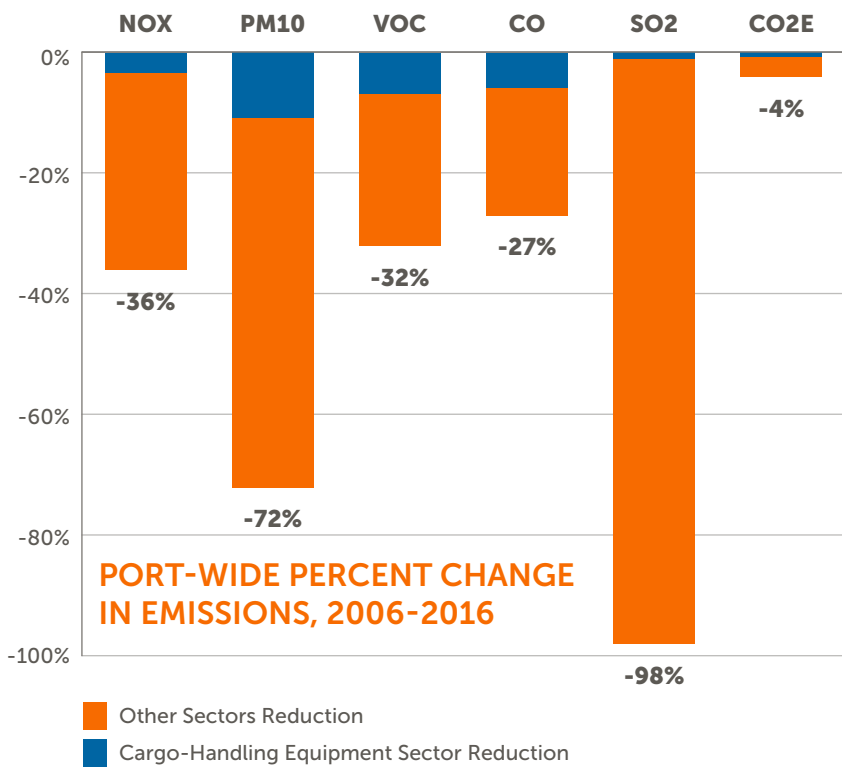


# CARGO-HANDLING EQUIPMENT

YARD TRACTORS • STRADDLE CARRIERS • FORKLIFTS • CONTAINER HANDLERS (TOP/SIDE) • GANTRY CRANES • STACKERS • AUXILIARY EQUIPMENT

## PROGRESS



### EMISSION REDUCTION ACTIONS

- Cargo Handling Equipment Fleet Modernization Program
  - Invested \$2.24 million in incentives to replace 46 pieces of equipment
- Decommissioning or electrification of 11 diesel-powered ship to shore gantry cranes
- Retrofitted 4 yard tractors with auto start-stop electric hybrid technology
- Deployment of semi-automation at Global Container Terminal
  - The terminal uses Optical Character Recognition and Radio Frequency Identification to match containers and chassis to bookings
  - Increase of 20% in hourly container moves

## OPPORTUNITIES



### Replace older equipment with...

- Tier 4 engines
- Alternative fuels, such as natural gas or hydrogen fuel cells
- Hybrid or full electric units



### Install emission reduction retrofit technologies (e.g., diesel particulate filters (DPF) and diesel oxidation catalysts (DOC))

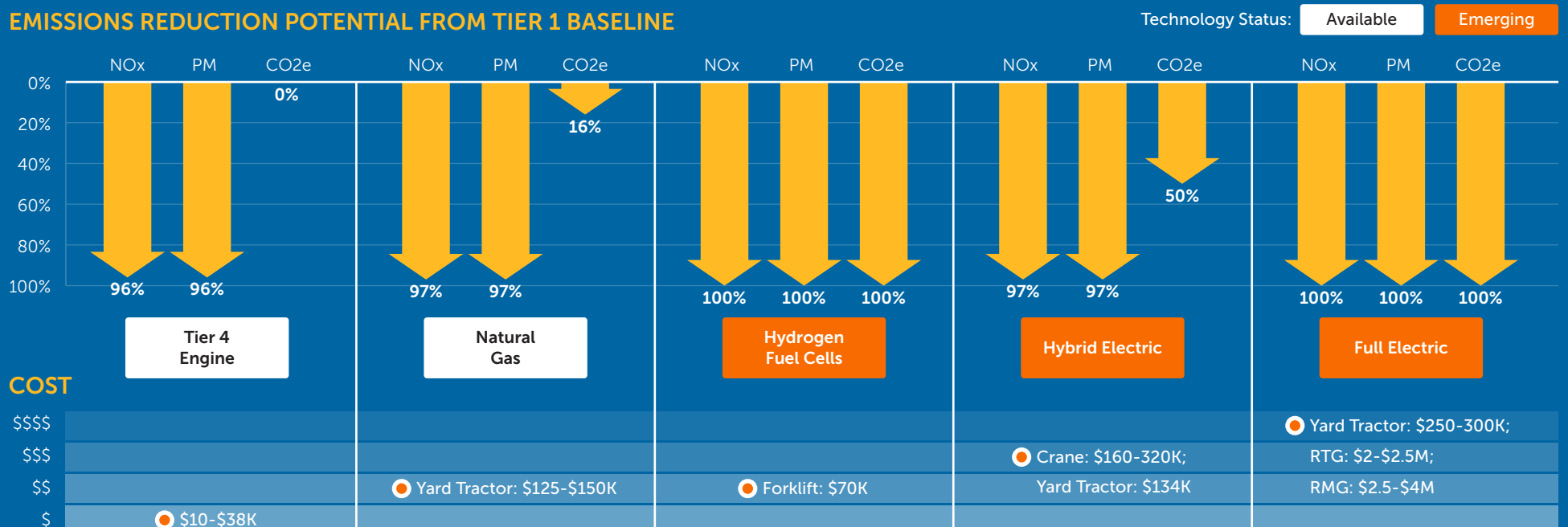


### Increase automation to improve container handling capacity and efficiency



### Implement an engine maintenance audit program to ensure efficient performance

### EMISSIONS REDUCTION POTENTIAL FROM TIER 1 BASELINE



### OTHER TECHNOLOGY COSTS

- Natural Gas Infrastructure – Installation Cost:** CNG: \$10,000-\$2 million; LNG: \$1-4 million
- Automation:** \$0.5-\$1 Billion; Estimated 30-40% operational cost savings (measured in \$/TEU)
- Engine Maintenance Audit Program:** \$5,500-\$9,000 equipment; \$1,800 training, \$50/engine for on-going testing
- All Electric – Grid-Sourced (Busbars/Conductor Rails):** \$11 million
- Hydrogen fuel cell infrastructure:** \$6 million

### SOURCES

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Some cost estimates provided by manufacturers