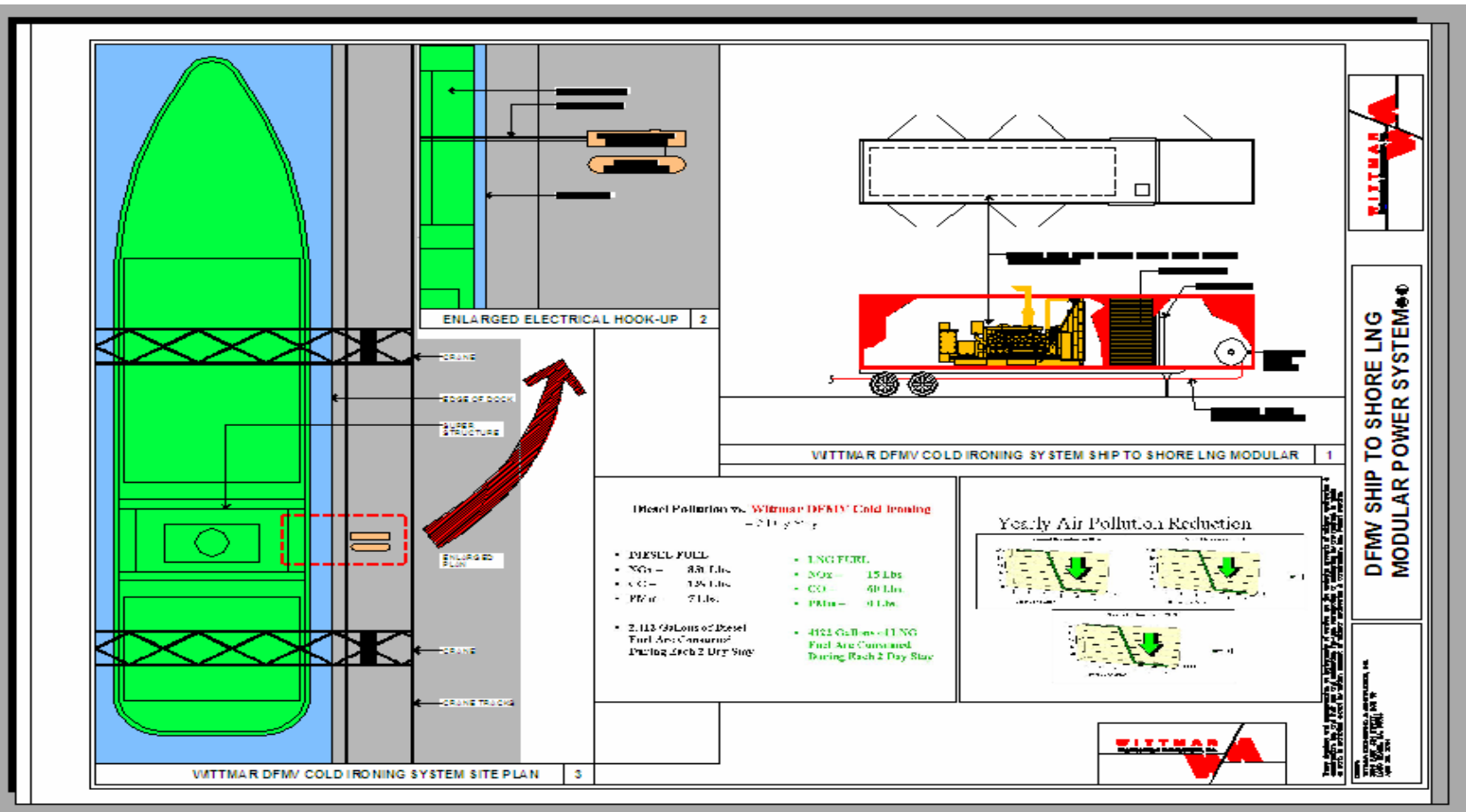


# DFMV Cold Ironing™

**A Wittmar Solution Made  
Simple** and the Clean  
Ships Conference  
February 9, 2007



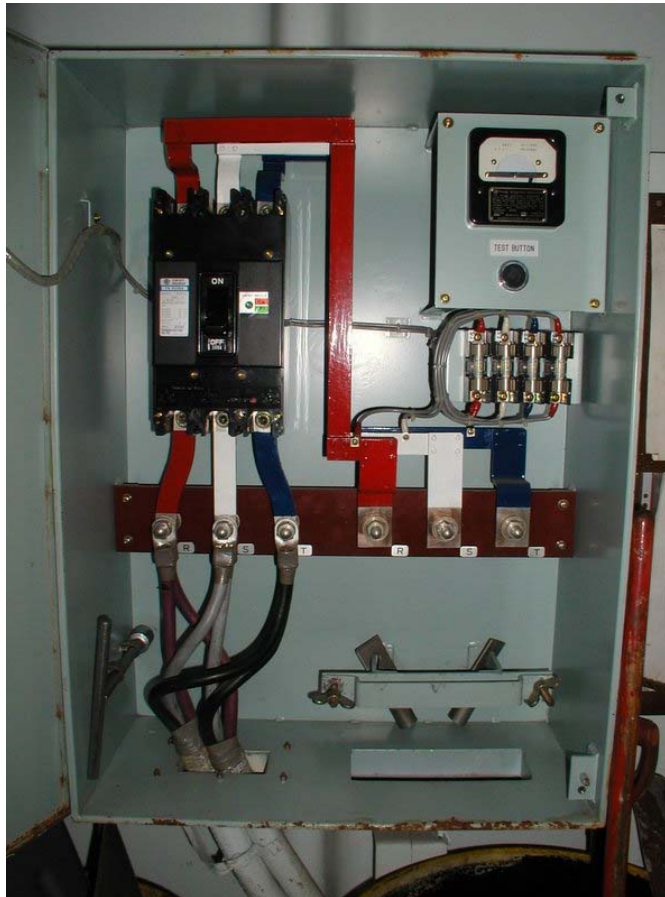
# Typical Layout- Dual Frequency \* Multi Voltage \* Mobile \* Modular \* Flexible \* Built For Purpose



# Typical DFMV™ System



# Shore Side Connection Box



# DFMV™ Long Story Made Short

- NO Impact To Power Grid
- No Cable Management Issues. Wittmar DFMV™ Generates The Frequency And Voltage The Ship Needs Thus Requiring Small Cables
- No Transformers Or Frequency Converters Are Required. This Eliminates \$1.5 Million CAPEX Plus Dry Dock Time (= 50% of 1 DFMV™)
- Achieves Emissions Targets Years Ahead Of The CARB Plan – 2010 Goals In 2008

# DFMV™ Long Story Made Short

- Low Cost- 400% Less Than POLB/POLA Ship Electrification Projects
- Defined Cost For The Operator – Operator Pays A Daily Fee Or A Per Container Fee. No **Amortization** In Their Lease.
- No Public Money Is Required – Works In All Ports
- Dual Frequency Cold Irons More Ships Than POLA/POLB Ship Electrification Projects
- Multi Voltage Cold Irons More Ships Than POLA/POLB Ship Electrification Projects

# DFMV™ Long Story Made Short

- DFMV™ Especially Suited For Irregular And Infrequent Ship Visits.
- Bulk Ships Are Easily Cold Ironed
- Flexible, Mobile, Effective- Preferred By Operators Over AMP Or The POLB Ship Electrification Project.
- 43 Units Can Be Up And Running By 2012. This Equates To 4,472 Ships Cold Ironed Per Year.

## Diesel Pollution vs. Wittmar DFMV Cold Ironing – 2 Day Stay

- Ship Aux Diesel Engine

- 950 bhp – 725 kW

- NOx – 851 Lbs.
- CO – 139 Lbs.
- PM10 – 7 Lbs.
- SOx - 139 Lbs.
- CO2 - 85,955 Lbs.

- 3,840 Gallons of 0.5% Diesel Fuel Are Consumed During Each 2 Day Stay

- Wittmar DFMV Cold Ironing™ System

- 950 bhp – 725 kW

- NOx – 15 Lbs.
- CO – 60 Lbs.
- PM10 – 0.05 Lbs.
- SOx - 0 Lbs.
- CO2 - 49,018 Lbs

- 4752 Gallons of LNG Fuel Are Consumed During Each 2 Day Stay

## Diesel Pollution vs. Wittmar DFMV™ Cold Ironing – Pollution Reduction

- Using Wittmar DFMV™ to Cold Iron a typical 48 Hour Ship Stay Will Reduce Pollution by:
- NOx - 836 Pounds
- CO - 79 Pounds
- PM<sub>10</sub> - 6.95 Pounds
- SOx - 139 Pounds
- CO<sub>2</sub> - 36,937 Pounds

# Diesel Pollution vs. Wittmar DFMV™ Cold Ironing – 4992 hours per year (96 hrs/wk)

- Ship Aux Diesel Engine
  - 950 bhp – 725 kW
  - NOx – 88,504 Lbs.
  - CO – 14,456 Lbs.
  - PM10 – 728 Lbs.
  - SOx - 14,456 Lbs.
  - CO2 - 8,939,320 Lbs.
  - 399,360 Gal of 0.5% Diesel Fuel Used per Year
- Wittmar DFMV Cold Ironing™
  - 950 bhp – 725 kW
  - NOx – 1,560 Lbs.
  - CO – 6,240 Lbs.
  - PM10 – 4.99 Lbs.
  - SOx - 0 Lbs.
  - CO2 - 5,097,872 Lbs.
  - 494,208 Gallons LNG Fuel Used per Year

2 ships per week staying 48 hours  
over 1 year

## Diesel Pollution vs. Wittmar DFMV™ Cold Ironing – Pollution Reduction

- Depending on the Length of Stay and Hotelling kW load, the Air Pollution Reduced by using Wittmar DFMV™
- NOx - is Reduced **98%**
- CO - is Reduced **57%**
- PM10 - is Reduced **99%**
- SOx - is Reduced **100%**
- CO2 - is Reduced **57%**

# The DFMV Capital Cost To Reduce Pollution for 2 Ships per Week is:

NOx = \$8,010 per Ton

Category	All Ships	Ships with 3+ Visits	Ships with 6+ Visits
<b>Container</b>			
--POLA/POLB	\$18,500	\$14,500	15,500**
--Oakland	\$56,000	\$50,500	\$48,500**
--Oakland w/o ship costs	\$25,500	\$24,000	\$26,000**

# Wittmar DFMV Cold Ironing™

## Investment Cost

- Wittmar DFMV Cold Ironing™ Operating Cost Is \$4.75 To \$9.00 Per Container (Depending On Each Situation)
- Wittmar DFMV Cold Ironing™ Investment Cost For NOx Reduction = \$8,010 Per Ton
- The California ARB Believes That An Investment Cost Of \$4 To \$13 Per Container Is Reasonable
- The California ARB Believes That Nox Reduction Investments Of \$18,000 Per Ton In POLB/POLA Is Reasonable
- The California ARB Believes That NOx Reduction Investments Of \$56,000 Per Ton In Oakland Is Reasonable

# Wittmar U. S. Trademarks

- ❑ DFMV Cold Ironing™ System
- ❑



# Wittmar DFMV Cold Ironing™

- A SOLUTION MADE SIMPLE by:



*Pacific*  
**SPILL CONTROL SCHOOL**



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