ARE ELECTRIC CARS WORSE FOR THE ENVIRONMENT?

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HOW CAN WE DETERMINE THIS?

- Compare the amount of pollution generated by using regular cars to the amount produced from electric cars
  - For regular cars I will measure the amount of Co2 emissions produced while driving and to make an average car
  - For electric cars I will measure the amount of C02 released when making the cars as well as when the car is charged
    - This will be harder to calculate due to many different form of providing electricity

HOW I WILL MEASURE

- Regular Car C02 emissions
  - Will use C02 emissions from the Toyota Rav4 hybrid (best selling car in 2021 so far)
    - Will drive 13,500 miles (average for American)
  - Emissions from production of car
- Electric Car CO2 emissions
  - Will use Tesla Model 3
  - Emissions from the power source used to charge car
    - Will drive 13,500 miles
  - Production emissions

TESLA RESULTS

- The production of a Tesla Model 3 produces approximately 15 tons of CO_2
- Standard full charge takes 50 kw of power and will last for about 263 miles before needing another charge
- According to the Energy Information Administration (EIA) average kw of electricity resulted in .92 lbs of CO_2 emissions
- Total of 2361 lbs of CO_2 emissions per year due to electricity
- With these numbers, a Tesla that is produced and then driven 13,500 miles will produce a total of approximately 32,361 lbs of CO_2 emissions

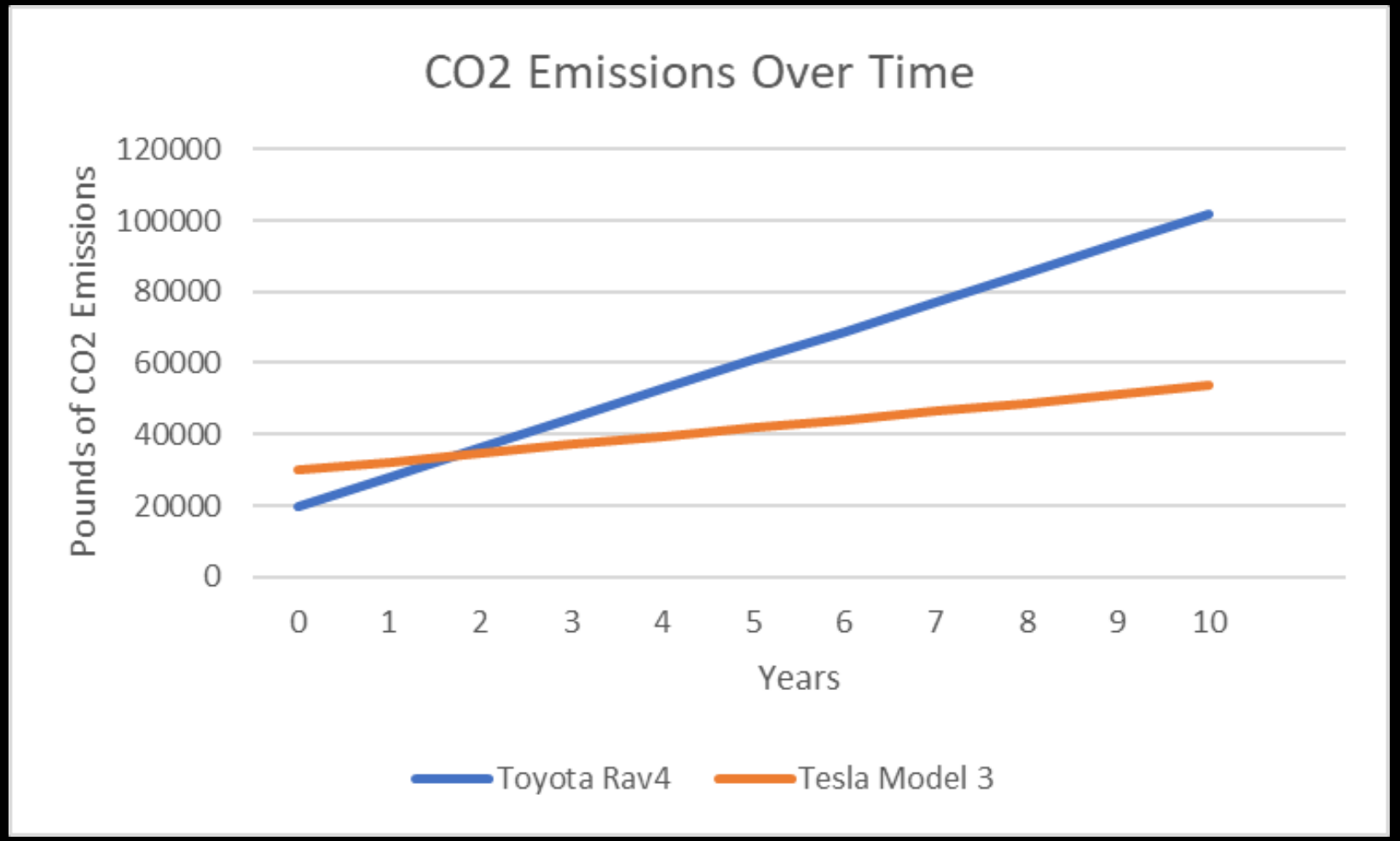
TOYOTA RESULTS

- The production of a Toyota Rav4 will produce approximately 10 tons of C02

- Rav4 gets an estimated 30 miles per gallon
- Emits 275 grams of c02 per mile (.6 lbs)
- For one year that totals 8185 lbs of CO2 emissions due to gas

- A Rav4 that is produced and is driven 13,500 miles will produce approximately 28,185 lbs of CO2 emissions

RESULTS


CO2 Emissions Over Time
Pounds of CO2 Emissions
120000
100000
80000
60000
40000
20000
0
0
1
2
3
4
5
6
7
8
9
10
Years
Toyota Rav4
Tesla Model 3

RESULTS

- Initially owning the Toyota Rav4 is more environmentally friendly
- Tesla produces less emissions per year after it is made
- Between year 1 and 2 of ownership the Tesla Model 3 is the better option

- Cars are usually bought to last a long time so Tesla Model 3 is better for the environment long term

ENVIRONMENTAL IMPACT OF BATTERIES

- It is well known that the production of batteries is not environmentally friendly and also produces a lot of waste when they are discarded
- Tesla designs batteries to last at least 20 years and even after that timeframe they can be used broken down and recycled
- 90% of the battery can be recycled and only the remaining 10% ends up in a landfills
- Currently Tesla is developing a battery that would be able to survive over one million miles on the road

INTERCHANGEABLE PARTS

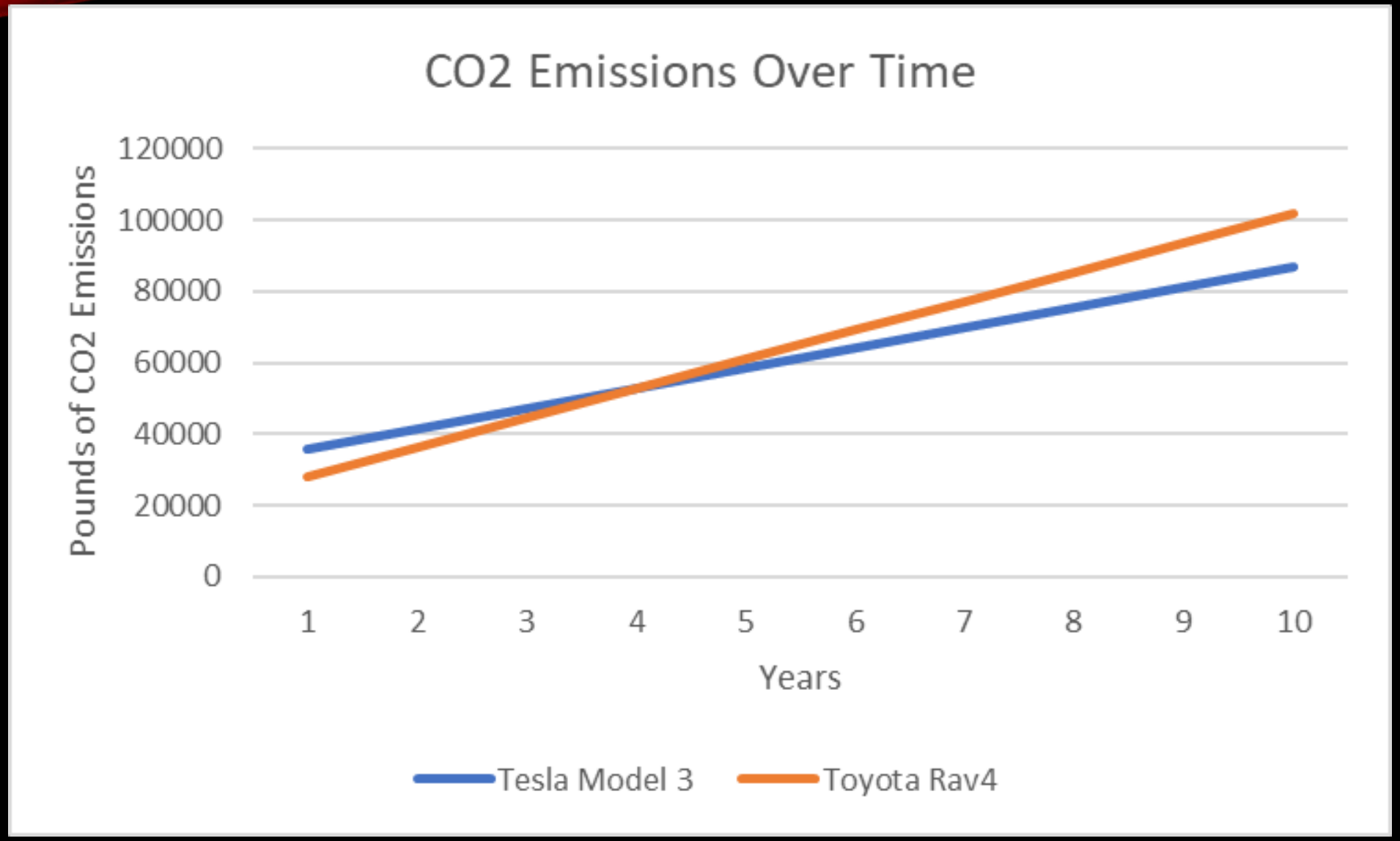
- Electric cars are more complex than gas powered cars and require different parts
- Due to this a wrecked or old Tesla will leave more waste because fewer cars can use any parts that can be scavenged
- If the battery is ever damaged it must be replaced which will cause more emissions that gas powered cars will not have to deal with

OTHER FACTORS TO CONSIDER

- The total CO2 emissions from producing electricity can very vastly from area to area
  - When produced with coal it emits 2.21 pounds per kw
  - Natural gas gives off .91 pounds per kw
  - Petroleum gives off 2.13 pounds per kw
- Other alternatives that you can use such as solar energy and wind energy
  - These lower the total emissions to as low as only .15 pounds of CO2 emissions/kw
- In some areas that rely heavily on coal or petroleum it may be worse for the environment to own an electric car

OTHER FACTORS TO CONSIDER CONT.

- As mentioned earlier, the source of electricity is a major factor in the amount of emissions that electric cars produce
  - The worst of the three most common sources is coal which emits 2.21 pounds of CO_2 per kw
  - If this is the only option for electricity in your area it greatly reduces how environmentally friendly an electric car would be in that area
- This would result in the total emission for the year increasing to approximately 5672 lbs of CO_2
  - Up from the average amount of 2361 lbs


CO2 Emissions Over Time
Pounds of CO2 Emissions
120000
100000
80000
60000
40000
20000
0
1
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3
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5
6
7
8
9
10
Years
Tesla Model 3
Toyota Rav4

RESULTS

- Using electricity that comes from coal leads to the Tesla taking almost four years to surpass the Rav4
- Even in this situation the Tesla is better long term
- Tesla battery is currently designed to last at least 300,000 miles which would be about 22 years at the average miles driven per year in the US
- Tesla is still the best long term option for being environmentally friendly

TOYOTA RAV4 PRIME

- Toyota developed a car that can run off of gas as well as electricity
- This gives users the option to pick what is best for the environment in their area
  - Could also do a combination of both
- Other car companies are looking to develop cars similar to this in the future

CONCLUSION

- Electric cars long term produce less CO2 emissions than gas powered cars and therefore are not worse for the environment
- How much better they are is dependent on the sources of the electricity needed to power them
- In the near future cars that can use gas as well as electricity will allow us to minimize their emissions and will be better for the environment
- “Are Electric Cars Worse For The Environment?” The answer is NO

SOURCES

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