State of California
AIR RESOURCES BOARD

Executive Order G-25-200-001

CARB Approval of the STAXbox system used to control emissions from tanker vessels for compliance with the Control Measure for Ocean-Going Vessels At Berth

STAX Engineering (STAX)
STAXbox

WHEREAS August 27, 2020, the California Air Resource Board (CARB) adopted the Control Measure for Ocean Going Vessels (OGV) At Berth, California Code of Regulations, sections 93130-93130.22 (2020 At Berth Regulation), which establishes requirements for ocean-going vessels at berth in a California port to reduce oxides of nitrogen (NOx), diesel particulate matter (PM), and reactive organic gases (ROG) emissions from auxiliary engines;

WHEREAS section 93130.5 of the 2020 At Berth Regulation establishes requirements for an emission control strategy to qualify as a CARB Approved Emission Control Strategy (CAECS) that can be used to reduce emissions from ocean-going vessel auxiliary engines and applicable tanker auxiliary boilers while at berth in a California port;

WHEREAS no emission control strategy may be used to comply with the requirements of the 2020 At Berth Regulation unless CARB approves it as a CAECS;

WHEREAS the 2020 At Berth Regulation requires that the emission control strategy, if applicable for auxiliary engines, achieves emission rates of less than 2.8 grams per kilowatt hour (g/kW-hr) for NOx, 0.03 g/kW-hr for PM 2.5, and 0.1 g/kW-hr for ROG demonstrated through testing conducted under a CARB approved Test Plan as specified in section 93130.5(d) of the 2020 At Berth Regulation;

WHEREAS for strategies approved after 2020, greenhouse gas (GHG) emissions from the strategy must be grid-neutral using the grid emission rate for the year that the technology is granted an Executive Order, as specified under section 93130.5(d) of the 2020 At Berth Regulation;

WHEREAS the 2020 At Berth Regulation requires that the emission control strategy, if applicable for tanker auxiliary boilers, achieves emission rates less than 0.4 g/kWhr for NOx, 0.03 g/kWhr for PM 2.5, and 0.02 g/kWhr for ROG demonstrated through testing conducted under a CARB approved Test Plan as specified in section 93130.5(d) of the 2020 At Berth Regulation;

WHEREAS STAX is subject to the 2020 At Berth Regulation as a CAECS operator;

WHEREAS STAX developed STAXbox, a barge-based capture and control system to reduce emissions from the auxiliary engines on an ocean-going tanker vessel while at berth;

WHEREAS, STAXbox consists of the following components and subcomponents as specified in the Description of Control Strategy in "Test Plan: STAXbox Emissions Control System" (Test Plan) dated December 18, 2024, including: an exhaust capture system using flexible ducting, and an emission control system comprising of a particulate filter and Selective Catalytic Reduction (SCR) unit to reduce NOx, PM, and ROG;

WHEREAS, STAXbox, also known as the control unit or train, is the emission control system, and Xcraft is the barge. Xcraft-1 barge includes two STAXboxes (STAXbox 1-1 and STAXbox 1-2), where each STAXbox controls one auxiliary engine.

WHEREAS STAX submitted their final Test Plan on December 18, 2024 using the Xcraft-1 (STAXbox 1-1 and STAXbox 1-2), and CARB issued STAX a Test Plan approval letter on March 19, 2025;

WHEREAS STAX submitted the "Emissions Measurement from Tanker Vessels Using STAX Engineering's Barge Based Capture and Control System" (Test Report) and request for Executive Order on January 7, 2025;

WHEREAS CARB reviewed and evaluated the Test Report, supplemental data submitted on March 13, 2025, May 22, 2025, June 6, 2025, July 9, 2025, and request for Executive Order for the STAXbox 1-1 and STAXbox 1-2 based on the requirements specified in the 2020 At Berth Regulation;

WHEREAS CARB found the submitted documents indicate STAXbox 1-1 and STAXbox 1-2 achieves the emission reductions and has GHG emissions that are grid neutral for 2025 as stated in the Test Report and required by the 2020 At Berth Regulation under section 93130.5(d) and issued EO G-25-200 on July 29, 2025, approving STAXbox 1-1 and STAXbox 1-2 for use for compliance with the 2020 At Berth Regulation for tanker vessels.

WHEREAS STAX submitted "Research Test Plan for Design Change – Tankers: Two Sources to One STAXbox Emissions Control System " (Design Change Test Plan) on July 22, 2025, seeking to use STAXbox 1-1 and STAXbox 1-2 to demonstrate control of two auxiliary engines with one STAXbox by using a "Y" manifold, and CARB issued STAX a test plan approval letter on August 28, 2025, for the Design Change Test Plan;

WHEREAS STAX submitted "Testing Results for Design Change – Tanker Vessels: Two Sources to One STAXbox Emissions Control System" (Design Change Test Report) on January 27, 2026;

WHEREAS CARB found the submitted documents indicate the use of the "Y" manifold to control two auxiliary engines with one STAXbox is a modification to the design or operation of a CAECS per section 93130.5(i)(2) of the 2020 At Berth Regulation, and the Executive Officer finds it is appropriate to update the approval with changes to reflect the modification which include the approval to control two tanker auxiliary engines using one STAXbox;

WHEREAS CARB found the testing submitted by STAX indicates the STAXbox achieves the performance standards in section 93130.5(d) when operated as either one STAXbox to

control a single auxiliary engine on a tanker vessel, two STAXboxes operating simultaneously in dual-train mode to control two auxiliary engines on the same tanker vessel, where each STAXbox controls only one auxiliary engine, one STAXbox using a "Y" manifold to control two auxiliary engines while the other STAXbox is not in operation, or one STAXbox using a "Y" manifold to control two auxiliary engines while the other STAXbox controls one auxiliary engine;

WHEREAS STAX manufactured additional equipment that is a duplicate of the STAXbox 1-1 and STAXbox 1-2 dual train system to be operated under the same approved operating conditions, and requested the duplicate be added to the Executive Order;

WHEREAS duplicate equipment can be added to an Executive Order after the equipment has been verified to be a duplicate, with the condition that the required in-use compliance testing is conducted with the in-use compliance test (including emissions) data submitted to CARB within 6 months or 30 vessel visits, whichever comes first;

WHEREAS duplicate equipment must be identical to the equipment described in STAX's Test Plan submitted on December 18, 2024.

WHEREAS the following in-use compliance tests must be conducted on each duplicate equipment within 6 months or 30 vessel visits, whichever comes first, after the date that the duplicate equipment is approved and added to the Executive Order: 1) Third-party source testing at one load point following the requirements of section 93130.5(g) of the 2020 At Berth Regulation with Relative Accuracy Test Audit (RATA) testing; 2) Third-party capture efficiency testing at one load point; 3) Durability testing on a minimum of 5 vessels and a minimum of 200 hours;

WHEREAS for systems approved for use on multiple vessel types (such as container, ro-ro, and/or tanker vessels) for auxiliary engines, the in-use compliance testing requirements outlined above shall only be conducted on one selected approved vessel type, based on the earliest applicable in-use compliance deadline, to avoid duplicative testing across vessel types;

WHEREAS for dual train systems, each of the two STAXboxes (trains) must complete all of the in-use compliance testing outlined above.

WHEREAS in-use compliance third-party source testing must be conducted for all pollutants listed in section 93130.5 (g) of the 2020 At Berth Regulation, and all testing must follow the test methods specified in section 93130.5 (g) and in STAX's Test Plan submitted on December 18, 2024;

WHEREAS duplicate equipment will be removed from the Executive Order if the required testing is not submitted to CARB within 6 months or 30 vessel visits, whichever comes first, after the date that the duplicate equipment is approved and added to the Executive Order;

WHEREAS duplicate equipment may require additional testing or be removed from the Executive Order if, after CARB evaluates the test data, CARB determines that the in-use

compliance test data demonstrates the system achieves emission rates greater than those specified in section 93130.5(d) of the 2020 At Berth Regulation;

WHEREAS during the in-use compliance period, all requirements of the Executive Order must be followed, including all malfunction reporting and recordkeeping requirements. Failure to comply with the requirements of the Executive Order, including section 93130.12 of the 2020 At Berth Regulation, will cause the equipment to be removed from the Executive Order and the approved equipment list;

WHEREAS STAX requested the STAXbox system(s) listed in addition to the STAXbox 1-1 and STAXbox 1-2 dual train system in Attachment 1 to be approved as duplicate equipment under this Executive Order and submitted information for CARB to verify the systems are duplicates of the STAXbox 1-1 and STAXbox 1-2 dual train system;

WHEREAS the Executive Officer finds it is appropriate to issue this Executive Order that identifies the operating conditions, recordkeeping, and monitoring requirements for STAX's use of the STAXbox to allow its use as a CAECS for compliance with the 2020 At Berth Regulation;

WHEREAS this approval does not constitute an air pollution or land use permit, nor does it relieve the responsibility of STAX or the end user to comply with all Federal, State, and local laws, rules, and regulations;

NOW, THEREFORE, IT IS ORDERED that the STAXbox is approved for use in demonstrating compliance with the 2020 At Berth Regulation as a CAECS, when used by STAX as intended and in accordance with the following terms and conditions, and in accordance with all other applicable requirements in the 2020 At Berth Regulation.

The approved STAXbox system(s) (Approved Equipment) and the vessel and engine types for which the STAXbox system(s) are approved to control can be found in Attachment 1 of this Executive Order.

APPROVAL OF DUPLICATE EQUIPMENT

BE IT FURTHER ORDERED, the duplicate STAXbox system(s) listed as Approved Equipment in Attachment 1 of this Executive Order are approved as verified duplicates of the approved STAXbox 1-1 and STAXbox 1-2 dual train system described in STAX's Test Plan submitted on December 18, 2024, and may be used pursuant to the terms and conditions of this Executive Order on the vessels and engine types as provided in Attachment 1.

BE IT FURTHER ORDERED, STAX will conduct the required in-use compliance testing to verify compliance of duplicate equipment within six months or 30 vessel visits, whichever comes first, for every new piece of equipment added to this Executive Order.

BE IT FURTHER ORDERED, STAX may only use the STAXbox equipment identified as Approved Equipment in Attachment 1 to demonstrate compliance with the 2020 At Berth Regulation pursuant to this Executive Order, and any additional duplicates must receive CARB approval prior to use pursuant to this Executive Order.

APPROVED OPERATING CONDITIONS

Parameter	Value
Ocean-going vessel engine type	Approved operating modes for STAXboxes on ocean-going tanker vessels: • One STAXbox controlling one auxiliary engine, • Two STAXboxes operating simultaneously in dual-train mode, each controlling one auxiliary engine, • One STAXbox using a "Y" manifold to control two auxiliary engines while the other STAXbox is not in operation, or • One STAXbox using a "Y" manifold to control two auxiliary engines while the other STAXbox controls one auxiliary engine. Only one STAXbox may use a "Y" manifold at a time, and the maximum number of auxiliary engines controlled between both STAXboxes is three.
Ocean-going vessel type	Tanker vessel
Ocean-going vessel fuel composition limitation	Marine distillate fuel meeting 0.1% sulfur content limit (0.1% sulfur marine gas oil (MGO) or marine diesel oil (MDO))
SCR inlet operating temperature range in degrees Fahrenheit (ºF)	600 – 720ºF
Ocean-going vessel engine maximum continuous rating (MCR) in kilowatts (kW)	1056 kW per STAXbox
Ocean-going vessel allowable operating range (kW) for one engine per STAXbox	207 kW to 671 kW
Allowable exhaust flow rate in standard cubic feet per minute (scfm) for one engine per STAXbox	2,106 to 5134 scfm of engine exhaust
Ocean-going vessel total allowable operating range combined for two engines (kW) per STAXbox when using the "Y" manifold	257 to 1087 kW
Allowable exhaust flow rate for two engines in standard cubic feet per minute (scfm) per STAXbox when using the "Y" manifold	2938 to 7325 scfm of engine exhaust
Maximum engine exhaust temperature requirements	1,000ºF
Static Pressure	Differential pressure between -2 to -20 inches of water across the diesel particulate filter
Other parameters that affect performance	1-2 inches of water back pressure at the capture system inlet

Parameter	Value
GRID Neutral Target – CA CO2e state output emission rate from eGRID2023 in pounds per megawatt hour (lb/MWh)	394.8 lb/MWh
Maximum CAECS auxiliary generator operating load (kW)	320 kW
CAECS auxiliary generator renewable diesel carbon intensity limit in grams of carbon dioxide equivalent per megajoule of fuel (g CO2e/MJ)	22.18 g CO2e/MJ fuel
Maximum ammonia slip emissions in parts per million by volume, dry basis (ppmdv)	5 ppmdv averaged over 60 minutes

OPERATIONAL REQUIREMENTS

BE IT FURTHER ORDERED, STAX will operate the STAXbox following the notification and operational requirements per sections 93130.12(b)(1) and 93130.12(b)(2) of the 2020 At Berth Regulation:

1. At least seven calendar days before a vessel's arrival, the operator of the CAECS must coordinate in writing with the vessel operator and terminal operator for the use of the strategy and supply the vessel operator with information about the compatibility with the vessel and terminal of the CAECS.
2. During each visit, the operator of the CAECS shall:
    a. Begin controlling emissions within two hours of vessel "Ready to Work";
    b. Record inlet and outlet levels of emissions during the visit;
    c. Continue controlling emissions until at least one hour before "Pilot on Board"; and
    d. Ensure vessels are operating on CARB compliant distillate marine fuel.

MONITORING REQUIREMENTS

BE IT FURTHER ORDERED, for every 1,000 hours of operation (and at a minimum annually), STAX shall submit data to the Executive Officer from the continuous emission monitoring system (CEMS) for each visit the CAECS is operated, to verify that the emission reduction levels are maintained, paying the applicable Certification Fee for the 2020 At Berth Regulation (California Code of Regulations, Title 13, Division 3, Chapter 16, Article 7, sections 2913 and 2914) for each visit.

BE IT FURTHER ORDERED, the CEMS parameters submitted to the Executive Officer must follow the parameters and measurement methods listed in STAX's CEMS parameter list submitted on June 4, 2025.

BE IT FURTHER ORDERED, within 30 days of a vessel departure, for every visit where STAXbox is used as a CAECS, STAX shall report to CARB visit information as required by section 93130.12(b)(3) of the 2020 At Berth Regulation.

BE IT FURTHER ORDERED, within seven days of a vessel departure, STAX shall report to their vessel operator customers the information necessary for vessel operators to submit their visit information to CARB as required by section 93130.7(e)(4) of the 2020 At Berth Regulation, including the following:

1) Emissions control start date and time
2) Emission control end date and time
3) Details on any delays or interruptions while controlling emissions and the times that emission reductions were uncontrolled during the visit.

BE IT FURTHER ORDERED, when vessel operators submit visit information to CARB as required by section 93130.7(e)(4) of the 2020 At Berth Regulation, the vessel operator must also report the following information per the compliance instructions for section 93130.7(e)(4)(Q):

1) Total power generated by vessel's auxiliary engines while at berth in kW-h. Data must be recorded at a minimum once an hour.

BE IT FURTHER ORDERED, within seven days of a vessel departure, STAX shall report to their terminal operator customers the information necessary for terminal operators to submit their visit information to CARB as required by section 93130.9(d)(5) of the 2020 At Berth Regulation, including the following:

1) Emissions control start date and time;
2) Emission control end date and time;
3) Details on any delays or interruptions while controlling emissions and the times that emission reductions were uncontrolled during the visit.

BE IT FURTHER ORDERED, STAX shall maintain the STAXbox in accordance with "Section 5. Maintenance" of STAX's Test Plan.

BE IT FURTHER ORDERED, the Executive Officer may request that the STAXbox be tested annually using the test methods specified in the 2020 At Berth Regulation to demonstrate the overall percentage of the emission reduction being achieved, and the results of such testing shall be provided to the Executive Officer within 30 days of testing per section 93130.5(j) of the 2020 At Berth Regulation.

MALFUNCTION REPORTING AND RECORDKEEPING REQUIREMENTS

BE IT FURTHER ORDERED, STAX shall report within 24 hours to CARB, by electronic means, any malfunction that is expected to create emissions in excess of any applicable emissions limitation for a period greater than one hour and shall retain for five years all records pertaining to the malfunction pursuant to section 93130.12 of the 2020 At Berth Regulation.

BE IT FURTHER ORDERED, STAX shall report within 24 hours to CARB, by electronic means, any malfunction with the CEMS system that occurs for a period greater than one hour and makes the emission control unverifiable, and STAX shall retain for five years all records pertaining to the malfunction pursuant to section 93130.12 of the 2020 At Berth Regulation.

BE IT FURTHER ORDERED, a delay or interruption in emissions control caused by a malfunction is eligible for remediation for the hours of uncontrolled emissions only when CARB is notified by STAX according to the provisions of section 93130.12(c) of the 2020 At Berth Regulation.

BE IT FURTHER ORDERED, STAX shall submit a corrective action report within seven calendar days after a malfunction has been corrected as pursuant to section 93130.12(d) of the 2020 At Berth Regulation.

BE IT FURTHER ORDERED, records made pursuant to section 93130.12 of the 2020 At Berth Regulation shall be kept for a minimum of five years, and STAX shall submit information to CARB according to section 93130.19 of the 2020 At Berth Regulation.

BE IT FURTHER ORDERED, this approval is subject to the following conditions:

- STAX must submit documentation, within 30 days upon request, to CARB showing STAXbox is being maintained and the maintenance schedule in "Section 5. Maintenance" of STAX's Test Plan is being adhered to.
- STAX must keep records, including purchase receipts, for a minimum of five years, for renewable diesel purchases demonstrating the fuel used on the STAXbox complies with the Approved Operating Conditions in this Executive Order.
- STAX must inform the vessel operator of the STAXbox operating conditions and ensure the vessel is only operating one or two auxiliary engine(s) while the STAXbox(s) are controlling emissions.
- STAX must operate either one STAXbox to control a single auxiliary engine on a tanker vessel, or two STAXboxes operating simultaneously in dual-train mode to control two auxiliary engines on the same tanker vessel, where each STAXbox controls only one auxiliary engine.
- Delays or interruptions in emissions control caused by a malfunction, or when the operational requirements in section 93130.12 of the 2020 At Berth Regulation are not met may result in enforcement actions and ultimately revocation of the EO unless the visits are made compliant through use of the Remediation Fund or with a Vessel Incident Event (VIE) or Terminal Incident Event (TIE).

DESIGN CHANGES AND EXTENSIONS

BE IT FURTHER ORDERED, no changes are permitted to Xcraft or STAXbox design or approved operating parameters set forth in STAX's application, test plan, and this Executive Order and its appendices, unless CARB is notified and approves in advance per section 93130.5(i)(2) of the 2020 At Berth Regulation. Design changes include changes to any part of the STAXbox system including the exhaust capture hood, ducting, control equipment, and deployment platform. The changes must be approved in writing by the Executive Officer and any applicable Certification Fees for the At Berth Regulation (California Code of Regulations, Title 13, Division 3, Chapter 16, Article 7, sections 2913 and 2914) must be paid before the modifications may be used for compliance with the 2020 At Berth Regulation. The Executive Officer may revoke this Executive Order, or approval of any

or all STAXbox system(s) listed as Approved Equipment in Attachment 1 of this Executive Order, if the system fails to demonstrate that the expected emissions reductions are being achieved or if the STAXbox design or approved operating parameters are changed without prior notification and approval by the Executive Officer. If a STAXbox system malfunctions and fails to achieve emissions reductions required by the 2020 At Berth Regulation while performing with the same design, conditions, and requirements approved for the original approved system, the Executive Officer may revoke its approval of the duplicate system, remove it from the Executive Order, and/or require additional testing requirements if necessary.

BE IT FURTHER ORDERED, this Executive Order shall have a duration of five years from the date G-25-200 was executed (July 29, 2025), unless it is revoked by CARB as set forth in section 93130.5(l) of the 2020 At Berth Regulation. As specified in section 93130.5(i)(1), at least six months prior to the expiration of this Executive Order, STAX may apply for an extension by submitting an extension application to the Executive Officer asserting that the strategy has not changed and is still effective, following the requirements specified in section 93130.5(d) as provided in section 93130.5(i)(1) of the 2020 At Berth Regulation, after paying any applicable Certification Fees for the At Berth Regulation (California Code of Regulations, Title 13, Division 3, Chapter 16, Article 7, sections 2913 and 2914).

BE IT FURTHER ORDERED, marketing of the STAXbox using any identification other than that shown in this Executive Order or marketing of the STAXbox for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from CARB.

BE IT FURTHER ORDERED, this Executive Order does not relieve STAX from complying with all other applicable regulations.

BE IT FURTHER ORDERED, this Executive Order may be revoked if the Executive Officer determines that STAXbox does not comply with any of the requirements in this Executive Order.

Executive Order EO G-25-200 is hereby superseded and is of no further force and effect.

Executed at Sacramento, California, this 19th day of March 2026.

Bonnie Soriano, Branch Chief
Freight Activity Branch
Transportation and Toxics Division

Attachment 1: Approved Equipment List

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Barge	STAXbox	Ocean-going Vessel Type	Ocean-going Vessel Engine Type**	Capture Hood Type	In-Use Compliance Testing*
Xcraft-1	STAXbox 1-1	Tanker vessel	One or two auxiliary engines	Flex duct or "Y" manifold	Original STAXbox system approved, and not a duplicate. No requirement.
Xcraft-1	STAXbox 1-2	Tanker vessel	One or two auxiliary engines	Flex duct or "Y" manifold	Original STAXbox system approved, and not a duplicate. No requirement.
Xcraft-5	STAXbox 5-1	Tanker vessel	One or two auxiliary engines	Flex duct or "Y" manifold	Test data must be submitted to CARB within 30 vessel visits or by January 29, 2026, whichever comes first.
Xcraft-5	STAXbox 5-2	Tanker vessel	One or two auxiliary engines	Flex duct or "Y" manifold	Test data must be submitted to CARB within 30 vessel visits or by January 29, 2026, whichever comes first.
Xcraft-6	STAXbox 6-1	Tanker vessel	One or two auxiliary engines	Flex duct or "Y" manifold	Test data must be submitted to CARB within 30 vessel visits or by September 19, 2026, whichever comes first.
Xcraft-6	STAXbox 6-2	Tanker vessel	One or two auxiliary engines	Flex duct or "Y" manifold	Test data must be submitted to CARB within 30 vessel visits or by September 19, 2026, whichever comes first.
Xcraft-7	STAXbox 7-1	Tanker vessel	One or two auxiliary engines	Flex duct or "Y" manifold	Test data must be submitted to CARB within 30 vessel visits or by January 29, 2026, whichever comes first.
Xcraft-7	STAXbox 7-2	Tanker vessel	One or two auxiliary engines	Flex duct or "Y" manifold	Test data must be submitted to CARB within 30 vessel visits or by January 29, 2026, whichever comes first.
~~Xcraft-8~~	~~STAXbox 8-1~~	~~Tanker vessel~~	~~One auxiliary engine~~	~~Flex duct~~	~~Test data must be submitted to CARB within 30 vessel visits or by January 29, 2026, whichever comes first.***~~

Barge	STAXbox	Ocean-going Vessel Type	Ocean-going Vessel Engine Type**	Capture Hood Type	In-Use Compliance Testing*
~~Xcraft-8~~	~~STAXbox 8-2~~	~~Tanker vessel~~	~~One auxiliary engine~~	~~Flex duct~~	~~Test data must be submitted to CARB within 30 vessel visits or by January 29, 2026, whichever comes first.***~~

*Consistent with the terms and conditions of the Executive Order, duplicate equipment listed in Attachment 1 may be used for compliance with the At Berth Regulation. Duplicate equipment remains eligible for use under this Executive Order unless or until removed from Attachment 1.

**Consistent with the terms and conditions of the Executive Order, STAX is approved to operate either one STAXbox to control a single auxiliary engine on a tanker vessel, two STAXboxes operating simultaneously in dual-train mode to control two auxiliary engines on the same tanker vessel, where each STAXbox controls only one auxiliary engine, one STAXbox using a "Y" manifold to control two auxiliary engines while the other STAXbox is not in operation, or one STAXbox using a "Y" manifold to control two auxiliary engines while the other STAXbox controls one auxiliary engine.

*** STAX requested that STAXbox 8-1 and STAXbox 8-2 be removed from this Executive Order on November 12, 2025. STAXbox 8-1 and STAXbox 8-2 are no longer approved for use on tanker vessels. Before they can be used on tanker vessels, STAX must reapply and request that STAXbox 8-1 and STAXbox 8-2 be added to this Executive Order.