Pacts Process Book

Team Name: Green Horizon

Team Leader: Jonathan Collins, joncollins@gatech.edu

Team Members:

Will Shaw, wshaw31@gatech.edu

Jessie Rigsbee, jrigsbee3@gatech.edu

Nicolas Miranda, nmiranda3@gatech.edu

Team Agreement

- We will distribute our workloads for project design, storyboarding, coding, etc. as evenly as possible.
- All code that we write should be well-documented and self-explaining, or otherwise explained with a document, so that we can understand and provide feedback for each other's work.
- We will make all major story, design, and coding decisions collaboratively in regular meetings (not needed for smaller decisions).
- We will use GitHub to document major progress in the coding portion of our project.
- The primary channel of communication will be our text message group chat.
- To ensure we do not miss each others' messages, we will check our texts at least once every day – including over holidays or other absences – and try to respond to any questions within the same calendar day. Answering all questions immediately is not needed – just an acknowledgement that we are working on an answer to the question/solution to a coding or design or other problem.
- The primary method of file sharing will be our shared OneDrive folder.
- We will have weekly virtual meetings (over Zoom or Teams) to update each other on our progress or make major decisions. This schedule should only change for holidays or weeks that we mutually agree (at least 3 / 4 members) that we cannot make the meeting. Apart from holidays, we will try to reschedule the meeting instead of cancelling it for the week.
- Any lack of communication or lack of progress by a team member should be brought up in these meetings. That said, inquiries about progress should not be accusational and should be supportive as a default (though this should change for a deliberately slacking team member).

Signatures

- By typing our names and the date below, we agree to this agreement:

Name	*Date*
Jonathan Collins	8/28/2025
Nicolas Miranda	8/28/2025
Jessie Rigsbee	8/29/2025
William Shaw	8/29/2025

Project Proposal

Illuminating the Energy Transition: A Global Dashboard on Renewable Power Growth (2010–2025)

Abstract

To mitigate the rise of environmental damage, nations are looking towards sustainable development as a way to encourage better environmental, social, and economic practices. In this push for sustainability, renewable energy sources have become the foundation for the environmental pillar of development [1]. Our project aims to further evaluate the global adoption of renewable energy technologies between 2010 and 2025. An interactive data visualization dashboard will be created to highlight dataset trends collected from the World Resource Institute (WRI) and energydata.info. Our analysis will focus on hydroelectric, wind, and solar power production in different regions of the globe. Through the consolidation, aggregation and cleansing of raw datasets we plan to display a comprehensive picture on the state of renewable energy. Our visualization model will leverage Tableau to display analytical results on renewable power usage across countries, income groups, and geographic regions.

Using our visualization, we aim to formulate key insights on energy transformation. This will be done through the identification of regions with the fastest renewable energy adoption as well as calculated rates of adoption in countries with varying economic statuses. In addition, we plan to explore patterns as they relate to global climate policies and initiatives. This dashboard will show changes within the energy sector and highlight global diversity in adoption. Our team objective is to provide transparency about sustainability practices and the impacts of global events on renewable energy.

[1] https://www.sciencedirect.com/science/article/abs/pii/S1364032199000118

Data Sources

World Resource Institute: global powerplants

Mapping

Data Collection and Project Plan

Audience Options: general public, utility companies, government employees (department of energy)

Target Audience: general public – those looking to stay informed about renewable energy trends.

What do they know: The general public is aware of different energy source options definition. Such as solar power drawing energy from the sun, hydroelectric drawing power from rivers, etc. We do not want to assume the public knows anything beyond the basics; they might not know what good locations for renewable energy plants are or what limitations each source has. They also might not know/might disagree with renewable energy sources being better than non-renewable ones.

What are their interests: Individuals will want to know how they are affected by changes in energy trends. The public will want to know if their energy costs are going to increase, if their residence can be supported by renewable energy, and if public policy is pushing for renewable energy adoption.

What visualization literacy do they have: We can anticipate that the general public will be able to read and understand simpler visualizations like bar charts and scatter plots with trends, at the very least. More complicated visualizations might have to include some sort of explanation with deeper context about what is being shown.

At what level of detail will you present information to them: We plan to present information to the audience at a high level and will not dive too deeply into technical metrics or language (without plain-language definitions). By keeping the details at a high level, we hope to inform the audience of general trends and provide them with information to enable them to be more informed on the energy sector as a whole.

Questions:

1. How have government incentive programs affected the adoption of renewable energy
2. What countries are leading the adoption of renewable energy sources?
3. What percentage of electricity generation comes from renewables?
4. Why is renewable energy beneficial enough to adopt over non-renewables?
    a. Look at renewable energy proportions vs. cost of electricity or carbon emissions, plot it against vars people care about

5. How has the adoption of renewable energy sources changed over the last few years?
6. How have data centers increased/decreased renewable energy increases/proportions?
    a. We are still working on a visualization for this one. Our visualization might have to focus on a specific region's datacenters. (Virginia or Arizonia)
7. Are there any other variables/landmark events that correlate with renewable energy increases/decreases?
8. Where are renewable energy plants located by country (and by type of renewable)
9. What is the share of primary fuel sources among power plants?
10. What is the most used energy type in each country?
11. What countries have the greatest number of power plants?
12. Which countries produce the most power?
13. What has the adoption of renewables looked like specifically for the 3 countries with the highest energy production *from all sources*? (China, US, and India)
14. What has the adoption of renewables looked like for the 3 countries with the highest energy production *from renewables*/highest proportion of total energy from renewables? (not sure)
    a. Interesting contrast between the two questions above
15. How has an increase in renewable energy related to pollution (carbon emissions, sulfur dioxide, etc.)?

Available Data and Descriptions:

global powerplants - A global list of all power plants. This includes both renewable and non-renewable energy. The dataset covers 30,000 power plants across 164 countries.

Attribute	Data Type
country	Text (categorical)
country_long	Text (categorical)
name	Text (categorical)
gppd_idnr	Text (categorical)
capacity_mw	Number (quantitative)
latitude	Number (quantitative)
longitude	Number (quantitative)
primary_fuel	Text (categorical)
other_fuel1	Text (categorical)
other_fuel2	Text (categorical)
other_fuel3	Text (categorical)

commissioning_year	Number (ordinal)
owner	Text (categorical)
source	Text (categorical)
url	Text (categorical)
geolocation_source	Text (categorical)
wepp_id	Text (categorical)
year_of_capacity_data	Number (ordinal)
generation_gwh_2013	Number (quantitative)
generation_gwh_2014	Number (quantitative)
generation_gwh_2015	Number (quantitative)
generation_gwh_2016	Number (quantitative)
generation_gwh_2017	Number (quantitative)
generation_gwh_2018	Number (quantitative)
generation_gwh_2019	Number (quantitative)
generation_data_source	Text (categorical)
estimated_generation_gwh_2013	Number (quantitative)
estimated_generation_gwh_2014	Number (quantitative)
estimated_generation_gwh_2015	Number (quantitative)
estimated_generation_gwh_2016	Number (quantitative)
estimated_generation_gwh_2017	Number (quantitative)
estimated_generation_note_2013	Text (categorical)
estimated_generation_note_2014	Text (categorical)
estimated_generation_note_2015	Text (categorical)
estimated_generation_note_2016	Text (categorical)
estimated_generation_note_2017	Text (categorical)

renweable energy in the US wikipedia - good starting point for information and major events in US renewable energy

Renewable energy statistics - public Investments by country/area, technology and year

Attribute	**Data Type**
Region	String (categorical)
Sub-region	String (categorical)
Country	String (categorical)
ISO3 code	String (categorical)
M49 code	Number (quantitative?)
RE or Non-RE	String (categorical)
Group Technology	String (categorical)
Technology	String (categorical)
Sub-Technology	String (categorical)
Producer Type	String (categorical)
Year	Number (quantitative/ordinal)

Electricity Generation	Number (quantitative)
Electricity Installed Capacity	Number (quantitative)
Heat Generation	Number (quantitative)
Public Flows	Number (quantitative)
SDG. 7a1 Intl. Public Flows	Number (quantitative)
SDG 7b1 RE capacity per capita	Number (quantitative)

Local Government Renewables Action Tracker

Attribute	**Data Type**
Buyer Name	Categorical
State	Categorical
City Latitude	Quantitative
City Longitude	Quantitative
ISO or FERC Region	Categorical
Announcement Year (or Operations Year if Announcement Year unavailable)	Ordinal
Technology	Categorical
Transaction Type	Categorical
Size of Purchase (MW)	Quantitative
DC/AC	Categorical
Contract Length (Years)	Quantitative
Energy Price in Year 1 ($/MWh)	Quantitative

Data Cleansing:

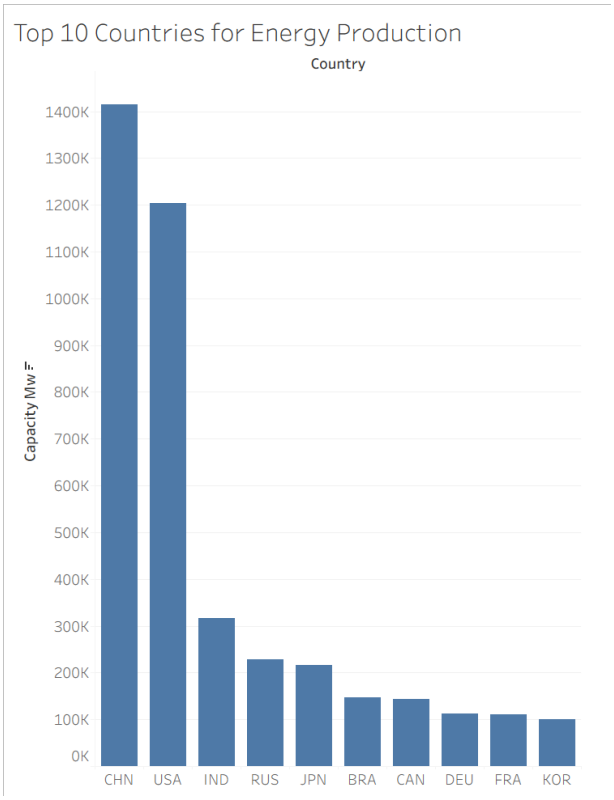
Global Power Plants – no data cleansing required.

Renewable Energy – no data cleansing required.

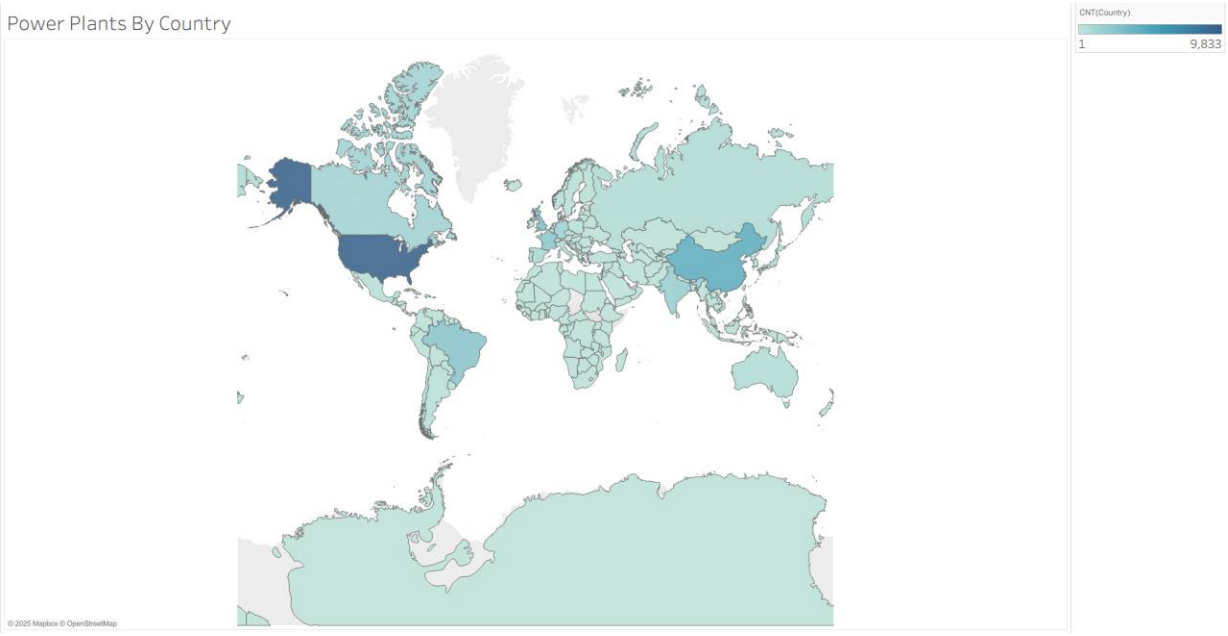
Energy Consumption – Some geographic locations are improperly named. (Some data cleansing)

Local Government Renewables Tracker – Some dates are not represented correctly when importing into Tableau; minor corrections required

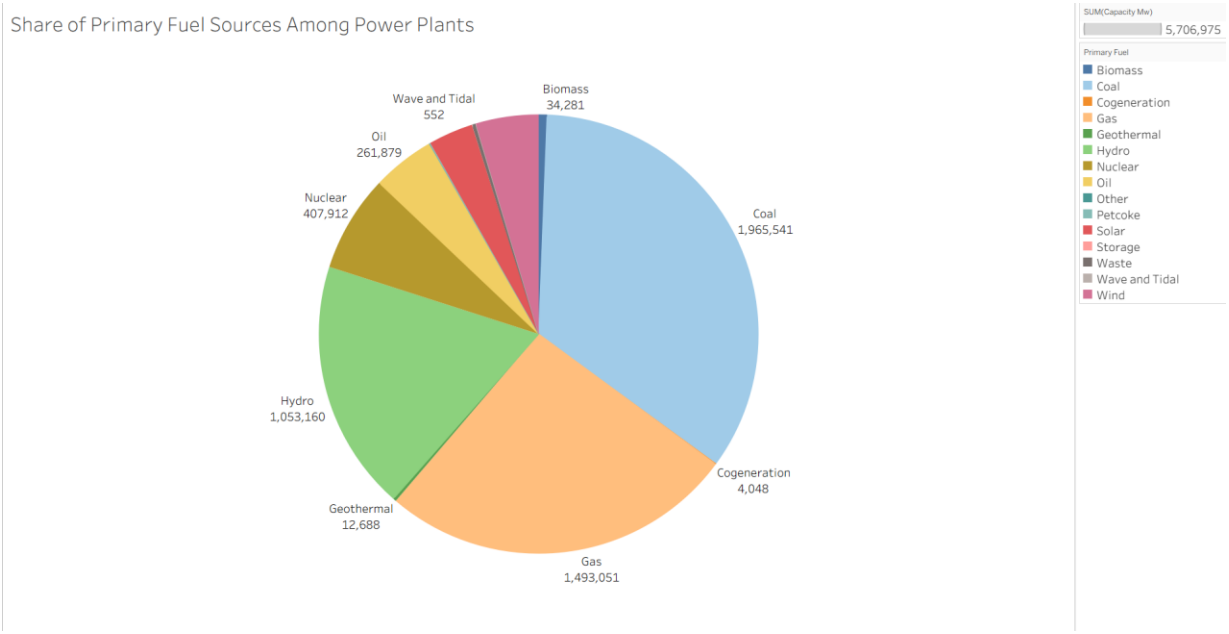
Data Exploration



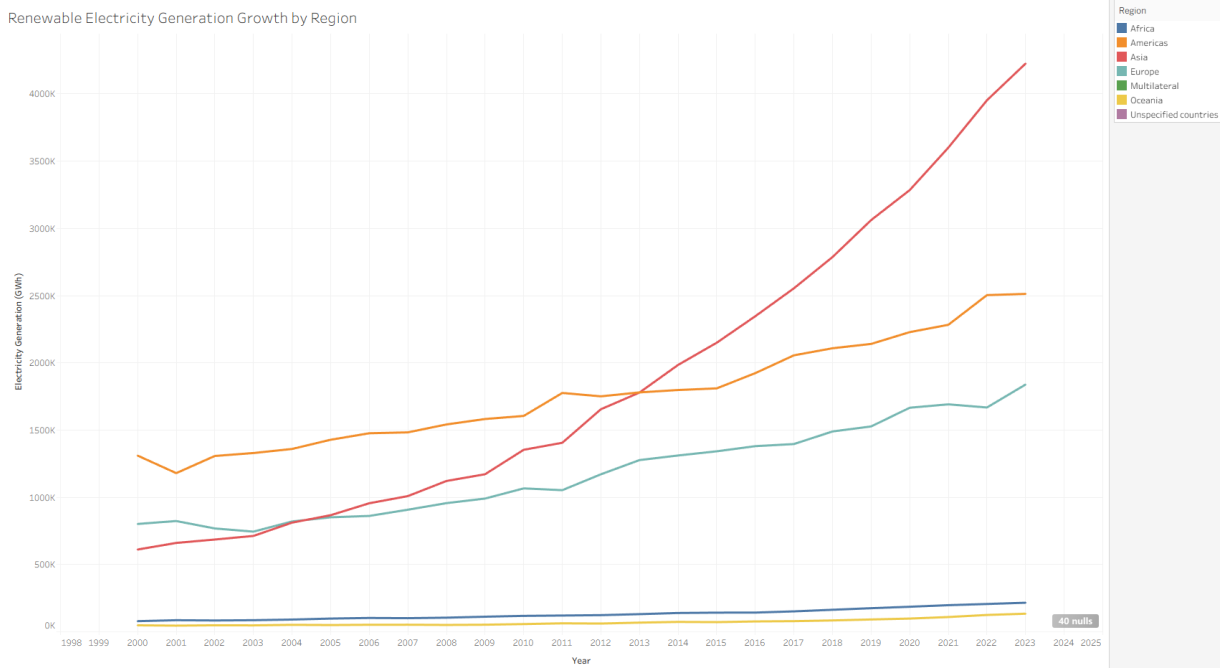
Visualization by Jonathan Collins. This visualization helps answer the question “Which countries produce the most power?” (Q. 12). This provides important insight into how the largest producers of energy (China and USA), produce more energy than the next 8 countries combined.



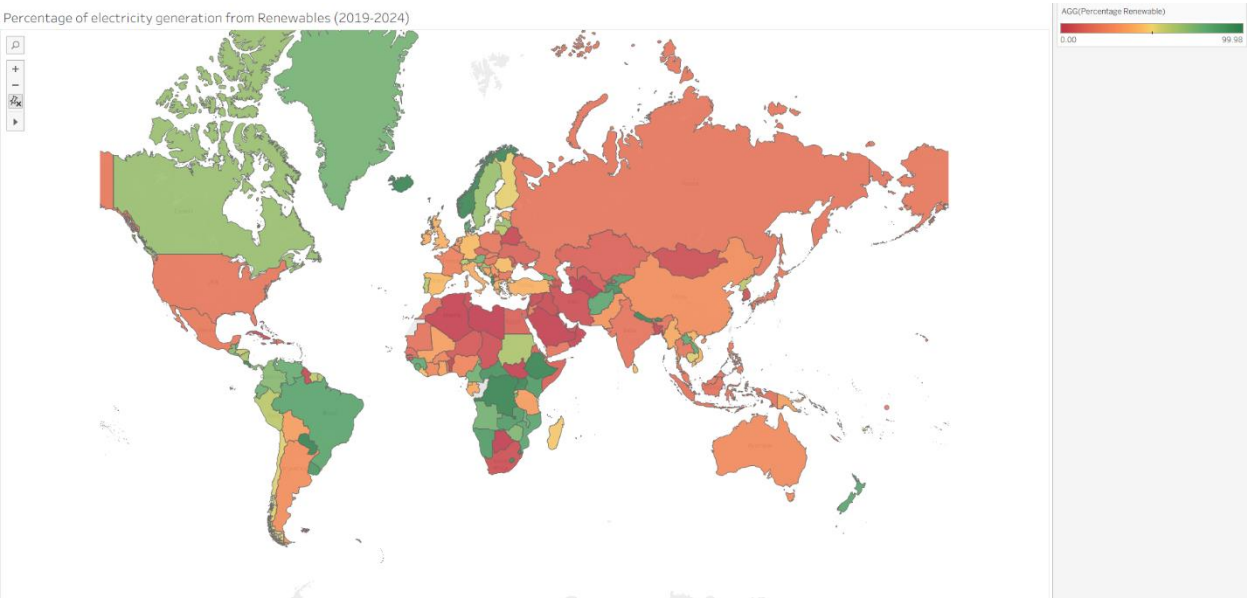
Visualization by Jonathan Collins. This visualization answers question 11, which asks “What countries have the greatest number of power plants?”. This visualization is interesting as it shows the number of power plants throughout the globe, and how many them are concentrated within the U.S. and China.



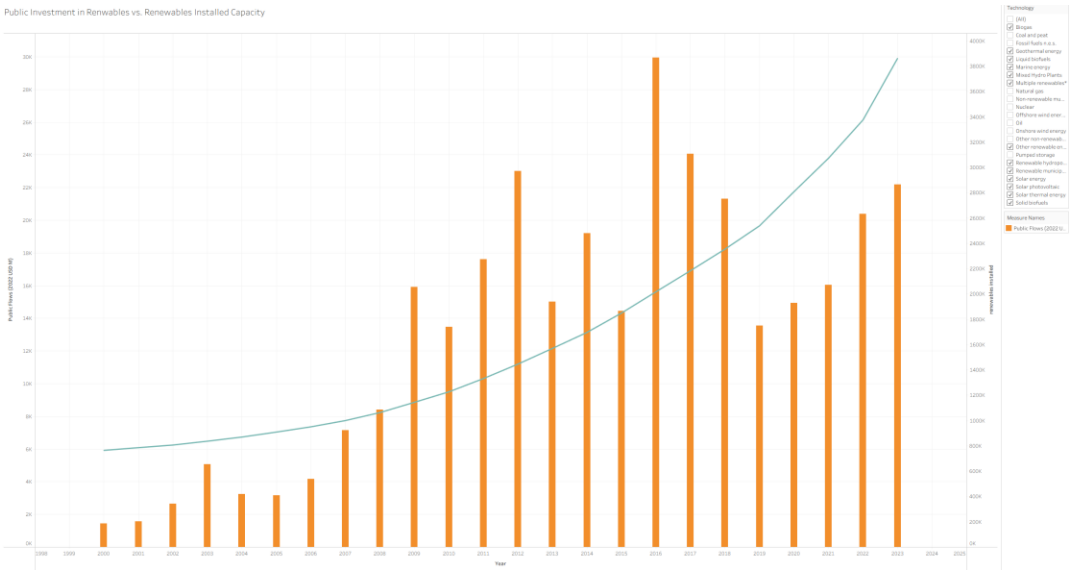
Visualization by Jonathan Collins. This visualization addresses question 9, which asks “What is the share of primary fuel sources among power plants?”. This is important as it shows the most common fuel sources for operating power plants. As we can see, Coal, Gas and Hydro account for approximately 79% of the primary fuel source share.



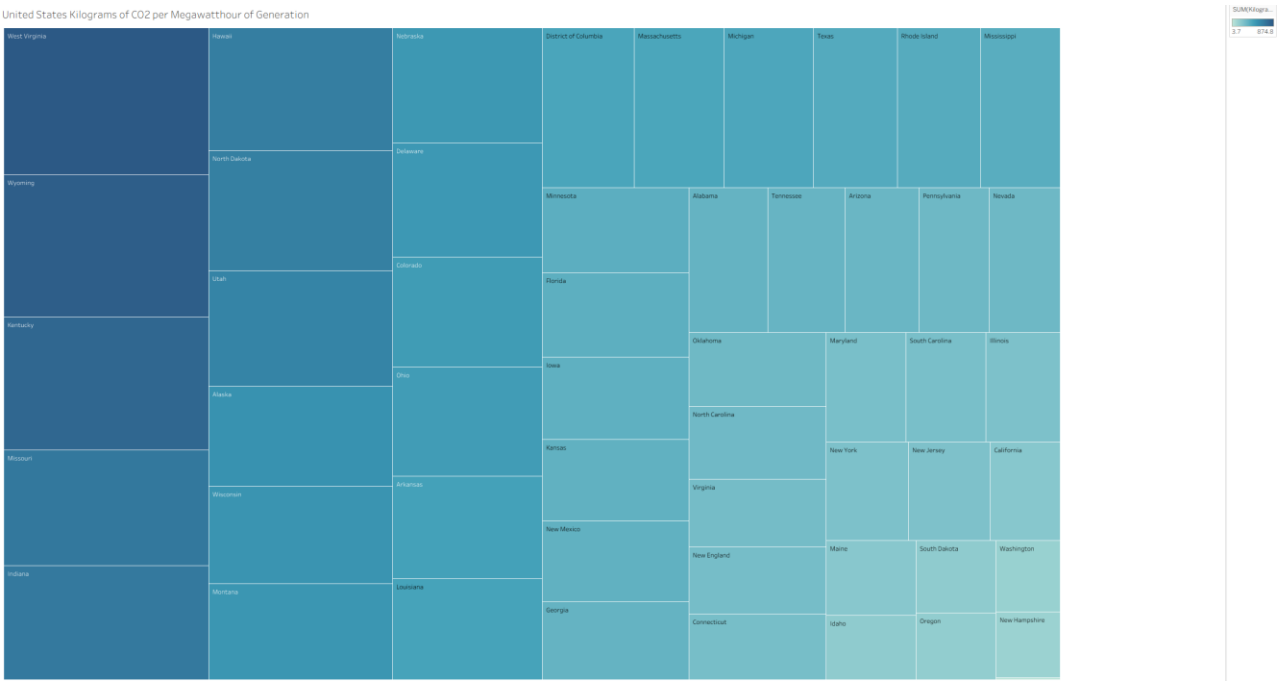
Visualization by Jessie Rigsbee. This visualization answers the question ‘How much is renewable energy growing?’. The image shows different regions renewable energy generation year over year. This enables the readers to pull insights into what countries are growing the fastest and what years have led to stagnation. (Q.2 / Q.5)



Visualization by Jessie Rigsbee. This visualization answers the question “What percentage of energy is generated by renewables?”. The map allows a reader to see the countries leading in highest percentage of renewable energy. (Q.2 / Q.3)



Visualization by Jessie Rigsbee. This visualization helps answer the question “How have investments (public/government) impacted the renewables installed.”. The image shows public flows in comparison to the generative capacity of renewables installed. (Q.1).

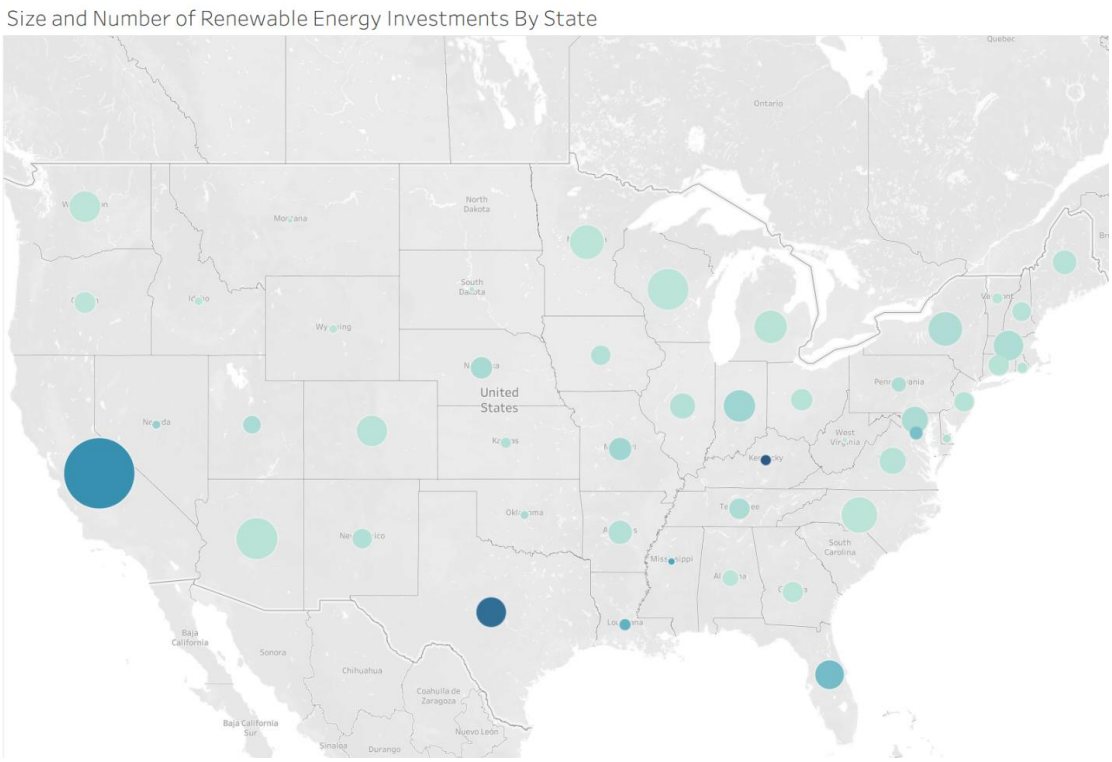


Visualization by Jessie Rigsbee. This visualization helps to answer questions relating to pollution and energy consumption. States like Virginia and Ohio are known to have a lot of datacenters. California is also known to have a lot of datacenters but has a focus on renewable energy. These correlations could be helpful when discussing pollution and energy (Q.15 / Q.6)

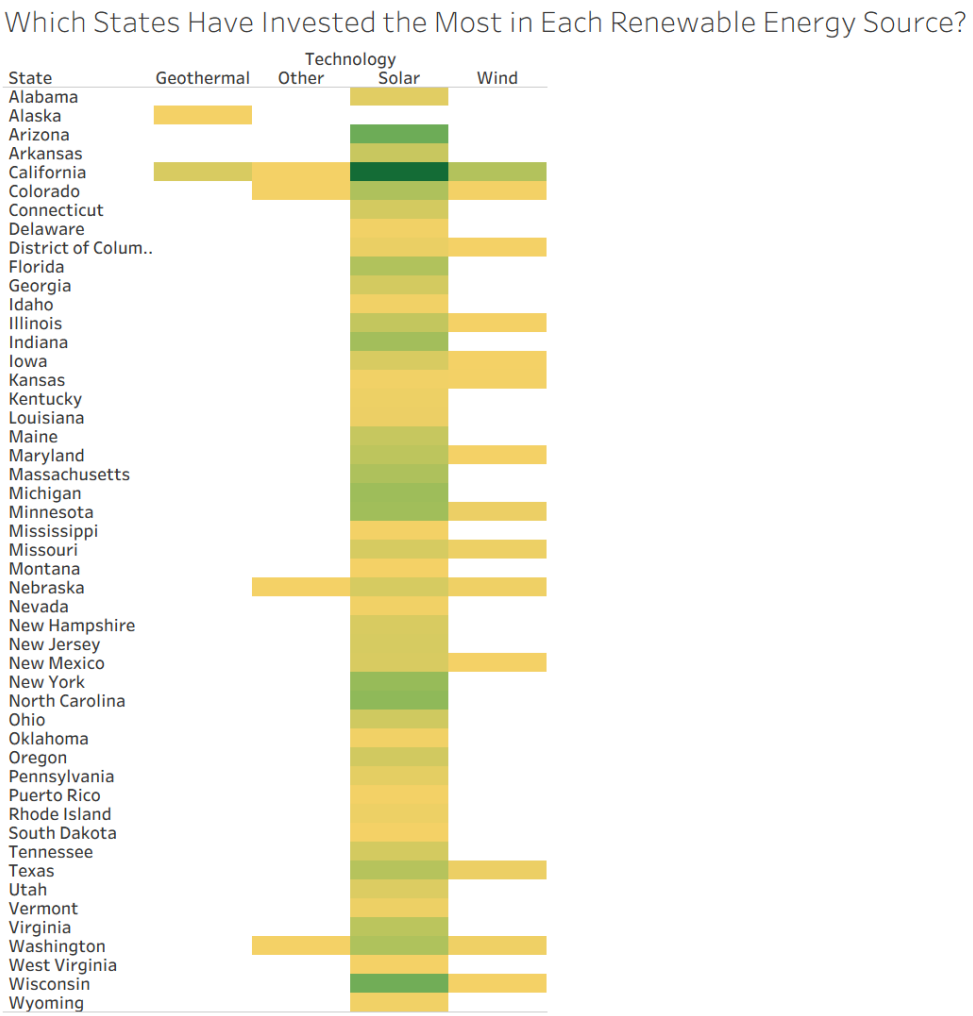
Most Popular Fuel Sources in the Top 10 Energy-Producing Countries

	Primary Fuel														
Country Long	Bioma..	Coal	Cogen..	Gas	Geoth..	Hydro	Nuclear	Oil	Other	Petcoke	Solar	Storage	Waste	Wave ..	Wind
Brazil	444	19		118		701	2	627	1		24		12		412
Canada	111	15		75		556	6	9	2		143			1	241
China		946		170	2	947	12	5			1,318				835
France	148	5		9	1	429	19	5			817			1	721
Germany	53	96		180		112	7	24	11		735		66		25
India	50	253		68		233	9	17			851				108
Japan		51		29	14	55	16	26			324		1		6
Russia	3	96		258	3	105	10	8	2		57				3
South Korea	2	18		33		36	6	3			17		4	1	12
United States of ..	153	286	34	1,818	65	1,449	58	876	16	11	3,283	104	541		1,139

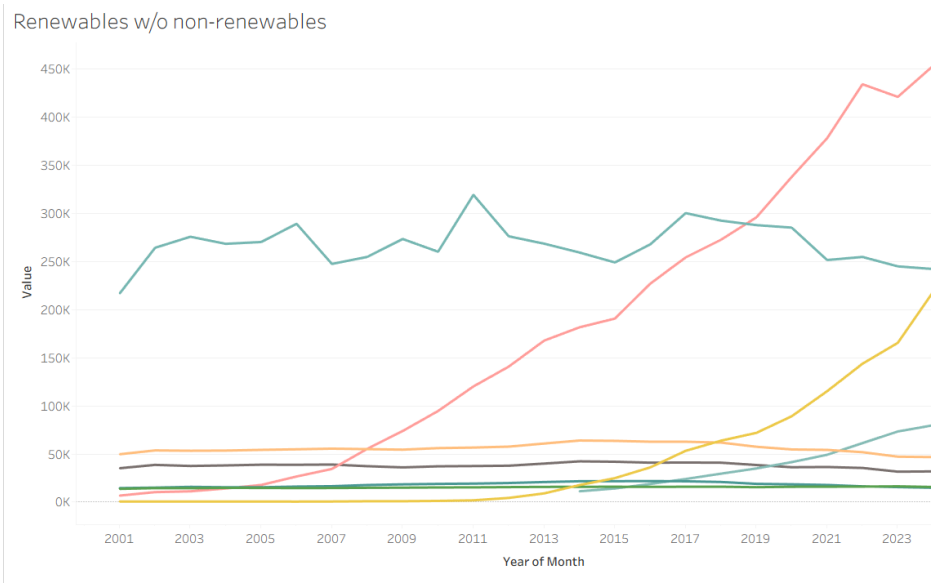
Visualization by William Shaw. This visualization helps the reader to understand not only which fuel sources are being used in these 10 major energy-producing countries, but also to what degree these countries are investing in these resources. The level of investment that the US has made into solar energy is a stand-out statistic from this visual.

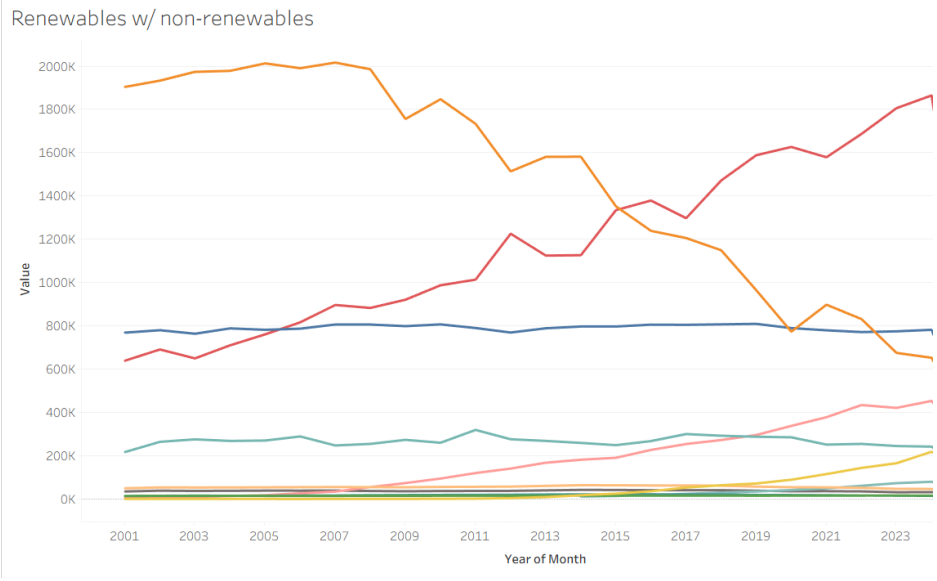


Visualization by William Shaw. This visualization is useful because we can see both how many purchases are being made per-state (size of the circles) and the median amount of energy production that can be attributed to those purchases in MW. This is useful because we can see that a state like Kentucky hasn't made as many purchases, but the ones that it has made were relatively productive in terms of energy.



Visualization by William Shaw. This visualization shows the level of investment that each of the given states has made into these renewable energy sources. One of the more interesting observations that can be made is that California has both the widest portfolio of renewable energy investment, as well as the most significant investments in each of these technologies.



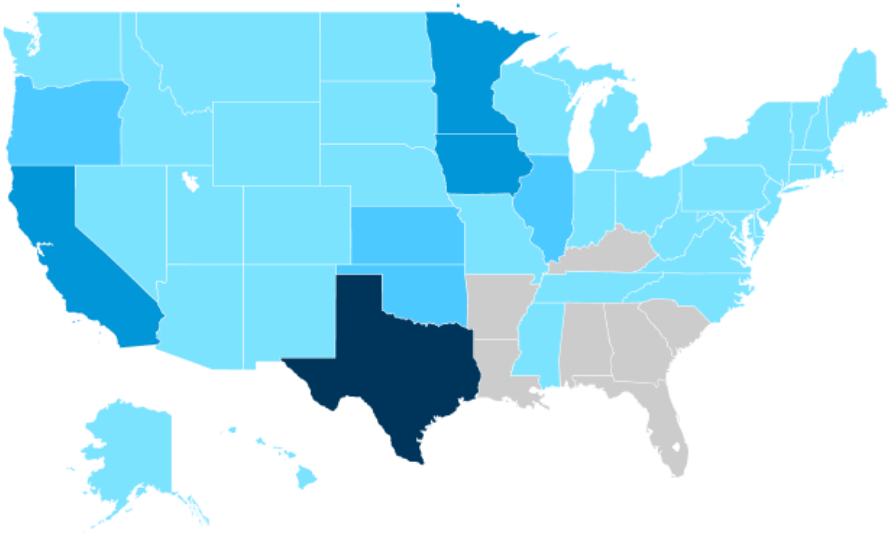


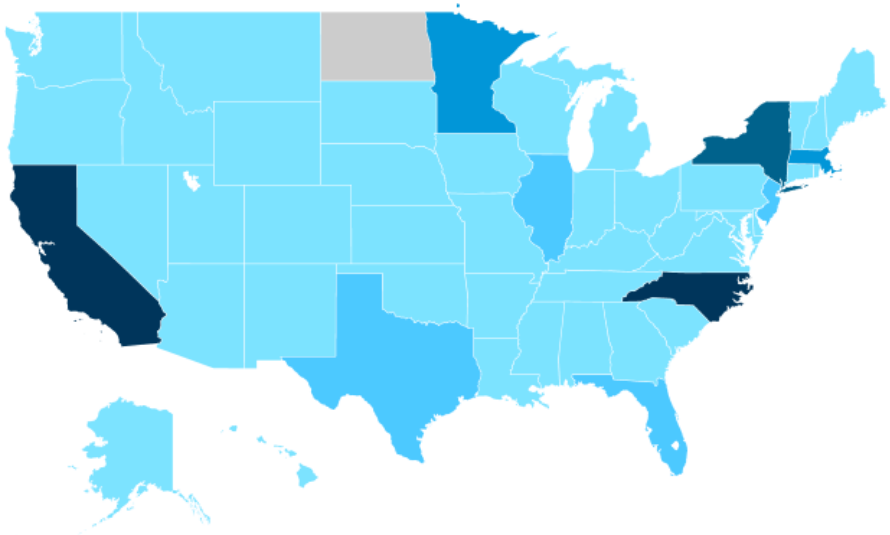
Visualizations generated by Nicolas Miranda. Data sourced from the U.S. Energy Information Administration's website. The first line chart shows the generation of power, each month, by renewable energy type in the U.S. in thousands of megawatt-hours; the second line chart shows these lines in context with nuclear energy and fossil fuels (natural gas, coal).

- Even though most renewables have made massive increases in energy generation since 2005, their power generation still pales in comparison to coal, natural gas, and nuclear power production.
- Also, the market shares of natural gas and coal energy production have essentially swapped values over the years, with natural gas (in 2024) producing roughly the same amount of power as coal was (in 2001). This suggests that, at least currently,

fossil fuels are just as prevalent (not by proportion, but by energy produced) as they were 25 years ago.

- If coal continues dropping in energy produced and wind continues rising, wind could overtake coal's share of energy produced within a few years. Solar power would be the next renewable energy source in the U.S. that could accomplish this.
- Lastly, nuclear power and hydroelectric power have remained very constant in the power they have produced. These 'clean' (but not necessarily renewable in nuclear's case) sources have stagnated over the last 25 years.





Visualizations generated by Nicolas Miranda from the U.S. Energy Information Administration's Website. These maps show the distribution of wind farms and solar farms

(respectively) throughout the United States. States shaded more deeply in blue have more of each type of plant, and lighter-blue shades mean less of the plant type. Gray shaded states have none of that type of plant.

- Higher-population states aren't necessarily correlated to more wind plants of both types. Texas, California, and Minnesota have lots of both types of plants, but other high-pop states like New York or Florida only stick out in the solar farm map.
- Most wind farms are located in the geographic regions where they'd have the best production: the U.S. west coast (to take advantage of westerlies from the Pacific ocean) and the Great Plains (large storm systems provide consistent windstorms).
- Solar farms seem to follow population more closely; populous Midwestern and New England states, alongside Texas, California, North Carolina, and Florida, have the most solar farms.
- These points might be consistent with other countries' solar and wind infrastructure; wind farms could follow good environmental conditions while solar farms follow population centers.

Storyboard

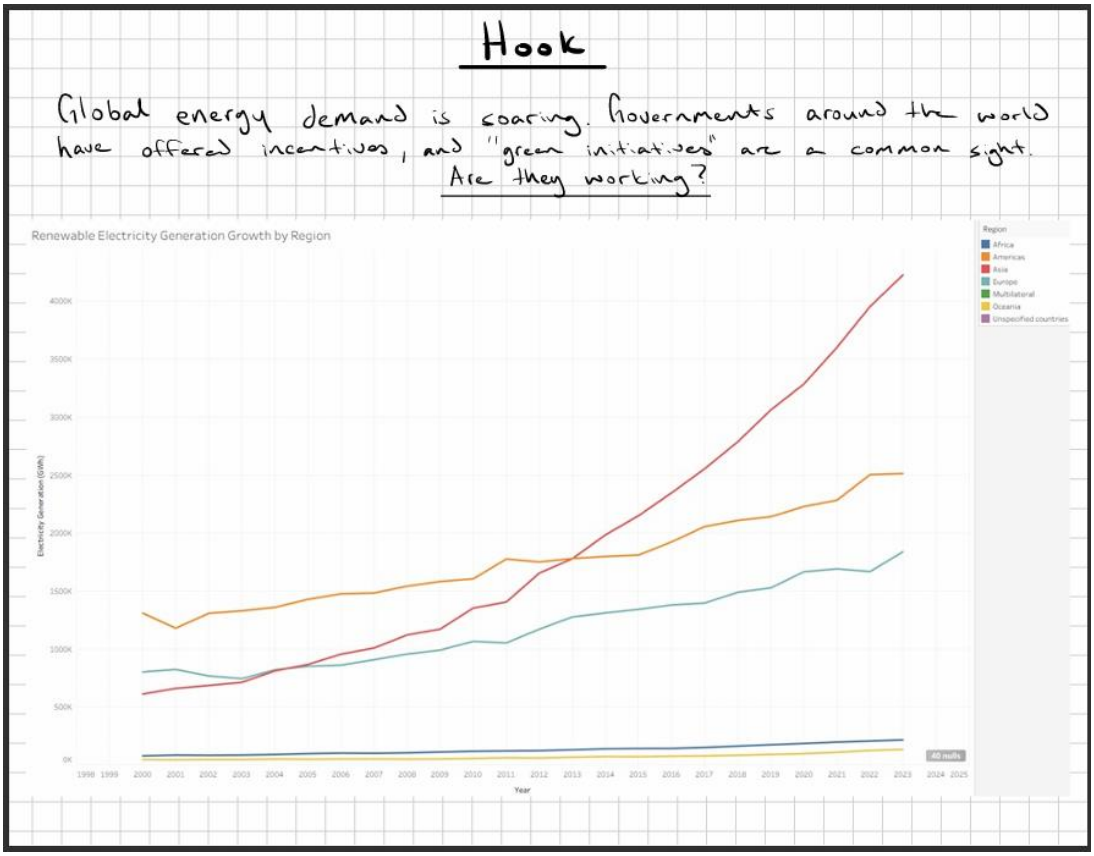
Main Message:

How the growing investment in renewable energy is combating pollution in an increasingly energy-dependent world.

Why we chose it:

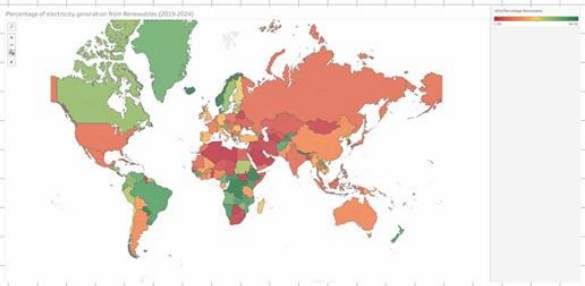
This message combines a number of correlating topics in the energy industry. Legislation and funding are big contributors to the adoption of renewable energy. Electricity demand is skyrocketing due to energy intensive use, such as data centers and artificial intelligence training. Understanding how each of these aspects contribute to pollution and better energy management will help tell a cohesive story.

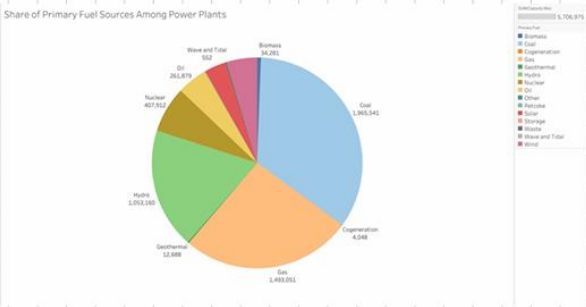
Storyboard Sketches:

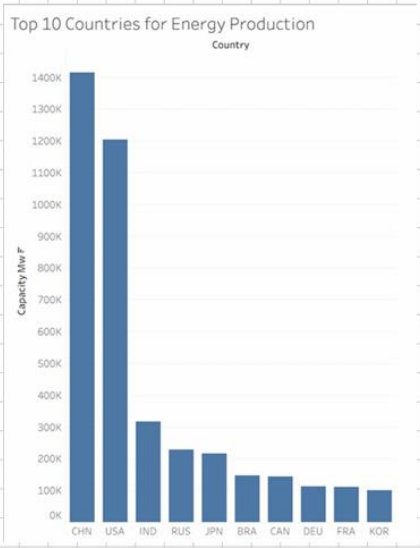


Rising Insights

The global picture is uneven: some countries lead in renewables, others in sheer output. Fossil fuels still hold the lions share.

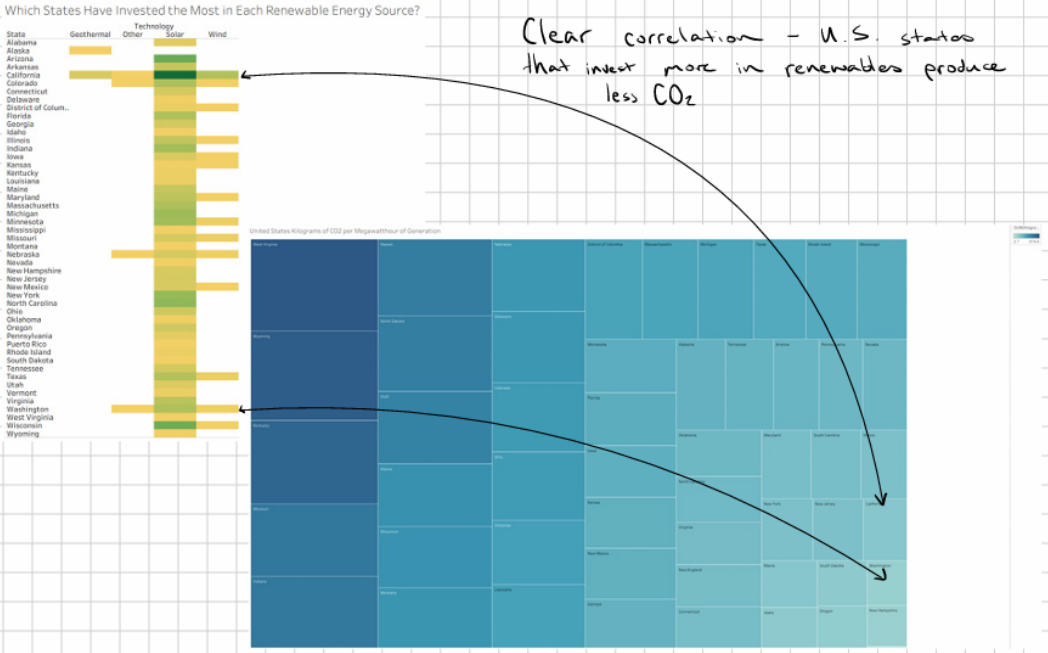






Main Message

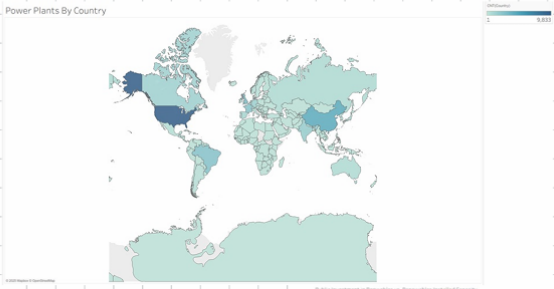
Renewable adoption is not just symbolic. It's reducing emissions, and changing the trajectory of energy use.



Clear correlation - U.S. states that invest more in renewables produce less CO_2

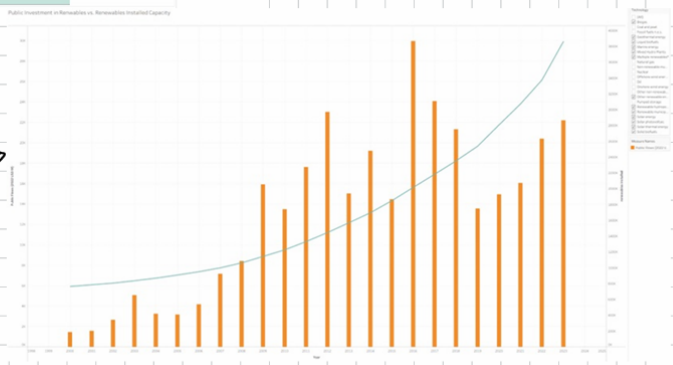
Solution

By expanding green funding in the largest energy-producing nations, we can accelerate the global transition and dramatically reduce pollution



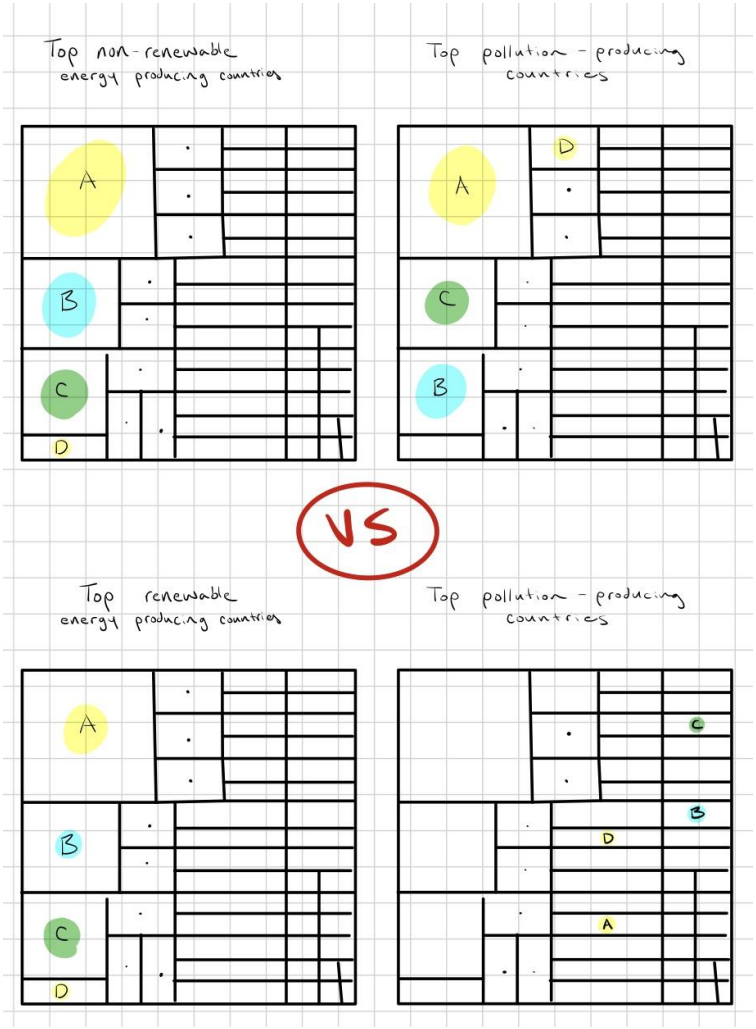
Largest energy producers = Biggest opportunities

Investment directly leads to installed capacity growth →



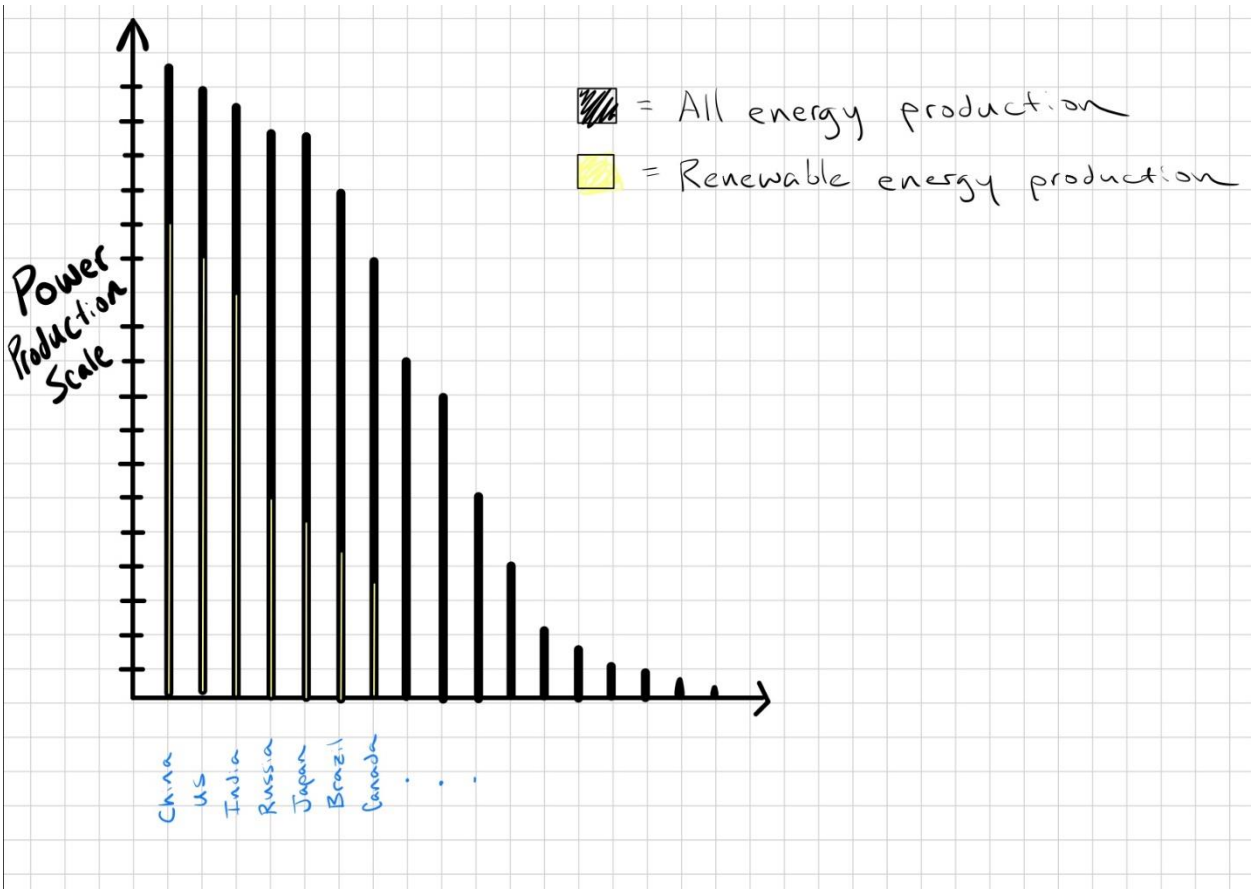
Visualization Idea Sketches

Jonathan:



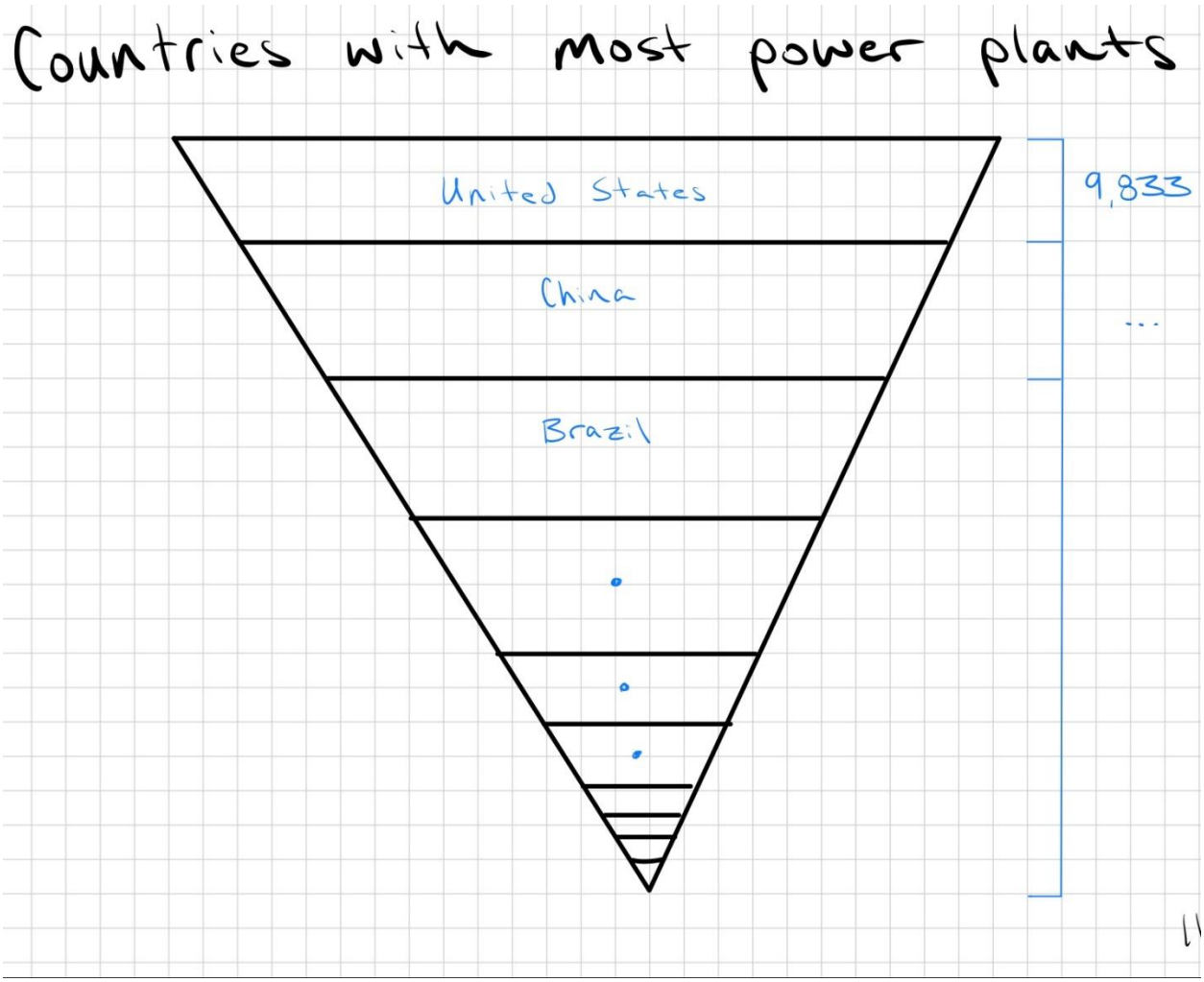
(ID 1: Message ID 1)

- Explores the assumption if non-renewable production correlates with high pollution (expected correlation), and if renewable production correlates with lower pollution (expected correlation). Targeted Data Story Element: Main Message



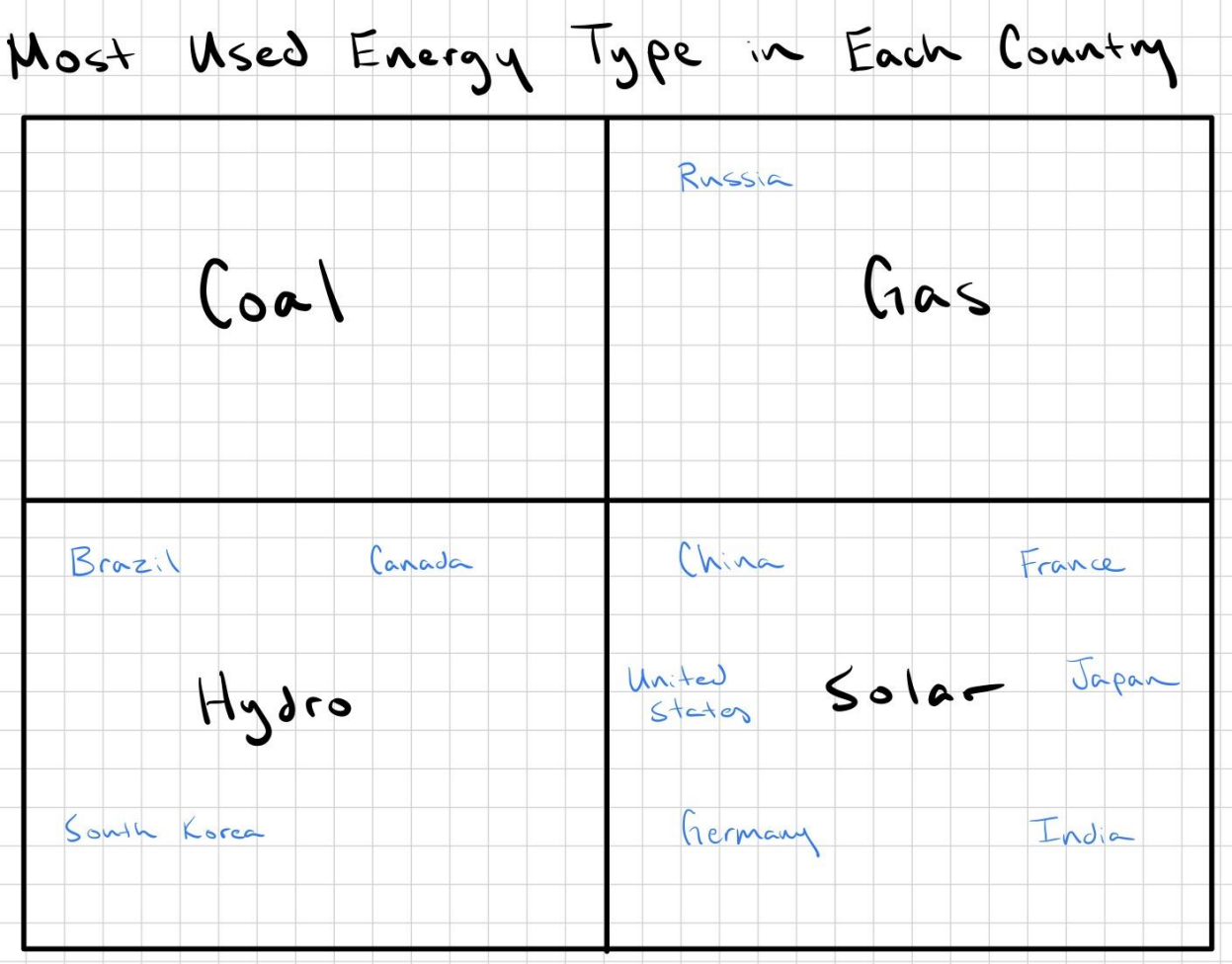
(ID 2: Message ID 2)

- Explores the relationship between the world's biggest energy producers and how much of their energy is renewable. Data Story Element: Rising Insights



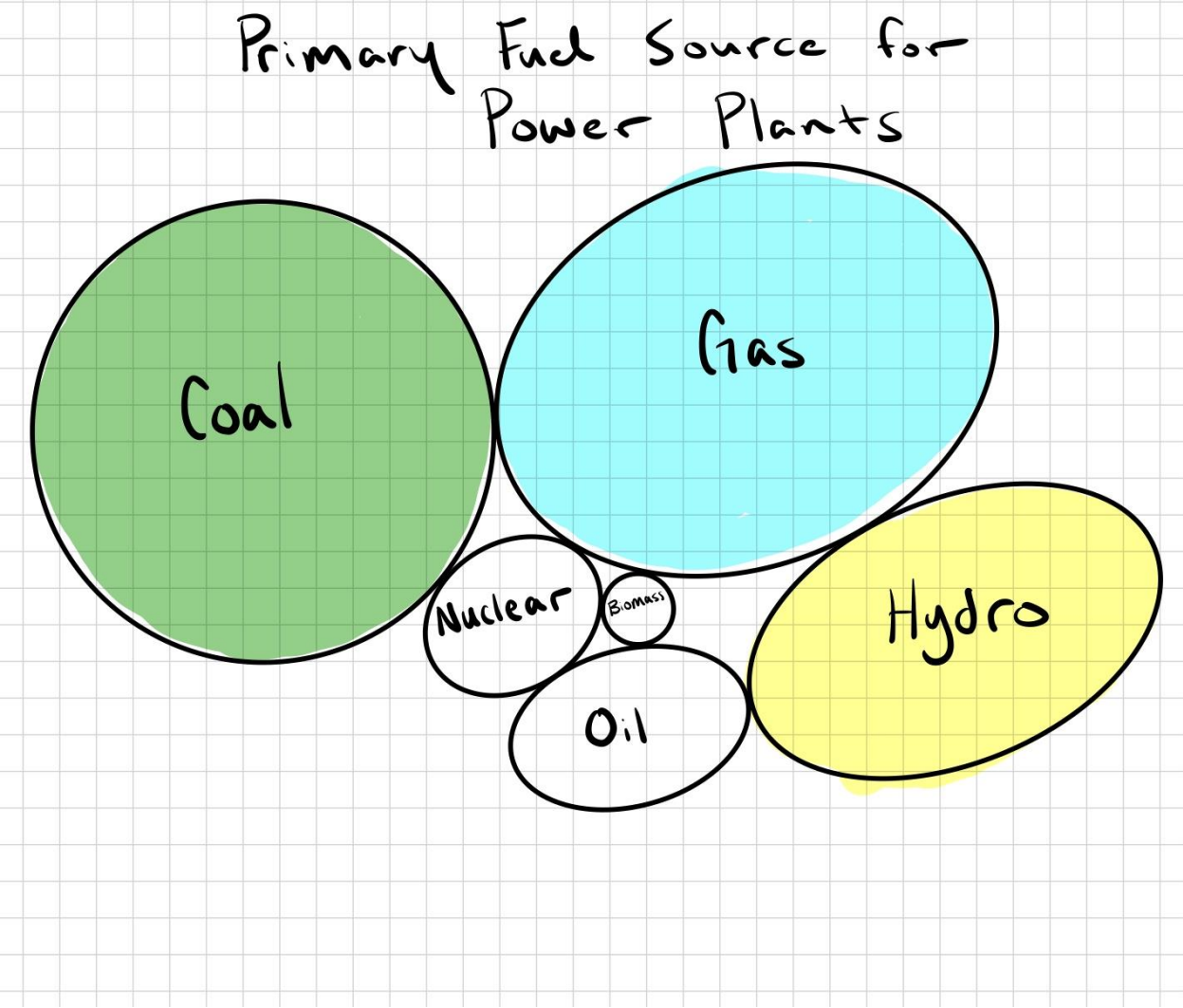
(ID 3: Message ID 2)

- This sketch provides insight into the top producers of power, showing has drastic the size of the top producers are compared to others. This shows how important it is to encourage change in these countries in particular. Data Story Element: Solution



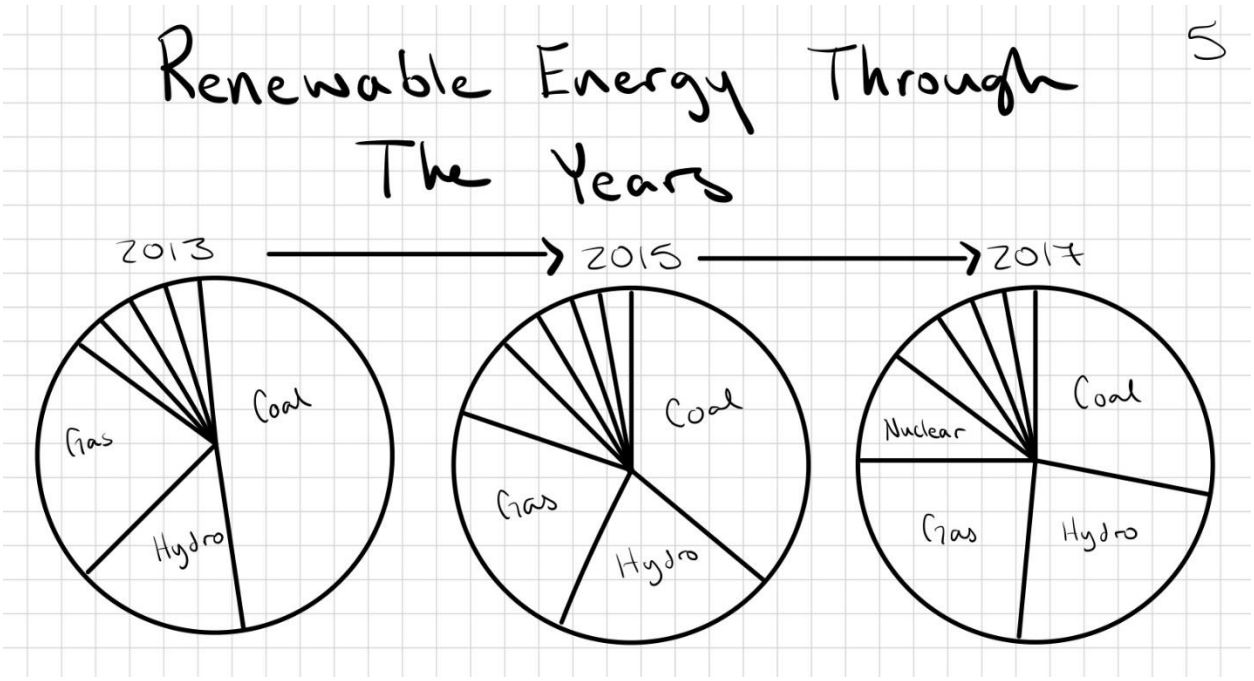
(ID 4: Message ID 3)

- This sketch provides insight into how different countries rely on different primary fuel sources. Data Story Element: Rising Insights



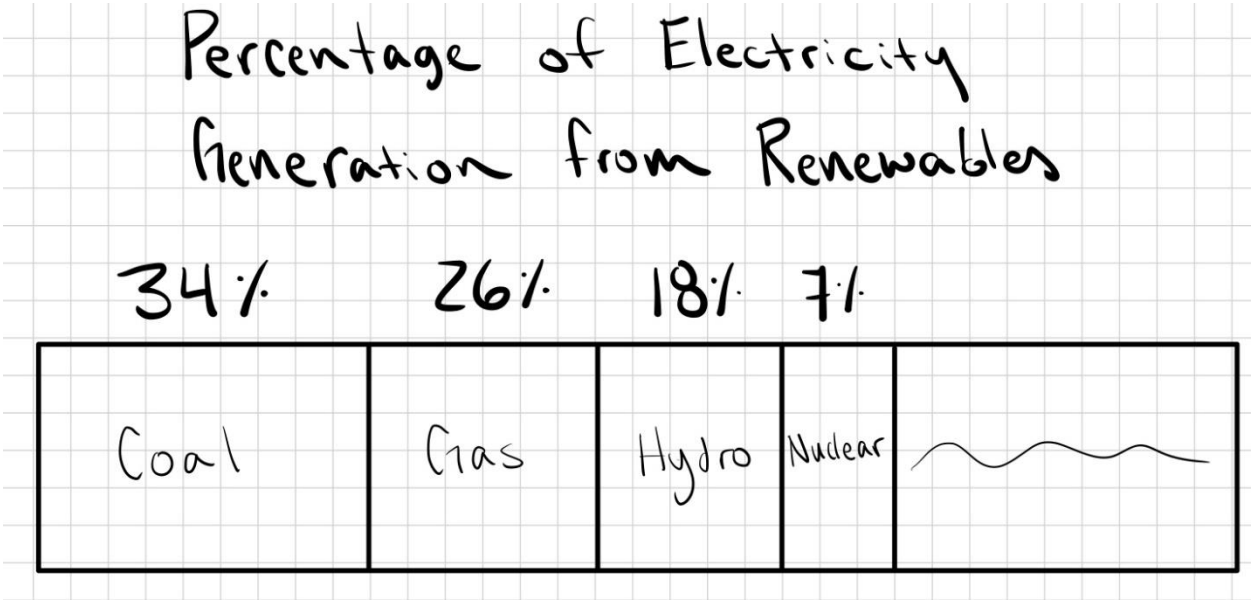
(ID 5: Message ID 3)

- This sketch shows a difference between countries primary fuel source and what they use to create energy. Few countries lead the world in energy production with power plants, and as we can see they overwhelmingly use non-renewables to create energy. Data Story Element: Rising Insights



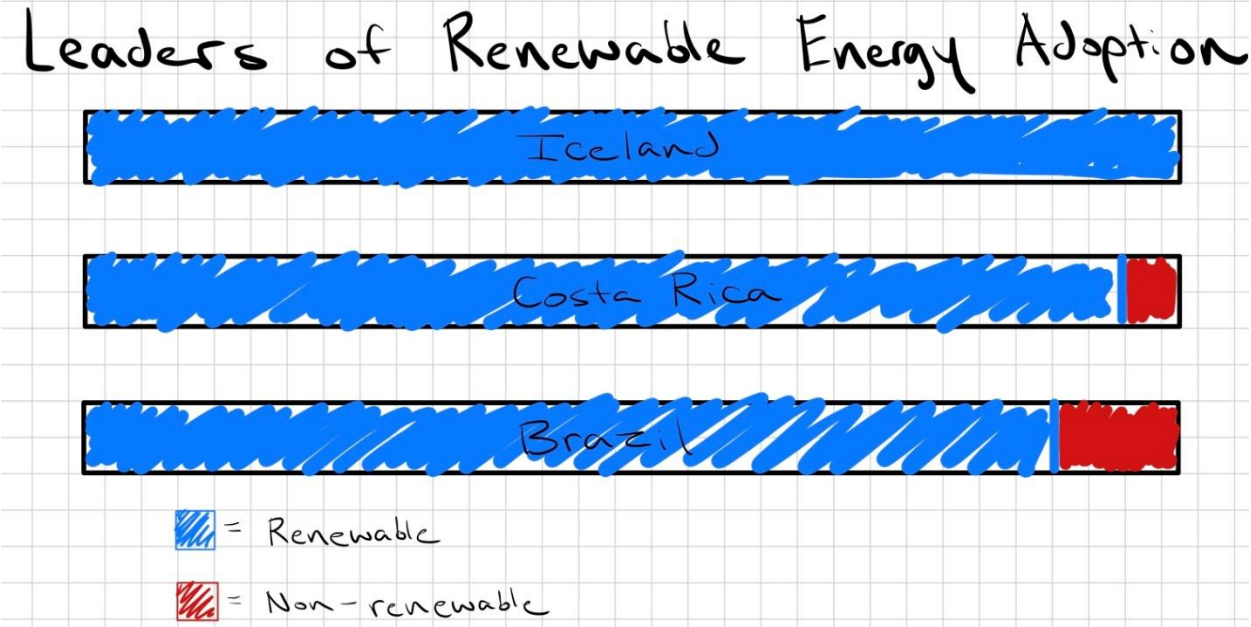
(ID 6: Message ID 4)

- This sketch provides powerful insight into how the global energy use has shifted over the years, highlighting how much renewable energy has grown. Data Story Element: Solution



(ID 7: Message ID 5)

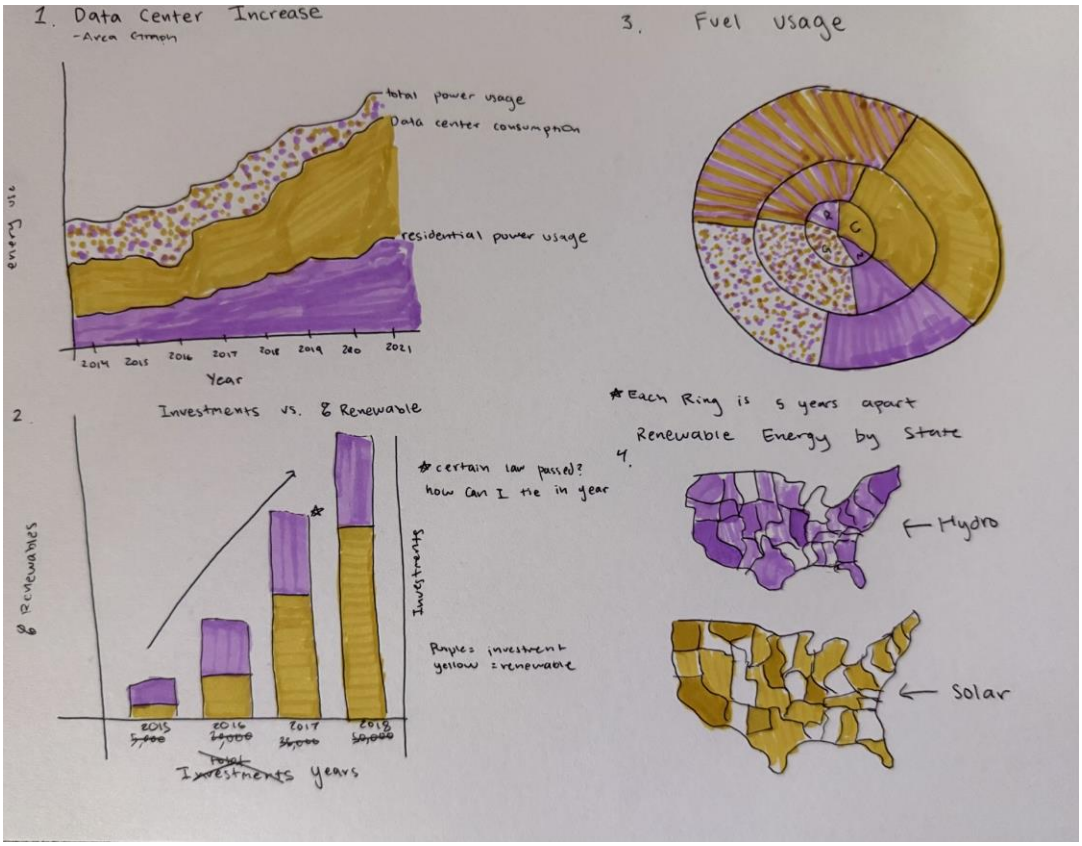
- This sketch provides an insight into the overarching power production landscape - which sources provide us with the most power, and which of those are renewables vs non-renewable. Data Story Element: Rising Insights



(ID 8: Message ID 3)

- This sketch provides valuable insight into the countries that almost exclusively use renewable energy sources to power their population. Using these countries as case-studies could provide powerful evidence in how to apply their policies and legislations to the rest of the world. Data Story Element: Hook

Jessie Rigsbee



1. (ID 9: Message ID 7)

Message: Show how data centers are the source of the majority of energy usage and placing a strain on energy providers

Insights/Evidence: In the past 5 years there has been an increase in the number of datacenters

Data Story Element: Rising Insights

2. (ID 10: Message ID 6)

Message: Show how investments in renewables have translated into a higher percentage of renewable energy generation

Insights/Evidence: Show how certain legislation has affected renewable growth. Increase in funds has positively impacted the percentage of renewables generated.

Data Story Element: Solutions

3. (ID 11: Message ID 3)

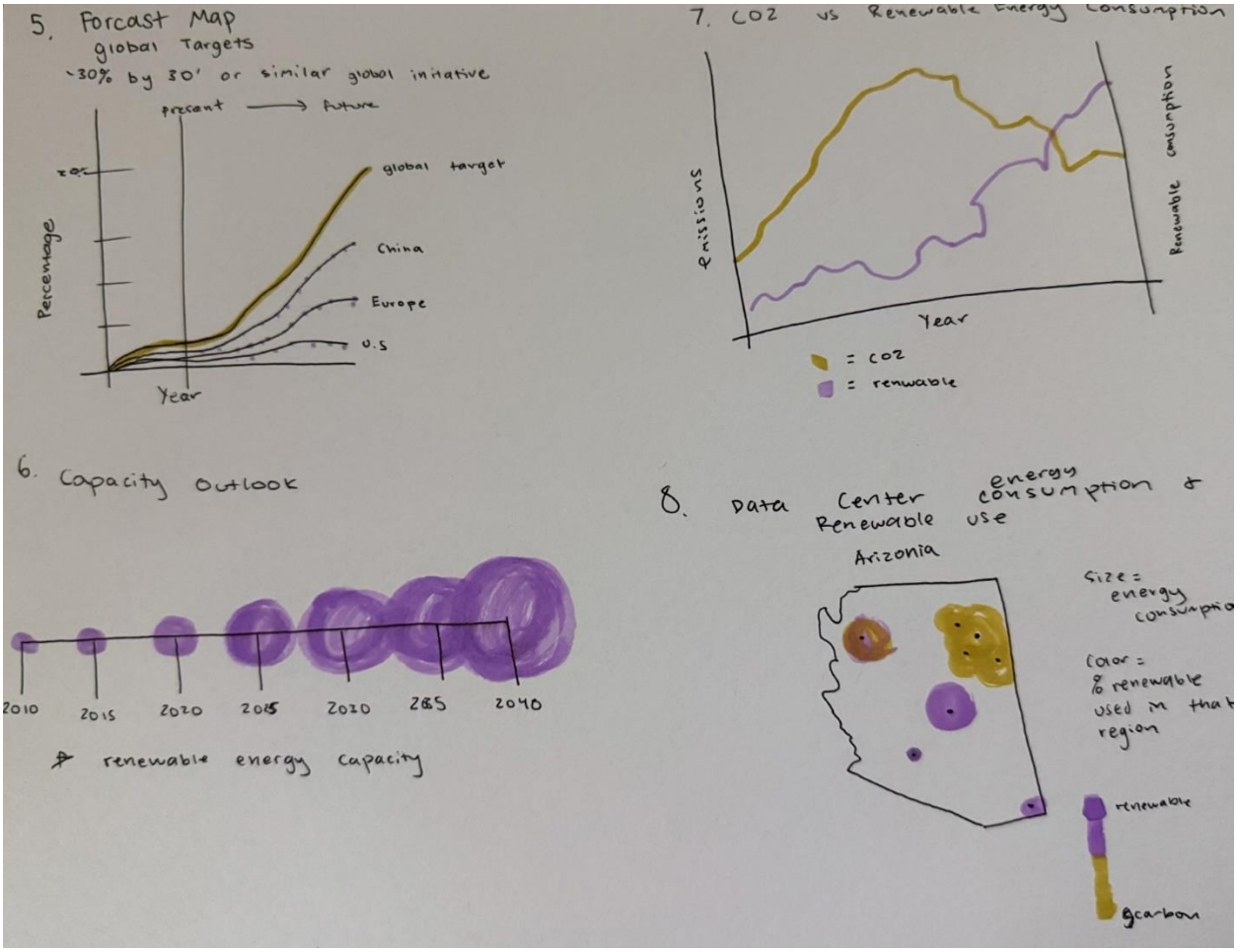
Message: Fuel usage in power plants has been changing from non-renewables to renewables (A given countries fuel use).

Insights/Evidence: year-over-year there has been a decrease in Coal and Gas usage

Data Story Element: Aha Moment

4. (ID 12: Message ID 12)
Message: Show the states that are leading in the production of certain renewable energy sources
Insights/Evidence: Shows what parts of the country are responsible for the most renewable energy production
Data Story Element: Rising Insights

Jessie Rigsbee



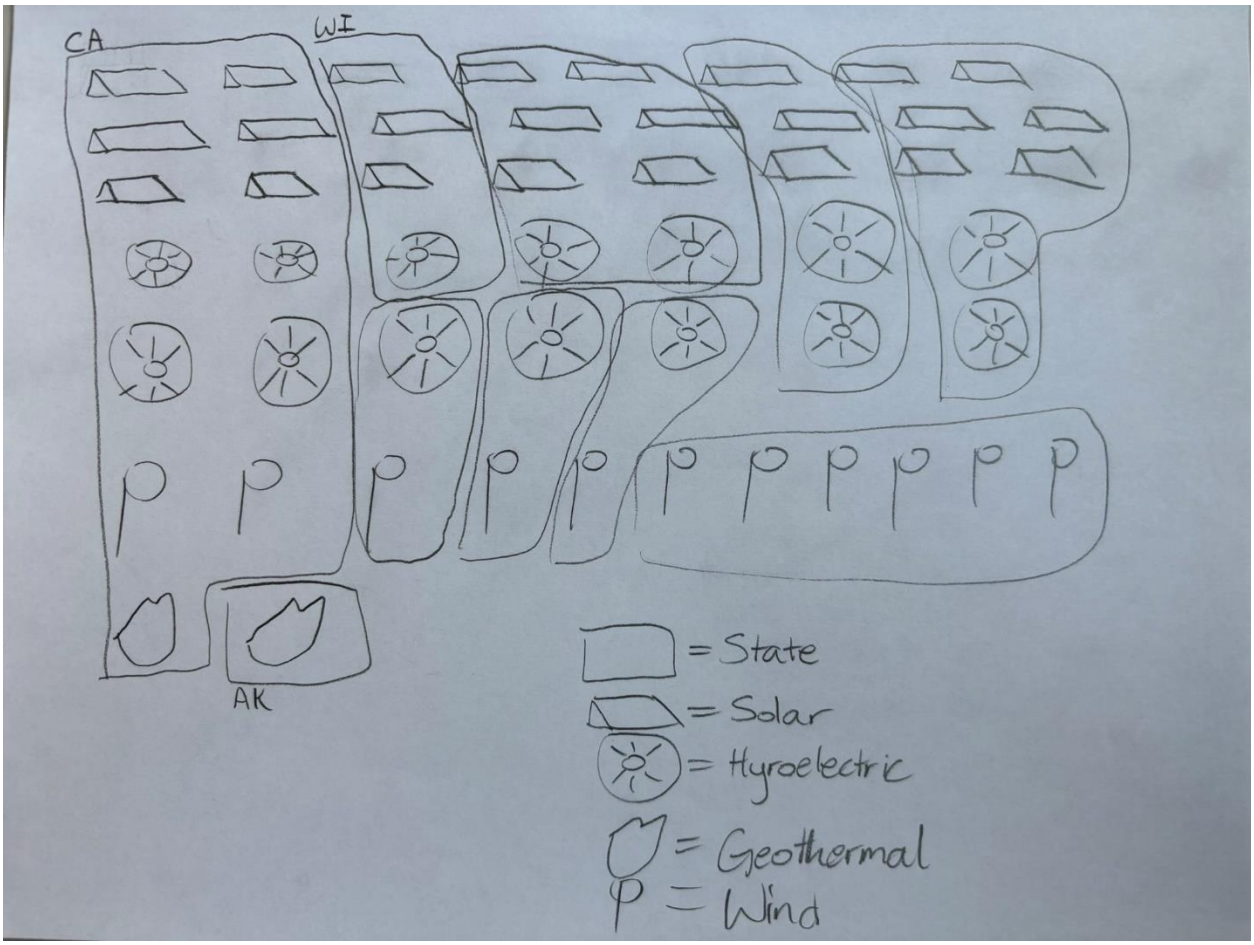
5. (ID 13: Message ID 8)
Message: Show what countries are close to reaching a unified global goal on renewable energy usage
Insights/Evidence: This shows what countries are leading the charge and what places are lagging

Data Story Element: Aha Moment

6. (ID 14: Message ID 10)
Message: Show how the generation capacity of renewable energy has a positive outlook for the next 15 years
Insights/Evidence: Supports the idea that renewable energy is in a growth cycle
Data Story Element: Solutions

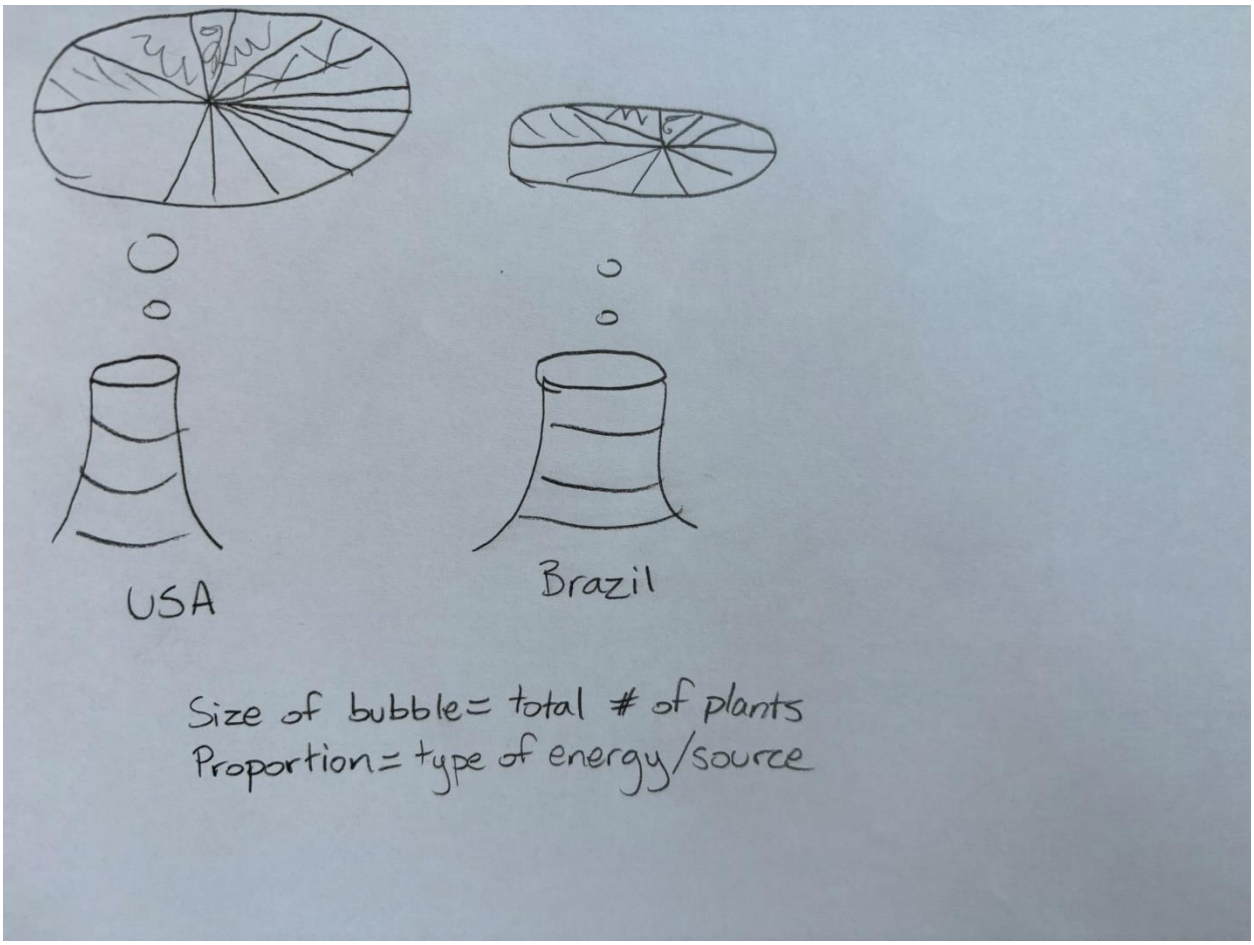
7. (ID 15: Message ID 1)
Message: Shows the reader how carbon emissions and renewable energy are closely tied together
Insights/Evidence: An increase in renewable energy corresponds to a decrease in carbon emissions
Data Story Element: Aha Moment

8. (ID 16: Message ID 9)
Message: Show the datacenters and what type of energy they are mostly consuming
Insights/Evidence: Shows the impact of an increase in datacenters and helps the reader to understand that most run on nonrenewable sources
Data Story Element: Next-Steps (Call to Action)



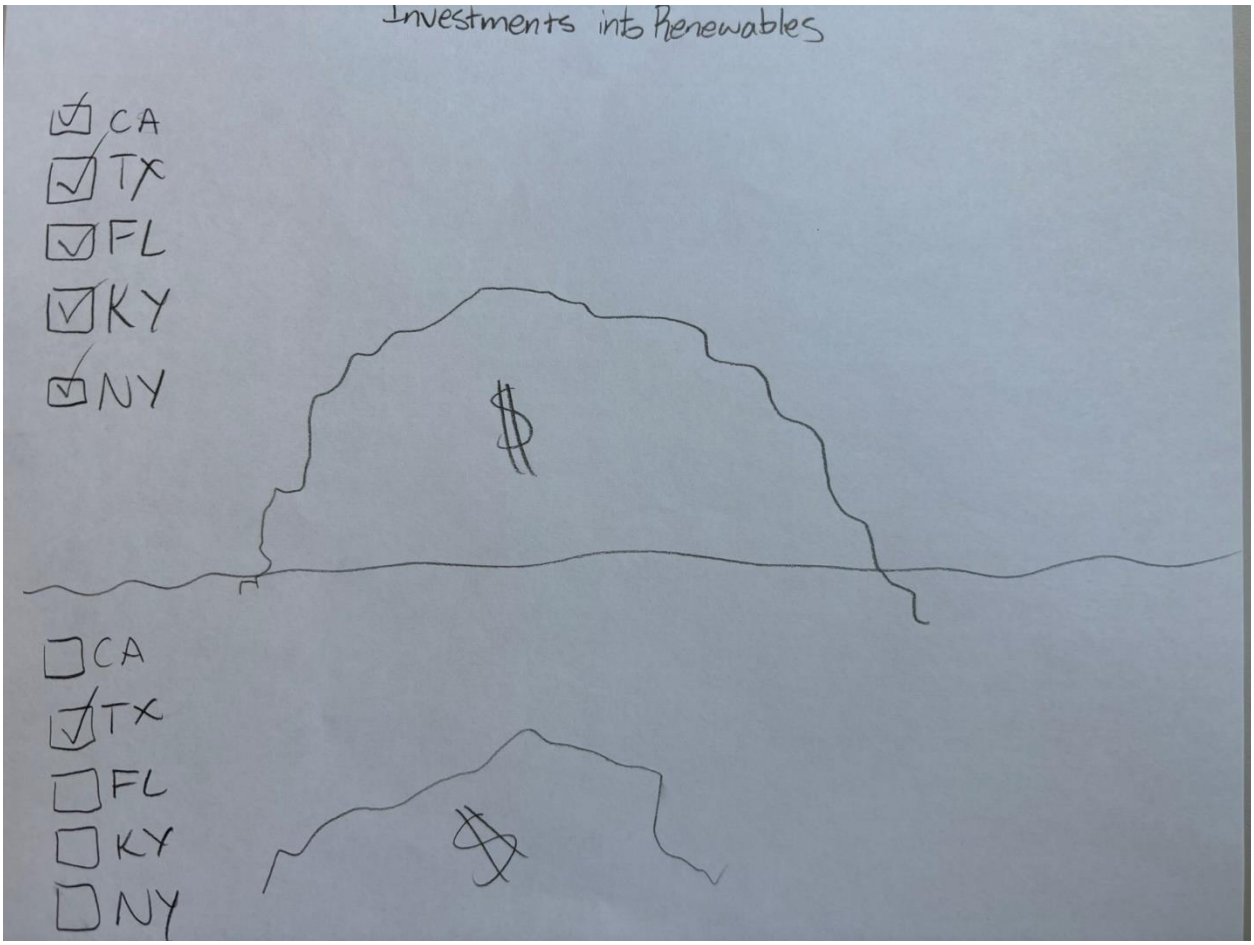
(ID 17: Message ID 12)

- The purpose of this visualization is to show the breakdown of different renewable energy source investments between states. It simultaneously shows what proportion of each source is taken up by each state, as well as what areas some states have yet to invest in. Story Element: Rising Insights



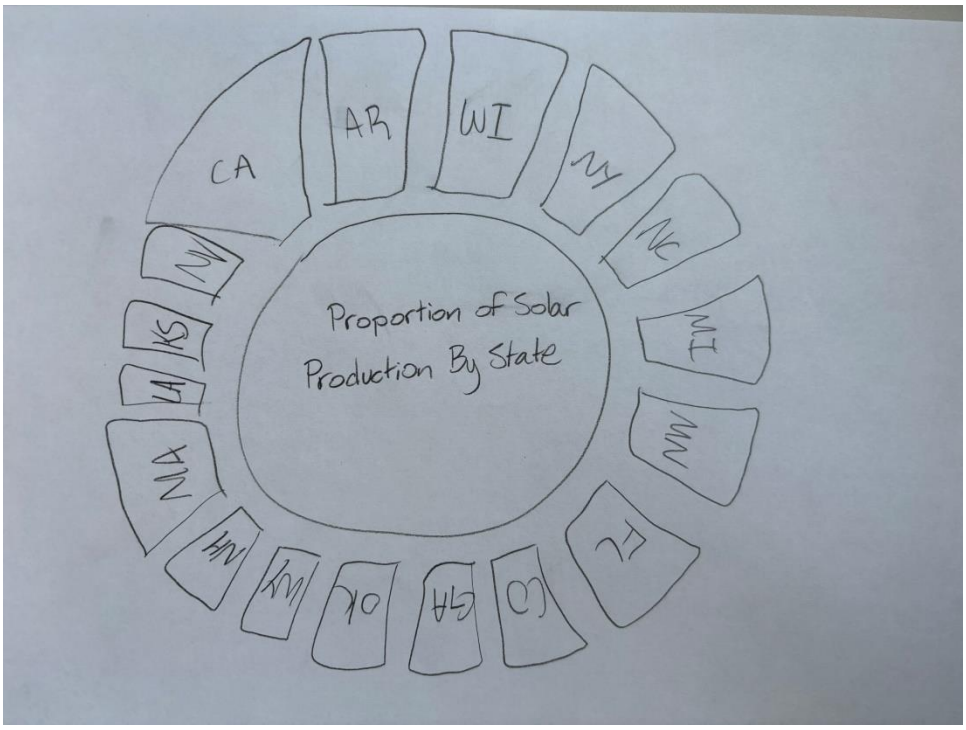
(ID 18: Message ID 3)

- The idea behind this visualization was to show the amount of investment into different energy sources as well as the proportion. Given the US has more power plants than Brazil, it'll have a larger "bubble", and the proportions within would be colored to show the reader which energy sources have the greatest investment. Data Story Element: Rising Insights



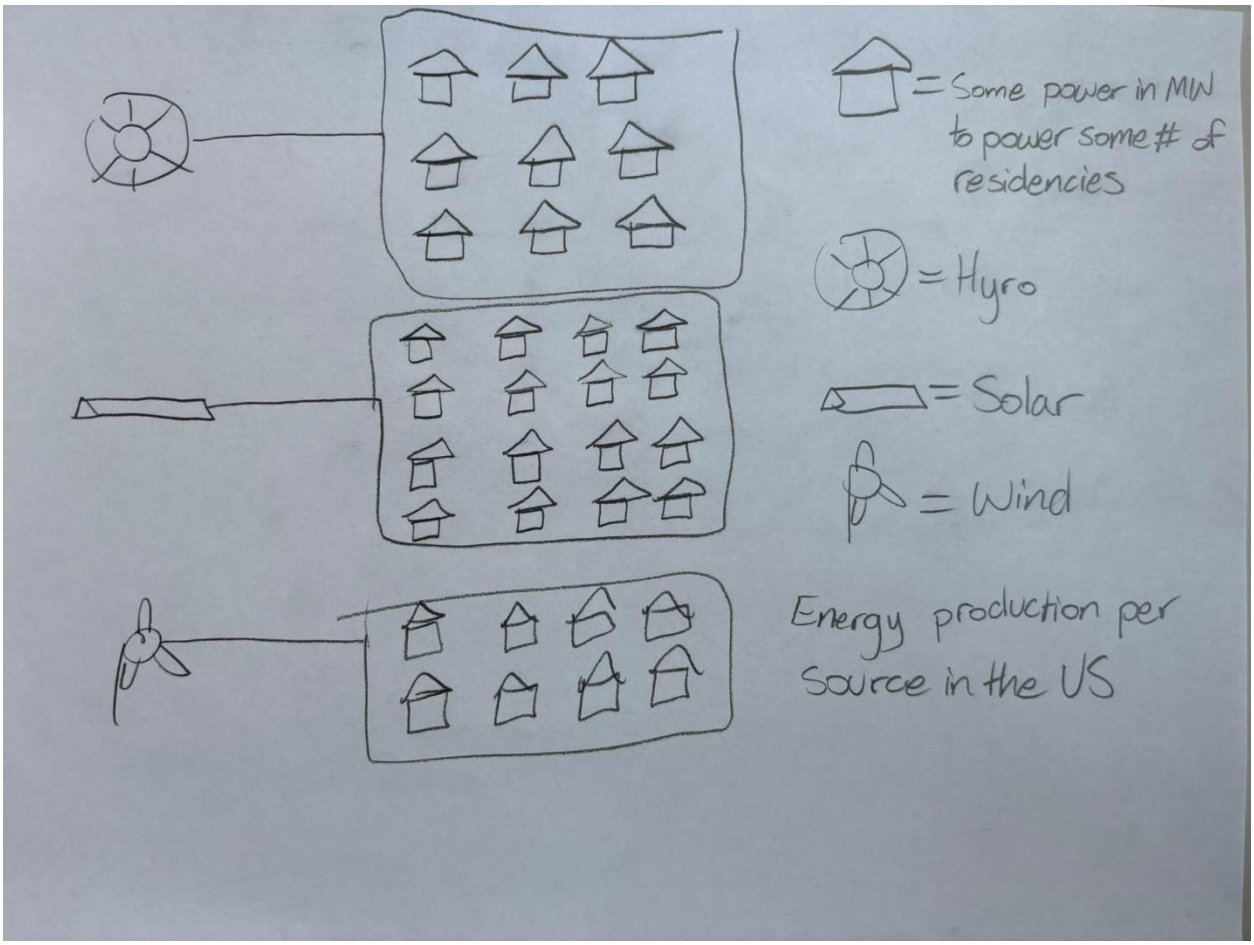
(ID 19: Message ID 12)

- This visualization is focused on the money that is being spent on renewable energy production. The idea for this one is that it would be a somewhat interactive visualization where the amount of money/size of the pile scales with the amount of money that a state (or multiple states) has invested. Data Story Element: Solution



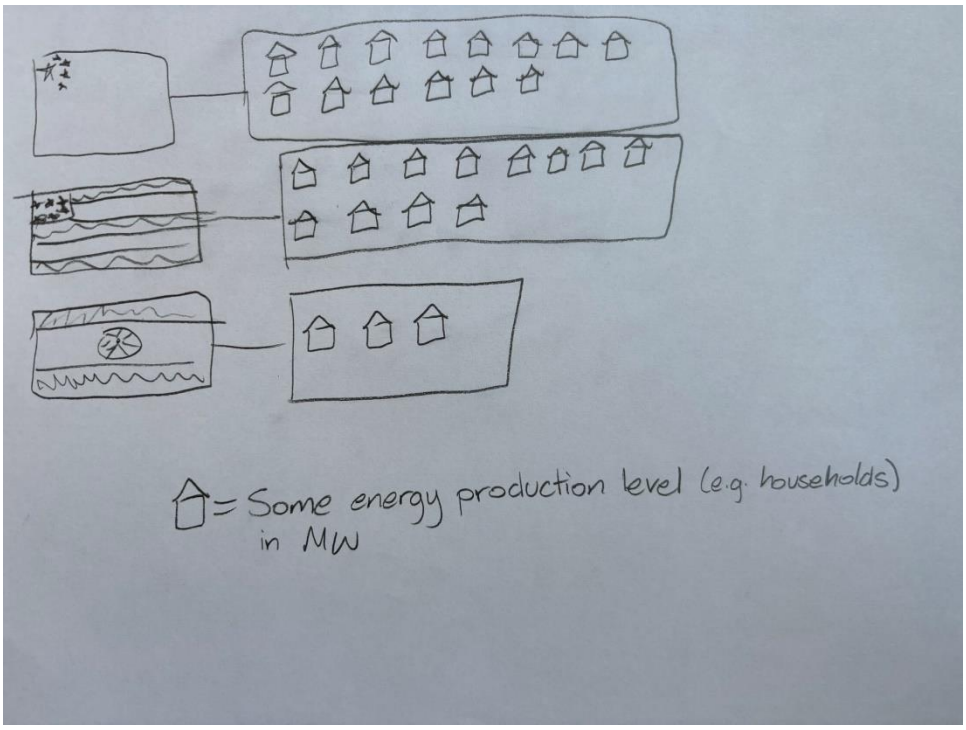
(ID 20: Message ID 12)

- For this visualization, I wanted to make a pie chart that showed the proportion of solar energy in the US that each state was producing. These proportions are displayed through the scale of the rays that the sun is producing. Hard values could also be added for the sake of clarity. Story Element: Rising Insights



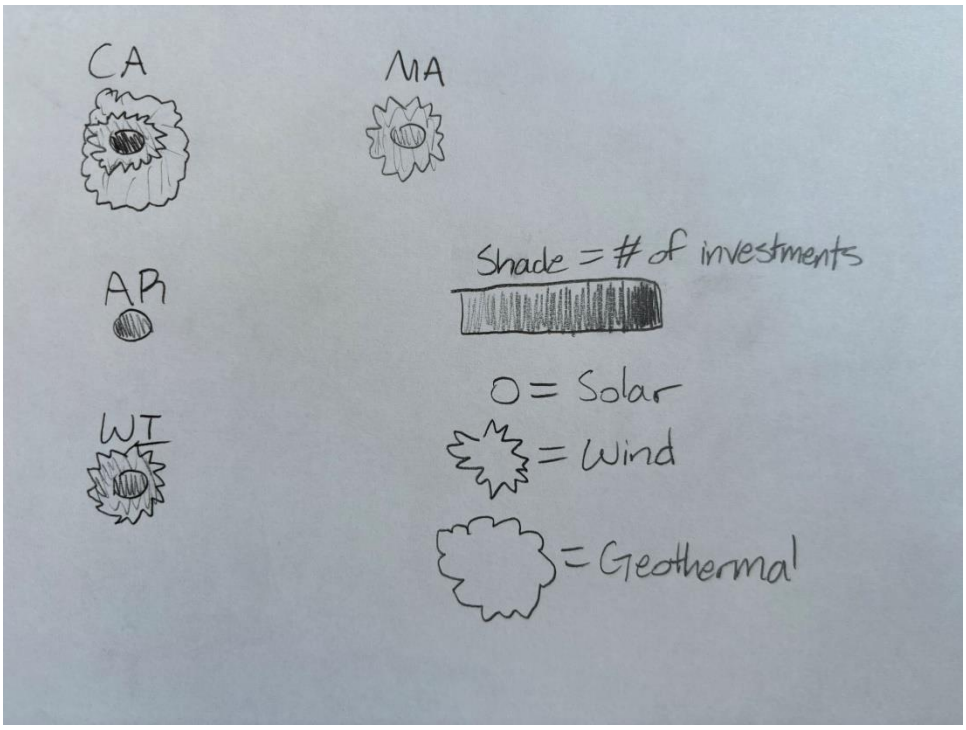
(ID 21: Message ID 13)

- This visualization is meant to show how many residencies are being powered per energy source in the US. The houses would be an established standard of MWs of energy consumption. This would make it apparent to the reader just how much solar energy is being produced and how far ahead its development is. Story Element: Rising Insights



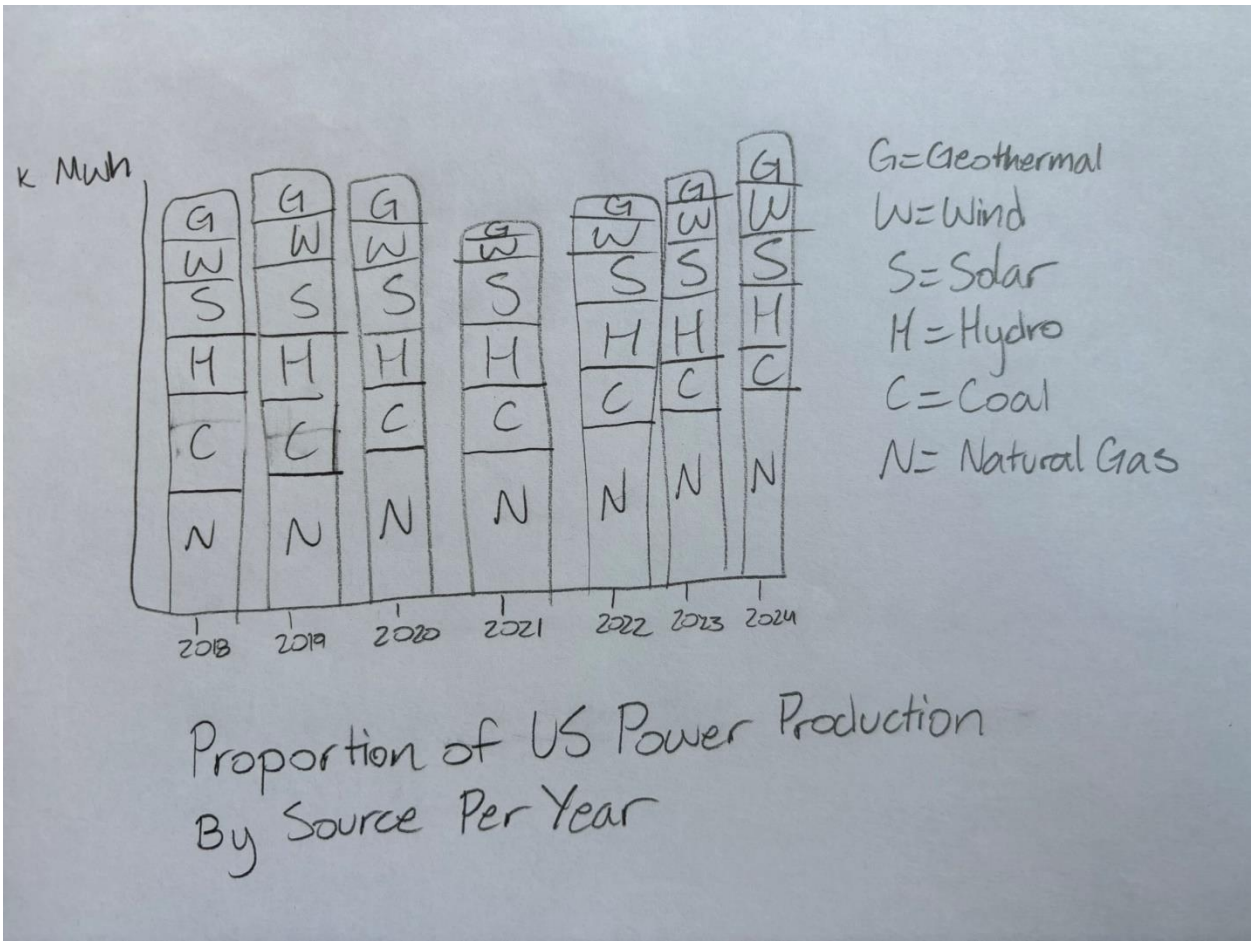
(ID 22: Message ID 3)

- The purpose of this graphic is to convey to the reader how much power individual countries are producing using only renewable energy sources. Similar to the previous one, there would be some established standard consumption in MW represented by the house, and the number of houses would convey how much renewable energy a country is producing. Data Story Element: Rising Insights



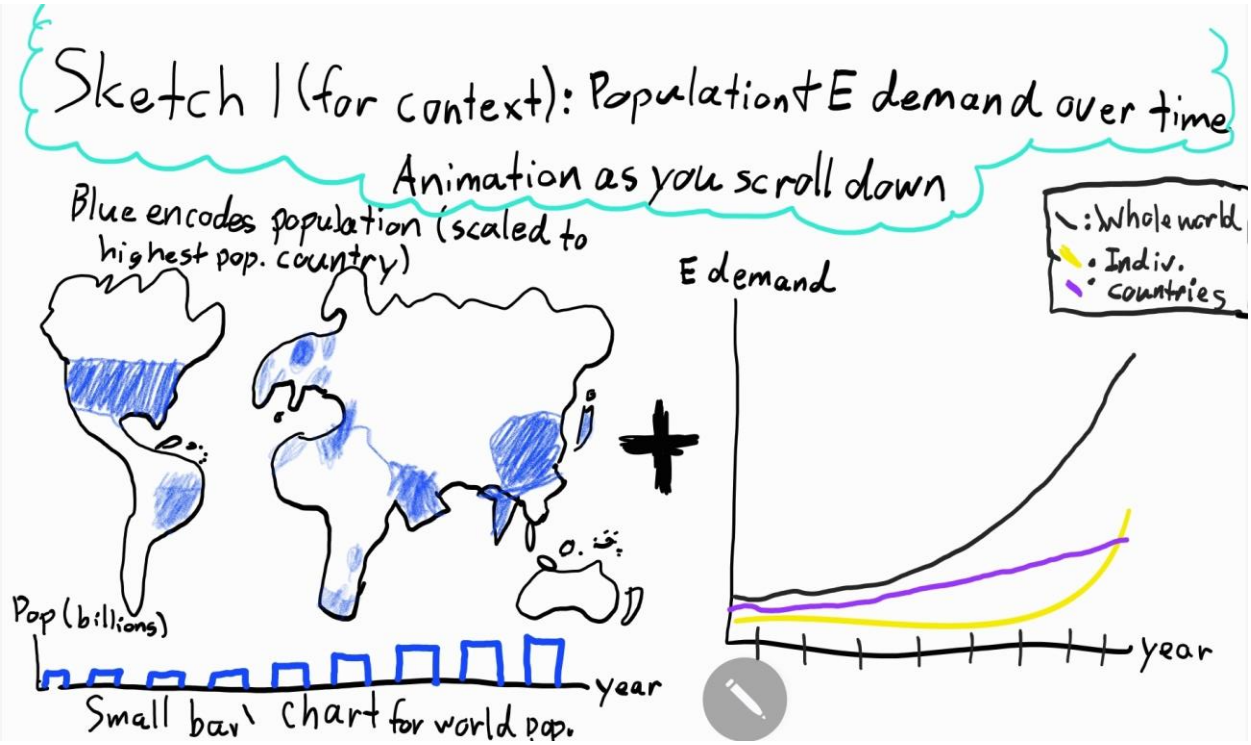
(ID 23: Message ID 12)

- With this visualization, I intended to combine a lot of information about a state's renewable energy production into a relatively compact graphic. I did this by creating a layered graphic, where the shade of the layer implies the number of investments being made, and the shape of the layer is the type of energy being invested into. Story Elements: Main Idea



(ID 24: Message ID 11)

- This visualization shows the proportion of US power production in the US by source, year-on-year. In a fully realized version of this graphic, the reader will be able to see that although these renewable sources have a growing trend, so does natural gas. Data Story Element: Hook



(ID 25: Message ID 2, 5)

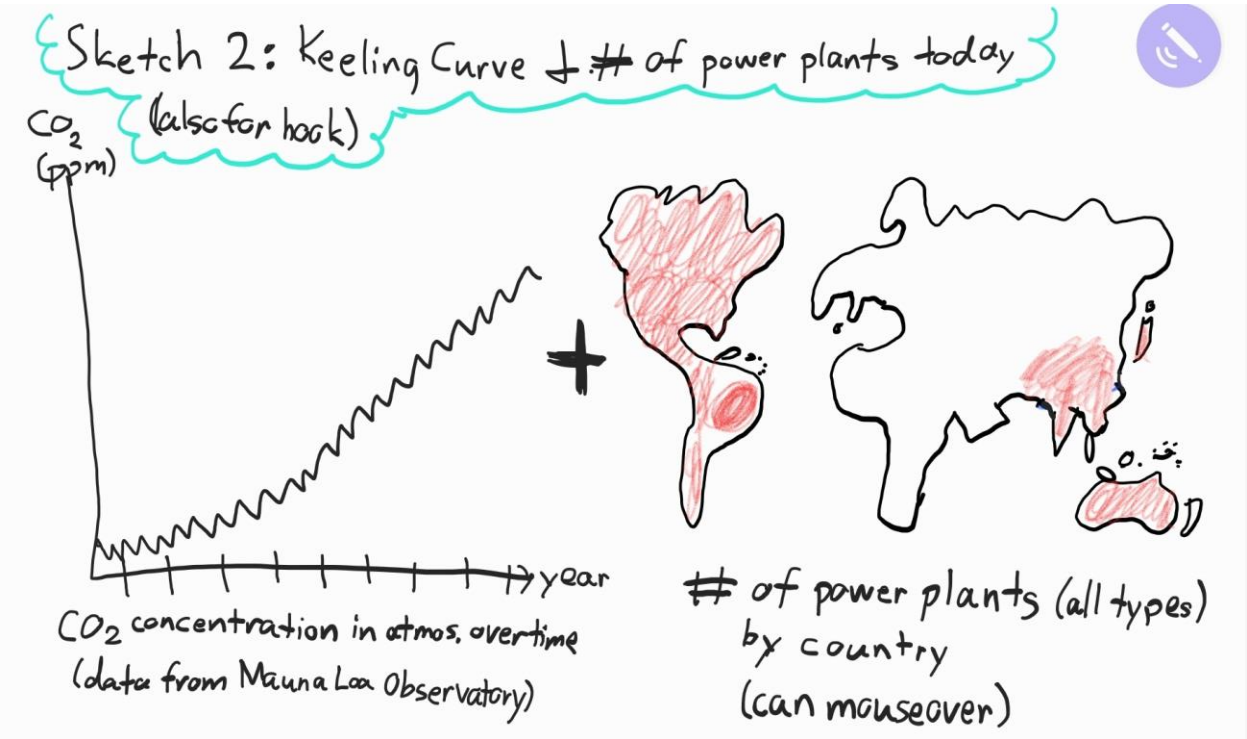
Sketch by Nicolas Miranda. This sketch is meant to give context on the problem that's inspiring our data story. The final combined visualization I am envisioning from this graphic would be animated: as the reader scrolls down on our webpage, the visualization would progress through the years and interactively change the shading on the world map, draw new bars on the bar chart, and extend the lines on the line chart.

This sketch would be best for the hook: it introduces a problem we will explain and offer a solution to.

The mechanics of the visualizations themselves are as follows. The world map and bar chart below it are simply meant to display the world's population (over time, as described above); story readers could either mouse over each country to see its population in a given year or mouse over the bar chart below the world map to see the world's population that year. Each country's shading would be scaled to the most populated country at the time: a deeper blue color means its population is closer to that of the most populous country, while lighter blue means the opposite. On the right, the line chart shows world energy demand (scale and units TBD) over time with some individual countries (most likely the most energy-demanding ones) also plotted for individual examination. These individual country lines could be scaled to the same maximum value or to a different value (for visibility).

All of these visualizations are meant to allow the user to investigate changing demographics over time and how energy demand has risen alongside these changes, leading to the message that population changes have increased energy demand.

In retrospect, I could also add a trendline over the bar chart to more clearly show the world population trend. It might also be interesting to add a data point over each country listing the rank of the country in a) population and b) energy demand.



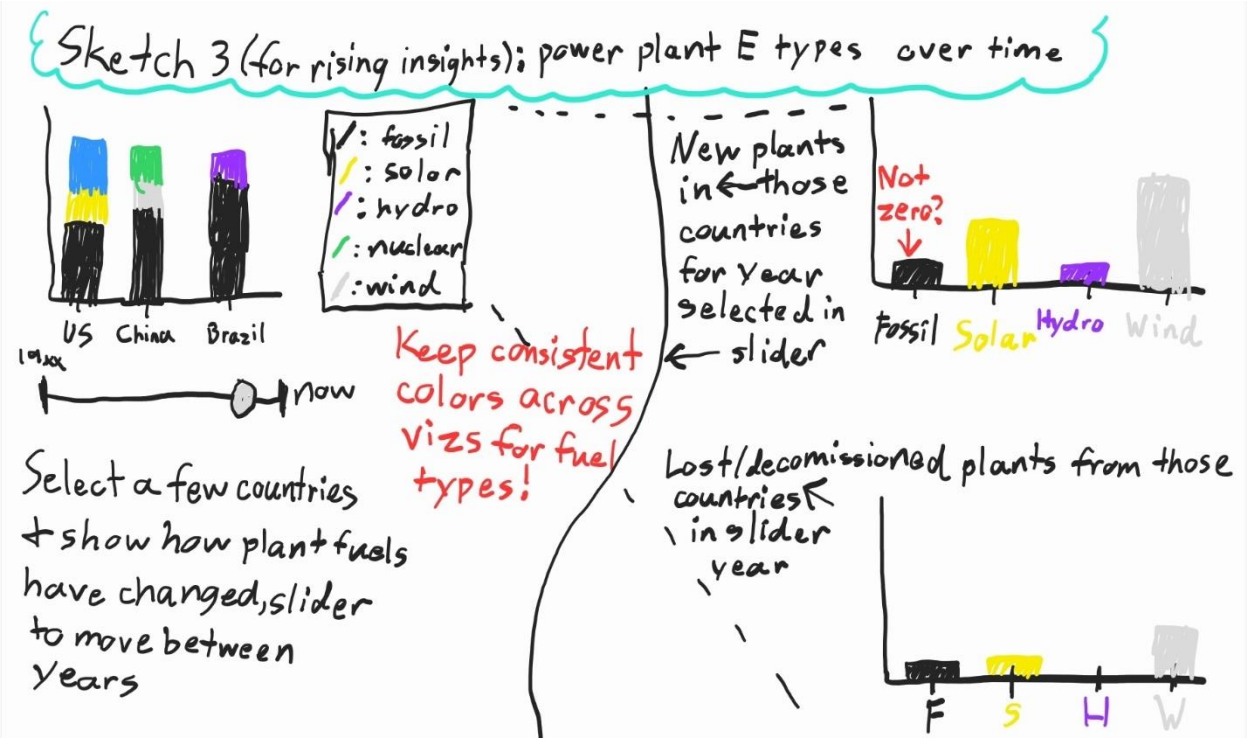
(ID 26: Message ID 1)

Sketch by Nicolas Miranda. The final graphic from these two visualizations would not be animated.

This would be best for the hook: it introduces another problem we can explain and offer a solution for.

Elements/mechanics: Keeling Curve from Mauna Loa Observatory CO2 observations. This graphic is a very famous plot of CO2 over time and could even be a still image from the Mauna Loa Observatory's website. The world map on the right would simply show the number of power plants of all main fuel types in 2025 (or whenever the most updated data is from). The website reader can mouse over each country to show the number of plants in that country, not yet breaking down each one by its fuel source.

Main message: problem with CO2 atmospheric increases & plotting this with power plants, a main historical producer of carbon emissions. We need power, so how can we produce it where it's needed while minimizing our carbon emissions?



(ID 27: Message IDs 3, 11, 8)

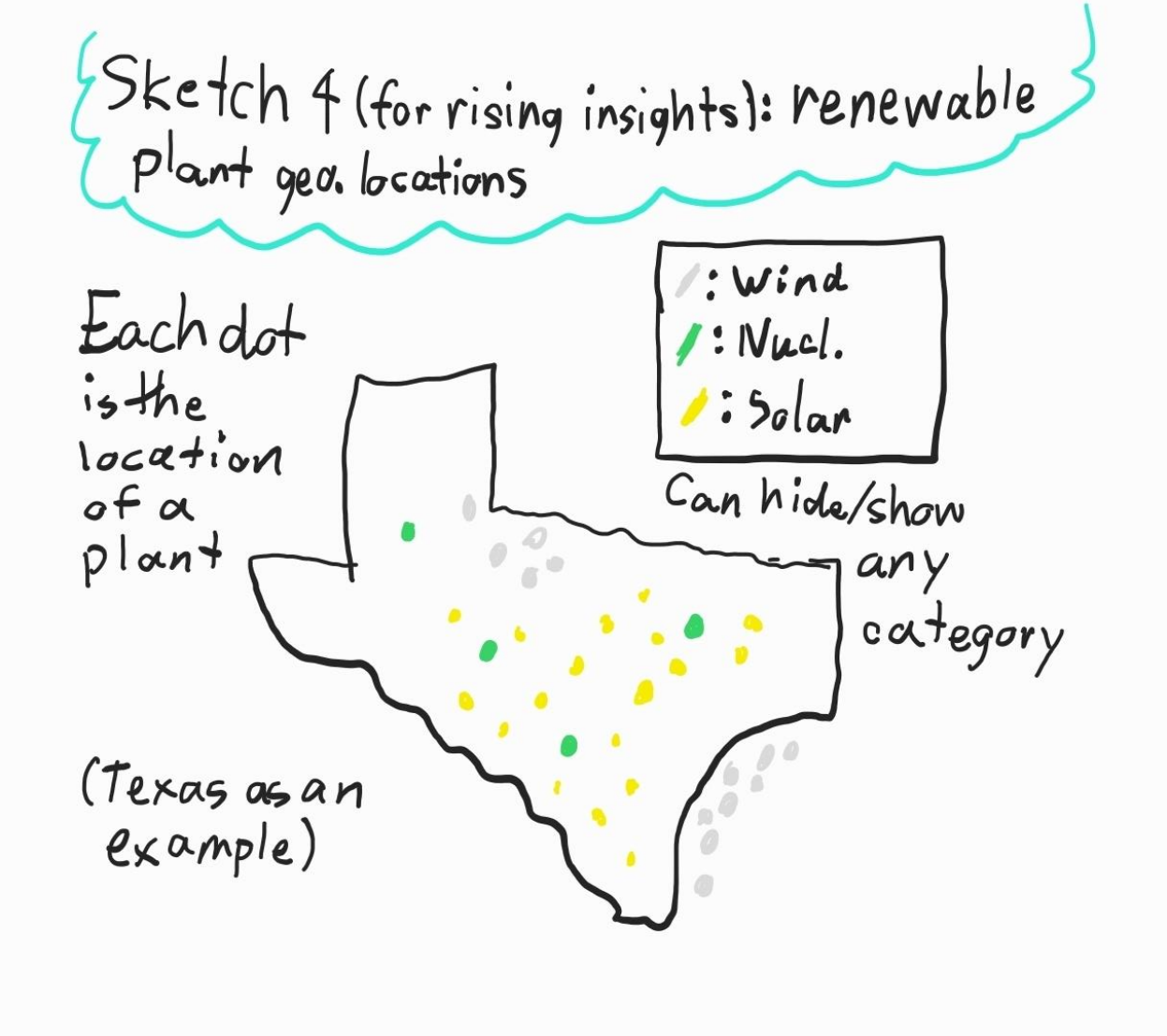
Sketch by Nicolas Miranda. The final graphic from these visualizations would be interactive, driven by the slider under the leftmost bar graph.

This would best fit in the rising information section: this presents countries' progress or lack thereof.

Elements/mechanics: The leftmost bar graph breaks down the number of power plants in the top few energy-demanding countries by their main fuel type and by the year (as far back as records go for all selected countries). By sliding the slider, the user can select a year and see how the overall bar for each country grows (change in total plants) and how each plant type within each country changes qualitatively. The bar charts (man, I need to think of a different visualization type) on the right show all of the *selected countries'* gains or losses/decommissions of plants from the year *prior* to the one selected in the slider to the current year selected in the slider. Every bar in this sketch can be moused over to see total plant numbers, plant numbers by fuel source, and the contributions to plant additions/losses by each selected country.

Message: This graphic could provide some interesting insights into how countries have focused new power plants: have they completely stopped building fossil fuel plants? Have nuclear sites

been decommissioned? Does solar/wind growth not outpace fossil fuel plant additions? In summary, have countries actually focused on decommissioning fossil fuel plants and creating new renewable plants?



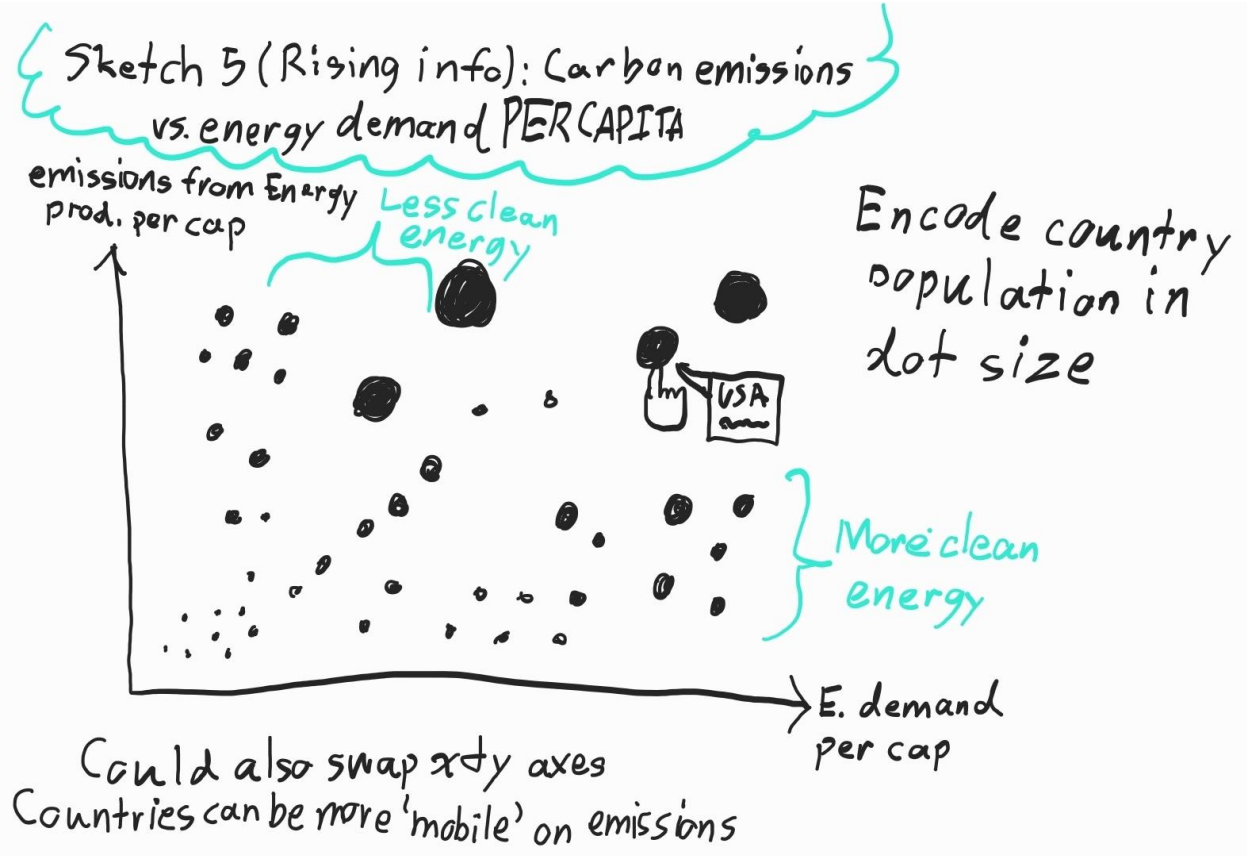
(Sketch ID 28: Message ID 13)

Sketch by Nicolas Miranda. The finalized graphic would be interactive, with users being able to hide any specific type of renewable plant.

This sketch would be best for the rising information section: it presents information on some of the drawbacks of renewable plants, namely where they can geographically be located to produce viable amounts of energy.

Elements/mechanics: This map would likely focus on individual U.S. states, given the high resolution needed to see individual plant locations and the possible unavailability of that information for places outside the U.S. A dropdown would let the user select a U.S. state, whereupon the locations of any renewable energy plant would be plotted on the background of said state. Users could then hide plants by renewable energy type used if they want to see the locations of a specific type in more detail or without the context of other plants.

Message: This visualization might help show the drawbacks of renewable energy, namely its high dependence on geographic/climatological conditions to be useful compared to fossil fuels.



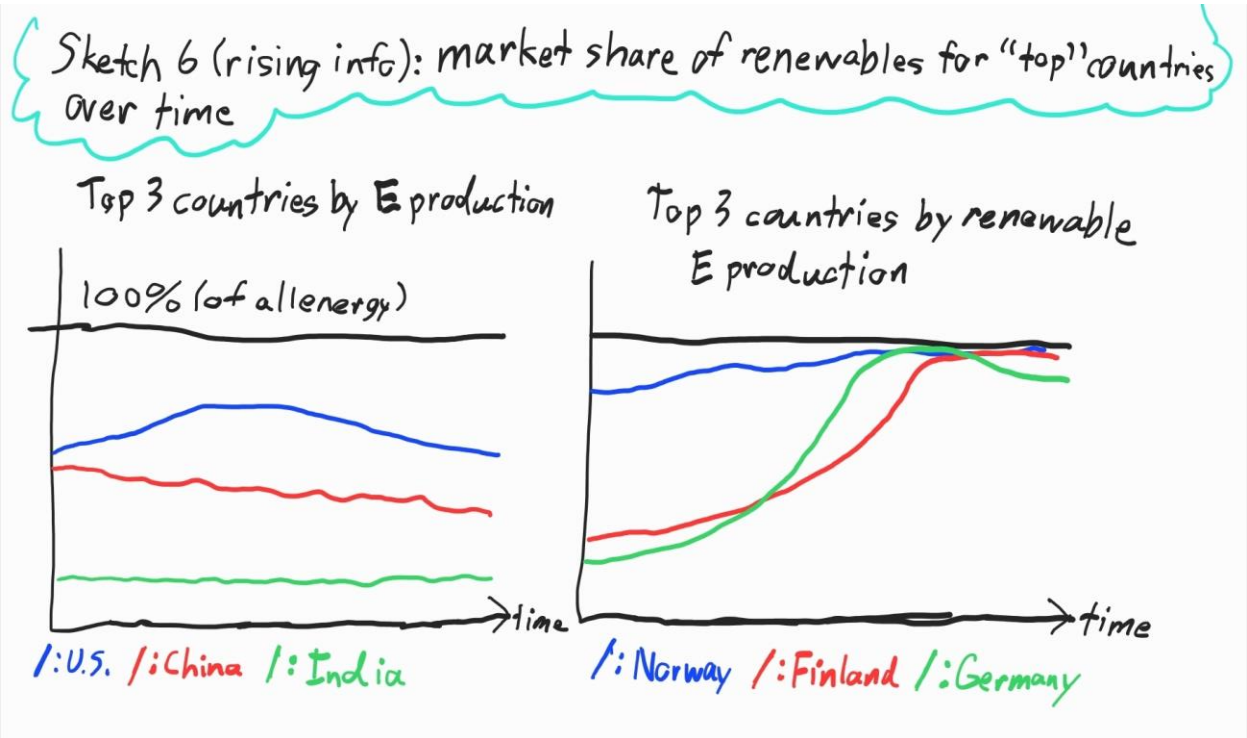
(Sketch ID 29: Message ID 1, 3)

Sketch by Nicolas Miranda.

This sketch would also be best for the rising information section: it presents information we can use to draw conclusions later. It *could* also be used for the main message section for a discussion on the drawbacks to renewables for developing/low population countries.

Elements/mechanics: This scatter plot would encode three variables: CO2 equivalent emissions per capita (units TBD), energy demand per capita (units also TBD), and each country's population. CO2 emissions and energy demand would be best represented as the x and y variables, while country populations, as a variable for context, would be best encoded in the dot size. Users could mouse over each data point to get exact values for all 3 variables and each country's name.

Message: This visualization could show which countries are adopting renewables well by having the least emissions per capita. This well help hold accountable countries that produce a lot of energy from renewables *because they produce a lot of energy in the first place*. This could also show how developing countries or low population countries just need energy by any means necessary and aren't focused on transitioning to renewables.



(Sketch ID 30: Message ID 2, 4, 5, 11)

Sketch by Nicolas Miranda.

This sketch would also be good for the rising information section, even though I have already classified a lot of my sketches in this section. It does present information that we can use for discussions, especially if the top energy-producing countries are actually decreasing their market

shares of renewables. It could also be used for the solution section, showing the market share available for renewables to fill in the top countries.

Elements/mechanics: This visualization would need both bar graphs in tandem, so they can contrast each other. The finalized visualization should be mostly static, though a mouseover on the trend line could show each country's % of renewable adoption for each year. The number of countries shown on each graph and the colors aren't final, just placeholders.

Message: This also shows how countries have either adopted or failed to adopt renewable energy, and it shows trends in adoption over time. If the top renewable-production countries (presumably all-in on renewable energy) have all been having downturns in renewable market share in the last few years, then maybe other countries can't be blamed for having less renewable energy production over the last few years. This viz also shows the opportunity for renewables to take higher market shares of energy production in energy-hungry countries.

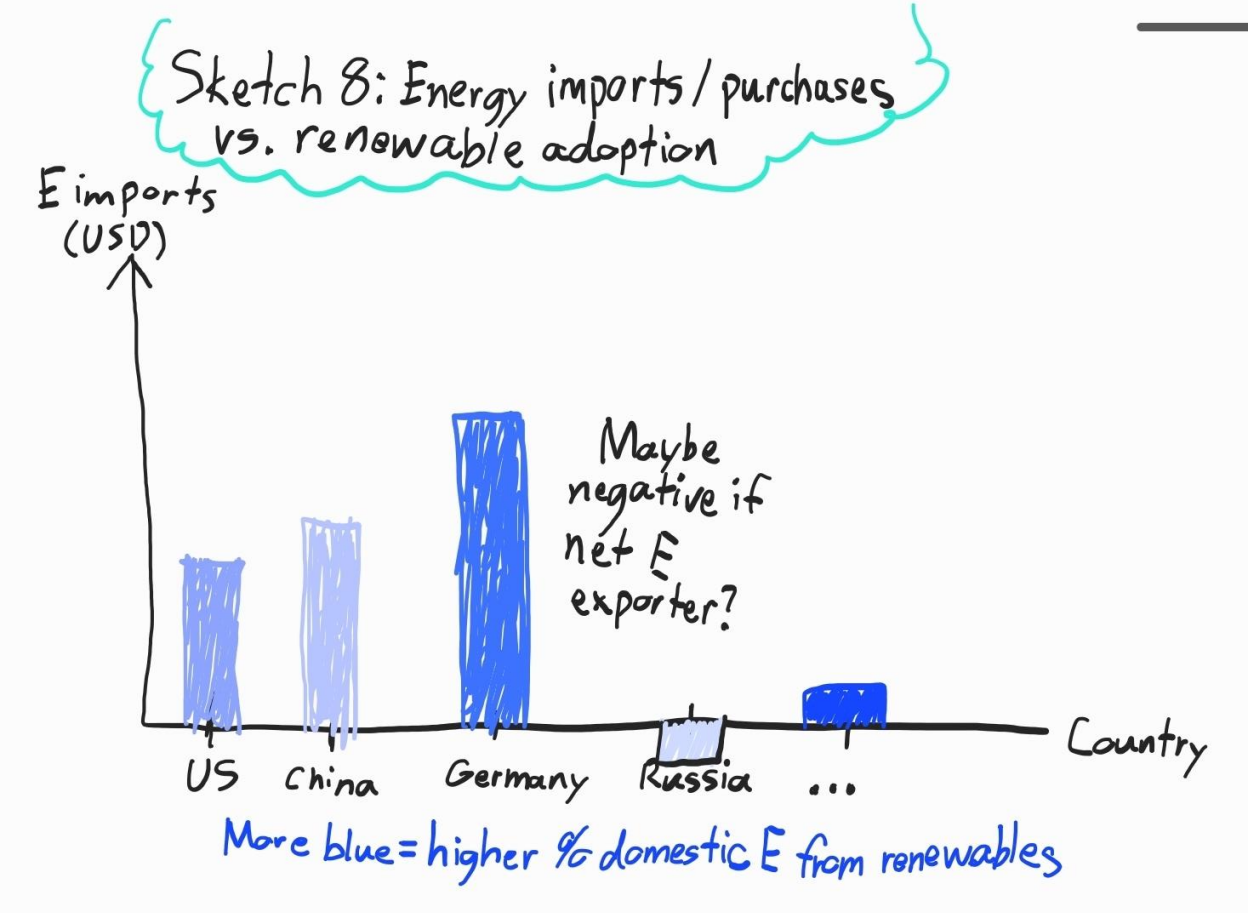
(Sketch ID 31: Message ID 3)

Sketch by Nicolas Miranda.

This sketch, in retrospect, would also be best for the solutions section: it shows the greatest opportunities for renewable adoption in a different way, by % of country power produced by renewables rather than quantitative energy production by renewables.

Elements/mechanics: The slider would be the main mechanic for this world map. By sliding it, the user can select a percentage; countries which have an equal or higher market share of renewables than this percentage will remain shaded, while countries with less renewable energy production will become unshaded. Moving the slider towards lower percents will update the map the same way, shading countries as they become valid.

Message: This is a good way to interactively show renewable adoption around the world and, again, the greatest opportunities for adoption in terms of market share of energy produced by renewables. It's more exploratory, letting users investigate which countries are above a 'good' renewable threshold that they might think of.



(Sketch ID 32: Message ID 2)

Sketch by Nicolas Miranda.

This would be best for the rising information or main message sections. It presents information that we could use to discuss, but might also show whether more renewable adoption can lead to less (or more) national spending on energy imports (not enough domestic energy production, so they need to but fuels or power from other nations).

Elements/mechanics: This would just be a bar graph; users could mouse over each bar to get a dollar value for each country's annual energy imports/exports. Market share of renewable energy would be encoded in each bar by its color – deeper blues mean more of that country's energy is produced by renewables. It might also be good to include a way for users to sort the bar graph: by highest energy production, by most imports or exports, by lowest renewable share, etc.

Message: This could show a strong benefit or a strong detriment of renewable energy, depending on whether countries with more renewables pay less or more for energy imports. It can also show what fuel sources the energy exporters rely on; maybe they don't care about renewable adoption and are willing to burn as much fossil fuel as necessary to power themselves and sell extra power to anyone willing to buy (most notably, Russia).

Decide

Message IDs:

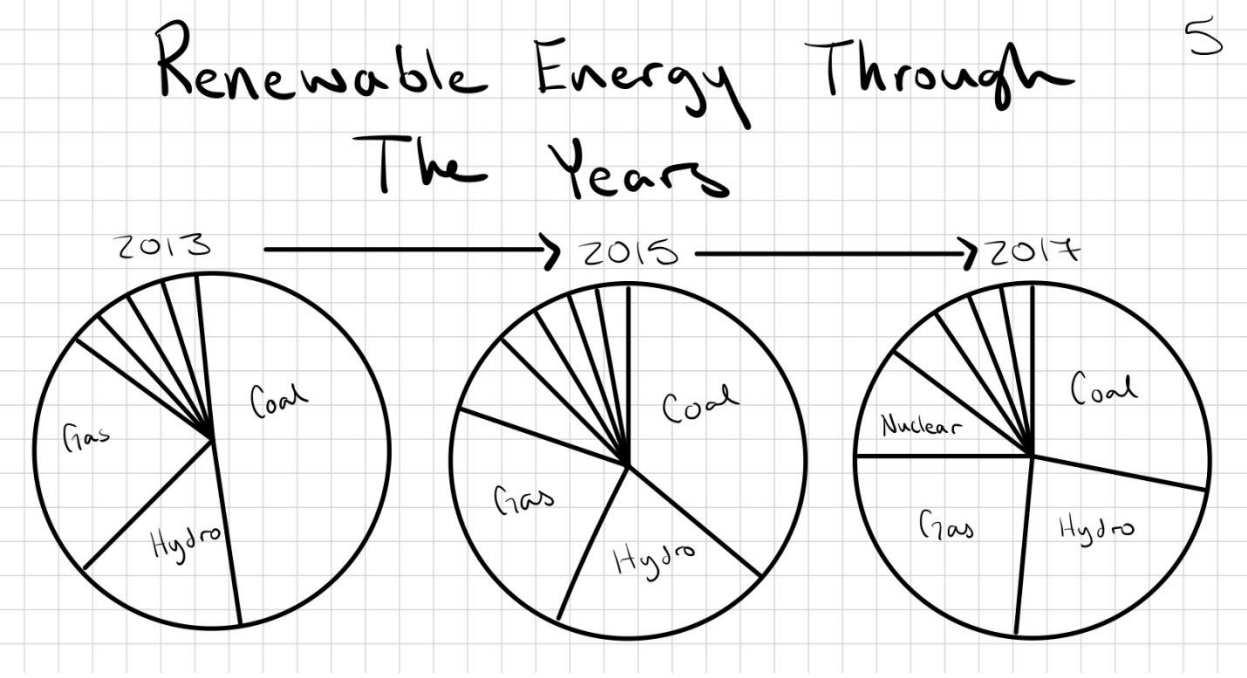
- 1: How renewable energy and pollution correlate
- 2: Some countries produce a disproportionate amount of power
- 3: Countries and their most used sources for energy
- 4: The progression of renewable energy use over time
- 5: Overarching share of energy generation in the world
- 6: Investment correlation to renewable generation
- 7: How data centers majority share on energy usage
- 8: Country progress towards global renewable goal
- 9: Datacenters and the type of energy they are consuming
- 10: Renewable energy capacity outlook
- 11: Coal energy production has gone down over time, but natural gas has increased, so the overall trend of nonrenewable isn't completely negative
- 12: Per-state investments into renewable energy
- 13: Proportions of renewable energy production in the US

Sketch ID	Message ID	Author	Votes
1	1	JC	2
2	2	JC	1
3	2	JC	0
4	3	JC	1
5	3	JC	0
6, 11	4, 3	JC, JR	3
7	5	JC	0
8	3	JC	1
9	7	JR	1
10	6	JR	2
12	12	JR	0
13	8	JR	0
14	10	JR	0
15	1	JR	0
16	9	JR	2
17	12	WS	0
18	3	WS	0
19	12	WS	0
20	12	WS	1

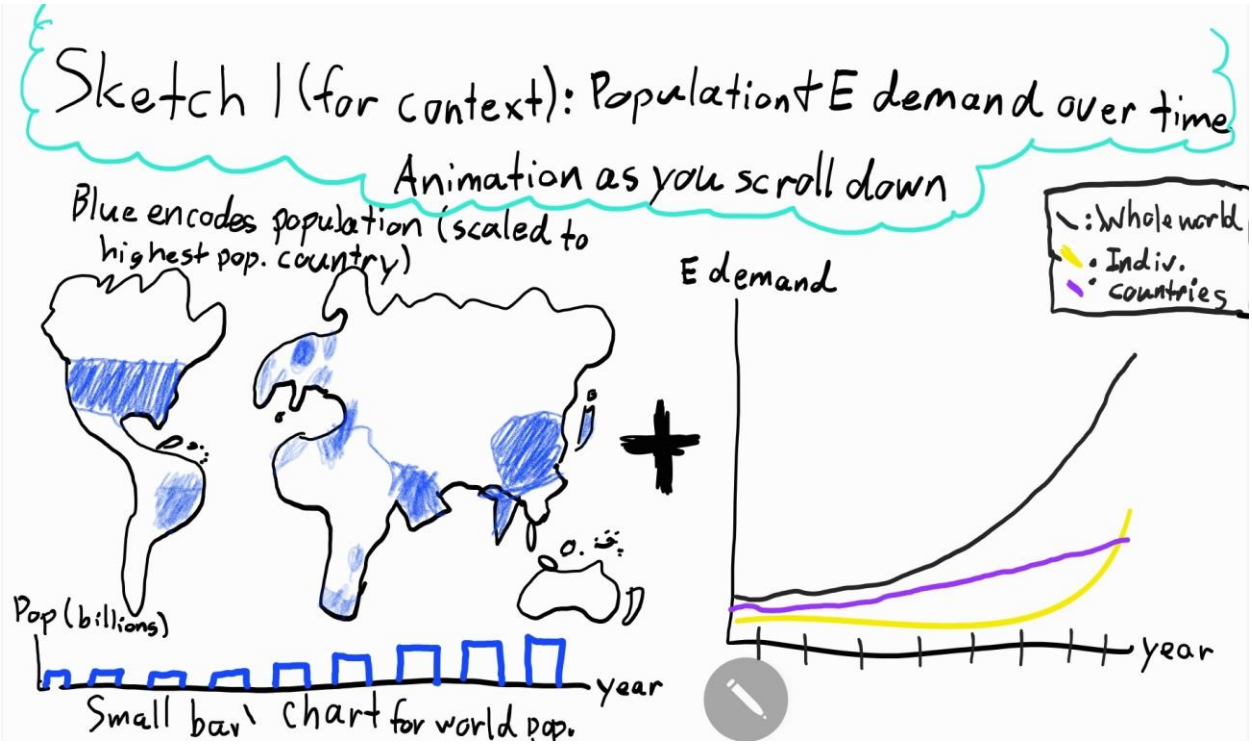
21	13	WS	0
22	3	WS	2
23	12	WS	0
24	11	WS	1
25	2, 5	NM	2
26	1	NM	0
27	3, 11, 8	NM	2
28	13	NM	0
29	1, 3	NM	0
30	2, 4, 5, 11	NM	0
31	3	NM	0
32	2	NM	0

Chosen Sketches

- Mapping question 3. What Percentage of electricity generation comes from renewables?
- Mapping question 9. What is the share of primary fuel sources among power plants?

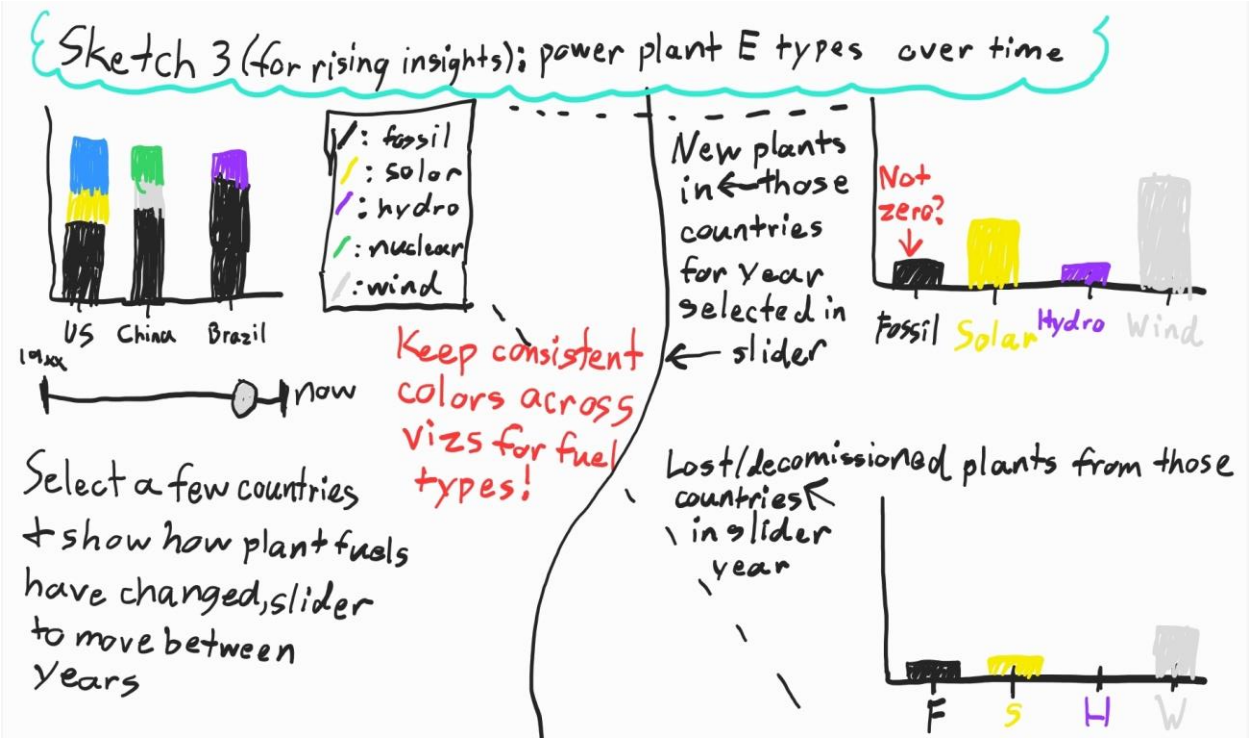


- Mapping question 12: Which countries produce the most power?

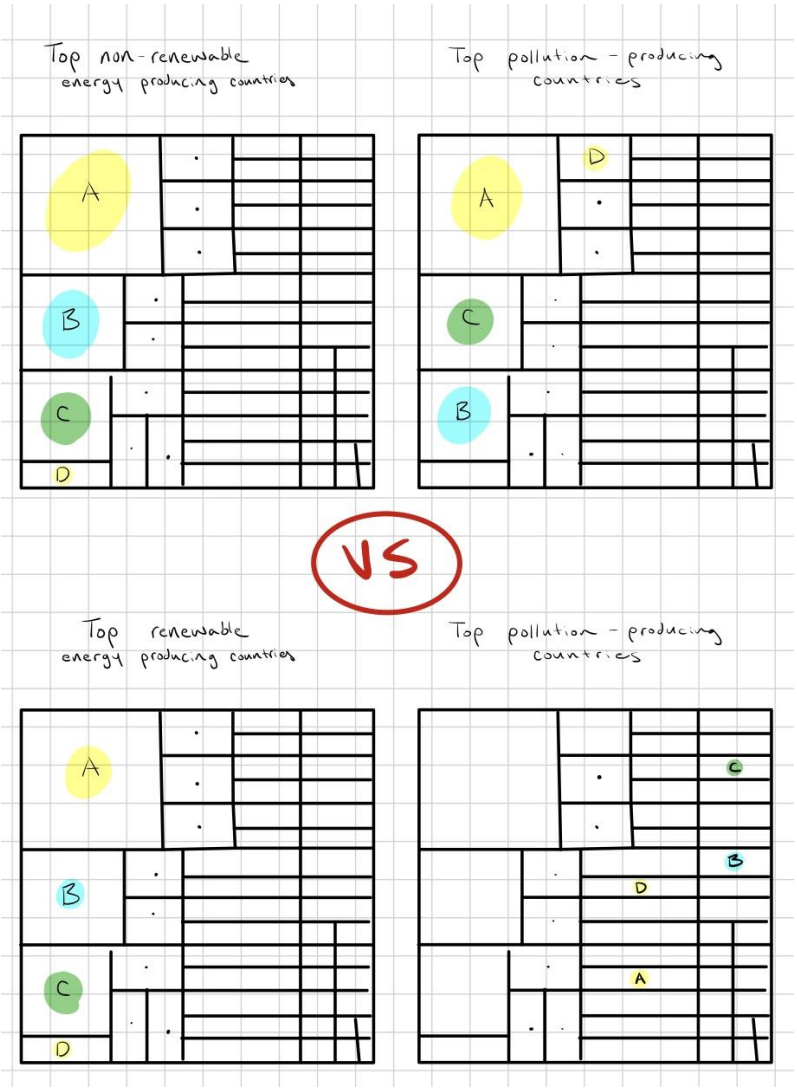


(For Sketch #27 below)

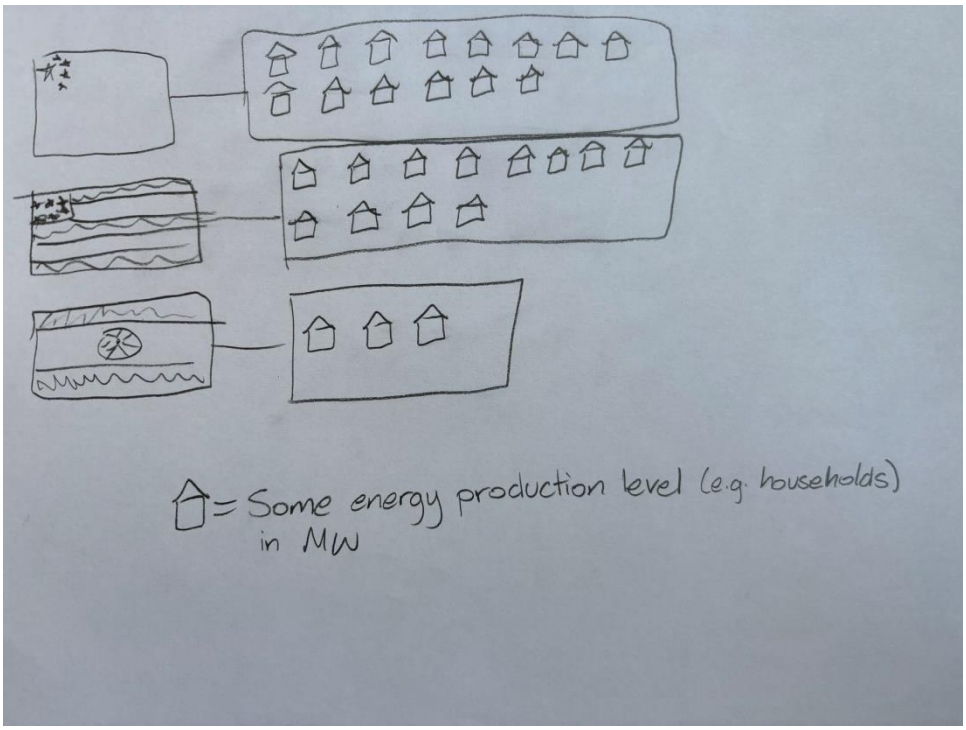
- Mapping question 2: What countries are leading the adoption of renewable energy?
- Mapping question 5: How has the adoption of renewables changed over the past few years?
- Mapping question 9: What is the share of primary fuel sources among power plants?
- Mapping question 13: What has the adoption of renewables looked like specifically for the 3 countries with the highest energy production *from all sources*? (China, US, and India)


Sketch 3 (for rising insights): power plant E types over time
US
China
Brazil
: fossil
: solar
: hydro
: nuclear
: wind
1900
now
Keep consistent colors across vizs for fuel types!
Select a few countries + show how plant fuels have changed, slider to move between years
New plants in those countries for year selected in slider
Not zero?
Fossil
Solar
Hydro
Wind
Lost/decomissioned plants from those countries in slider year
F
S
H
W

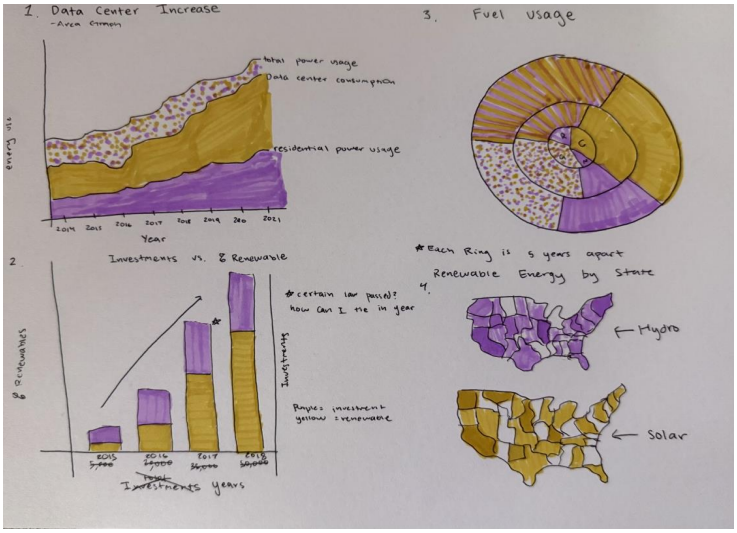
- Mapping question15: How has an increase in renewable energy related to pollution (carbon emissions, sulfur dioxide etc.)



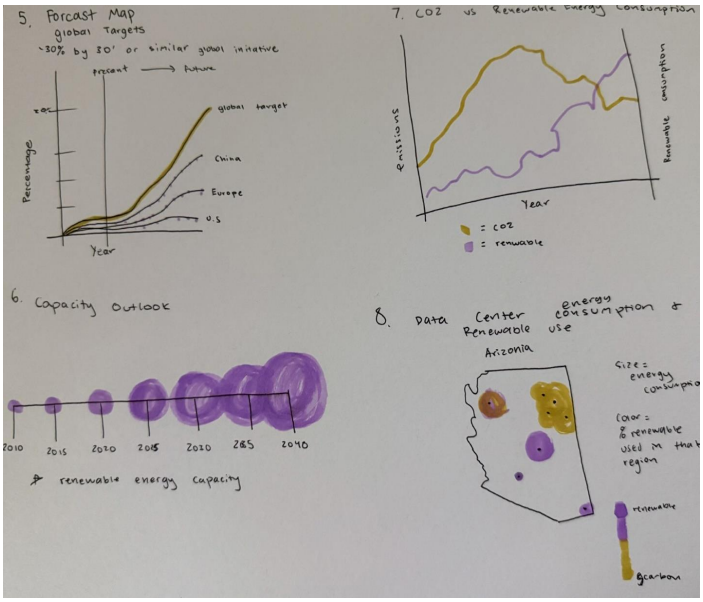
- Mapping question 12: Which countries produce the most power?



- Mapping question 1: How have government incentive programs affected the adoption of renewable energy?
- Mapping question 7: Are there any landmark events that correlate with renewable energy increases/decreases?



- Mapping question 6: How have datacenters increased/decreased renewable energy usage?



Rationale

The team selected sketches based on the goal of choosing visualizations that would provide the widest breadth of information about our topic. We chose sketches that focus on U.S. energy trends (for more in-depth investigations) as well as global energy trends, and we also chose sketches that focus on overall energy production as well as visualizations that focus on renewable energy. This will allow us to present a large amount of information to the public and support many different conclusions. We also ensured that the sketches we selected would allow us to tell a story about the past and outlook of renewable energy. This will empower readers to think more about the impacts of energy intensive operations such as datacenters.