



**June 11, 2020**

**To:** Transit Committee

**From:** Darrell E. Johnson, Chief Executive Officer

**Subject:** Zero-Emission Bus Rollout Plan

### **Overview**

The Orange County Transportation Authority has developed a draft plan to comply with the California Air Resources Board's Innovative Clean Transit regulation. The regulation requires transit agencies to gradually transition to a 100 percent zero-emission bus fleet by 2040, by phasing in the purchase of zero-emission buses as part of future bus procurements beginning in 2023. The regulation also requires transit agencies to submit a Zero-Emission Bus Rollout Plan and an accompanying resolution to the California Air Resources Board by July 1, 2020.

### **Recommendations**

- A. Direct staff to finalize the Zero-Emission Bus Rollout Plan and submit a final report to the California Air Resources Board as required for compliance purposes.
- B. Adopt Orange County Transportation Authority Resolution No. 2020-055 authorizing the Chief Executive Officer, or designee, to authorize the submittal of the Zero-Emission Bus Rollout Plan to the California Air Resources Board as required by the Innovative Clean Transit regulation.
- C. Direct staff to continue battery-electric and hydrogen fuel-cell electric bus pilot projects and return with periodic performance reports that will be used for future plan updates.

### **Background**

The California Air Resources Board (CARB) adopted the Innovative Clean Transit (ICT) regulation in December 2018, as part of a long-term goal of transitioning the transportation sector to zero-emission technologies. Under the ICT regulation, a zero-emission bus (ZEB) is defined as a bus without any tailpipe emissions and is either battery-electric or hydrogen fuel-cell electric. The regulation applies to all revenue vehicles with a gross vehicle weight rating

over 14,000 lbs., either directly operated by a transit agency or under contract.

This impacts the entire Orange County Transportation Authority (OCTA) fixed-route and paratransit fleet. OCTA and the California Transit Association expressed concerns to CARB during the rule development that the increased cost of ZEB vehicles, fuel, and infrastructure will impact the ability of transit agencies to provide current levels of service without the addition of new funding. OCTA is actively seeking grants to help offset a portion of the increased costs and the State of California is arranging bulk purchase agreements for ZEBs to reduce per-vehicle costs.

The main provisions of the regulation include:

- Transit agencies which operate a fleet larger than 100 buses are required to submit a ZEB Rollout Plan (Rollout Plan) by July 1, 2020;
- Transit agencies must purchase a minimum number of ZEBs during future procurements, according to the following schedule:
  - Starting in 2023, 25 percent of new bus purchases must be ZEBs (applies to 40-foot buses only),
  - Starting in 2026, 50 percent of all new bus purchases must be ZEBs (40-foot, 60-foot, and smaller “cutaway” buses typically used for paratransit service),
  - Starting in 2029, 100 percent of all new bus purchases must be ZEBs;
- Transit agencies can earn credits to offset the 2023 and 2026 ZEB purchase requirements by purchasing certain ZEBs prior to 2023 or by providing zero-emission vehicles not covered by the ICT regulation; and
- The minimum ZEB purchase requirement may be delayed if a certain number of ZEBs are purchased statewide by the end of 2020 and 2021.

The OCTA Fiscal Year 2019-20 Budget includes two procurements for vehicles which will have met their minimum federal useful life and are not subject to the ICT regulation because they are being purchased prior to 2023. These include portions of the compressed natural gas (CNG) fixed-route bus fleet and gasoline paratransit bus fleet.

### ***Discussion***

Transitioning to ZEBs will take careful planning and require additional infrastructure and financial resources to implement. OCTA is taking a measured approach to meeting the regulation, while prioritizing the delivery of transit service to our customers.

### Rollout Plan Development

To successfully transition to an all ZEB fleet by 2040, each large transit agency is developing a Rollout Plan demonstrating how it will procure ZEBs, perform an assessment of the necessary fueling infrastructure, and train coach operators and mechanics to operate and/or maintain the buses. CARB allows transit agencies to update the Rollout Plan as necessary. Additionally, if an agency is adversely affected or unable to meet the ZEB purchase mandates, the ICT regulation allows agencies to apply for exemptions for circumstances outside an agency's control. This Rollout Plan must be approved by the OCTA Board of Directors (Board) prior to the submittal to CARB and it is understood that the Rollout Plan will be updated as bus technologies evolve, and market conditions change. The draft Rollout Plan is included as Attachment A and includes the following elements:

- Type(s) of ZEB technologies best suited for OCTA's transit service,
- Schedule for all ZEB and conventional bus purchases,
- Schedule for infrastructure upgrades and modifications,
- Identification of costs and potential funding sources,
- Plan to deploy ZEBs in disadvantaged communities,
- Training plan for operators and maintenance staff, and
- Attainment of full transition to ZEBs by 2040.

To develop the Rollout Plan, OCTA retained professional consultant assistance with expertise in vehicle technology, fueling infrastructure, and transit operations. The two main roles of the consultant were to model OCTA's existing routes for ZEB compatibility and develop recommended technology scenarios for consideration. It is important to note that this work began prior to the novel coronavirus (COVID-19) pandemic and is based on transit service levels provided during fall 2019. Further, OCTA can likely adjust service planning parameters to make best use of the available technologies as more information become available. Moreover, the Rollout Plan will be updated as transit service levels and fleet requirements are adjusted in response to demand.

### Route Modeling and Vehicle Technology Options

The consultant team gathered data from OCTA, ZEB manufacturers, and energy companies to use as input to their analysis. Vehicle range and cost are key factors in determining the most appropriate fuel technology. There are currently two types of ZEB technologies to consider: hydrogen fuel-cell electric buses (FCEB) and battery-electric buses (BEB).

Detailed route modeling indicated that many OCTA vehicle shifts are too long for BEB technology that is currently available without charging the buses at the ends

of the route or mid-route. OCTA can service the current routes using FCEBs because of their extended range. As the technologies evolve, and OCTA re-examines how transit routes are operated, OCTA could amend the Rollout Plan over time. For this initial submittal, various technology mix scenarios were modeled, including a 100 percent FCEB fleet and a mixed-fleet consisting of FCEBs and BEBs with depot and on-route charging. The 100 percent FCEBs scenario showed a slightly lower overall cost than the mixed technology fleet given current vehicle, fuel, and support infrastructure pricing. Consultant findings indicated that FCEBs offer an extended range and better match to OCTA's current operating parameters. In comparison, the current range of BEBs may require more vehicles and drivers to meet similar service levels. The consultant also assessed infrastructure needs by energy type and how feasible it would be to implement at each OCTA base. General BEB operations would require cooperation from other agencies to install charging infrastructure along bus routes, making operation more complicated and potentially affecting service reliability. Additional detail on the trade-offs between technology scenarios is included in Attachment B.

Based on the results of the consultant analysis, the Rollout Plan focuses on using FCEBs for fixed-route operation, with some depot-charged BEBs at the Garden Grove Base. Further, based on current vehicle availability, staff is assuming that all paratransit vehicle purchases will need to be depot-charged BEB starting in 2026, though additional analysis of this fleet is underway to determine the best long-term, vehicle type to use for the service. These vehicle technology findings are included in the draft plan; however, specific Board action would still be required to approve vehicle purchases and fueling infrastructure improvements. Vehicle technology types may need to be updated in the future based on operating experience and changes in costs and technology. OCTA will be testing both ten battery-electric and hydrogen fuel-cell electric buses over the next few years as part of a pilot project to gain experience with each technology.

### Cost Impacts

The transition to ZEBs will have a substantial cost compared to OCTA continuing to operate existing fuel types. The per-unit vehicle costs for ZEBs are higher, and OCTA will need to install new fueling infrastructure at a significant cost. The draft Rollout Plan attempts to keep the lowest overall cost for OCTA through this transition. The Rollout Plan achieves this by continuing to operate existing fuel technologies as long as allowable and implementing the lowest-cost ZEB vehicles based on the total cost of ownership. The costs for vehicles, fuel, and infrastructure may change over time. Breakthroughs in battery technology may make BEBs less expensive, and a lower cost to produce hydrogen would make FCEBs less expensive. The Rollout Plan proposed is based on what is currently known about each technology and the associated costs. The long-term cost impacts will be evaluated in the next version of the OCTA Comprehensive

Business Plan based on the technology assumptions in the Rollout Plan. The financial planning work will help OCTA better understand the long-term cost and how it may impact the level of transit services that is sustainable.

### Short-Term Recommendations

OCTA will be testing both types of ZEBs over the next few years. Ten FCEBs were purchased and put into service in late 2019. A hydrogen fueling station was also constructed at the Santa Ana Bus Base to fuel the new buses. OCTA received “early action credits” for purchasing fuel-cell buses prior to 2023, which can be used to offset future ZEB purchase requirements partially. Staff has also initiated the procurement process for ten BEBs, which were included in the OCTA Fiscal Year 2019-20 Budget. Infrastructure necessary for electric charging will be installed at the Garden Grove Bus Base. External funding from state and federal grants has helped offset the cost differential between the new technologies when compared to the standard CNG bus. With a combination of ten FCEBs and ten BEBs, OCTA will gain valuable experience with both ZEB technologies in the local operating environment. This will support an informed decision about a long-term fueling strategy, as well as position OCTA to meet the ICT regulation during each stage of technology transition.

In addition to the procurement of ten BEBs, the Board recently approved two procurements: the purchase of up to 299 CNG buses and the purchase of up to 117 cutaway paratransit buses, given maximum useful life considerations. With the ongoing procurements of buses and the ZEB pilots underway, OCTA is well positioned to allow the ZEB technologies to mature and identify the appropriate fueling technology and meet the ICT regulation. OCTA does not need to purchase ZEBs for fixed-route service until 2029, when 20, 60-foot articulated buses are due for replacement, as shown on the vehicle replacement schedule in Attachment C. At that time, per the ICT regulation, 100 percent of the vehicles purchased would have to be ZEBs. Staff is assuming that all paratransit vehicle purchases will need be depot-charged BEBs starting in 2026. A study is underway to analyze the optimal paratransit fleet mix and assess viability of using more smaller and more economical vehicles rather than cutaways. The result of this study will inform OCTA on the type and size of vehicles to purchase, as well as fueling technology.

### ***Summary***

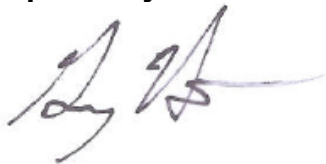
OCTA has developed a draft Rollout Plan recommending how to best comply with the CARB ICT regulation. Pilot projects will help inform the decision on which type of ZEBs will work best for OCTA in the long-term. A consultant effort helped OCTA develop a plan to satisfy CARB's ICT regulation. The Rollout Plan will assist OCTA to adopt an initial ZEB implementation strategy, and CARB gives agencies the ability to update it in future years as needed. Staff is

requesting Board approval of the draft Rollout Plan and the accompanying resolution (Attachment D) prior to submitting it to CARB by July 1, 2020.

***Attachments***

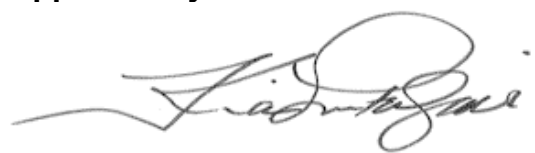
- A. Orange County Transportation Authority, Zero-Emission Bus Draft Rollout Plan, Revised: June 3, 2020
- B. Stantec, Fleet Fit Trade-Off Considerations
- C. Vehicle Purchase Outlook, Fixed-Route Bus Purchases
- D. Resolution No. 2020-055 of the Board of Directors of the Orange County Transportation Authority, Zero-Emission Bus Rollout Plan

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