CALIFORNIA
AIR RESOURCES BOARD

CARB Staff Analysis of Potential Emission Reduction Strategies by Port/Terminal/Berth

For Auto/Ro-Ro Vessels

May 2019

The berth analysis is an assessment made by California Air Resources Board (CARB) staff to characterize what additional shore power infrastructure improvements and potential emission control technologies (land- or barge-based alternative capture and control systems) may be necessary to support the new draft At Berth Regulation for auto carrier and roll on-roll off (ro-ro) vessels. For the development of the analysis CARB staff relied on port maps, Google Earth maps, and vessel visit information from Wharfinger, San Francisco Marine Exchange, and California State Lands Commission data. CARB staff's assessment was based on comment letters received from industry stakeholders in response to the new draft At Berth Regulation, numerous port/terminal site visits and tours, extensive discussions with terminal operators, Port staff throughout the state, and harbor pilots servicing the Northern and Southern California Ports.

The assessment is also intended to assist CARB staff to estimate the potential cost impacts that could be incurred due to infrastructure and/or equipment upgrades as a result of the requirements of the new draft At Berth Regulation.

If you have any comments, feedback and/or updated information we would welcome additional information to further refine this analysis. Please submit your feedback to CARB via email to Nicole Light (nicole.light@arb.ca.gov) or Lynsay Carmichael (lynsay.carmichael@arb.ca.gov).

Legend:
C+C= capture and control system
SP= shore power

Subject Headers:
- **# of Auto/Ro-Ro Visits in 2017** = Total number of auto/Ro-Ro vessel visits by berth based on 2017 visit information
- **# of Frequent Auto & Ro-Ro Vessels Visiting Terminals in 2017 =** Number of frequent (vessel that visits the same berth in California at least 4 times in a year) auto/Ro-Ro vessels by port
- **# of Visits by Frequent Auto & Ro-Ro Vessels in 2017** = Number of visits made by frequent auto/ro-ro vessels
- **Estimated # of C+C Systems Needed** = Number of emission capture and control system (land- or barge-based) that CARB staff estimates will be necessary per port
- **Assumed Control Technology** = Type of emissions control technology that CARB staff's analysis indicates may be most feasible for use
- **Improvements to Existing Infrastructure Needed?** = Additional landside infrastructure improvements needed to support the emission control technology assumption for a given port/marine terminal complex (in some situations infrastructure upgrades, such as wharf improvements may be necessary to support a land-based emission control strategy)
- **Reasoning** = Basis for CARB staff analysis and assumptions

Berth Level CARB Staff Analysis of Potential Emission Reduction Strategies
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Port/Terminal/Berth	# of Auto & Ro-Ro Visits in 2017	# of Frequent Auto & Ro-Ro Vessels Visiting Terminals in 2017	# of Visits by Frequent Auto & Ro-Ro Vessels in 2017	Estimated # of C+C Systems Needed	Assumed Control Technology	Improvements to Existing Infrastructure Needed?	Reasoning
Carquinez	**122**	**5**	**24**	**1**	**1 Barge-based C+C (shared)**	**No**	**Barge-based C+C seems most feasible option for Benicia terminal considering minimal space on wharf and implementation date of 2025. CARB staff anticipate terminal being able to share one C+C system, with some operational adjustments.**
Benicia - AM Ports	122	5	24	1			Barge-based C+C seems most cost effective option.
Berth 2	115	5	24	1	Barge-based C+C	No	Comment letter from Benicia Port Terminal Company expressed concern that a land-side C+C system would restrict cargo movement and a barge-based system may not be feasible due to strong currents and navigational hazards. SF Bar Pilots commented they have no significant concerns about a barge-based C+C system being used here, as long as the system is designed with the strong currents in mind.
Berth 3	7	0	0		Barge-based C+C	No	This berth seems primarily used for overflow Auto/Ro-Ro visits.
One berth used 105 days of the year, two berths used at same time 3 days of the year (in 2017)							

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Hueneme	**240**	**5**	**21**	**1**	**SP already installed, 1 Land-based C+C**	**No**	**Hueneme already has three SP berths at Wharf 1 for plugging in regulated reefer vessels. Land-based C+C at main Auto/Ro-Ro berth with operational changes at overflow berths may be most cost effective option considering visit activity.**
Wharf 1	19	0	0	0		No	SP already installed at this terminal.
Berth 1	4	0	0	0	SP already installed	No	These berth are primarily used for reefer vessels and overflow Auto/Ro-Ro visits, and already have SP installed.
Berth 2	15	0	0		SP already installed	No	
Wharf 2	212	4	16	1	Land-based C+C	No	This berth is the primary Auto/Ro-Ro berth. Port staff advised there is no room for a barge-based C+C system due to space constraints. Port has expressed concerns with using a capture and control bonnet connection due to diurnal windy conditions that run perpendicular to the bonnet sock.
Berth 4	212	4	16	1	Land-based C+C	No	This berth is the primary Auto/Ro-Ro berth. Port staff advised there is no room for a barge-based C+C system due to space constraints. Port has expressed concerns with using a capture and control bonnet connection due to diurnal windy conditions that run perpendicular to the bonnet sock.
Wharf 3	9	1	5	0		No	Berth 6 is used for overflow Auto/Ro-Ro visits. It does not have the space constraints of berths 1,2, and 4, but is operated by Hueneme through a joint-use agreement with the Navy. CARB staff would like to discuss if operational changes can be made to absorb visits at another berth with controls.
Berth 6 (Navy Joint-Use)	9	1	5	0	Operational changes may be most cost effective?	No	Berth 6 is used for overflow Auto/Ro-Ro visits. It does not have the space constraints of berths 1,2, and 4, but is operated by Hueneme through a joint-use agreement with the Navy. CARB staff would like to discuss if operational changes can be made to absorb visits at another berth with controls.
One berth used 213 days of the year, two berths used at same time 31 days of the year, three berths used at same time 2 days of the year (in 2017)							

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Long Beach	**211**	**7**	**36**	**2**	**1 Barge-based C+C (shared), 1 Land-based C+C**	**No**	**Barge-based C+C systems with minor operational changes; Jacobson Pilots at POLB expressed concern about using a barge-based C+C at Berth 83.**
Cooper T. Smith	47	0	0	1 (shared with Crescent Terminal)	Barge-based C+C	No	Jacobson Pilots at POLB did not express any significant concern about using a barge-based C+C system at this berth. Assuming shared barge-based C+C most feasible for flexibilty and cost effectiveness.
Berth F204	3	0	0	1 (shared)	Barge-based C+C	No	Jacobson Pilots at POLB did not express any significant concern about using a barge-based C+C system at this berth.
Berth F205	44	0	0	1 (shared)	Barge-based C+C	No	Jacobson Pilots at POLB did not express any significant concern about using a barge-based C+C system at this berth.
Crescent Terminal	60	0	0	1 (shared with Cooper Terminal)	Barge-based C+C	No	Jacobson Pilots at POLB did not express any significant concern about using a barge-based C+C system at this berth. Assuming shared barge-based C+C most feasible for flexibilty and cost effectiveness.
Berth F207	60	0	0	1 (shared)	Barge-based C+C	No	Jacobson Pilots at POLB did not express any significant concern about using a barge-based C+C system at this berth.
One berth used at F205 and F207 at same time 98 days of the year, two berths used at same time 15 days of the year							
Toyota Logistics	104	7	36	1	Land-based C+C	No	Jacobson Pilots at POLB stated a barge-based C+C system here would block navigational access to the back of the channel for other vessels. A land-based C+C system appears to fit on the berth basis visual maps; port or terminal staff have not advised any wharf infrastructure improvements would be necessary to support weight of land-based C+C system.
Berth B83	104	7	36	1	Land-based C+C	No	Jacobson Pilots at POLB stated a barge-based C+C system here would block navigational access to the back of the channel for other vessels. A land-based C+C system appears to fit on the berth basis visual maps; port or terminal staff have not advised any wharf infrastructure improvements would be necessary to support weight of land-based C+C system.

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Los Angeles	**94**	**7**	**54**	**1**	**1 Barge-based C+C (shared)**	**No**	**No significant concern from Los Angeles Pilots about use of a barge-based C+C system. Assuming shared barge-based C+C most feasible for flexibilty and cost effectiveness. Multiple berths only used a few times a year on any given day, anticipate terminal to be able to address this overlap with operational changes.**
WWL	94	7	54	1	Barge-based C+C	No	No significant concern from Los Angeles Pilots about use of a barge-based C+C system at this terminal.
Berth 196	1	0	0	1 (shared)	Barge-based C+C	No	No significant concern from Los Angeles Pilots about use of a barge-based C+C system here.
Berth 197	8	1	7		Barge-based C+C		
Berth 198	69	5	32		Barge-based C+C		
Berth 199	16	1	15		Barge-based C+C		
One berth used 128 days of the year, two berths used at same time 2 days of the year (in 2017)							
Richmond	**71**	**1**	**5**	**1**	**1 Barge-based C+C (shared)**	**No**	**Conversation with SF Bar Pilots did not raise any significant concerns about a barge-based C+C system being used for auto/ro-ro terminal at Richmond. Assuming shared barge-based C+C most feasible for flexibilty and cost effectiveness.**
Auto Warehouse Co.	71	1	5	1	Barge-based C+C	No	Conversation with SF Bar Pilots did not raise any significant concerns about a barge-based C+C system being used at this terminal.
Berth RCH8	71	1	5	1	Barge-based C+C	No	Conversation with SF Bar Pilots did not raise any significant concerns about a barge-based C+C system being used at this berth.

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San Diego	**253**	**4**	**36**	**2**	**1 Barge-based C+C (shared), 1 Land-based C+C**	**No**	**Based on port maps, a barge-based C+C system looks to fit at berths 24-2, 24-4, and 24-5 with no navigational concerns. Port staff advised that due to channel restrictions, barge-based C+C was not feasible for berths 24-10 and 24-11. Land-based C+C looks feasible at these berths. Unknown if any wharf infrastructure improvements would be necessary to support weight of C+C system.**
National City Marine	253	4	36	2	1 Barge-based C+C (shared), 1 Land-based C+C	No	Based on port maps, a barge-based C+C system looks to fit at berths 24-2, 24-4, and 24-5 with no navigational concerns. Port staff advised that due to channel restrictions, barge-based C+C was not feasible for berths 24-10 and 24-11. Land-based C+C looks feasible at these berths. CARB staff have not received any information suggesting wharf improvements are needed to support the weight of land-based system at this time.
Berth 24-2	26	1	23		Barge-based C+C		
Berth 24-4	19	0	0	1 (shared)	Barge-based C+C		Based on port maps, a barge-based C+C system looks to fit at berths 24-2, 24-4, 24-5 without navigational concerns. Land-based C+C looks like it may possibly fit on the berth, but assuming shared barge-based C+C most feasible for flexibilty and cost effectiveness.
Berth 24-5	156	3	13		Barge-based C+C	No	
Berth 24-10	23	0	0	1 (shared mobile)	Land-based C+C		Based on port maps and conversation with Port staff, a land-based system seems most feasible due to narrow channel causing possible navigational concerns for a barge-based C+C system.
Berth 24-11	29	0	0		Land-based C+C		
One berth used 177 days of the year, two berths used at same time 73 days of the year, three berths used at same time 7 days of the year (in 2017)							
San Francisco	**26**	**0**	**0**	**1**	**1 Barge-based C+C (shared)**	**No**	**Per Port staff, barge or land-based C+C system seems feasible, but port is confirming with SF Bar Pilots and engineering staff.**
Pasha Terminal	26	0	0	1	1 Barge-based C+C (shared)	No	Growth to 50-70 vessel visits is expected in 2019, so have included this terminal in our updated berth analysis. Per Port staff, barge or land-based C+C system seems feasible, but port is confirming with SF Bar Pilots.
Pier 80*	26	0	0	1	Barge-based C+C	No	Per Port staff, barge or land-based C+C system seems feasible, but port is confirming with SF Bar Pilots.

Port/Terminal/Berth	# of Auto & Ro-Ro Visits in 2017	Estimated # of C+C Systems Needed	Assumed Control Technology	Additional Infrastructure Improvements Needed?
Statewide #'s	1017	9	6 Barge-based C+C, 3 Land-based C+C	No Infrastructure Improvements Assumed

*Port staff advise vessel activity expected to exceed threshold in 2019