ORECRFP22-1 Preliminary Determination Memorandum
Public Service Law (PSL) § 66-r (the New York "Buy-American" law)

1. Purpose of This Document

NYSERDA's preliminary determination with respect to U.S. iron and steel for purposes of Request for Proposals ORECRFP22-1 is described in Section 3.b. of ORECRFI22-1 Summary of Material Changes and Focus Areas and set forth in full in Section 2.2.4 of DRAFT-Request for Proposals (ORECRFP22-1). NYSERDA is providing additional details relating to that preliminary determination for further evaluation and feedback.

2. Executive Summary

- Public Service Law (PSL) § 66-r (the New York "Buy-American" law) requires that certain iron and steel used in certain state-supported offshore wind facilities be sourced domestically unless the head of the applicable state entity concludes that the requirement is not in the public interest for a particular procurement.
- The assessment as to whether the requirement is in the public interest must be conducted prior to each procurement and included in the procurement itself.
- NYSERDA commissioned such an assessment and determined that due to lack of availability and increased costs, including the requirement in ORECRFP22-1 would not be in the public interest.
- The assessment showed that for a suite of projects with an aggregate generation capacity of 4,640 MW, imposing the requirement would be expected to lead to incremental capital expenditure costs ranging from $475 million to $1.9 billion for only a portion of the structural steel required. These incremental costs would ultimately be borne by the ratepayers of the State of New York.
- Despite these findings, NYSERDA continues to strive to support the development of a domestic supply chain for offshore wind through a number of requirements and incentives in its Offshore Wind Program, including economic benefits evaluation points dedicated to the sourcing of domestic iron and steel- including both structural and non-structural components.

3. New York Buy American Law and Policy

PSL § 66-r (the New York "Buy-American" law) was enacted into law on April 16, 2021 and applies to certain procurements issued after October 1, 2021.

Section (4) (a) of PSL § 66-r requires that public entities must include in any "contract for construction, reconstruction, alteration, repair, improvement or maintenance" of a covered renewable energy system (including offshore wind facilities) a provision requiring that "the iron and structural steel used or supplied in the performance of the contract or any subcontract thereto and that is permanently incorporated into the public work, shall be produced or made in whole or substantial part in the United States, its territories or possessions."

Note, the Offshore Wind Renewable Energy Certificate ("OREC") Purchase and Sale Agreements that will be entered into with awardees under from ORECRFP22-1 are for the purchase and sale of ORECs, and strictly speaking it is not clear that they constitute contracts "for construction,

reconstruction, alteration, repair, improvement or maintenance" subject to the exact words of PSL §66-r (4) (a). Notwithstanding this, NYSERDA has fully embraced the substance of PSL §66-r and is proceeding on the basis that it applies to the contracts to be awarded under ORECRFP22-1.

4. Public Interest Review Contemplated by PSL §66-r

Section (4) (b) of PSL §66-r states that the requirement to include a contractual provision mandating use of U.S. iron and steel described in Section (4) (a) **shall not apply** "if the head of the department or agency constructing the public works, in his or her sole discretion, determines that the provisions would not be in the public interest, would result in unreasonable costs, or that obtaining such steel or iron in the United States would increase the cost of the contract by an unreasonable amount, or such iron or steel, including without limitation structural iron and structural steel cannot be produced or made in the United States in sufficient and reasonably available quantities and of satisfactory quality."

The section goes on to state that "[t]he head of the department or agency constructing the public works shall include this determination in an advertisement or solicitation of a request for proposal, invitation for bid, or solicitation of proposal, or any other method provided for by law or regulation for soliciting a response from offerors intending to result in a contract pursuant to this subdivision."

Notably, this requirement in PSL §66-r – that the public interest review be completed, and a determination made, at the time the procurement is issued – is different from the approach taken in other similar statutes. For example, New York State Finance Law § 146 and Public Authorities Law § 2603-a do not include this timing requirement. Similar federal statutes such as the Buy America Act (49 U.S.C § 5323(j)) expressly contemplate waiver processes that can be issued at any time, which differs from the pre-procurement review mandated by PSL §66-r.

The timing of the determination required by PSL §66-r is understandable given the character of NYSERDA's renewable energy certificate (including OREC) procurements. In these procurements, proposers submit OREC prices that will apply to 20-25 years of monthly payments that will begin only after the offshore wind facility has been constructed and is producing renewable energy. This procurement approach places development and cost risk on offshore wind developers and requires that proposers build their risk-adjusted expected costs into their bid pricing, which is provided many years before any contractual payments are made by NYSERDA.

Because the OREC prices are set at this stage of the process, not at the time selected proposers take bids for construction of the project, the determination as to whether the requirement to use U.S. iron and steel will apply must also be made at this stage so that pricing committed to by proposers can appropriately reflect the determination.

A new feasibility study, a public interest review, and a determination will be required for each procurement and include the latest data and analysis for consideration.

5. Review Conducted by NYSERDA

In accordance with PSL §66-r (4) (b), NYSERDA conducted a preliminary assessment as to whether requiring U.S. structural iron and steel in ORECRFP22-1 "would not be in the public interest, would result in unreasonable costs, or that obtaining such steel or iron in the United States would increase the cost of the contract by an unreasonable amount, or such iron or steel, including without limitation structural iron and structural steel cannot be produced or made in the United States in sufficient and reasonably available quantities and of satisfactory quality."

To conduct this assessment, NYSERDA engaged the advisory firm Advisian to study, among other questions, (i) the availability of domestic structural iron and steel for the purposes required by the types of offshore wind facilities to be awarded in ORECRFP22-1, and (ii) the expected impact on costs of using only domestic, as opposed to globally sourced, structural iron and steel in offshore wind facilities awarded in ORECRFP22-1.

This assessment also required defining "structural" iron and steel for purposes of ORECRFP22-1, as the phrase is not defined in PSL § 66-r. To do so, NYSERDA consulted similar New York State statutes, such as State Finance Law § 146 (and its recently repealed predecessor), as well as guidance issued and practices followed by other New York State agencies. NYSERDA found that in these contexts, the phrase is generally understood to mean steel comprising the load-bearing components necessary to provide support to the constructed asset.

In the context of ORECRFP22-1, NYSERDA found that "structural" iron and steel subject to PSL §66-r include: (1) the tower supporting the turbine, inclusive of any platforms, transition pieces, or other similar structural elements permanently affixed to the tower; (2) elements incorporated into or comprising the foundation supporting the tower, including a steel monopile or reinforcing iron or steel; (3) reinforcing iron or steel incorporated into or supporting the foundation of any offshore substation; and (4) reinforcing iron or steel incorporated into the offshore substation topside which houses the electrical equipment.

Similarly, NYSERDA determined that the following components are *operational* by nature and are therefore not "structural" iron or steel components that are "permanently incorporated" into an offshore wind project, and therefore are not subject to the PSL §66-r: (1) rotor hub; (2) main shaft; (3) main frame (transition from nacelle to tower; (4) yaw system; (5) rotor blades; (6) rotor bearings; (7) gearbox; (8) generator; (9) pitch system; (10) power converter (11) transformer; (12) brake system; (13) nacelle housing; (14) electrical equipment; and (15) cables, screws, and other fasteners.

6. Study Results

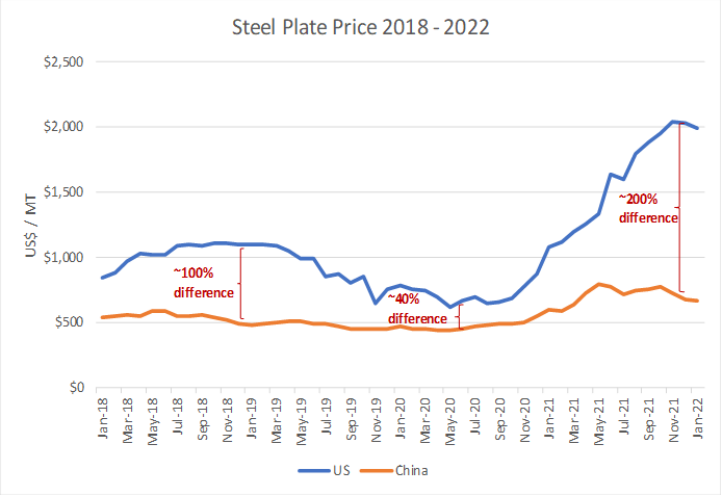
A summary of findings prepared by Advisian for NYSERDA is attached hereto as the Appendix to this document.[1]

[1] Advisian's findings were based on assumptions relating to the nameplate capacity of the turbines (10MW) and project sizes of 400MW-1,000MW. These assumptions do not necessarily reflect industry advancements where turbine sizes for offshore wind projects procured in 2022 may be substantially larger. Advisian's study is supported by available data collected from projects that have been constructed and does not speculate on

With respect to availability, monopile foundations for wind turbines and offshore substations typically utilize S355ML steel plate originating from a continuous casting mill that produces steel slab of 15+ inches, which is then "hot-rolled" to produce thick plate that meets industry reduction ratios. The produced plate width exceeds 13 feet, and plates typically weigh over 30 tons. NYSERDA and Advisian were unable to identify any U.S. steel mill capable of producing steel slab/plate that fits this specification. The steel plate required for tower fabrication is not currently produced domestically but is expected to be manufactured at a new facility currently under construction (to be completed in late 2022) in Brandenburg, Kentucky. NYSERDA understands that this facility will be able to produce continuously cast steel slab between 8 and 12 inches thick, and over 13 feet wide. However, the timing, quantity, and cost of steel produced from that facility are not yet known. In addition, it is not yet known what specifications will be required for steel incorporated in foundations and towers to support the larger emerging technology turbines.

Other structural iron and steel components such as the tower, offshore substation foundation, and offshore substation topside, may be available from a limited number of domestic supplier(s), as further described in pages 17-19 of Advisian's summary findings.

As to costs, U.S. steel prices have recently seen dramatic increases and have greatly expanded the cost differentials between foreign and domestic steel, as illustrated in the following graph on page 20 of Advisian's summary findings:



Source: http://steelbenchmarker.com/history.pdf

potential changes in the relative tonnage of steel required per MW under future designs. NYSERDA acknowledges that more megawatts could be hosted on fewer, larger and more robust structures, but how much less or additional steel will be required to support these emerging technologies is not readily available; potential variations resulting from this issue are expected to be captured in the low and high range estimates.

As set forth on page 22 of its summary findings, Advisian estimates that the incremental cost of utilizing U.S. structural iron and steel for the tower, offshore substation topside and offshore substation foundations for facilities awarded under ORECRFP22-1 is likely to be between $98,000/MW and $393,000/MW compared to globally sourced structural iron and steel. For a suite of projects with an aggregate generation capacity of 4,640 MW[2], this translates to additional capital expenditure costs ranging from $475 million to $1.9 billion[3]. It should be noted that these costs do not include the incremental costs of tower foundations or any other structural steel that would be necessary for the full construction of a project.

These costs also do not include the risk premia that proposers would be expected to add into their bids given the uncertainty of future pricing in a limited market or how developers would amortize these costs over the life of the project. Notably, Advisian's study showed significant price volatility in both the U.S. and global steel markets, highlighting great uncertainty regarding future steel prices and the ultimate impact of mandating the use of domestic steel. The costs associated with this additional capital expenditure and risk premium would be passed on to New York State ratepayers through higher OREC prices.

7. NYSERDA Public Interest Findings and ORECRFP22-1 Approach

NYSERDA is committed to carrying out procurements of renewable energy certificates, including ORECRFP22-1, in a manner designed to responsibly meet the mandates of the Climate Act, which include the deployment of 9GW of offshore wind by 2035. Development of offshore wind projects is challenging and complex, and the costs of NYSERDA's procurements of ORECs are ultimately borne by ratepayers across New York State through electricity bills. NYSERDA therefore takes seriously, as the Public Service Commission requires it to, all procurement design decisions that may affect the cost to ratepayers or the viability of offshore wind projects. This is fundamentally the same lens through which PSL §66-r requires NYSERDA to assess whether requiring the use of U.S. structural iron and steel is in the public interest. In the case of ORECRFP22-1, NYSERDA's preliminary finding is that it is not.

Specifically, based on the study results described above, NYSERDA has determined that steel plate with the necessary thickness, dimension, and strength properties used to manufacture monopile foundations cannot be produced or made in the United States in sufficient and reasonably available quantities without incurring unreasonable expense. Furthermore, for other structural iron and steel subject to §66-r, NYSERDA has determined that requiring all structural iron or steel to be sourced domestically would not be in the public interest, as it may result in unreasonable increased costs and schedule delays, and the limited availability of large-dimensioned (length, width, and thickness) heavy steel plate may negatively impact offshore wind project cost and schedule. Accordingly,

[2] This is the amount of additional offshore wind capacity that needs to be procured for New York State to meet its nation-leading goal to deploy 9,000 MW of offshore wind capacity by 2035.

[3]This is derived from steel plate pricing ranging from $457-$845/ton in international markets (including $20-$50/ton for shipping), and $620-$2,042/ton in US markets.

NYSERDA's preliminary determination has concluded that it would not be in the public interest to require that projects be required to domestically source all structural iron and steel subject to §66-r.

Despite these findings, however, NYSERDA continues to strive to support the development of a robust domestic supply chain for offshore wind through a number of requirements and incentives in its Offshore Wind Program, including the deployment of the $500 million investment in offshore wind ports and supply chain infrastructure proposed in the 2022-23 Executive Budget.

In ORECRFP22-1, NYSERDA is proposing to establish a first-of-its kind incentive for the use of U.S. iron and steel in offshore wind projects, extending additional scoring credit for economic benefits that accrue to any domestic supplier, even those located outside of New York State. Structuring this component of the procurement as an incentive rather than a mandate greatly mitigates the concerns regarding cost and project viability described above while still creating an additional commercial motivator for developers to use iron and steel sourced in the United States where available.

In particular, the draft ORECRFP22-1 provides that proposals with commitments to utilize domestic steel for any components of the project – both structural and non-structural – will receive additional scoring credit in the category of economic benefits, which makes up 20% of the aggregate score.

Claimed expenditures associated with purchasing commitments for U.S. Iron and Steel will be entered in the OREC Purchase and Sale Agreement as "Expected U.S. Iron and Steel Dollars", which will be a subset of "Expected Total Dollars" that will be given greater weight in scoring. NYSERDA will hold developers accountable to their commitments contractually by comparing the Verified U.S. Iron and Steel Dollars against the Expected U.S. Iron and Steel Dollars, and should the Verified U.S. Iron and Steel Dollars fail to total at least 85% of the Expected U.S. Iron and Steel Dollars, the developer will be required to make additional investments or pay damages. This approach goes beyond the scope of "structural" iron and steel analyzed for purposes of PSL §66-r and would apply to any iron and/or steel utilized by the project.

8. Next Steps

NYSERDA encourages all interested stakeholders to submit comments on this topic in the manner described in ORECRFI22-1 Summary of Material Changes and Focus Areas. NYSERDA will make a final determination on this matter when ORECRFP22-1 is issued.

Appendix
Advisian Summary of Findings

Buy American Determination Study for Offshore Wind

Final Report

NYSERDA

January 2022

Advisian
Worley Group

Table of Contents

Executive Summary

From the analysis captured in this document, Advisian has summarized some key findings for consideration as NYSERDA decides how to best implement the New York Buy American Act

- Steel production and manufacturing is a global market and is largely commoditized. Further, the global supply chain is complicated by the fact that standard alloys and forms of steel (i.e., billets, ingots, etc.) can be shipped internationally for further forming into final products.
  - Developers will want to know where NYSERDA begins "Buy American" requirements – at the site of fabrication or at the mill
- Not only has the steel market (like other commodities) seen drastic price volatility over the past 2 years, but has also seen substantial volatility historically, both in $/ton prices as well as spreads between prices in different countries of production
  - Additionally, prices are subject to policy changes both in the U.S. and abroad, as well as changes in currency exchange rates
- Barriers to entry for *steel production* are high but barriers to entry for *component fabrication* are low and can be overcome by state-level incentives i.e., state building authority bonds, etc.

Note: All sources and notes for each slide are at the end of the presentation

Objectives and Structural Steel Definition and Components

Overview & Objectives

- In 2021 New York State Public Service Law (PSL) § 66-r (4) was enacted, the Buy-American Act
  - Applies to public entity contracts for "construction, reconstruction, alteration, repair, improvement or maintenance of a covered renewable energy system which involves the procurement of a renewable energy credits agreement by a public entity."
  - Requirement is for "iron or structural steel used of supplied in the performance of the [contract…] and that is permanently incorporated into the public work, [be] produced or made in whole or substantial part in the United States, its territories or possessions."
- NYSERDA leadership is seeking to understand the implications of this requirement on both the offshore wind developments in the state as well as the cost of the energy produced by a Buy American compliant system. Furthermore, NYSERDA is seeking to understand if the opportunity to further industry and create jobs outweighs any negative impacts this policy might have on the industry

"Structural Steel" Definition

- "Structural Steel" for this exercise is defined as components that are:
  - Load bearing
  - Necessary to create the structure of the installation
  - Are comprised of steel or iron
  - Do not include components that are core to the function of producing electricity (i.e., wind turbine nacelle and internal components, hydro turbine and generator components, etc.)
  - Note that all steel manufacturing for these components is included in NAICS code 331110 (Iron and Steel Mills and Ferroalloy Manufacturing)

"Structural Steel" Components

Offshore Wind
Tower
Monopile foundation
Offshore substation foundation
Platform for offshore substation

Approach, Assumptions and Results

Approach

- Collected data from various Worley / Advisian studies and EPC projects
- Performed literature search to identify studies and summaries of cost breakdowns
- Normalized cost breakdowns to a percent of total project cost basis in order to ensure comparability between sources and eliminate impacts of different project sizes on cost categories
- Developed crosswalk of cost categories in literature review and project review to ensure costs were allocated to proper categories (i.e., project breakdowns provided varying levels of granularity; this process combined cost categories as necessary to get to a common denominator of cost categories)
- Applied percentage of each cost category to assumed $ / kW capital cost to create graphic illustration of cost build-up

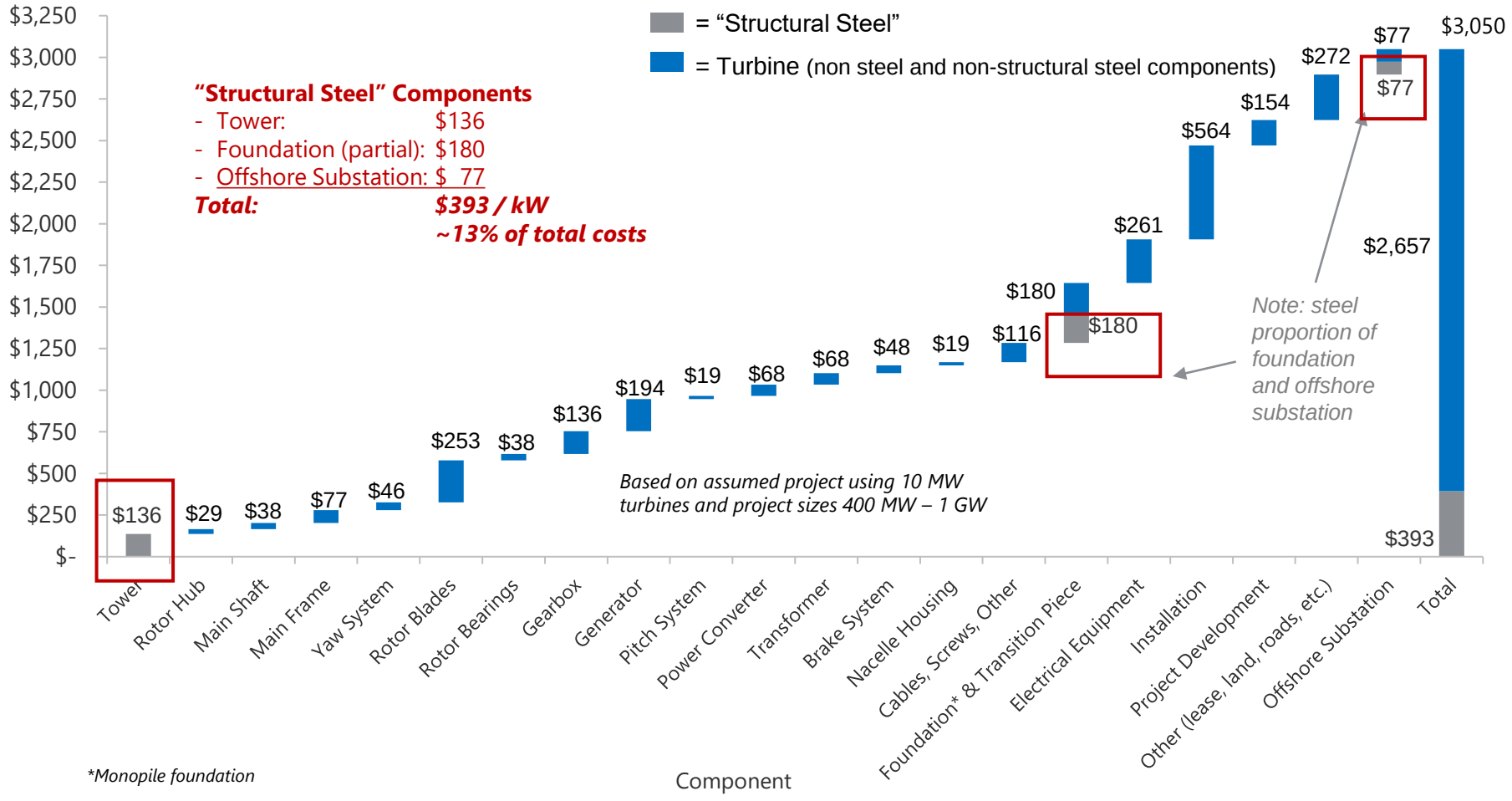
Assumptions

- Offshore wind projects used 10 MW turbines with project sizes 400 MW – 1 GW
- Total project per kW capital cost based on Lazard's 2021 Levelized Cost of Energy Analysis version 15.0, NREL's Benchmark Breakdown, multiple publicly available reported costs, and EIA's Annual Energy Outlook (2020)
    - Offshore Wind: $3,050 / kW

Results

Technology	Total $ / kW Installed	% "Structural Steel"
Offshore Wind	$3,050	13%

Offshore Wind Cost Breakdown - $ / kW Installed



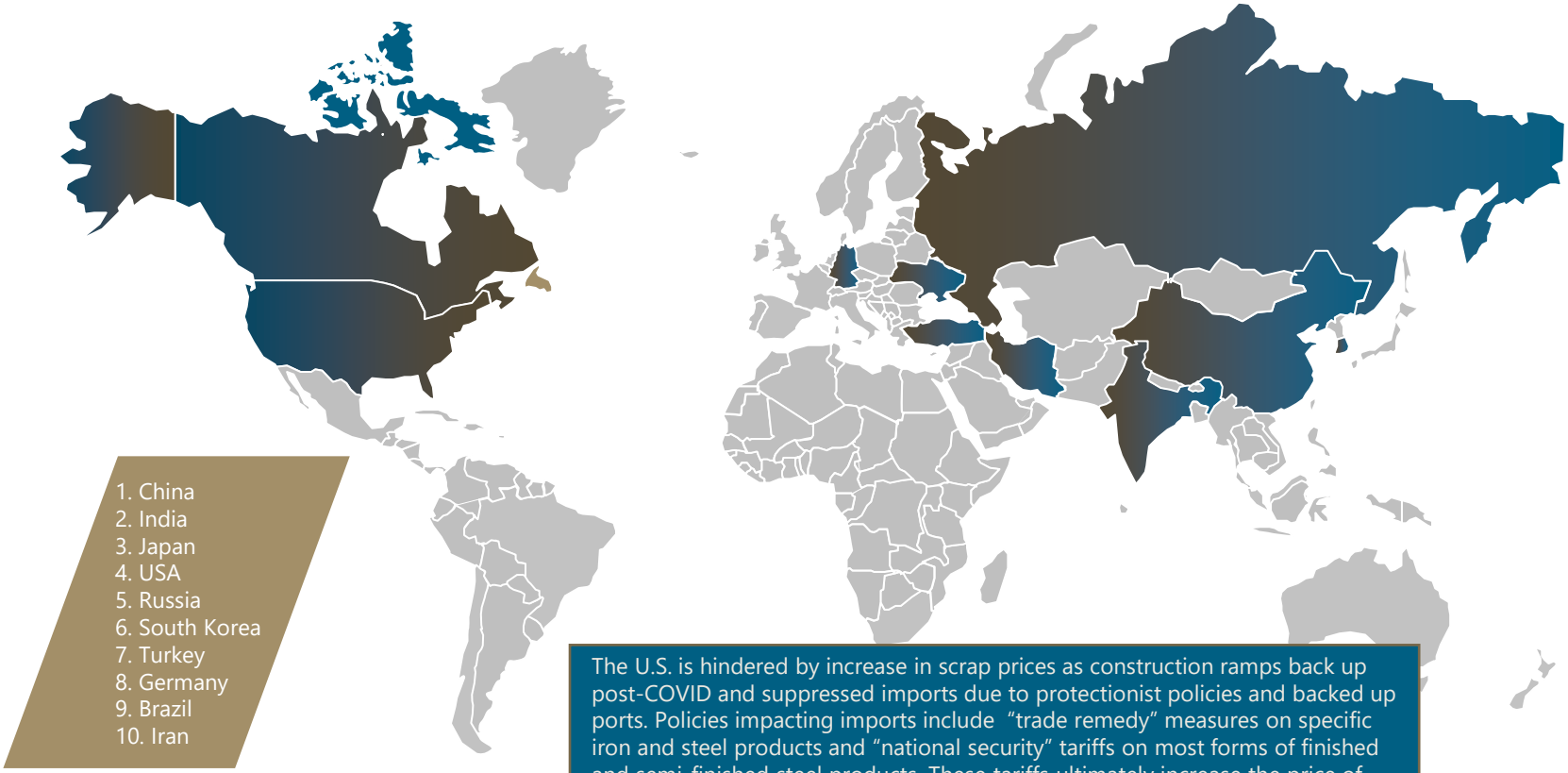
*Monopile foundation

Market Assessment and Supply Perspective

- The global market for steel and component suppliers
- U.S. market and New York economics for steel
- Steel market understanding
- Top domestic manufacturers – steel
- Top domestic manufacturers – components
- Quality and durability analysis
- Cost differential analysis
- New market entrants and New York considerations

The global steel market is dominated by China, the U.S. ranks fourth in global production

The graphic below highlights the top 10 steel producing countries in the world. In 2020, China's steel production accounted for 56% of the supply and has supplied cheaper steel into western markets which drove down global steel prices and bottomed out markets in the US. Through 2020 and 2021 prices recovered to record levels



1. China
2. India
3. Japan
4. USA
5. Russia
6. South Korea
7. Turkey
8. Germany
9. Brazil
10. Iran

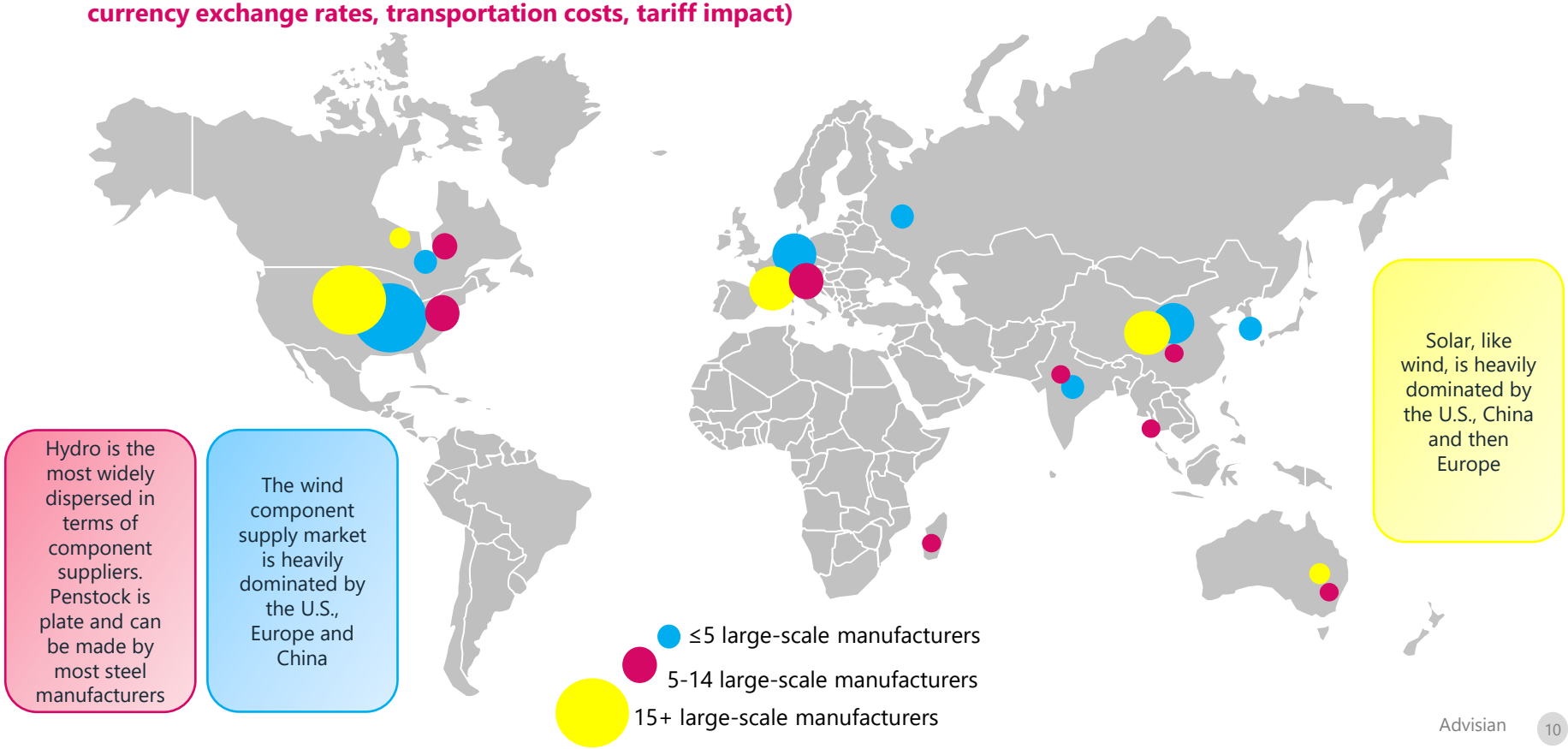
The U.S. is hindered by increase in scrap prices as construction ramps back up post-COVID and suppressed imports due to protectionist policies and backed up ports. Policies impacting imports include "trade remedy" measures on specific iron and steel products and "national security" tariffs on most forms of finished and semi-finished steel products. These tariffs ultimately increase the price of domestic steel by increasing raw cost and setting market prices higher.

China's overproduction had a negative impact on markets in Japan, India, and the US as prices dropped in these more expensive markets

Country	Production (metric tons)	Major Off-takers	Major Producers	Notes
China	1,880 m	Domestic use, South Korea, Vietnam, Philippines	Hesteel Group, Baosteel Group (state owned)	State run, driving overproduction for jobs
Japan	83 m	South Korea, Thailand, China	Nippon, Sumitomo, JFE	Sophisticated, high-grade steel
India	100 m	Domestic use, Nepal, Belgium, and Bangladesh	TATA Steel Group, Steel Authority of India, JSW Steel Ltd	Ramping up as Japan is ramping down
USA	72 m	Canada, Mexico, exports to 150 countries	Nucor, US Steel, ArcelorMittal	Largest importer of steel, exports high-grade
Russia	71 m	Turkey, Taiwan, Mexico	Novolipetsk Steel, Evraz Group, Severstal JSC	Third largest exporter
South Korea	67 m	China, US, and Japan	POSCO, Hyundai Steel Co.	Fourth largest exporter of crude steel
Germany	35 m	France, Poland, Netherlands	ThyssenKrupp, AcelorMittal, Salzgitter	High-grade steel for automotive and weaponry
Turkey	35 m	US, Egypt, and UAE	Erdemir Group, Icdas, Habas	Production totals impacted by regional unrest
Brazil	31 m	South America	Gerdau, AcelorMittal, USIMINAS, CSN	Economic crisis has severely hit the industry
Iran	28.9 m	Southwest and Southeast Asia, Egypt	Tadarok Senaate Ebtekare Sepahan, Saab Power Paya, Esfarayen Industrial Complex	Production is overreported and falling due to sanctions and lack of investment

Component suppliers most highly reflect the geography in which they are deployed

Research indicates component manufacturers who are vertically integrated companies will source steel from their own mills regionally. In other cases where mid-tier companies do not have their own mills, they will either source raw steel for major manufacturing locally or from international sources depending on a variety of factors (e.g., price differences, currency exchange rates, transportation costs, tariff impact)



Hydro is the most widely dispersed in terms of component suppliers. Penstock is plate and can be made by most steel manufacturers

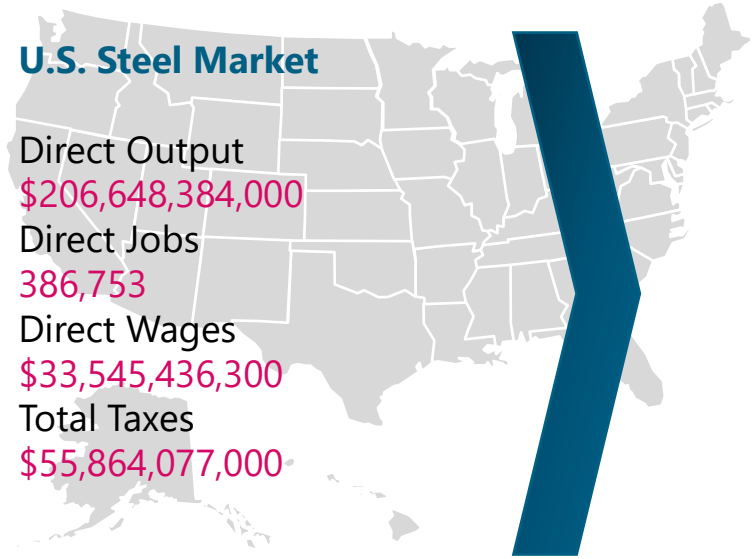
The wind component supply market is heavily dominated by the U.S., Europe and China

Solar, like wind, is heavily dominated by the U.S., China and then Europe

The US iron & steel industry accounts for a total economic impact[1] of $522 billion[2]

In 2020 shipments from domestic steel mills was 81 million net tons, down 15.8% from 2019; US raw steel production was 80.2 million net tons, down 17.1% from 2019 – falling for the third year in a row, the specific impact of COVID on this production is not known but is certainly responsible for some of the impact

Imports were also down during this period, reflecting a manufacturing downturn overall. Total steel imports decreased 21% in 2020 from 2019 and finished steel imports decreased 23% over the same period. Construction and automotive industries are the leading consumers of U.S. steel



U.S. Steel Market

Direct Output
$206,648,384,000
Direct Jobs
386,753
Direct Wages
$33,545,436,300
Total Taxes
$55,864,077,000

New York Steel Market

Direct Output
$3,336,839,400
Direct Jobs
8,150
Direct Wages
$646,160,600
Total Taxes
$1,186,731,400

Rank	State	Direct Jobs
1	Ohio	38,402
2	Indiana	37,649
3	Pennsylvania	34,124
4	Texas	31,250
5	Illinois	25,328
6	Michigan	23,052
7	California	22,647
8	Alabama	14,900
9	Wisconsin	13,258
10	Minnesota	10,269
14	**New York**	**8,150**

Understanding how the U.S. iron/steel market breaks down…

Prices have begun to drop but remain high in the U.S., new tonnage will provide further relief, but costs remain high due to supply chain logistics issues and tariff structures. U.S. utilization rate is 80%, China is well over 90% supplying excess into the market to keep people working[1]

Production and Processing

Includes materials such as iron ore, ferrous scrap, coke, and mill services

This accounts for 76,000 jobs in the U.S.

Manufacturing

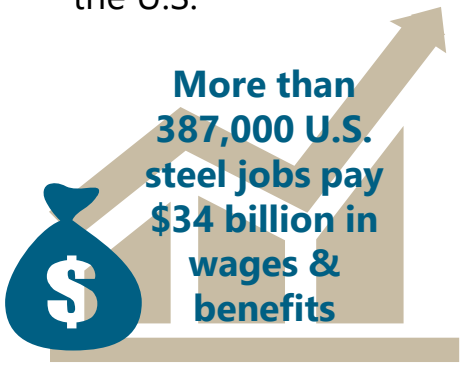
Iron and steelmaking and manufacturing of steel mill products such as sheet, plate, pipes, and bars.

This accounts for 141,000 jobs in the U.S.

Foundry Production

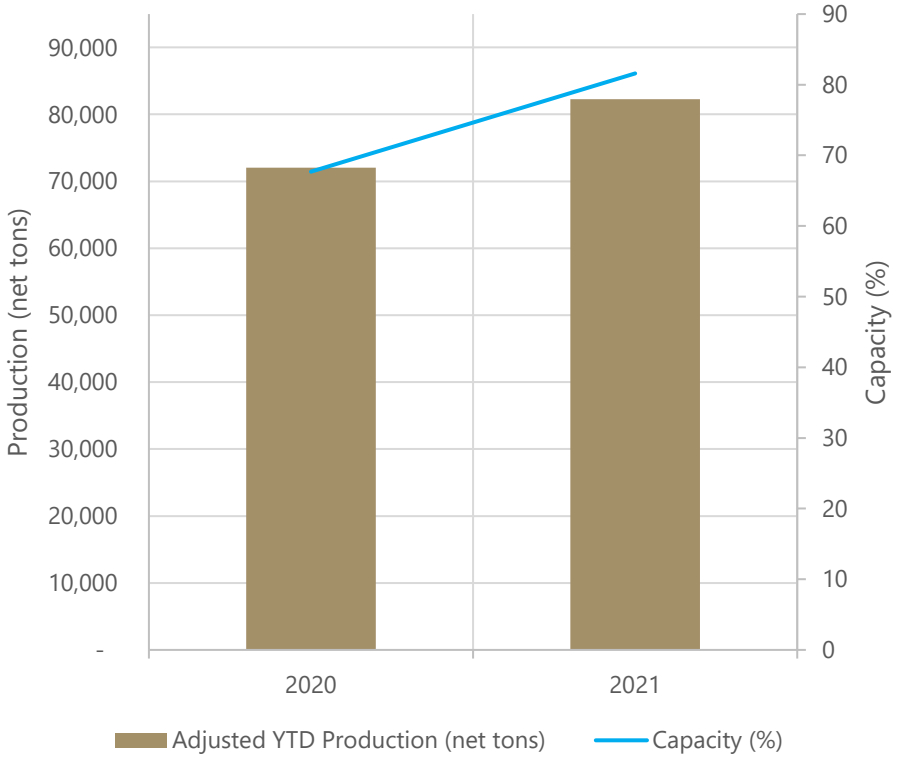
Ferrous metal foundry production, steel processing and distribution, and other steel product manufacturing.

This accounts for an additional 170,00 jobs in the U.S.



U.S. steel production and capacity has increased significantly from 2020

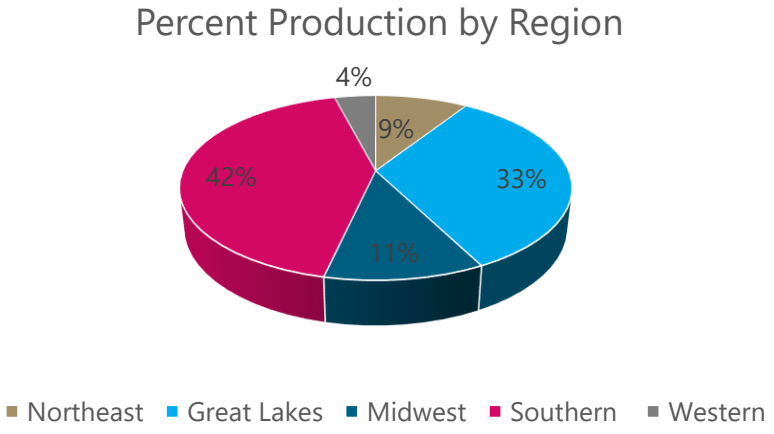
U.S. Steel Market Production & Capacity*



*Data as of 27 Nov 2021 and YTD equivalent for 2020

Market share concentrated in the Great Lakes and South

- Current capacity is estimated at 83.2%
- The year-to-date adjusted steel production was 86,274,000 net tons as of 27 November 2021
- Predominant use of U.S. steel is traditional construction and automotive
- Production is roughly distributed as:



The three largest producers composed approximately 62% of the market in 2020

Nucor

- Billets themselves as North America's most diversified steel company with over 300 offices nationwide including large scrap recycling facilities
  - 100% of their steel is produced domestically
  - Offices in Waverly and Auburn manufacture joists and decking and bars respectively
- Currently indicates a net-zero carbon goal
- From mono-poles and lattice towers to hydro-electric, nuclear and solar power plants, Nucor produces a wide range steel and steel products for modern energy projects.
  - Power and transmission products include sheet, plate, bar, beam, tubular products, piling, fasteners, and cold finish
  - They also have a solar arm specializing in customized and off-the-shelf solar structures, foundation beams, galvanized solar torque tubing, fasteners and castings
- 25.5 million tons of steel, steel products and scrap to outside customers in 2020

U.S. Steel

- US Steel became independent from Marathon Oil in 2002 and has grown in the US through M&A to the second largest steel manufacturer
- Like Nucor, US Steel has a net-zero carbon emission goal
- US Steel has 23 locations in the US, however, no New York sites
- 2020 raw steel production capability of 17.0 million net tons for Flat-Rolled, 5.0 million net tons for U. S. Steel Europe and 0.9 million net tons for Tubular
- Most of their energy industry work is focused on offshore rigs which could pivot to offshore wind but has not yet done so

Cleveland-Cliffs

- Fully vertically integrated mining and steel producer
  - Acquired AK Steel and a large portion of ArcelorMittal North America in 2020
  - Supply chain security: from mined raw materials to primary steelmaking to downstream stamping, tooling, and tubing
- Largest producer of flat-rolled steel and iron ore pellets in North America
  - Third-quarter 2021 steel product volume of 4.2 million net tons consisted of 32% hot-rolled, 31% coated, 18% cold-rolled, 6% plate, 4% stainless and electrical, and 9% other, including slabs and rail.
  - Previous annual capacity of 23 million tons will look different in 2021
  - 45% to automotive, 15% to infrastructure and manufacturing, 13% to distributors and converters, and 27% to other steel producers
- The company has nationwide operations centers and is headquartered out of Cleveland, OH
  - There does appear to be a NY office acquired through ArcelorMittal NA

There are four mid-tier market players, 2020 was hard on this group but all report upticks in 2021

ArcelorMittal

- ArcelorMittal is the largest global mining and steel company based in Europe with a large steel mill north of Mobile AL after the sale of the rest of their assets to Cleveland-Cliffs
  - Main manufacturing occurs in Alabama
  - All major steel outputs are produced in the U.S., but most products are channeled to automotive and construction
- Production in 2020 was 9.9 million net tons – this will change substantially in 2021

Carpenter Technology

- Headquartered in Philadelphia, Carpenter is a global company with the bulk of their operations in the U.S.
  - They do not have a New York office
- Carpenter provides end-to-end manufacturing and specialty and distributed alloys
- They serve many markets most heavily aerospace but also including energy – offshore wind specifically
- Annual tonnage not reported

Steel Dynamics, Inc.

- Steel Dynamics is a U.S. company inclusive of Steel of West Virginia; they do not have a New York office
- Their products cover all the flat rolled and beams standard in the industry and are predominantly transportation based but they do provide solar PV beams used in mounting
- Steel Dynamics produced 9 million tons of steel in 2020, they have a capacity of 13 million tons

Commercial Metals Company (CMC)

- CMC is headquartered in Irving, TX but is a global company; they do not have offices in New York (there is a mill in New Jersey that would likely serve New York)
- Fully vertically integrated including scrap recycling
- Products include mill products, fabrication, performance steel and construction services
- CMC serves construction, agriculture, etc. but they also make steel for onshore and offshore wind
  - 37% to infrastructure, 32% non-residential, 16% residential, 15% OEM/agriculture

There are several small players in the market producing stock steel or customized products from raw materials serving local areas[1]

Company	Location	Scale	Production	Off-take
Eastern Steel Corp	Brookly, NY	Small business	All standard steel stock products	Construction
Sabre Steel, Inc.	Plymouth, MI	Family-owned	Steel stock - Cold Rolled, Hot Rolled, High Strength Low Alloy Steel, Coated Products, High-Carbon Grades	Wide variety of off takers
Regol-G Special Steel Services	Glenview, IL	Small business	High-strength, abrasion resistant, water-resistant products, piping	Grinding, machining, rolling
Continental Steel & Tube Company	Fort Lauderdale, FL	Small business	Alloy and stainless-steel stock products	Industrial, Construction, military, oil and gas
Eagle National Steel	Texas	Family-owned	Structural steel stock defined as steel flats, rounds, beams and squares	Construction
Alloys Inc.	San Diego, CA	Small business	Production fabrication	Ship building, industrial, federal, construction
Beartech Alloys	Placentia, CA	Family-owned	Stainless steel piping and bars	General construction
Zeeco Metals, Inc.	Bridgeview, IL	Family-owned	Hot and Cold rolled steel stock	General construction
Advantage Metal Services, Inc.	South El Monte, CA	Small business	Full range of steel stock products and custom fabrication	General construction
Crystal Steel	Federalsburg, MD	Mid-sized business	Relatively small business grew by 30% to support Orsted in making steel for footings for MD-based wind project	

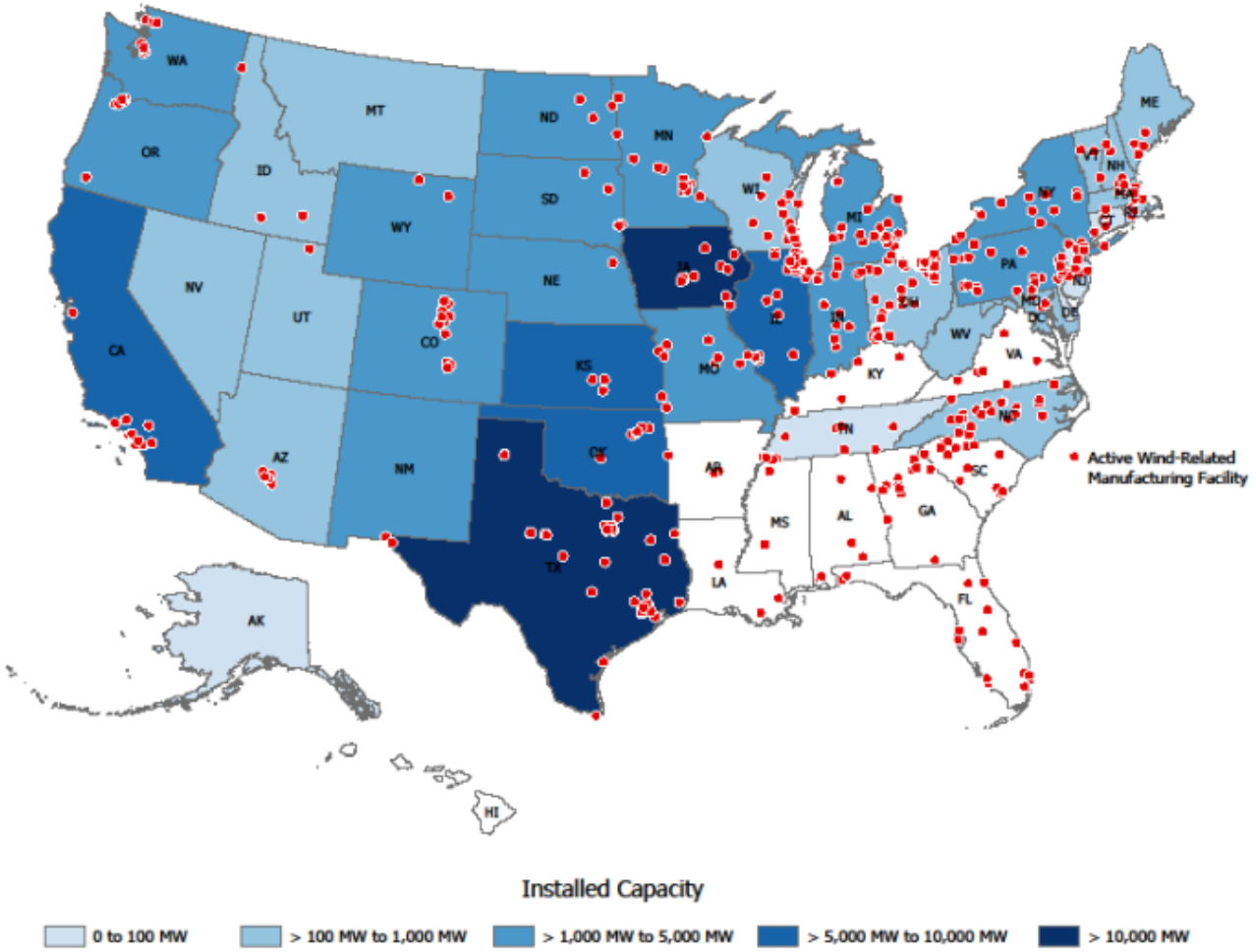
The tables below summarize the current U.S. component suppliers in the market for Offshore Wind

Existing suppliers tend to be located near steel mills or near the markets, new suppliers are cropping up, especially in wind, based on state-based drivers (e.g., Crystal Steel & Ørsted in MD)

Supplier	Location	Components
Broadwind	Wisconsin & Texas	Wind - Towers
Ventower Industries	Michigan	Wind – Foundations & Towers
Arcosa	Illinois, Iowa, Oklahoma	Wind – Tower
PacWind	California	Wind - Tower
Kiewit Offshore Services	Texas	Wind – Foundation and Substation
Nucor Skyline	Various	Wind – Foundations
Crystal Steel	Maryland	Wind – Foundations
Cleveland-Cliffs	Indiana, Ohio	Wind – Foundations
Sparrows Point Steel	Maryland	Wind – Foundations
Tower Tech Systems	Wisconsin	Wind – Tower
Renewtech LLC	Minnesota	Wind – Tower

Illustratively, the map below shows ALL active wind-related manufacturing in the US (tower, blades, nacelle, etc.)

Onshore wind is a well-established industry and the map below from DOE shows that with time manufacturing has proliferated across the entire US, including New York – with the right incentives and market drivers New York can be competitive for new OSW component development



Quality and durability are established by global standards as shown for wind towers below and therefore does not vary by region but instead is based on the region of install and the turbine vendor

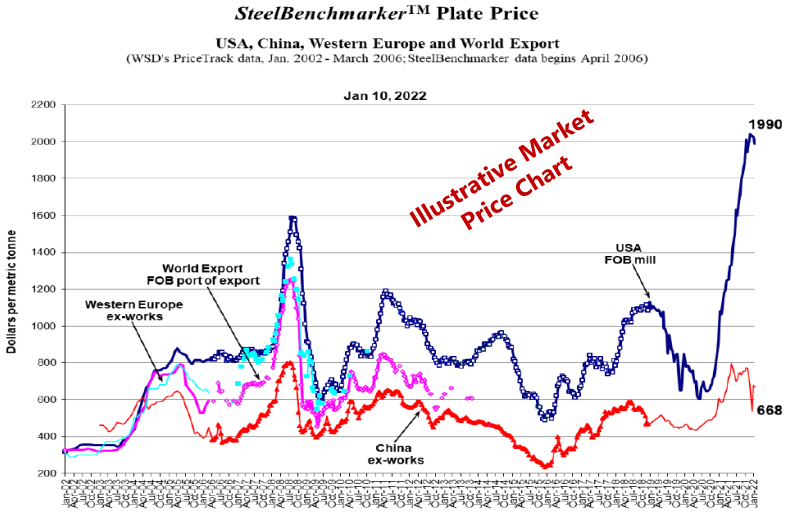
The table below shows international grade levels and their associated quality, strength, and impact absorption for wind towers. Tower strength/grade is based entirely on location of install; offshore towers need greater strength, cold weather versus warm weather will impact the required thickness and strength. The developer will select the appropriate tower grade and vendor based on location and requirements as modeled.

Grade			State	Quality Level	Yield Strength (thickness in mm)			Tensile Strength (N/mm^2)	Impact absorbed energy (kv_2/J)≥	Bending Test (Thickness (mm))	
GB (China)	ASTM (US)	EN10025 (UK)			≤16	16-40	40-100			≤16	16-100
Q235	A283M Gr.D	S235	Hot, controlled, normalizing rolling	B, C, D	235	225	215	360-510	24	Diameter = 2a, where a is the sample thickness	Diameter = 3a, where a is the sample thickness
Q275	A709M Gr.36	S275		B, C, D	275	265	255	410-560	21		
Q345	A709M Gr.50	S355		C, D	345	335	325	470-630	21		
Q420	A283M Gr.E	S420	Hot, controlled, normalizing rolling	C, D	420	400	390	520-680	19		
Q460	A709M Gr.70	S460		C, D	460	440	420	550-720	17		
Q550	Type 8 Gr.80	S550	Quenching, tempering	D, E	550	550	530	670-830	16		
Q690	A709M Gr.100	S690		D, E	609	690	670	770-940	14		

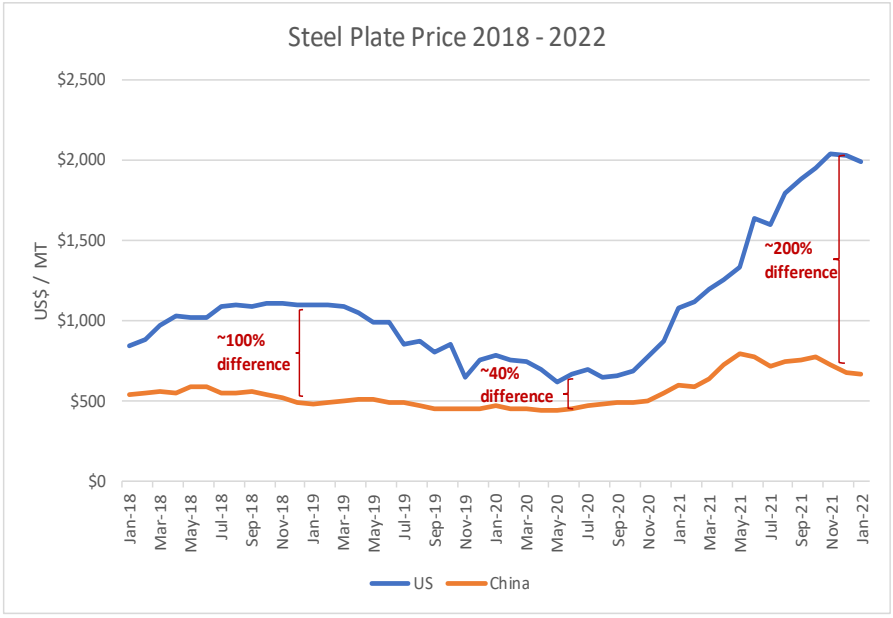
Steel prices have seen significant volatility, including the spread between the cost of domestic versus international supply

Global Steel Market Comments

- Market has seen significant volatility over the past twenty years
- 2020 to 2022 has seen historic changes to the price volatility
- Volatility is seen across different alloys and form factors (i.e., rebar, plate, etc.)
- Along with price volatility, the spread between US and international sources has also been volatile over the decades
- Volatility is similarly shown over the past two years as shown in Steel Plate Price 2018-2022 (right) and is not seasonal as is the case with power markets but instead has more to do with global policies and trade



Source: https://www.scrapmonster.com/steel-prices/standard-plate-prices/595



Source: http://steelbenchmarker.com/history.pdf

Cost Differentials: An illustrative view of global steel commodity pricing[1]

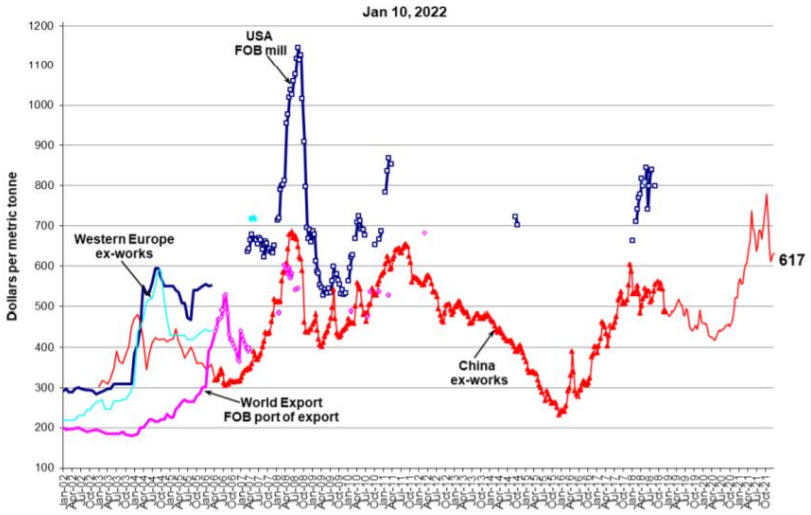
Market Prices from December 2021

	(USD/mt)		
	Rebar	HRC	CRC
USA	$1,030	$1,435	$2,290
China	$630	$700	$860
Northern Europe	$1,016	$764	$907
Western Europe	$707		
Turkey	$648	$805	$990
Commonwealth		$780	$855

***SteelBenchmarker*™ Rebar Price**

USA, China, Western Europe and World Export

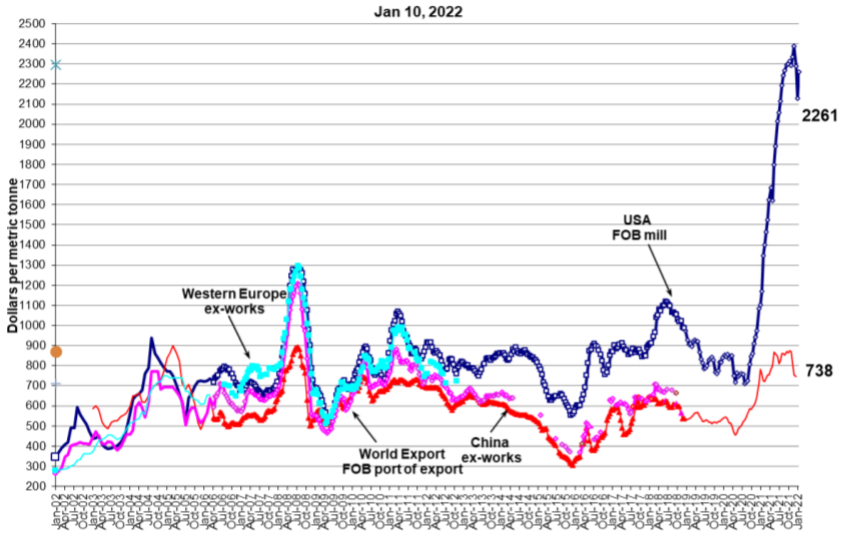
(WSD's PriceTrack data, Jan. 2002 - March 2006; SteelBenchmarker data begins April 2006)



***SteelBenchmarker*™ CRC Price**

USA, China, Western Europe and World Export

(WSD's PriceTrack data, Jan. 2002 - March 2006; SteelBenchmarker data begins April 2006)



Cost differentials

Cost differentials globally have varied widely in the past 2 decades as shown in the following slide.

This information is based on data predominantly from 2018 - present

Technology / Component	Commodity Standard	International Cost Range ($/ton)*	U.S. Cost Range ($/ton)	Cost Differential Range	$/Unit Increase
Offshore Wind					
Tower	Plate	$457 - $845	$620 - $2,042	High: ~100% Med: ~50% Low: ~25%	High: $393 / kW Med: $197 / kW Low: $98 / kW
Offshore Substation Foundation	Plate	$457 - $845	$620 - $2,042		
Offshore Substation Platform	Plate	$457 - $845	$620 - $2,042		

* International cost includes $20 - $50 / ton for shipping

Comments

- Cost comparisons on a component level is made difficult by the fact that the component supply chain is international – that is, US fabricators of *components* source steel commodity input material globally*
- The variability in the steel commodity markets create the majority of component cost variability
- The past two years have seen significant volatility in steel commodity prices; it is unclear if these prices will reduce to more normal levels or if they will stay elevated

Offshore Wind Foundations

- Continuous cast, slow rolled steel for foundations is currently not fabricated in the US and cannot be made without investment in new milling capabilities
- A solution of equal grade (grade 50) and strength can be created by steel suppliers that requires additional welding by the fabricator (where those costs would be realized)
- US steel companies are actively working with developers here and abroad to determine what is required and what can be manufactured to meet requirements or where additional mills and fabrication capabilities would need to be developed
- Cleveland-Cliffs estimates a new jumbo roller and associated milling facilities would cost $1 billion

*If steel suppliers (i.e., Nucor or Cleveland Cliffs) make components they typically use domestic steel as they are large vertically integrated steel suppliers vice component manufacturers who may specialize in a specific component and will source steel from wherever is most appropriate for their business (e.g., optimized for cost or contract)

While new entry to the steel market faces steep challenges, there is potential for steel manufacturing to expansion in the Northeast, and New York. Entry into component manufacturing faces less challenges

Steel Market – New Entrants

New entrants to the mid and top-tier steel producers is unlikely. Most of these large companies have experienced mergers and acquisitions in the last decade to increase profitability; these players also often have a global footprint.

Small component steel stock producers and fabrication facilities face less barriers to entry but also likely cannot scale to the level required to provide a significant impact on the components required for large-scale renewables.

One thing in common is that all these companies have been around for decades, those that are "new" to the industry started with an acquisition or merger.

Steel Market – New York Development

The large manufacturers could open or ramp up New York offices if incentivized to do so through purchase agreements. However, these players have already emerged in the wind and solar market as domestic steel suppliers and so they already have mills established to fabricate the required products.

The hurdles to entry for new steel in the U.S. is high and for a New York office specifically is unlikely but not impossible.

Component Supply – New Entrants

Maryland completed a study on the steel market to support offshore wind and found "While the market opportunity is substantial, so is competition due to the fact that capital requirements to enter this market are low. Therefore, policymakers should focus on large components that require long learning curves, such as specialized foundations." Other recommendations in their report as well as industry best practices include capitalizing on location – siting multiple manufacturing sites at one port for example, focusing on specialty equipment, focused effort (time and money) on consortium building and a well balanced and localized portfolio of suppliers (vice spread across multiple sites)

Case Study: Crystal Steel, Mid-Tier Steel Manufacturer

Crystal has just been awarded a contract with Ørsted for steel footings for their Skipjack Wind, and Ocean Winds 1 & 2 projects. The company is headquartered in Delmar, DE and has offices in DE, MD, NY, TN, and PA as well as the Philippines. Many mid-tier companies have secured international fabrication sites such that procurement from a US-based firm may indicate some international involvement. Crystal has 275 fabrication staff across four of the sites. The Ørsted contract will add an additional 50 jobs and represent USD 70 million in revenue.

Component Supply – New York Development

Market development in New York may be most fruitful in component production which can be done by mid to small firms who could potentially open a plant in New York for specific parts, again this is more likely if there are clear purchase agreement incentives to take that financial risk. Crystal Steel in Maryland is a good example of this – growing 30% and creating a plant specifically to support Ørsted's Maryland wind project; this resulted in 50 jobs.

Bottom line, the northeast in general and New York specifically is underrepresented when it comes to steel production and fabrication of components, in companies where these capabilities have already been developed for renewables, they are unlikely to move to the region without incentives.

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