

# APPENDIX F

## DATA COLLECTION REQUIREMENTS

### Advanced Technology Demonstration and Pilot Projects

Mobile Source Control Division  
California Air Resources Board  
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All projects need to propose at least one year of data collection except for those combustion only projects funded by AB 179's Commercial Harbor Craft regulatory compliance funding where the data collection period must be at least 3 months. Emission testing is required for all funded combustion engine projects, with the exception of combustion only projects funded by AB 179's Commercial Harbor Craft regulatory compliance funding where emission testing is not required if the new engine being installed into the vessel has a valid CARB Executive Order or equivalent.

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

## Vehicles

1. Vehicle Specification
  - a. Vehicle Specification (e.g., manufacturer, model, model year, gross vehicle weight, fuel capacity, etc.)
  - b. Full propulsion system specification, including legible CARB and federal certification label photos.
2. Vehicle Operation
  - a. Description of daily use of vehicles; duty cycle
  - b. Vehicle usage, e.g., hours of operation per day, days of operation per year, odometer reading, GPS data (must be able to distinguish between key off and key on but not moving)
  - c. Origin and destination on a per trip basis
  - d. Miles traveled per trip.
  - e. Average speed
  - f. Weight of load
  - g. Duration of trip.
  - h. Idling/queuing time (helpful in determining efficiency of use) (applicable to trucks)
  - i. Driver experience
  - j. Battery degradation (battery charge capacity/power output over the length of the project), for battery electric trucks
  - k. Fuel cell degradation (reduction in fuel cell power output over the length of the project), for trucks that are equipped with a fuel cell.
3. Vehicle Performance
  - a. Miles between road calls, if applicable
  - b. Number of road calls (including propulsion-related, energy storage system-related)
  - c. Maintenance staff experience
  - d. Vehicle availability

- e. Vehicle zero-emission range
- 4. Fuel/Energy Consumption
  - a. Amount of fuel/electricity; odometer reading; date; fuel price per unit when a vehicle is fueled (include electricity rates as applicable)
  - b. State of charge (SOC), if applicable
  - c. Refueling time/charging time
  - d. Distance traveled to refuel/charge
  - e. Refueling/charging source (e.g., on-site energy storage, grid, delivery, etc.)
  - f. Off-peak and/or renewable energy load shifting potential (e.g., battery recharging optimization with smart meter)
  - g. Refueling/charge frequency
  - h. Fuel efficiency, energy consumption rate per distance driven
  - i. Fuel/energy consumption while idling (if applicable)

#### **Off-Road and Agricultural Equipment**

- 1. Equipment Specifications (see above vehicle specification requirement that apply)
- 2. Operation Specifications (see above vehicle specification requirement that apply)
- 3. Performance Specifications (see above vehicle specification requirement that apply)
- 4. Mobile Charger Refueler Specifications
  - a. Description, (manufacturer, model number, model year, weight)
  - b. Charge capacity
    - i. Electricity source
    - ii. On-Board storage capacity
    - iii. Discharge rate
    - iv. Number of dispensers
    - v. Charging plug type
    - vi. Amount of power pulled from the grid
      - 1. Rate of power draw from grid
      - 2. Time to fully recharge on-board batteries
  - c. Hydrogen
    - i. Maximum fill capacity
    - ii. Flow rate
    - iii. Storage capacity

## Locomotives

1. Locomotive Specifications
  - a. Manufacturer, model number, model year
  - b. Powertrain specifications
    - i. Technology type (e.g., battery electric, fuel cell-battery hybrid, etc.)
    - ii. Battery, fuel capacity
    - iii. Fuel cell power (if applicable)
    - iv. Tractive effort
    - v. Motor size (e.g., rated hp)
  - c. Other auxiliary power sources (if applicable)
2. Locomotive Operation
  - a. Description of daily use of locomotives; duty cycle
  - b. Locomotive usage, e.g., hours of operation per day, days of operation per year, MWh meter reading, GPS data with notch setting
  - c. Origin and destination on a per trip basis
  - d. Trailing weight and MWh per trip. (must separately record MWh of other locomotives in the consist during the trip)
  - e. Duration and distance of trip.
  - f. Battery SOC and/or Fuel used during trip.
  - g. Operator and Engineer experience.
  - h. Battery degradation (battery charge capacity/power output over the length of the project), for battery electric locomotives.
  - i. Fuel cell degradation (reduction in fuel cell power output over the length of the project), for fuel cell locomotives.
  - j. Maintenance events, downtime, maintenance staff experience.
3. Fuel/Energy Consumption
  - a. Amount of fuel/electricity; MWh meter reading; date; fuel price per unit when a vehicle is fueled (include electricity rates as applicable)
  - b. State of charge (SOC), if applicable
  - c. Refueling time/charging time
  - d. Refueling/charging source (e.g., on-site energy storage, grid, delivery, etc.)
  - e. Connection type (e.g., reverse pantograph, plug, etc.)
  - f. Off-peak and/or renewable energy load shifting potential (e.g., battery recharging optimization with smart meter)
  - g. Refueling/charge frequency
  - h. Fuel/energy consumption while idling (if applicable)
  - i. Auxiliary power source fuel/energy consumption. (if applicable)

## Vessels – Commercial Harbor Craft

1. Vessel Information
  - a. All information required by subsection 93118.5 (m)(2) of the Commercial Harbor Craft Regulation as amended on December 30, 2022
  - b. CARB-issued Unique Vessel Identifier (UVI)
  - c. Vessel manufacturer
  - d. Vessel carrying capacity (crew and passengers)
2. Vessel Operation
  - a. Description of daily use of vessel; duty cycle
  - b. Vessel usage, e.g., hours of operation per day, days of operation per year, odometer reading, GPS data (must be able to distinguish between key off and key on but not moving)
  - c. Origin and destination on a per trip basis
  - d. Miles traveled per trip
  - e. Average speed
  - f. Duration of trip
3. Combustion Source Information
  - a. Description of application for all engines, boilers, and other combustion sources
  - b. Description of the engine rated power
  - c. Description of the duty cycle rating of all engine(s)
  - d. Engine average load factors with and without idle time
  - e. Typical emission factors for each combustion source
  - f. Maximum Continuous Rating (MCR) of each combustion source in kilowatts (kW) or horsepower (hp)
  - g. Typical operating load range for each combustion source in kW or hp (Minimum to Maximum)
  - h. Typical range of exhaust flow rates cubic feet per minute (CFM) from each combustion source
4. Fuel/Energy Consumption
  - a. Amount of fuel/electricity; fuel price per unit when a vessel is fueled (include electricity rates as applicable)
  - b. Type of fuel used in each mode of operation
  - c. State of charge (SOC), if applicable
  - d. Refueling time/charging time
  - e. Distance traveled or hours of operation to refuel/charge
  - f. Refueling/charging source (e.g., on-site energy storage, grid, delivery, etc.)
  - g. Off-peak and/or renewable energy load shifting potential (e.g., battery recharging optimization with smart meter)
  - h. Refueling/charge frequency

- i. Fuel efficiency, energy consumption rate per distance traveled

## Vessels – Ocean Going Vessels

1. Vessel Information
  - a. Vessel name
  - b. IMO number
  - c. Operator
  - d. Vessel Specification (e.g., vessel type, length, carrying capacity, etc.)
  - e. If vessel equipped to receive shore power while at berth also known as AMP, include a description of shore power system
2. Vessel Operation
  - a. Description of use in each mode of operation: In transit, Maneuvering, At Berth, At Anchor
  - b. Duty cycle of auxiliary and main engines, and other combustion sources, in each mode of operation mode
  - c. Average speed while in-transit
  - d. Type of fuel used during each mode of operation
  - e. Origin and destination for the voyage
  - f. GPS data
3. Combustion Source Information
  - a. Description of application for all engines, boilers, and other combustion sources
  - b. Description of duty cycle rating of all engine(s)
  - c. Typical emission factors for each combustion source
  - d. Maximum Continuous Rating (MCR) of each combustion source in kilowatts (kW) or horsepower (hp)
  - e. Typical operating load range for each combustion source in kW or hp (Minimum to Maximum)
  - f. Typical range of exhaust flow rates cubic feet per minute (CFM) from each combustion source
4. Fuel/Energy Consumption
  - a. Amount of fuel/electricity used in each mode of operation; fuel price per unit when a vessel is fueled (include electricity rates as applicable)
  - b. Type of fuel used in each mode of operation, include bunker delivery notes when applicable
  - c. Refueling time/charging time
  - d. Distance traveled or hours of operation to refuel/charge
  - e. Refueling/charging source (e.g., on-site energy storage, grid, delivery, etc.)
  - f. Off-peak and/or renewable energy load shifting potential (e.g., battery recharging optimization with smart meter)
  - g. Refueling/charge frequency

- h. Fuel efficiency, energy consumption rate per distance traveled

## Aircraft

1. Aircraft Information for baseline and advanced technology aircraft
  - a. Aircraft type
    - i. Dry weight
    - ii. Model numbers
    - iii. Engine model and description
    - iv. Primary function of aircraft
      1. Passenger aircraft
      2. Air taxi
      3. Cargo
      4. Agriculture spaying
      5. Last mile delivery
    - v. Primary storage location
  - b. Fuel used, usage rate and fuel consumed
  - c. Number of take-offs and landings
  - d. Hours of flight
  - e. Refuel or recharge time
  - f. Cargo capacity in pounds and or number of people
  - g. Routes
  - h. Routine maintenance requirements
  - i. Non-routine maintenance and repairs completed on advanced technology aircraft
  - j. FAA restrictions on usage of advanced technology aircraft
  - k. FAA application and approval status
  - l. Safety systems used
    - i. Fire suppression
    - ii. Aircraft recovery
    - iii. Crew safety
    - iv. Ground crew safety
  - m. First responder training and support materials

## Workforce Training and Development

The Grantee must provide data in support of other CARB needs such as request from legislators, governor's office, data reporting needed by Greenhouse Gas Reduction Fund (GGRF) reporting requirements and other data needs such as regulatory development.

Detailed jobs creation data (aka. jobs reporting) will be required to be submitted. The required data may include the top three funded project activities by cost, percent of



total project budget associated with each of the top three project activities, job classifications or trades, job training credentials earned, number of jobs provided, total project work hours, average hourly wage, total number of workers that completed job training, description of job quality (e.g., benefits provided such as health care and paid time off), and targeted hiring strategy used. The Grantee shall track and report information on employment outcomes from funded projects that provide jobs or job training, including:

1. Project Reporting

- a. Job classifications or trades
- b. Job training credentials
- c. Number of jobs provided (in full and for priority populations)
- d. Total project work hours (in full and for priority populations)
- e. Average hourly wage (in full and for priority populations)
- f. Total number of workers that completed job training (in full and for priority populations)
- g. Description of job quality (e.g., benefits provided such as health care and paid time off)
- h. Targeted hiring strategy
- i. Census tracts of education and training(s), outreach, and partner organizations
- j. Location of trainees/participants (low-income and/or disadvantaged communities)
- k. Race/ethnicity of trainees/participants
- l. Number of trainees/participants in training program, and total hours of training provided
- m. Number of trainees/participants completing training program (including number of certifications received)
- n. Employment status, job titles, occupations, and salary wages of trainees/participants
- o. Level of trainee involvement in training and curriculum design
  - i. Expected wages participants could receive as a result of training
- p. Expected wages that participants will receive as a result of the training or for developing the relevant expertise

2. Program benefits reporting shall include, but is not limited to:

- a. Geographic distribution of workforce training, curriculum, and program offerings
- b. Increased connections to ZEV technology employers and industries
- c. Number of job placements, including full- and part-time jobs, and paid internships or apprenticeships
- d. Number of new full- and part-time jobs created and retained
- e. Development of new partnerships with local and regional workforce entities, and economic/business development entities

- f. Connections between training and education programs and small, women, minority, disadvantaged, and certified business employment or support in priority communities
  - g. Replication of concepts and program outcomes in other priority communities
  - h. Community education events by type of event and attendance
  - i. Direct address of community-specific workforce training and development needs
3. Program participant progress reporting shall include, but is not limited to:
- a. Participant's level of satisfaction in their preparation for ZEV industry jobs and careers provided by the ZEV education and training program curriculum.
  - b. Participant's current employment status (part- or full-time employment, or unemployed)
  - c. Participant's level of satisfaction with services provided, including increased access to potential economic opportunities. (For example: improved outcomes over program expenses or investments, willingness to recommend the program to others)
  - d. Participant's level of satisfaction with accessibility and ease of training program
  - e. Participant's level of satisfaction with program workforce, career development, and job placement support and opportunities
  - f. Portal or other resources for existing trainees to provide their experiences and feedback loops to ensure changes to programs are made over time to best meet needs and boost new student recruitment

### **Maintenance**

- Type of maintenance: scheduled, unscheduled, configuration change
- Repairs: date, description of problem, description of repair performed, parts replaced, costs of parts replaced, costs of labor, odometer reading
- Time out of service with an explanation of reason for any extended delay
- Maintenance schedule or plan
- Maintenance and repair cost analysis and optimization

### **Service Calls**

- Date of service call, length of repair, description of problem, description of repair performed, parts replaced, odometer reading
- Time out of service
- Service response time to new trouble call
- Service history of equipment
- Analysis of service and repair costs and optimization
- Customer feedback on service and repair experience

## Safety

- Description of any accidents or incidents, including collisions, maintenance and fueling incidents
- Safety policies and procedures
- Safety inspections and audits, including a narrative of the U.S. Coast Guard inspection and approval process, including plans submitted and relevant correspondence with the U.S. Coast Guard

## Emissions Testing

- Tailpipe emissions test for vehicles/equipment that are not 100% zero emission, and their respective baseline vehicles/equipment using PEMS technology. Vessels applying for AB 179 Commercial Harbor Craft regulatory compliance funding and only proposing an EPA-certified engine repower without the use of zero-emission technologies will not be required to perform emission testing.
- Identify realistically achievable reductions of nitrous oxides (NO<sub>x</sub>), reactive organic gasses (ROG), sulfur oxide (SO<sub>x</sub>) and particulate matter 2.5 (PM<sub>2.5</sub>) control levels, as well as ammonia (NH<sub>3</sub>) slip levels
- Identification of the type and amount of fuel used during emissions testing
- Identification of the testing facility and its certification
- Documentation of the testing protocol and procedures, including any variations or deviations from standard procedures
- Analysis of the emissions testing results and identification of opportunities for emissions reductions

## Fueling/Charging Infrastructure and Maintenance Infrastructure

- Infrastructure location and facility description, including station throughput/capacity, for both fueling/charging station and maintenance bay
- Infrastructure reliability
  - Permitting agencies and include the anticipated timeframes for the permitting, construction, and commissioning of infrastructure
- All-electric range and average electric usage in hybrids as a function of trip duration and work output, if applicable
- Any infrastructure data elements for CEC, if applicable
- Type of charging/fueling infrastructure (e.g., level 1, level 2, DC fast charging, hydrogen fueling, etc.)
- Charging/fueling station throughput and capacity
- Maintenance and repair history of charging/fueling infrastructure
- Energy source and pricing for charging/fueling infrastructure
- Grid connection information for charging/fueling infrastructure

- Data on usage patterns of charging/fueling infrastructure, including utilization rates and peak demand times
- Safety and environmental impact assessments for charging/fueling infrastructure
- Operational & Maintenance costs associated with charging/fueling infrastructure
- Integration with other clean energy infrastructure (e.g., solar PV, wind turbines)

### Capital Costs

- Capital costs for advanced technology vehicles and baseline vehicles, or cost of vehicle upgrade
- Capital costs for advanced technology vessels, or cost of vessel upgrade, and comparison to capital costs for baseline vessels or cost of vessel upgrades
- Infrastructure/facility capital costs, or cost of facility modification/upgrade, for both fueling/charging station and maintenance bay
- Identification of funding sources for capital costs, including government grants, loans, and private investments
- Evaluation of the scalability of capital costs and the potential for cost reductions through increased production and economies of scale

### Operating and Maintenance (O&M) Costs

- Detailed operating costs for both baseline and advanced technology vehicles, equipment, or vessels.
- Detailed maintenance costs for both baseline and advanced technology vehicles, equipment, or vessels, including parts and labor (total labor cost and mechanic labor cost in \$/hour)
- Fueling/charging infrastructure and maintenance bay O&M costs (e.g., type of maintenance, costs for parts and labors, problems)
- O&M costs for facility safety systems related to hydrogen and fuel cells (e.g., type of maintenance, costs for parts and labors, problems)
- Comparison of operating and maintenance costs for advanced technology vehicles, vessels, and equipment to baseline options, including consideration of any cost savings or efficiencies

### Cooperative Intelligent Transportation Systems (C-ITS)

- Describe any applications of C-ITS. Identify the vehicles that make up the network, including their drive cycles and the resulting benefits (e.g., work cycle efficiency productivity optimization, safety (collision/accident avoidance), cost reductions, emission reductions, etc.). Log the opportunities encountered to use the C-ITS technology.

## User/Fleet Experience Survey

- User/fleet experience of the advanced technology vehicles/equipment, e.g., vehicle availability, power, capacity to meet fleet operation demand, O&M challenges, service parts availability, perceived safety, refueling experience and any barriers
- Describe the workforce training programs, if any, related to the use and maintenance of the advanced technology vehicles. 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 vehicle/equipment manufacturers in the instance of an accident or a major period of unexpected down time (as applicable).
- The vehicle or equipment manufacturer response/service for warranty claims and/or trouble shooting
- Identify any opportunities for improvement in the use or maintenance of advanced technology vehicles/vessels or equipment, and provide recommendations for addressing these issues