Implementation of Action 6 of the California Sustainable Freight Action Plan (CSFAP)
Phase 3: Tracking Economic Competitiveness
Final Report Part 3: Economic Impacts of Electrification of Cargo Handling Equipment at POLA/POLB

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Project Objective

The purpose of this research is to estimate the full macroeconomic costs of transitioning cargo handling equipment (CHE) at the ports of Los Angeles and Long Beach to zero emission. The transition is part of the ports' Clean Air Action Plan (CAAP) and anticipated regulation by the California Air Resources Board (CARB). Understanding the impacts of the transition on the state economy and the port and related industry sectors will help guide policies for funding and timing.

Problem Statement

Transportation is critical to the functioning of the economy and of daily life, but also has many environmental and social costs: air pollution, safety, GHG emissions, and more. As the human health impacts of air toxics and climate change grow, policy efforts to reduce these emissions are increasing. Significant progress is being made to transition from fossil fuels to zero emission fuels for passenger vehicles, and electric propulsion is emerging as the zero-emission fuel of choice. However, electrification for trucks and other heavy equipment is far more challenging due to range and charging requirements.

Large seaports are local pollution hot spots due to the concentration of emissions from port operations, ships at berth, and cargo drayage. The Los Angeles and Long Beach ports are a major generator of the region's air pollution. Low income, communities of color located near the ports experience high levels of pollution and have been identified as being in the "extreme" category of pollution burden and vulnerability by the state's CalEnviroScreen measure. Growing environmental justice concerns have motivated both the ports and their regulators to take ambitious steps to reduce port related emissions. The urgent need for climate change mitigation has added more incentive.

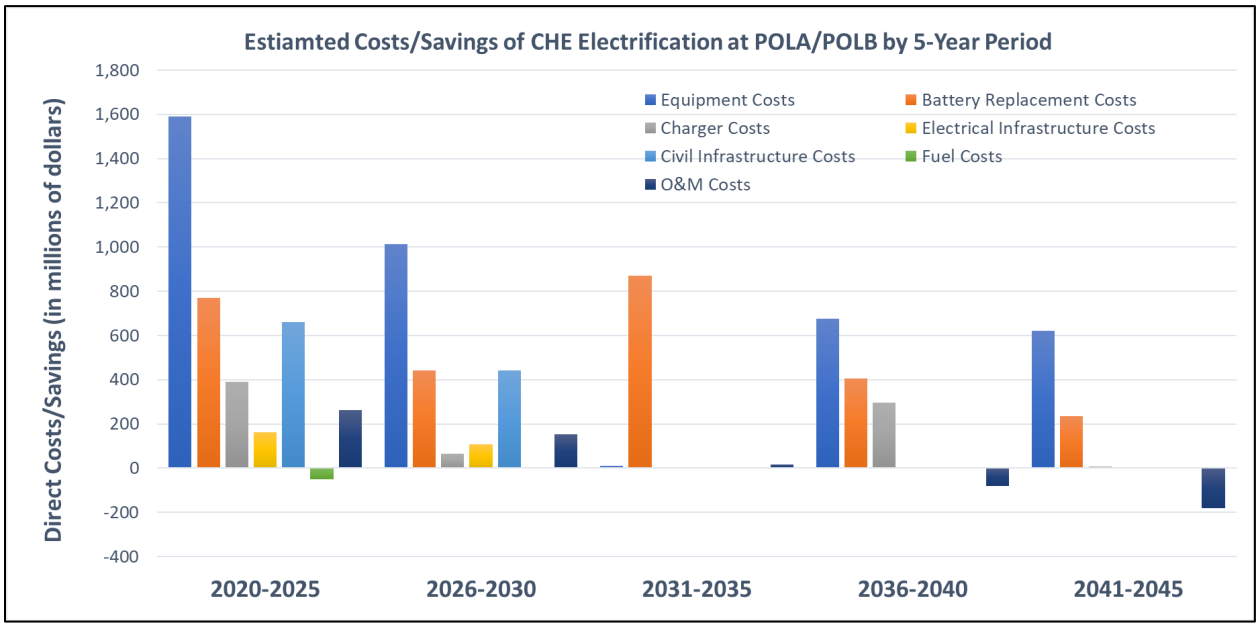
Research Methodology

We use the Regional Economic Models, Inc. (REMI) Policy Insight Plus (PI+) Model to analyze the economic impacts of electrification of cargo handling equipment at the Ports of Los Angeles and Long Beach. We begin with the establishment of the policy scenario(s) to be evaluated, followed by the estimation of the micro-level impacts of the policy on the regulated industries (or entities). The micro-level impacts are the direct incremental costs and savings associated with implementation of the policy. These are used as the inputs in the REMI macroeconomic model to analyze the aggregate and sectoral impacts of the policy on the state economy. The REMI model estimates impacts in terms of gross state product (GSP), jobs, state output, and personal income.

Results

We estimate the impacts of transitioning all CHE to electric power. The period of analysis is 2020 through 2045. CHE are replaced based on useful life of each piece of equipment. Direct costs/savings include capital (equipment, battery replacements, chargers, and local power infrastructure), operating, and maintenance costs. Total incremental costs in net present value are just under $7 billion in 2019 dollars. Direct costs/savings are given by 5 year period in Figure 1. Costs are much higher in the first decade. One conventional powered CHE must be replaced with 2 electric CHE because of range and charge time requirements until battery technology improves in the later periods. Power infrastructure investments must be made early to provide the increased demand for electricity.

Figure 1. Summary of Total Costs of Transition to ZE CHE at POLA/POLB (2020-2045) (in million 2019$)



The macroeconomic impacts of our baseline scenario are loss of 96,800 job-years, $7.2 billion GSP, $13 billion output, and $8.8 billion in personal income. The policy has net losses because 1) the capital costs are greater than the associated stimulation in demand from capital purchases, 2) lower operating and maintenance costs in later periods do not offset the added costs in earlier periods. We conduct a series of sensitivity tests to determine the potential range of macroeconomic impacts. Table 1 gives results. GSP losses could range from $5 to $10 billion. While significant, these losses are quite small relative to the state economy, and may be offset by health savings from reduced emissions.

Table 1: Total economic impacts, base case, lower and upper bounds

Scenarios	Employment Impact (job-years)	GSP Impact (NPV in B $)	Output Impact (NPV in B $)
Base Case	-96,771	-7.24	-13.00
Lower-bound Cost Case	-67,758	-5.19	-9.41
Upper-bound Cost Case	-133,254	-9.76	-17.41