Port Electrification Project
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**Project Objectives & Goals**

**Goal of project**
By performing case studies on port electrification, to gain deeper insight into the costs and benefits of electrification for military and commercial ports in the U.S.
- including a better understanding of the potential role of energy storage

**Project Objective**
To perform case studies on three East Coast ports to understand the costs and benefits of port electrification
- while considering the potential for energy storage to reduce costs.

The ports studied were:
- JAXPORT Container Port, Blount Island
- US Marine Corps (USMC) Blount Island
- Massport: Conley Container Terminal and Flynn Cruiseport

The evaluation focused on three main areas of port activity:
1. Trucking centers – the electrification of trucks providing port cargo transfer
2. Shore power – powering ships from the grid while at berth
3. Port cargo handling – switching cranes from diesel to electric

**Blount Island**
Blount Island is on the St. Johns River in Jacksonville, Florida. One side of the island hosts a Jacksonville Port Authority (JAXPORT) container port, and the other side hosts the U.S. Marines Blount Island Command.

**Massport**
Massport is a port facility in Boston, Massachusetts serving the New England region. It consists of the Conley Container Terminal, the Flynn Cruiseport, the Boston Autoport, and the Boston Logan International Airport.

### Trucking Facility Electrification Impact Assessment

#### Methodology Steps:
- Identifying potential locations for drayage e-truck charging stations
- Projecting e-truck adoption for trucking facilities
- Projecting the number of required chargers and charging profiles in each facility
- Projecting the charging load for different regions
- Charging load are mapped to help utilities understand where concentrated loads may occur in relation to feeders / substations
- Assessing the potential benefits of storage deployment (as a mitigation solution)

#### JAXPORT Blount Island
Trucking Facilities Linked to Substations

#### Massport Container Terminal
Distribution Facilities Density Linked to Substations

#### USMC Blount Island

**Shore Power**

- **Location of shore power in the US (EPA, 2017)**
- **Shore power allows for a vessel to plug into the local grid while at berth, as opposed to running its auxiliary engine**
- **This reduces emissions, and should provide a cost savings**
- **Shore power installations in the U.S. are concentrated on the West Coast**
- **USMC Blount Island could potentially save $7m/year**

#### Energy Storage and Port Electrification

**By smoothing power consumption over time and reducing peak demand, energy storage can:**
- **Help minimize the cost of required transmission and distribution upgrades**
- **Decrease utility demand charges**

This applies to:
- **Crane electrification**
- **Shore power provision**
- **Trucking facility electrification**

#### Electrification of Cranes

- **Ship to Shore (STS) cranes has a higher contribution to port power consumption (compared to other types of cranes)**
- **STS crane operation cycle has two phases: (1) Ship to Platform (STP) and, (2) Platform to Shore (PTS). Total cycle duration: ~120 seconds**
- **If multiple cranes operate at the same time, they might create huge spikes (each crane around 4MW)**
  - **The large short-lived spikes in demand indicate that ultracapacitor storage could be of great benefit**

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