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Mr. Mike Waugh
Manager, Program Assistance Section
Air Resources Board
P.O. Box 2815
Sacramento, CA 95812

Subject: **Comments on March 2006 Evaluation of Cold-Ironing Ocean-Going Vessels at California Ports**

Dear Mike:

Dock Watts LLC submits the following comments on the Air Resource Board's (ARB) "Evaluation of Cold-Ironing Ocean-Going Vessels at California Ports" (Cold Ironing Report). Dock Watts is a California based company that specializes in shore power development. We appreciate ARB's work on the Cold Ironing Report and welcome the opportunity to participate and share our perspective.

GENERAL COMMENTS:

Shore power provides a unique form of mobile source emission reductions that when deployed, have characteristics of stationary source reductions that are point specific. While other control measures may reduce emissions, shore power virtually eliminates emissions. Shore power results in quantifiable emissions reductions; metered MWh translates directly to pounds of emissions reduction. Ship hotelling MWh requirements are a key metric in evaluating shore power feasibility. In addition to NOx, particulate matter, and SOx, ship auxiliary engines emit significant volumes of CO_2 (690 g/kWh or 1,520 lb/MWh). Shore power complements State of California initiatives to reduce greenhouse gas (GHG) emissions.

Dock Watts supports the Cold Ironing Report's general findings that initially, shore power will be cost effective for select applications that meet certain operational criteria, including:

- Electric loads of ships while at berth in a port (MWh per port call)
- Frequency of the same ship calling on the same port (port calls per year)
- Duration of ship port calls (hours per port call)
- Berth utilization of shore power (hours of year occupied)

Dock Watts recognizes that initially, shore power may not be cost effective for all ships visiting California. Stakeholders need to manage expectations with reasonable and appropriate policy. Like many emerging technologies, shore power promotion will need incentives and supplements to spark implementation. Dock Watts comments are intended to offer specific recommendations on implementation of shore power as a viable emission control measure.

SPECIFIC COMMENTS

Dock Watts agrees with many of the recommendations contained in the Cold Ironing Report, including minimizing ship on-board electric equipment (ie placing transformers on shoreside). Dock Watts appreciates the technical and logistical challenges to shore power. Stakeholders will need to develop standards that provide safe, efficient, and cost effective implementation. The following are specific comments and recommendations.

Development of Shore Power Standards

While each class of ship has unique technical and operating characteristics and individual ships have unique requirements, standards will need to be developed to pave the way for general acceptance of shore power. The maritime industry and electric industries have their own forums to develop technical and operating standards. Common ground needs to be developed to establish shore power standards among all stakeholders, with representation from ship owners, energy companies, terminal operators, and regulatory authorities. Such shore power standards may include:

- Voltage and frequency (current standard evolving is 6.6 kV at 60 Hz)
- Connectors and receptacles
- System protection
- Metering and measurement (including emissions factors)
- Connection procedures and safety considerations

Cost and Financial considerations

Cost estimates referenced in the Cold Ironing Report were based on select historical data. Dock Watts believes these costs represent "first of a kind" developments, with great potential to be reduced. The cost of Seattle shore side facilities (under $2.0 million) was less than a similar project in Juneau and significantly less than the $3.5 million referenced in the Cold Ironing Report. The Cold Ironing Report assumes ship on-board cost with out transformer of $500,000 and with transformer to be $1.5 million. This suggests the incremental cost to add a transformer is $1.0 million, which appears excessive. As with other technologies, experience and standards development will likely result in efficiencies that drive costs down over time.

Dock Watts recommends that for certain segments of the shipping community, higher criteria than six port calls per year may be more appropriate in assessing shore power cost effectiveness. We recommend further assessment of "frequent visitor ships" with consideration for seasonality (ie cruise ships) and fixed destination container ships (ie Asia-Pacific routes). Certain home ported cruise ship can have return frequencies that exceed 20 calls per year. Certain container ships on fixed Asia-Pacific routes have a typical return frequency of 45 days (8-9 visits per year).

The Cold Ironing Report should clearly define economic and financial assumptions used in determining cost effectiveness. Review of Table E-1 of Appendix E suggests a 10 year life using a 5.0 % discount rate. Consideration should be given for longer life for shore side facilities more in line with utility distribution facilities expected useful life (ie 20 or more years). In addition, there may be financing and tax considerations available to project proponents that may result in more efficient use of capital and improved cost effectiveness.

Shore Power Should Focus on Land-Based Ports, Not Off-Shore Moorings

The Cold Ironing Report included off-shore mooring ports, such as El Segundo. Provision of shore power to off-shore moorings may be technically and economically impractical. The cost of running underwater cables for significant distances may be cost prohibitive for the electric loads being considered. Dock Watts recommends that off-shore moorings ports, like El Segundo be excluded from the Cold Ironing Report.

Ship Avoided Cost of Generation

The Cold Ironing Report suggests ship engine fuel consumption based on derived engine performance assuming a general 35% fuel conversion efficiency. Like power plants use of BTU/kWh heat rates, the marine industry typically expresses engine fuel consumption on a metric ton per MWh (Mton/MWh) basis. This can typically range from 0.200 to 0.230 Mton/MWh, depending on engine type, size, and fuel type. The equivalent fuel consumption factor in the Cold Ironing Report is 0.236 Mton/MWh. Dock Watts recommends that the Cold Ironing Report reflect March 2006 Marine Diesel Oil costs of $631/ton for Los Angeles (March 31, 2006 Bunker World). This equates to 14.9 cent/kWh avoided fuel cost. Dock Watts recommends that ship avoided cost of generation include accrued (avoided) O&M cost which for engine generators of this size can range from 1.0 to 1.5 cent/kWh. Adding avoided O&M brings the avoided cost of ship generation that shore power could displace with in the range of the 16 cent/kWh the Cold Ironing Report suggests as the cost of utility supplied grid power.

The Cold Ironing Report assumes 0.1% sulfur to be the standard marine fuel by 2010. However, the ARB Auxiliary Engine Rule acknowledges uncertainty on the availability of such fuel in California and has provisions to re-evaluate the feasibility and availability of 0.1 percent sulfur Marine Gas Oil by 2008. Dock Watts recommends that the basis for shore power cost effectiveness and associated emissions reduction be based on 0.5% sulfur Marine Diesel Oil.

Evaluate Ship Electric Loads

Ship hotelling energy consumption (MWh) is a key metric in evaluating shore power feasibility. Shore power is a MWh driven process (MWh = lb/hr emissions reduction). Dock Watts recommends that the Cold Ironing Report include data tables showing MWh/day and MWh/year and associated emission reductions based on standardized emission factors.

Shore power studies have been based on name plate ratings of auxiliary engines, with general assumptions on generator load factors. Ship electric load profiling analysis, similar to land based commercial and industrial facilities is recommended as a preferred measure of ship electric loads. We also recommend further assessment of refrigerated containers (reefers) and related impacts on container ship electric loads while in port. Most container ships have capabilities to carry several hundred reefer containers with loads averaging 3 kW per reefer container. Loading and unloading reefer containers will likely impact ship electric load profile while a ship is in port. A ship electric assessment and load profile will provide a more accurate portrayal of ship energy and peak electric demand requirements. Ship electric load assessments (or energy audit) may also identify opportunities for ships to reduce electric energy consumption, peak demands, and associated impacts.

Utility Power Supply Options for Ships

Dock Watts also believes there is a need for closer coordination with shore side utilities to appropriately plan and develop necessary local electric distribution facilities. Work needs to be done to determine reasonable and appropriate allocation of utility cost, differentiating costs specific to shore power from "network" upgrades otherwise needed by a utility system.

Ships currently have an option to generate their own power or buy from the grid using shore power. Shore power should be considered a unique rate class for utilities (like agricultural pumps or street lighting). California utilities serving ports should be encouraged to develop electric supply choices that are at or less than ship avoided cost of on-board power generation using allowed fuels. This new utility customer class would be associated with environmental and other operational attributes that need to be considered when developing utility rates. Given shore power has direct correlation to air quality and environmental improvements to utility service areas, consideration should be given for supplemental tariff support similar to other California public benefits, alternative energy and demand management programs.

Economic Incentives to Promote Shore Power

Knowing that initially shore power may not be cost effective for all ships, it will be difficult to mandate and enforce compliance. Industry adoption of shore power will likely remain voluntary until costs become reasonable and a certain market saturation level is achieved. Support and incentive programs may be required to motivate early shore power development. Types of shore power incentives to be considered could include.

- Certification of emission reduction credits (ERC) to be sold under cap & trade programs
- State tax credits or other favorable tax treatment
- Low cost power supply (below ship avoided cost of on-board generation)
- Government Agency sponsored financing and funding (shore side and ship side facilities)
- Port fee adjustments for shore power
- Ship queuing priorities at ports

Dock Watts appreciates the opportunity to participate in shore power policy development as a viable means to improve air quality near port communities.

Sincerely,

Robert D. Hoffman

President

cc: ARB Commissioners