San Pedro Bay Ports Energy Baseline Study

San Pedro Bay Ports Energy Workshop

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J.R. DeShazo, Director
UCLA Luskin Center for Innovation

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OVERVIEW

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- The San Pedro Bay Ports of Long Beach and Los Angeles lead the world in the reduction of harmful emissions.
- This study is a high level analysis of energy use and management options by the Ports. It will seek to answer ...
  - How much electricity is used by each Port?
  - How much does it cost?
  - What are biggest energy users?
- What are the most promising energy investments?
  This study looked at a few options for addressing the increasing electrical needs through the lens of competitiveness, port efficiency, environmental benefit and job creation.
- The intent of this study is to spark a conversation between important Port stakeholders about the future of energy management of the San Pedro Bay Ports.
- This study is a partnership with:

AQUAMARINE INSTITUTE

THE PORT OF LOS ANGELES

Port of LONG BEACH
The Green Port

WHY DO A STUDY TO INFORM ENERGY PLANNING?

Benefits of Energy Planning

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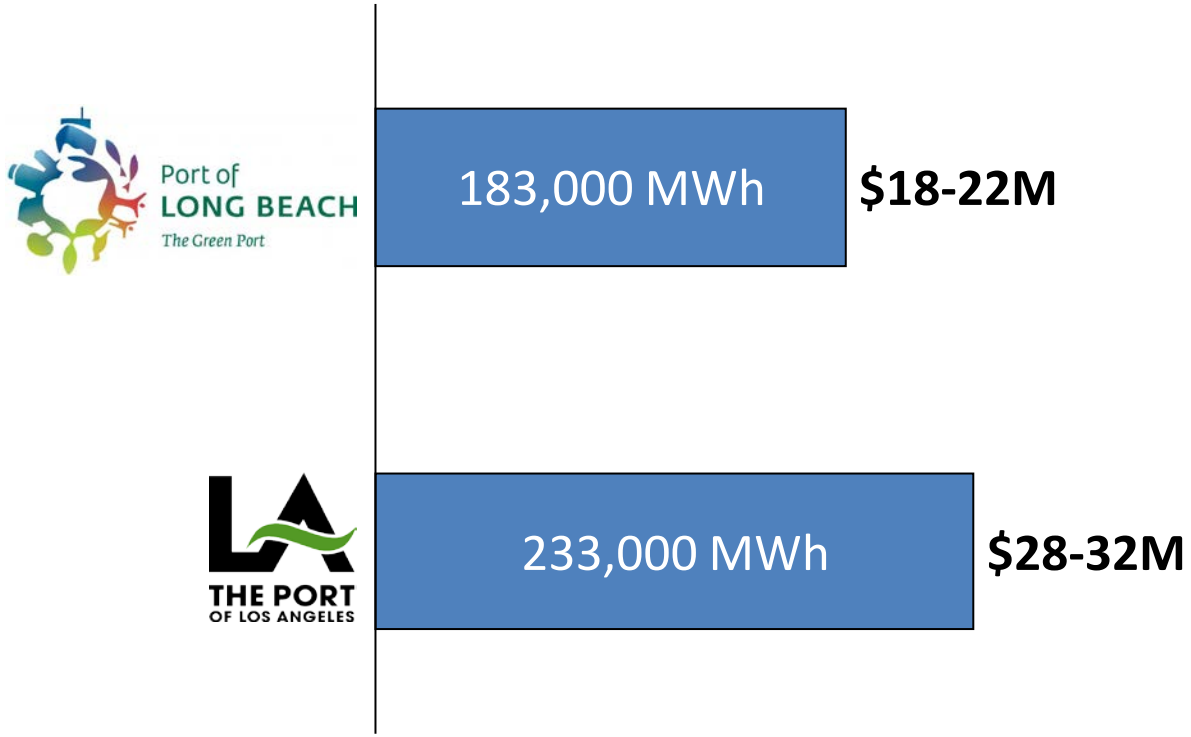
Increased competitiveness, through reduction of operating costs and increased reliability

Jobs creation through the installation and maintenance of new energy management systems

Improved ability to cost-efficiently comply with environmental mandates and goals that will result in increased electrification. Result: reduced greenhouse gas emissions and criteria air pollutants

Increased national security, supply chain resiliency, and grid independence in the event of an outage

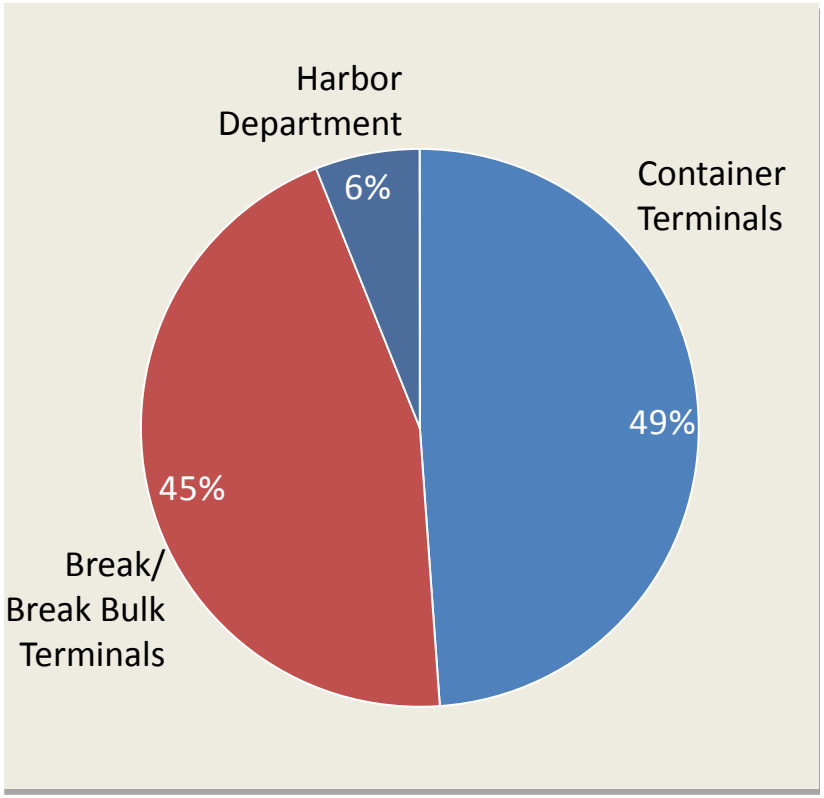
SAN PEDRO BAY PORTS COLLECTIVITY SPEND OVER $50M PER YEAR ON ELECTRICITY



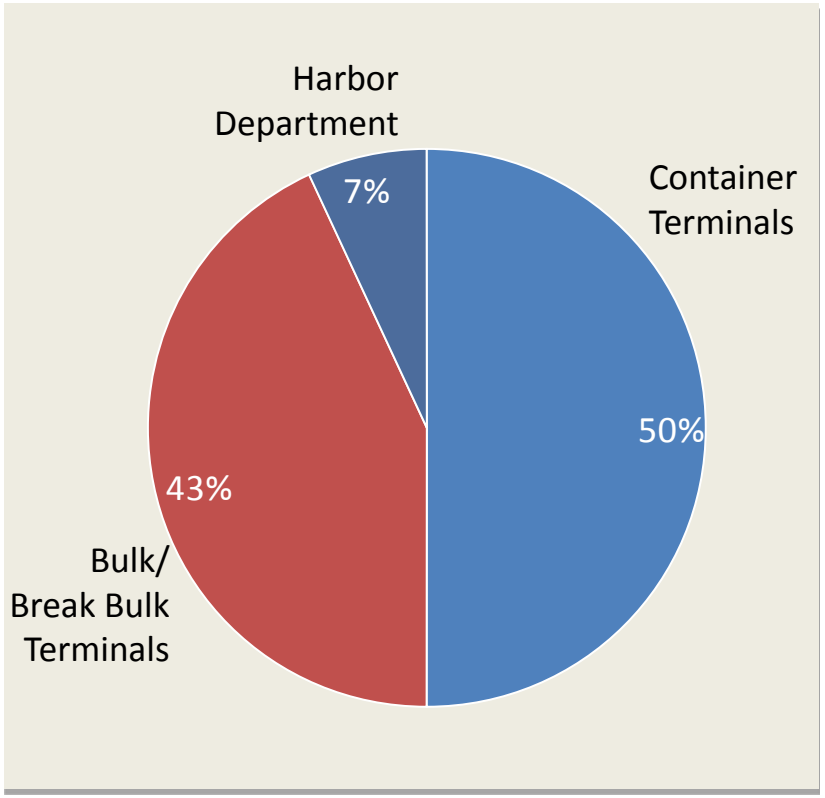
Note: POLB: Peak hourly average: 30-40 MW; Annual average: 21 MW. POLA: Peak hourly average: 50-60 MW; Annual average: 27 MW
Figures for POLB represent calendar year 2011, Figures for POLA represent fiscal year 2011-12

CONTAINER TERMINALS USE THE MOST ELECTRICITY

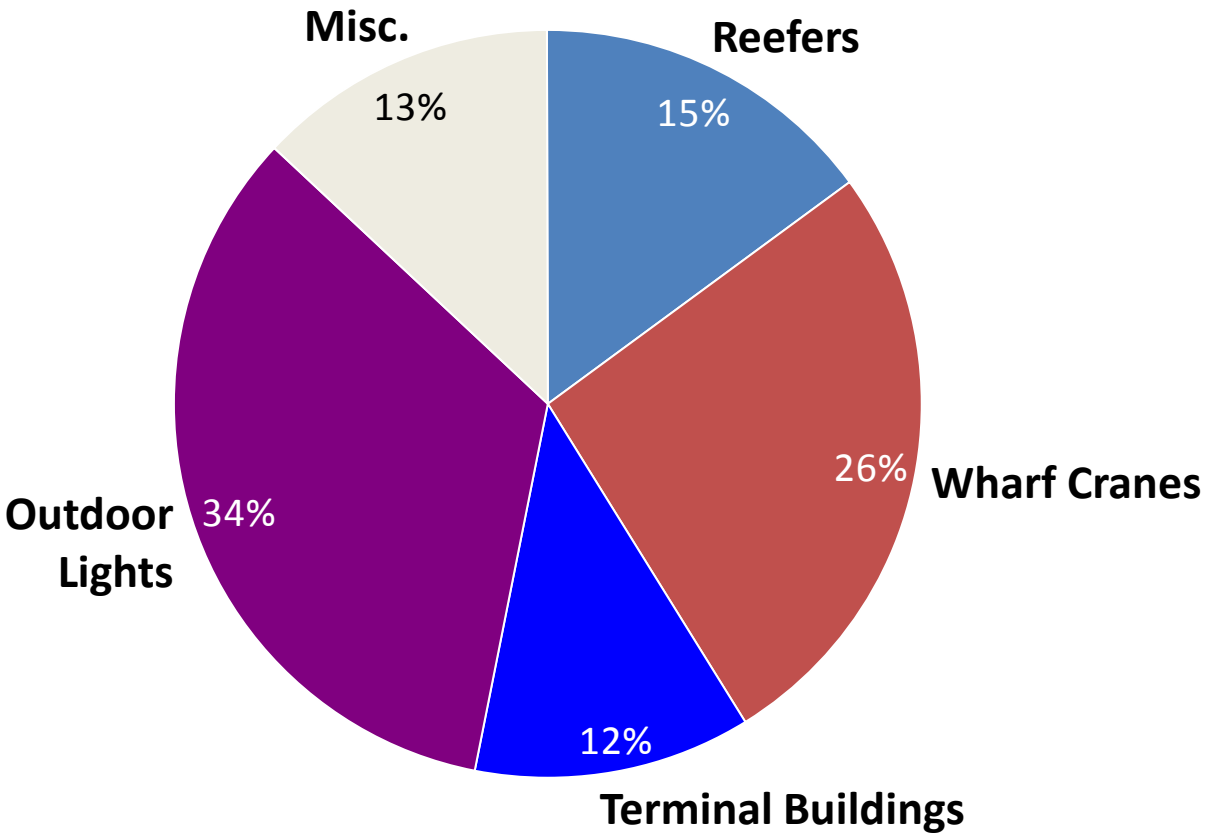
Port of Long Beach



Port of Los Angeles



THE BIGGEST OPPORTUNITY IN CONTAINER TERMINALS IS LIGHTING



- Typical annual energy use: 30,000 to 40,000 MWh
- Typical cost: $4.5 to $5.5 million

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BULK TERMINALS ARE MORE UNIQUE MAKING THEM HARDER TO CATERGORIZE

Example 1:
POLA Break Bulk Terminal

- 1,331 MWh
- $250,000
- Implied Avg demand: 152 kW

Example 2:
POLA Liquid Bulk Terminal

- 6,316 MWh
- $1.3 million
- Implied Avg demand: 721 kW

Example 3:
POLB Liquid Bulk Terminal

- 3,235 MWh annually
- $446,000 annually
- Implied Avg demand: 369 kW

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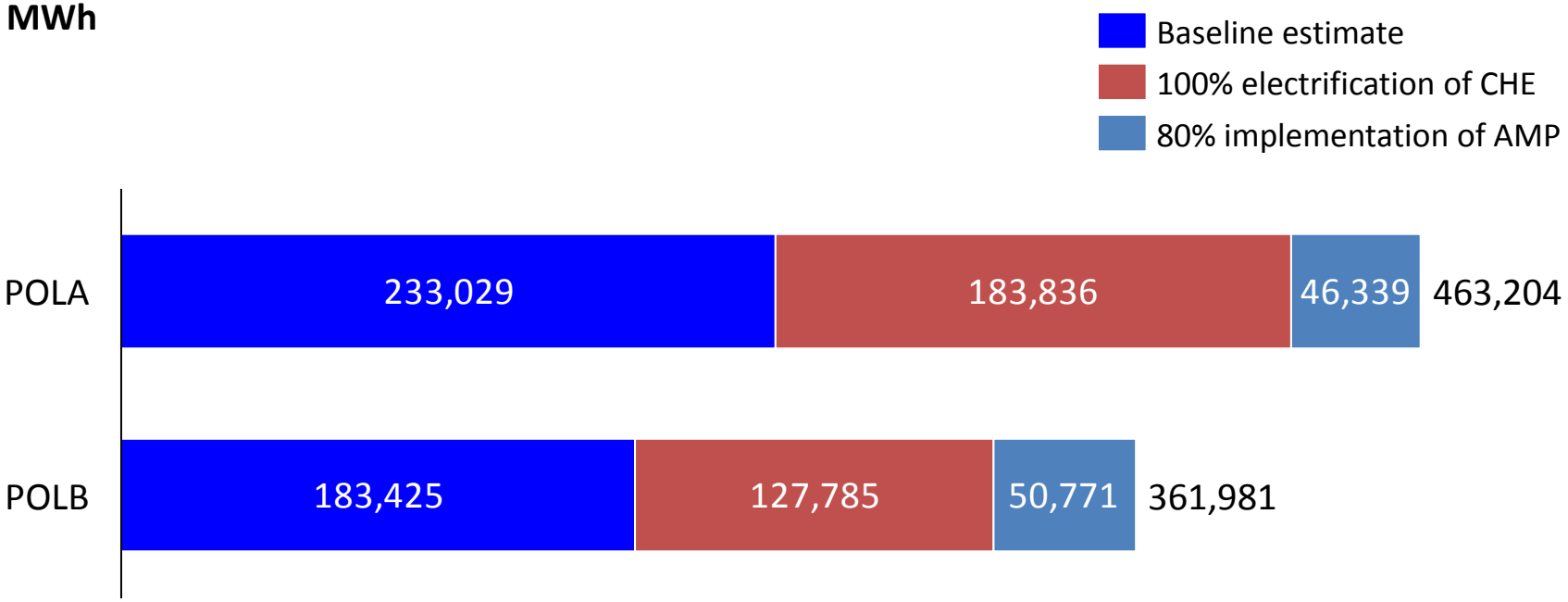
HOW WILL COMPLIANCE WITH 2020 REGS INCREASE CONSUMPTION?

Estimated Impact of Electrification on Total Annual Energy Consumption

MWh



ANNUAL ELECTRICITY EXPENDITURES FOR A TYPICAL CONTAINER TERMINAL

Double Whammy:

- Electricity usage could double by 2020
- Electricity prices by unit expected to rise

WE EXAMINED OPTIONS THAT FACILITATE ELECTRIFICATION WITH FOUR CRITERIA IN MIND

	Competiveness: How does it impact costs? What economic benefits does it provide for port customers?
	Jobs: What is the economic impact of the region? Does it provide jobs?
	Environment: How does it impact harmful emissions?
	Security and Operational: How does it improve port security and operational resiliency?

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WE CONDUCTED A HIGH LEVEL ANALYSIS IN THREE AREAS

1. **Energy efficiency** to reduce current and future consumption and expenditure
2. **Renewable energy generation** to self supply or offset current and future consumption and expenditure
3. **Local (dispatchable) generation** to ensure continuity and security during grid power outages

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ENERGY EFFICIENCY OFFERS BENEFITS ACROSS ALL FOUR AREAS

Example: Reduce energy demand by 60% for all high-mast terminal lighting

- Annual POLB savings: 20,000 MHw/ $2.1 million
- POLA savings: 32,000 MHw/$2.4 million
- Pay back in less than 5 years

- 28 full and part-time jobs in region created during construction period
- UCLA analysis did not examine any new manufacturing or change in the existing structure of the regional industries

- POLB carbon emissions reduction: up to 11,000 metric tons
- POLA carbon emissions reduction: up to 17,000 metric tons

- Offers clear opportunities for multiple benefits including modest energy security benefits.

Note: Conservation assumptions used in modeling economic viability. Financial savings calculated using current electricity prices, but prices will increase. Financial proposition could also improve with grants, incentive programs or third party financing

OTHER EFFICIENCY AREAS COULD ALSO YIELD SIGNIFICANT SAVINGS

Examples from other major uses of electricity

- **Buildings:** Increase in energy efficiency by 25% for buildings in the POLB would yield annual savings of up to $400,000. Similar reductions possible for POLA
- **Cranes:** Reducing demand of the fleet of POLA wharf cranes by 5% would yield annual savings of $350,000
- **Reefers:** Reducing demand from refrigerated containers by 50% would save $1.7 million annually throughout POLA. Shaded parking for refrigerated containers could help yield these savings, and parking canopy could also be used for solar power generation
- For many investments, coordinated energy initiative could allow for syncing up energy efficiency investments with equipment replacement schedule

Note: For details, refer to Chapter 3.2 in the Technical Report at innovation.luskin.ucla.edu

AT CURRENT TIME, RENEWABLE ENERGY MAY NOT PROVIDE SIGNIFICANT BENEFITS

Example: Terminal-owned 1 MW Solar parking structure

- Not likely to be cost-effective for either Port. Would produce only about 5% of total consumption of a large terminal

- 28 full-time and part-time jobs in region created during construction period

- Carbon dioxide emissions reduction: 486 metric tons per facility per year

- Would make visible environmental statement but would make no contribution to energy security or continuity with a standard-grid connection

LOCAL / DISPATCHABLE GENERATION OFFER TRADE OFFS WORTH CONSIDERING

Example: 40 MW simple cycle natural gas combustion turbine

- Could save at least $200 million in avoided electricity purchases alone but would require additional capacities that would increase cost and complexity

- Up to 226 job-years created during the construction phase
- Up to 44 jobs per year during the operations phase

- Relative to power purchased from the grid in Los Angeles, the carbon dioxide impacts would be a reduction of up to 9,968 metric tons per year
- Environmental clearance would be an issue

- Could provide most of the energy needed at either Port, but would require additional emissions control technology, load balancing automation, and systems controls for backup power in order to provide significant energy security benefits

LOCAL / DISPATCHABLE GENERATION OFFER TRADE OFFS WORTH CONSIDERING

Example one: 10 MW natural gas reciprocating engine in a large terminal to occasionally shave peak demand during routine operations or power critical loads in an emergency

- Assuming the avoided outage-caused delay is valued at $100,000 per hour, the Net Present Value of the continuity benefits would be $8.5 million over 20 years
- But, no benefit of avoided electricity costs

- 84 full and part-time jobs during the construction period
- 2 long-term jobs over the life of the project

- Carbon dioxide emissions impacts would be negligible because the engines would operate infrequently
- During operation, the engines' carbon dioxide emissions would be comparable to that of purchased power in Los Angeles

- High security benefits at port and regional level
- Avoid work shutdown losses by providing flexible backup power / continuity during grid outages

SUMMARY

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1) Energy costs are likely over $50 million a year for the Ports.
2) Expect double whammy in the future:
   - Energy consumption could at least double by 2020.
   - Electricity prices are also expected to increase
3) But we can address these challenges by evaluating and prioritizing energy strategies:
   - Energy efficiency would clearly produce collaborative benefits
   - On-site renewable energy is financial and logistical challenge
   - On-site dispatchable generation could produce collaborative benefits, but would require addressing institutional challenges

OPPORTUNITIES

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1. **Energy Efficiency: Immediate opportunity**
   Energy efficiency offers immediate opportunities that increase competitiveness, job creation, environmental benefits and security benefits. Port stakeholders should begin to develop strategies to encourage energy efficiency improvements at port terminals

2. **Renewable Energy: Go slow**
   At the current state of technology + cost, renewable energy projects should be examined on a case by case basis, as same may be feasible and cost effective.

3. **Dispatchable Energy: Good opportunities, need more study**
   Local, dispatchable energy offers significant advantages across many of the categories examined. However, each offers tradeoffs. Port stakeholders should do more research on which areas offer the most benefits

4. All options are complex and will require coordination among many parties including port authorities, utilities, terminal operators, labor, policy makers, and other important port stakeholders

NEXT STEPS FOR A COLLABORATIVE ENERGY INITIATIVE

- Facilitate additional research on energy topics
  - Validate model with field data
  - Energy audits at terminals and other units at the Ports
  - Port-wide security case study
- Learn from pilot demonstration projects and scale lessons learned to other terminals
- Conduct comprehensive and collaborative energy management planning for energy security

*** Well positioned to go after state and federal funding and realize numerous benefits of energy management ***


Thank you
Download technical report at:
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