# ISSUE BRIEF: ELECTRIFYING PORTS ON THE GREAT LAKES

CHARGE

LIEBHERS

HERE

112241222

LIEBHERR

A Case Study of the Port of Cleveland

By Stephen Naimoli and Katherine Shok

November 2024



### Acknowledgments

Thank you to the Coalition Helping America Rebuild and Go Electric (CHARGE) for their support of this brief. Thank you also to the individuals interviewed for this brief.

### Introduction

With access to two major shipping routes, Ohio plays a large role in maritime shipping. According to a release from the U.S. Department of Transportation (DOT) in January 2024, two of the busiest 25 ports in the United States by dry bulk<sup>1</sup> are in Ohio: the Port of Cleveland and the Port of Toledo. Although these ports provide significant economic benefits, they are also sources of greenhouse gas (GHG) emissions and other air pollutants. This brief will explore electrification initiatives to reduce emissions at ports, with a focus on the Port of Cleveland, and identify the challenges ahead in ensuring ports can power the economy without a cost to communities and the environment.

Shipping to Ohio ports is conducted along both the Ohio River through East Ohio and through Lake Erie to the north. The transportation of goods through these two areas brings significant economic value to the region. A <u>2018 report</u> commissioned by the Ohio Department of Transportation found that shipping along the Ohio River was linked to over 37,000 direct, induced, and indirect jobs and \$26.5 billion in economic activity for the state. Meanwhile, a <u>2023 report</u> commissioned by shipping industry stakeholders in the United States and Canada found that shipping in the Great Lakes region supported 31,400 jobs and over \$3.7 billion in economic value for Ohio.

Shipping also impacts local communities in the form of air and climate pollution. The International Council on Clean Transportation (ICCT) <u>estimates</u> that ships in the Great Lakes and St. Lawrence Seaway emitted 32,000 tonnes of nitrogen oxides, 1,300 tonnes of carbon monoxide, 1,200 tonnes of volatile organic compounds, and 813 tonnes of fine particulate matter (PM<sub>2.5</sub>) in 2019.<sup>2</sup> These air pollutants, particularly when emitted while the ships are docked at ports, impact the <u>low-income communities and communities of color</u>

<sup>&</sup>lt;sup>2</sup> National estimates of port-related and shipping-related emissions are available but are out of date. The most recent estimates come from the 2016 National Port Strategy Assessment, which uses data from 2011. No similar national assessment has been conducted since. The U.S. Environmental Protection Agency issued guidance to ports on conducting their own emissions inventories as recently as 2023 but has not undertaken its own national assessment since 2011.



<sup>&</sup>lt;sup>1</sup> Unpacked and homogeneous commodities such as grain, iron ore, and coal.

who often live and work nearby. This is certainly the case in Cleveland where the port is surrounded by disadvantaged communities (see Figure 1). The impact of shipping on the climate is even more significant: the same report from the ICCT found that ships in the Great Lakes and St. Lawrence Seaway emitted over 1.6 million tonnes of carbon dioxide (CO<sub>2</sub>) in 2019.

While port operations affect only a small part of these emissions—8.5 percent of these CO<sub>2</sub> emissions occurred while at berth, port activities such as cargo handling contribute additional pollution and GHG emissions, and port electrification can go a long way in tackling both air and climate pollution.



Figure 1: Cleveland Port is Surrounded by Disadvantaged Communities

The Cleveland Port census tract is bounded in dark blue and is not a disadvantaged community per the Climate and Economic Justice Screening Tool (CEJST). Shaded census tracts are classified as disadvantaged communities.

Source: Council on Environmental Quality



Port electrification involves <u>converting port operations from combustion to electric</u>. This can include electrifying cargo handling equipment, on-port rail systems, trucks, light-duty vehicles, ocean-going vessels, harbor craft, and shore power for ships at berth. A <u>2023</u> <u>study</u> from the International Council on Clean Transportation found that fully electrifying the Port of Seattle and the Port of New York and New Jersey would reduce local fine particulate matter pollution by 75 percent and 69 percent, respectively.

Electrification efforts at the Port of Cleveland, the <u>third largest</u> port and the fourth-largest by annual tonnage on the Great Lakes, the only Great Lakes port receiving from and shipping to Europe, and a leader among Ohio's ports in planning for electrification, provides an illustrative example of how planning and governmental funding can set ports on the path to a more sustainable future.<sup>3</sup> To that end, this brief will focus primarily on federal funding for port electrification and specifically electrification efforts at the Port of Cleveland.

## Federal Funding for Port Electrification

Through Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) funds, the federal government has made available \$5.7 billion for port infrastructure and about \$9 billion in broader funding nationwide to reduce emissions from trucks that can be used at ports (Table 1).

Program	Funding	Type of Funding	Port Focus
Carbon Reduction Program	\$6.4 billion	Formula	Truck emissions
Clean Ports Program	\$3 billion	Competitive	Port infrastructure
Charging and Fueling Infrastructure Program	\$2.5 billion	Competitive	Port EV charging infrastructure

Table 1: IRA and IIJA Programs that can support port electrification

<sup>&</sup>lt;sup>3</sup> In dry goods shipping, the busiest port on the Great Lakes is Duluth-Superior, Minnesota and Wisconsin, the second largest is Northern Indiana District, Indiana, and the third largest is Two Harbors, Minnesota.



Program	Funding	Type of Funding	Port Focus
Port Infrastructure Development Program	\$2.3 billion	Competitive	Port infrastructure
Reduction of Truck Emissions at Port Facilities	\$400 million	Competitive	Port infrastructure
Diesel Emissions Reduction Act	\$60 million	Competitive	Truck emissions

Source: <u>Climate Program Portal</u>, <u>U.S. Department of Transportation (DOT)</u>; accessed September 26, 2024.

The U.S. Environmental Protection Agency's Clean Ports Program provides funding for equipment and planning to facilitate the deployment of zero-emission equipment (e.g., electrification) at ports. In October 2024, the Port of Cleveland and partners were awarded a \$94 million grant under this program to help electrify operations at its general cargo terminal (see *Case Study: The Electrification of the Port of Cleveland* below for more information).

Additionally, Ohio projects received around \$77 million between 2019 and 2022 from the U.S. DOT's Port Infrastructure Development Program, which awards projects that improve the "safety, efficiency, or reliability of the movement of goods into, out of, around, or within a port." Ohio did not receive funding in the 2023 round. Projects are not necessarily required to involve electrification or emissions reductions but may advance electrification technology in some way. For example, <u>Conneaut</u>, <u>Toledo</u>, <u>and Cleveland</u>'s 2020 awards do not appear to be directly related to electrification, but Cleveland's 2021 and 2022 awards are tied to the port's electrification and will be detailed in the case study below.

Under the Carbon Reduction Program, Ohio has been allocated <u>\$214.7 million in formula</u> funding over five years to reduce CO<sub>2</sub> emissions from transportation. As of October 2024, the only elements of the state's <u>strategy</u> that could benefit port electrification are charging infrastructure for electric vehicles and grant programs for zero-emission vehicles, and the state does not list any planned projects that would install charging at ports or help them purchase zero-emission vehicles. Local governments and community groups in Ohio have been awarded \$47.6 million in the first <u>two rounds</u> of the Charging and Fueling Infrastructure Program, but the winning projects do not appear to benefit ports.

The IRA also provided funding for existing programs that can support port-related air pollution reduction efforts. Congress created the Diesel Emissions Reduction Act (DERA) program in 2005 and appropriated <u>\$100 million per year</u> from 2009 to 2016. The Inflation Reduction Act infused another <u>\$60 million</u> into the program. Ohio was awarded <u>\$5.3 million</u>



under the DERA from 2008 to 2022,<sup>4</sup> with three marine-related projects and one project involving partial electrification. Among these funded projects, two replaced older diesel engines on boats with new diesel engines and a third replaced a diesel engine with a diesel-electric hybrid system.

Finally, no Ohio projects have received any grants under the Federal Highway Administration's <u>Reduction of Truck Emissions at Port Facilities</u> program. One project on the Great Lakes, at the Port of Indiana-Burns Harbor, will be funded \$4.4 million to "replace diesel vehicles at the Port of Indiana-Burns Harbor with electric vehicles (EVs) to reduce heavy truck idling that contributes to air and noise pollution in the local community."

# Case Study: The Electrification of the Port of Cleveland

Despite the slow uptake of port electrification in the state, the Port of Cleveland is emerging as a strong case study of the potential for electrification in Ohio. The Port of Cleveland was established in 1959 but initially underperformed other Great Lakes ports, which shipping companies <u>attributed</u> to poor management. In 1968, the Cleveland-Cuyahoga Port Authority was created to oversee its operations, and today the port's operations support <u>over 22,000 jobs and \$4.7 billion</u> in economic activity, according to the port authority.

The Cleveland-Cuyahoga Port Authority owns the property while port operator Logistec owns most of the onsite equipment, including cranes and forklifts. According to port officials in interviews conducted by Atlas, the Port of Cleveland is undertaking electrification efforts not only because it reduces GHG emissions but also because many in the maritime industry are moving toward electrification. Key stakeholders, they argue, expect that electrification will soon become the norm and are preparing accordingly. Port officials cited the example of Tata Steel, a major customer at the Port of Cleveland, given the company's efforts to decarbonize its operations.

In 2023, the Port of Cleveland adopted a climate plan that established a <u>goal</u> to reach netzero CO<sub>2</sub> emissions from port-owned operations (Scope 1 emissions) and purchased electricity (Scope 2 emissions) by 2050. According to an <u>emissions inventory</u> conducted for the port by Starcrest Consulting Group, the port's Scope 1 emissions in 2022, from natural gas used to heat buildings and diesel and gasoline used in port-owned surface vehicles, were 362 tons of CO<sub>2</sub>-equivalent (CO<sub>2</sub>e). Scope 2 emissions associated with electricity used

<sup>&</sup>lt;sup>4</sup> 2023 and 2024 reporting for DERA is not available yet.



in buildings and terminal lighting were 1,579 tons of CO<sub>2</sub>e. The large majority of the port's emissions, however, are Scope 3 emissions,<sup>5</sup> which is standard with ports per <u>analysis</u> released by the Environmental Defense Fund and Arup in March 2024. At the Port of Cleveland, Scope 3 emissions were about four times Scope 1 and 2, totaling 7,609 tons of CO<sub>2</sub>e. These emissions include those from vessels at berth, harbor craft, stevedore operators' equipment, and on-terminal truck and locomotive emissions. The Port's net zero plan does not include Scope 3 emissions. The breakdown of emissions by scope is detailed in Figure 2.



Figure 2: GHG Emissions by Scope for the Port of Cleveland in 2022

The major challenge to reducing Scope 3 emissions is decarbonizing ocean-going vessels. In 2022, 76 percent of the port's Scope 3 GHG emissions came from ocean-going vessels and harbor craft, 22 percent came from cargo handling equipment, and two percent came from on-road vehicles (Figure 3). Among equipment, 42 percent came from the 21 forklifts operated on-site.

As part of the port's climate goal, electrification efforts are underway that will eventually include purchasing electric equipment and installing solar panels paired with battery storage to power the port. Port officials see electrification as a <u>major enabler of emissions</u>

<sup>&</sup>lt;sup>5</sup> Scope 3 emissions are all indirect emissions in the value chain of a company, both upstream and downstream of the company's operations.



Source: Starcrest Consulting Group

<u>reductions</u> and the driver of the port's climate goals. Before a large-scale transition from diesel to electric equipment can occur, however, the port needs to ensure the power supply and physical infrastructure can support the new technologies.



Figure 3: Share of Scope 3 GHG Emissions for the Port of Cleveland by Source in 2022

Under the port's plan, one warehouse is being modernized and upgraded to serve the electricity needs of the port, pictured in Figure 4. As part of the warehouse modernization project, an annex is being added to house an electrical room that will help enable future electrification efforts. The port authority is working with Cleveland Public Power, the utility that already serves the port, to upgrade distribution capacity in preparation for increased power demand from port facilities. The warehouse modernization project is funded with \$27.2 million from the U.S. DOT's Port Infrastructure Development Program and \$4.9 million from the Ohio Department of Transportation's Maritime Assistance Program.

Accessing additional funding from the state is key, according to port officials. Carly Beck, the port's senior manager of planning, environment, and information systems, said, "[t]here's all that federal money out there. But even if it's an 80/20 match, that 20 local match can get really expensive for a small organization such as ourselves. So having that state money available is really critical."



Source: Starcrest Consulting Group

The port, Logistec, and Great Lakes Towing were also <u>awarded a \$94 million grant</u> from the U.S. EPA's Clean Ports Program on October 29, 2024 to support the next stage of port electrification. This step will add solar and battery storage to the modernized warehouse, add shore power for ships at berth, and purchase one electric mobile crane, two electric reach stackers with chargers, 10 electric forklifts, and two electric tugboats with chargers. This will replace one of the port's two mobile cranes, both of its reach stackers, about half of its 21 forklifts, and two of its four tugboats. Port staff have also stated that plans for future efforts include installing EV charging stations and converting the warehouse's switcher locomotive from diesel to a hybrid model.



Figure 4: Warehouse A at the Port of Cleveland that will be the electrification hub

Source: Stephen Naimoli, Atlas Public Policy

The port's electrification efforts will address Scope 1 and 2 emissions primarily by providing emissions-free solar power to buildings and by installing chargers for EVs. The port's plan to electrify its equipment will somewhat address the much more significant Scope 3 emissions. However, with the exception of adding shore power for ships at berth, most of



these actions will not impact the 76 percent of Scope 3 emissions from on-water activities including ocean-going vessels and harbor craft.

Alongside climate pollution reduction, the port's electrification efforts should help reduce air pollution. In 2022, the port emitted 83 tons of nitrogen oxides—primarily from oceangoing vessels (69 tons), followed by cargo handling equipment (seven tons), harbor craft (six tons), and on-road trucks (one ton), according to an emissions inventory conducted for the port and provided to Atlas Public Policy. The census tract in which the port is located is <u>not</u> <u>designated</u> as a Justice40 disadvantaged community, but the <u>area surrounding the port is a</u> <u>disadvantaged community</u>, as shown in Figure 1.

SeMia Bray, co-founder and co-director of the Black Environmental Leaders (BEL) Association, emphasized in an interview that the community adjacent to the port is also affected by emissions from the nearby steel and cement plants that do business with the port and from cars and trucks on the nearby highway. Bray said, "[w]hen we talk about environmental justice, it's not just the emissions from the port, it's the emissions from the highway. It's the emissions from industry that has been placed in those same communities during redlining... And so there's multiple impacts, but all of those impacts, they happen around emissions... from diesel exhaust, from particulate matter, from nitrogen oxides." While the port is not responsible for emissions from the other industrial plants or the highway, the effects are compounded for residents, and so the BEL celebrates the port's efforts to reduce its emissions.

The port has demonstrated sincere efforts in integrating environmental justice principles into their plans, according to BEL. Although the port did not engage directly with environmental justice groups in designing its electrification process, Bray shared that BEL supports the port's "clear, specific decisions" in reducing emissions and looks forward to being an accountability partner as the port moves forward with its climate goals. The Clean Ports Program <u>requires</u> projects to meaningfully engage with their communities either before or during their projects. It is reasonable to assume that this will lead to engagement meetings between the Port of Cleveland and nearby communities during the electrification process.

#### **More State Action Needed**

Port electrification is a nascent but growing area of interest to deliver improved climate and public health outcomes. This process often involves electrifying individual pieces of equipment such as mobile cranes and switcher locomotives. Port electrification also requires major infrastructure changes that often need to be funded before forklifts and



cranes are electrified and solar panels are installed on buildings—this may include upgrading power capacity and modernizing port buildings like at the Port of Cleveland. To support port electrification, we recommend the following:

- The Port of Cleveland engages disadvantaged communities surrounding the port, particularly in the implementation of the \$94 million in Clean Ports Program funding.
- The Port of Cleveland shares lessons learned from its electrification efforts with other Ohio and regional ports.
- State and federal agencies engage ports in a broader discussion around reducing emissions from ocean-going vessels to help ports reduce their Scope 3 emissions beyond electrifying cargo handling equipment and shore power.



