APPENDIX F

DATA COLLECTION REQUIREMENTS

Control and Capture System for Oil Tankers Project

Transportation and Toxics Division
California Air Resources Board
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Appendix F: Data Collection Requirements Capture and Control System for Oil Tankers

The list below is the minimum requirements for data collection elements to be collected as part of a project requesting funding under this solicitation. Additional data collection elements may be collected beyond what is presented below.

1. Tanker Vessel Specification

Landside or barge based control strategies are typically designed to treat a range of vessel configurations and exhaust parameters. The following sections are designed to describe the range of vessel type, engine and boiler specifications, and exhaust parameters that this system can effectively treat. Note that for tankers that use the steam driven pumps[1] both the auxiliary engine and boiler emissions must be controlled.

A) Vessel Information

- Vessel type(s) that will be treated with control strategy (Tankers, Ro-Ro, Container, and Cruise)
- List number of vessels that will be treated with the control strategy per year
- Fuel type and maximum sulfur content in ppm for each vessel and combustion source (auxiliary engine and/or auxiliary boiler)
- Typical range of vessel hoteling times
- Range of vessel classes to be treated
- Carrying capacity of vessel sizes to be treated

B) Combustion Source Information (auxiliary engine and auxiliary boiler)

- For tankers operating steam-driven pumps, list the auxiliary boilers and auxiliary engines technical specifications
- For tankers operating diesel-electric-driven pumps, list the auxiliary engine technical specifications
- Description of duty cycle of the auxiliary boilers and auxiliary engines
- Typical emission factors (if any) for each combustion source

[1] Control Measure for Ocean-Going Vessels At Berth CCR Title 17 Section 93130.5(d)(2) CARB Approved Emission Control Strategy – Pending Final Approval, March 26, 2020

- Maximum Continuous Rating (MCR) of each combustion source in kilowatts (kW) or horsepower (hp)
- Typical operating load range for each combustion source in kW or hp (Minimum to Maximum)
- Typical range of exhaust flow rates from each combustion source
- Typical range of combustion source fuel consumption rates while at-berth
- List any International Marine Organization (IMO), Oil Companies International Marine Forum (OCIMF), or International Association of Independent Tanker Owners (INTERTANKO) certifications issued for each combustion source

2. Tanker Vessel Cargo Loading and Unloading Operations at Berth

- What type of cargo does the tanker carry?
- Description of duty cycles for both product loading and off-loading operations, including product flow rates
- Does this tanker typically unload/off-load all their product at one terminal in one sitting?
- List the loading and off-loading duty cycles if they vary for the same vessel that visits different tanker terminals?
- Describe the typical manifold (not exhaust stack) connection/disconnection times before berthing, and time to be secured to berth

3. Tanker Emissions Control Technologies Testing Performance

Based on the Recommended Emission Testing Guidelines for Ocean-Going Vessel (2012)[2] (OGV Emission Test Guidelines) under section " 12.4 Test Cycles," the ISO 8178-4 D2 Cycle has been the recommended test cycle for shore-based or vessel-based units that treat auxiliary engines. For units that treat both auxiliary engines and boilers, Table 7 provides a recommended cycle. Multiple combustion sources concurrently.

- Develop a baseline emissions profile, based on a representative range of typical operation for control system, or whatever vessels this system will be approved to treat
- Specify in use performance and durability evaluation for a minimum cumulative 200 hours for each vessel type (in the case of tankers, crude tankers would be considered a different vessel type to product

[2] Available at: https://ww2.arb.ca.gov/sites/default/files/2019-11/ogv%20test%20guidelines_ADA.pdf

tankers) across a typical range of vessel loads (see page 14 " In-Use Performance and Durability" of OGV Emission Test Guidelines).

- Identify the exhaust stack configurations
- How many combustion sources will be treated with a single control strategy?
- Description of type of connection system between control strategy and vessel, and any losses in capture efficiencies
- What are the typical times needed to begin controlling emissions (e.g. attaching controls to vessel) and the time period needed to disconnect strategy?
- Specify the range of operational exhaust flow rates the control strategy can handle (minimum and maximum flows)
- Describe any variation in engine load or exhaust flow rate during operation
- Identify realistically achievable nitrous oxides (NOx), reactive organic gasses (ROG) and particulate matter 2.5 (PM2.5) control levels, as well as ammonia (NH_3)slip levels
- Identify in the case of boilers, metals, and formaldehyde emissions.
- Typical range of fuel consumption rates for the control technology
- What is the turnaround time for the system to service another vessel after completing emission capture/control from previous vessel?
- Who are the third party source testers that the technology provider has lined up?

4. Tanker Emissions Control Technologies Fuel / Energy Consumption (Power Source for the Emission Control System)

Existing emissions capture and control strategies are typically powered by diesel generator sets which contribute their own set of emissions when in operation. The At Berth Regulation will require new systems greenhouse gases (GHG) emissions to be " grid neutral," that is to be in line with the California grid carbon intensity of 422 lbs CO_2eq/MWhr.

- How will the capture and control system connect to the tanker?
- Describe how the control strategy is powered?
- What are the emissions generated by the power source?
- How does the control strategy mitigate the PM2.5, ROG, NOx, and GHG emissions generated by the power source in order to attain grid neutrality?
- If the control strategy is designed to be recharged/refueled, please describe how this process works?

- How frequently does the control strategy need recharging/refueling?

5. Tanker Emissions Control Technologies Maintenance Schedule

- What are the regularly scheduled maintenance tasks that will be performed throughout the year? Please describe the nature of the tasks and their expected frequency during the year.
- In the event of equipment failures, what do you expect the downtime to be?

6. Tanker Emissions Control Technologies Safety

- Detailed description of any emergency events (e.g., equipment failures, extreme weather/earthquake-related events)

7. Tanker Emissions Control Technologies Infrastructure Modification and Safety and Certification Work

There may be some control strategies which require additional supporting infrastructure to be built at existing terminals. For land-based systems, this would include potential berth reinforcement (or expansion), additional piping and power conduits, and waste disposal amenities. For barge-based systems, this would include docking, refueling, and maintenance amenities.

- Location and facility description including:
    - Terminal layout;
    - Areas of operation that cannot be obstructed
    - Cargo throughput and capacity for both crude and product; and
    - Identify the spaces used to accommodate for the emissions control technologies and their supporting infrastructure.
- List the infrastructural expansions/modifications requests put into place and indicate their locations on a map;
- List the relevant permitting agencies and include the anticipated timeframes for the permitting, construction, and commissioning of infrastructural expansions/modifications.
- List any permitting tasks that fall within International standards, or require class society approval (this may lengthen the time needed to obtain these particular approvals).
- Identify any other structures necessary for the docking, maintenance, and recharging/refueling of mobile barge-based systems

- What practices/procedures are in place to ensure that tanker industry safety concerns are continually being incorporated into the design, and are stress-tested within the design and implementation of the system?
- Are there regular recordkeeping/reporting milestones that you will share with stakeholders?

8. Tanker Emissions Control Technologies Capital Costs

- Detailed capital costs for:
    - Technology fabrication
    - Design finalization
    - Permitting
    - Installation
    - Commissioning
    - Fueling/charging infrastructure

9. Tanker Emissions Control Technologies Operating and Maintenance Costs

- Detailed operation and maintenance costs for:
    - Replacement parts costs
    - Labor costs (technology provider labor cost and potentially terminal/oil company labor cost in $/hour)
    - Fueling/charging operation and maintenance costs

10. User / Fleet Experience Survey

- Describe the workforce training programs, if any, related to the use and maintenance of the tanker emissions control technologies.
- Identify loss of NOx and PM control scenarios and what would be their likely causes
- Evaluate the effectiveness of such programs and the costs associated with them.
- Describe warranty claims and insurance policies, as well as the experience of working with tanker industry in the instance of an accident or a major period of unexpected down time (as applicable).