

EPA-Port Everglades Partnership: Emission Inventories and Reduction Strategies

Presented by:



United States Environmental Protection Agency

Office of Transportation and Air Quality

with:



August 1, 2018 at 2:00 pm – 3:00 pm EDT



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Acknowledgements

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- Starcrest: Guiselle Aldrete, Bruce Anderson, and Joseph Ray



Outline

- Background on EPA's Ports Initiative, Port Everglades, and the EPA-Port Everglades Partnership
- Port Everglades' 2015 On-port Baseline Inventory
- EPA's Emissions and Strategy Analysis
- Key Findings
- Additional Resources
- Questions

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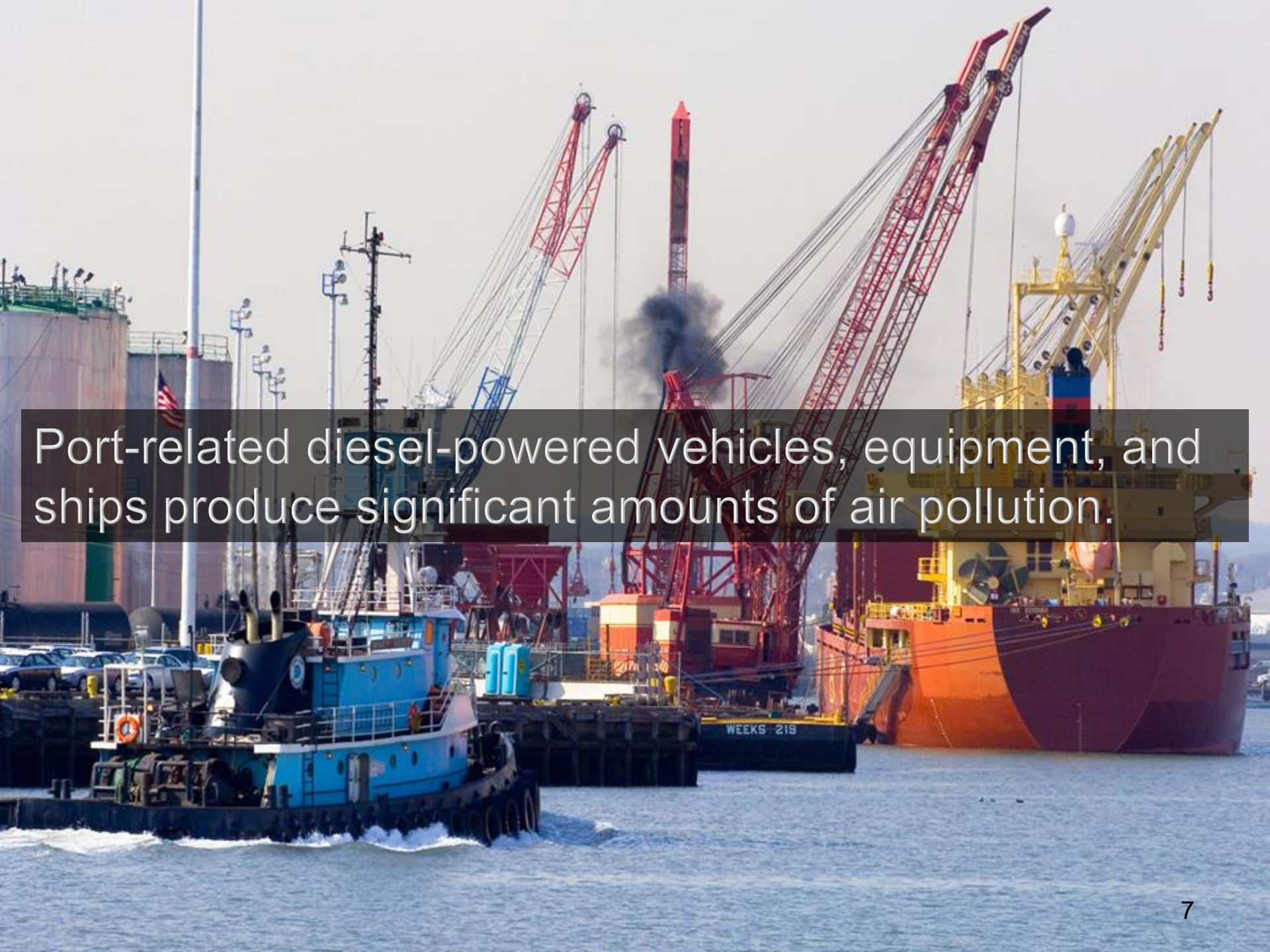
Background on EPA's Ports Initiative

Why focus on ports?



American Association of Port Authorities estimates that ports need \$28.9 billion for landside infrastructure alone to handle projected 2025 freight volumes.

Source: The State of Freight, American Association of Port Authorities (2015).



Port-related diesel-powered vehicles, equipment, and ships produce significant amounts of air pollution.



Ports Initiative Elements

Funding

Helping Ports Capitalize on Funding for Clean Technologies

Technical Resources

Providing Tools to Help Identify Smart Infrastructure Investments

Collaboration

Promoting Port-Community Collaboration for Effective Planning

Coordination

Increasing Efficiency in Federal Government and Port Operations

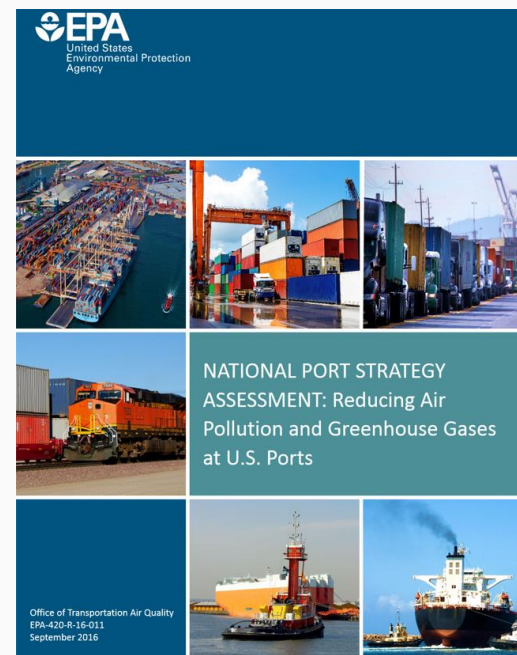
Communications

Creating a Knowledge Clearinghouse



National Port Strategy Assessment

- *National Port Strategy Assessment: Reducing Air Pollution and Greenhouse Gasses at U.S. Ports*
- Released September 22, 2016
- Available at: www.epa.gov/ports-initiative/national-port-strategy-assessment





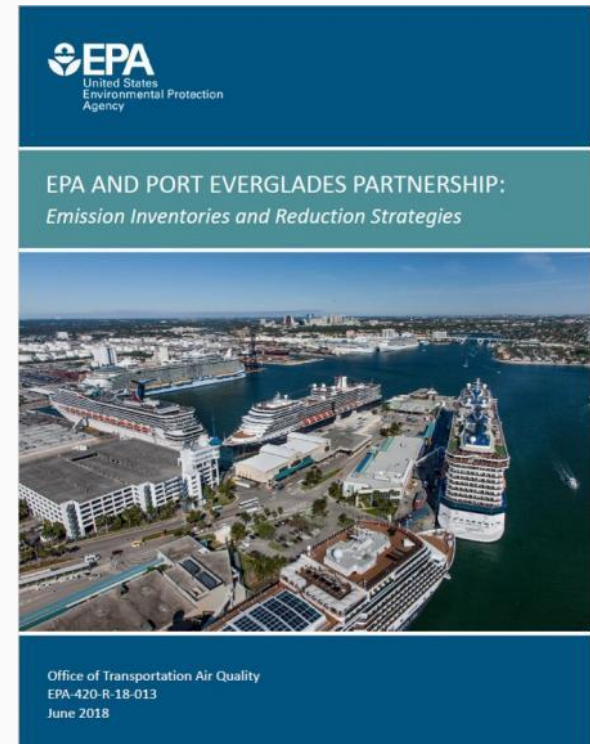
EPA-Port Everglades Partnership





Final Report

- *EPA and Port Everglades Partnership: Emission Inventories and Reduction Strategies*
- Released June 1, 2018
- Available at: www.epa.gov/ports-initiative/epa-and-port-everglades-partnership-emission-inventories-and-reduction-strategies





Background on Partnership

- As part of EPA's Ports Initiative, we issued a call for interest:

U.S. EPA is Seeking to Partner with a Port Authority to Assess Port-Related Emissions Reduction Strategies

The objective of this opportunity is to refine and demonstrate quantitative methodologies that ports, their stakeholders, researchers and others could use to assess the potential for future criteria pollutant and greenhouse gas (GHG) emissions reductions under various technology and operational implementation scenarios.

- Port Everglades submitted a letter to EPA and was selected



Background on Port Everglades

- The first port to partner with EPA in this way
- One of the busiest cruise ports in the world
- South Florida's main seaport for receiving petroleum products
- One of the nation's leading container ports



Port Everglades' Mission Statement

- “Port Everglades is Florida’s powerhouse global gateway. A respected leader in trade, travel, and financial stability, we create economic and social value by working in partnership with world-class clients. We achieve advancements focusing on efficient facilities, trade and cruise expansion, jobs growth, safety, security, and environmental stewardship for our customers, stakeholders and community.”



Additional Information

- Port Everglades is located in an area that currently meets all applicable National Ambient Air Quality Standards
- Additional information about Port Everglades is available at www.porteverglades.net/environment/



Partnership Activities

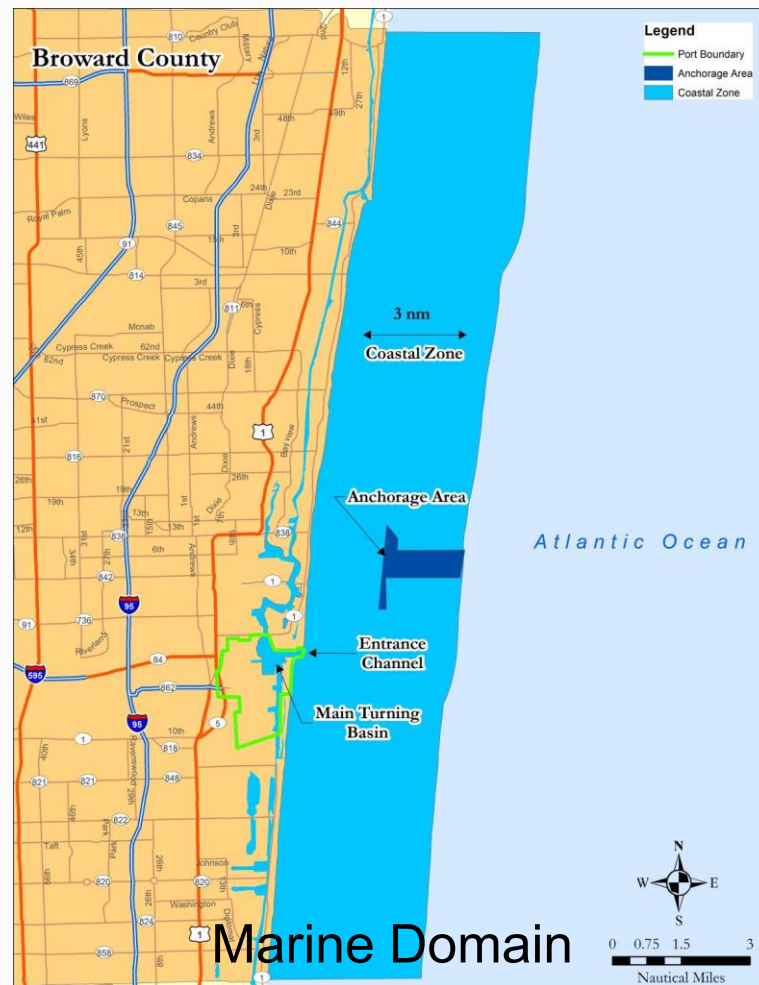
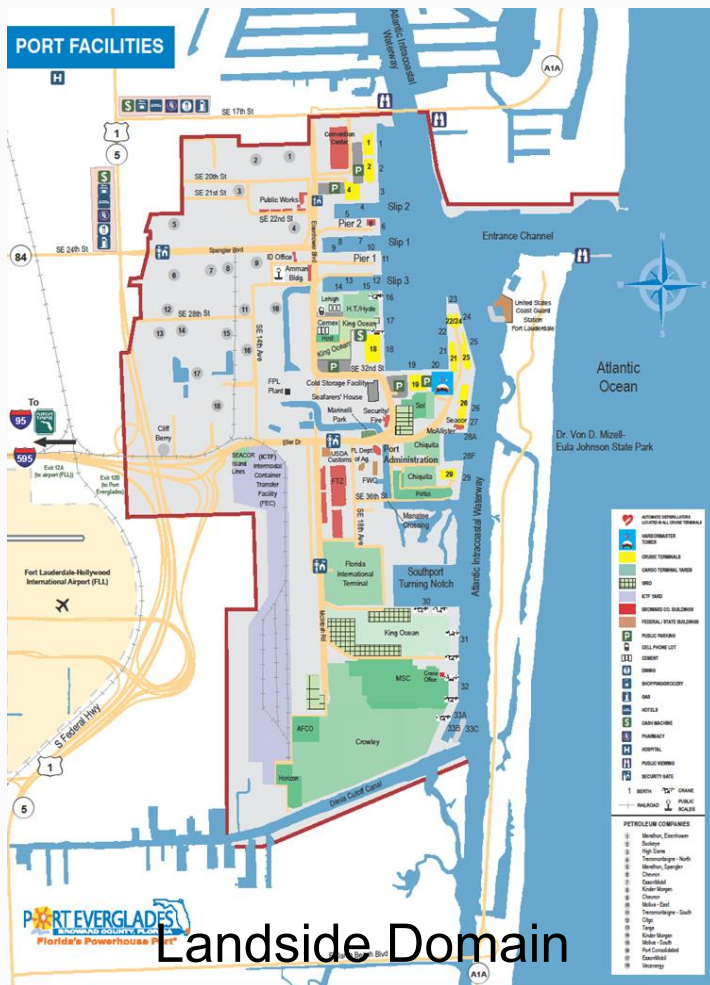
- Port Everglades:
 - Developed an activity-based inventory for port facilities and operations
 - 95% of customers participated in a voluntary and confidential survey
 - Provided technical and policy support to EPA's project activities
- EPA:
 - Supported development of the Port's baseline emissions inventory
 - Developed baseline emissions estimates for mobile source corridors outside the Port
 - Developed future Business as Usual inventories and emission reduction scenarios
 - Documented methods, lessons learned, and practical examples that EPA can share with stakeholders and incorporate into our future update of the EPA's 2009 Port Inventory Guidance



Port Everglades' 2015 On-port Baseline Inventory

www.porteverglades.net/environment/air-quality/air-emissions-inventory/

On-port Geographic Domain



Emission Source Categories



1. Ocean Going Vessels
2. Cargo Handling Equipment
3. Harbor Craft
4. Onroad Vehicles
5. Locomotives



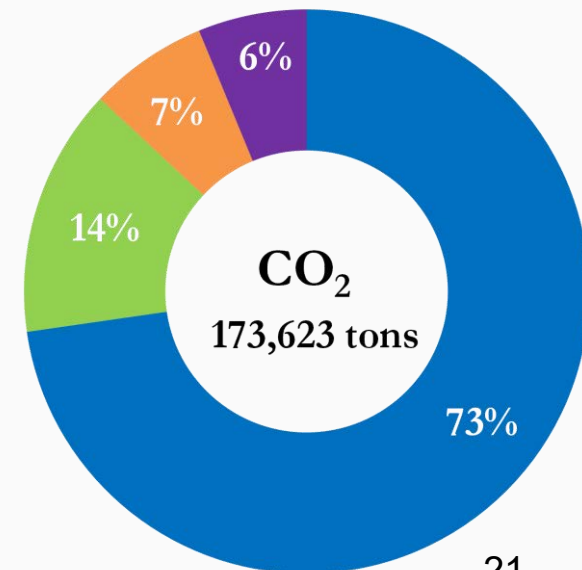
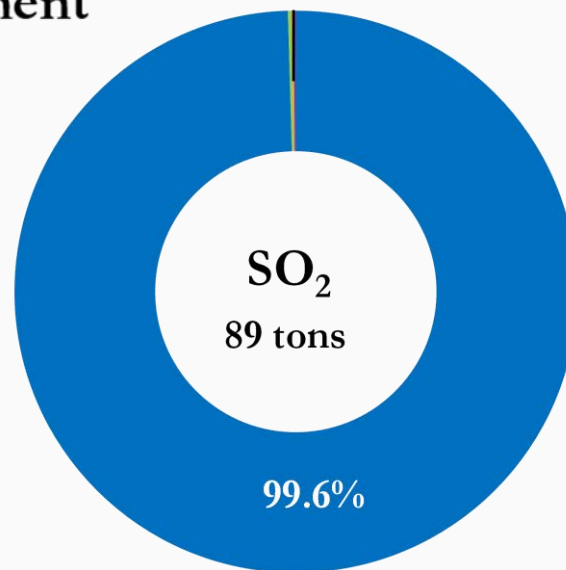
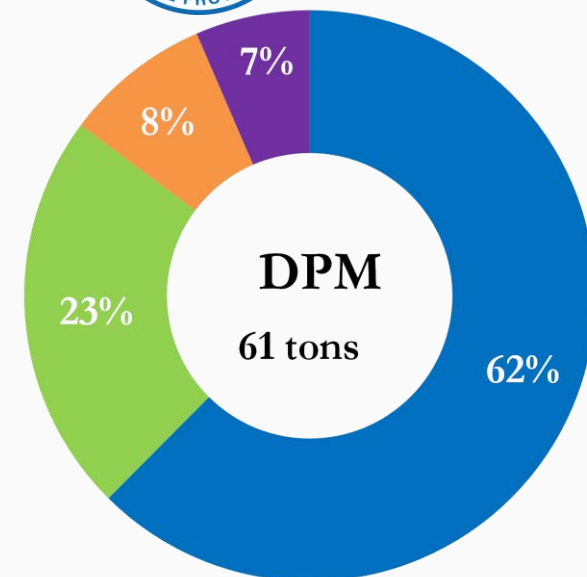
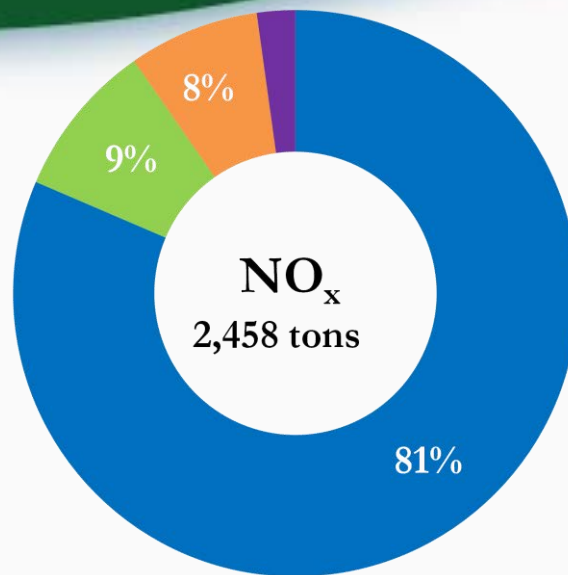
Pollutants Included in the 2015 Baseline Inventory

- Criteria pollutants and precursors:
 - Nitrogen oxides (NO_x)
 - Particulate matter less than or equal to 10 microns (PM₁₀)
 - Particulate matter less than or equal to 2.5 microns (PM_{2.5})
 - Volatile organic compounds (VOCs)
 - Carbon monoxide (CO)
 - Sulfur dioxide (SO₂)
- Diesel particulate matter (DPM)
- Fuel combustion-related greenhouse gases (GHGs):
 - Carbon dioxide (CO₂)
 - Nitrous oxide (N₂O)
 - Methane (CH₄)



2015 On-port Baseline Results

- Ocean-going vessels
- Cargo handling equipment
- Harbor craft
- On-road vehicles
- Locomotives



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EPA's Emissions and Strategy Analysis



Overview of EPA's Analysis

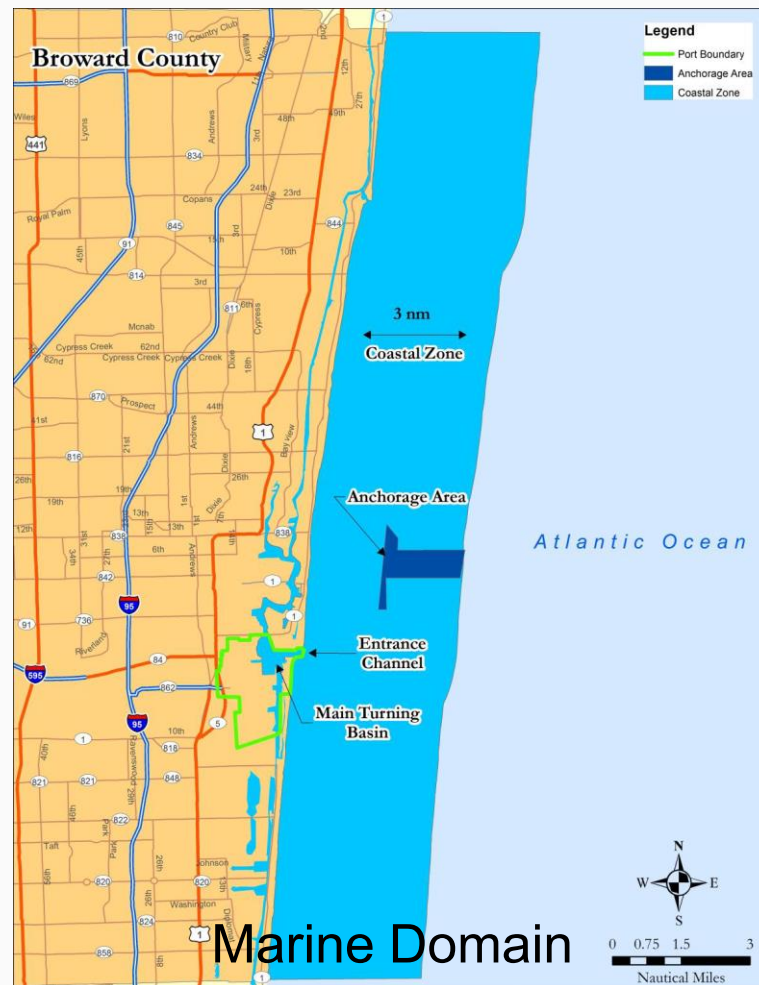
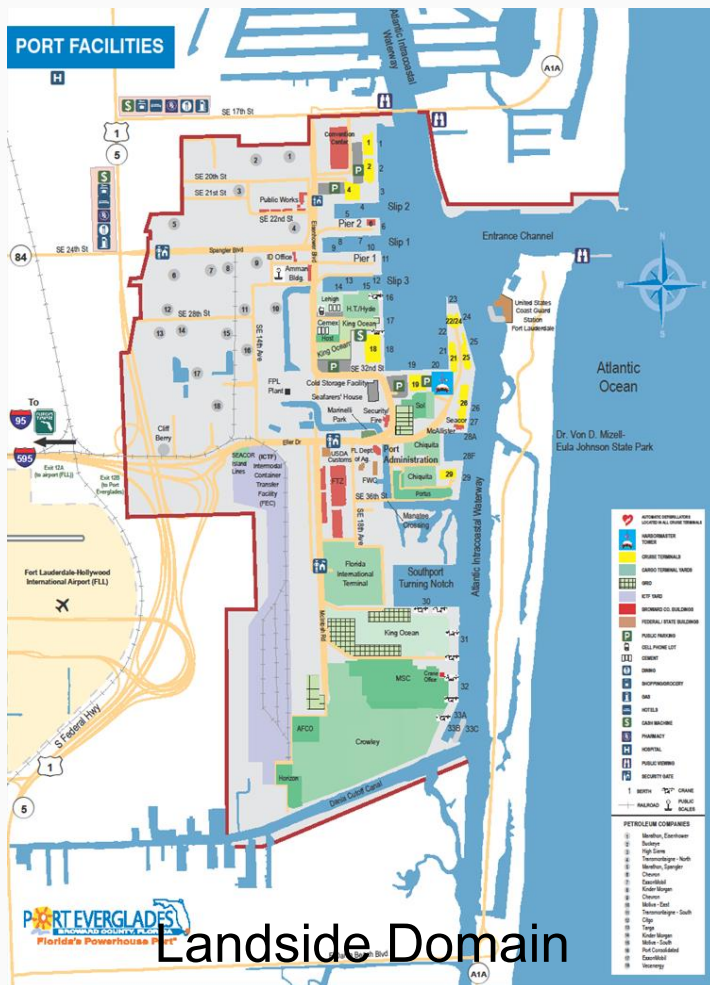
- **On-port Analysis:**
 - Started with Port Everglades' 2015 on-port baseline inventory
 - Projected Business as Usual (BAU) emissions for 2025, 2035, and 2050
 - Evaluated hypothetical emission reduction strategies and scenarios to BAU inventories in future years
- In addition, estimated 2015 **off-port** baseline inventory and projected inventories for 2025, 2035, and 2050 for three port-related corridors
 - Marine, truck, and rail



Pollutants Included in EPA's Analysis

- Criteria pollutants and precursors:
 - Nitrogen oxides (NO_x)
 - Particulate matter less than or equal to 10 microns (PM₁₀)
 - Particulate matter less than or equal to 2.5 microns (PM_{2.5})
 - Sulfur dioxide (SO₂) (OGV only)
 - Volatile organic compounds (VOCs)
- Air toxics:
 - Diesel particulate matter less than or equal to 10 microns (DPM₁₀)
 - Diesel particulate matter less than or equal to 2.5 microns (DPM_{2.5})
- Climate related pollutants:
 - Carbon dioxide equivalents (CO_{2e})
 - Black carbon (BC)

On-port Geographic Domain



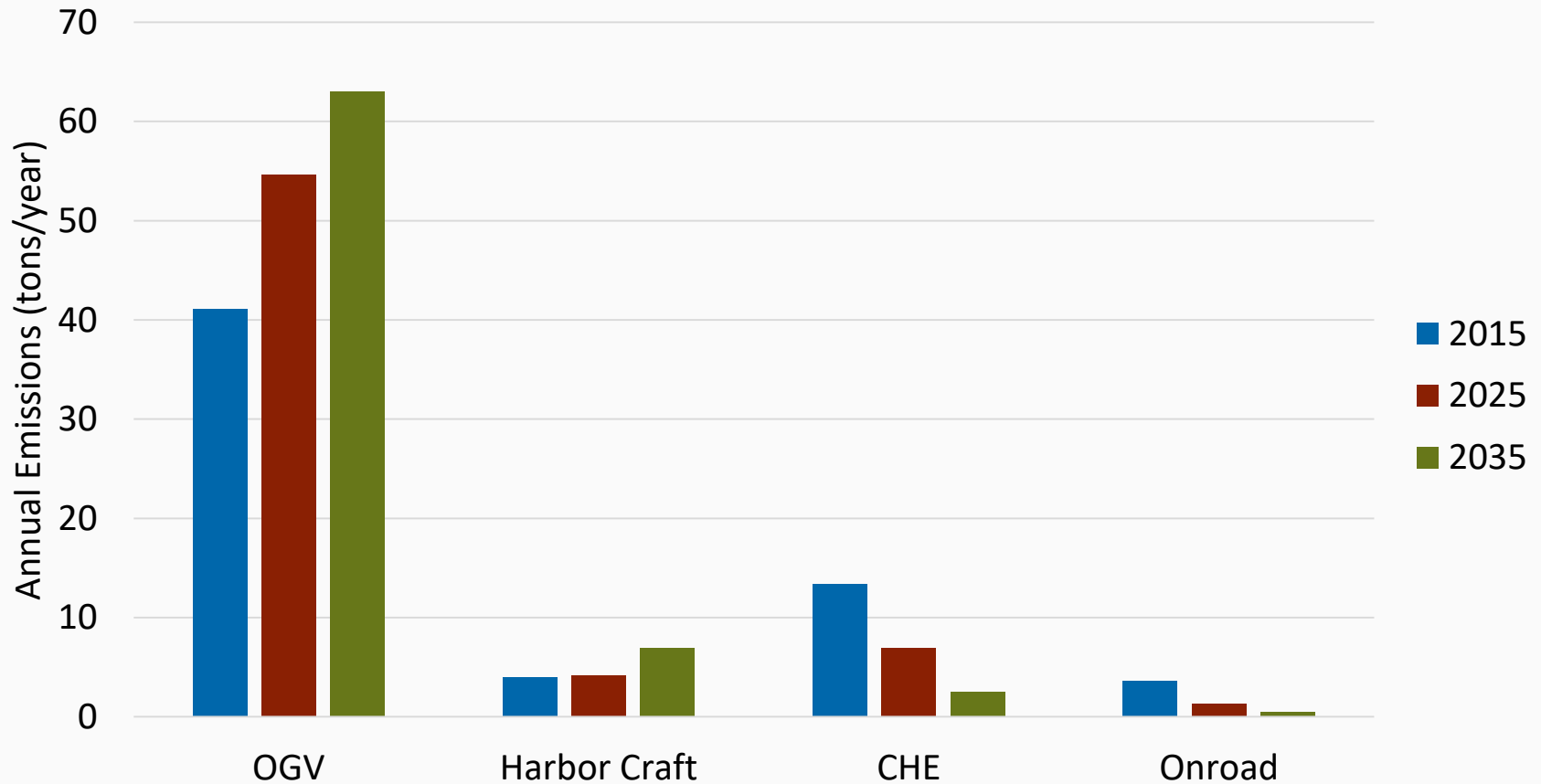


Projected Future Inventories

- Estimated on-port BAU emissions for 2025, 2035, and 2050 by:
 - Developing growth factors by vessel/cargo type using expected port growth from Port Everglades' *2014 Master/Vision Plan**
 - Adjusting emission factors based on expected fleet turnover



Projected On-port $PM_{2.5}$ Inventories



Note: $PM_{2.5}$ on-port rail emissions are <1 ton per year.



On-port Emission Reduction Strategies

- Strategies selected for analysis in collaboration with Port Everglades

Sector	Strategy Descriptions
OGV	<ul style="list-style-type: none">• Reduced hotelling time• At-berth alternative control technology• Lower sulfur fuels and alternative fuels like LNG• Shore power
Harbor Craft	<ul style="list-style-type: none">• Engine replacement (to Tier 3) / vessel replacement (to Tier 4)
CHE	<ul style="list-style-type: none">• Equipment replacement (to Tier 4) and electrification• Diesel particulate filters / oxidation catalysts
Onroad	<ul style="list-style-type: none">• Truck replacements to MY2010+ and BEV• Truck idle reduction
Rail	<ul style="list-style-type: none">• Increase modal shift of cargo from truck to rail



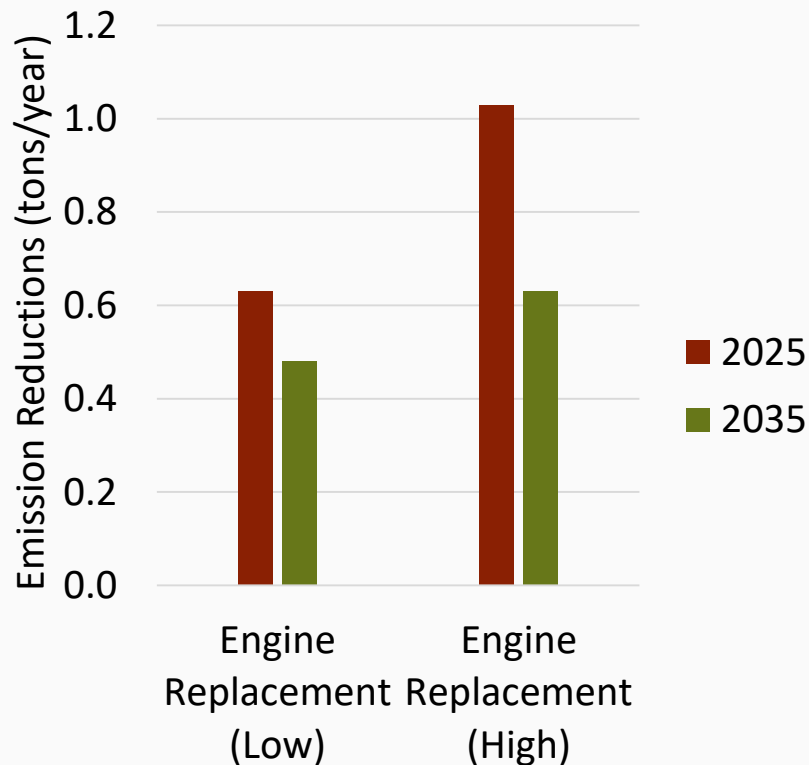
Example: Harbor Craft Engine Replacement

- Replace pre-Tier 3 engines with Tier 3
- Low Scenario (20%):
 - 11 vessels in 2025
 - 7 vessels in 2035
- High Scenario (30%):
 - 13 vessels in 2025
 - 8 vessels in 2035

Strategy	NOx	PM ₁₀	PM _{2.5}	DPM	BC
Per vessel reductions for replacing T0 with T3	44.7%	80.6%	80.6%	80.6%	80.6%



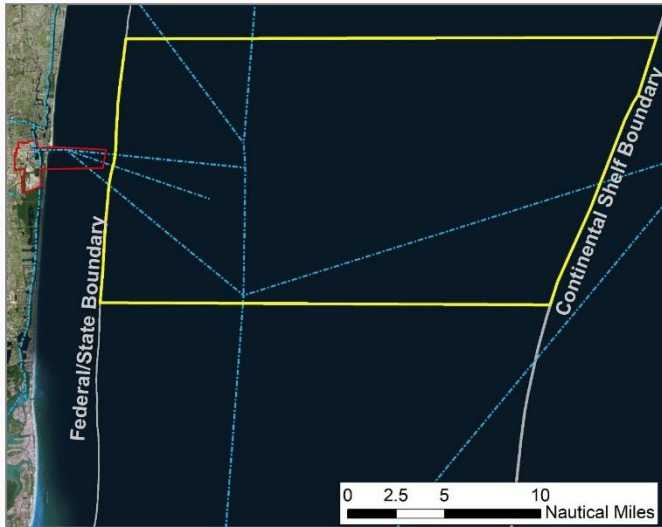
Projected On-port PM_{2.5} Reductions from Harbor Craft Engine Replacement



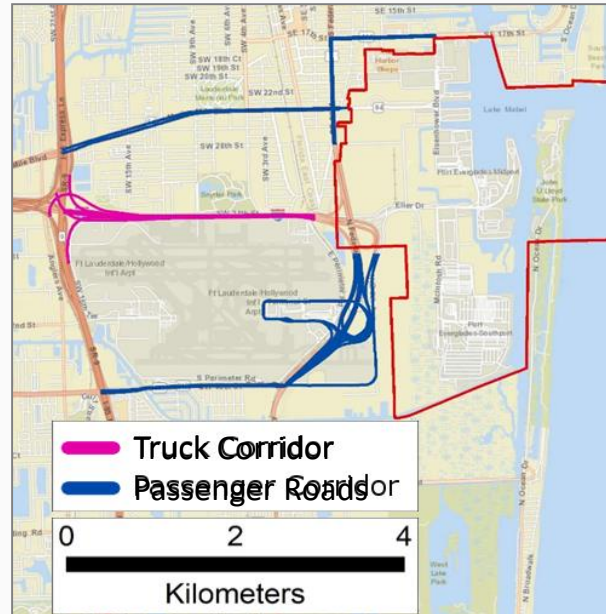
- Annual reductions for each scenario
- Fewer reductions available in 2035 compared to 2025 due to fewer T0 engines to replace

Off-port Geographic Domain

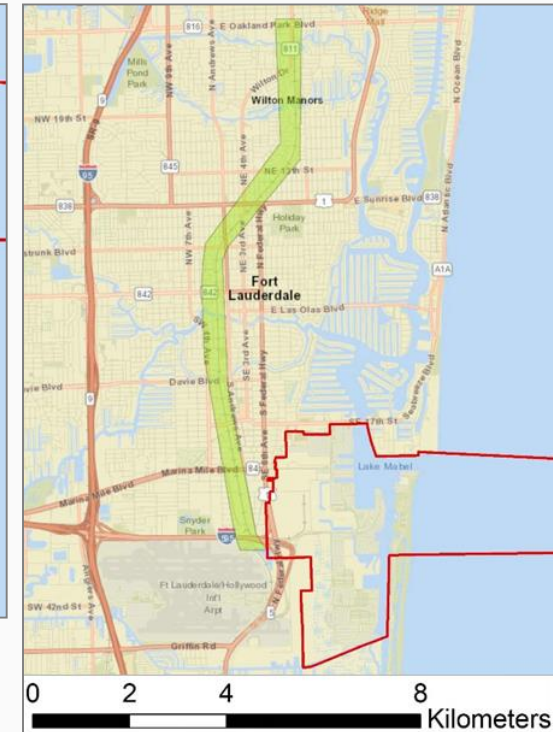
Marine Corridor and Associated Shipping Lanes



Truck Corridor



Rail Corridor





Off-port Inventory

- Calculated 2015 off-port baseline inventories using consistent assumptions from Port Everglades' 2015 baseline inventory
- Marine inventories were based on:
 - AIS data from the U.S. Coast Guard
 - IHS' Register of Ships
 - Starcrest's Vessel Boarding Program
 - Wharfinger vessel call data
- Truck and rail inventories were based on activity data presented in the on-port inventory
- Projected inventories for 2025, 2035, and 2050 using the same growth and turnover assumptions as on-port



Off-port Emission Reduction Strategies

- Strategies selected for analysis in collaboration with Port Everglades

Sector	Strategy Descriptions
OGV	<ul style="list-style-type: none">• Vessel speed reduction• Lower sulfur fuels and alternative fuels like LNG
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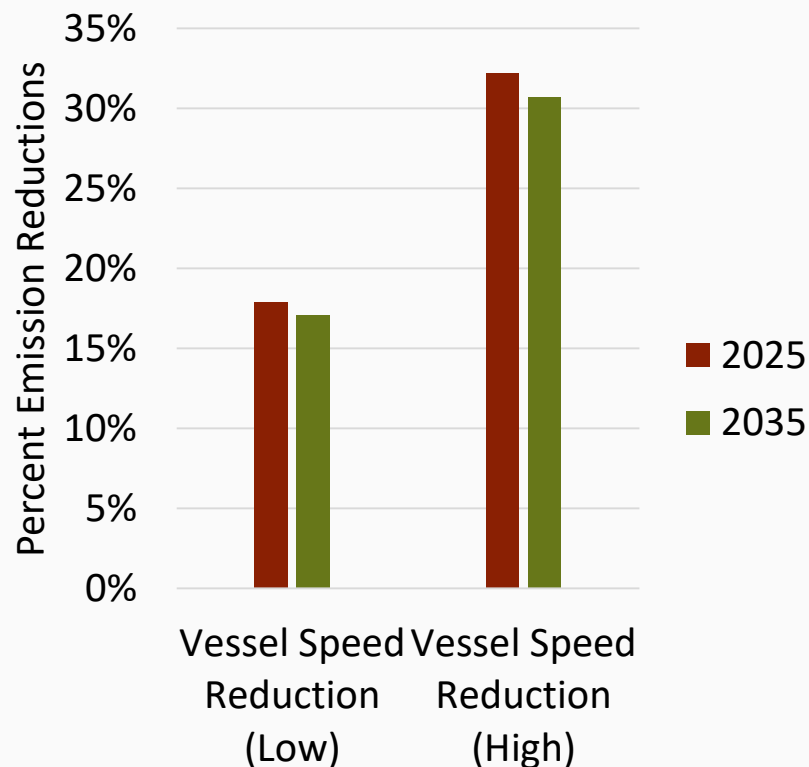


Example: Vessel Speed Reduction

- Modeled as a voluntary program where vessels reduce their speed to 12 knots or less in federal waters near Port Everglades
- Low Scenario: Assume 50% vessels participate
- High Scenario: Assume 90% vessels participate



Projected Off-port NOx Reductions from Vessel Speed Reduction



- Annual reductions for each scenario
- Fewer reductions available in 2035 compared to 2025 due to estimated fleet turn over



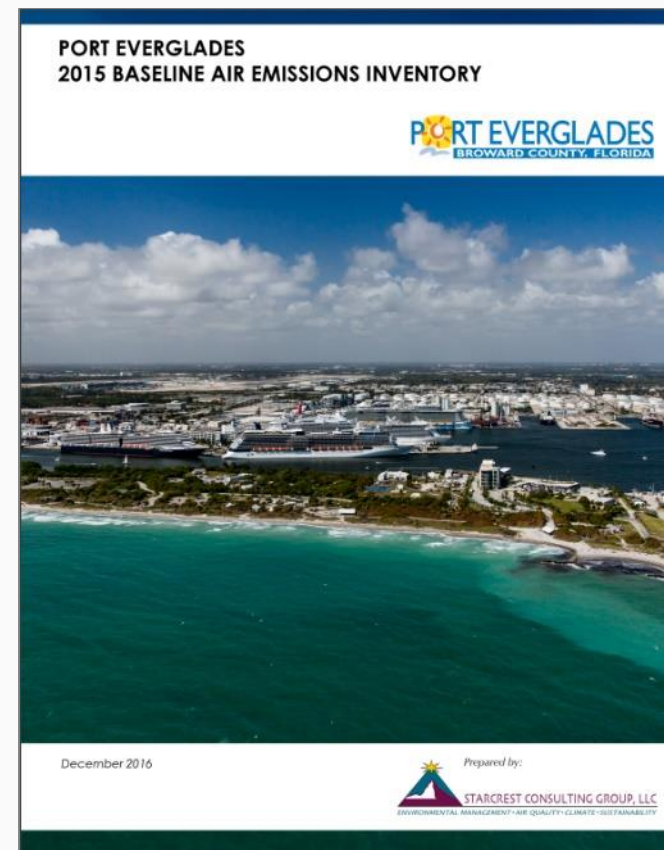
Key Findings of the EPA-Port Everglades Partnership

What did we learn?



Partnering with PEV was key to developing methods and lessons learned that can be applied to other ports

- Through the partnership, EPA and Port Everglades worked together on common environmental objectives and shared their perspectives
- Example methods and lessons learned:
 - The terminal surveys done to support the baseline inventory illustrated data availability, efforts required for data collection, and what details are useful for further analysis
 - Methodology to analyze AIS data is a gap in the current inventory guidance that EPA can now fill

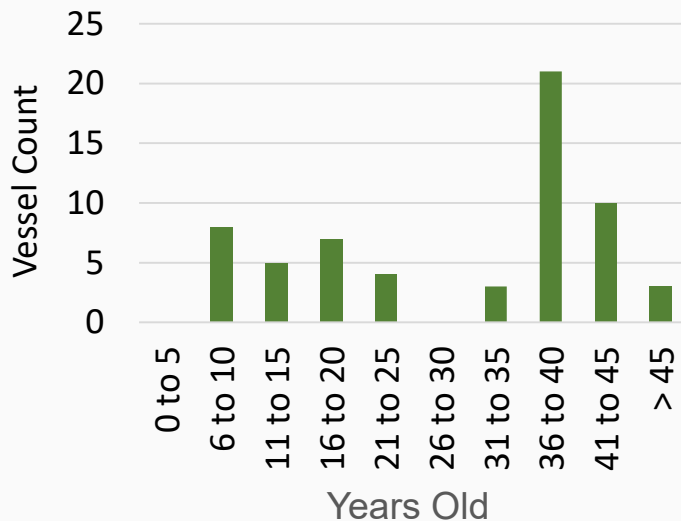




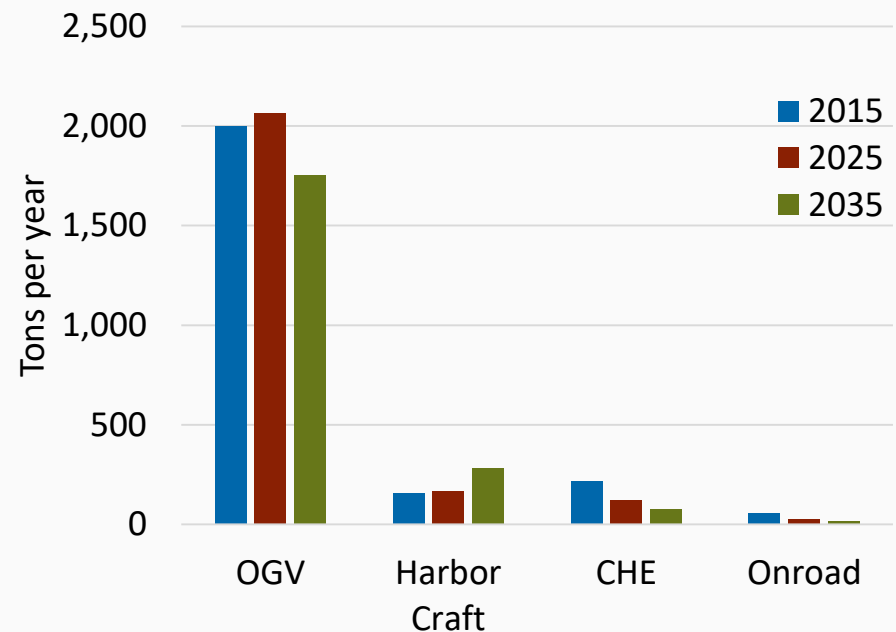
Inventories can help benchmark port and port industry progress

- Baseline inventories can identify reduction opportunities and prioritize future investment or operational changes

Harbor Craft Age Distribution



PEV Baseline and Projected Business as Usual On-port NOx Emissions



Note: NOx on-port rail emissions are <2 tons per year.



Emissions are being reduced, but more can be done with available strategies

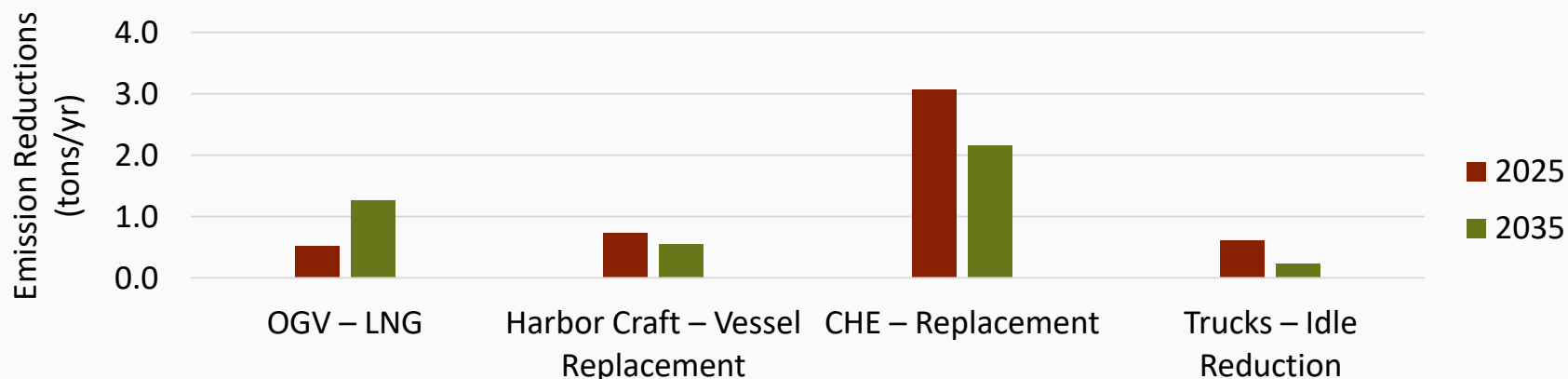
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Strategies and scenarios are effective to reduce on-port emissions

- Example on-port strategies to reduce NOx emissions:
 - **OGVs**: Use LNG in 5–10 percent of containerships
 - **Harbor Craft**: Replace 20 percent of Tier 0 vessels with Tier 4 vessels
 - **CHE**: Replace Tier 0 through Tier 3 equipment with Tier 4 or electric equipment
 - **Trucks**: Limit on-port truck idling to 5 minutes per truck per visit

Projected Annual NOx Emission Reductions for Selected On-port Strategies



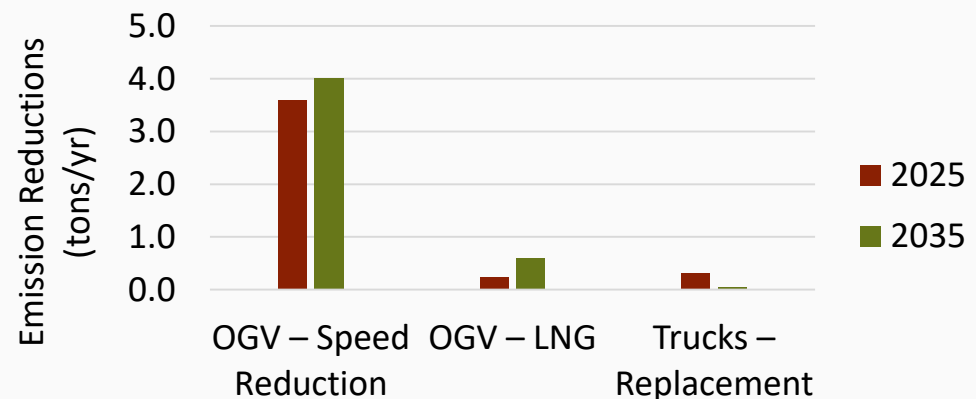


Potential actions can have benefits beyond a port's boundary

- Example on-port strategies to reduce NOx emissions:
 - **OGVs**: Have 50 percent of vessels participate in voluntary vessel speed reduction to 12 knots or less
 - **OGVs**: Use LNG in 5–10 percent of containerships
 - **Trucks**: Accelerate replacement of pre-2007 and pre-2010 trucks with model year 2010 or later trucks and some BEVs

- Quantifying mobile source emissions using local data along these types of corridors can help stakeholders identify impacts and opportunities to reduce emissions

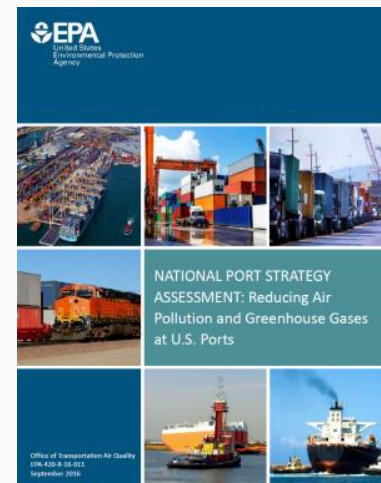
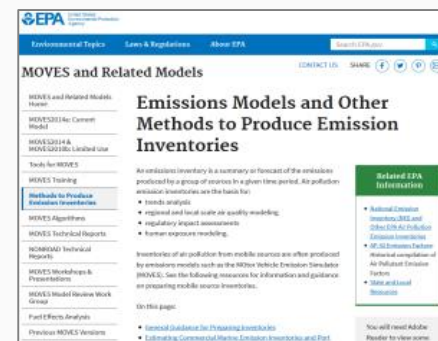
Projected Annual PM_{2.5} Emission Reductions for Selected Off-port Strategies





Data and methods are available for developing port inventories and analysis

- Emission estimation methods are currently available for all land and marine emission sources at ports
- Partnering with Port Everglades allowed EPA to refine inventory development methods and will inform EPA's next update of the Port Emissions Inventory Guidance.
 - For example, the MOVES model was not yet available when the existing guidance was issued, and its predecessor did not have the same capabilities





Additional Resources

- EPA Ports Initiative Webpage (www.epa.gov/ports-initiative)
 - Sign up for the Ports Initiative Newsletter
- Port Everglades Partnership webpage (www.epa.gov/ports-initiative/epa-and-port-everglades-partnership-emission-inventories-and-reduction-strategies)
 - Press release
 - Report downloads (Executive Summary and Main Report)
 - Link to EPA-Port Everglades Partnership Agreement
- Direct inquiries about the partnership and Ports Initiative to talkaboutports@epa.gov



Questions?

- When asking a question, please first identify yourself and your organization
- If you have a question, please enter it into the Q&A pod below
- If you would like to ask your question verbally, you will need to unmute your phone by pressing *6



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Kathryn Dotzel & Benjamin VanGessel
Office of Transportation Air Quality
U.S. Environmental Protection Agency



Dale Aspy and Alan Powell

Region 4

U.S. Environmental Protection Agency



Erik Neugaard

Environmental Program Manager

Seaport Engineering and Construction
Division

Broward County's Port Everglades