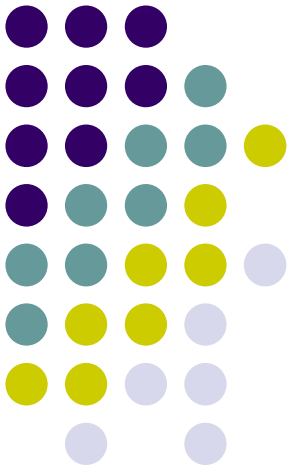
Status Report on the Zero Emission Bus Regulation

Air Resources Board Meeting
July 23, 2009

San Diego, CA



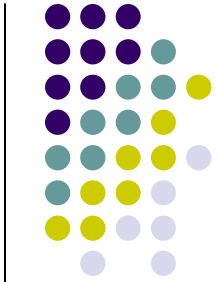
Overview

- Regulatory History
- Current Requirements
- Technology Assessment
- Other Efforts
- Staff Recommendations

Zero Emission Bus (ZBus) Regulation

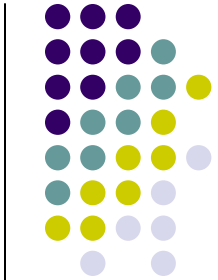
- Adopted in 2000 as part of the Transit Fleet Rule
- ZBus is: Battery Electric, Electric Trolley, or Fuel Cell
- Regulation elements:
  - ZBus demonstration
  - 15% ZBus purchase requirement
  - Affects only large agencies (>200 Buses)

Current Regulation



- Delayed twice due to:
  - Technology not yet commercial
  - Cost
- Purchase requirement
  - Diesel path: 2011 – 2026
  - Alternative fuel path: 2012 - 2026
- Includes a second phase demonstration for diesel path Transit Agencies (TAs)
- Report to the Board in July 2009 with status report on feasibility of implementing purchase requirement

Initial Demonstrations



- Santa Clara Valley (SCV) TA & San Mateo County TA demonstration
  - 3 fuel cell buses
  - Now finished
- Alameda-Contra Costa (AC) Transit & Golden Gate Transit demonstration
  - 3 hybrid fuel cell buses
  - Ongoing
- SunLine Transit demonstration
  - 1 hybrid fuel cell bus
  - Ongoing

Demonstration Results

Santa Clara VTA		
	Fuel Cell	Diesel
Fuel Economy (M/DEG)	3.52	3.98
Availability	58%	85%
Reliability (MBRC)	918	10,838

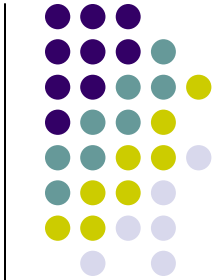
AC Transit		
	Fuel Cell	Diesel
Fuel Economy (M/DEG)	6.96	4.20
Availability	67%	N/A
Reliability (MBRC)	1,189	10,661

SunLine Transit		
	Fuel Cell	CNG
Fuel Economy (M/DEG)	8.19	3.16
Availability	76%	86%
Reliability (MBRC)	2,292	14,468

Second Phase Demonstration (Required by 2006 Amendments)

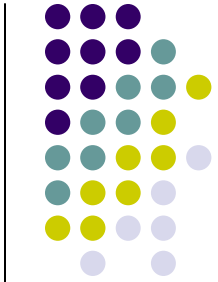
- Joint demonstration of 5 Bay Area TAs
  - AC Transit, SCV TA, Golden Gate Transit, San Francisco Muni, SamTrans
  - 12 hybrid fuel cell buses
  - Originally scheduled to begin January 2009
  - Data from demo was expected for this report
- First bus to be deployed Q4 of 2009

Demonstration Funding



- Initial demonstration
  - 54% from government agencies
    - California = $14.3 million
    - US FTA = $6.3 million
    - BAAQMD = $2.0 million
- Second phase demonstration
  - California = $7.0 million
  - US FTA = $5.7 million
  - BAAQMD = $2.0 million

Other ZBus Demonstrations



- California
  - SunLine Transit – 1 hybrid fuel cell bus
  - City of Burbank – 1 battery dominant fuel cell bus (winter 2009)
  - Foothill Transit – 3 battery buses (2010)
- South Carolina
  - 1 battery dominant fuel cell bus
- Connecticut
  - 1 hybrid fuel cell buses
    - 4 additional buses soon

Worldwide Efforts

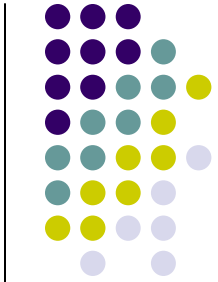
Ongoing

- Japan – 11 fuel cell buses
- Germany – 9 fuel cell buses
- China – 6 fuel cell buses
- Brazil – 2 fuel cell buses
- Holland – 2 articulated fuel cell buses
- Belgium – 1 fuel cell bus
- Korea – 1 fuel cell bus

Planned

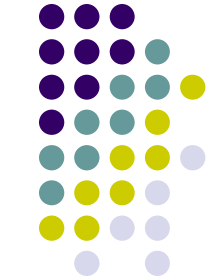
- London – 10 fuel cell buses (2010)
- Vancouver – 20 fuel cell buses (2010 Olympics)
- Hamburg – 30 fuel cell buses (2011)

Technology Assessment



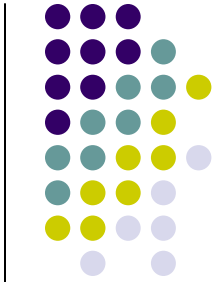
- Not yet commercially ready
- Costs remain high
  - 3 to 6 times that of conventional buses

Staff Recommendations



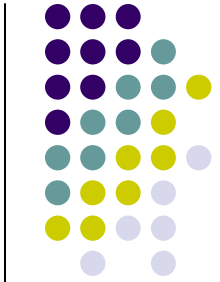
1. Delay purchase requirement
2. Continue second phase demonstration
3. Establish purchase requirement metrics/trigger
4. Add GHG reduction as goal

Delay Purchase Requirement



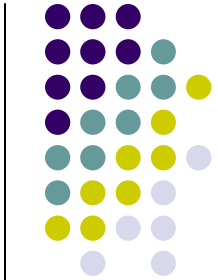
- Durability and reliability need improvement
- Second phase demonstration behind schedule
  - Need more data to assess technology readiness
- Cost still too high

Continued Demonstrations



- Demonstrations are still needed
- Continue Bay Area demonstration

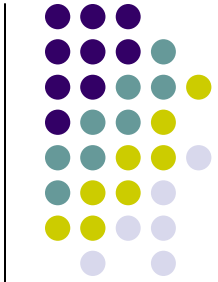
Performance Metrics



	Implementation Criteria As Listed in Resolution 06-28	Current State of Technology
Purchase Cost Ratio (FCB vs. Electric Trolley)	1.25:1	2.75:1
Durability/Warranty	20,000 hours	8,000 – 12,000 hours
Reliability (MBRC)	10,000 miles	1,466 miles
Availability	85%*	67%

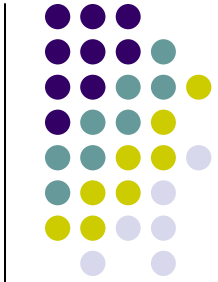
* Based on Industry Standard

Achieving GHG Reductions



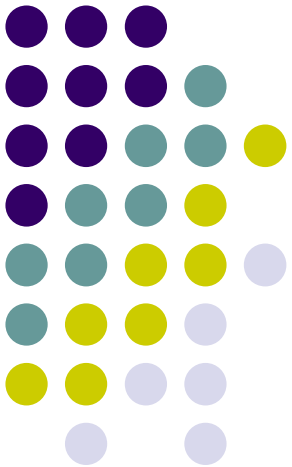
- Expand ZBus goals to include GHG reduction
  - Urban pollution reduction goals being achieved
  - Develop appropriate requirement, for example:
    - Declining cap on GHG emissions from transit
    - Could reward increased ridership
    - Could include light rail and hybrid electric buses
  - Would continue technology advancement to reach GHG reduction goal

Summary



- ZBus technology still developing – purchase requirement should be delayed
- Continued demonstration needed
- Performance metrics should be established to trigger purchase requirement
- Return to Board with regulatory changes late in 2010
- GHG reductions should be a ZBus program goal

Back Up Slides



California Transit Fleet Size

Transit Agency	Total # Urban Buses	Fuel Path	15% Purchase Requirement
Los Angeles Metro	2696	CNG	37
San Francisco Muni	800	Diesel	0
Orange County Transportation Authority	730	CNG	11
Alameda-Contra Costa Transit	580	Diesel	9
San Diego MTS	483	CNG	7
Santa Clara Valley Transportation Authority	438	Diesel	7
San Mateo County Transit	324	Diesel	5
Foothill Transit	314	CNG	5
Sacramento Regional Transit	221	CNG	3
Golden Gate District	209	Diesel	3

Total Annual Purchase = 87 Buses

Cost of Technology

Technology	Cost
2010 compliant diesel	$380,000
CNG	$490,000
Diesel Hybrid Electric	$560,000
CNG Hybrid Electric	$630,000
Battery Electric	$1,200,000
Hybrid Fuel Cell Electric	$2,200,000