POTENTIAL NEW LOCATIONS TO USE DUAL-MODE LOCOMOTIVES TO SOLVE OPERATIONAL CONSTRAINTS

A White Paper Prepared by the
Locomotive Technology Task Force
of the
Next Generation Equipment Committee

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Introduction

The Locomotive Technology Task Force (LTTF) was established by the PRIIA 305 Next Generation Equipment Committee's Executive Board to investigate what advances in technology might be available to use in diesel-electric and dual mode locomotives purchased as part of the PRIIA effort. With regard to dual mode locomotives, the initial focus was on Amtrak, Metro-North Railroad and Long Island Rail Road routes serving New York City Terminals. At the present time, dual mode locomotives with a combination of diesel electric and 700vDC-third rail pickup are used. New Jersey Transit has recently taken delivery of the first of 29 diesel electric/12kV-25Hz/25kV-60Hz catenary dual mode locomotives. These are identical to the locomotives procured by Montreal's AMT for use in Central Station and the Mount Royal tunnel. Several discussions were had among LTTF members about the expansion of dual-mode service to other locations to solve location-specific problems. This paper contains a summary of those locations, and the possible needs/benefits dual mode motive power might provide.

Potential Locations

This discussion focused on what "non-traditional" locations or services for which a dual mode locomotive could be used. Some of these had been mentioned during the May 18 call.

1. South Station, Boston. Amtrak's Northeast Corridor NEC) service is all-electric; the *Lake Shore Limited* uses diesel locomotives. The MBTA's extensive commuter rail service uses only diesel locomotives, and the authority is forced to halt its commuter trains several car lengths from the end of track to prevent diesel engines from idling underneath the bus station built 15 years ago over the station tracks. An installed ventilation system to handle the exhaust has never worked properly. Back Bay station, serving both the NEC and Worcester routes, also has significant ventilation problems that could be mitigated by use of a dual mode. Catenary would have to be installed on the tracks serving the Worcester route platform.

At a minimum, MBTA trains could use Amtrak's existing overhead catenary system within the South Station terminal area. Trains on the Providence line could use straight electric motive power, while the Stoughton, Needham and Franklin Branch trains would only need to operate on a diesel while once off the main NEC spine.

2. Chicago Union Station. Amtrak intercity service and Metra commuter train service is exclusively handled by diesel-electric locomotives. Through the development of riverfront buildings over the station tracks, the ventilation situation has progressively degraded. Here electrification could be used to

mitigate increasing problems with fumes in the poorly-ventilated station track overbuilds.

Either catenary or 3rd rail options could be considered; clearances in Union Station are adequate for a 1500vDC catenary electrification. While electrification would likely be a short-distance one, focused on the terminal area, the use of 1500vDC would open up possibilities of through electric running on the South Shore/Metra electric.

3. North Carolina has expressed an interest in a dual mode locomotive for its *Carolinian* service that runs between New York City and Charlotte, NC. The state has plans to increase the number of round trips from the current 1/day service. The goal of this effort would be eliminating the present engine change in Washington, DC, at the south end of the NEC electrification. Amtrak might also benefit from having a diesel-electric/12kV-25kVAC-catenary dual mode locomotive for its NEC services that extend beyond Washington to Virginia destinations. In New England, using dual modes on through trains over the Hartford line would eliminate the engine change in New Haven.

4. Caltrain, the commuter train between San Francisco, San Jose and Gilroy, has plans to electrify its route north of San Jose. To enable a single-engine service to be provided on the handful of trains that continue south of San Jose to Gilroy, a dual mode would be needed. In addition, the new Transbay Terminal, currently under construction in San Francisco, is going to be underground, so a dual mode locomotive might be needed in the near future, too, depending upon the progress of constructing the overhead catenary system to permit opening the station before the entire route to San Jose is electrified. Caltrain intends to electrify the 49 miles between San Francisco and Tamien station in San Jose; the remaining 28 miles to Gilroy will not be electrified.

5. In Southern California, the South Coast Air Quality Management District identified a need to deploy the cleanest transportation technologies to meet air quality needs, which includes consideration of dual mode locomotives. The AQMD notes that locomotive operations are one of the largest sources of air pollution in the South Coast Air Basin. Although AQMD's focus is on freight locomotives, intercity passenger services provided by Amtrak as well as the Metrolink and Coaster commuter service may also be affected. The AQMD has been in discussions with Metrolink on deployment of the cleanest locomotives, which includes pathways to zero-emission electric locomotives.

6. Toronto/Montreal. Metrolinx is studying electrification as a way of increasing capacity on its busier routes. If the Union Station terminal is electrified, then dual modes may provide improved capacity/service capabilities on less-busy lines that originate in Union Station.

Amtrak's Maple Leaf, New York City to Toronto, currently undergoes an engine change in Rensselaer, which could be eliminated if the dual mode

locomotive were used in electric mode at both ends and in diesel mode in the middle.

Likewise, Amtrak might benefit by equipping theAmtrak's Adirondack, between New York City and Montreal with dual mode 12kV-25kV/60Hz locomotives as Central Station in Montreal is equipped with 25kV/60 Hz catenary thus providing a potential for electric propulsion at both ends with diesel service in the middle.

7 New York City. Metro-North Railroad has indicated a desire to be able to run their next generation dual mode locomotives in electric mode on all routes as far as the third rail electrification is present, before switching to diesel mode. (The routes all originate at Grand Central Terminal: third rail to Croton/Harmon, thence diesel to Poughkeepsie (Hudson Line); third rail to Southeast, thence diesel to Wassaic (Harlem Line); third rail to Mount Vernon (New Haven Line) thence diesel to Danbury, CT (Danbury Branch) and diesel to Waterbury, CT (Waterbury Branch). The Danbury and Waterbury branch trains operate over the New Haven line which, beyond Mount Vernon is catenary operated to New Haven.

Long Island Rail Road operates in third rail electric mode on the Main Line from Penn Station before transitioning to diesel mode for operation on the Port Jefferson, Oyster Bay, and Montauk Branches. Based on the reliability and maintainability of their existing dual mode locomotives, however, LIRR is skeptical about continuing with dual mode locomotives. If there is a better electric capacity, reliability, and maintainability on a new dual mode locomotive, LIRR may reconsider its position.

With better electric capacity on a dual mode locomotive, Amtrak might consider electrifying the West Side Connection from the present end of third rail near Penn Station to the connection with Metro-North Railroad near Spuyten Duyvil, which would enable electric running all the way to Croton/Harmon. In the two decades since the West Side Connection to Penn Station was opened, there has been extensive construction just beyond the north portal of the electrified Empire Tunnel. This has increased overbuilds above the track without necessarily a concomitant increase in ventilation capacity for use of diesel-electric locomotives under those overbuilds.

Vermont has expressed interest in having the existing Ethan Allan service and future additional service to its state not require a motive power change to reach New York City.

Summary

The LTTF has identified additional locations where the use of a dual mode locomotive could be used to solve problems such as limited station capacity, air quality concerns, etc. None of the locations inherently require the use of technology that isn't currently available. Especially in locations where wayside electrification doesn't exist, or would have to be expanded, the cost of that

construction would be a very important consideration. The LTTF recognizes that the business cases for some of these possible uses of dual mode locomotives may be driven by forces beyond the operator's control, e.g., air quality improvement.

The variety of locations and solutions demonstrate the difficulty in designing a "standard" dual mode locomotive. However, the design of different "power modules," e.g., internal combustion, AC pickup, electric storage, etc., that could be interchanged upon a standard platform may well be worth pursuing through the Rail Energy, Environment and Engine Technology Subprogram in the FRA's Office of Research and Development.

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