Achieving the Paris Agreement Goals

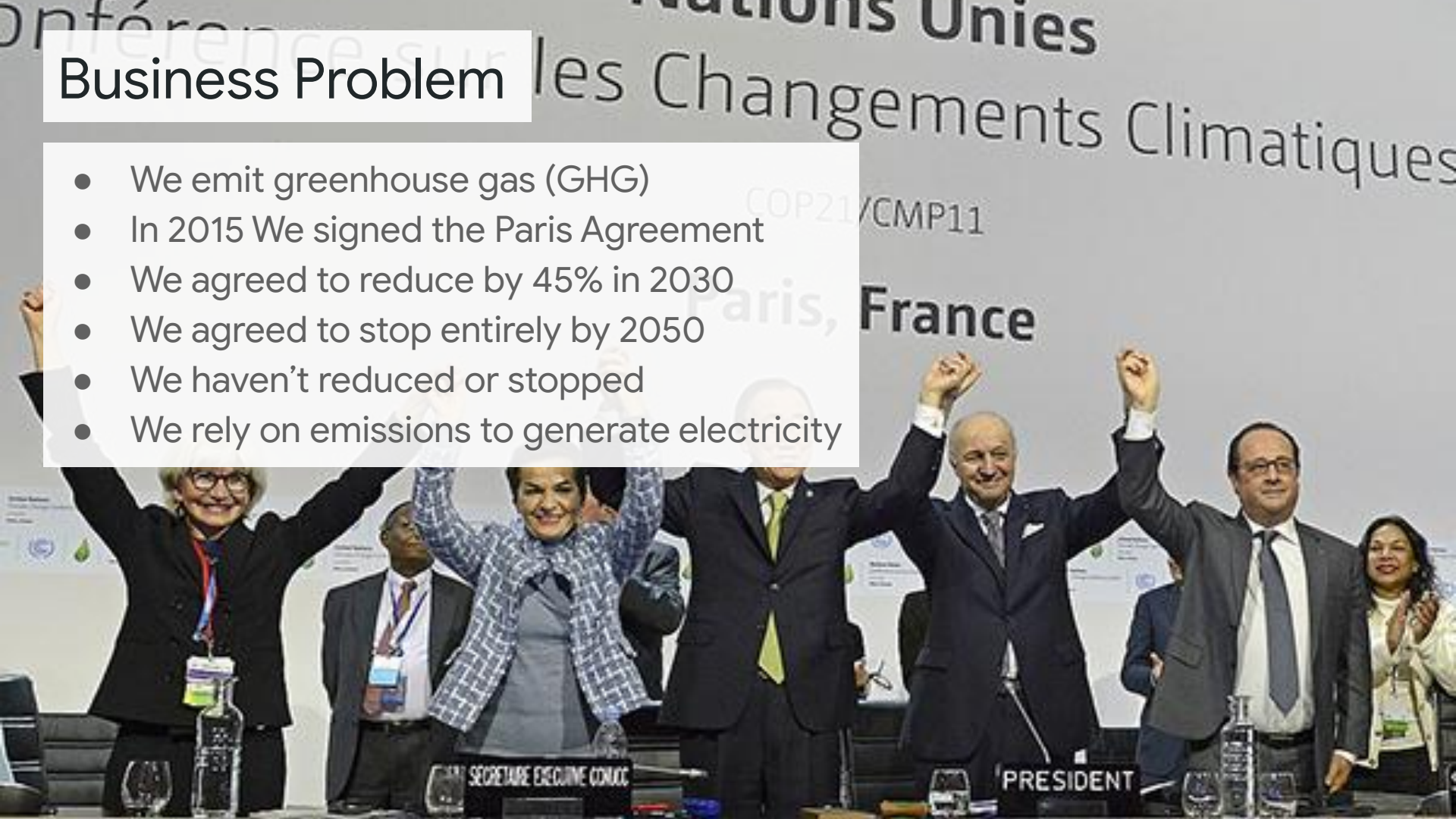
Projecting Energy Production Sources in the United States With Time Series Modeling

Summary

- The Environmental Protection Agency (EPA)
  - Seeks to reach the goals set by the IPCC.
- Osborne Analytics
  - Data Science firm of Greg Osborne, hired by the EPA.
- Business Problem
  - Meeting Paris Agreement Goals.
- Time Series Modeling
  - Analysis Projecting current energy production.
- Interpolate to Meet Paris Goals
  - Meeting demand while cutting GHG
- Increasing Renewable Power Sources
  - Production rates of renewables necessary to fill the deficit
- More Research Is Possible.
- Thank you

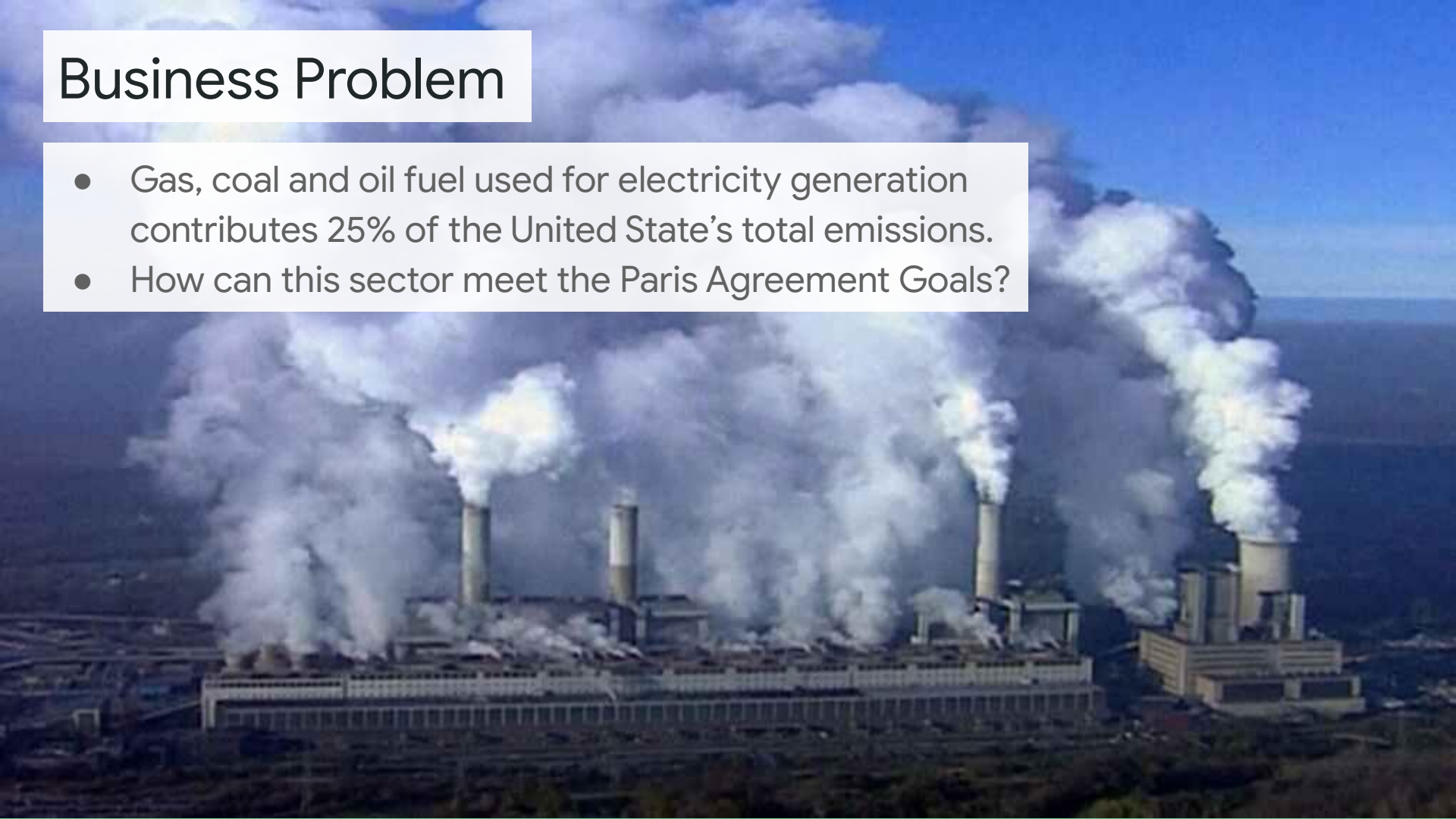
Business Problem

- We emit greenhouse gas (GHG)
- In 2015 We signed the Paris Agreement
- We agreed to reduce by 45% in 2030
- We agreed to stop entirely by 2050
- We haven't reduced or stopped
- We rely on emissions to generate electricity

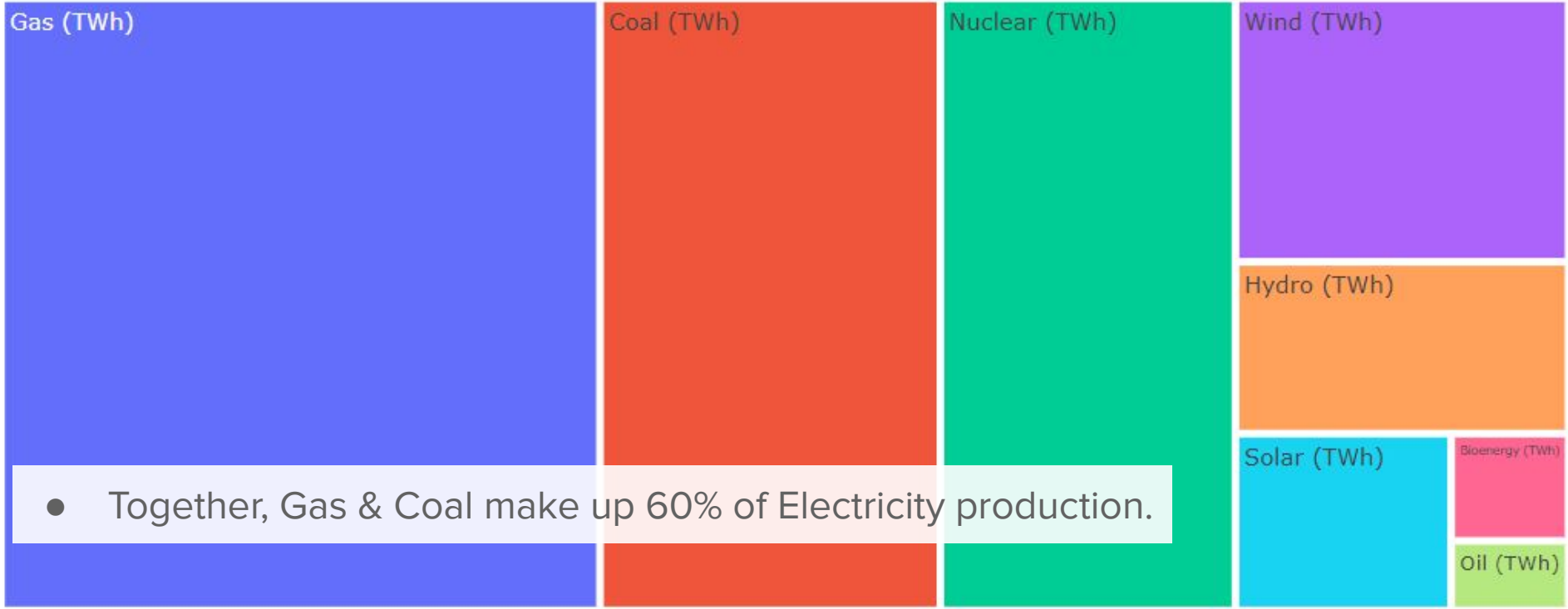


Business Problem

- Gas, coal and oil fuel used for electricity generation contributes 25% of the United State's total emissions.
- How can this sector meet the Paris Agreement Goals?



Current USA Electricity Production Distribution
Each Box Represents Percentage of Total KWh

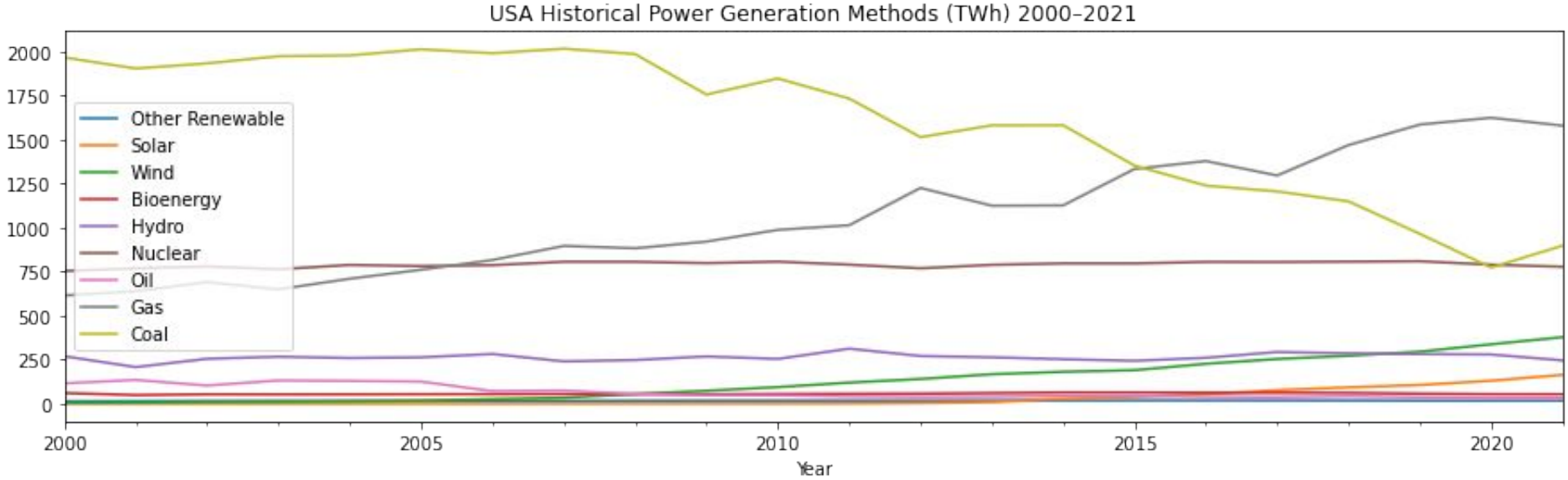


- Together, Gas & Coal make up 60% of Electricity production.

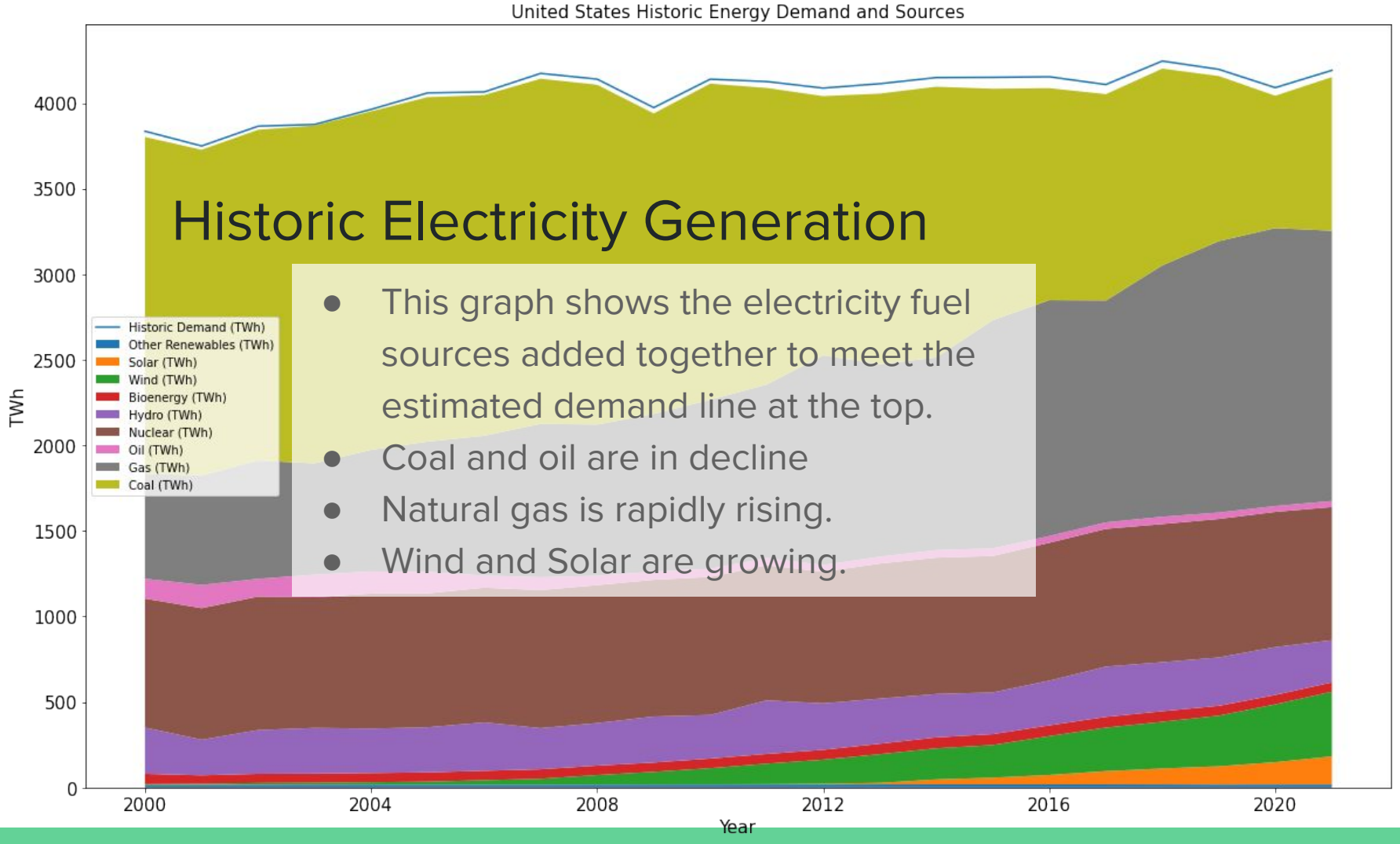
Time Series Analysis

- Time Series analysis can model linear trends, and predict the future.
- The tool can predict future electricity generation fuel sources.
- With this, the EPA can see if predicted trends will achieve the Paris targets.
- The EPA can adjust US policy to achieve the Paris goals.

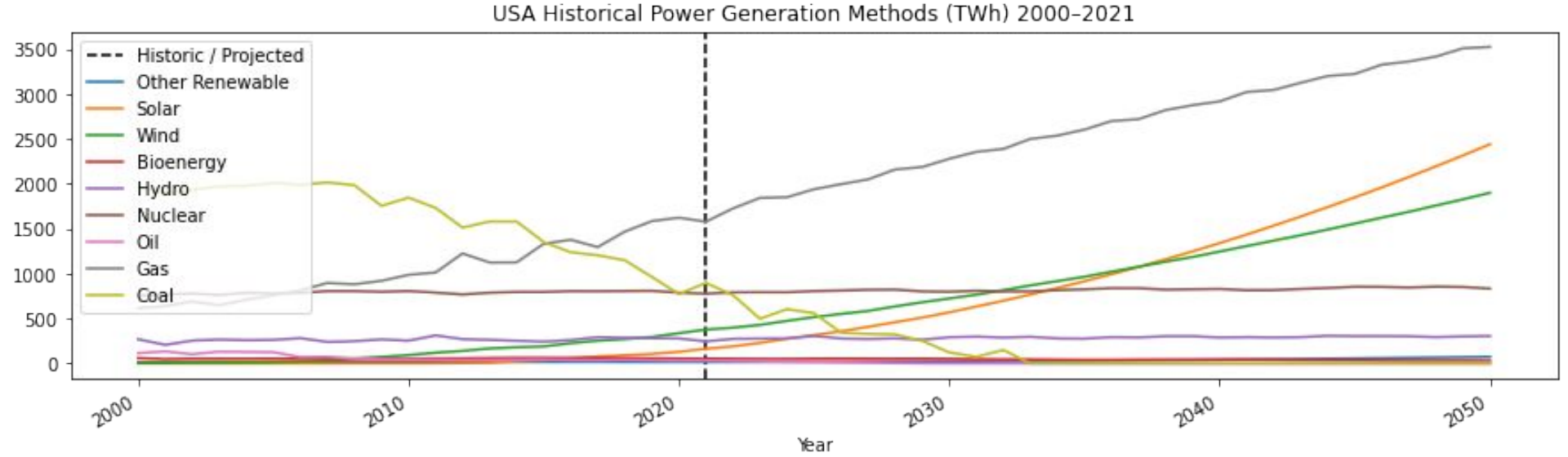
Historic Electricity Generation



- The US uses nine fuel sources for electricity generation.
- GHG emitting Fossil fuels sources include coal, natural gas, and oil.


United States Historic Energy Demand and Sources
Historic Electricity Generation
This graph shows the electricity fuel sources added together to meet the estimated demand line at the top.
Coal and oil are in decline
Natural gas is rapidly rising.
Wind and Solar are growing.
Historic Demand (TWh)
Other Renewables (TWh)
Solar (TWh)
Wind (TWh)
Bioenergy (TWh)
Hydro (TWh)
Nuclear (TWh)
Oil (TWh)
Gas (TWh)
Coal (TWh)
TWh
0
500
1000
1500
2000
2500
3000
3500
4000
2000
2004
2008
2012
2016
2020
Year

Model Results: Electricity Generation Trends



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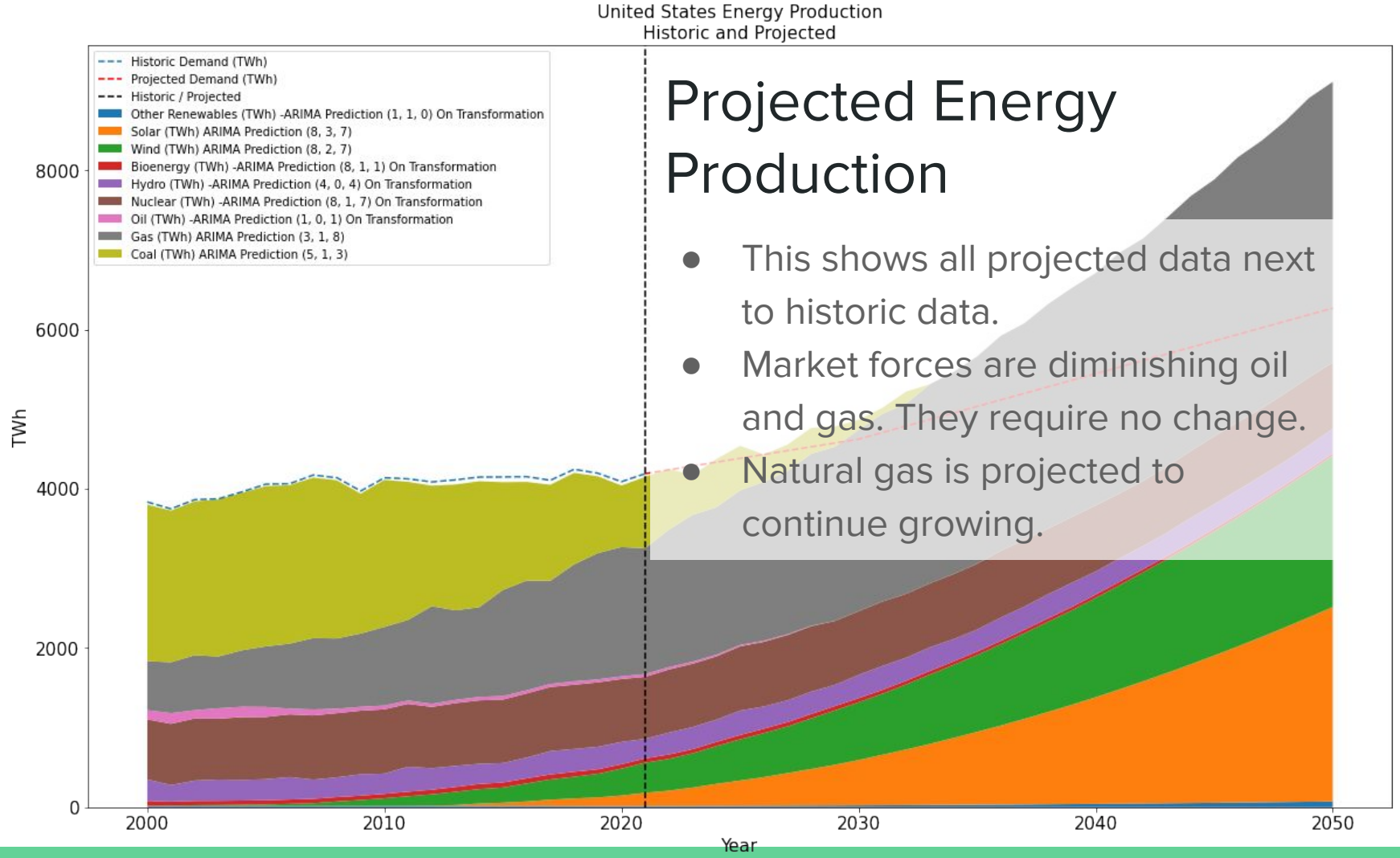
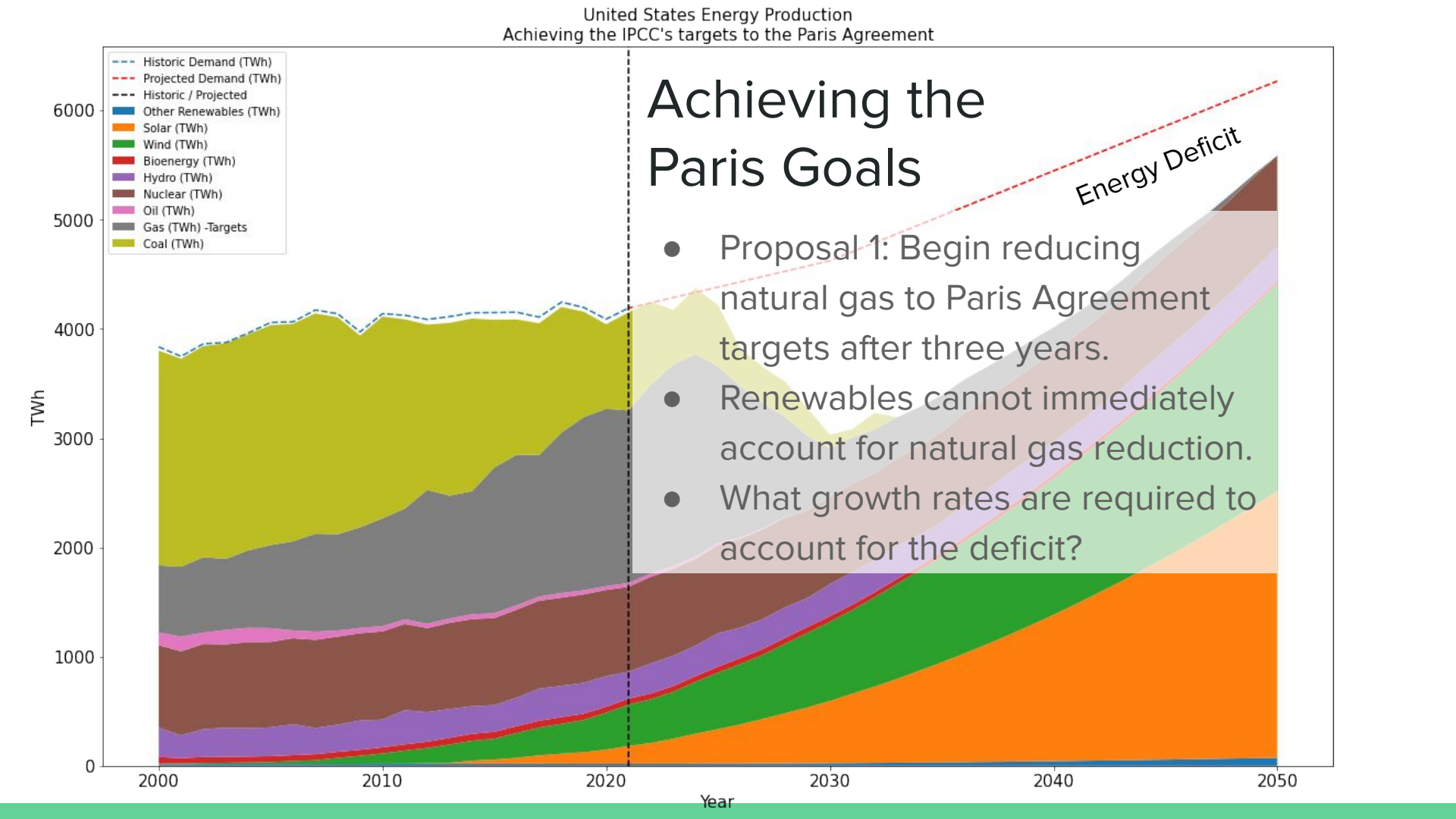
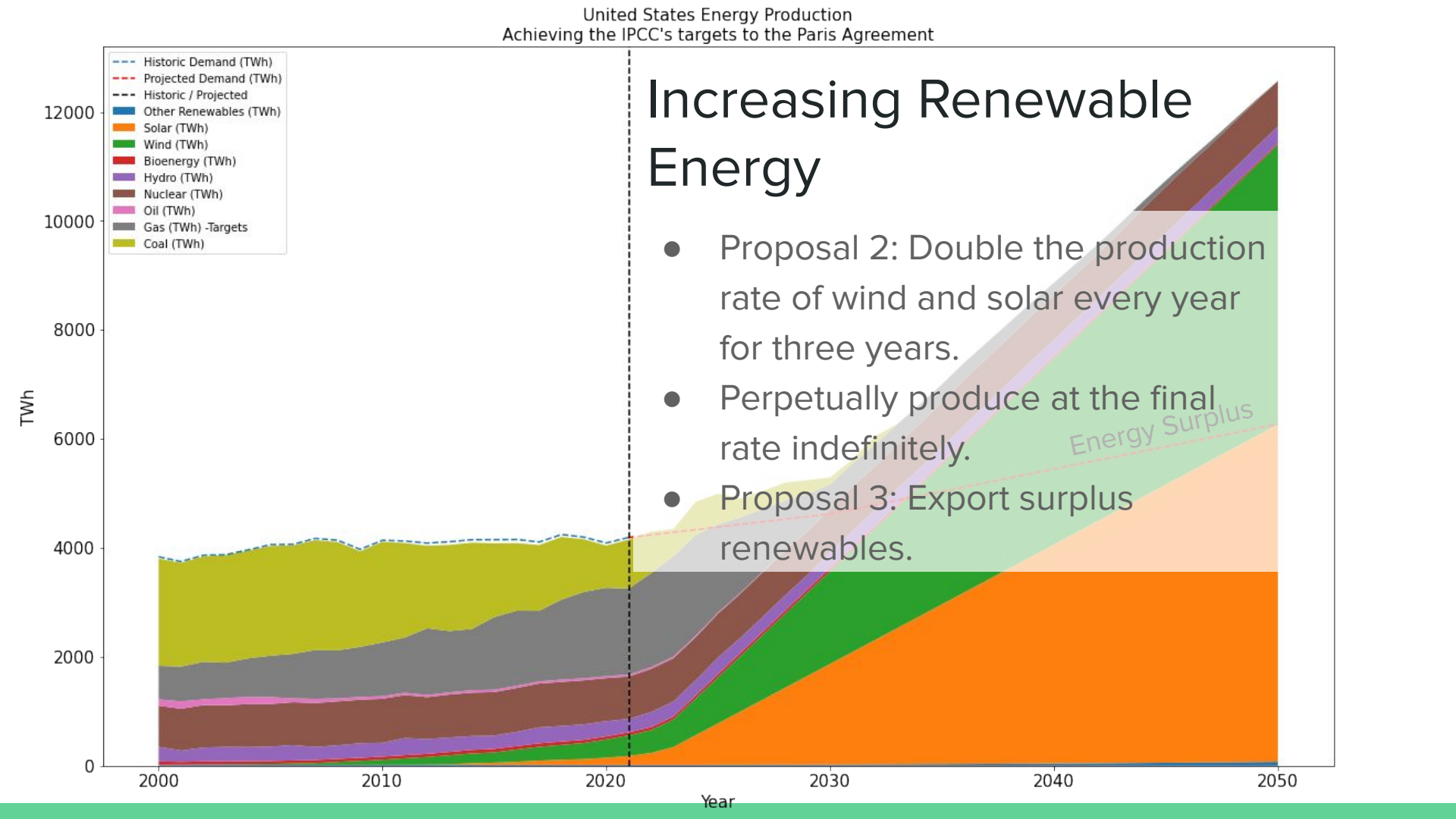


Projected Energy Production

- This shows all projected data next to historic data.
- Market forces are diminishing oil and gas. They require no change.
- Natural gas is projected to continue growing.


United States Energy Production
Achieving the IPCC's targets to the Paris Agreement
Historic Demand (TWh)
Projected Demand (TWh)
Historic / Projected
Other Renewables (TWh)
Solar (TWh)
Wind (TWh)
Bioenergy (TWh)
Hydro (TWh)
Nuclear (TWh)
Oil (TWh)
Gas (TWh) -Targets
Coal (TWh)
TWh
Year
0
1000
2000
3000
4000
5000
6000
2000
2010
2020
2030
2040
2050
Achieving the Paris Goals
Energy Deficit
Proposal 1: Begin reducing natural gas to Paris Agreement targets after three years.
Renewables cannot immediately account for natural gas reduction.
What growth rates are required to account for the deficit?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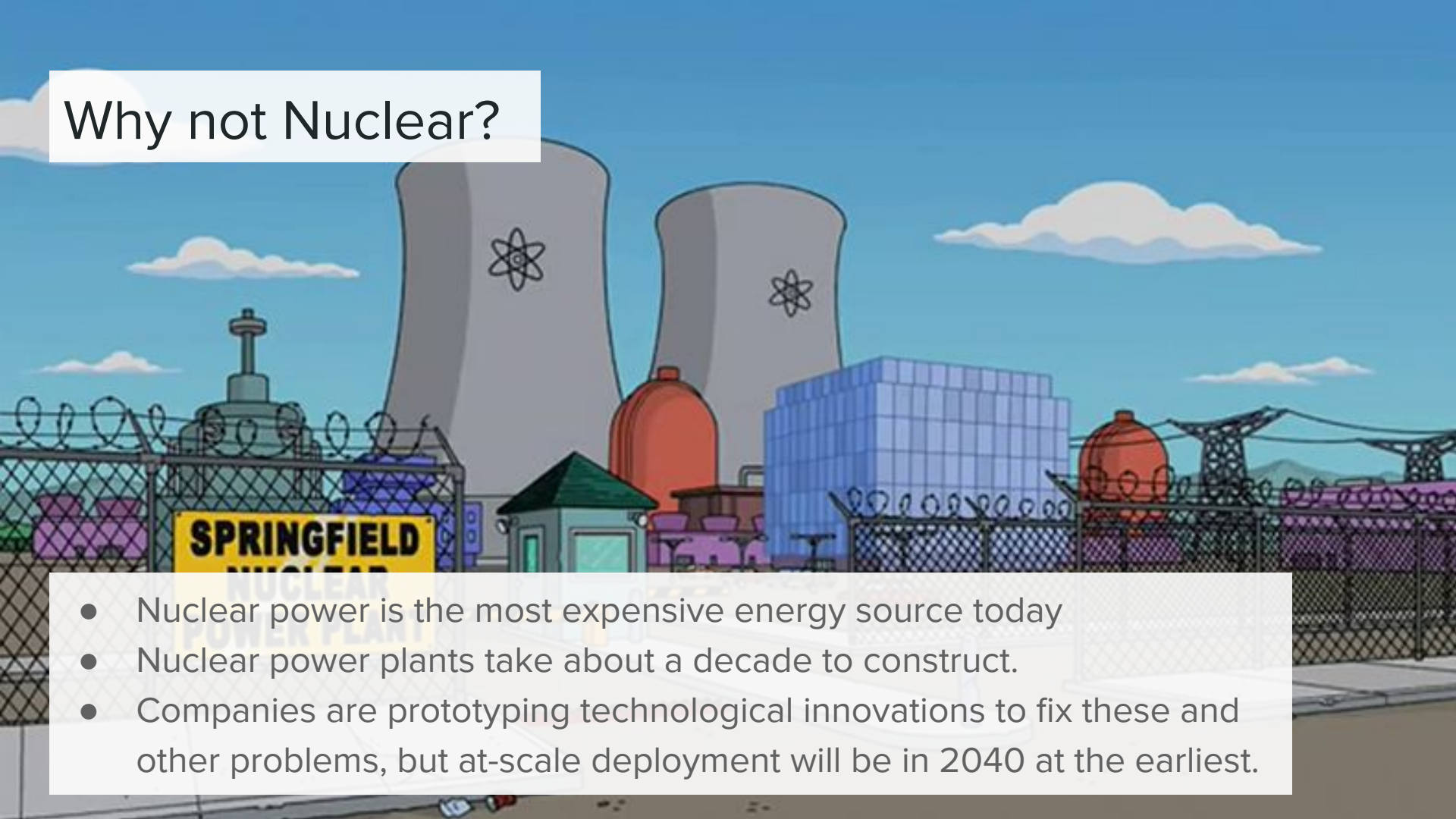
Nuclear (TWh)
Oil (TWh)
Gas (TWh) -Targets
Coal (TWh)
TWh
0
2000
4000
6000
8000
10000
12000
2000
2010
2020
2030
2040
2050
Year
Increasing Renewable Energy
Proposal 2: Double the production rate of wind and solar every year for three years.
Perpetually produce at the final rate indefinitely.
Proposal 3: Export surplus renewables.
Energy Surplus

Why not Nuclear?



- Nuclear power is the most expensive energy source today
- Nuclear power plants take about a decade to construct.
- Companies are prototyping technological innovations to fix these and other problems, but at-scale deployment will be in 2040 at the earliest.

Next Steps: More Research

- Analyze all countries.
- Correlate temperature with the proposed fuel source reductions.
- Add 2022 data.
- Analyze Primary Fuel Extraction from the Earth.
- Analyze power line transmission losses

Thank You!

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