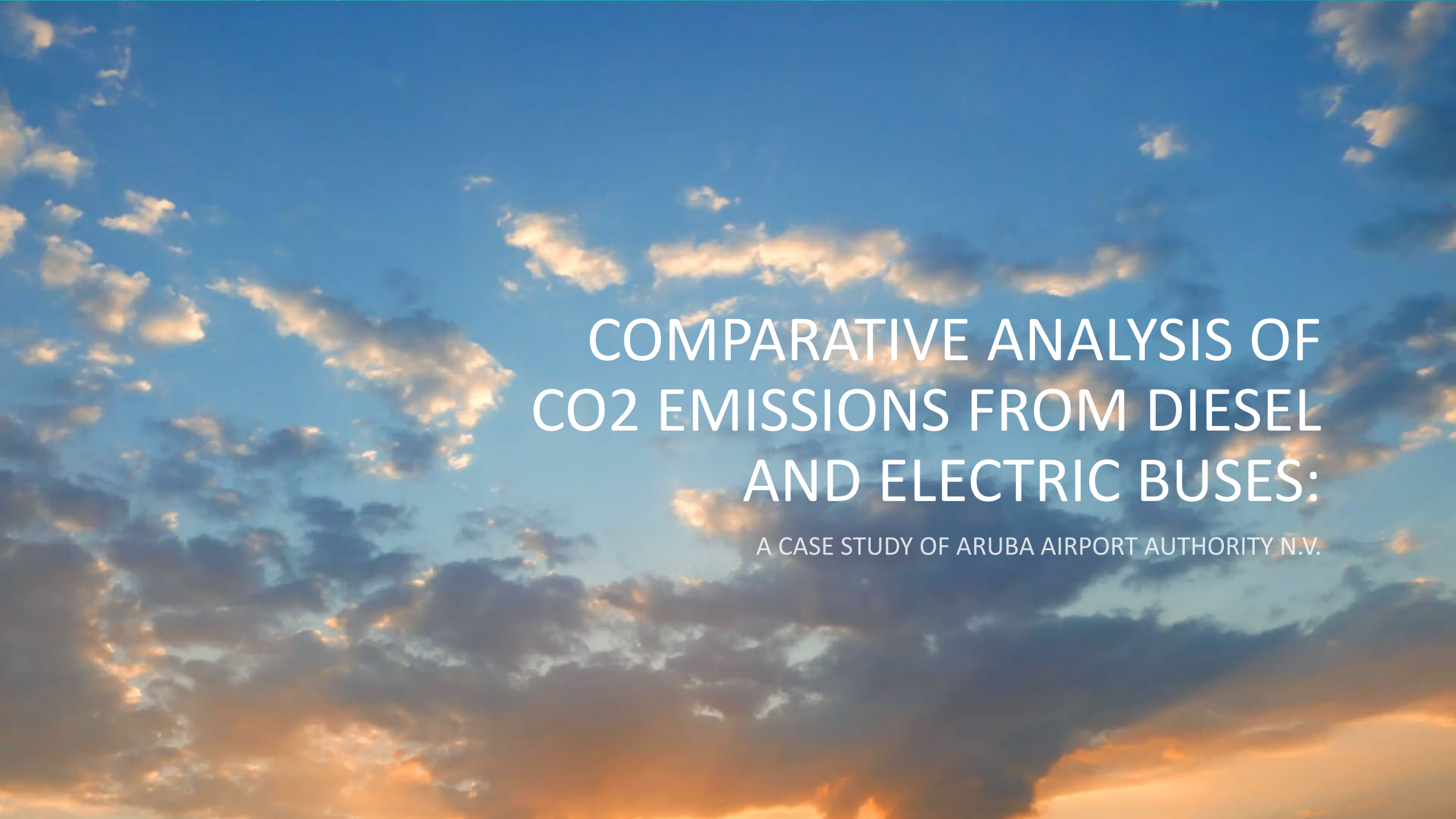


COMPARATIVE ANALYSIS OF CO2 EMISSIONS FROM DIESEL AND ELECTRIC BUSES:

A CASE STUDY OF ARUBA AIRPORT AUTHORITY N.V.

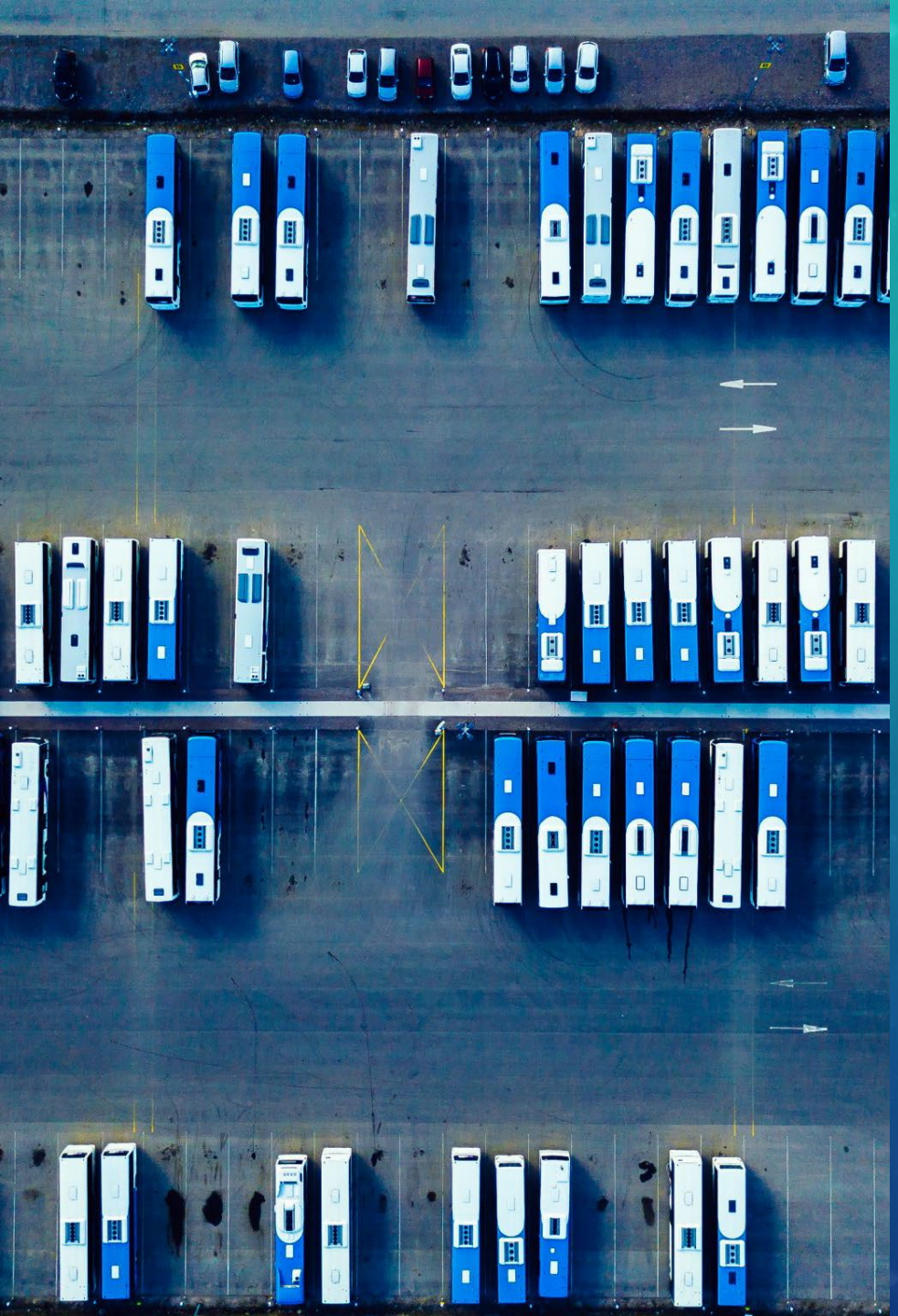

2040
Join the REGENERATION

INTRODUCTION

- Comparative analysis of CO_2 emissions from Diesel and Electric buses Aruba Airport Authority N.V (AAA) case study
- Importance of studying CO_2 emissions

BACKGROUND AND OBJECTIVES

- AAA's vision to become the most sustainable airport
- What strategy should Aruba Airport Authority N.V. invest in to have an as low as reasonably possible impact on the environment?



BACKGROUND AND OBJECTIVES

- What is the current environmental impact of the vehicles owned by Aruba Airport Authority N.V.?
- What alternatives could be recommended to replace the current equipment?
- What are the emissions factors of the local energy-producing company?
- What are other social sustainability impacts between the compared strategies?

METHODOLOGY – LIFE CYCLE ASSESSMENT (JUST A SAMPLE)

[1]

CLIMATE CHANGE

LIFE CYCLE ASSESSMENT – CLIMATE CHANGE IMPACTS

[1]

CO_2

LITERATURE REVIEW – PRODUCTION[2]

- Raw material extraction
  - Metal, Plastic, Rubber
- Energy usage
  - During extraction, processing
- Supply Chain
  - Individual parts
- Transportation

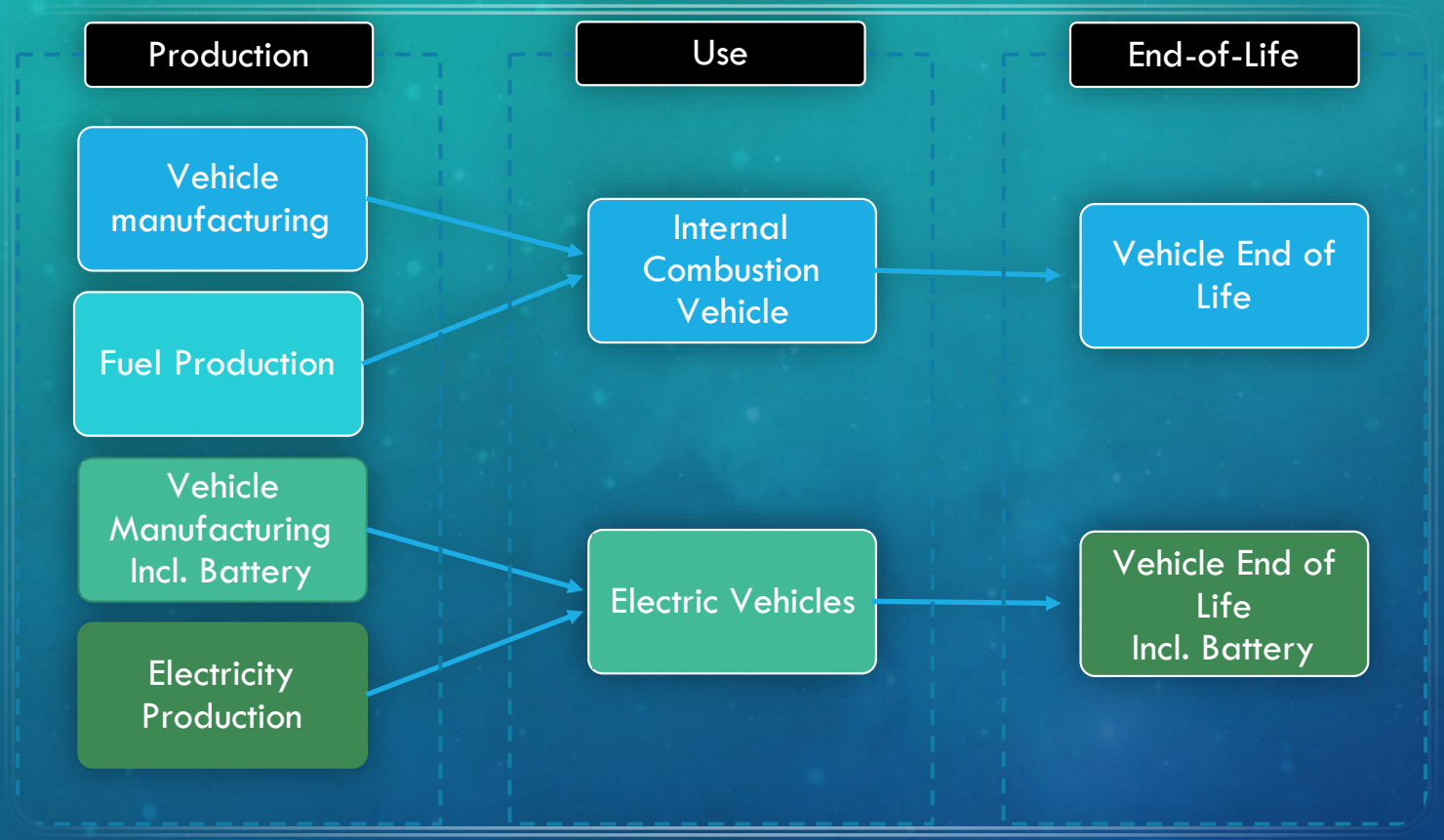
Gabriel et al (2021)

DATA COLLECTION – USE & DISPOSAL

- Energy Consumption
  - Actual operations
  - Maintenance
  - Energy sources

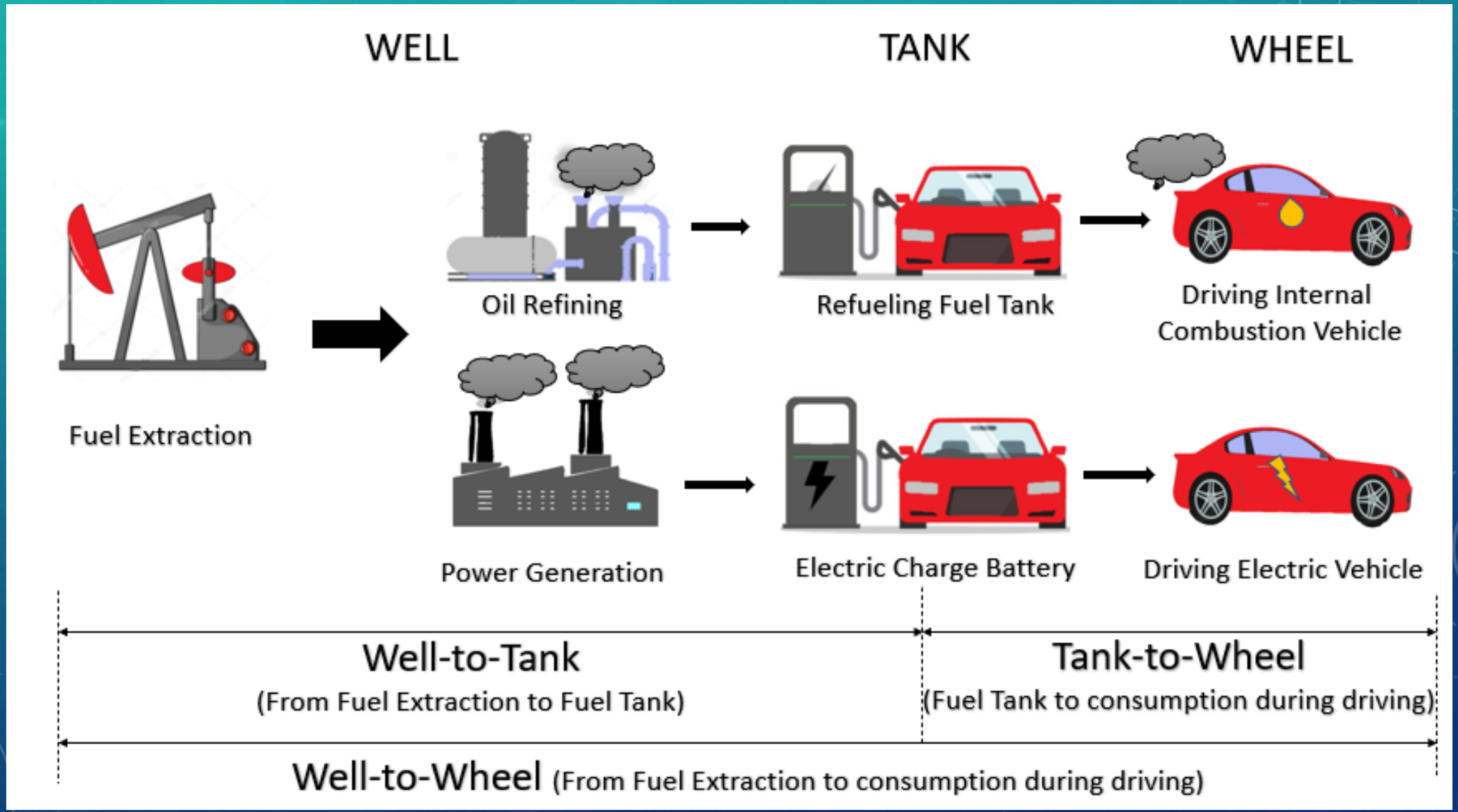
- Disposal
  - Landfill
  - Recycle
  - incineration

DATA COLLECTION



- Production – Existing studies [2][3][6][7]
- Use – Real-world Data
- End of life – Previous research & Experts [4][5]
- Parameters: fuel consumption, distance traveled, and emission factors

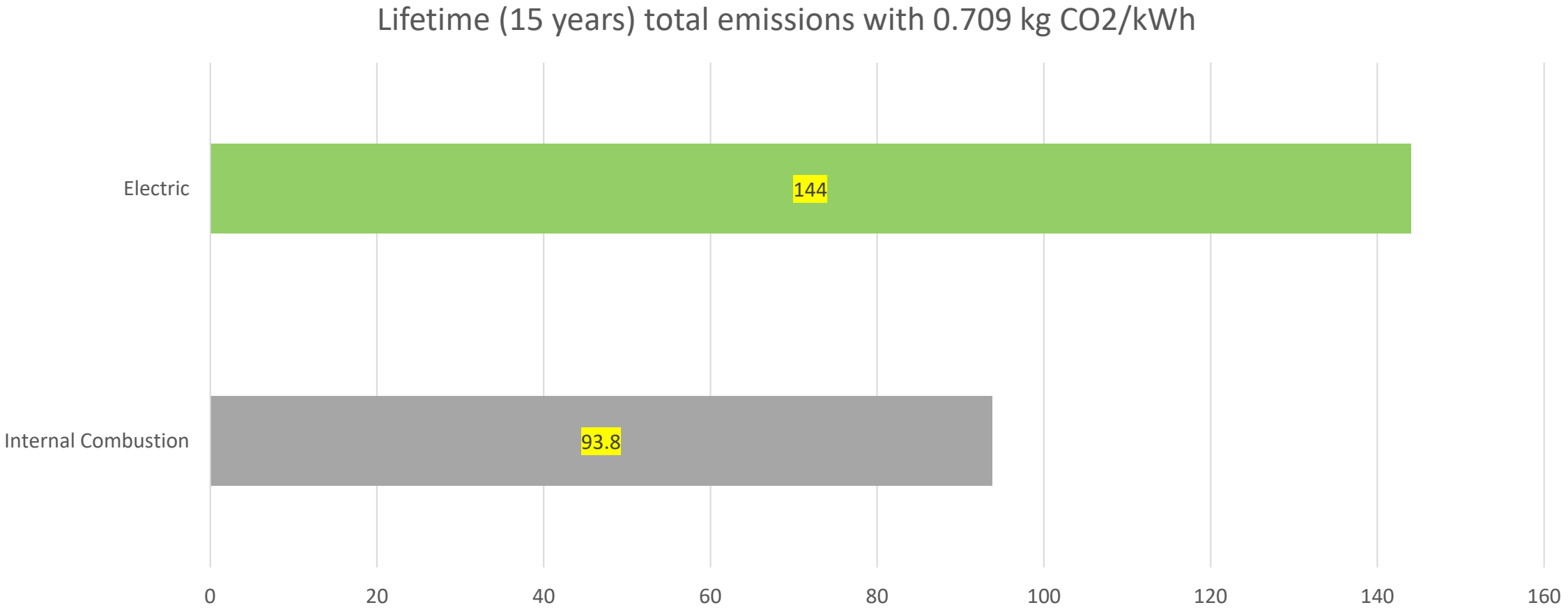
EMISSION FACTOR



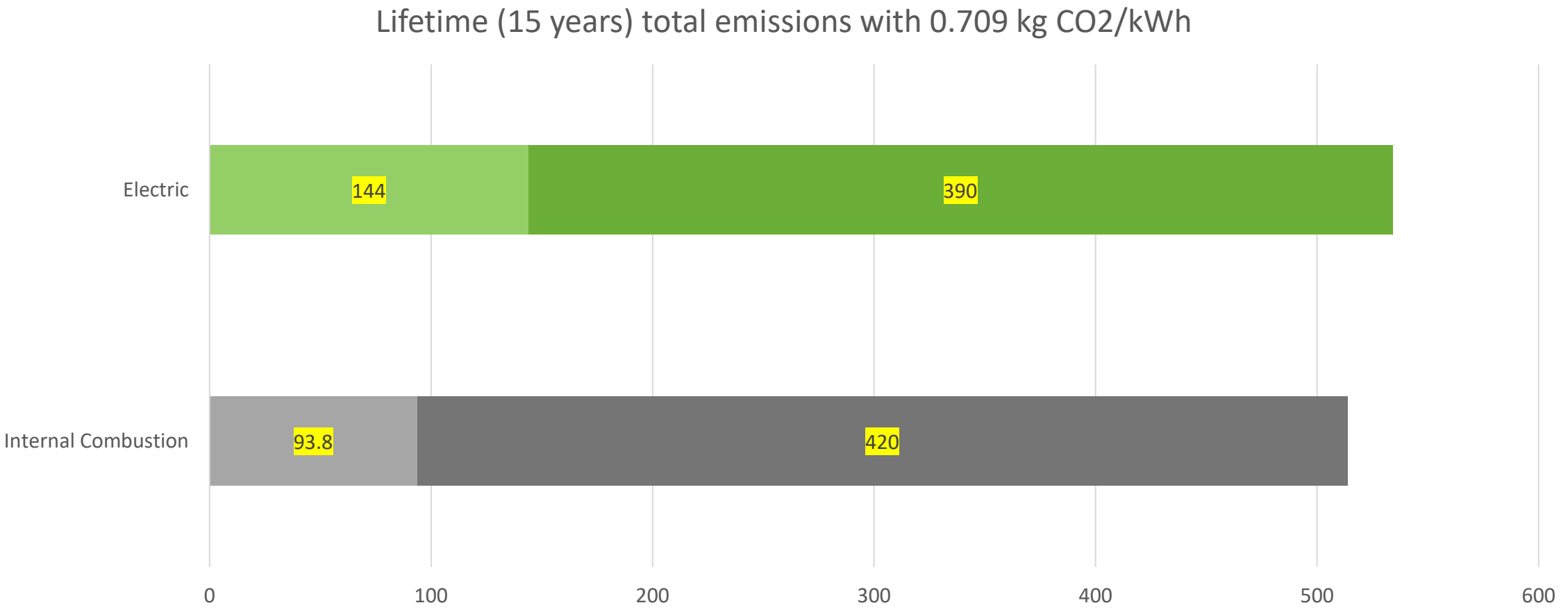
EMISSION FACTOR

- Airport Council International (ACI) - Airport Carbon Emissions Reporting Tool (ACERT)
  - Diesel emissions
  - Unit conversions
  - Emission Calculators

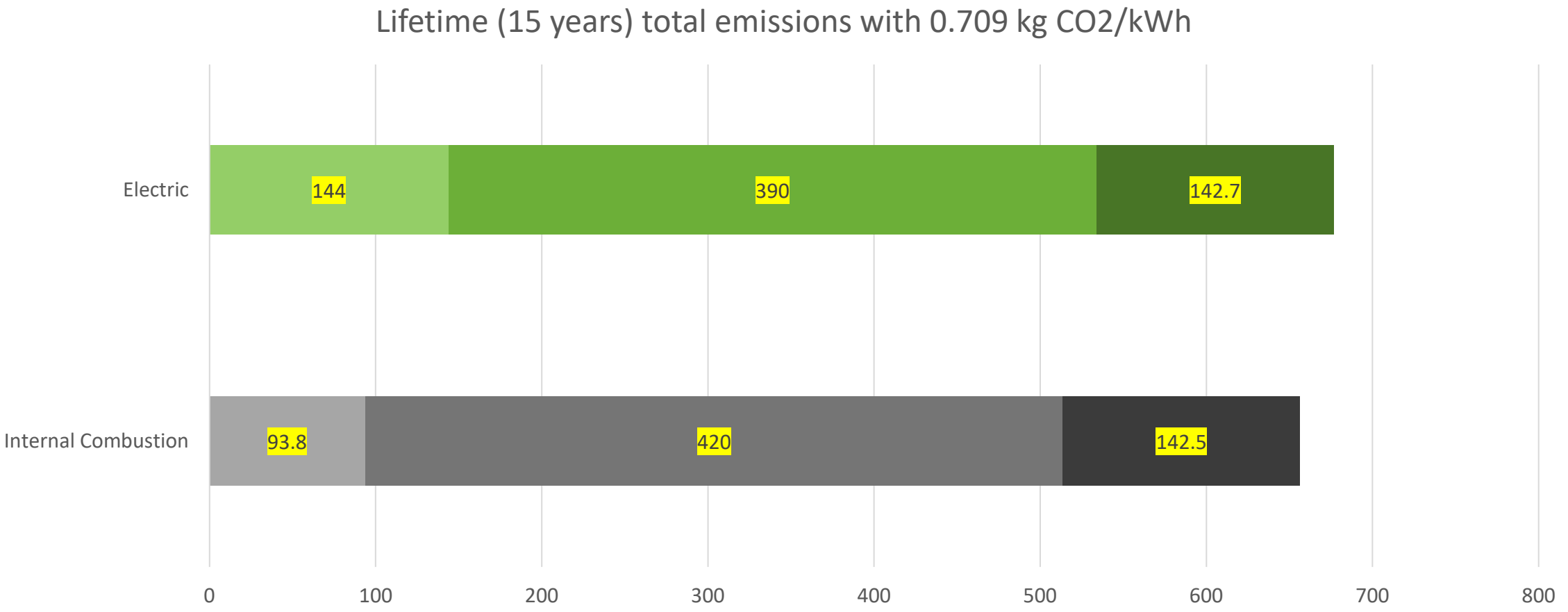
PRODUCTION


Lifetime (15 years) total emissions with 0.709 kg CO2/kWh
Electric
144
Internal Combustion
93.8
0
20
40
60
80
100
120
140
160

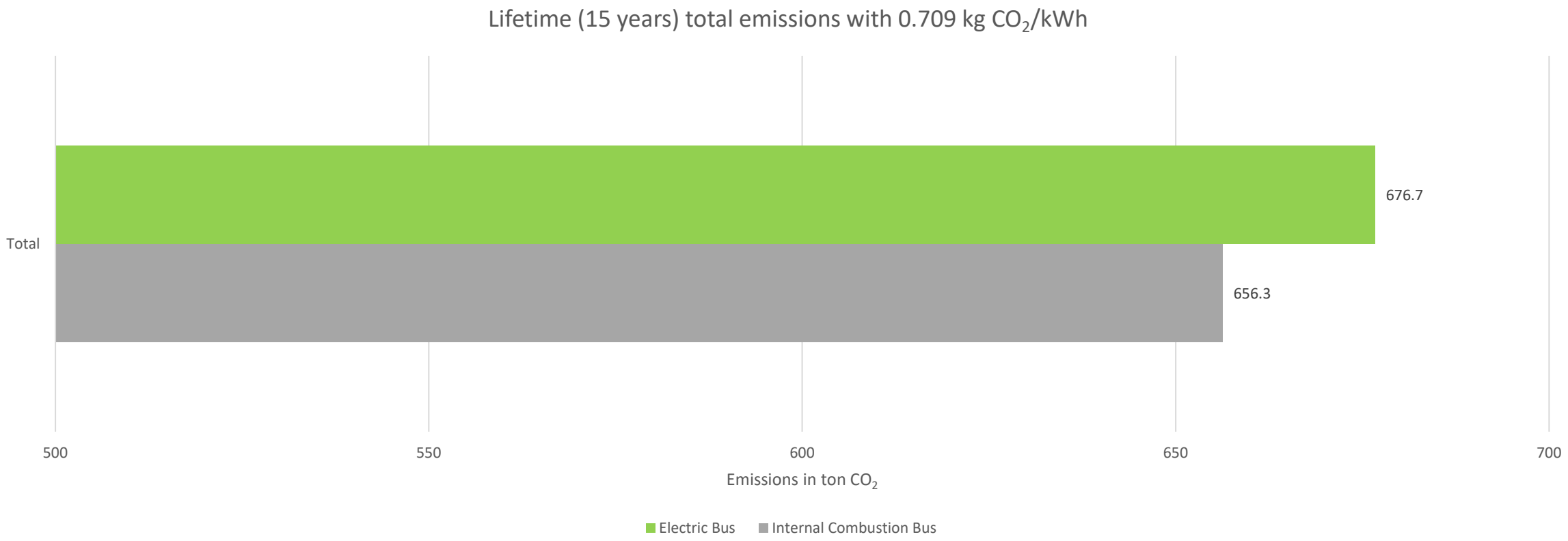
PRODUCTION + USE



PRODUCTION + USE + EOL



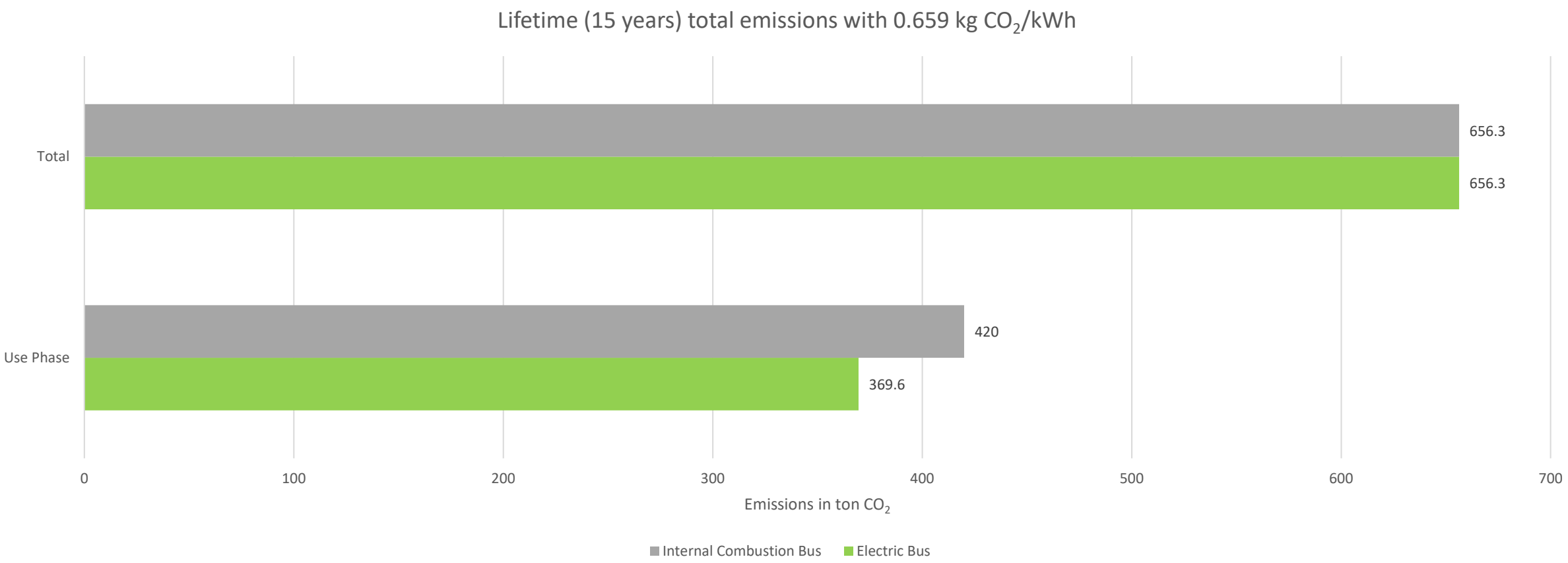
RESULTS AND ANALYSIS



BREAK EVEN POINT

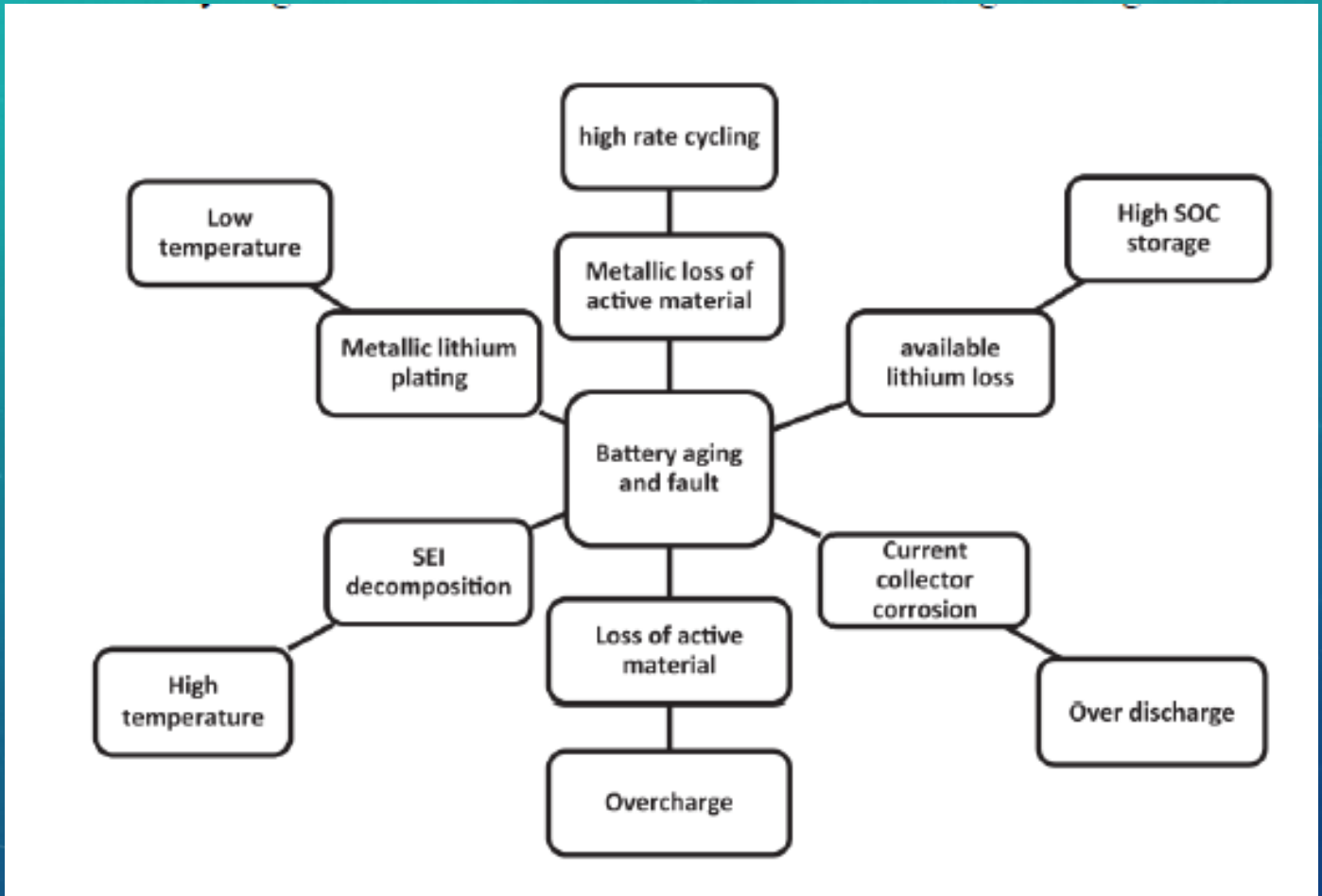
- Reach an emission factor of 0.659 kg CO_2/kWh
- 5 more Wind turbines of 15 MW are needed

RESULTS AND ANALYSIS – BREAK EVEN POINT



SWOT ANALYSIS

- S- Long term sustainability, economical resiliency & influence
- W – Many uncertainties and high fixed cost on imports
- O – Innovations in industry and island
- T – Changing policies, prices and environment



BATTERY MANAGEMENT

- High environmental impacts
  - Saltpeter & Humidity – Corrosion
  - High temperature – Overheating, Higher degeneration rate

RECOMMENDATIONS

- Centralized data management
- Expanded Life Cycle Assessments
- Supplier Collaboration
- Systems analysis – Utilities, GoA, DCCA
- Partnership with Arubus
- Climate Change Data Collection
- Battery management Focus

CONCLUSION

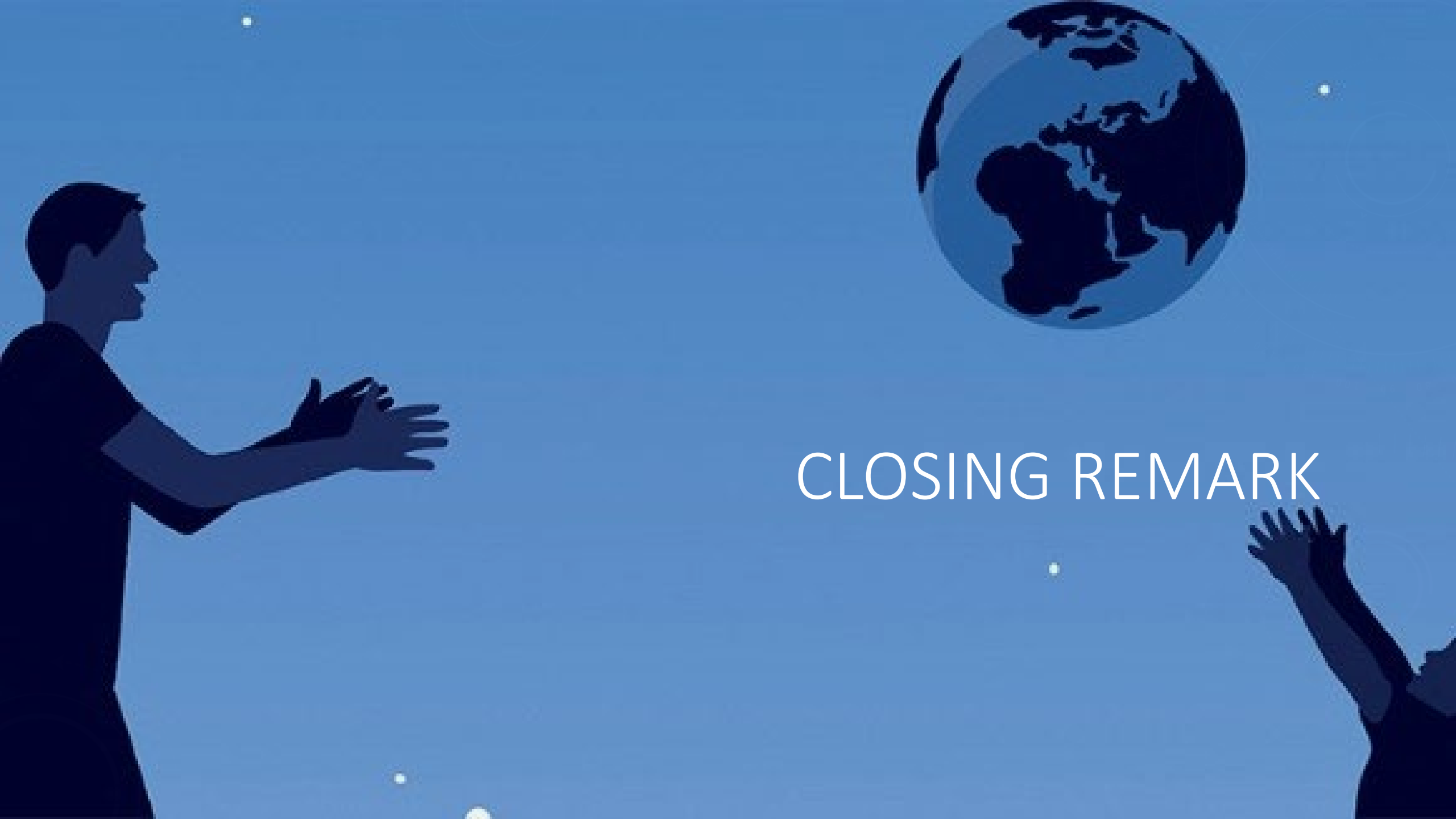
- Emission of the buses over the year 2021 is $28.1\ ton\ CO_2$. According to EPA.gov, this is 3.5 American homes' energy use for one year
- Electric Bus would have a higher impact regarding CO_2 with current emission factors
- To Reach 15-year break even point 5 more Wind turbines of 15 MW are needed
- AAA's economical influence could play a major role in R&D of the technology as a system's approach

IN RETROSPECT

- Transparency and Data is still a major stumbling block for research
- AAA could capitalize in developing valuable data that can be used by other external parties
- Aruba could shift from tourism towards investing in more skilled workforce in science & engineering starting in **Education**
- **We need critical thinkers & problem solvers for future crisis**
- Establish partnerships

CONCLUSION

- For Aruba Airport – Infrastructure and policies aren’t their… YET.
- Teamwork makes the dreamwork!



CLOSING REMARK


QUESTIONS AND
DISCUSSION

ACKNOWLEDGMENTS


THANK YOU

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