

Post Workshop Discussion

Meeting Date: 4/16/2021 2:00 PM

Participants: David Schonbrunn (DS) – Train Riders Association of CA
Layla Gonzalez – Air Pollution Specialist, Reg Lead
Ajay Mangat – Freight Systems Section, Manager

DS: Locomotives emissions are a tiny amount of the GHG inventory at ~.2%. Unimpressed that locomotive GHG is a challenge for the state. The big challenge in reducing GHGs is mode shift, but billions of state dollars are being wasted on dysfunctional programs to address that. Overall goal of Train Riders Association is to get passengers on trains.

DS: A TRAC consultant is working on analysis of short haul freight being shifted to rail.

DS: CARB's Emissions inventory for locomotives is incorrect. See TRAC's 3/7/21 comment letter. An example of what is wrong: the duty cycle is not accurate for passenger locomotives because of extensive idling. Emissions can be very high because aftertreatment is not functioning at low RPM. (This is a big issue for Tier 4 locomotives, causing them to not deliver the emissions reductions otherwise expected.)

DS: CARB certification letters should indicate the actual total emissions measured, not EPA emission levels. EPA Certification emissions are irrelevant to the actual emissions that need to be used in Inventory reporting, SIPs and in incentive grant awards.

DS: Hotel power is missing from locomotive emissions inventory. For purposes of an inventory you need to know the whole story. All emissions need to be accounted for.

DS: Carl Moyer website is disorganized and not easy to follow. It looks like CARB is hiding where the money is being spent, because there is no link to the Case-by-Case page. In general, the Moyer Locomotive Guideline paper doesn't make sense and is confusing.

DS: A current Moyer scandal is the grant to PHL for new GE switch locomotives, which claims they are "the cleanest available technology" when that is flatly untrue. That grant needs to be stopped.

DS: The U.S. EPA definition of new locomotive is problematic as it exempts remanufactured locomotives from current emissions standards. This is HUGE mistake. CARB should ask that be fixed.

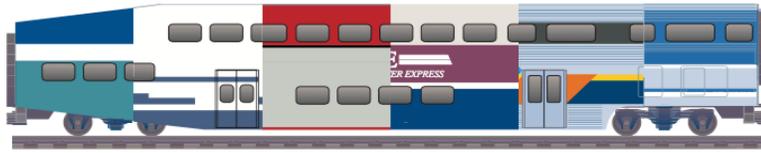
Regulation Comments:

- Spending Account should be called Mitigation Fund or something better than Spending Account.
- Don't just look at emissions of locomotives by Tier. Incentivize remanufacturing and after treatments by basing payment on the actual emissions of verified aftertreatments.
- Page 4. #19 - Remove propel from definition to account for hoteling and other locomotive engines.
- Change name of reg to "Incentivizing Cleaner Locomotives in California."
- Create a factsheet for the reg and a paragraph on the webpage that says what CARB is trying to accomplish with the draft regulation, and the legal basis for its regulatory authority.
- Make clear that the spending plan is not a CEQA project. On Page 15 (3)s state in (e) the plan itself is not a project under CEQA but it could contain physical improvements to which CEQA would apply.
- The zero emission program should not discriminate against strategies that involve diesel backup engines for use in emergencies. The diesel engine would only be used in emergency events and can have separate hour meter and would be charged if operated.

Follow up:

Layla to send meeting note summarizing main conversational points and comments given by David. As well as any helpful links.

David will send the short haul freight shifting to train study and any other relevant studies.



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Re: Reducing Emissions From In-Use Locomotives

Dear Sirs:

The Train Riders Association of California ("TRAC") is a statewide rail advocacy organization that has worked since 1984 to improve passenger rail service in California. We seek to attract automobile drivers to rail, thereby reducing the emissions from motor vehicles. While the emissions from locomotives are only a small part of the motor vehicle emissions inventory, we were pleased to receive an announcement about the upcoming Reducing Emissions From In-Use Locomotives workshop.

In advance of that workshop, we wanted to offer our thoughts on the testing of passenger locomotive emissions, which have important implications for emissions inventories and emissions reduction incentive programs, such as Carl Moyer and the Prop. 1B Goods Movement Emission Reduction programs.

Our concerns about locomotive emissions began when we were informed that Caltrain idled its trains all night long in the San Francisco railyard. Besides the noise pollution to the new residential buildings that abut the railyard, the criteria and GHG emissions must be substantial--and completely unnecessary. This is the foundation for our first recommendation:

1. Passenger locomotive emission measurements must be based on a real-world duty cycle, which captures all the idling that occurs during a 24-hour day of standard operation.

Locomotives in commuter and intercity service constitute a supermajority of the passenger rail fleet, and need to have their own unique duty cycle, different from locomotives for long-distance passenger trains. The start-stop nature of their service, coupled with modest periods of operations during the day, cause them to sit idling in standby much more, both in stations and at termini overnight.

In checking into the emissions from Tier 4 engines at idle, using EPA data, we became concerned that the NO_x emissions at idle are more than 100 times

March 7, 2021

By email to:
freight@arb.ca.gov

higher than those at Notch 8 maximum power. Unlike freight locomotives, passenger locomotives contribute significant emissions when idling, because they produce hundreds of horsepower to generate hotel power (which runs the lights and HVAC in the passenger cars).

This reinforces the importance of fully capturing emissions at idle when developing emissions inventories or awarding emissions reduction incentive funding. ARB's 2017 Passenger Rail Emissions Model generates its outputs simplistically, using gallons of fuel burned, converted into bhp-hrs, and then multiplied by a factor in grams of criteria pollutant/bhp-hr. That last factor is what we are criticizing. It needs to be based on a real-world 24-hour duty cycle combined with full-system emissions testing.

We dug a bit deeper and found that the EPA testing procedures do not include the emissions from the generation of hotel power. Because hotel power is obviously in use when trains are running, accurate emissions measurements for inventories and incentive programs must include the emissions from the generation of the full electrical load for a typical consist.

2. Passenger locomotive in-use emissions measurements must be made with hotel power producing the full electrical load needed for the typical consist.

The issue here is not the compliance with the EPA regulations regarding engine certifications. EPA certification test data were never designed to provide measurements of a locomotive's total in-use emissions. The issue is the actual total emissions of a passenger locomotive. That is the number of central importance to all of ARB's emissions reduction activities.

Either as part of an incentive funding program or by regulation, ARB should require logs from commuter and intercity rail operators that enable accurate duty cycles and total emissions to be calculated for each operator. According to ARB's workshop materials, Tier 4 passenger locomotives cost 2.7 times more than line haul freight locomotives. That makes the job of properly measuring the emissions from these locomotives all that more important, to make sure that incentive funds aren't being wasted. We urge ARB to gather all the data from public operators needed to determine real-world emissions, and then recheck its incentive program funding decisions to ensure that the expected emissions reductions are actually being achieved.

Thank you for considering these comments.

Sincerely yours,

/s/ DAVID SCHONBRUNN

David Schonbrunn, President

CC: Wayne Nastri, SCAQMD
Jack Broadbent, BAAQMD
David Haugen, EPA Office of Transportation and Air Quality

(<https://www.railwayage.com>)

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For LIRR, a Potential First: Battery/Third-Rail 'BEMU'

Written by William C. Vantuono (<https://www.railwayage.com/author/wvantuonosbpub-com/>), Editor-in-Chief



LIRR President Phil Eng (at microphone): “Embracing new technology might allow us to essentially electrify the entire railroad without the need for billions of dollars in massive capital investments.”

If all goes as planned, in about one year, MTA Long Island Rail Road will be testing a prototype “BEMU” (battery-electric multiple unit) that operates on third-rail power or batteries on the 13-mile, non-electrified Oyster Bay Branch. The program, a venture with Alstom, will be North America’s first test-of-concept of this application on commuter railcars.

LIRR's prototype BEMU will be a two-car Bombardier M7 married pair, with four of the car-set's eight traction motors (one per axle), which normally draw power from 750 VDC third-rail, retrofitted with battery propulsion. LIRR had begun discussions with Bombardier on the project prior to Alstom's acquisition of Bombardier; the program is now an LIRR/Alstom venture.

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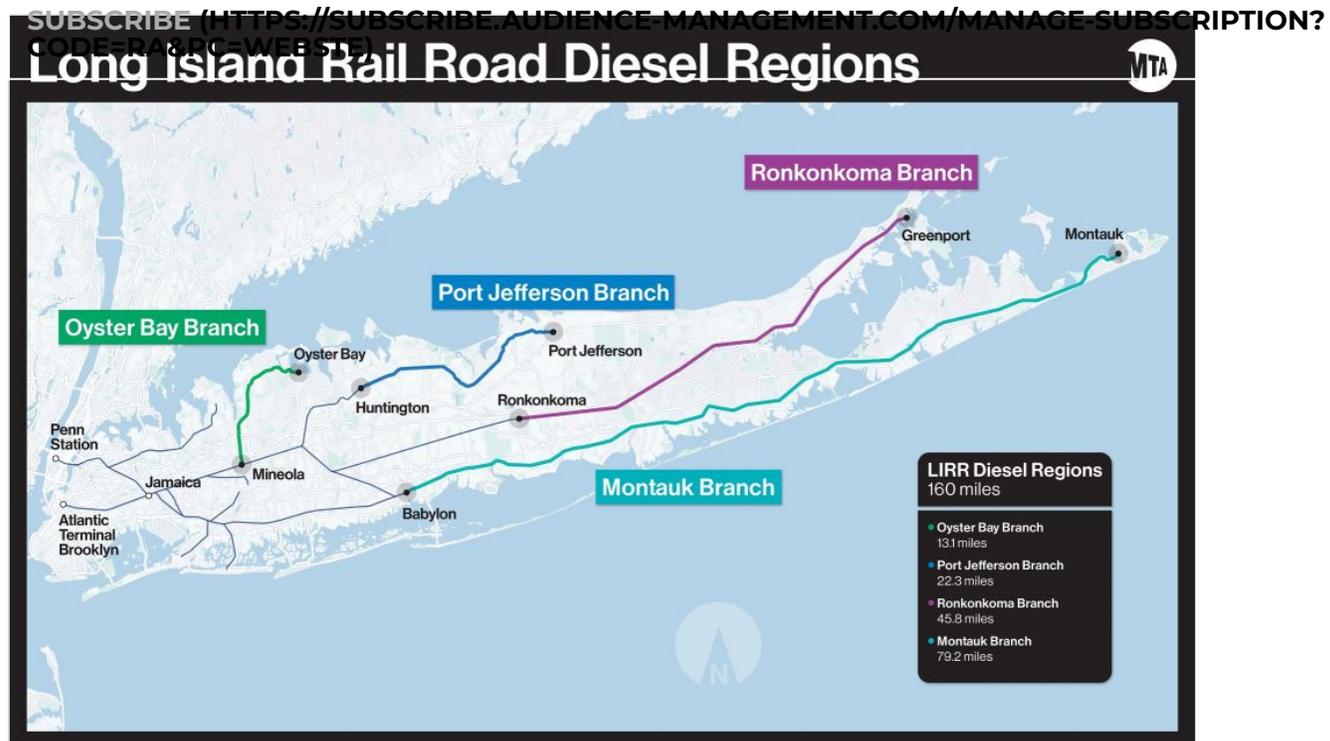


Bombardier M7

The \$850,000 program has several steps; LIRR and Alstom will commence work within the next month. In the first phase, expected to last eight months, technicians will evaluate specifications for batteries and where they could be placed aboard M7 cars. They will study the physical characteristics of the Oyster Bay Branch and the Port Jefferson Branch, including grades and distances between stations, and evaluate sites for recharging stations. Upon successful completion of the analysis, technicians will retrofit one M7 pair to operate on battery power in deadhead service (without passengers) on the Oyster Bay Branch between East Williston and Oyster Bay. The outcome of these tests will enable LIRR to evaluate the number of M7 car-sets that could be retrofitted, and when and which trains in revenue service could be converted to BEMUs.

"Part of the analysis will tell us if we need additional charging stations for longer distances, how fast can a battery recharge in a 60-second station stop, and if we decide to go further, how many charging stations would be required," LIRR President Phil Eng said. If the test period without passengers is successful,

LIRR said it would then be able to operate revenue trains, providing passengers with a one-seat ride between Oyster Bay and the railroad's terminals at Penn Station New York and/or Atlantic Avenue in Brooklyn (<https://www.railwayage.com>)



In addition to the Port Jefferson Branch, LIRR's two other non-electrified branches—Montauk and Ronkonkoma—would be evaluated in the future, as well as the feasibility of the battery technology and the ability to retrofit existing trains. "If we have the ability to improve service on the Oyster Bay Branch, that [will] improve service on [the other branches]," Eng noted. Longer-term, if the pilot is successful, "embracing new technology might allow us to essentially electrify the entire railroad without the need for billions of dollars in massive capital investments," he added. "People have been talking about extending electrification to various segments of the railroad for generations. The MTA is already transforming the LIRR through East Side Access and Main Line Third Track; this is potentially a no-less-profound transformation for the rest of the railroad. Everybody benefits."

This program will be the first test of hybrid battery/third-rail-electric commuter railcars in North America. The technology is already in use in North America, albeit on much-smaller light rail vehicles and streetcars that have dramatically different operating characteristics and requirements than commuter rail, in terms of tractive effort, maximum operating speed (typically 80-100 mph) and acceleration/braking curves. It's also in use overseas in regional rail applications, but those vehicles are still comparatively less massive than North American FRA-compliant commuter railcars.



Bombardier (now Alstom) Talent 3 BEMU

If successful, battery-electric technology “could be deployed anywhere diesel-powered commuter trains operate on the LIRR or Metro-North,” officials said. “If batteries succeed on the LIRR as they have for light rail in Europe and Asia, the use of battery-powered railcars promises over the long term eliminate the need for transfers to a separate diesel fleet to reach the railroad’s expansive unelectrified regions extending 160 miles from East Williston to Oyster Bay, Huntington to Port Jefferson, Babylon to Montauk and Ronkonkoma to Greenport.” BEMUs “could open the possibility that in the years and decades ahead,” the MTA could totally replace its sometimes-problematic diesel fleet with “quiet, reliable, zero-emission electric railcars offering seamless transfer-free travel across the railroad.”

“In the near term, conversion of a fraction of the 836-car M7 electric fleet to operate with battery power on even just one of the railroad’s non-electrified branches would allow the LIRR to consolidate its diesel fleet on remaining non-electrified branches, enhancing the frequency of diesel service there and lengthening trains,” officials noted. “In recent years, the LIRR has seen such a surge in seasonal demand for diesel service that it has had to lease additional cars from Maryland’s MARC system.”

“Battery technology is improving year after year in ways we see every day from smartphones to automobiles, so I challenged private industry to use improving battery technology to benefit railroad customers,” Eng noted. “This is ingenuity at its best.”

The LIRR is sharing program details with Metro-North. “This is an exciting technology with implications for Metro-North,” said Catherine Rinaldi, President of MTA Metro-North Railroad. “We will be working with the LIRR as this technology test advances.”

“We’re proud to be partnering with the LIRR, the largest and busiest commuter railroad in North America, to test one of our efficient and eco-friendly alternatives to diesel trains,” said Jérôme Wallut, President, Alstom Americas. “Alstom’s battery technology and range of green-traction solutions are helping railroads around the world meet their environmental commitments while delivering sustainable mobility solutions for generations to come.”

The LIRR, established in the 1830s, electrified major segments with third rail between 1900 and the early 1930s, and replaced steam locomotives with diesel-electric units between 1926 and 1955. The Oyster Bay Branch was electrified as far as East Williston in 1934. Plans for extending that electrification never materialized amid the Great Depression and World War II and were never resurrected. Estimates have placed completing electrification of the Port Jefferson Branch alone at close to \$4 billion.

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Battery train operates for 185km without charge in Swiss research project

Mar 31, 2021

Written by

[Kevin Smith](#)

Stadler completes three-year trials with Flirt Akku battery-electric multiple unit.



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STADLER has successfully completed a three-year research project to test battery operation of a Flirt Akku multiple unit, with the train operating in battery mode continuously without charge for 185km during the tests.

Stadler worked alongside German battery manufacturer, Intilion, to test the technical feasibility of battery capacity for operating railway rolling stock and to gain valuable experience for the future design of rail vehicles.

Specially designed tests verified the feasibility of the battery technology for rail traffic and the limits of installed battery capacity. The Flirt train covered 15,000km in battery operation and the project team emphasised tests of the batteries' performance in possible operating scenarios such as catching up on unplanned delays and in extreme weather conditions.

"In summer 2019 we tested the Flirt battery train during a heat wave when temperatures reached 40°C outside and the air-conditioning system was in full use, and in the winter of 2021, when temperatures were in double digits below freezing," says Ms Evelyn Thiel, technical director of the research project at Stadler. "The use in sole battery mode was possible without any restriction and without reaching the lower limits of capacity."

The project was funded by the Swiss Federal Ministry for Economic Affairs and Energy and the project was developed alongside TU Berlin and EWE. Stadler says it is targeting the development of battery trains to meet demand for emissions free rail vehicles for use on lines where electrification is not economically feasible.

Stadler won a €600m contract to supply [55 two-car 160km/h Flirt Akku BEMUs](#) to Schleswig-Holstein transport authority NAH-SH in October 2019, which will replace DMUs on routes in the state. The company also [unveiled a prototype](#) battery Flirt Akku in November 2018, which had a range of 80km without charge.

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Static charging system for BEMUs unveiled

Mar 14, 2021

Written by

[Keith Fender](#)

The system allows a 15kV traction supply to be provided at 50Hz.



The Voltap system uses a rigid overhead conductor rail to provide the charge.

Stadtwerken Tübingen

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SWISS catenary specialist Furrer + Frey, working with southwest German energy utility company Stadtwerken Tübingen, has developed a rapid charging system for mainline trains, which they say could provide an alternative to “electrification islands” or discontinuous electrification to enable BEMUs to operate on otherwise non-electrified lines.

The “Voltap” system is similar in concept to technology already in use in several countries for electric buses and trams. However, this system is designed for high-voltage ac electricity supplies of up to 1.2 MW compared with the usual 850V dc supplied by most tram and bus applications.

The Voltap system provides the charge via a short section of rigid overhead conductor rail, with initial tests undertaken in Tübingen, Germany, suggesting that a standard 50Hz energy utility supply at 10kV or 20kV ac can be converted via a transformer to 15kV in Germany or 25kV elsewhere.

The tests, monitored by TÜV Süd, suggest that the ‘standard’ industrial supply at 50Hz can be used for 15kV traction supply rather than the specialist 16.66Hz normally used for railway traction current in Germany and some other countries. This is possible as the charging process will only be undertaken whilst stationary and modern batteries are designed for 50Hz supplies.

Further tests with a BEMU are due to take place.

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