



# PORT OF HOUSTON AUTHORITY

## CLEAN AIR STRATEGY PLAN

The Clean Air Strategy Plan (CASP) is the Port of Houston Authority's (PHA) plan to reduce real and sustainable maritime and port-related emissions. The CASP is an element of PHA's strategic goals, which includes being environmentally friendly and commercially successful. PHA recognizes that no organization can grow and thrive in a vacuum, and recognizes that business decisions have far reaching consequences. As such the port will act in the best interests of business, the environment, and the community. PHA's environmental management programs employ proactive approaches that protect, conserve, and integrate sustainable goals and strategies into recommendations and guidance that yield measurable results. The focus of the CASP is to strategize economically feasible ways and means to implement emissions reduction from maritime intermodal interests in the greater Port of Houston. The greater Port of Houston (POH) includes the PHA as well as 150-plus private industrial companies along the Houston Ship Channel.

PHA's commitment to air quality is a top priority. This commitment is being implemented in the development of the Clean Air Strategy Plan.

- 1. Benefit the Houston region through clean air and economic development**
  - Seek cost-effective and commercially viable emission reduction strategies
  - Create a forum for maritime and port related industries to discuss the latest challenges and achievements in emission reduction practices and technologies
  - Develop policies and procedures to minimize ozone forming and GHG emissions
- 2. A plan to reduce emissions from maritime, intermodal transportation, and port related businesses**
  - Encourage consensus for national and international clean air standards and regulations
  - Research best management practices and proven technologies for cost effective emission reduction measures
  - Provide PHA staff support to CASP committees
- 3. Informed and motivated maritime businesses engaged in the implementation of emission reductions**
  - Locate funding opportunities for the implementation of clean air strategies
  - Build public/private partnerships
  - Support implementation projects with economies of scale
- 4. Regulatory entities knowledgeable about the maritime and port industry**
  - Educate government agencies on maritime and port related business practices
  - Engage government entities in port and maritime industry concerns



## GEOGRAPHY

The geographical extent for commercial vessel carriers is the POH. The Port of Houston is made up of the PHA and private industrial companies located along the Houston Ship Channel. The outer boundary area is located approximately nine nautical miles (nm) off the coast at the outer sea buoy. Emissions associated with vessels that called the Port of Houston private and public facilities along the Houston Ship Channel were included; port-specific emissions for Ports of Galveston, Texas City and Freeport, and the Galveston, Texas City and Freeport Ship Channels are outside the scope, though their participation and input is invited and welcome. On the land side, the scope for cargo handling equipment, locomotives and trucks includes PHA owned property (PHA operated and tenant operated) and Port Terminal Railroad Association (PTRA) property. For trucks visiting PHA and locomotives visiting PTRA, the HGB ozone nonattainment area is included as well. The PHA includes activities within 'PHA property,' (Barbours Cut Terminal, Turning Basin Terminals, Bayport Terminal, CARE Terminal, Jacintoport Terminal, Manchester Wharves, Sims Bayou Terminal, Southside Wharves, Woodhouse Terminal, Rosa Allen, Bulk Materials Handling Plant, Industrial Park East, North "L" Street, Pelican Island, Southside Brady Island, and Wah Chang Tract), includes PHA on-terminal properties (PHA operated and tenant operated) and those occurring on-road in the HGB nonattainment area from trucks visiting the Houston Ship Channel

**Ports are not air quality regulators - state and federal air regulatory agencies are responsible for meeting air quality requirements within their domain of authority, and international governing bodies like the IMO are responsible for setting international standards for ocean-going vessels that will protect the global environment.**

## BACKGROUND

The Houston-Galveston-Brazoria (HGB) eight-county area is classified by the Environmental Protection Agency (EPA) as an 'ozone nonattainment area', meaning it is out of compliance with the Clean Air Act (CAA). Ozone refers to 'ground-level ozone' commonly known as smog, which causes lung disease. EPA has set timelines for the HGB area to be in compliance with the CAA, the principal milestones are:

- April 2010 – when the State of Texas must deliver a plan to EPA specifically outlining measures to reduce emissions or face penalties. These penalties, if enacted, will harm all transportation modes in the state.
- June 15, 2019 is the date when the air in the HGB area must be clean, or else suffer the threat of both health ramifications and further penalties.

Proactive steps have already been taken to reduce air emissions from operations and to encourage emission reductions by tenants and the broader Houston Ship Channel maritime community. A number of leading ports are also engaged in air emission reduction efforts similar to those of PHA, including accelerated engine and equipment replacements, modernized truck gates, and tenant education. Examples include:



- The Port Authority of New York and New Jersey is investing in a port linked barge and rail transport system, which is anticipated to significantly reduce truck traffic and improve air quality<sup>1</sup>
- The Ports of Los Angeles and Long Beach incorporate mobile and stationary source emissions reduction mechanisms, such as lease requirements, tariff change, financial incentives, and voluntary measures to adopt low-emission technologies
- Three port authorities in the Pacific Northwest - the Port of Seattle, Port of Tacoma, and Vancouver Fraser Port Authority –developed a common Clean Air Strategy to jointly reduce port and port-related air emission<sup>2</sup>

The highlights of PHA efforts to improve air quality in the HGB area through air emissions reductions include:

- Development of a Goods Movement Air Emissions inventory
- Clean Fleet Policy Program
- Pre-check gate at the Barbours Cut Container Terminal to reduce truck idling
- Tenant engagement and education, including addressing air quality issues as part of the quarterly tenant meetings and support for obtaining TERP grants
- Reducing employee commute and associated emissions through Van Pool and 9/80 work weeks
- Resource support for the ratification of MARPOL Annex VI, Regulations for the Prevention of Air Pollution from Ships
- Preference for contractors that include emission reduction plans as part of their bids, in awarding construction contracts
- Bayport Terminal is equipped with the infrastructure to provide shore power to vessels once the demand emerges

#### **INDUSTRY BEST PRACTICE EXAMPLES**

PHA activities in community and stakeholder engagement are similar to other leading ports in the United States and around the world. Some leading ports have established formal port-wide stakeholder advisory bodies, such as the Port of Brisbane’s Community Consultative Committee,<sup>3</sup> consisting of representatives from conservation, business, and community groups that meet quarterly to provide input to the port authority.

Based on review of industry best practice examples and discussions with PHA representatives, the following opportunities for community and stakeholder engagement thru the CASP were identified:

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<sup>1</sup> See [http://www.panynj.gov/doingbusinesswith/seaport/html/port\\_inland.html](http://www.panynj.gov/doingbusinesswith/seaport/html/port_inland.html).

<sup>2</sup> See [http://www.portvancouver.com/the\\_port/docs/NWCleanAirStratDRAFTDec07.pdf](http://www.portvancouver.com/the_port/docs/NWCleanAirStratDRAFTDec07.pdf).

<sup>3</sup> [http://www.portbris.com.au/community/thecomunity/community\\_consultative\\_committee](http://www.portbris.com.au/community/thecomunity/community_consultative_committee)



- Involve key stakeholders such as community, public agency, and NGO representatives as well as business partners, to advise PHA on emerging issues and concerns.
- Increase transparency of the stakeholder engagement process
- Based on review of industry best management practice examples and discussion with PHA representatives, the following opportunities to address air quality and Climate Change issues have been identified:
  - Re-introduce an updated set of air emission reduction targets for PHA operations, including NO<sub>x</sub>, VOC, and PM reduction targets, along with greenhouse gas (GHG) reduction targets.
  - Establish a formal requirement for air emission reduction plan as part of construction Request for Proposals (RFPs).
  - Integrate air emission reduction plans into new leases.
  - Develop a port-wide Air Quality Strategy Plan based on the completed Goods Movement Air Emissions inventory.
  - Investigate incentives and funding mechanisms, possibly in conjunction with local and state governments, to encourage the adoption of clean-air practices by business partners.
  - Promote use of Bayport shore power infrastructure and investigate feasibility of providing shore power to harbor crafts.
  - Investigate feasibility of new technologies for use in PHA operations, including hybrid yard trucks, electric vehicles and solar-powered recharging facilities for electric vehicles.
  - Renewable energy specification of 5% in current energy contract.
  - Participation in the C40 World Ports Climate Conference, including commitment to accept measures to the World Ports Climate Declaration to reduce GHG emissions and improve air quality.
  - Establish a GHG reduction target as part of the EMS. The GHG reduction target should include reduction in direct GHG emissions from PHA operations as well as indirect emissions from electricity use in PHA operations.
  - Investigate feasibility and cost of increasing procurement of renewable energy from the current 5%.
  - Quantify greenhouse-gas emission reductions from the current activities, including those related to air emission reductions and energy and water conservation.
- Promote and educate tenants and the Houston Ship Channel marine industry on greenhouse-gas reduction practices as part of the regular tenant meeting as well as broader outreach activities.
- Convene maritime businesses, government agencies, and stakeholders to discuss climate change and identify adaptation/mitigation opportunities in the Houston Ship Channel area.
- Explore the possible comparative advantage that the Port of Houston provides relative to other ports in the country in terms of reducing air emissions (including greenhouse gases) through efficient multimodal transportation and central location in the country.

**Greenhouse-gas reduction is typically implicit in port authorities' air quality and energy conservation programs. The City of Los Angeles Harbor Department has developed a Climate Action Plan<sup>1</sup> that outlines specific steps to reduce greenhouse-gas emissions from its tenants' operations, such as cargo-handling equipments, ships, harbor crafts, trucks, and rail locomotives, including implementation actions such as a Green Building policy, green power, and green procurement requirements.**



## CASP PROGRAM DEVELOPMENT

Port administrators realize that they can play an important role in facilitating and encouraging significant emission reductions and promoting air quality awareness within their sphere of influence. Therefore, PHA is initiating the CASP as a comprehensive air quality management plan to promote 'voluntary' emissions reductions for the common good of the HGB area. Overall goals and targets will be approved to the PHA Commission level. CASP will be supported by PHA Environmental Affairs Department personnel. The foundation for the CASP has been initiated by PHA through the creation of public / private partnerships for EPA's National Clean Diesel Campaign that provides economic stimulus funding through the Diesel Emission Reduction Act (DERA) as part of the American Recovery Reinvestment Act (ARRA). By serving as the local maritime industry clearing agency for applications, PHA hopes to 'jump-start' the CASP while expanding participation in DERA throughout the POH community.

### *PURPOSE AND STRUCTURE*

The purpose of the CASP is to develop and implement a plan to reduce emissions from maritime and associated intermodal transportation sources servicing the Houston Ship Channel businesses, such as the Petro-chemical industry. These actions will benefit the HGB community and assist the State of Texas and EPA in reducing the harmful health effects of ground-level ozone and the potential of associated economic repercussions. The structure of the CASP will include a 'CASP Steering Committee' made up of principal Houston Ship Channel businesses and services, and major PHA tenants. The Steering Committee will be developed in conjunction and parallel to Stakeholder Committees. Emphasis will be placed on strategies that gain the greatest POH participation in order to reduce intermodal emissions in a collaborative manner in order to maximize effectiveness while reducing costs. Subject matter may include;

**The CASP is a sustainable initiative that maintains PHA's strategic financial goals such as economic development and self-sufficiency.**

- Implementation Issues
  - Identifying funding opportunities
    - Grant funding (local, state, federal funds, private and corporate foundations, with the potential to contribute to a designated 501 (c) 3 as an additional 'grant')
  - Creating potential implementation synergies / public-private partnerships
  - Sharing critical updates in technology and policy
  - Recognition and Incentive programs
    - Green Ship, Green Tenant, Green PassPORT
  - Publicity for participants
  - Voluntary compliance
  - Compulsory compliance
    - Tariff changes
    - Lease agreements



- Climate Change
  - Greenhouse Gas Inventories
  - Reduction Opportunities
    - Energy Efficiencies
    - Technology
  - Credits - Cap and trade programs
- National Ambient Air Quality Standards (NAAQS)
  - Nitrogen Oxides (NO<sub>x</sub>) (a precursor to the EPA criteria pollutant ozone)
  - Volatile Organic Compounds (VOCs) (a precursor to the EPA criteria pollutant ozone)
  - Particulates (PM<sub>10</sub> / PM<sub>2.5</sub>) (an EPA criteria pollutant)
  - Carbon monoxide (CO) (an EPA criteria pollutant)
  - Sulfur dioxide (SO<sub>2</sub>) (an EPA criteria pollutant)
  - Carbon dioxide (CO<sub>2</sub>) (a greenhouse gas)
- Outreach / education
  - Fact sheets
  - Environmental training
  - Seminars
  - Program status brochures
    - Outlining the goals that have been met / implemented

The Steering Committee will also be supported by source and specialty subcommittees, such as:

- Ocean-going vessels (e.g., containerships, bulk cargo ships, tankers)
- Harbor vessels (assist tugs and tugboats push or tow barges)
- Cargo handling equipment (e.g., cranes, yard tractors, forklifts)
- Locomotives (switching and line haul rail locomotives)
- Heavy-duty diesel-fueled vehicles (large on-road diesel trucks)

Subcommittees will be open meetings whose members include interested stakeholders in the specified source / topic. The purpose of the subcommittees will include; opportunities to evaluate and share potential measures and implementation options; as well as outreach for potential funding of their equipment.

### **EMISSIONS INVENTORIES**

The foundation of the air quality strategy is the detailed emission inventory for the sources included in the Plan. For ports, the primary emission sources are associated with operational equipment used at terminals, trucks and locomotives serving the terminals, and ships and harbor vessels calling on the terminals. The PHA has been inventorying these sources since 2000<sup>4</sup> and these inventories were developed and updated for emission reduction planning purposes.

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<sup>4</sup> For the operating year 1997.



## PORT OF HOUSTON AUTHORITY AIR EMISSIONS

In 2008, Starcrest Consulting Group, LLC (Starcrest) prepared the *2007 Goods Movement Air Emissions Inventory at the Port of Houston*.<sup>5</sup> The GM EI was funded by PHA and included the following source categories:

- Ocean-going vessels (e.g., containerships, bulk cargo ships, tankers)
- Harbor vessels (assist tugs and tugboats push or tow barges)
- Cargo handling equipment (e.g., cranes, yard tractors, forklifts)
- Locomotives (switching and line haul rail locomotives)
- Heavy-duty diesel-fueled vehicles (large on-road diesel trucks)

Passenger vehicles (including fleet and commuter), for which PHA has estimated emissions outside the GM EI, will also be included in the CASP. These include passenger and light-duty vehicles licensed for use on public roads.

Other sources include emissions associated with maintenance operations, energy consumption of port and tenant offices, terminal and street lighting, electrified cargo handling equipment, building heating, ventilating, and air conditioning, and so on. These sources typically make up less than 5-10% of total port-related emissions. Some of these sources have been inventoried, but not all at this time.

The following pollutants were estimated:

- Nitrogen oxides (NO<sub>x</sub>), consisting primarily of nitrogen dioxide with lesser amounts of nitric oxide and other oxides of nitrogen (a precursor to the EPA criteria pollutant ozone)<sup>6</sup>
- Volatile organic compounds (VOCs) (a precursor to the EPA criteria pollutant ozone)
- Carbon monoxide (CO) (an EPA criteria pollutant)
- Sulfur dioxide (SO<sub>2</sub>) (an EPA criteria pollutant)
- Particulate matter 10 microns and smaller (PM<sub>10</sub>) (particulate matter is an EPA criteria pollutant)
- Particulate matter 2.5 microns and smaller (PM<sub>2.5</sub>) (particulate matter is an EPA criteria pollutant)
- Carbon dioxide (CO<sub>2</sub>) (a greenhouse gas)

In synopsis, the maritime emissions associated with the Port of Houston as a whole indicate ocean-going vessels have nearly all the SO<sub>2</sub> emissions because SO<sub>2</sub> is estimated from fuel sulfur content. Sulfur in fuel used in ocean-going vessels is regulated internationally by the IMO and is currently capped at 4.5%. However, the world average sulfur content is around 2.7% which equates to 27,000 ppm.<sup>7</sup> Fuel used in landside vehicles and equipment and

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<sup>5</sup> Starcrest 2008, draft. PUT link to webpage that has the GM EI report.

<sup>6</sup> The EPA criteria pollutants are listed in the *Code of Federal Regulations*, Title 40, Part 50 (40 CFR 50).

<sup>7</sup> IMO. See: <http://www.imo.org>.

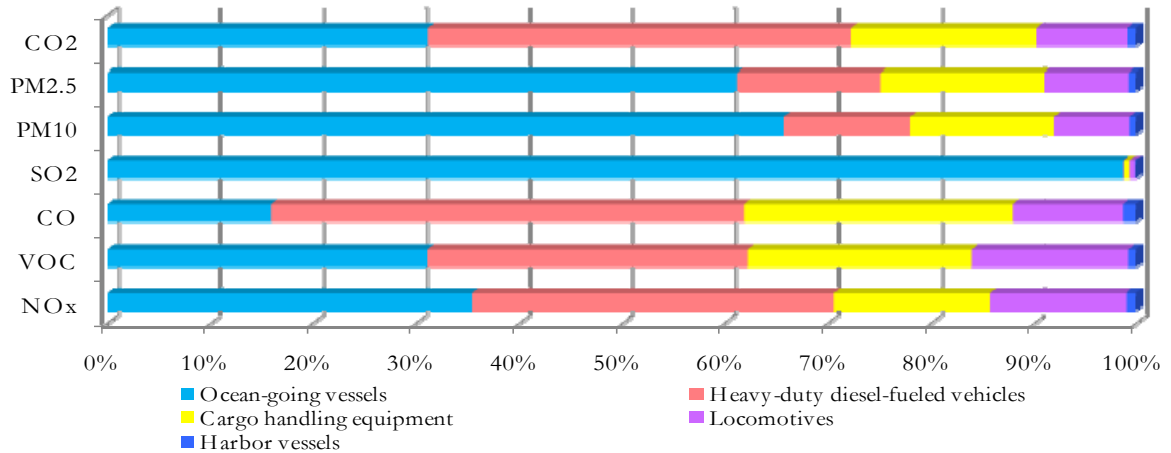


harbor vessels are regulated by the EPA where the current fuel sulfur limits are 15 ppm for onroad fuel<sup>8</sup> and 500 ppm for nonroad fuel.<sup>9</sup>

2007 PHA Associated Maritime-Related Emissions, tpy

Source	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
Ocean-going vessels	2,386	108	222	3,296	296	237	195,580
Heavy-duty diesel-fueled vehicles	2,357	108	640	2	56	54	257,980
Cargo handling equipment	1,020	75	363	22	63	61	112,618
Locomotives	885	53	148	18	33	32	56,120
Harbor vessels	68	2	19	2	3	3	5,276
<b>Total</b>	<b>6,716</b>	<b>346</b>	<b>1,392</b>	<b>3,340</b>	<b>450</b>	<b>386</b>	<b>627,574</b>

2007 PHA Associated Maritime-Related Emissions, %



“PHA associated” is defined as follows for each source category:

- For vessels (ocean-going vessels and harbor vessels), “PHA associated” includes vessels that visit a terminal on PHA property, whether PHA operated (Barbours Cut, Turning Basin or Bayport Terminals) or

<sup>8</sup> 40 CFR 80.520.

<sup>9</sup> 40 CFR 80.510.



tenant operated. Emissions during dwelling, maneuvering and transiting the Houston Ship Channel are included.

- For heavy-duty diesel-fueled vehicles, all reported emissions are “PHA associated” and include those occurring on-terminal at PHA properties (whether PHA operated or tenant operated) and those occurring on-road in the HGB nonattainment area from trucks that have visited a PHA property.
- For cargo handling equipment, all reported cargo handling equipment emissions are “PHA associated” (occurring on PHA property, whether PHA operated or tenant operated).
- For locomotives, all reported emissions are considered “PHA associated” and include emissions from switching operations at PTRA and from line haul operations within the HGB nonattainment area from locomotives visiting PTRA.

In summary, for PHA associated emissions:

- Ocean-going vessels represent 36% of NO<sub>x</sub>, 31% of VOC, 16% of CO, nearly 99% of SO<sub>2</sub>, 61 - 66% of PM, and 31% of CO<sub>2</sub>.
- Heavy-duty diesel-fueled vehicles represent 35% of NO<sub>x</sub>, 31% of VOC, 46% of CO, 0.1% of SO<sub>2</sub>, 12 - 14% of PM, and 41% of CO<sub>2</sub>.
- Cargo handling equipment represents 15% of NO<sub>x</sub>, 22% of VOC, 26% of CO, 0.7% of SO<sub>2</sub>, 14 - 16% of PM, and 18% of CO<sub>2</sub>.
- Locomotives represent 13% of NO<sub>x</sub>, 15% of VOC, 11% of CO, 0.5% of SO<sub>2</sub>, 7 - 8% of PM, and 9% of CO<sub>2</sub>.
- Harbor vessels represent 1% of NO<sub>x</sub>, 1.4% of CO, and less than 1% each of all other pollutants.

### **OCEAN-GOING VESSELS**

An important consideration for ocean-going vessels is occurring at the international level. In April 2008, the IMO revised the air quality-related standards for ocean-going vessels. These revisions impact fuel sulfur content, which affects not only SO<sub>2</sub> but also PM emissions, and engine standards, which impact NO<sub>x</sub> emissions. The fuel sulfur limitations take the form of global and emission control area (ECA) requirements. The engine standards provide a tiered emission limit for new engines as well as emission limits when certain engines are overhauled.

Because the current world average fuel sulfur content of 2.7% is used to calculate emissions for the Port of Houston, the global fuel sulfur cap reduction from 4.5% to 3.5% effective in 2012 will have no impact on emissions for vessels frequenting POH. However, the global cap will be further reduced to 0.5% in 2020, which will result in significant reductions in SO<sub>2</sub> (80%) and PM (75%).

Ocean-going vessels have nearly all the SO<sub>2</sub> emissions because SO<sub>2</sub> is estimated from fuel sulfur content (see Section 1.2). Sulfur in fuel used in ocean-going vessels is regulated internationally by the IMO and is currently capped at 4.5%. However, the world average sulfur content is around 2.7% which equates to 27,000 ppm.<sup>10</sup> Fuel

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<sup>10</sup> IMO. See: <http://www.imo.org>.



used in landside vehicles and equipment and harbor vessels are regulated by the EPA where the current fuel sulfur limits are 15 ppm for onroad fuel<sup>11</sup> and 500 ppm for nonroad fuel.<sup>12</sup>

The three tiered NOx engine standards that were set forth in the revision to Annex VI provide long-term emission reductions. The Tier II standard would be phased in from 2011 to 2016 and would provide modest NOx reductions for ships being built during that time. The more significant reductions would start in 2016 when the Tier III standard is implemented. The diesel engine standards for existing ships will produce an approximately 7% reduction in NOx from ships built between 1990 and 2000.

The downsides to the engine standard approach in the short to mid-term are:

- The standards are for new ships built after 2011 or 2016.
- For existing ships, the standards will only be applied when the ship engine is overhauled.
- Each port will be affected differently depending on the ship types, carriers, route significance, world economy, and other factors that would determine when new ships are placed on which routes.
- Estimating emission reductions from these engine standards will be extremely difficult due to the many variables that impact ship deployments.

New ship diesel engine standards will be most effective in a strong global economy and rising trade among nations. Favorable economic conditions and strong trade help drive ship-building contracts and fleet modernization. At this time, it is uncertain to what magnitude and when these engine standards will have a positive impact on the Houston Ship Channel area. The GM EI does include ship construction dates so it will be possible to determine the impact of the regulation during inventory updates.

For PHA associated emissions, ocean-going vessels contribute the most NOx (36%, just ahead of HDDV), VOC (31%, same as HDDV), SO<sub>2</sub> (99%), and PM (61 - 66%).

Achieving reductions in this category will be challenging because the PHA and the Port of Houston typically do not receive the newest built ships. Shipping lines typically put their newest ships in the Asia-Europe, Asia-West Coast or Europe-East Coast trade routes. Houston typically gets ships that have been moved from these trade routes, so there is a lag in the technology available onboard, and the room available onboard for placement of retrofit devices. Ships visiting PHA are five to six years older, on average, than ships visiting the major west coast ports. The vessel age is a weighted average based on number of vessel calls and average vessel age, by subtype.

Vessel speed reduction (VSR), effective at other ports, has been evaluated for the Houston Ship Channel and was determined to not yield emission reduction benefits as the ships must already slow down to navigate. Likewise, cold ironing (transferring power from the engines to shoreside electricity while at dock) has been considered, and appears to have limited potential; however, both measures will be evaluated in more detail, along with other measures by the CASP stakeholders.

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<sup>11</sup> 40 CFR 80.520.

<sup>12</sup> 40 CFR 80.510.



### **HEAVY-DUTY DIESEL-FUELED VEHICLES**

Following ocean-going vessels, the next potential priority source category is drayage trucks, i.e., heavy-duty vehicles that make frequent short-haul trips to and from PHA and local companies. For PHA associated emissions, heavy-duty diesel-fueled vehicles contribute 35% of NO<sub>x</sub>, 31% of VOC, 46% of CO, 0.1% of SO<sub>2</sub>, 12 - 14% of PM, and 41% of CO<sub>2</sub>.

Based on a study conducted in 2008 by PHA with support from Starcrest, most (81%) trips originating from or going to PHA were less than 100 miles. For these, the average trip was 22 miles. The average age for all trucks in the study was ten to eleven years old. Because of the trip frequency, the duration of time in the nonattainment area, and the age of the fleet, there are opportunities for reducing truck emissions even though, as on-road vehicles, they are already regulated at the federal level. A program to promote the use of TERP, including education in Spanish as well as English, is likely to be a cornerstone of the CASP for this source category. For example, there is a perception among some truck drivers that visit PHA terminals that their trucks would not qualify because they are not old enough when in fact they probably would since any truck older than model year 2004 would meet the 25% emission reduction criteria. Grants and low-interest loans will be among the measures evaluated for the accelerated replacement of trucks. Once a program is established, there may also be opportunities to transfer it to the municipality or county level.

For on-terminal activity, idling emissions constitute a greater share of the total emissions than do driving emissions. For example, for NO<sub>x</sub>, idling emissions are 78% of on-terminal truck emissions. There may be opportunities for idling reduction; however, the summer climate presents a challenge when requesting drivers to turn off engines and suffer the extreme Houston heat and humidity.

Short sea shipping, in which cargo normally transported on trucks is transported by barge, is one opportunity which may be considered to reduce longer haul trucks. On October 9, 2008, EPA published an Interim Final Rule proposing "America's Marine Highways Program," and requesting comments, due February 6, 2009, with suggestions from ports and government authorities that might sponsor "Marine Highway Corridors." The feasibility of such a program would require evaluation prior to determining whether it might be a viable alternative for PHA or Port of Houston cargo.

### **CARGO HANDLING EQUIPMENT**

For PHA associated emissions, cargo handling equipment contributes 15% of NO<sub>x</sub>, 22% of VOC, 26% of CO, 0.7% of SO<sub>2</sub>, 14 - 16% of PM, and 18% of CO<sub>2</sub>. PHA has had a program in place since 2001 to reduce CHE emissions. With the replacement of older engines with newer, cleaner EPA Tier II engines, and the use of PuriNO<sub>x</sub> beginning in 2003 and ending in 2006, PHA reduced NO<sub>x</sub> emissions from 0.52 tons NO<sub>x</sub>/1,000 vessel moves in 2001 to 0.33 tons NO<sub>x</sub>/1,000 vessel moves in 2007, meeting their 2005 EMS target of 0.39 tons NO<sub>x</sub>/1,000 vessel moves by 2003.<sup>13</sup>

At PHA, 966 pieces of CHE were included in the 2007 GM EI: 45 had onroad engines, 106 were Tier 1, 253 were Tier 2, 10 were Tier 3, and nine were Tier 4. This leaves an opportunity to upgrade 44% of the fleet to newer,

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<sup>13</sup> Estimated using EPA NONROAD 2004 model.



cleaner engines. 89% (863) of the 966 pieces of CHE were fueled by nonroad diesel, 8% (79 pieces) by onroad diesel, 2% (21) by LPG, and 0.3% (3) by gasoline. To the extent equipment may be run on cleaner fuels, there may be further opportunities for emissions reductions.

PHA has developed a "Clean Fleet Policy" for PHA and tenant operations that would accelerate the reduction of emissions from off-road mobile sources. by requiring a certain percentage of the fleet to be operated by tiered engines such that within five years of program implementation, approximately 80% of the fleet would have Tier II engines or cleaner, and no equipment would be operating on PHA property that did not meet at least the Tier 1 standards, including rental equipment. This program has been demonstrated and will be further developed by the CASP. Electrification of trucks and yard tractors at facilities, for example, may be considered and other emission reduction opportunities will be explored by the CASP.

### *Harbor Vessels*

Harbor vessels contribute 1% of NO<sub>x</sub>, 1.4% of CO, and less than 1% each of all other pollutants of PHA associated emissions. PHA believes that the best approach for harbor vessels, which consists primarily of tug and towboat operators, is advocacy, support and documentation of existing emission reductions so that this category can receive credit for its extensive efforts to date.

In 2001, the Texas Waterways Operators (TWOA), representing area tugboat companies, the EPA, the TNRCC (TCEQ's predecessor) and the Houston-Galveston Area Council, entered into a voluntary Memorandum of Agreement (MOA) to reduce air pollution in the HGB nonattainment area. Through the TWOA, 23 tug, barge, and towing companies agreed to reduce their emissions by 1.1 tpd of NO<sub>x</sub>, or approximately 400 tpy. Emission reduction measures included the early use of new engines or the retrofit of existing engines, the implementation of fleet operating efficiencies, and methods to reduce vessel idling time. These voluntary reductions were included in the SIP.<sup>14</sup> In addition, the towboats operate using Texas Low Emission Diesel (TxLED), and companies have also retrofit vessels with later tiered engines under the TCEQ Texas Emission Reduction Plan (TERP). At least one company with significant operations in the area has implemented a fuel optimization program on some of its tugboats, reducing emissions. Other emission reduction measures will be considered if identified, and dredging operations (for example, a hybrid tug) may be specifically targeted.

EPA published a final rule May 6, 2008, containing standards to reduce emissions from marine diesel engines and locomotives. These standards include more stringent requirements for remanufactured locomotives and marine diesel engines, and take effect as soon as certified remanufacturer systems are available. Tier 3 engines for newly-built marine diesel engines and locomotives phase in starting in 2009, and will reduce PM and NO<sub>x</sub> emissions. New idle reduction requirements are also created for new and remanufactured locomotives, and a new generation of clean switch locomotives, based on clean nonroad diesel engine standards, is established. The final long-term

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<sup>14</sup> EPA, TWOA, EPA, TNRCC, and HGAC Enter Agreement to Reduce Air Pollution in the Houston-Galveston Area, 22 June 2001. See:

<http://yosemite.epa.gov/opa/admpress.nsf/b1ab9f485b098972852562e7004dc686/aa081228b299f0fb852570d6005e7db5!OpenDocument>.



emission standards (Tier 4) apply to newly built locomotives and marine diesel engines. These standards are based on the use of high-efficiency catalytic aftertreatment technology and will phase-in beginning in 2014 for marine diesel engines and 2015 for locomotives. This technology requires the use of ultra-low sulfur diesel fuel (15 ppm sulfur), which will be available by 2012.<sup>15</sup>

### *Locomotives*

Locomotives contribute 13% of NO<sub>x</sub>, 15% of VOC, 11% of CO, 0.5% of SO<sub>2</sub>, 7 - 8% of PM, and 9% of CO<sub>2</sub> of PHA associated emissions. Within the locomotives category, the Port Terminal Railroad Association (PTRA) covers a small geographic area and contributes only 9 tpy (1%) of NO<sub>x</sub> emissions as compared to the major rail lines (BNSF Railway, Union Pacific [UP], Kansas City Southern Railroad [KCS]) which contribute the remaining 876 tpy of the 885 tpy of NO<sub>x</sub> represented by the locomotives source category.

Because of the initiatives already in place by PTRA (see below) and the smaller relative contribution of PTRA's switching emissions as compared to the major lines' line haul emissions, the major lines will generally receive a higher priority than PTRA within this source category. However, the major lines may be more difficult to affect, as they are national companies outside the influence of PHA. A national approach, perhaps through the AAPA or the EPA Rail Sector, in coordination with the EPA Ports Sector contact, may provide a more successful avenue for outreach.

PTRA has embarked on several efforts which they believe will result in lower emissions, although for technical reasons (listed below) reductions are not figured into the emission estimates presented in the GM EI. All efforts were fully implemented in 2007 except the engine rebuild program, and include:

- A 10-year engine rebuild program to be completed in early 2009,
- Automatic shutdown devices installed in all switch engines to eliminate idling time longer than 30 minutes, and
- The use of a fuel additive called Ener-Burn™<sup>16</sup> which eliminates engine deposits and increases fuel efficiency.

These measures cannot be accounted for in the emissions estimates because:

- Unless the rebuilds are intended to make the engines meet a lower emission standard there is no way of quantifying any reductions, because the rebuilds will only correct the effects of deterioration. Since there is no way accepted methodology for factoring deterioration into the calculations for old engines, it cannot be factored out for rebuilds.
- Without detailed records of the frequency and duration of idling without the shutdown devices, calculating the reductions is not possible.

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<sup>15</sup> EPA, Regulatory Announcement: *EPA Finalizes More Stringent Emissions Standards for Locomotives and Marine Compression-Ignition Engines*, EAP420-F08-004, March 2008. See: <http://www.epa.gov/otaq/marine.htm> or <http://www.epa.gov/otaq/locomotr.htm>.

<sup>16</sup> See: <http://www.batlbiofuels.com/>.



- Because Ener-Burn™ is not a verified emission reduction technology, there is no established reduction percentage. However, any effect on fuel efficiency would be included in the seven gallon per hour fuel use estimate.

There may be an opportunity to work with PTRA to obtain the estimated \$150,000 funding necessary to make the Ener-Burn™ fuel additive EPA verified.

#### ***-EVALUATION CRITERIA***

Evaluation criteria will include estimated potential reductions, cost effectiveness (including capital and operating expense), time for implementation, duration of reductions, life cycle analysis, and practicability. To the extent practicable, each measure will be reduced to a ratio of dollars per ton of pollutant reduced for each affected and/or targeted pollutant. The potential measures will then be ranked to help select the measures with the highest potential, taking care to ensure that reductions of one targeted pollutant do not significantly increase another targeted pollutant, or result in an undesirable and uncontrolled media transfer, for example from air to waste.

#### ***FORECASTING AND TRACKING***

In order to track the progress of the reduction measures, PHA will prepare annual updates to the emissions estimates documented in the 2007 GM EI. The emissions reduced by some measures fall outside the scope of the GM EI, and thus other means of monitoring progress will be developed by the CASP.

#### ***TIMELINE***

Development and implementation of the CASP is a significant effort, spanning multiple years. The process begins with the development of this approach document, which will be finalized at the beginning of 2009. There will be multiple efforts working in conjunctions and parallel over time.

#### ***INTEGRATION WITH EMS***

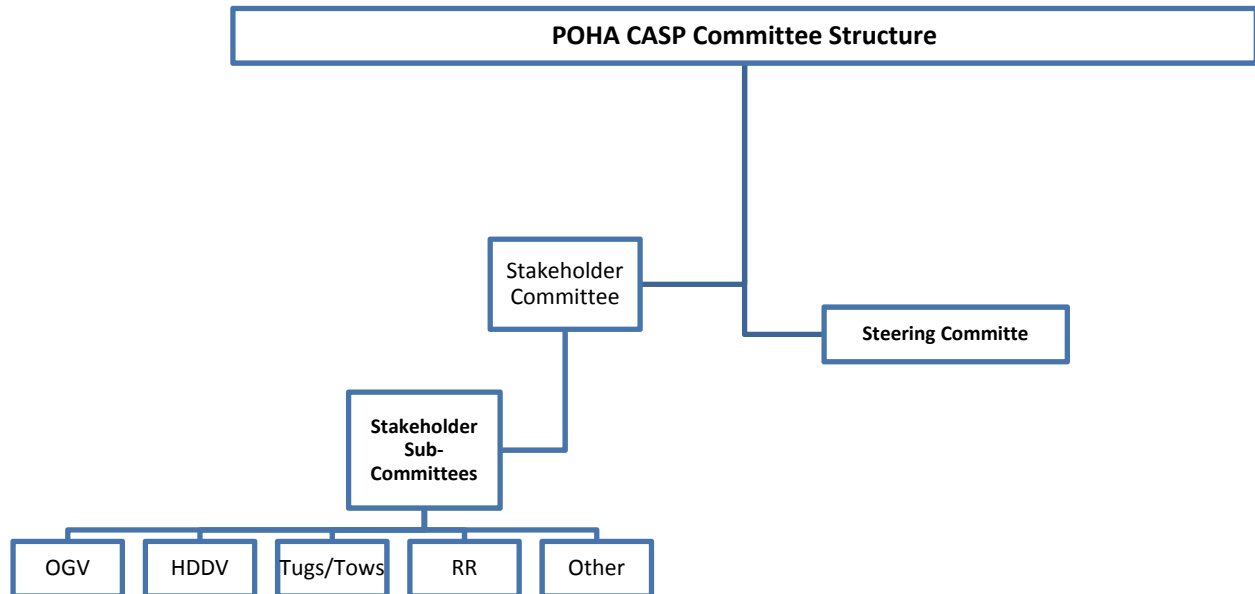
The CASP will be coordinated with the PHA EMS, such that aspects, impacts, and targets developed for the CASP are integrated with the air quality objectives of the EMS and other environmental initiatives EPA National Environmental Performance Track, TCEQ CLEAN TEXAS, and the EPA Blue Skies Collaborative (see the GM EI for more discussion of these initiatives).

As a leader in environmental stewardship, the Port of Houston Authority established the Environmental Leadership Program to encourage PHA contractors to adopt environmentally protective business practices and encourage innovation in design and operations to benefit the environment. The Port of Houston Authority was the first port in the nation to attain the respected International Standard for Environmental Management Systems (ISO 14001) Certification.



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## CASP STRUCTURE



The Steering Committee will be supported by specialists in technology, policy, and grants. Committee members will be invited by the PHA Board of Commissioners and follow Robert's Rules of Order. These Steering Committee members will meet quarterly to determine over-all strategies.

Subcommittees will be open meetings whose members include interested stakeholders in the specified source / topic. The purpose of the subcommittees will include; opportunities to evaluate and share potential measures and implementation options; as well as outreach for potential funding of their equipment.

The methodology for determining committee structure was as follows:

- PHA Tenants
- Frequency of Calls to PHA
- Houston based headquarters/ regional office