Zero-Emission Bus Status

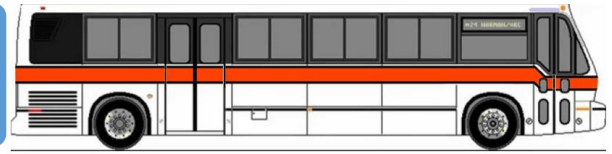
Innovative Clean Transit Regulation

- In 2018 the California Air Resources Board (CARB) passed the Innovative Clean Transit (ICT) Regulation
- Requires all transit agencies to transition bus fleets to 100% zero emission and submit agency rollout plans
  - OCTA Board of Directors approved OCTA's Zero-Emission Bus (ZEB) Rollout Plan in 2020
- ZEB purchasing requirements
  - Beginning in 2023 – 25%; 2026 – 50%; 2029 – 100%
- CARB will complete a comprehensive review in 2025
  - Will inform 2026 purchase mandate and inclusion of small agencies
  - Articulated buses and cutaways may also be subject to regulation in 2026

OCTA's History of Bus Emissions Reductions

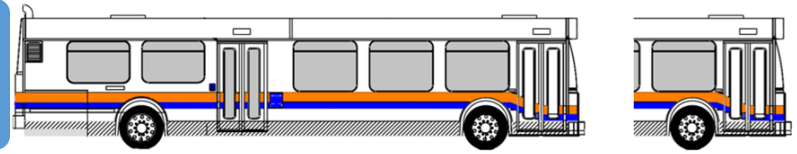
1980's Diesel Bus - 4.8* Nox Baseline

*g/bhp-hr = grams per brake horsepower-hour



1990's Clean Diesel Bus - 4.0* NOx

1.2x Cleaner



2000's 202 LNG & 299 CNG Buses - 1.8* NOx

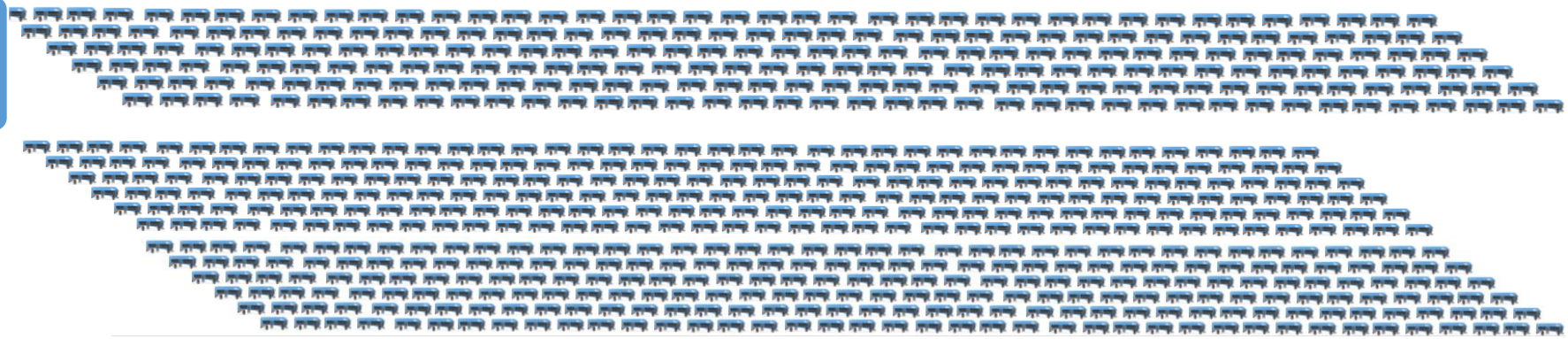
2.6x Cleaner

2014 201 CNG Engines - 0.2* NOx

24x Cleaner

2016+ 173 buses Near-Zero Engine .02* NOx

240x Cleaner



Full Fleet
"100% Zero Emission"
By 2040

*NOx – Nitrogen Oxide *LNG – Liquified natural gas *CNG – Compressed natural gas

Fixed-Route Bus Fleet

- Current fixed-route fleet
  - 428 Active buses
    - 408 CNG buses
    - Ten BEBs
    - Ten FCEBs
- Fleet plan: 470 buses
  - Based on the implementation of the recommendations from the Making Better Connections Study
- Future bus procurements
  - 2024 – 50 2008 CNG buses (ICT 25% purchasing requirement)
  - 2028 – 20 2013 60-foot CNG buses (ICT 50% purchasing requirement)
  - 2031 – 179 2016 40-foot and 60-foot CNG buses (ICT 100% purchasing requirement)

*BEB – Battery Electric Bus *FCEB – Fuel Cell Electric Bus

Background

- Initiated the ZEB Pilot Program with 20 buses
  - 2020 Ten FCEBs
  - 2022 Ten BEBs
- Expand the program to a ZEB Fleet of 76 buses (16%)
  - 2024 – 50 ZEBs to replace 50 2008 40-foot CNG buses
  - 2025 – Six ZEBs to replace six 2013 60-foot CNG buses

ZEB Observations

- Higher capital cost
  - BEB 49% higher cost than CNG
  - FCEB 71% higher cost than CNG
- Lower usable operating range
  - BEB 150 miles
  - FCEB 250 miles
- Availability remains around 55%
  - Target is 80%
- Maintenance
  - Higher mid-life overhaul costs – FCEB 2Xs; BEB 4X-6Xs greater than CNG
- Infrastructure/fueling
  - BEB higher cost; high risk that not all the electricity needed will be available for charging
  - FCEB not as high as BEB, fuel cost higher than CNG

Producer Price Index (PPI)

PPI – WPU143. PPI Commodity Data for Transportation Equipment Truck and Bus Bodies.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	228.8	229.3	229.7	229.6	229.9	230.3	230.6	231.0	231.3	232.1	232.1	232.2
2015	233.0	235.1	235.1	235.1	235.5	235.5	235.6	235.6	235.6	235.7	235.8	235.8
2016	236.2	236.8	237.0	237.1	237.1	237.3	237.7	237.9	FCEB	238.0	238.3	238.4
2017	238.5	238.5	238.7	239.0	239.4	239.6	240.4	240.6	240.8	240.8	240.8	241.1
2018	242.0	242.5	243.1	244.0	244.5	245.5	246.4	247.4	248.1	249.2	250.2	250.5
2019	253.8	254.8	255.8	255.7	255.9	CNG	BEB	258.7	259.5	259.8	259.8	260.0
2020	258.9	259.0	259.3	259.3	259.9	260.0	260.9	261.4	262.8	262.9	263.1	263.8
2021	264.8	266.7	267.4	268.1	269.5	272.5	276.618	278.670	280.431	283.496	283.777	285.695
2022	294.556	298.149	299.891	303.899	315.486	319.479	320.398	322.792	324.091	329.534	329.581	329.801
2023	333.224	335.400	336.119	337.094	337.249	336.643	338.199	338.507	338.752	342.539	342.190	344.270
2024	346.677	346.785	347.509(P)	348.076(P)	345.372(P)	345.445(P)						

P : Preliminary. All indexes are subject to monthly revisions up to four months after original publication.

ZEB Trends

- Operating range is improving
  - BEB 150 miles – 225+ miles
  - FCEB 250 miles – 300+ miles
- Availability
  - Will improve with supply chain improvements
- Maintenance
  - Lower costs for routine maintenance
  - Higher mid-life costs
- Infrastructure
  - BEB – many choices/solutions for charging stations
  - FCEB – many available vendors
- Capital cost
  - Anticipated to decrease over time with maturity of the technology and market

Next Steps

- Continue to study and analyze the most effective way to deploy ZEBs
- Continue to strategically ramp up the deployment of ZEBs
- Deploy ten battery electric vans
- Procure 50 40-foot ZEBs in 2024
- Procure six 60-foot ZEBs in fiscal year 2025
- Install additional charging stations
- Build a second hydrogen fueling station