Indigenous and People of Color
BOSS	Black Owners of Solar Services
c-Si	Crystalline Silicon
DE&I	Diversity, Equity & Inclusion
DOE	Department of Energy
DPA	Defense Production Act
IJA	Infrastructure Investment and Jobs Act
IPP	Independent Power Producer
IRA	Inflation Reduction Act
ISN	International Suppliers Network
ISO	International Organization for Standardization
MBEs	Minority-Owned Business Enterprises
MSIs	Minority Serving Institutions
MWBEs	Minority- and Women-Owned Business Enterprises
NAICS	North American Industry Classification System
NMSDC	National Minority Supplier Development Council
NREL	National Renewable Energy Laboratory
OEM	Original Equipment Manufacturers
OSHA	Occupational Safety and Health Administration
PV	Photovoltaics
RFI	Request for Information
RFP	Request for Proposals
SBA	U.S. Small Business Administration
SEIA	Solar Energy Industries Association
WBENC	Women's Business Enterprise National Council
WBEs	Women-Owned Business Enterprises

Executive Summary

Driven by customer demand, competitive prices, and increasingly aggressive policies to decarbonize the economy, the renewable energy and battery storage sectors have grown to contribute more than 21 percent of the nation's electricity generation¹ and employ over 600,000 Americans.² However, the equipment and materials used for renewable and battery storage projects – from solar panels to wind turbine gearboxes – are typically sourced from global supply chains rather than U.S. manufacturing.³

Recognizing clean energy manufacturing as a significant opportunity for U.S. economic growth, the federal government and states are undertaking actions to help onshore manufacturing and develop more robust domestic renewable energy and battery storage supply chains. Such actions include new domestic manufacturing tax incentives included in the Inflation Reduction Act (IRA)⁴ and President Biden's authorization of the Defense Production Act (DPA) to accelerate the domestic production of clean energy technologies.⁵

Meanwhile, the government is implementing equitable policies focused on benefiting individuals and communities in the energy transition who have



¹ Energy Information Administration. n.d. "EIA projects that renewable generation will supply 44% of U.S. electricity by 2050". Accessed March 18, 2022. <https://www.eia.gov/todayinenergy/detail.php?id=51698>

² Department of Energy. 2022. "U.S. Energy & Employment Jobs Report". Accessed November 16, 2022. https://www.energy.gov/sites/default/files/2022-06/USEER%202022%20National%20Report_1.pdf, p.12

³ U.S. Department of Energy. n.d. Accessed August 25, 2022. https://www.energy.gov/sites/default/files/2022-02/America%E2%80%99s%20Strategy%20to%20Secure%20the%20Supply%20Chain%20for%20a%20Robust%20Clean%20Energy%20Transition%20FINAL.docx_0.pdf

⁴ \$10 billion for extension of the 48C Advanced Energy Project Credit for clean technology manufacturing facilities in the U.S. that produce wind turbines, solar panels, energy efficiency technologies, electric vehicles, etc., with at least \$4 billion earmarked for brownfield or coal energy communities; and Advanced Manufacturing Production Tax Credit for solar, wind, and battery components, along with critical mineral processing. House of Representatives. 2022. "H.R. 5376". Accessed December 12, 2022. <https://www.congress.gov/bills/117th-congress/house-bill/5376/text>

⁵ The White House. 2022. "FACT SHEET: President Biden Takes Bold Executive Action to Spur Domestic Clean Energy Manufacturing". Accessed August 25, 2022. <https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/06/fact-sheet-president-biden-takes-bold-executive-action-to-spur-domestic-clean-energy-manufacturing/>

historically been excluded from or underserved during periods of growth. For example, the Biden administration's Justice40 initiative directs 40 percent of the overall benefits of certain climate and clean energy-related federal investments to flow to disadvantaged communities.⁶ New private sector initiatives have also launched to diversify the clean energy workforce and support the success of companies owned or operated by leaders who identify as women or minorities – such as the American Council on Renewable Energy (ACORE)'s Accelerate Membership Program.⁷

Developing a domestic renewable energy and battery storage manufacturing base with a focus on equity can help realize these workforce goals. In particular, the buildout of a domestic renewable energy supply chain can provide important points of entry for minority- and women-owned business enterprises (MWBEs) to enter the renewable energy and battery storage sectors.

Toward this end, ACORE collaborated with BW Research Partnership (BW Research) to assess the current landscape for opportunities to diversify the U.S. utility-scale wind, solar and battery storage manufacturing supply chains.⁸ The study identifies existing MWBEs within these supply chains⁹ and considers the findings within the context of developer supplier selection practices and recent policy developments.

The purposes of this report are threefold:

- Engage with utility-scale developers to assess current procurement practices and evaluate where opportunities and challenges may exist for MWBE manufacturers.
- Identify MWBE manufacturers with U.S.-based operations in the utility-scale solar, wind and battery storage supply chains.
- Provide initial recommendations and opportunities to help expand MWBEs in the U.S. renewable energy and battery storage supply chains.

Key Findings

- While the study identified 658 manufacturers supporting the utility-scale wind, solar and battery storage sectors in the Tiers 1, 2, 3 and Support categories, only 12 can be categorized as MWBEs.¹⁰
- In a series of interviews, utility-scale developers in the solar, wind and battery storage sectors identified risk mitigation as the top priority when considering and prequalifying manufacturers. As a result, developers tend to rely on legacy relationships, particularly with original equipment manufacturers (OEM) and Tier

⁶ The White House. n.d. "Justice40: A Whole of Government Initiative". Accessed November 16, 2022. <https://www.whitehouse.gov/environmentaljustice/justice40/>

⁷ ACORE. "Accelerate Membership Program". Accessed November 8, 2022. <https://acore.org/accelerate/>

⁸ Refer to Appendix D for a discussion of the specific stratification of technologies that were considered for this report.

⁹ Ibid.

¹⁰ The study did not map Tier 2 and 3 manufacturers in the battery storage sector.

- 1 companies; express a preference for working with industry-recognized firms, which tend to be large, multinational corporations; and identify newcomers as higher risk.
- MWBEs can experience difficulties scaling their businesses past small business designation to meet manufacturing industry specifications and safety standards, due to a lack of access to capital and difficulties becoming a trusted supplier.
 - Identification of MWBE suppliers is a challenge across industries. The requirements for MWBE certification programs run by federal, state and private entities are often inconsistent, and the resulting reference lists of MWBEs are incomplete.
 - Awareness of MWBE suppliers among utility-scale wind, solar and battery storage developers is low, and many developers do not have a precedent for identifying and selecting MWBEs in their current procurement procedures.
 - Developers beginning to incorporate MWBEs in their supply chains cite the guidance of internal Diversity, Equity & Inclusion (DE&I) goals or the need to comply with government regulations. However, these developers are still in the early stages of executing such practices into their overall supplier selection processes with varying results. Methods include embedding diversity requirements in supplier bidding contracts, looking for U.S. Small Business Administration (SBA) certifications signifying MWBEs, and tracking MWBEs in their own internal databases.
 - Many utility-scale wind, solar and battery storage developers are more likely to perceive entry points for MWBEs further down in supply chains rather than as OEMs or Tier 1 suppliers. Some developers are reviewing their contractual terms with large equipment suppliers to accelerate MWBE uptake in the Tier 2 and Tier 3 manufacturing categories.
 - With the recent passage of the IRA, new domestic manufacturing bonus credits and other policies provide new opportunities for MWBEs and other market entrants to enter the renewable energy and battery storage supply chains.

Summary of Opportunities to Enhance Supply Chain Diversity in the Renewable Energy and Battery Storage Sectors

The study identifies three sets of opportunities: developing and supporting MWBEs to expand the supply of companies, connecting MWBE suppliers to downstream purchasers, and incentivizing and de-risking MWBE procurement. They are summarized here.

1. Developing and supporting MWBEs to expand the supply of companies. Due to a history of fragmentation, equity in the renewable energy industry will require a multi-pronged and sizeable investment to remedy. Specific suggestions include:

- Increase public funding for entrepreneurship centers, such as incubators and accelerators, with a specific emphasis on women and BIPOC founders and federally designated Minority Serving Institutions (MSIs)¹¹ to create new companies that can develop renewable energy and battery storage products.
- Enhance economic development grant and loan programs for business expansion and technical assistance to MWBEs looking to enter the renewable energy and battery storage markets.
- Develop public/private partnerships that leverage industry contacts and relationships to incubate new and expand existing suppliers.

2. Connecting MWBE suppliers to downstream purchasers in the renewable and battery storage sectors. Specific suggestions include:

- Develop and maintain a filterable, industry-wide, national database and clearinghouse of MWBE renewable energy and battery storage suppliers by type.
- Create a federal MWBE supplier certification program for public access.
- Identify venues and showcases for MWBEs to highlight their goods and services at trade events and conferences.
- Create and share best practices for developers to equitably incorporate MWBE manufacturers into their supply chains.

3. Incentivizing and de-risking procurement processes to address market challenges and promote support for MWBEs in the renewable energy and battery storage supply chains. Specific suggestions include the following:

- Enhance rebates, tax credits and other incentives for developers that meet minimum procurement targets for MWBE suppliers.
- Provide developers additional tax credits and incentives for partnering with MWBE suppliers and their goods.

¹¹U.S. Department of the Interior. n.d. "Minority Serving Institutions Program". Accessed October 25, 2022. <https://www.doi.gov/pmb/eeo/doi-minority-serving-institutions-program>

Introduction

As the U.S. renewable energy economy expands, intentional commitments for equitable economic and workforce development will be critical to achieving the nation’s just transition objectives and building a diverse domestic manufacturing supply chain.

Any current business owner will face various challenges to establishing a business in “non-traditional” industries; however, MWBE owners face additional challenges to business inception and growth.¹² While the number of MWBE firms has risen over the past decade, firms with MWBE owners are less concentrated in the professional, scientific and technical services, and construction sectors.¹³ MWBEs are especially underrepresented in the manufacturing sector, with minority-owned business enterprises (MBEs) accounting for 13 percent¹⁴ and women-owned businesses (WBEs) representing less than seven percent¹⁵ of U.S. manufacturing firms. In the utility-scale wind, solar and battery storage industries, developers report an interest in developing relationships with MWBE suppliers for manufactured products but are still in the early stages of diversifying their supply chains.¹⁶ With billions of dollars in forthcoming investments to these industries, it is imperative for the industry to reexamine diverse supplier policies and programs to increase the representation of MWBEs in the renewable energy and battery storage supply chains.

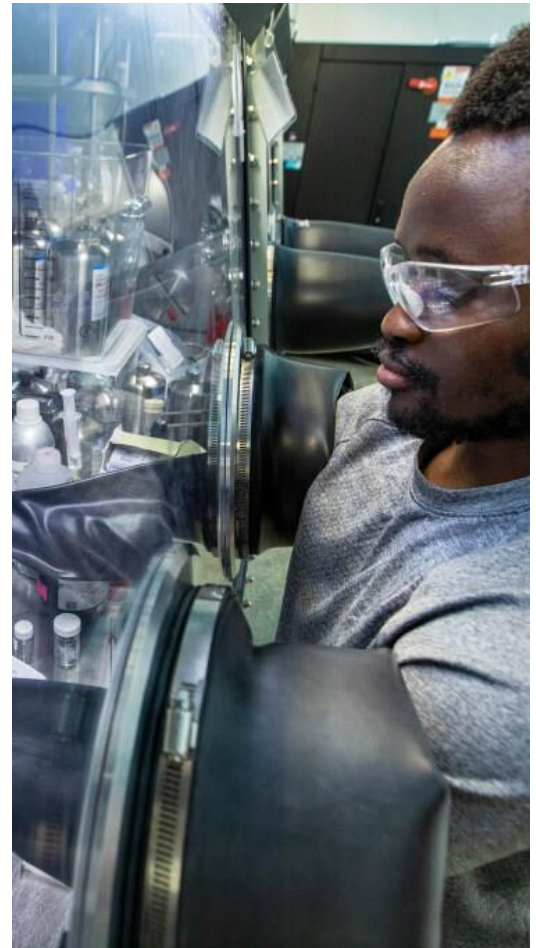


Photo by Werner Slocum, NREL 140327

¹³Toussaint-Comeau, M., and Williams, V. 2020. “Secular Trends in Minority-Owned Businesses and Small Business Finance”. ProfitWise News and Views, 2. Accessed October 25, 2022. <https://www.chicagofed.org/publications/profitwise-news-and-views/2020/secular-trends-minority-owned-businesses-small-business-finance>

¹⁴ Minority Business Development Agency. 2019. Accessed August 25, 2022. <https://www.mbda.gov/news/blog/2019/12/mep-national-networktm-connects-minority-owned-manufacturers>; IndustrySelect. 2022. Accessed September 9, 2022. <https://www.industryselect.com/blog/women-owned-manufacturers-key-facts-infographic>

¹⁵United States Census Bureau. 2021. “Women Business Ownership in America on the Rise”. Accessed October 25, 2022. <https://www.census.gov/library/stories/2021/03/women-business-ownership-in-america-on-rise.html>

¹⁶ Ludt, B. 2021. “SEIA Launches Solar Supplier Database of Minority-Owned Companies”. *Solar Power World*. Accessed October 25, 2022. <https://www.solarpowerworldonline.com/2021/06/seia-launches-solar-supplier-database-of-minority-owned-companies/>

While state and federal policies, investments and incentives can help boost the potential for diverse businesses to participate in the transition, a renewed focus on re-engineering industry practices can also help shed light on the opportunities available to incorporate equity in a meaningful way.



Supply Chain Landscape

The supply chain landscape for the utility-scale wind, solar and battery storage sectors has historically had limited points of entry for MWBE manufacturers, but opportunities are emerging as developers begin to integrate DE&I practices throughout their operations. This section discusses current MWBE participation in renewable energy and battery storage supply chains, along with utility-scale developers' procurement practices and supplier selection behaviors.

Refer to Appendices A. and B. for information on how the research team surveyed the supply chain landscape.

Current MWBE Participation in the Renewable Energy and Battery Storage Supply Chains

MWBEs in Supply Chains

U.S. manufacturing activity in the utility-scale wind, solar and battery storage sectors relies on connections with the global supply chain, and MWBE manufacturing activity is severely underrepresented. This study identified just 12 existing MWBEs in the manufacturing supply chains for the utility-scale wind, solar and battery storage industries. While the federal government has recently implemented initiatives for domestic manufacturing, it is unclear to what extent these initiatives will directly benefit MWBEs.

Refer to Appendix B. Database Findings:

U.S. MWBEs in the Supply Chain for results derived from the database creation and analysis exercise undertaken by the research team.



Barriers Facing MWBE New Entrants^{17, 18, 19, 20}

MWBEs face barriers to entry across industry sectors. Studies have demonstrated the gendered and racialized participation of businesses in specific industries due to multiple factors related to ideating and starting up businesses. In particular, MWBE startups often have limited access to the capital and credit needed to launch successful manufacturing enterprises. Institutional barriers, like inconsistent and patchworked systems across states, can also prevent MWBEs from scaling their businesses past small business designation to meet manufacturing industry specifications and safety standards.

Connectivity

Attaining federal, state and private certification requirements poses a significant challenge for MWBEs in any industry or sector. While the U.S. Small Business Administration, through the Business Development Program, supports small MWBEs when bidding for government contracts, qualifying businesses are required to demonstrate a two-year record to show potential success. While most state guidelines are similar to federal guidelines, certain documentation requirements vary from state to state. Requirements also differ across non-government certification entities like the National Minority Supplier Development Council (NMSDC) and Women's Business Enterprise National Council (WBENC). MWBEs must meet the challenge of qualifying for the differing certification requirements needed to match the standards of these certification entities. Renewable energy developers who rely on federal, state and other industry-recognized certificates therefore receive an incomplete picture of available MWBE suppliers.

Procurement Practices and Supplier Selection Behavior

The following section documents findings from interviews with utility-scale developers of wind, solar and battery storage projects on their supplier selection behaviors and how they incorporate MWBEs in their procurement and sourcing strategies.

Developers' Supplier Selection Processes and Criteria

Developers rely on pre-approved lists of or established relationships with vendors and suppliers. Having a list of pre-approved suppliers can streamline the supplier selection process, so utility-scale developers do not need to vet suppliers at the beginning of every project. For this reason, supplier relationships tend to be long-term with little turnover. One developer noted retaining the same suppliers for up to ten years. Many developers vet suppliers internally, though in some cases, they may obtain a supplier list from a trusted external source. One developer reported receiving a list from a project

¹⁷ Baboolall, David, Kelemwork Cook, Nick Noel, Shelley Stewart, and Nina Yancy. 2020. "Building supportive ecosystems for Black-owned U.S. businesses". McKinsey Institute for Black Economic Mobility. Accessed October 25, 2022. <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/building-supportive-ecosystems-for-black-owned-us-businesses>

¹⁸ U.S. Small Business Administration Office of Advocacy. 2020. "Frequently Asked Questions About Small Business". Accessed October 25, 2022. <https://cdn.advocacy.sba.gov/wp-content/uploads/2020/11/05122043/Small-Business-FAQ-2020.pdf>

¹⁹ U.S. Small Business Administration. 2021. "Women-Owned Small Business NAICS Analysis". Accessed October 25, 2022. <https://www.sba.gov/document/report-women-owned-small-business-naics-analysis>

²⁰ Minority Business Development Agency. 2016. "Contracting Barriers and Factors Affecting Minority Business Enterprises A Review of Existing Disparity Studies". Accessed October 25, 2022. <https://archive.mbda.gov/news/news-and-announcements/2017/01/contracting-barriers-and-factors-affecting-minority-business.html>

financier; another respondent refers to having master service agreements with select suppliers; another uses the database Jaeger²¹ for offshore wind suppliers.

Developers typically vet new suppliers for approval by requiring them to submit Requests for Proposals (RFPs) or Requests for Information (RFIs), which they use to evaluate and select suppliers to award project contracts. Developers typically evaluate RFPs/RFIs internally, though they may hire third parties as needed. Third parties, such as Refinitiv, can help developers assess equipment quality, such as modules, finances, technical due diligence, operational capability, and/or risk audits.

Developers may require companies to register in a database with built-in requirements prior to going through the bidding process. Two developers mentioned using Ariba²² as their supplier qualification system. Another developer referenced using Occupational Safety and Health Administration (OSHA) 300 logs to evaluate safety requirements.

MWBE designations are a low priority for most developers when selecting suppliers.

Developers primarily select suppliers based on their price competitiveness weighted against other critical criteria, such as safety compliance. Other supplier qualifications considered by developers include:

- Low credit, financial, safety, and operational risks
- Safety certifications, e.g., International Organization for Standardization (ISO), International Suppliers Network (ISN) certifications
- Insurance coverage
- Codes of conduct, e.g., background check policy, and drug standards to gain access to facilities
- Product quality, e.g., warranty, energy efficiency
- Reliability in project completion timelines

Developers typically do not consider the supplier's location or proximity to the project site as highly as other supplier qualifications. Generally, developers are willing to exchange the proximity of equipment for higher equipment quality, though noting that having nearby equipment suppliers can lower transportation-related costs and risks. However, developers did acknowledge the value of using local service providers, noting that the quality of services can increase due to local providers' knowledge of and relationships in the community.

Solar developers are more likely to cite concerns with the country of origin of their equipment suppliers than wind or battery storage developers. Solar developers referred to internal policies to not import equipment, such as modules and minerals like

²¹ JAEGER Group. n.d. "For More Power Offshore". Accessed October 18, 2022. <https://www.jaegergroup.com/en/solutions/industries/power-engineering/offshore/>

²² SAP Ariba. n.d. "Supplier Management Made Simple with Software and Solutions". Accessed October 18, 2022. <https://www.ariba.com/solutions/solutions-overview/supplier-management>

lithium, from sites where the equipment is made using forced labor or is from regions with tariffs.

Developer Selection Processes for MWBE Suppliers

Developers are in the early stages of formalizing strategies and governing documents to identify and include MWBEs in their supply chains. Some developers are overhauling their bid processes and contractual clauses to include DE&I targets and measures. While these developers intend to implement supplier diversity goals, they are still in the ideating stages of developing such targets.

Solar and wind developers that have begun incorporating MWBEs into their supply chains use differing approaches. Multiple utility-scale developers evaluate MWBE status during the process of reviewing RFPs or using a document to guide procurement and evaluate supplier qualifications. One developer uses a third-party to verify MWBEs in the factory-testing space. Another developer requires potential vendors to register in an online system that includes fields for company diversity requirements, including government-regulated requirements for supplier diversity, at the beginning of the bidding process. In this system, the company self-declares whether they meet the diversity requirements, but this developer intends to eventually implement a verification process requiring that vendors have relevant certifications. Another developer provides their Tier 1-category contractors with a list of vetted MWBE subcontractors to consider hiring for projects. One developer partnered with a corporate buyer to develop a scoring and selection process for MWBE contractors.

Developers value industry recognized MWBE certifications to identify and verify the ownership structures of MWBEs. Certifications include state-level certifications, like the Supplier Clearinghouse certification in California,²³ and SBA certifications.

Developers infrequently use databases to monitor or track MWBE suppliers. Several developers noted they are unaware of databases that store information on MWBEs. However, some interviewed companies use internally developed databases to track MWBEs and other suppliers or are aware of externally developed platforms. One developer mentioned starting an internal database as part of the supplier registration process. Another developer has clients who rely on a consultant to develop customized databases of MWBE suppliers.

However, solar developers demonstrated awareness of databases and other networks dedicated to tracking and certifying MWBEs.²⁴ Some solar developers are aware of the National Minority Supplier Development Council and the WBENC networks and utilize the supplier database developed by the Solar Energy Industries Association

²³ The Supplier Clearinghouse. n.d. Homepage. Accessed October 18, 2022. <https://sch.theupplierclearinghouse.com/>

²⁴ This includes councils and networks supporting members of the LGBTQ+ community, veterans, and people with disabilities.

(SEIA). An interviewed solar, wind and storage developer uses supplier.io²⁵ to identify MWBE manufacturers.

Government regulations have encouraged some developers to implement supplier diversity programs. Two developers — one in battery storage and one in both solar and wind — adhere to state-level mandates and have clauses to incorporate MWBEs in their supply chains.

To incentivize the diversity of their supply chain, one developer pays MWBEs earlier in the project timeline and awards multi-project contracts to provide certainty.²⁶

These practices provide increased financial certainty to their MWBE suppliers by paying the companies within ten days instead of the usual 30-60 days, so they do not require using credit to begin working on a project. The developer also awards companies multi-project contracts to improve the retention of the MWBE suppliers.

To address the connectivity issues described in the previous section, some developers directly assist MWBE suppliers in the certification process. A solar and wind developer proactively identifies MWBEs in their existing supplier database and provides them with the resources to acquire MWBE certification.

Developers' Suggestions of Points of Entry for MWBEs in the Supply Chain

Developers perceive entry points for MWBEs further down the supply chain.

Developers reported that there are few Tier 1 MWBEs because most of these companies are large, multinational corporations, particularly in the wind industry. Solar developers indicated opportunities for MWBEs in Tier 2 or Tier 3 spend categories for balance-of-plant subcomponents. Developers also identified professional services (e.g., engineering and aerial surveying), logistics, and operations and maintenance services as MWBE entry points into the renewable energy and battery storage industries. Downstream equipment suppliers include producers of controls, small electronic components, and accessory equipment for wind turbines.

Developers noted that initiatives to build out domestic clean energy supply chains are potential opportunities for MWBEs to enter the sector. In particular, one developer is seeking to develop domestic procurement channels for their company's equipment and is considering MWBEs as part of this process.

Developers meet potential MWBE suppliers via conferences and partnerships. A developer stated that most of their success meeting smaller suppliers has been through industry conferences, such as the Southeast Solar Conference and SEIA conferences. One developer recounted that a partnership with Volt Energy, a Black-owned independent

²⁵ Supplier.io. n.d. Homepage. Accessed October 18, 2022. <https://www.supplier.io>

²⁶ Albeit for construction contractors.

power producer (IPP), introduced the company to MWBE business networks. Another developer reported meeting MWBEs through the Black Owners of Solar Services (BOSS).



Findings & Opportunities

The U.S. energy sector is entering a period of rapid decarbonization. Federal policies – such as the Inflation Reduction Act, Infrastructure Investment and Jobs Act (IIJA), federal procurement initiatives, and executive orders – as well as state policies, such as New York’s Climate Leadership and Community Protection Act, are designed to both facilitate the rapid deployment of renewable energy and battery storage technologies, and to create local supply chains to support the domestic manufacturing of clean energy products.

At the same time, current U.S. supply chains for renewable energy and battery storage equipment are at various stages of maturity and still include a significant amount of imported goods from large, multinational public corporations. The policies will therefore usher in a period of opportunity for U.S. companies across the supply chains of renewable energy and battery storage goods and services.

The aforementioned policies also include significant goals for equitable economic development, highlighted by the Justice40 initiative,²⁷ which directs 40 percent of the overall benefits of certain federal investments to flow to disadvantaged communities. Based on the research for this report, bold investments and support will be needed to ensure rapid improvement in the number and size of MWBEs participating in the clean energy economy.



²⁷ The White House. n.d. "Justice40: A Whole of Government Initiative". Accessed November 16, 2022. <https://www.whitehouse.gov/environmentaljustice/justice40/>

There are relatively few MWBEs in the wind, solar and battery storage sectors, particularly manufacturing. The MWBEs that do participate in these supply chains can face significant challenges in starting and growing their businesses.

MWBE participation is further affected by issues with wind, solar and battery storage developers' processes to identify and general awareness of MWBEs. State and local governments have attempted to develop certification programs or databases, but these efforts are largely incomplete. Developers and downstream OEMs seek a more streamlined, searchable, and meaningful process for identifying MWBEs across categories. These firms also indicated needs within their own organizations for external guidance and the standardization of policies to support MWBE suppliers.

Finally, developers identified risk mitigation as the top priority when considering and prequalifying manufacturers. As a result, developers tend to rely on legacy relationships with well-established suppliers. Additionally, because the domestic supply chains are still developing and there are not many OEM and Tier 1 suppliers — particularly in wind — developers tend to choose industry-recognized firms, which tend to be large and multinational corporations, as a risk mitigation strategy.

To address these challenges, we recommend a multi-pronged strategy across government policies and private-sector practices. Given the depth of the obstacles, both short- and long-term policies are necessary that engage every level of government and businesses of all sizes.

Opportunities

Increasing the number and size of MWBEs in the industry to ensure there are adequate suppliers for downstream purchasers

- Increase public investment in entrepreneurship centers such as accelerators and incubators focused on minorities and women and anchored at Minority Serving Institutions, including Historically Black Colleges and Universities, Tribal Colleges, and many public and private universities that have particularly high minority enrollment. There are very few clean energy-focused incubators and accelerators at MSIs – the research could only identify one such center. The Department of Energy, as a start, should allocate 40 percent of its business support and university-focused research grants to principals and centers at MSIs.
- Enhance economic development grant and loan programs for business expansion and technical assistance to MWBEs looking to enter the renewable energy and battery storage markets. Most states that are aggressively pursuing clean energy economic development have targeted financial incentives to attract and grow businesses. These programs should actively recruit minorities and women to participate in their programs and set aside funds specifically for MWBEs.
- Develop public/private partnerships that leverage industry contacts and relationships to incubate new and expand existing suppliers. Developers, OEMs, utilities and other private sector firms can also develop and support company incubation. As the ultimate purchasers of the goods from upstream suppliers, these firms are uniquely positioned to support growth and build relationships with MWBEs. Companies can create entrepreneurship centers at MSIs and with other local entities that are specifically focused on their supply chain needs.

Connecting suppliers with downstream purchasers

- Develop and maintain a filterable, industry-wide, national database and clearinghouse of renewable energy and battery storage suppliers, by type. There is no national clearinghouse of MWBE suppliers for renewable energy and battery storage. Too often, purchasers operate from a limited pool of known partners, including a number from overseas. As purchasers look domestically, a current, useful listing of suppliers by type will be critical for expanding access to the bidding process.
- Create strict guidelines about what an MWBE is and what it is not, to help ensure that the goals of initiatives like Justice40 are met. The federal and state governments have differing standards on how to qualify a business as an MWBE. The Department of Energy should play a leading role in developing rigorous standards, providing technical support to businesses during the application process, and making the certified business list accessible so that it can be easily incorporated into business listings and bidders' lists.
- Highlight MWBE suppliers through industry associations. At events and conferences, industry associations could provide reduced booth rates for MWBEs, designate MWBEs in marketing materials, and create pavilion highlights for MWBE suppliers. These actions can help purchasers more easily identify MWBEs with which they can partner.
- Create and share best practices for developers to incorporate MWBE manufacturers into their supply chains. While there may not be a one-size-fits-all approach, developers could benefit from hearing about other supplier diversity practices in the renewable energy and battery storage sectors.

Addressing market challenges by providing key support for MWBEs already in the supply chain

- Enhance rebates, tax credits and other incentives for developers that meet minimum procurement targets for MWBE suppliers. Purchasers have noted that the relative maturity and experience of MWBEs introduce an element of risk and additional expense to the project bids. Linking incentives to MWBEs ensures that companies that invest time and resources to develop relationships with MWBEs are not at a competitive disadvantage to companies that do not invest in those resources. Consistent requirements and incentives de-risk supplier selection behavior by leveling the playing field.
- Provide additional tax credits and incentives for developers to use MWBE suppliers and their goods. Direct incentives drive down prices, making project bids more competitive. Making MWBE-procured goods more cost effective through tax rebates and credits will help to support the market for goods from MWBE suppliers available in the marketplace.

Conclusion

In the wake of IRA enactment, we have today a critical opportunity for progress toward the parallel goals of realizing a domestic clean energy manufacturing base and meaningfully advancing our sector's diversity, equity and inclusion priorities. ACORE looks forward to working with policymakers, utility-scale developers and MWBEs in executing these recommendations and other efforts to expand the diversity of the domestic renewable energy and battery storage supply chains.

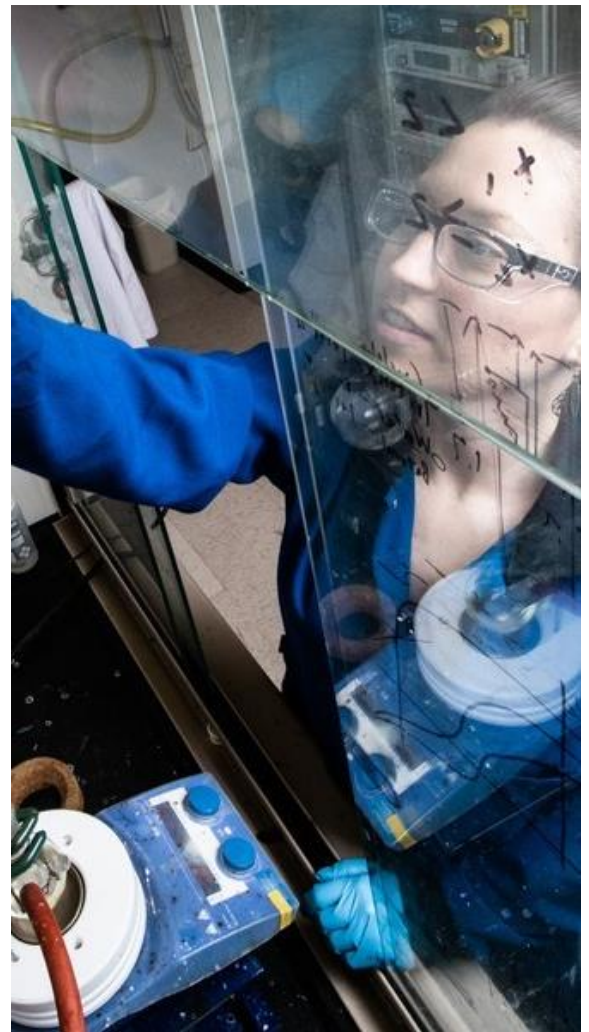


Photo by Dennis Schroeder, NREL 110231

Appendix A. Methodology & Definitions

Overview of Methodology

The research team conducted an initial review of existing literature on the utility-scale wind, solar and battery storage supply chains in the U.S. to develop a tier system against which to match manufacturers. The research process consisted of developing a database of 658 manufacturing firms in, or adjacent to, the wind, solar and battery storage industries. Firms were matched to different Tiers – including OEMs, Tier 1, Tier 2, Tier 3 and Support categories – which are identified in Appendix D. Tier System.

For battery storage, the team developed a Tier system that did not account for raw material production which would have been Tier 3. Tier 2 companies would include refined materials and electrolyte components, but there were no U.S.-based companies identified through this analysis in these industries. Thus, battery storage firms are matched within OEM, Tier 1 and Support in our manufacturer database.

To identify MWBEs in the database, the research team conducted desktop research to collect information on companies and identify characteristics. To confirm the research team’s findings, a web and phone survey was conducted to fill in gaps and understand different aspects of wind, solar and battery storage industry suppliers (including MWBEs). A total of 39 manufacturers responded to the survey.

Concurrently, the research team conducted 20 qualitative interviews with utility-scale developers in solar, wind, and battery storage to determine their supplier selection behavior and how much MWBE incorporation there is in procurement and sourcing strategies.

Terms and Categories

Minority- and Women-owned Business Enterprises^{28,29,30,31}

This report focuses on small, closely held, for-profit enterprises with U.S. manufacturing operations that are owned by U.S. citizens who are women, racial and ethnic minorities, or belong to both groups. For a business to be certified as a Women-owned Business Enterprise, the business must be at least 51 percent owned by one or more women. For a business to qualify as a Minority-owned Business Enterprise, the firm must be at least 51 percent owned or controlled by one or more people who can identify as socially and economically disadvantaged; this includes race and ethnic origin as distinguishing features.

²⁸ U.S. Small Business Administration. n.d. "Women-Owned Small Business Federal Contracting Program". Accessed October 18, 2022. <https://www.sba.gov/federal-contracting/contracting-assistance-programs/women-owned-small-business-federal-contracting-program>

²⁹ U.S. Small Business Administration. n.d. "Minority-Owned Businesses". Accessed October 18, 2022. <https://www.sba.gov/business-guide/grow-your-business/minority-owned-businesses>

³⁰ National Minority Supplier Development Council. n.d. "MBE Certification." Accessed October 18, 2022. <http://nmsdc.org/mbe-certification-2/>

³¹ National Archives. n.d. "Code of Federal Regulations: Business Development." Accessed October 25, 2022. <https://www.ecfr.gov/current/title-13/chapter-I/part-124/subpart-A>

Renewable Energy Industries

Based on energy industry reports released by the Department of Energy (DOE)³² and the National Renewable Energy Laboratory (NREL),^{33,34} the research team analyzed specific technology foci as defined below engaged in utility-scale development:

- **Solar:** this study focuses on crystalline silicon (c-Si) photovoltaic (PV) modules, which represent over 90 percent of the market.³⁵
- **Wind:** refers to both land-based and offshore wind.
- **Battery Storage:** refers to lithium-ion battery storage technology.

³² U.S. Department of Energy Office of Policy. n.d. "Securing America's Clean Energy Supply Chain." Accessed October 18, 2022. <https://www.energy.gov/policy/securing-americas-clean-energy-supply-chain>

³³ Woodhouse, Michael A., Smith, Brittany, Ramdas, Ashwin, and Margolis, Robert M. 2019. "Crystalline Silicon Photovoltaic Module Manufacturing Costs and Sustainable Pricing: 1H 2018 Benchmark and Cost Reduction Road Map". Accessed October 25, 2022. <https://www.osti.gov/biblio/1495719/>

³⁴ Smith, Brittany, and Margolis, Robert M. 2019. "Expanding the Photovoltaic Supply Chain in the United States: Opportunities and Challenges". Accessed October 25, 2022. <https://doi.org/10.2172/1547262>. <https://www.osti.gov/servlets/purl/1547262>.

³⁵ Ibid., p.5

Appendix B. Database Findings: U.S. MWBEs in the Supply Chain

Through a reiterative database development process, the research team identified a total of twelve (12) MWBEs involved in manufacturing activities for the utility-scale solar, wind and battery storage sectors. The following section provides a breakdown of these companies.

The database consists of 658 U.S.-based firms with manufacturing activities directly serving, or related to, the solar, wind and battery storage industries.

This is not an exhaustive list, and other MWBE companies may exist that were not identified through the research. Other MWBEs in the wind, solar and battery storage manufacturing supply chains who are not represented below can contact ACORE.

Solar

The team identified a total of eight (8) MWBEs in the utility-scale solar manufacturing supply chain.

One (1) California-based business involved in producing sheet metal and plastic products that can be used in solar paneling is both minority- and women-owned.

The minority-owned businesses are located in California (1), Texas (1) and Washington (1). Manufacturing activities range from producing electronics that are used in various devices, producing mounting and racking systems, and producing cabling and connector solutions for the solar industry.

The women-owned businesses are located in California (1), Illinois (1) and Ohio (1). One solar WBE manufactures solar tracker systems and another produces power conversion equipment. Two solar companies manufacture products that may provide support to the solar sector and other industries, e.g., sheet metal and plastic products, and silicone-based greases and compounds.

Wind

The team identified one (1) women-owned business in the wind manufacturing supply chain. The company manufactures custom components for the wind industry, including template rings, concrete forms, shim packs and other equipment.

Battery Storage

The team identified a total of three (3) MWBEs with battery storage manufacturing capabilities, although two currently operate in industries outside of the electricity sector. One (1) Florida business involved in producing lithium-ion batteries, among other energy power products, is both minority- and women-owned. This is also the only women-owned enterprise in the database.

The other two minority-owned businesses are located in California (1) and Indiana (1). Both companies produce battery packs, albeit with different sector interests in transportation and heavy equipment operation respectively.

Appendix C. Bibliography

- Baboolall, David, Cook, Kelemwork, Noel, Nick, Stewart, Shelley and Yancy, Nina. 2020. "Building Supportive Ecosystems for Black-owned U.S. Businesses". *McKinsey Institute for Black Economic Mobility*. Accessed October 25, 2022. <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/building-supportive-ecosystems-for-black-owned-us-businesses>
- BloombergNEF. n.d. Power Purchase Agreements (PPAs) database. Accessed April 21, 2022. <https://www.bnef.com/interactivedatasets/2d5d59acd9000022>
- Clean Energy States Alliance. n.d. "100% Clean Energy Collaborative - Table of 100% Clean Energy States". Accessed May 6, 2022. <https://www.cesa.org/projects/100-clean-energy-collaborative/guide/table-of-100-clean-energy-states/>
- Department of Energy. 2022. "U.S. Energy & Employment Jobs Report". Accessed November 16, 2022. https://www.energy.gov/sites/default/files/2022-06/USEER%202022%20National%20Report_1.pdf
- Energy Information Administration. n.d. "EIA projects that renewable generation will supply 44% of U.S. electricity by 2050". Accessed March 18, 2022. <https://www.eia.gov/todayinenergy/detail.php?id=51698>
- Fingersh, L, Hand, M, and Laxson, A. 2006. "Wind Turbine Design Cost and Scaling Model". Accessed October 25, 2022. <https://doi.org/10.2172/897434>. <https://www.osti.gov/servlets/purl/897434>.
- Fingersh, L., Hand, M., & Laxson, A. 2006. "Wind Turbine Design Cost and Scaling Model". (NREL/TP-500-40566; p. NREL/TP-500-40566). Accessed November 16, 2022. <https://doi.org/10.2172/897434>
- Frequently Asked Questions About Small Business". n.d. Accessed October 25, 2022. <https://cdn.advocacy.sba.gov/wp-content/uploads/2020/11/05122043/Small-Business-FAQ-2020.pdf>
- Homepage. n.d. Accessed October 18, 2022. Accessed October 18, 2022. <https://www.supplier.io>
- House of Representatives. 2022. "H.R. 5376". Accessed December 12, 2022. <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>
- JAEGER Group. n.d. "For More Power Offshore". Accessed October 18, 2022. <https://www.jaegergroup.com/en/solutions/industries/power-engineering/offshore/>
- Ludt, B. 2021. "SEIA Launches Solar Supplier Database of Minority-Owned Companies". *Solar Power World*. Accessed October 25, 2022. <https://www.solarpowerworldonline.com/2021/06/seia-launches-solar-supplier-database-of-minority-owned-companies/>
- Minority Business Development Agency. 2016. "Contracting Barriers and Factors Affecting Minority Business Enterprises A Review of Existing Disparity Studies". Accessed October 25, 2022. <https://archive.mbda.gov/news/news-and-announcements/2017/01/contracting-barriers-and-factors-affecting-minority-business.html>
- Minority Business Development Agency. 2019. "The MEP National Network™ Connects with Minority Owned Manufacturers." Accessed October 25, 2022. <https://www.mbda.gov/news/blog/2019/12/mep-national-networktm-connects-minority-owned-manufacturers>
- National Archives. n.d. "Code of Federal Regulations: Business Development." Accessed October 25, 2022. <https://www.ecfr.gov/current/title-13/chapter-I/part-124/subpart-A>
- National Minority Supplier Development Council. n.d. "MBE Certification." Accessed October 18, 2022., from <http://nmsdc.org/mbe-certification-2/>

SAP Ariba. n.d. "Supplier Management Made Simple with Software and Solutions". Accessed October 18, 2022., from <https://www.ariba.com/solutions/solutions-overview/supplier-management>

Smith, Brittany, and Margolis, Robert M. 2019. "Expanding the Photovoltaic Supply Chain in the United States: Opportunities and Challenges". Accessed October 25, 2022. <https://doi.org/10.2172/1547262>. <https://www.osti.gov/servlets/purl/1547262>.

Supplier.io. n.d. Accessed November 16, 2022. <https://www.supplier.io/>

The Supplier Clearinghouse. n.d. Homepage. Accessed October 18, 2022. <https://sch.thesupplierclearinghouse.com/>

The White House. n.d. "Justice40: Whole-of-government Initiative." Accessed October 26, 2022. <https://www.whitehouse.gov/environmentaljustice/justice40/>

Toussaint-Comeau, M., and Williams, V. 2020. "Secular Trends in Minority-Owned Businesses and Small Business Finance". *ProfitWise News and Views*, 2. Accessed October 25, 2022. <https://www.chicagofed.org/publications/profitwise-news-and-views/2020/secular-trends-minority-owned-businesses-small-business-finance>

U.S. Department of Energy Office of Policy. n.d. "Securing America's Clean Energy Supply Chain." Accessed October 18, 2022. <https://www.energy.gov/policy/securing-americas-clean-energy-supply-chain>

U.S. Small Business Administration. 2021. "Women-Owned Small Business NAICS Analysis". Accessed October 25, 2022. <https://www.sba.gov/document/report-women-owned-small-business-naics-analysis>

U.S. Small Business Administration. n.d. "Women-Owned Small Business Federal Contracting Program". Accessed October 18, 2022. <https://www.sba.gov/federal-contracting/contracting-assistance-programs/women-owned-small-business-federal-contracting-program#section-header-4>

U.S. Small Business Administration. n.d. "Minority-Owned Businesses". Accessed October 18, 2022. <https://www.sba.gov/business-guide/grow-your-business/minority-owned-businesses>

United States Census Bureau. 2021. "Women Business Ownership in America on the Rise". Accessed October 25, 2022. <https://www.census.gov/library/stories/2021/03/women-business-ownership-in-america-on-rise.html>

Woodhouse, Michael A., Smith, Brittany, Ramdas, Ashwin, and Margolis, Robert M. 2019. "Crystalline Silicon Photovoltaic Module Manufacturing Costs and Sustainable Pricing: 1H 2018 Benchmark and Cost Reduction Road Map". Accessed October 25, 2022. <https://www.osti.gov/biblio/1495719/>.

Appendix D. Tier System

Table 1. Solar Manufacturer Tier System by Items Sold

Tier	Generalized Category	Item
OEM	Whole Product	Full solar array
Tier 1	Whole Product/Array Components	Solar modules/panels
		Mounting and/or tracking systems
Tier 2	Module/Panel Components	Individual solar cells
		Circuit ribbons
		Frame (usually aluminum)
		Junction box
		Adhesive (usually silicon)
		Frontsheet/pane (glass, ceramic, etc.) – substrate
		EVA (ethylene-vinyl acetate) layers: “a key encapsulation material”
		Metal “fingers” and “busbars” / Metal conductors
		Backsheet (usually weatherproof sheet) – substrate
	Mounting Components	Mounts
		Vertical posts to angle the panel/array
		Top bar to connect vertical posts
		Steel channels to screw together individual modules to create array
		Concrete to secure vertical posts*
Tier 3	Individual Solar Cell Components	Wafers
		Sealant (e.g., Silicon Nitride)
		Anti-reflective coating (e.g., Silver paste)
	Junction Box Components (source: BGA) & General Electrical Systems	Transformer
		Inverter (to convert power and connect to grid)
		Blocking diode/semiconductor/transistor
		Charge controller
		Circuit breaker
		Switch gear
		Wiring
		Battery*
	Materials	Aluminum
		Steel
		Fiberglass
		Ceramics
Glass		
	Metals, alloys, oxides	

		Thermoplastics, polymer materials (used for backsheets and encapsulant layers)
	Assembly Components	Connectors
		Valves
		Tubing
Tier 4	Wafer Components	A source of carbon (to heat with silica sand to make silicon)
		Silica sand
		Boron (to blend with the metallurgical grade silicon/silicon ingot)
		Phosphorus (to blend with the metallurgical grade silicon/silicon ingot)
Support	Industry-Adjacent Products	Cables
		Tab wires
		Steel bolts
		Nuts & bolts
		Construction equipment
		Manufacturing equipment (e.g., compressors, vacuum pumps, etc.)
		Testing and R&D
		Instruments - measuring, laser, flow & pressure
		Electrical actuator
		Solar heating & cooling
		Energy storage
		Roofing systems
		Sensors, software, and monitoring

Table 2. Wind Manufacturer Tier System by Items Sold

Tier	Generalized Category	Item
OEM	Whole Product	Turbine
Tier 1	Main Components	Foundation
		Tower
		Rotor hub
		Rotor blades
		Nacelle
Tier 2	Nacelle Components	Generator
		Electrical components
		Drive train
		Inverters
		Gearbox
		Monitoring, communication, and environmental maintenance gear
		Tuned mass dampers
		Weatherproof fiberglass gondola

	Offshore Foundation	Monopiles
		Transitional piece
		Floating base & steel ropes*
	Land Foundation	Concrete
		Metal hooks ("Uplift Anchors" foundation)*
		Metal geopiler ("Long Metal Geopilars" foundation)*
	Blade Components	Either aluminum, lightweight wood, or fiberglass
		Guide pins for connecting the blades
		Fiberglass-resin composite mixture & mold for fiberglass blades
	Tower Components	Steel
Tier 3	Transitional Piece Components	Steel
		Paint/dye for bright colored offshore transitional piece
	Monopile Components	Steel
	Nacelle Subcomponents	Drive train
Support		Nuts & bolts
		Cables

Table 3. Storage Manufacturer Tier System by Items Sold

Tier	Generalized Category	Item
OEM	Whole Product	Battery
Tier 1	Subcomponent	Separator
		Electrolyte
		Anode
		Cathode
		Cell housing
		Conductive binder for electrode manufacturing in battery cell
Support	Industry-Adjacent Products	Battery backup technology
		Battery maintenance/repair
		Other battery services (non-lithium-ion batteries)
		Solar panel energy storage & related functions
		Battery store/reseller
	Electrolyte Components	Manufacturing services

*Indicates an item sources refer to as an optional component for the generalized category with which it is associated.



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