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Alternative Buses

QUICK SCIENCE REVIEW!

Environmental Impact

Environmental Breakdown

DIESEL

- Sulfur dioxide
- Carbon monoxide
- Solid carbon particulates
- Nitric oxide

PROPANE

- Related to natural gas

ELECTRIC

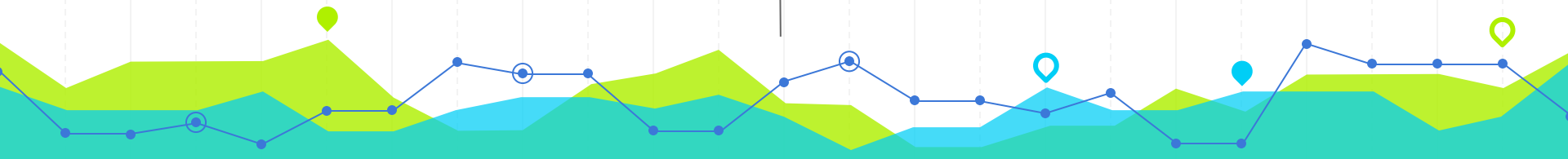
- Dependent on source of electricity

Diesel

Pros	Cons
• After extensive research, we have found environmental pros to diesel vehicles to be Non-Existent.	• CO_2 is greenhouse gas → climate change • Sulfur dioxide creates acid rain • Carbon monoxide interacts with other pollutants like methane, tropospheric ozone, & CO_2 ○ Presence can affect these concentrations • Contributes to ground level ozone, black carbon • Diesel vehicles →1/2 of all PM emissions

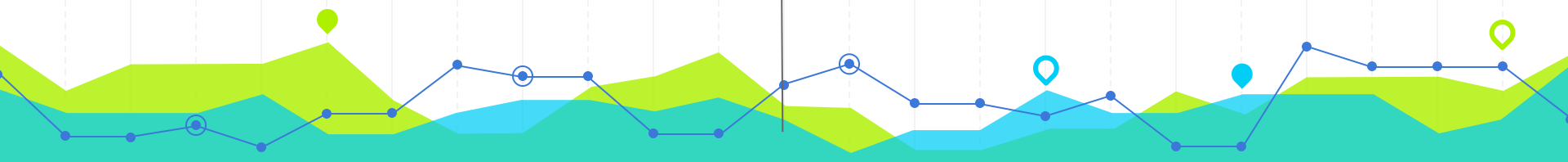
Propane

Pros	Cons
• Cleaner-burning fuel- reduce harmful emissions by 10% of conventional fuel • 60% less nitric oxide • 80% less smog producing hydrocarbons	• Combustion DOES produce wastes: PM, sulfur dioxide, nitrogen oxide, nitrous oxide, carbon monoxide, methane



Electric

Pros	Cons
• Doesn't even have exhaust system→ zero emissions from tail pipe • Factoring in mix grid charging, electric buses still only emit 1,078 g CO_2/mi	• Dependent on how electricity was generated



effect of acid rain in forests

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effect of acid rain on art & infrastructure

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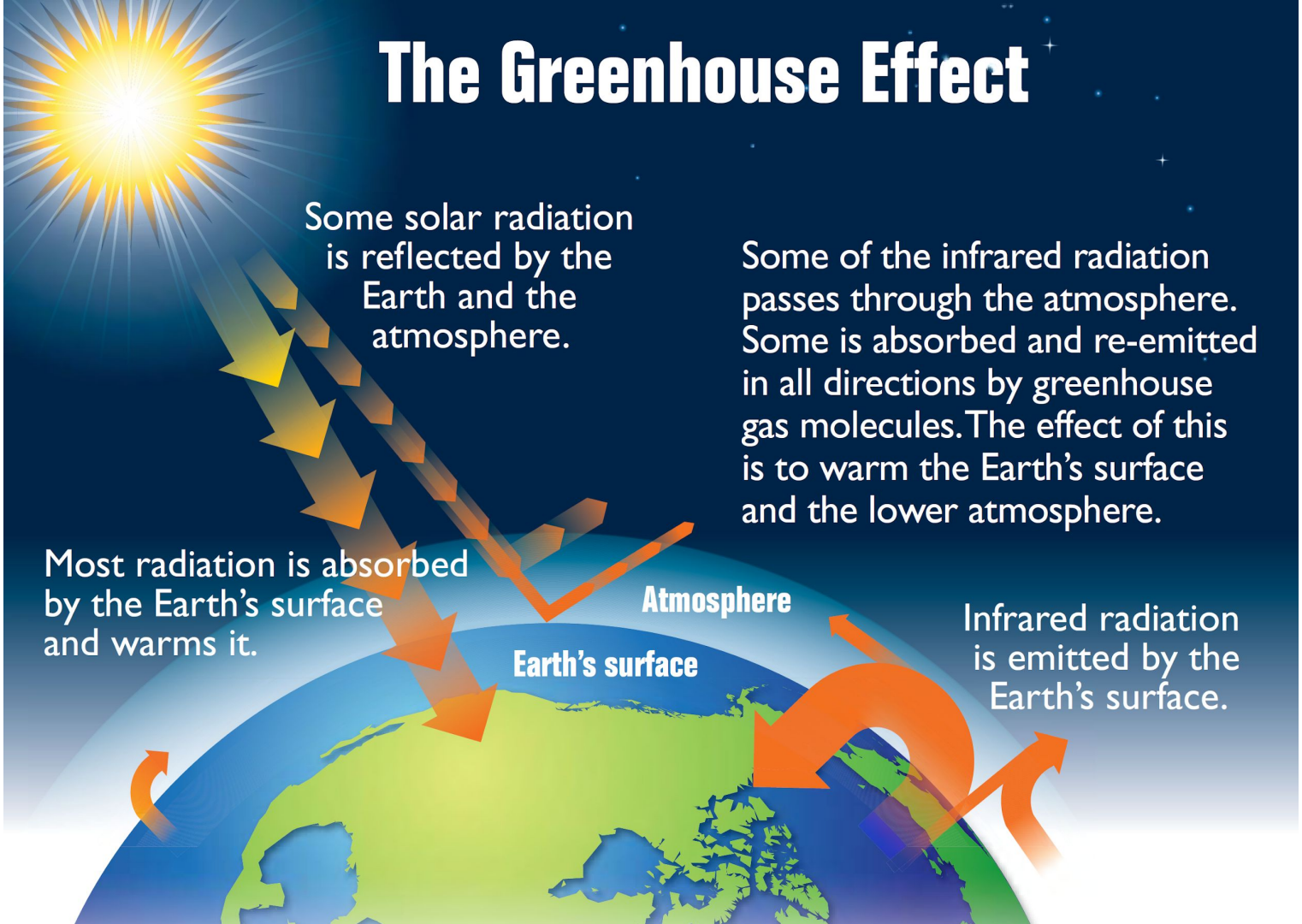

The Greenhouse Effect
Some solar radiation is reflected by the Earth and the atmosphere.
Some of the infrared radiation passes through the atmosphere. Some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the Earth's surface and the lower atmosphere.
Most radiation is absorbed by the Earth's surface and warms it.
Atmosphere
Earth's surface
Infrared radiation is emitted by the Earth's surface.


Safety

Diesel

Pros

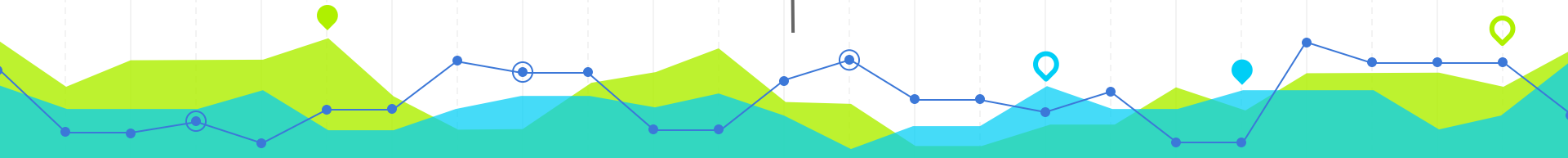
- Engines have more torque- run better and longer with heavy loads
- Because of various innovation within the diesel industry it is less harmful than it used to be

Cons

- Engine could explode
- Diesel exhaust contains 40 chemicals that are classified as “hazardous air pollutants” under the Clean Air Act
- Children may be especially susceptible to respiratory effects following exposure to particulate matter emitted from diesel engines

Propane

Pros	Cons
• No need to worry about spilling fuel in case of a malfunction • Fuel tank is 20x more puncture resistant • Quick connect nozzles- reduces emissions while fueling • Approved by the US government as a “green fuel” • Reliable cold-weather performance	• Easily flammable→ vital to check fuel line • Broken fuel tanks can be an explosion hazard • Propane, when extracted, produces carbon monoxide which is bad to breath in



Electric

Pros	Cons
• Reliable in cold weather • Zero emission of harmful chemicals • Electric engines run silently • No chance of explosion	• Still in development


Efficiency

Diesel

- The standard diesel bus cost around $300,000, which is cheaper than a propane or electric bus
- High maintenance
  - The older the bus, more frequent oil changes and filter replacements needed
  - Higher maintenance = higher cost
- Fuel efficiency: 4.82 miles per diesel gallon

Propane

- Widely available resource
- Less maintenance
  - Less oil needed for maintenance because propane burns clean, unlike diesel
  - No need for add on filters
- Less Expensive
  - Districts that transitioned to propane buses from diesel have reported savings of up to $0.37/mile
  - Can save up to $3500 annually per bus on fuel/maintenance
- 40% quieter than the typical diesel bus

Electric

- Buses can travel up to 120 miles on a single charge; taking 6-8 hours to fully charge
- Less maintenance
  - No need for engine oil changes, and no transmission or engine to maintain
- High upfront cost, but less expensive in the long run
  - electric transit buses cost around $200,000 more than diesel buses, lifetime fuel and maintenance savings of electric transit buses are around $400,000

Health

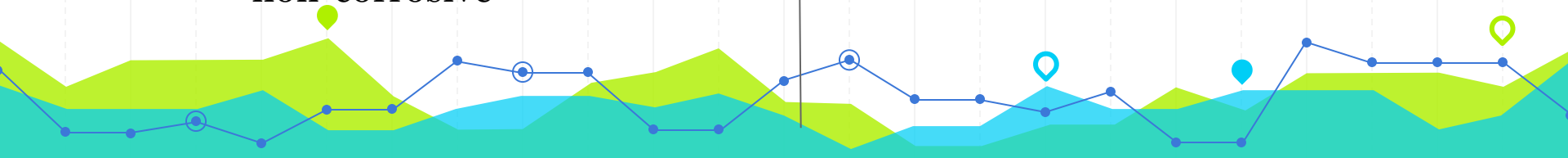
Diesel

Pros	Cons
• **After extensive research, we found zero benefits to health in using diesel powered vehicles.**	• Bc of C particles & toxic gases, EPA & CDC say diesel exhaust is a Group 1 carcinogen • Kids-most vulnerable- fast breathing rates & lungs not fully developed • Exhaust aggravate diseases- bronchitis, emphysema, asthma attacks, increase in pneumonia • Coalition for Clean Air & UCali (Berkeley)- levels of exhaust inside school bus→4x HIGHER than cars • Exhaust linked to higher rates of mortality

Exposure to diesel pollution contributes to 27,000 heart attacks, 14,500 hospitalizations, & 2.4 million lost work days per year

Propane

Pros	Cons
• Lower carbon composition → produces less PM & fewer GH emissions like nitrogen oxide→ improved lung function, improved respiratory function, less school absenteeism in asthmatic kids • Non-toxic, non-carcinogenic, non-corrosive	• Exposure to extremely high concentrations → dizziness, suffocation, cardiac arrest • Skin contact→frostbite



Electric

Pros	Cons
• Doesn't even have exhaust system→ zero emissions→Buses would not be a factor in respiratory, bronchial	• After extensive research, we have discovered that the health consequences for electric buses are in fact Non-Existent.

In Conclusion...

SOURCES

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