Creating the Next, One Ride at a Time

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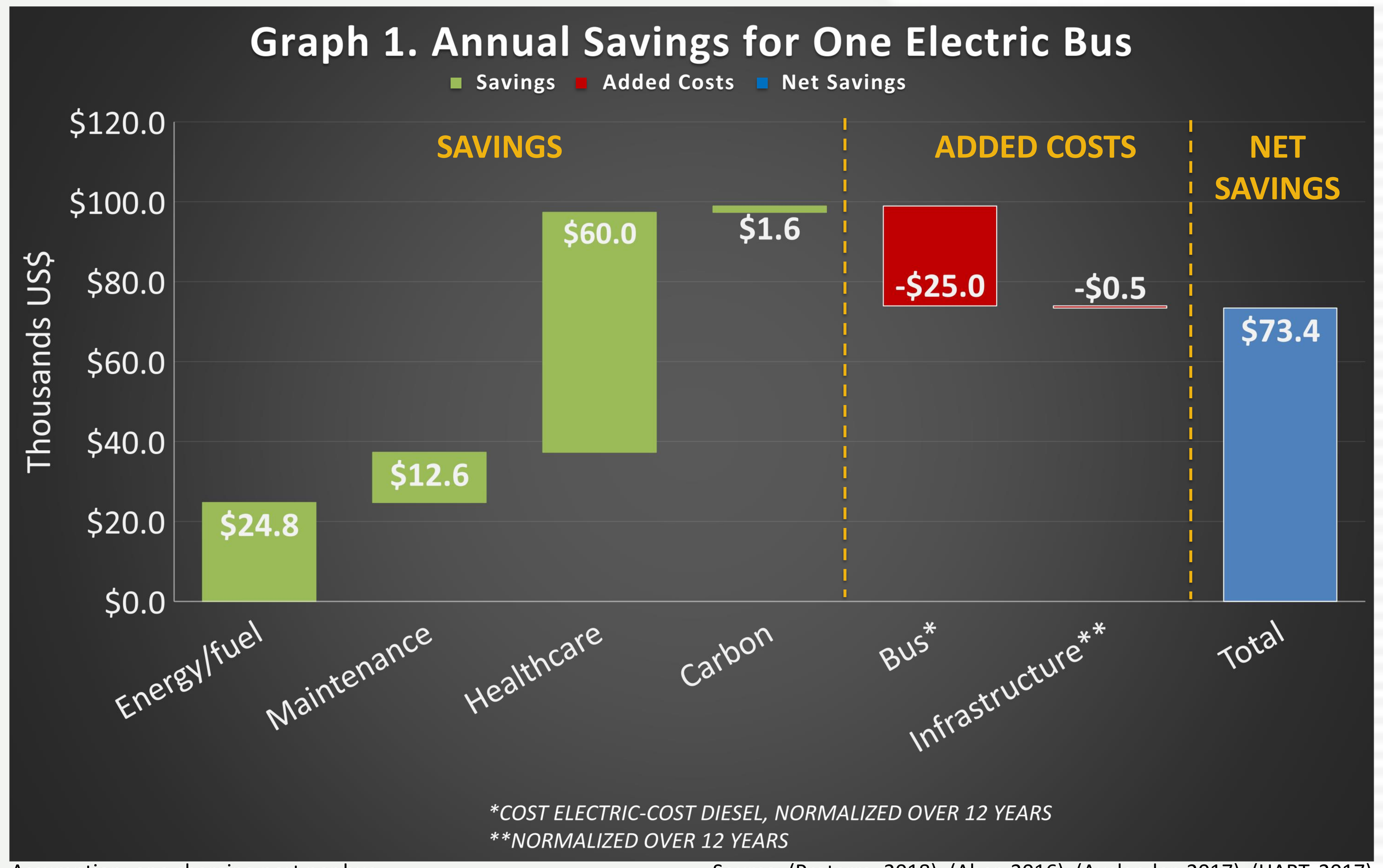
Goals and Scope

1. Investigate the feasibility of integrating electric buses into Georgia Tech's fleet.
2. Assess the sustainability of electric buses.
3. Make recommendations for the 2020 PTS contract.



Graph 1. Annual Savings for One Electric Bus

Assumption: one charging port per bus

Source: (Proterra, 2018); (Aber, 2016), (Auslander, 2017), (HART, 2017)

Project Funding

Georgia Tech should apply for a grant to reduce the costs of implementing this project.

<u>**What is the Low-No Grant?**</u>

- The Federal Transit Administration's Low or No Emissions Bus Program (Low-No Program) will cover up to 90% of the cost of equipment and facilities required to support low-emission transit buses.
- Georgia Tech is eligible because it is a public university and it provides fixed-route transportation that is open to the general public.

<u>**Partners & Their Role in the Grant Application**</u>

GT Parking and Transportation Services

- A PTS employee would likely be the grant's co-Principal Investigator.
- PTS would collect support letters from relevant stakeholders.
- PTS should partner with an organization that provides data collection services via GPS tracking and route analysis to quantify the impact of electric buses.
- PTS should also consider extending the contract duration to 12 years so Georgia Tech can purchase the batteries to store energy from the Living Building's solar panels.

Georgia Tech

- CPSM would likely choose the site for the charging infrastructure and could work Georgia Power to ensure that the site is viable.
- The Georgia Tech Foundation could write a letter of support for the grant and could also pledge to partially fund the project.

Georgia Power

- Georgia Power would likely be responsible for the installation of the charging infrastructure on campus.
- Georgia Power may be willing to donate design work/equipment.
- May be willing to partially finance the infrastructure in exchange for branding.

Student Government Association

- SGA could write a letter of support including collective student input on the importance of keeping student transit fees low while also demonstrating the willingness to partially finance the project.

Proterra

- Proterra could provide data analytics services to PTS to strengthen the application.
- Proterra could also help third party operators understand the benefits of electric buses and can also help operators draft proposals.

Third Party Operators

- A letter of support from the third party operator stating their commitment to purchase electric buses would benefit the grant application.

Stakeholders

Stakeholders interviewed for this project: The Brook Byers Institute for Sustainable Systems | The Collective Wisdom Group | Georgia Power | Proterra | GT Parking and Transportation Services | The Georgia Public Service Commission | Groome Transportation | GT Capital Planning and Space Management | The Center for Transportation and the Environment

Economic Analysis

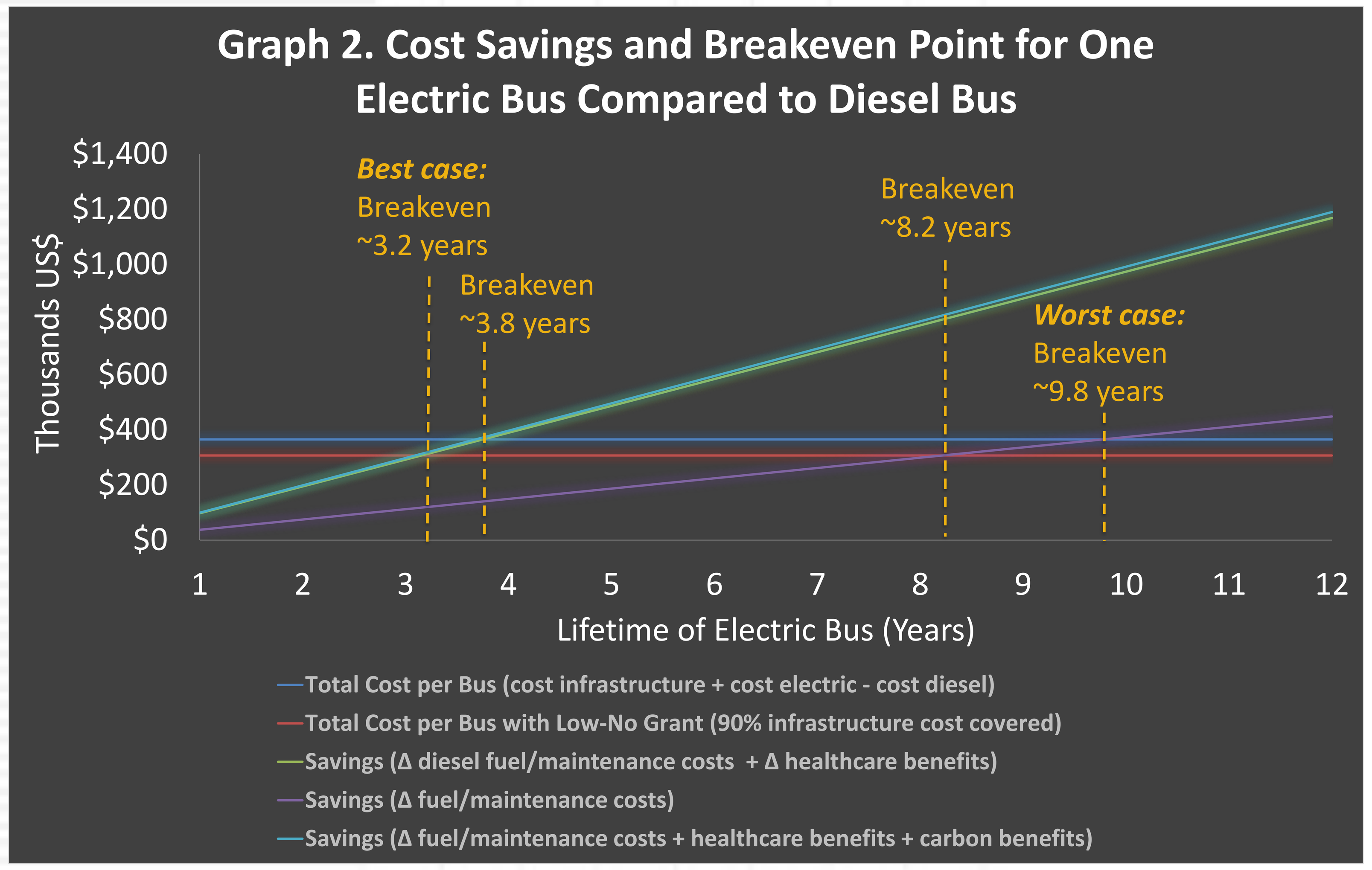
Electric buses have a lower operations lifecycle cost because 1) electricity is far cheaper and 2) 30% fewer moving engine parts significantly reduces maintenance costs.

Savings

- Energy/Fuel ($81,000 over 12 year lifetime)
- Maintenance ($238,000 over 12 year lifetime)
- Healthcare savings (conservative estimate of $60,000 per year)
- Carbon emissions (social cost of carbon = $36 per ton of CO_2)

Added Costs:

- Electric bus frame and battery (~USD 800,000 per bus)
- Charging infrastructure (~USD 50,000-80,000 / overnight charger)



Graph 2. Cost Savings and Breakeven Point for One Electric Bus Compared to Diesel Bus

Assumptions: one charging port per bus

Source: (Proterra, 2018); (Aber, 2016), (Auslander, 2017), (HART, 2017)

Social & Environmental Analysis

As shown in Graph 1, the benefits increase significantly when environmental and social benefits are factored into the cost-benefit analysis.

<u>**Environmental Impact**</u>

Carbon emissions reduction

- Scope: use-phase of electric buses.
- Functional unit: CO_2equivalent emissions/vehicle miles.
- Impact: the carbon savings demonstrated in Graph 1 could help Georgia Tech reach its goal to become carbon neutral by 2050.

<u>**Social Impact**</u>

Air quality improvements

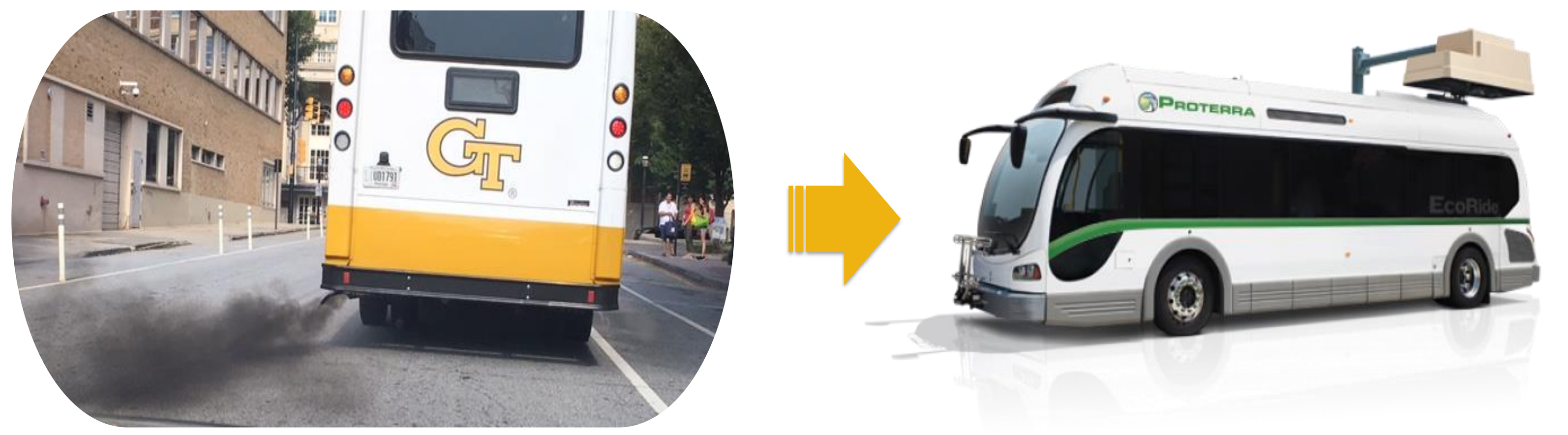
- Particulate matter (PM) emissions from transit vehicles have a number of detrimental human health impacts.[6]
- PM10 emissions of a diesel bus over the operations phase of its life are approximately 11.26 times greater than electric bus PM emissions.[7]

Local work-force development

- PTS should incorporate a local hire clause (e.g. 25-50% of workers must come from neighborhoods surrounding Georgia Tech).
- PTS should also require electric vehicle training programs for mechanics and drivers so they can enhance their professional skillset and experience.

Next Steps

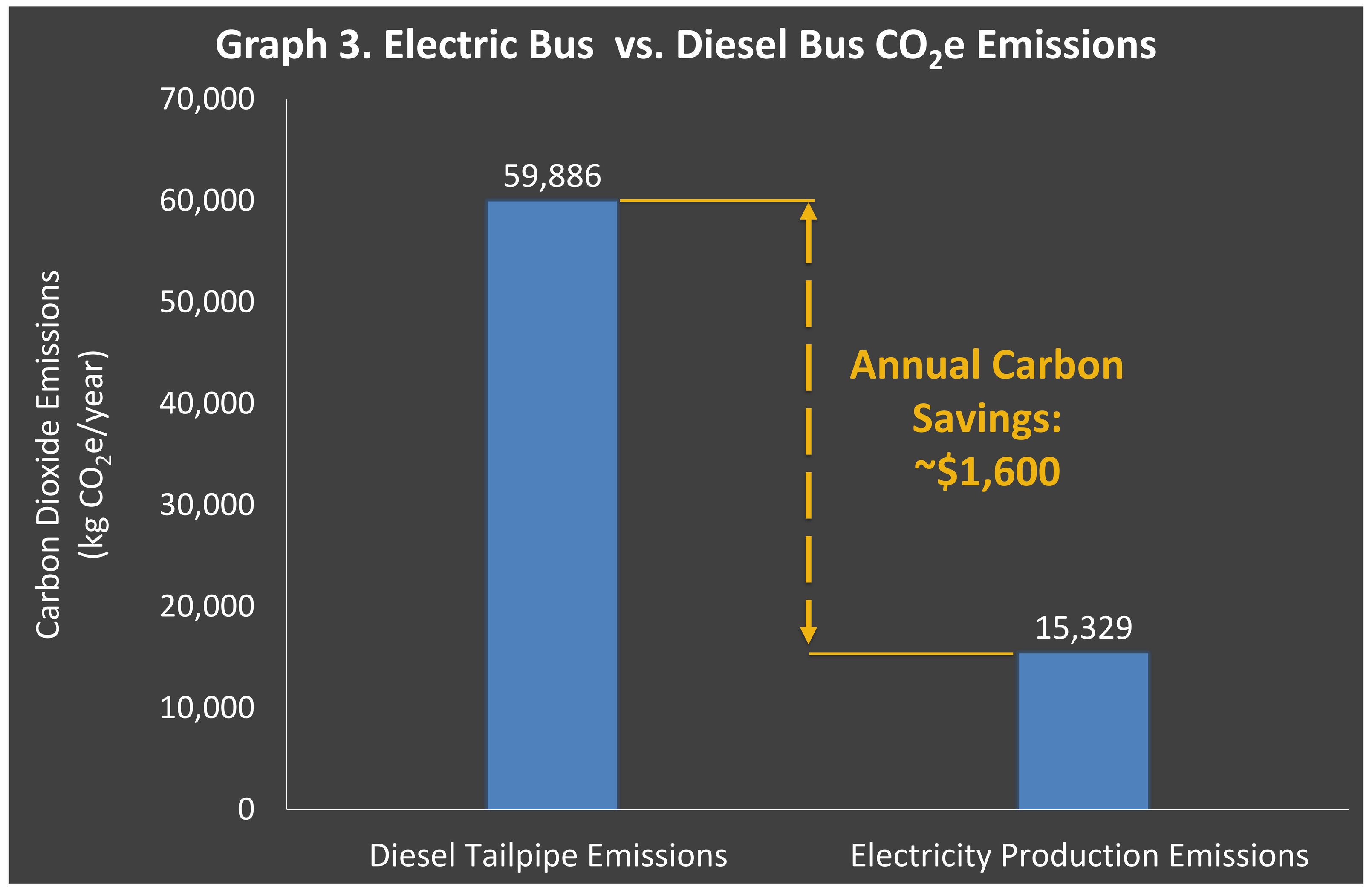
1. Pursue funding options, including but not limited to the Low-No grant.
2. Conduct a student survey to evaluate student support and willingness to pay higher fees.
3. Bring relevant stakeholders together to write a grant proposal.



Conclusions

- Electric buses are an economically viable option for Georgia Tech.
- Multiple funding opportunities make this investment even more attractive, including: grant funding, higher student fees, and donations from stakeholders.
- The breakeven point for an electric bus vs. a diesel bus could occur as early as three years into the seven-year contract.

As an anchor institution in Atlanta and a leading educational and research institute, Georgia Tech should take a stance and make this investment for its community's future. Georgia Tech's motto is "Creating the Next." This is the Next.



Graph 3. Electric Bus vs. Diesel Bus CO_2e Emissions

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