

# At-Berth Regulation Preliminary Cost Information



# Proposed Regulatory Concepts

- Regulated Parties
- Compliance Schedule
- Thresholds

## Discussion Document – Regulated Vessel Types and Ports

<b>Regulated Vessels</b>	
<i>Current Regulation</i>	<i>Proposed Concept*</i>
Container Refrigerated Cargo Cruise	Container Refrigerated Cargo Cruise Auto/Roll On-Roll Off Tanker Bulk General Cargo
<b>Regulated Ports and Marine Terminal Complexes</b>	
<i>Current Regulation</i>	<i>Proposed Concepts*</i>
Los Angeles Long Beach Oakland San Francisco San Diego Hueneme	Los Angeles Long Beach Oakland San Francisco San Diego Hueneme Stockton Marine Terminal Complex Richmond Marine Terminal Complex Carquinez Marine Terminal Complex Rodeo Marine Terminal Complex

\*Expected ports and marine terminal complexes basis 2017 visit data; exact ports and port complexes subject to the regulation is based on exceedance of threshold.

### Types of Thresholds

- Port or Marine Terminal Complex (MTC) Threshold
  - Exceedance of this threshold determines inclusion in regulation.
  - If port or MTC does not exceed this threshold, any vessel calling at that port or MTC is exempt from the regulation.
- Terminal Threshold
  - Must exceed port threshold for this threshold to be applicable.
  - If port or MTC is subject to regulation, then exceedance of this terminal threshold determines terminal’s inclusion in regulation.
- Low-Use Berth Threshold
  - Must exceed port/MTC threshold for this threshold to be applicable.
  - If terminal is subject to regulation, low-use berth(s) is defined as a berth (or combination of berths) that receives less than 5% of a terminal’s total calendar year visits.
  - Example: Terminal X is subject to the regulation based on the above thresholds. Terminal X gets 500 visits in a calendar year and has 3 berths. In that year, Berth 1 gets 300 visits, Berth 2 gets 180 visits, and Berth 3 gets 20 visits. Berth 3 received less than 5 percent of the terminal’s annual calendar year activity, so would be considered low-use.

**Preliminary Discussion Document**

**Preliminary Concepts – Implementation Schedule – For Non-Tanker Vessels Above Port/MTC<sup>1</sup>, Terminal, and Berth Thresholds**

		<b>2021</b>	<b>2025</b>	<b>2031</b>
<p><b><u>Container/Reefer</u></b></p> <p><b>Port/MTC Complex Threshold:</b> 50 visits  <b>Terminal Threshold:</b> 25 visits  <b>Ports Above Threshold:</b> Hueneme, Oakland, POLA, POLB, San Diego</p> <p><b><u>Cruise</u></b></p> <p><b>Port/MTC Complex Threshold:</b> 25 visits  <b>Terminal Threshold:</b> 5 visits  <b>Ports Above Threshold:</b> POLA, POLB, San Diego, San Francisco</p>	Regulation Implementation Begins	<p>✓</p> <p>100% of visits</p> <p>-----</p> <p>Shore power or Alt Control Tech (ACT<sup>2</sup> min 80% CF<sup>3</sup> for aux engines, DPM, NOx)</p> <p>GHG reductions**</p>	<p>--</p>	<p>--</p>
<p><b><u>Auto, Ro-Ro</u></b></p> <p><b>Port/MTC Threshold:</b> 50 visits  <b>Terminal Threshold:</b> 25 visits  <b>Ports Above Threshold:</b> Carquinez Complex, Hueneme, POLA, POLB, Richmond Complex, San Diego,</p>		<p>--</p>	<p>✓</p> <p>100% of visits</p> <p>-----</p> <p>Shore power or Alt Control Tech (ACT min 80% CF for aux engines, DPM, NOx)</p> <p>GHG reductions**</p>	<p>--</p>
<p><b><u>Bulk, General Cargo</u></b></p> <p><b>Port/MTC Threshold:</b> 75  <b>Terminal Threshold:</b> 25  <b>Ports Above Threshold:</b> POLA, POLB, Stockton Complex, Richmond Complex</p>		<p>--</p>	<p>✓</p> <p>100% of visits</p> <p>-----</p> <p>Shore power or Alt Control Tech (ACT min 80% CF for aux engines, DPM, NOx)</p> <p>GHG reductions**</p>	<p>--</p>

<sup>1</sup> MTC = Marine Terminal Complex (grouping of marine terminals not part of a larger port complex)

<sup>2</sup> ACT = Alternative Control Technology

<sup>3</sup> CF = Control Factor

**Preliminary Concepts – Implementation Schedule – For Tanker Vessels Above Port/MTC\*  
Complex, Terminal, and Berth Thresholds**

		2021	2025	2031
<p><b><u>Tankers with Electrically Powered Pumps</u></b></p> <p><b>Port/MTC Threshold:</b> 25 visits  <b>Terminal Threshold:</b> 5 visits  <b>Ports Above Threshold:</b>            Carquinez Complex, POLA, POLB, Richmond Complex, Rodeo Complex, Stockton Complex</p>	Regulation Implementation Begins	--	<p align="center">✓</p> <p align="center">100% of visits -----            50% CF<sup>4</sup>            for aux engines</p> <p align="center">Shore power or Alt Control Tech (ACT<sup>5</sup> min 50% CF for aux engines, DPM, NOx)</p> <p align="center">GHG reductions**</p>	<p align="center">✓</p> <p align="center">100% of visits -----            80% CF            for aux engines</p> <p align="center">Shore power or Alt Control Tech (ACT min 80% CF for aux engines, DPM, NOx)</p> <p align="center">GHG reductions**</p>
<p><b><u>Tankers with Steam Powered Pumps</u></b></p> <p><b>Port/MTC Threshold:</b> 25 visits  <b>Terminal Threshold:</b> 5 visits  <b>Ports Above Threshold:</b>            Carquinez Complex, POLA, POLB, Richmond Complex, Rodeo Complex, Stockton Complex</p>		--	<p align="center">✓</p> <p align="center">100% of visits -----            50% CF            for aux engines and boiler engines</p> <p align="center">Alt Control Tech (ACT min 50% CF for aux engines (DPM, NOx) and boiler (PM, NOx))</p>	<p align="center">✓</p> <p align="center">100% of visits -----            80% CF            for aux engines and boiler engines</p> <p align="center">Alt Control Tech (ACT min 80% CF for aux engines (DPM, NOx) and boiler (PM, NOx))</p>

**Notes:**

\*All vessel types are required to get NOx, DPM reductions for auxiliary engines; tankers with steam powered pumps must also reduce boiler emissions (PM, NOx).

\*\*All vessel categories assumed to get a GHG reduction from shore power usage; amount of GHG reduction will vary depending on the percentage of each vessel type's shore power utilization. Alternative technologies are being evaluated for potential to achieve GHG reductions.

<sup>4</sup> CF = Control Factor

<sup>5</sup> ACT = Alternative Control Technology

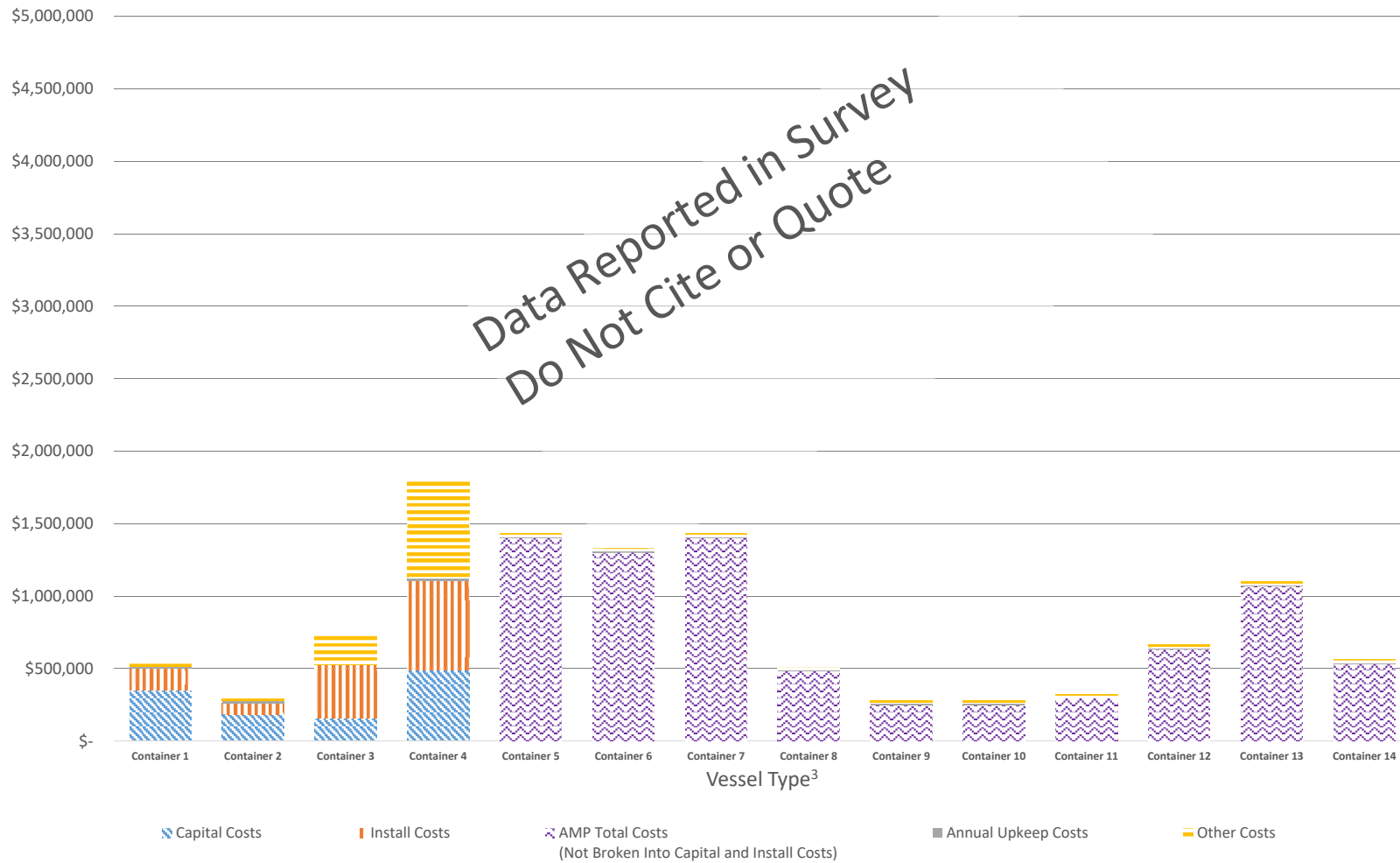


# Vessel and Port Surveys

# Vessel Cost Surveys

- CARB requested information on:
  - Vessel size
  - Vessel voltage
  - Capital costs
  - Installation costs
  - Total costs
  - Other costs, such as maintenance and labor

**Data Reported in Vessel Survey - Container  
Costs for Shorepower Retrofits<sup>1</sup> (One Side Only)**



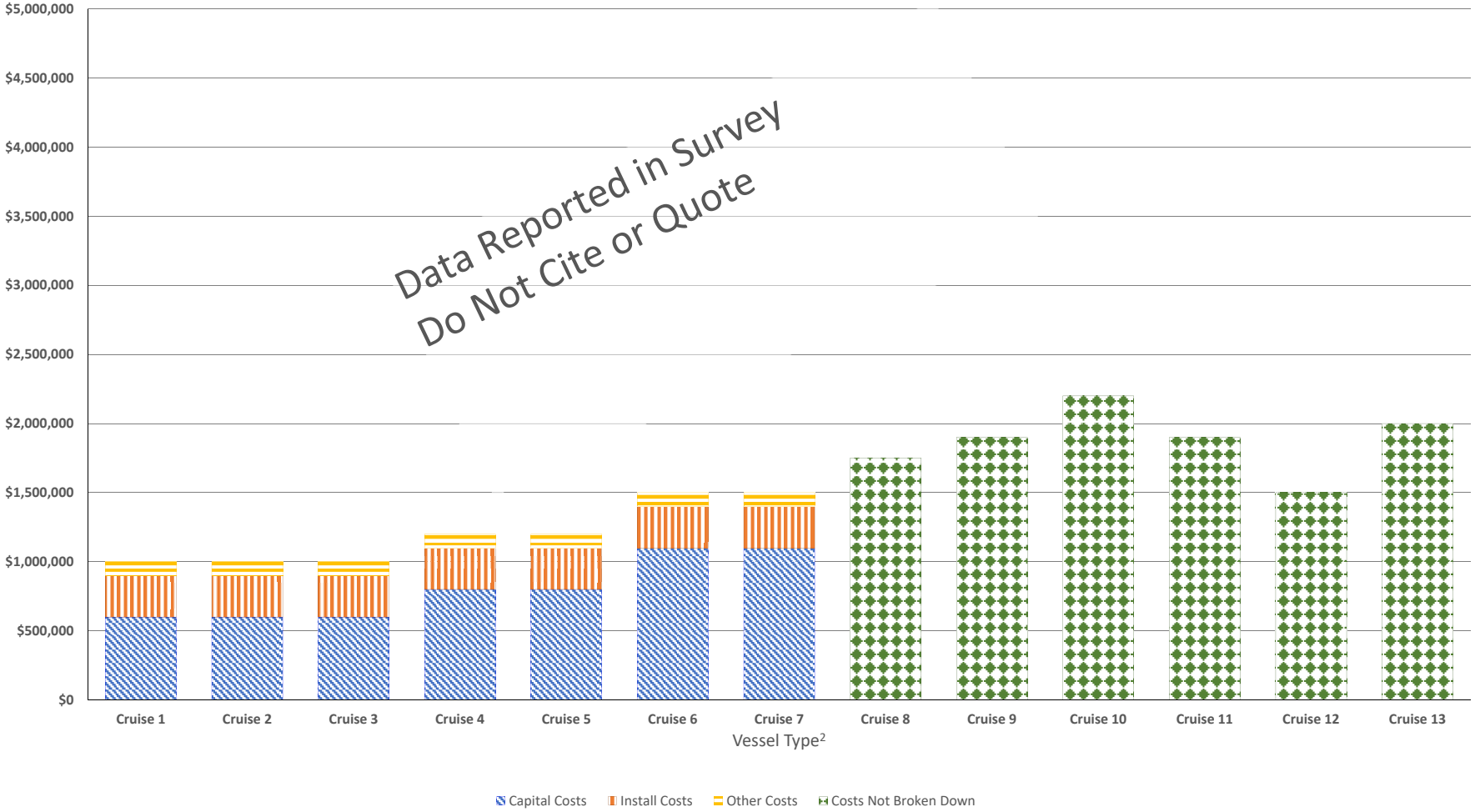
<sup>1</sup>CARB incentives paid for some of the vessel-side costs

<sup>2</sup>Represented costs are for both actual costs paid on existing infrastructure and projected retrofit estimates

<sup>3</sup>Some data displayed was not clear if it represented retrofit vessels, some for new builds - CARB staff is following up with the companies submitting the data



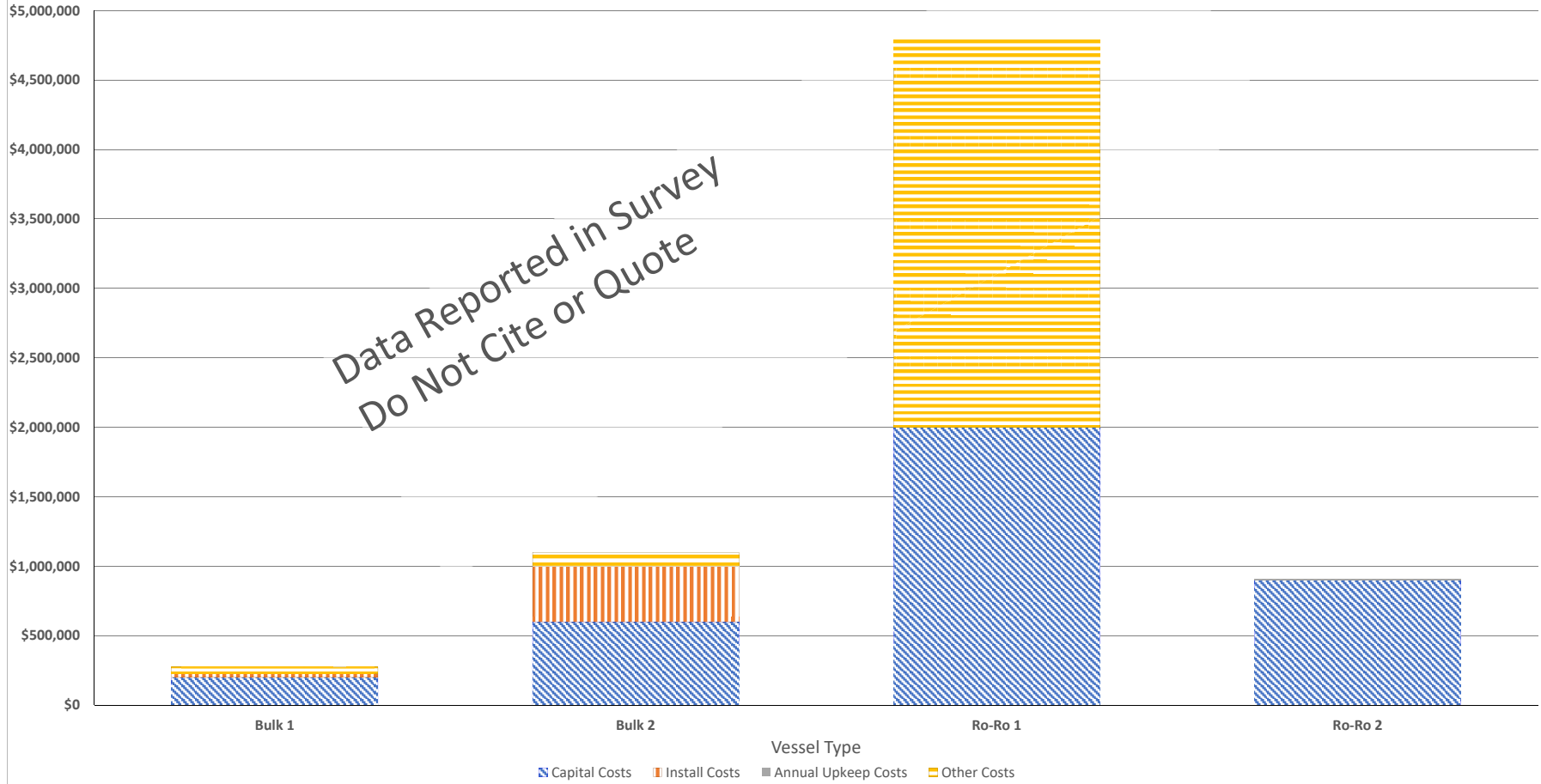
**Data Reported in Vessel Survey - Cruise**  
**Costs for Shorepower Retrofit<sup>1</sup> (One Side Only)**



<sup>1</sup>For projected retrofit costs

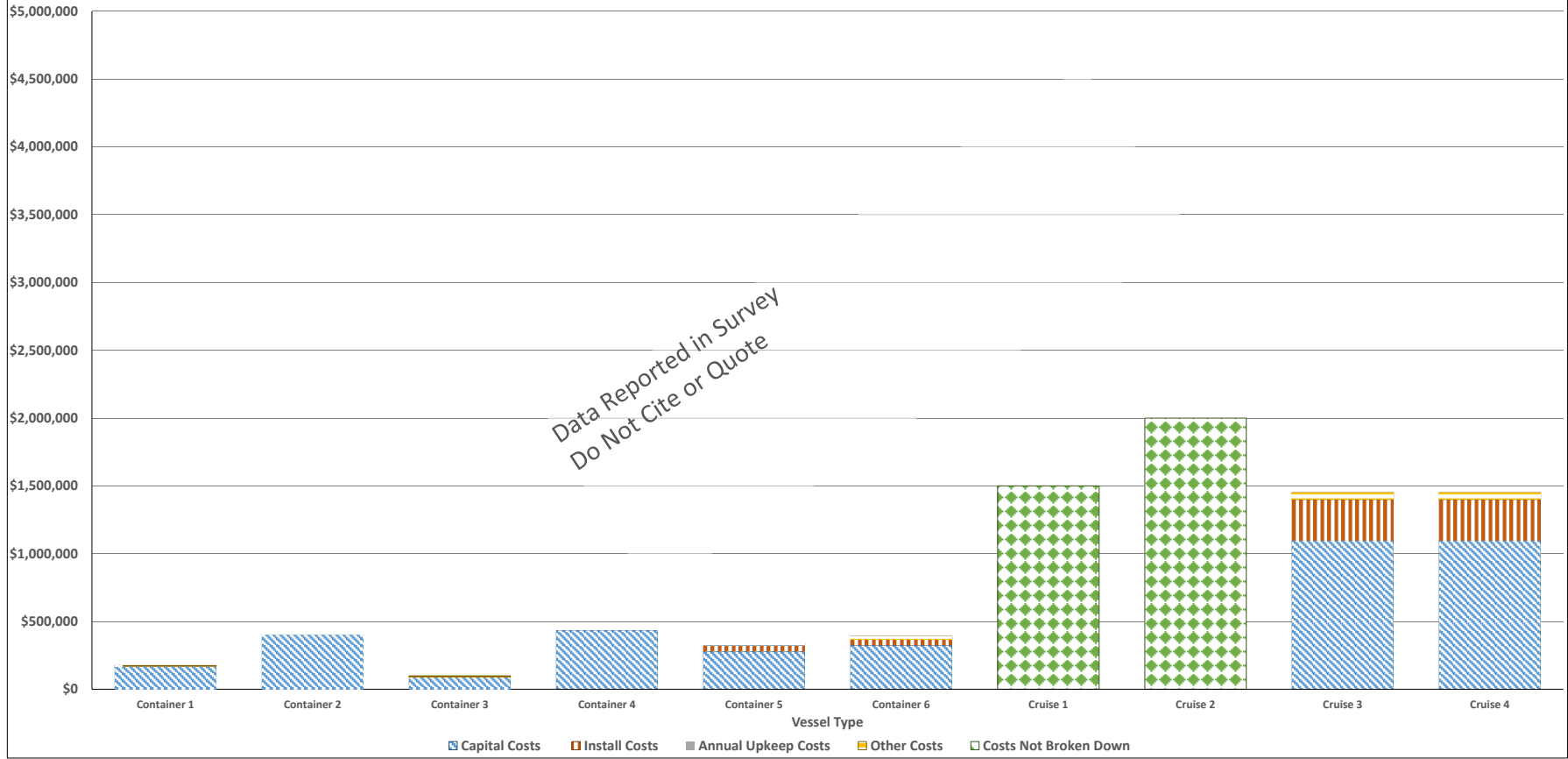
<sup>2</sup>Represented costs are for both actual costs paid on existing infrastructure and projected retrofit estimates

**Data Reported in Vessel Survey - Bulk/Ro-Ro**  
**Costs for Shorepower Retrofits<sup>1</sup> (One Side Only)**



<sup>1</sup>For projected retrofit costs

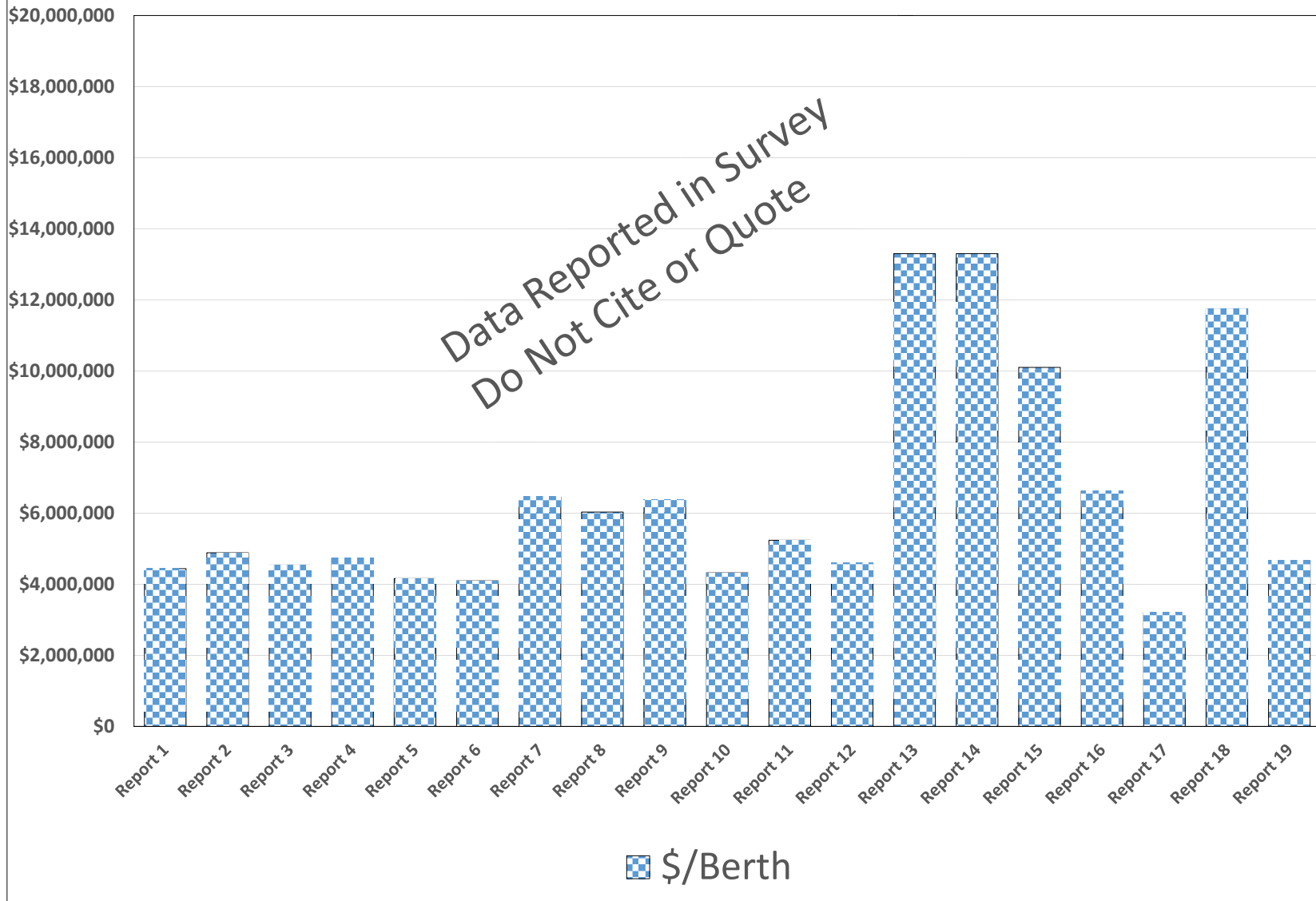
**Data Reported in Vessel Survey**  
**Costs for Shorepower - New Builds (One Side Only)**



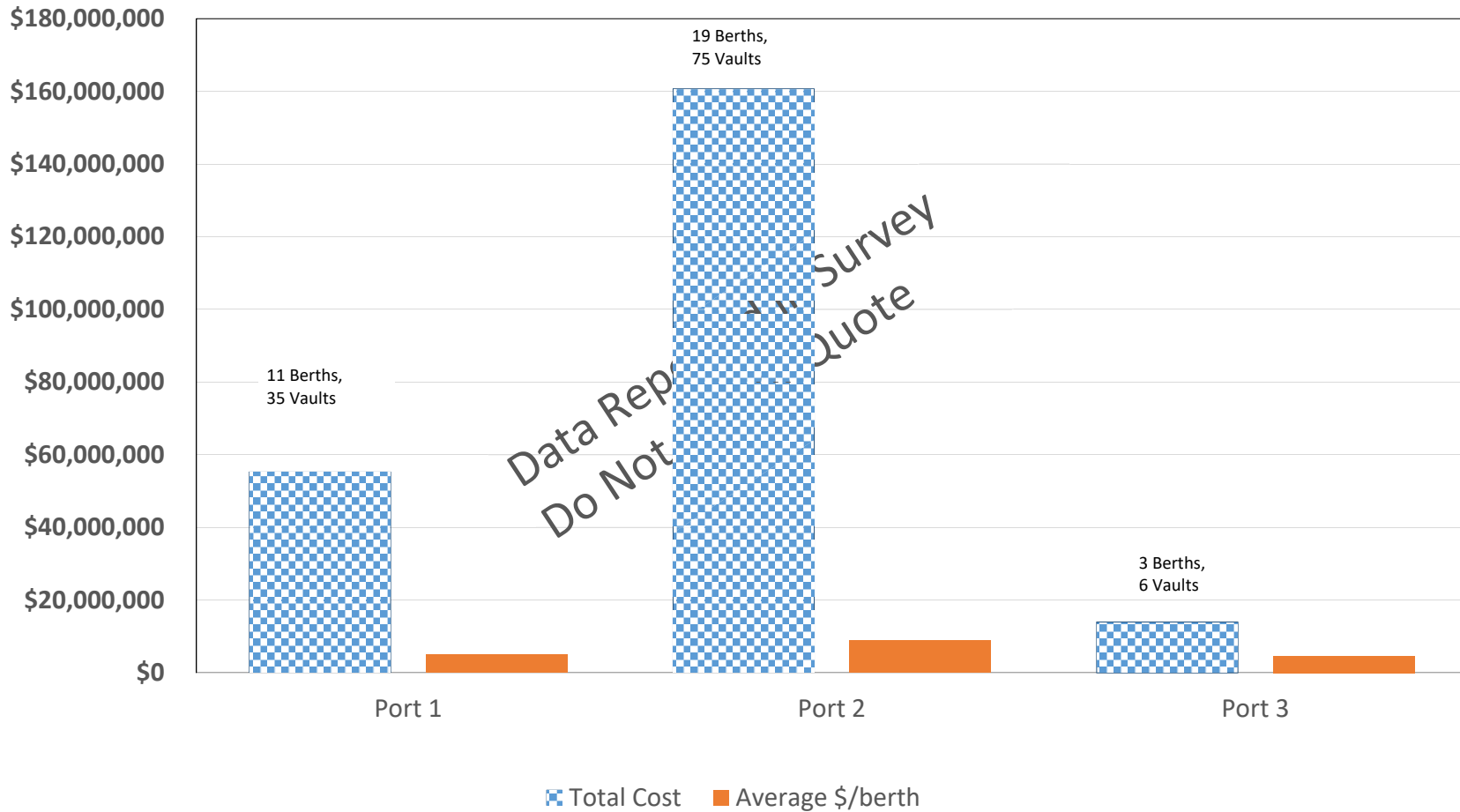
# Port Cost Surveys

- CARB requested information on:
  - Number of terminals
  - Types of vessels that visit
  - Number of berths and vaults
  - Design costs
  - Construction costs
  - Infrastructure costs
  - Total costs
  - Other costs, such as maintenance and labor

**Data Reported in Port Survey  
Existing Infrastructure -Costs Per Berth  
(Container Vessel Berths)**

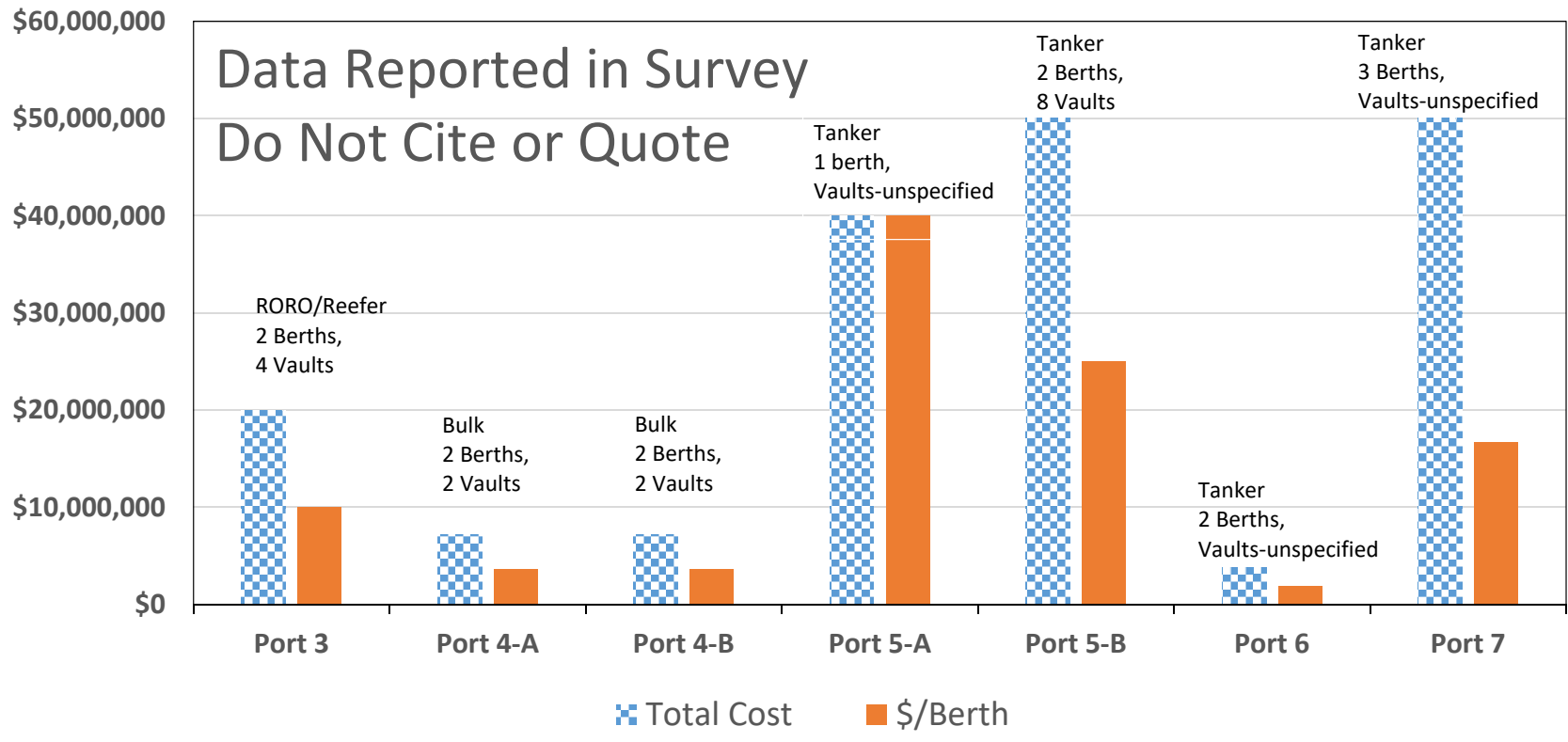


**Data Reported in Port Survey-Existing Infrastructure**  
**Total Port Cost and Average Berth Cost per Port**  
**(Container Vessel Berths)**



\* These charts do not reflect CARB incentives that assisted in paying for a portion of these berths

**Data Reported in Port Survey  
New Infrastructure  
Projected Total Port Cost and Average Berth Cost**



**Data Reported in Survey - Do Not Cite or Quote**

Vessel Shore Power Survey Reported Data														
Vessel Type	# of Vessels	Vessel Size (TEU)	Vessel Size (Gross Tonnage)	Voltage (Volts)	Load Rqmt	# Cables	SP Sides	Costs per Shore Power - One Side (\$)						Reported Additional Costs for Shore Power on 2nd side
								Capital Costs	Install Costs	Annual Upkeep Costs	Other Costs	Costs Not Broken Down	Total Costs (for one side)	
<b>Retrofit<sup>1</sup></b>														
Container <sup>2</sup>	72	2,100-14,000	N/A	440-6,600	N/A	1-2	1-2	\$160,000-\$1,400,000	\$80,000-\$623,000	\$10,000-\$20,000	\$20,000-\$670,000	N/A	\$140,500-\$890,000	\$280,000 (one vessel reported)
Cruise	13	N/A	6,100-170,000	440-11,000	1.2-11 MW	2-5	1-2	\$600,000-\$1,100,000 <sup>3</sup>	\$300,000 (one fleet reported)	Reported Minimal	\$100,000 (one fleet reported)	\$1,750,000-\$2,200,000	\$1,000,000-\$2,200,000	\$1,000,000-\$1,500,000
Bulk	2	N/A	24,400-44,000	440-6,600	1.7 MW (one vessel reported)	0-1	1	\$200,000-\$600,000	\$25,000-\$400,000	N/A	\$50,000-\$100,000	N/A	\$275,000-\$550,000	N/A
RORO/Auto	2	N/A	40,000-77,000	440	N/A	0-1	1	\$900,000-\$2,000,000	N/A	\$10,000 (one vessel reported)	\$2,800,000 (one vessel reported)	N/A	\$900,000-\$4,800,000	N/A
<b>New Build<sup>2</sup></b>														
Container <sup>4</sup>	6	4,500-14,000	N/A	440-6,600	N/A	2	2	\$92,500-\$435,000	\$35,000-\$40,000	\$10,000	\$10,000-\$20,000	N/A	\$98,000-\$405,000	N/A
Cruise	4	N/A	32,000-150,000	6,600-11,000	3-11 MW	2-5	1	\$1,100,000 (one fleet reported)	\$300,000 (one fleet reported)	N/A	\$100,000	\$50,000 (one fleet reported)	\$1,500,000-\$2,000,000	N/A
<sup>1</sup> Some of these costs were paid with incentives <sup>2</sup> Data reported for 72 individual vessels - vessels in same size class that showed same cost were grouped into 14 separate container categories <sup>3</sup> One cruise vessel reported 2 shorepower sides <sup>4</sup> Some container reports for new builds did not breakdown capital and install costs; this range represents reported capital and total AMP costs reported by fleets														





# **Cost Analysis**

# Compliance Assumptions for Cost Analysis

- Compliance through shore power assumed for frequently visiting vessels and frequently visited berths
- “Frequent” is defined as:
  - Frequent vessel: A vessel that visits a particular berth four or more times on an annual basis
  - Frequent berth: A berth that receives four or more frequent vessels visiting on an annual basis
- For non-frequent vessels and berths, staff assume compliance using a CARB-approved barge-based bonnet capture and control system

Preliminary Cost Estimates\* (Container/Reefer/Cruise)  
Proposed Implementation in 2021 (Ports/Terminals above Thresholds)

Do Not Cite or Quote

Vessel Information **		Unique Vessels			Vessel Visits		Berth Retrofits
	Vessels	Visits	Shore Power (SP)	Capture & Control (C&C)	SP	C&C	Berths
Container/Reefer	20	248	10	10	138	110	1
Cruise	17	46	17	0	46	0	1

Cost Estimates - Container & Reefer							
Capture and Control	Visits	Total Cost			Per Visit		Total Annual Cost
	110	\$4,683,800			\$42,600		\$4,683,800
Shore Power Energy	Visits	Electricity (\$)	Fuel Savings (\$)	Net Cost+Labor	Per Visit		
	138	\$1,228,100	\$972,700	\$586,600	\$4,300		\$586,600
Shore Power Cap Costs		Total Cost	Annualized	Ann+Maint.			
# Berths	1	\$6,450,000	\$517,600	\$547,600			
# Vessels	10	\$11,808,000	\$1,529,200	\$1,719,200			
Total Cap Costs		\$18,258,000	\$2,046,800	\$2,266,800			\$2,266,800
			Per Visit	\$30,400		Total (SP+C&C)	\$7,537,200

Cost Estimates - Cruise Ships							
Capture and Control	Visits	Total Cost			Per Visit		Total Annual Cost
	N/A***						
Shore Power Energy	Visits	Electricity (\$)	Fuel (\$)	Net Cost+Labor	Per Visit		
	46	\$754,400	\$597,900	\$266,900	\$5,800		\$266,900
Shore Power Cap Costs		Total Cost	Annualized	Ann+Maint.			
# Berths	1	\$6,450,000	\$517,600	\$547,600			
# Vessels	17	\$20,073,600	\$2,599,600	\$2,922,600			
Total Cap Costs		\$26,523,600	\$3,117,200	\$3,470,200			\$3,470,200
			Per Visit	\$81,200		Total (SP+C&C)	\$3,737,100

\*Values are rounded

\*\*Vessel visit information based on 2017 CSLC data

\*\*\*Loads too large for the C&C option

## Do Not Cite or Quote

Preliminary Cost Estimates (Container/Reefer/Cruise)			
Proposed Implementation in 2021 (Ports/Terminals above Thresholds)			
	Value	Units	Source
Cruise Power	5620	kw	2018 CARB Emissions Inventory
Cruise Visit Time	14.59	hours	2018 CARB Emissions Inventory
Container/Reefer Visit Time	42.58	hours	2018 CARB Emissions Inventory
Barge Hourly Rate	\$1,000	dollars	Barge provider estimate
Container/Reefer Vessel Power	1045	kw	2018 CARB Emissions Inventory
Fuel Cost (per metric ton)	\$730.50	dollars/MT	Ship and Bunker.com
Electricity Cost	\$0.20	dollars/kwh	Port and Terminal Contacts
Berth Retrofit	\$6,450,000	dollars	CARB Port Survey Results
Vessel Retrofit	\$1,180,800	dollars	CARB Vessel Survey Results
SP Berth Maint. (Annual)	\$30,000	dollars	CARB Port Survey Results
SP Labor/Visit	\$2,400	dollars	CARB Port Survey Results
Engine Fuel Consumption	217	g/kw-hr	2018 CARB Emissions Inventory
Vessel Equipment Life	10	years	Original At-Berth Regulation
Berth Equipment Life	20	years	CARB contact with POLB
Interest Rate	5%	percent	CARB contact with POLB
CRF(5%, 20 yrs) for Berths	0.08	n/a	CRF= capital recovery factor
CRF(5%,10 yrs) for Vessels	0.13	n/a	CRF= capital recovery factor
SP Vessel Maint. (Annual)	\$19,000	dollars	CARB Vessel Survey Results

Preliminary Cost Estimates\* (Bulk/General and Auto/Roll-On Roll-Off)  
 Proposed Implementation in 2025 (Berths/Terminals above Thresholds)

Do Not Cite or Quote

Vessel Information**		Unique Vessels			Vessel Visits		Berth Retrofits
	Vessels	Visits	Shore Power (SP)	Capture & Control (C&C)	SP	C&C	Berths
Auto/Roll-On Roll-Off	261	891	17	244	113	778	4
Bulk/General Cargo	305	409	0	305	0	409	0

Cost Estimates - Auto/Roll-On Roll-Off							
	Visits	Total Cost			Per Visit		Total Annual Cost
Capture and Control	778	\$14,859,800			\$19,100		\$14,859,800
Shore Power Energy	Visits	Electricity (\$)	Fuel Savings (\$)	Net Cost+ Labor	Per Visit		
	113	\$500,300	\$396,500	\$375,000	\$3,300		\$375,000
Shore Power Cap Costs		Total Cost	Annualized	Ann+ Maint.			
# Berths	4	\$25,800,000	\$2,070,300	\$2,190,300			
# Vessels	17	\$20,073,600	\$2,599,600	\$2,922,600			
Total Cap Costs		\$45,873,600	\$4,669,900	\$5,112,900			\$5,112,900
			Per Visit:	\$22,800		Total (SP+C&C)	\$20,347,700

Cost Estimates - Bulk and General Cargo							
	Visits	Total Cost			Per Visit Cost		Total Annual Cost
Capture and Control	409	\$29,541,500			\$72,200		\$29,541,500
Shore Power Energy	Visits	Electricity (\$)	Fuel Savings (\$)	Net Cost+ Labor	Per Visit		
	N/A	N/A	N/A	N/A	N/A		
Shore Power Cap Costs		Total Cost	Annualized	Ann+Maint.			
# Berths	N/A	N/A	N/A	N/A	N/A		
# Vessels	N/A	N/A	N/A	N/A	N/A		
Total Cap Costs							

\*Values are rounded

\*\*Vessel visit information based on 2017 CSLC data

## Do Not Cite or Quote

Preliminary Cost Estimates (Bulk/General Cargo and Auto/Roll-On Roll-Off)			
Proposed Implementation in 2025 (Ports/Terminals above Thresholds)			
	Value	Units	Source
Auto/Roll-On Roll-Off Power	1159	kw	2018 CARB Emissions Inventory
Auto/RORO Visit Time	19.1	hours	2018 CARB Emissions Inventory
Bulk Power	188	kw	2018 CARB Emissions Inventory
Bulk Visit Time	72	hours	2018 CARB Emissions Inventory
Gen Cargo Power	661	kw	2018 CARB Emissions Inventory
Gen Cargo Visit Time	77.5	hours	2018 CARB Emissions Inventory
Barge Hourly Rate	\$1,000	dollars	Barge provider estimate
Fuel Cost (per metric ton)	\$730.50	dollars/MT	Ship and Bunker.com
Electricity Cost	\$0.20	dollars/kwh	Port and Terminal Contacts
Berth Retrofit	\$6,450,000	dollars	CARB Port Survey Results
Vessel Retrofit	\$1,180,800	dollars	ARB Vessel Survey Results
SP Berth Maint. (Annual)	\$30,000	dollars	CARB Port Survey Results
SP Vessel Maint. (Annual)	\$19,000	dollars	CARB Vessel Survey Results
SP Labor/visit	\$2,400	dollars	CARB Port Survey Results
Engine Fuel Consumption	217	g/kw-hr	2018 CARB Emissions Inventory
Berth Equipment Life	20	years	Contact with POLB
Vessel Equipment Life	10	years	Original At-Berth Regulation
Interest Rate	5%	percent	Contact with POLB
CRF(5%,10 yrs) for vessels	0.13	n/a	CRF= capital recovery factor
CRF(5%, 20 yrs) for berths	0.08	n/a	CRF= capital recovery factor



## Do Not Cite or Quote

Preliminary Cost Estimates (Tankers @ 50%)			
Proposed Implementation in 2025 (Ports/Terminals above Thresholds)			
	<b>Value</b>	<b>Units</b>	<b>Source</b>
Product Tanker Aux Eng Power	778	kw	2018 CARB Emissions Inventory
Product Tanker Visit Time	44.3	hours	2018 CARB Emissions Inventory
Crude Tanker Aux Eng Power	1308	kw	2018 CARB Emissions Inventory
Crude Tanker Boiler Power	3000	kw	2018 CARB Emissions Inventory
Crude Tanker Visit Time	38.5	hours	2018 CARB Emissions Inventory
Barge Hourly Rate	\$1,000	dollars	Barge provider estimate
Fuel Cost (per metric ton)	\$730.50	dollars/MT	Ship and Bunker.com
Electricity Cost	\$0.20	dollars/kwh	Port and Terminal contacts
Berth Retrofit	\$6,450,000	dollars	CARB Port Survey Results
Vessel Retrofit	\$1,180,800	dollars	CARB Vessel Survey Results
SP Berth Maint. (Annual)	\$30,000	dollars	ARB Port Survey Results
SP Vessel Maint. (Annual)	\$19,000	dollars	CARB Vessel Survey Results
SP Labor/Visit	\$2,400	dollars	CARB Port Survey Results
Engine Fuel Consumption	217	g/kw-hr	2018 CARB Emissions Inventory
Berth Equipment Life	20	years	CARB contact with POLB
Vessel Equipment Life	10	years	Original At-Berth Regulation
Interest Rate	5%	percent	CARB contact with POLB
CRF(5%, 10 yrs)	0.13	n/a	CRF= capital recovery factor
CRF(5%, 20 yrs)	0.08	n/a	CRF= capital recovery factor
Costs Adjusted for 50% Control	0.625	n/a	Costs multiplied by 5/8 of full 2031 cost at 80% control



## Preliminary Cost Estimates\* (Tanker @ 80% CF)

Proposed Implementation in 2021 (Berths/Terminals above Thresholds)

**Do Not Cite or Quote**

Vessel Information**		Unique Vessels			Vessel Visits		Berth Retrofits
	Vessels	Visits	Shore Power (SP)	Capture & Control (C&C)	SP	C&C	Berths
Product Tanker	246	740	0	246	0	740	0
Crude Tanker	192	614	0	192	0	614	0

Cost Estimates - Product Tanker							Product Tanker (SP+C&C)
Capture and Control	Visits	Total Cost			Per Visit		Total Annual Cost
	740	\$32,782,000			\$44,300		\$32,782,000
Shore Power Energy	Visits	Electricity (\$)	Fuel Savings (\$)	Net Cost+ Labor	Per Visit		
	0	\$0	\$0	\$0			\$0
Shore Power Cap Costs		Total Cost	Annualized	Ann+Maint.			
# Berths	0	\$0	\$0	\$0			
# Vessels	0	\$0	\$0	\$0			
Total Cap Cost		\$0	\$0	\$0			\$0
			Per Visit	\$44,300	Total Annual Cost		\$32,782,000

Cost Estimates - Crude Tanker							Crude Tanker (SP+C&C)
Capture and Control	Visits	Total Cost			Per Visit		Total Annual Cost
	614	\$23,639,000			\$38,500		\$23,639,000
Shore Power Energy	Visits	Electricity (\$)	Fuel (\$)	Net Cost+Labor	Per Visit		
	N/A	N/A	N/A	N/A	N/A		
Shore Power Cap Costs		Total Cost	Annualized	Ann+Maint.			
# Berths	N/A	N/A	N/A	N/A			
# Vessels	N/A	N/A	N/A	N/A			
Total Cap Cost	N/A	N/A	N/A	N/A			
			Per Visit	\$38,500	Total Annual Cost		\$23,639,000

\*Values are rounded

\*\*Vessel visit information based on 2017 CSLC data

## Do Not Cite or Quote

Preliminary Cost Estimates (Tankers @ 80%)			
Proposed Implementation in 2031 (Ports/Terminals above Thresholds)			
	<b>Value</b>	<b>Units</b>	<b>Source</b>
Product Tanker Aux Eng Pow	778	kw	2018 CARB Emissions Inventory
Product Tanker Visit Time	44.3	hours	2018 CARB Emissions Inventory
Crude Tanker Aux Eng Power	1308	kw	2018 CARB Emissions Inventory
Crude Tanker Boiler Power	3000	kw	2018 CARB Emissions Inventory
Crude Tanker Visit Time	38.5	hours	2018 CARB Emissions Inventory
Barge Hourly Rate	\$1,000	dollars	Barge provider estimate
Fuel Cost (per metric ton)	\$730.50	dollars/MT	Ship and Bunker.com
Electricity Cost	\$0.20	dollars/kwh	Port and Terminal contacts
Berth Retrofit	\$6,450,000	dollars	CARB Port Survey Results
Vessel Retrofit	\$1,180,800	dollars	CARB Vessel Survey Results
SP Berth Maint. (Annual)	\$30,000	dollars	CARB Port Survey Results
SP Vessel Maint. (Annual)	\$19,000	dollars	CARB Vessel Survey Results
SP Labor/Visit	\$2,400	dollars	CARB Port Survey Results
Engine Fuel Consumption	217	g/kw-hr	2018 CARB Emissions Inventory
Berth Equipment Life	20	years	CARB contact with POLB
Vessel Equipment Life	10	years	Original At-Berth Regulation
Interest Rate	5%	percent	CARB contact with POLB
CRF(5%, 10 yrs)	0.130	n/a	CRF= capital recovery factor
CRF(5%, 20 yrs)	0.080	n/a	CRF= capital recovery factor

**Annualized Cost Estimate Summary**

<b>Vessel Type</b>	<b>Proposed Implementation Date</b>	<b>Annualized Cost</b>	<b>Annualized Cost at Full Implementation (2031)</b>
Containers and Reefer Vessels	2021	\$7,537,200	\$7,537,200
Cruise Vessels	2021	\$3,737,100	\$3,737,100
Bulk and General Cargo Vessels	2025	\$29,541,500	\$29,541,500
Ro-Ro/Auto Vessels	2025	\$20,347,700	\$20,347,700
Product Tanker Vessels (50%)*	2025	\$20,488,800	
Crude Tanker Vessels (50%)*	2025	\$14,774,400	
Product Tanker Vessels (80%)	2031	\$32,782,000	\$32,782,000
Crude Tanker Vessels (80%)	2031	\$23,639,000	\$23,639,000
		<b>Total Annualized Cost</b>	<b>\$117,584,500</b>

\* from 2025 to 2030

# Regulatory Alternatives Solicitation

- CARB staff are soliciting for alternatives to the proposed regulatory concepts
  - Economic Impact Assessment-regulatory alternatives are required for the Standardized Regulatory Impact Assessment (SRIA)
  - Environmental Impacts Evaluation
- Please provide alternative concepts to Kaylin Huang at [Kaylin.Huang@arb.ca.gov](mailto:Kaylin.Huang@arb.ca.gov)
- Date extended to August 24, 2018

# Next Steps

- Early September – Public workshops
- September – Marine-focused community meetings
- Staff welcome feedback and engagement from stakeholders
- Please reach out to staff with any questions or concerns

# Contacts

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CARB At-Berth Website:

<https://www.arb.ca.gov/ports/shorepower/shorepower.htm>