Why shore power?

Diesel emissions are associated with public health risks and new regulations have been established to require reductions of those emissions, not only from diesel-fueled trucks that operate at California ports, but also from ships docked at the ports.

Shore power is an emissions-control measure that allows ocean-going ships to run their auxiliary engines while at berth using grid-based power, thereby providing a mechanism to reduce diesel and other air pollutants from ships while they are at berth. Reducing emissions from ships is a key element of California’s Goods Movement Emission Reduction Program. Shore power is one of the principal methods of compliance with the California Air Resources Board (CARB) regulation for ‘vessels at berth’. One-half of a fleet’s vessel calls at California ports will be required to use shore power beginning in 2014. Over time, an increasingly higher percentage of each fleet is required to use shore power.

Shore power regulation

In December 2007 CARB approved a regulation to reduce emissions from diesel auxiliary engines on container, passenger, and refrigerated-cargo ships while berthing at a California port. This new California regulation requires that all operators of container vessels, that have more than 25 cumulative visits annually to California ports, employ an emission reduction system to reduce emissions from their fleets. Fleet operators visiting California ports will be required to reduce vessel emissions by either turning off the vessel auxiliary engines and connecting to a clean source of power or using alternative control technique(s) that achieve equivalent emission reductions while docked.

While a ship is at berth, it requires electricity for minimal functions (called ‘hoteling’). Shore Power (also known as ‘cold-ironing’) is a land-to-vessel connection that provides electrified power to the ship. It enables the ship to switch off its onboard diesel-powered generators while docked. Under the regulation, 50 percent of a fleet’s visits to a port must be shore power visits by 2014. 80 percent of a fleet’s visits must be shore power visits by 2020.

Description of project

The Port’s shore power project consists of design and construction of high voltage electrical infrastructure in the Port of Oakland (Port) Maritime area. The infrastructure generally runs from the Port’s main substations to on-terminal substations and, from there, to the terminal wharves. Power is extended down to the wharves, where vaults with electrical connections will provide the interface (outlets) for ocean going vessels to connect to the electric grid. Improvements for the shore-side electrical and control system at the Port include: industrial substations to receive power transmitted from the Port’s existing 12.47 kilovolt grid (kV - kilovolt); 7.5 MVA (MVA = power) transformers to bring the voltage down to a level compatible with the ship’s electrical requirements (6.6 kilovolts 3 phases, 60Hertz)

The power connection at the Port of Oakland is a 6.6 kilovolt electrical connection with an energy demand of up to 7.5 MVA power. The shore power design will follow IEEE/ISO/IEC standard P80005-1 (engineering and electrical standard). This standard addresses: high voltage shore distribution system; shore-to-ship connection and interface equipment; Transformers; ship distribution system; control, monitoring, interlocking and power management system.

Benefits of shore power

The Port of Oakland assumed the cost to install a shore power system not only to assist carriers with the financial burden to comply with California’s new regulation but also to minimize diesel emissions to residents of neighborhoods adjacent to the Port. Shore power also reduces greenhouse gases in addition to all other combustion byproducts. These reductions in emissions significantly improve air quality and reduce health risk from diesel and other air pollutant emissions at the Port.

At the Port of Oakland, Eagle Marine Services (EMS) completed its shore power infrastructure and Ports America will soon be building its own shore power system. Additionally, the Port of Oakland’s project includes 11 berths. By 2020, the Port estimates at least a 75 percent reduction in both diesel particulate matter (PM) and nitrogen oxide (NOx) emissions while ships are docked.

### FIGURE 1: PROJECTED EMISSIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>Diesel PM  (tons/year)/NOx (tons/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>PM 60.6/NOx 767</td>
</tr>
<tr>
<td>2014</td>
<td>PM 30.3/NOx 384</td>
</tr>
<tr>
<td>2020</td>
<td>PM 15.2/NOx 192</td>
</tr>
</tbody>
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Costs

The Port of Oakland’s shore power program is estimated to cost approximately US$70 million. The total combined cost of the Port’s project and the private sector shore power improvements at the Port is estimated to be more than US$100 million. Additionally, the maritime industry may be investing roughly up to US$2million per ship to retrofit a vessel for plugging into the power grid when docked at California ports.

Funding

To cost-effectively construct shore power infrastructure, the Port has employed a broad spectrum of funding sources, including looking beyond traditional funding sources, such as operating revenue and debt secured by such revenues, in order to implement this important initiative. The Port, and its tenants,
have pursued new funding and financing mechanisms, particularly grant funding, and have been successful in accessing federal, state, and local grants. The Port has been awarded approximately US$33 million in grants, including an approximate US$8 million Transportation Investment Generating Economic Recovery (TIGER) grant.

Since 2009, the Port of Oakland’s Maritime, Environmental Programs and Planning, Engineering and Finance divisions have collaborated in planning, funding and implementing this critical component of the Port’s overall Maritime Air Quality Improvement Plan or MAQIP. The utility upgrade program and the first three berths of the shore power program are completed and ready for the Port’s shipping partners that call at Berths 56, 57 and 58.

**Project schedule**

The Port’s shore power program schedule is governed by three principal factors comprising of: regulatory deadlines established by the California Air Resources Board; grant deadlines and time required to procure, manufacture, install and commission the equipment/infrastructure. The program is being constructed in three phases, as outlined below.
Challenges

The biggest challenge was the initial cost estimate of US$90 million for the Port of Oakland’s portion of the cost of shore power. However, since starting the program, Port staff were able to achieve significant cost savings from a variety of sources, including the efforts of personnel to value-engineer the design for each project and their due diligence in performing investigations that sought to leverage previous infrastructure investments on and off the terminals; the reduced the program from 12 to 11 berths; the benefits of an extremely competitive bid environment (indicative of the economic downturn in the current construction market); and the effective negotiations of staff with the contractors and consultants that helped to contain costs for change orders, design-scope changes, and diligent monitoring and tracking of project charges.

Another significant challenge is managing the complex and varied grant requirements. Reporting requirements can be extensive. Ensuring that grant assurances are met and preparing documentation in support of grant reimbursement continues to be a major task involving staff from multiple Port divisions and departments.

Maritime to grow as emissions decline

The Port of Oakland’s maritime business is projected to grow through 2020 and beyond. Concurrently, air pollutant emissions and health risk to workers in the seaport area and residents in the neighboring community are projected to decline dramatically, largely due to emissions reductions projects like shore power, the Port’s drayage truck programs, and other MAQIP emission reduction programs and projects.

Collaboration is key to project completion

The Port and its tenants will continue to collaborate and coordinate to complete implementation of the shore power project. The Port also continues to work closely with its funding and regulatory agency partners to navigate project challenges as they arise and ensure cost-effective and timely completion of the project. This important project will provide the necessary infrastructure to keep goods moving through the seaport in an environmentally sustainable manner.

ABOUT THE AUTHORS

Contributors:
Jill Borner-Brown: Port supervising engineer
Mohamad Ibrahim: Port associate engineer
Tim Leong: Port associate environmental scientist
Delphine Prevost: manager, financial planning
Marilyn Sandifur: media/public relations specialist
Richard Sinkoff: director of environmental programs and planning
Anne Whittington: Port environmental assessment supervisor

ABOUT THE PORT

The Port of Oakland oversees the Oakland seaport, Oakland International Airport, and 20 miles of waterfront, including commercial developments and hundreds of acres of public parks and conservation areas. The Oakland seaport is the fifth busiest container port in the United States. You can connect with the Port of Oakland through the website www.portoakland.com or on Twitter, Facebook, and YouTube.

ENQUIRIES

Marilyn Sandifur - Port of Oakland Spokesperson Port of Oakland
530 Water Street, Suite 324
Oakland, CA 94607
USA
Tel: 510-627-1193
Email: msandifur@portoakland.com
Web: www.portoakland.com