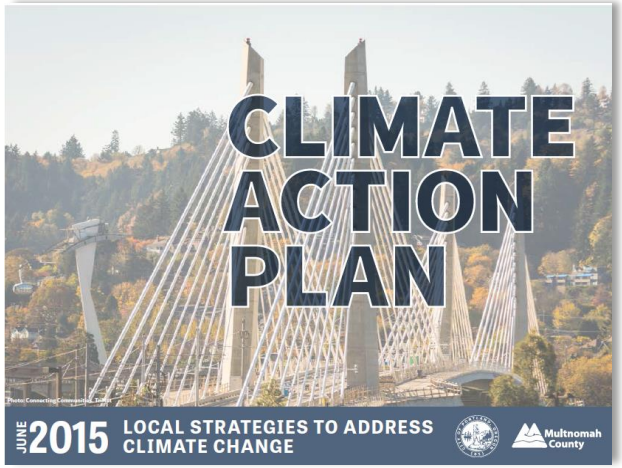
TriMet Non-Diesel Bus Plan

Policy Background



79th OREGON LEGISLATIVE ASSEMBLY--2017 Regular Session

Enrolled

House Bill 2017

Sponsored by JOINT COMMITTEE ON TRANSPORTATION PRESERVATION AND MODERNIZATION

74th OREGON LEGISLATIVE ASSEMBLY--2007 Regular Session

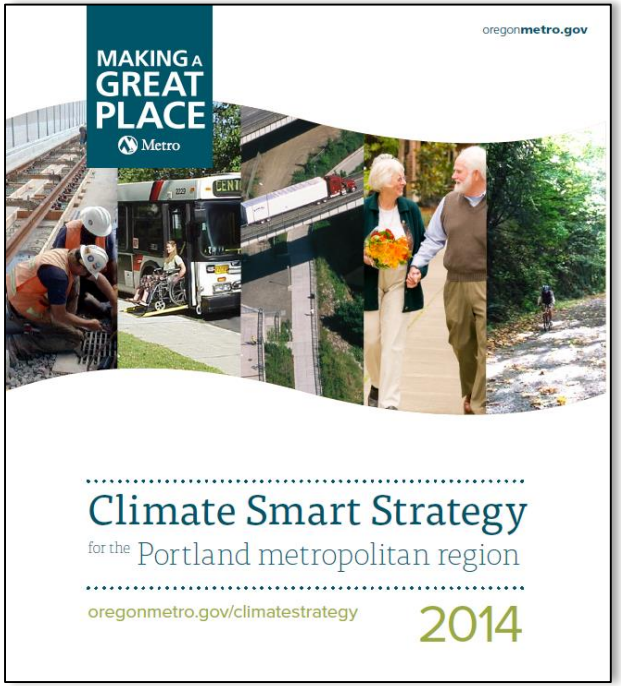
Enrolled

House Bill 3543

Sponsored by Representative DINGFELDER, Senator AVAKIAN; Representatives CANNON, MACPHERSON, MERKLEY, READ

Transportation and Land Use Roadmap to 2020

Report to the Oregon Global Warming Commission



Context

- HB2017 expressly calls out electric (and natural gas) bus
- TriMet buses have low emissions, but still a big consumer of fossil fuel
- A number of other national districts have announced conversion plans
- Significant community interest in TriMet adopting a strategy
- Technology is advancing/prices expected to fall
- Opportunity for TriMet to support broad community goals, innovate and lead

Existing TriMet Fleet

- TriMet has 658 diesel buses, 11th largest in the United States.
- 97% are standard 40-foot diesel buses.
- The average bus is 7.4 years old; the oldest bus is 19 years old.
- TriMet consumes just under 6 million gallons of diesel each year.

Evaluation Process

- Analyze available technologies
  - Which non-diesel technology to use
  - Industry trends
  - Past experience
- Conduct net present value analysis
  - How does the new technology compare to diesel
- Conduct financial analysis
  - What will it cost to deploy the new technology

Available Technologies

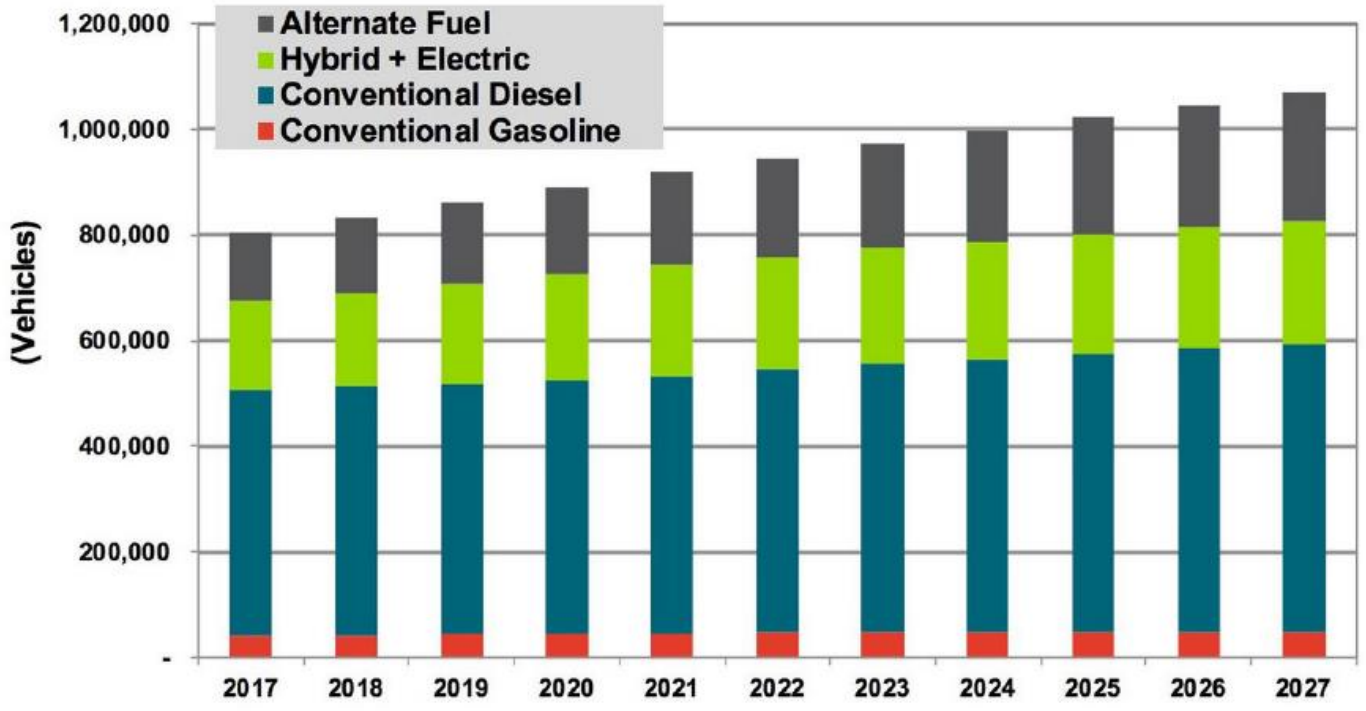
- Diesel hybrid
- Biodiesel
- Battery Electric
- Compressed Natural Gas
- Hydrogen

Experience

- Internationally, there are almost 400,000 BEBs deployed and approximately 99% are located in China.
- Within the US, at least 38 transit agencies have some experience with BEBs – most with fewer than 10 buses.

Industry Trends

Chart 1.1 Annual Bus Sales by Fuel Type, World Markets: 2017-2027



(Source: Navigant Research)

BEB Sub-types

- Fast Charge
  - Charges “on-route”
  - Longer distances today
  - More costly overall
  - Schedule and operator impacts
- Slow Charge – Preferred Option
  - Charges at depot
  - Shorter distances today – longer in future
  - Less costly overall
  - Operates more like diesel

Net Present Value Analysis

- Base case – diesel vs BEB
- Analysis considers cost of:
  - Current & future diesel and BEBs
  - Fuel
  - Changes in technology
  - Maintenance
  - Facilities
  - Lifespan
  - Tax credits
  - Externalities (air pollution & noise)

Net Present Value

(2018 Dollars)

	Diesel Fleet Replacement	BEB Fleet Replacement
Costs to TriMet		
Fuel Use	$182,943,672	$44,189,961
Electricity Use	$0	$55,312,872
Maintenance	$950,864,362	$805,503,906
Vehicle Purchase	$555,027,379	$848,020,727
Charger Infrastructure	$0	$22,258,676
Clean Fuel Credits	$0	-$78,025,868
Facility Upgrades	$0	$29,106,979
Total	**$1,688,835,413**	**$1,726,367,253**
Social Costs		
Emissions (Tailpipe)	$114,443,380	$28,739,881
Emissions (Power)	$0	$20,750,155
Noise	$31,808,196	$22,395,245
Total	**$146,251,576**	**$71,885,281**

Financial Analysis Assumptions

- First question: How quickly to implement BEB conversion?
- No conversion less than 16 years due to bus life-cycle.
- Buy many in one year or buy fewer over multiple years.
- Capture value of innovation and efficiency curves.

Financial Analysis Assumptions

- Fully convert by ~2040
- Purchase 70 BEBs over four years:
  - FY2016 – 5 (FTA Low-No grant)
  - FY2019 – 15 (FTA Low-No grant + HB2017)
  - FY2020 – 10 (HB2017)
  - FY2021 – 20 (HB2017)
  - FY2022 – 20 (HB2017)
- Analyzes the cost difference between same size diesel fleet

Financial Analysis

(YOE $s)

Fiscal Year	No. of BEBs Purchased	Equivalent Diesel Bus	Electric Bus	BEB Premium	Five year total	Five year average
2019	10	$ 5,453,195	$ 19,879,663	$ 14,426,469		
2020	10	$ 5,589,525	$ 10,678,295	$ 5,088,770		
2021	20	$ 11,458,525	$ 21,644,643	$ 10,186,118	$ **50,296,157**	$ **10,059,231**
2022	20	$ 11,744,989	$ 21,995,276	$ 10,250,288		
2023	20	$ 12,038,613	$ 22,383,126	$ 10,344,513		
2024	62	$ 38,252,694	$ 82,071,597	$ 43,818,903		
2025	5	$ 3,162,017	$ 4,186,189	$ 1,024,172		
2026	5	$ 3,241,067	$ 2,625,698	$ (615,369)	$ **124,805,871**	$ **24,961,174**
2027	60	$ 39,865,130	$ 81,813,220	$ 41,948,091		
2028	75	$ 51,077,197	$ 89,707,272	$ 38,630,074		
2029	65	$ 45,373,577	$ 97,289,085	$ 51,915,508		
2030	69	$ 49,369,942	$ 83,132,537	$ 33,762,594		
2031	82	$ 60,138,314	$ 129,121,996	$ 68,983,683	$ **205,809,735**	$ **41,161,947**
2032	55	$ 41,345,091	$ 65,190,287	$ 23,845,197		
2033	62	$ 47,772,373	$ 75,075,126	$ 27,302,753		
2034	69	$ 54,495,179	$ 116,249,405	$ 61,754,227		
2035	66	$ 53,428,968	$ 82,956,784	$ 29,527,816		
2036	61	$ 50,615,852	$ 75,622,236	$ 25,006,383	$ **172,474,877**	$ **34,494,975**
2037	62	$ 52,731,761	$ 102,006,781	$ 49,275,020		
2038	41	$ 35,742,778	$ 42,654,209	$ 6,911,431		
2039	5	$ 4,467,847	$ (21,731,350)	$ (26,199,198)		
2040	5	$ 4,579,543	$ (23,675,627)	$ (28,255,170)		

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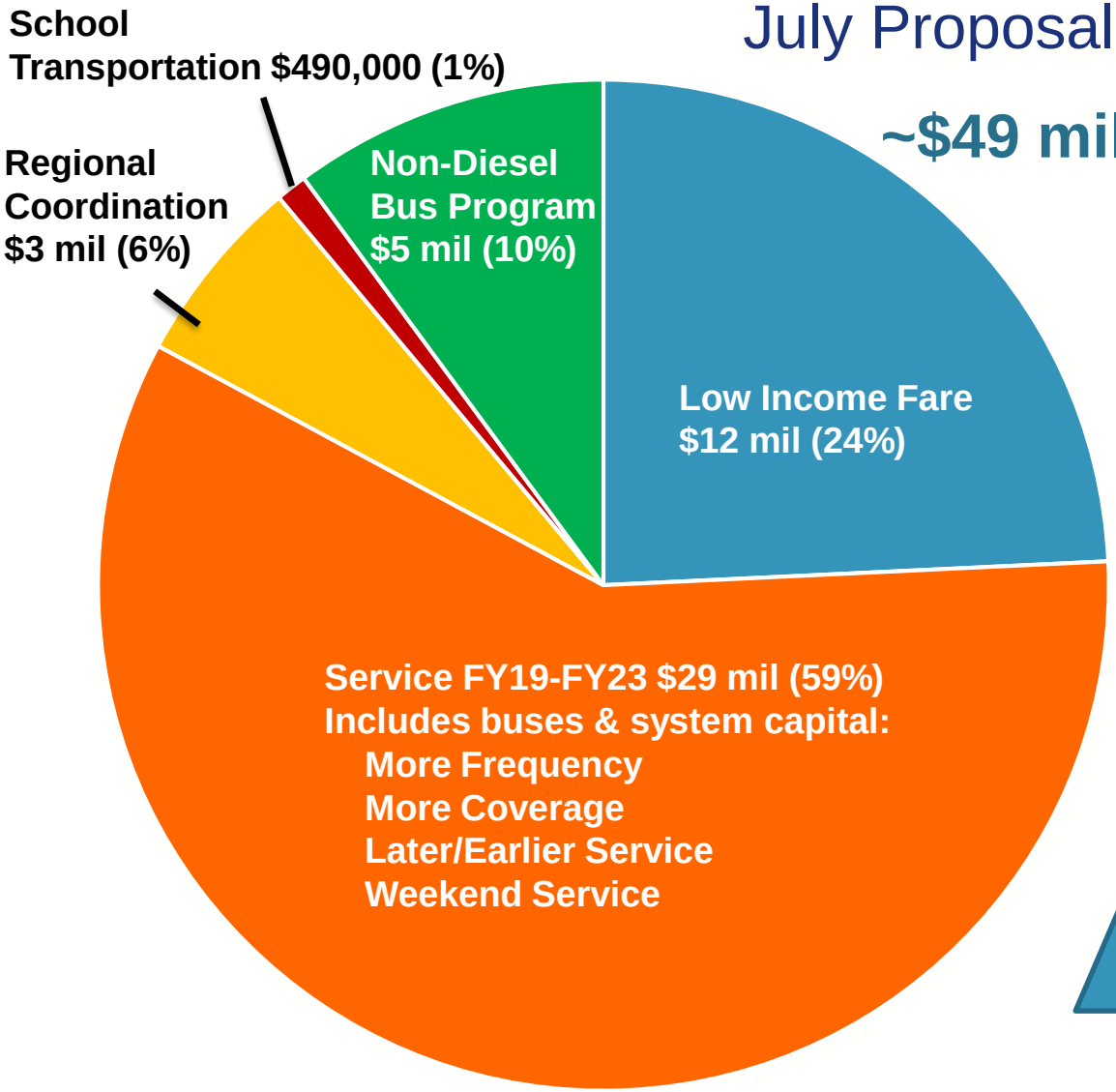
Funding Allocation Proposal

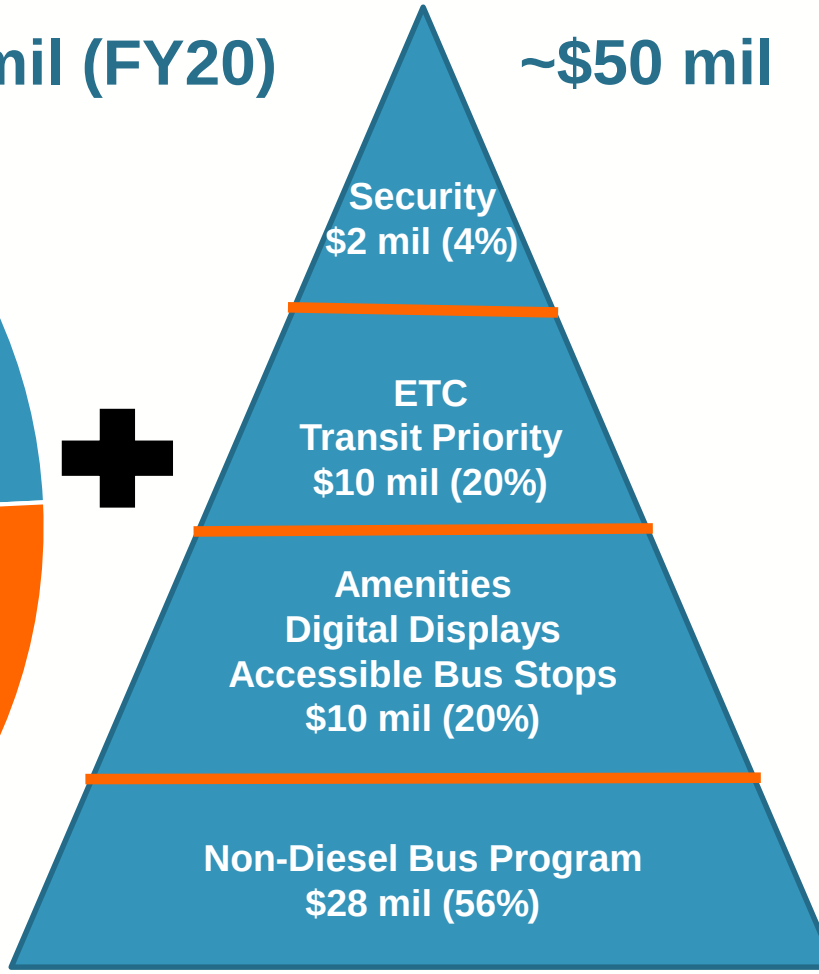
July Proposal



~$49 mil (FY20)

+

~$50 mil



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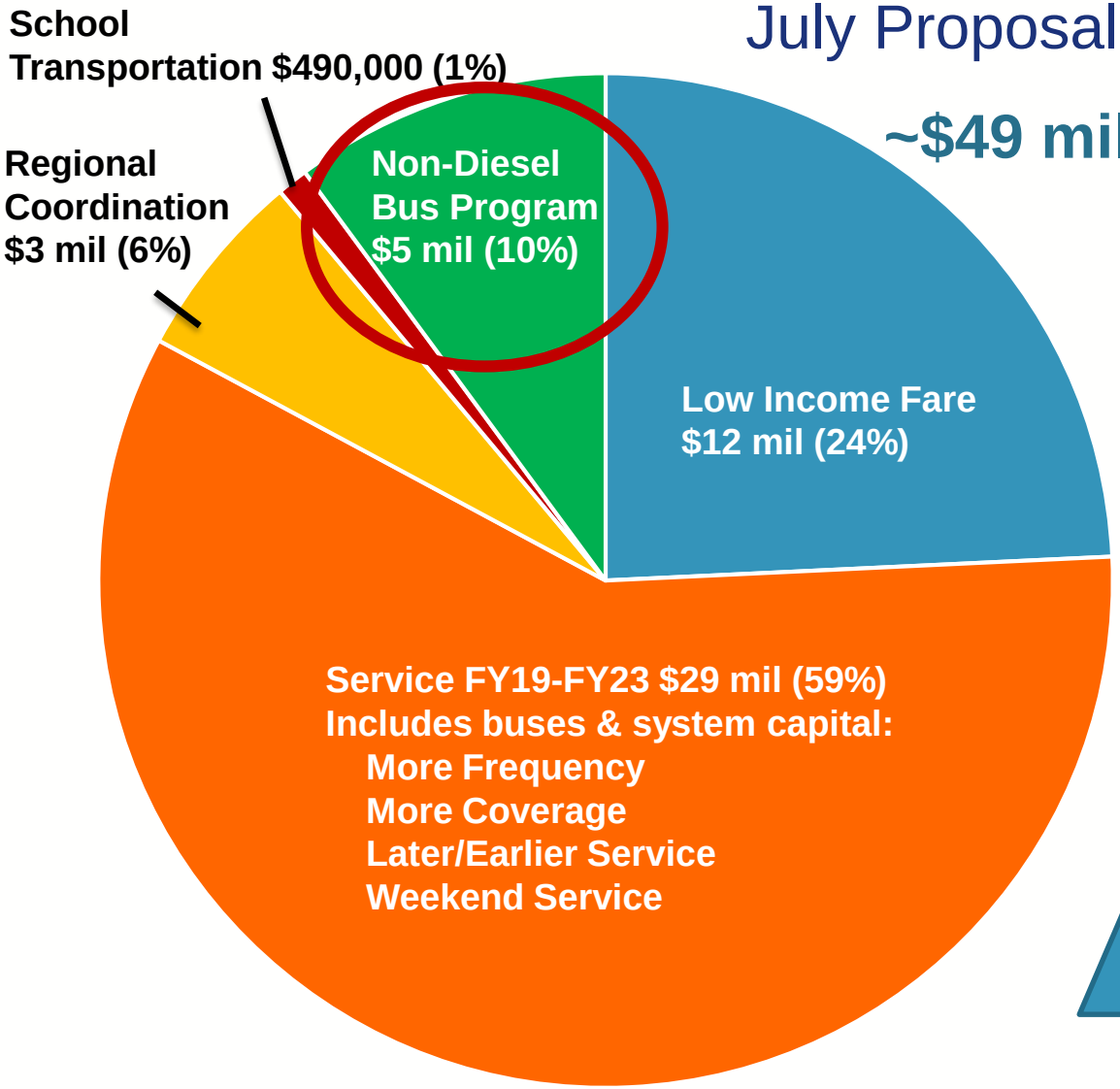

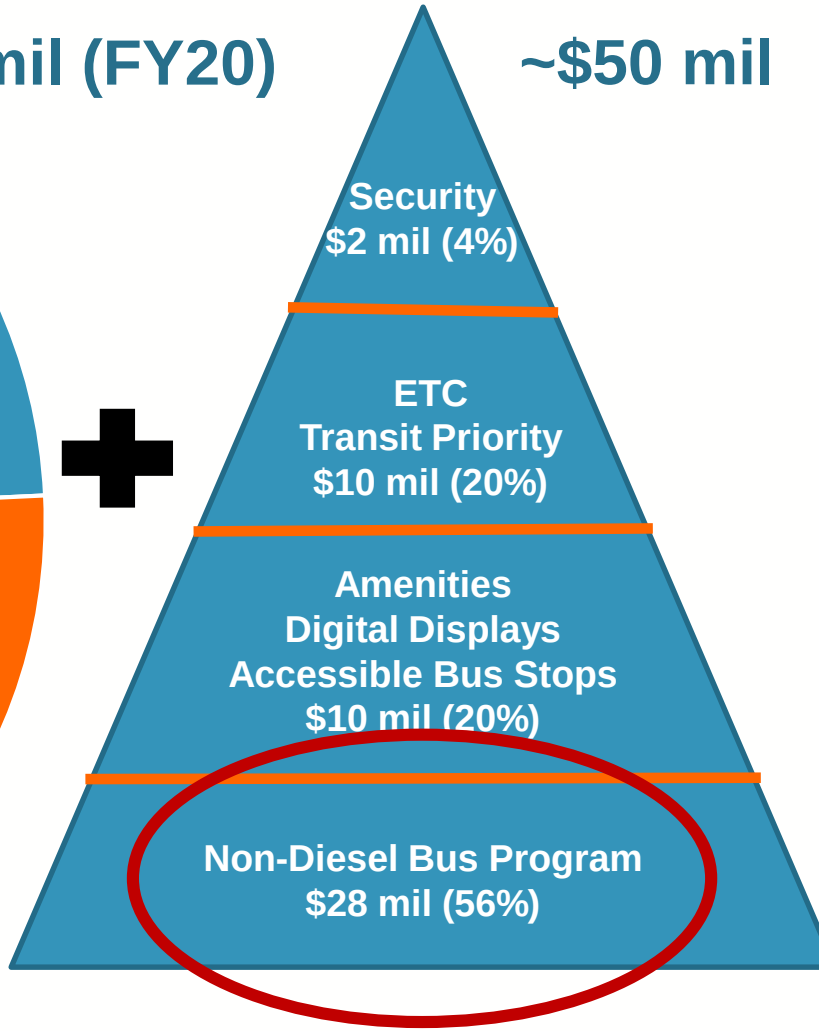

Long Term Strategy

- Subject to approval of $53m in HB2017 funds – September Board Meeting:
  - Adopt an ambitious long range plan to convert the fleet by ~2040 – but include important caveats and off ramps.
  - Implement a short term strategy to bring on 70 battery electric buses (10 grant funded, 60 STIF).
  - Purchase the initial buses over four years to “dollar cost average” the technology & efficiency.
- Explore other technologies: RNG & Hydrogen

Questions