



EIA Py

Analysis and forecasting of Electricity Information
Administration Electricity Demand Data

Project Links

- [GitHub Repo](#)
- [API Docs](#)
- [Slides](#)
- [Data Understanding Dashboard](#)

Objectives

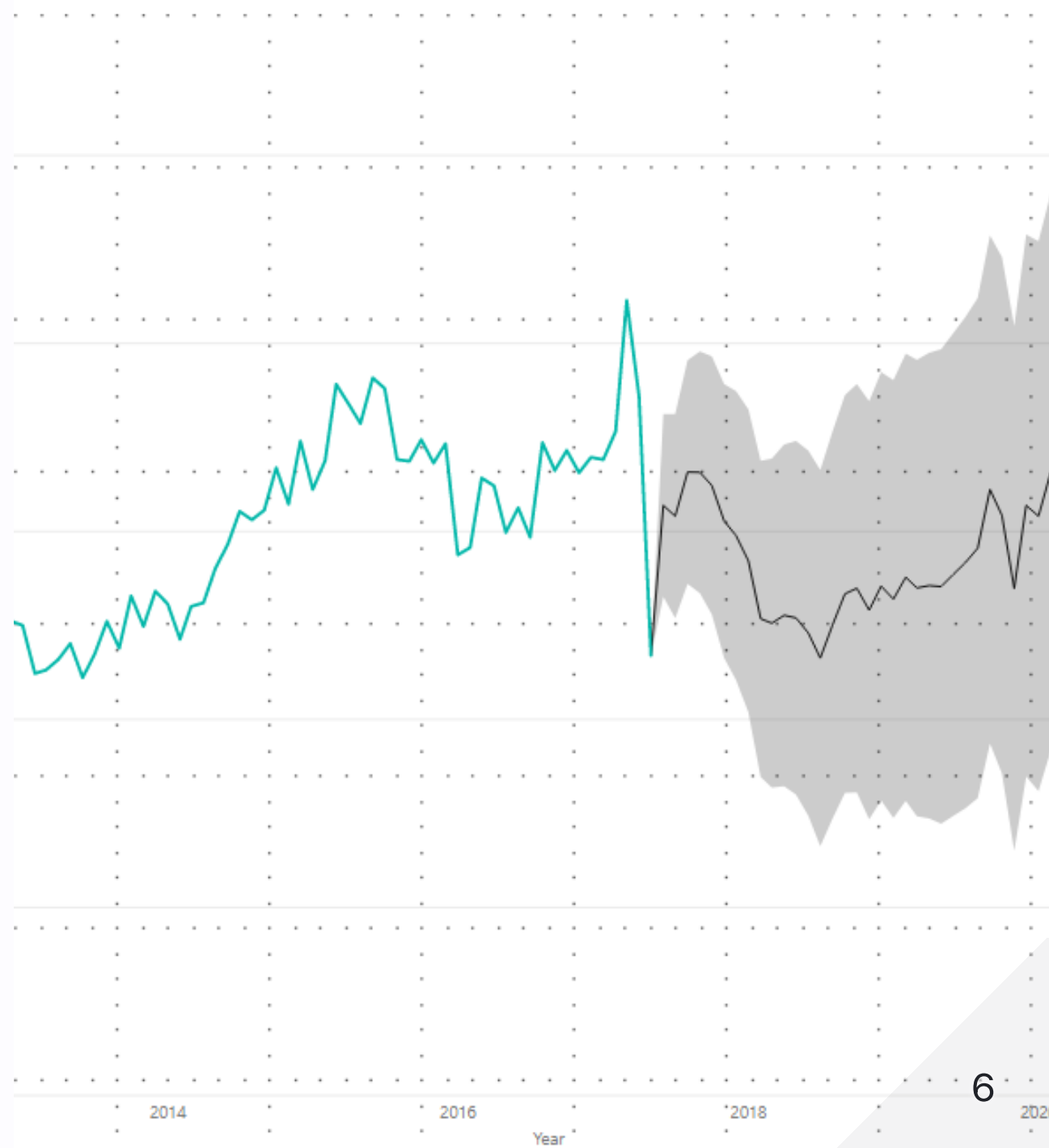
Publish `eia-py`

- publish a high quality PyPi package
- allow others to scrape and use the Energy Information Administration data
- efficiently cache data to minimize downloads

Energy Information Administration data analysis

- How electric energy is being consumed around the States?
- What are the sources contributing to its generation?
- What impact do the sources have on the environment?

Forecast electricity demand



Using the Python Package

```
pip install eia-py-api
```



```
import eia
dataframe = eia.load_dataframe()
# Scrapes, caches, and loads all data into a `pd.DataFrame`.
# Reuses cached data to avoid excessive redownloads
```

```
>>> eia.load_dataframe('electric-power-operational-data')
```

	Unnamed: 0	period	location	state	Description	...	ash-content	ash-content-units	heat-content
0	0	2021-06	SD	South	Dakota	...	0.0	percent	0.0000
1	1	2021-06	SD	South	Dakota	...	0.0	percent	0.0000
2	2	2021-06	SD	South	Dakota	...	5.2	percent	16.4020
3	3	2021-06	SD	South	Dakota	...	5.2	percent	16.4020
4	4	2021-06	SD	South	Dakota	...	0.0	percent	6.0000
...
4995	4995	2021-10	MD	Maryland	...	0.0	percent	0.0000	
4996	4996	2021-10	MD	Maryland	...	0.0	percent	2.4031	
4997	4997	2021-10	MD	Maryland	...	0.0	percent	5.9700	
4998	4998	2021-10	MD	Maryland	...	0.0	percent	0.0000	
4999	4999	2021-10	MD	Maryland	...	0.0	percent	0.0000	

```
[5000 rows x 38 columns]
```

More information available in [the GitHub repo README](#)

Quickstart

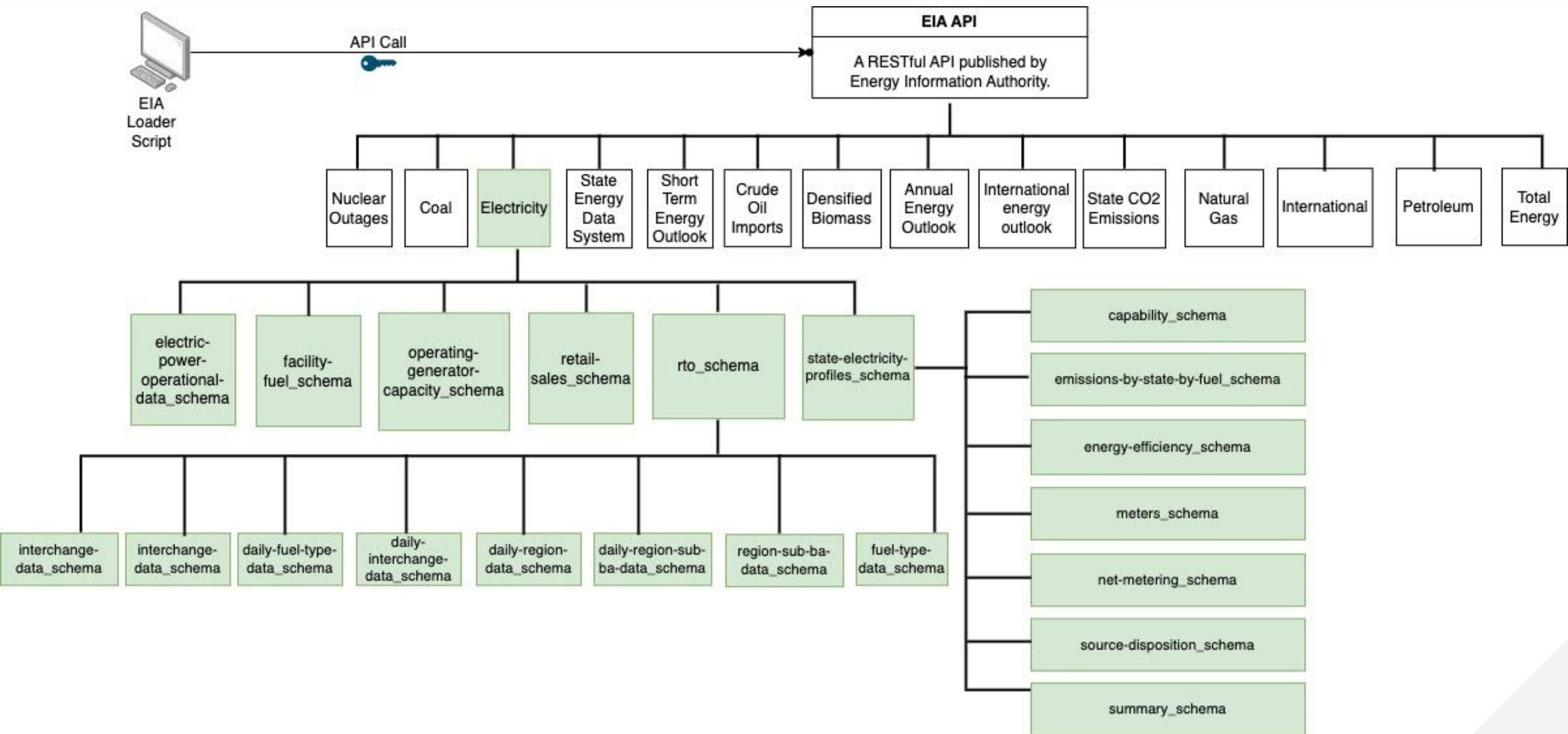
The easiest way to get started is to install from PyPi:

```
pip install eia-py-api
```

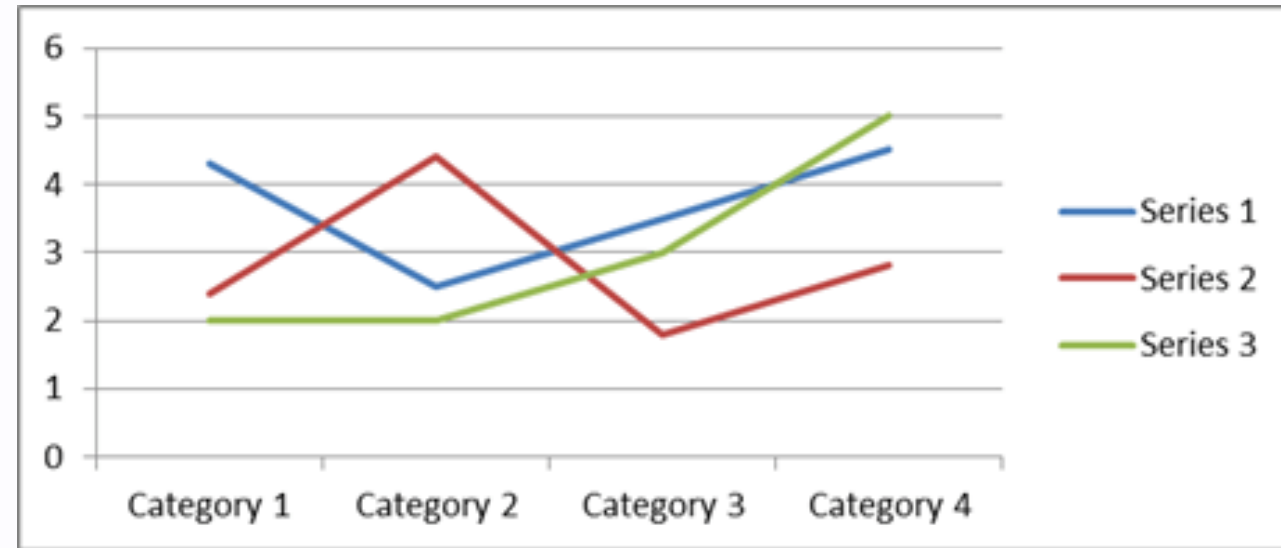
Next you'll need to export an API key in your environment variables:

```
export EIA_API_KEY="{your-key}"
```

You can get an API key from [the EIA website](#).



Data Anaysis



Green Score

- Scalar between 0 (Poor) and 5 (Best)
- Measures the environmental impact of electricity generation
- Primarily takes NO_x and CO₂ into account
- scales NO_x to CO₂ equivalent
- normalises the value to per unit of electricity generation

stateDescription	green_score_norm
------------------	------------------

Washington	4.800611
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New Hampshire	4.796714
---------------	----------

Vermont	4.763041
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Idaho	4.692732
-------	----------

South Dakota	4.691485
--------------	----------

Oregon	4.655318
--------	----------

New York	4.576435
----------	----------

Best 7 States

stateDescription	green_score_norm
------------------	------------------

Alaska	2.458610
--------	----------

Alaska	2.458610
--------	----------

District of Columbia	2.780220
----------------------	----------

District of Columbia	2.780220
----------------------	----------

Hawaii	2.932841
--------	----------

Hawaii	2.932841
--------	----------

Wyoming	3.118355
---------	----------

Wyoming	3.118355
---------	----------

West Virginia	3.268793
---------------	----------

West Virginia	3.268793
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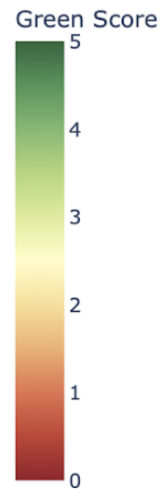
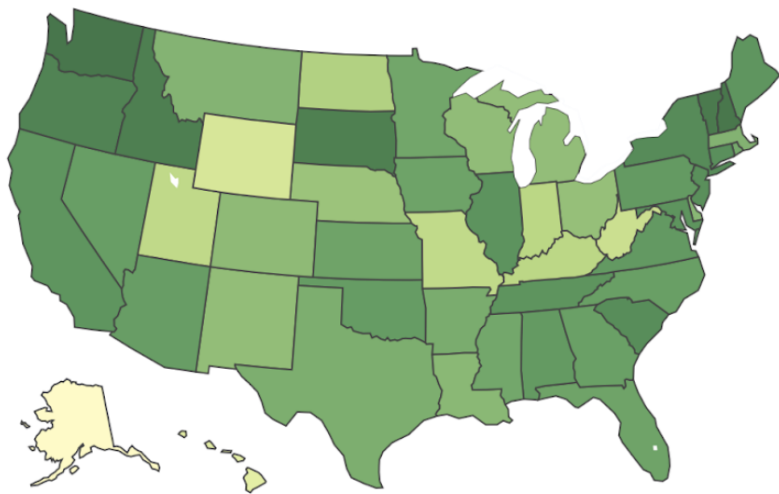
Missouri	3.395691
----------	----------

Missouri	3.395691
----------	----------

Utah	3.411592
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Utah	3.411592
------	----------

Worst 7 States



Green Score Over Time

[Link to the live plot on
the dashboard](#)

Trend!

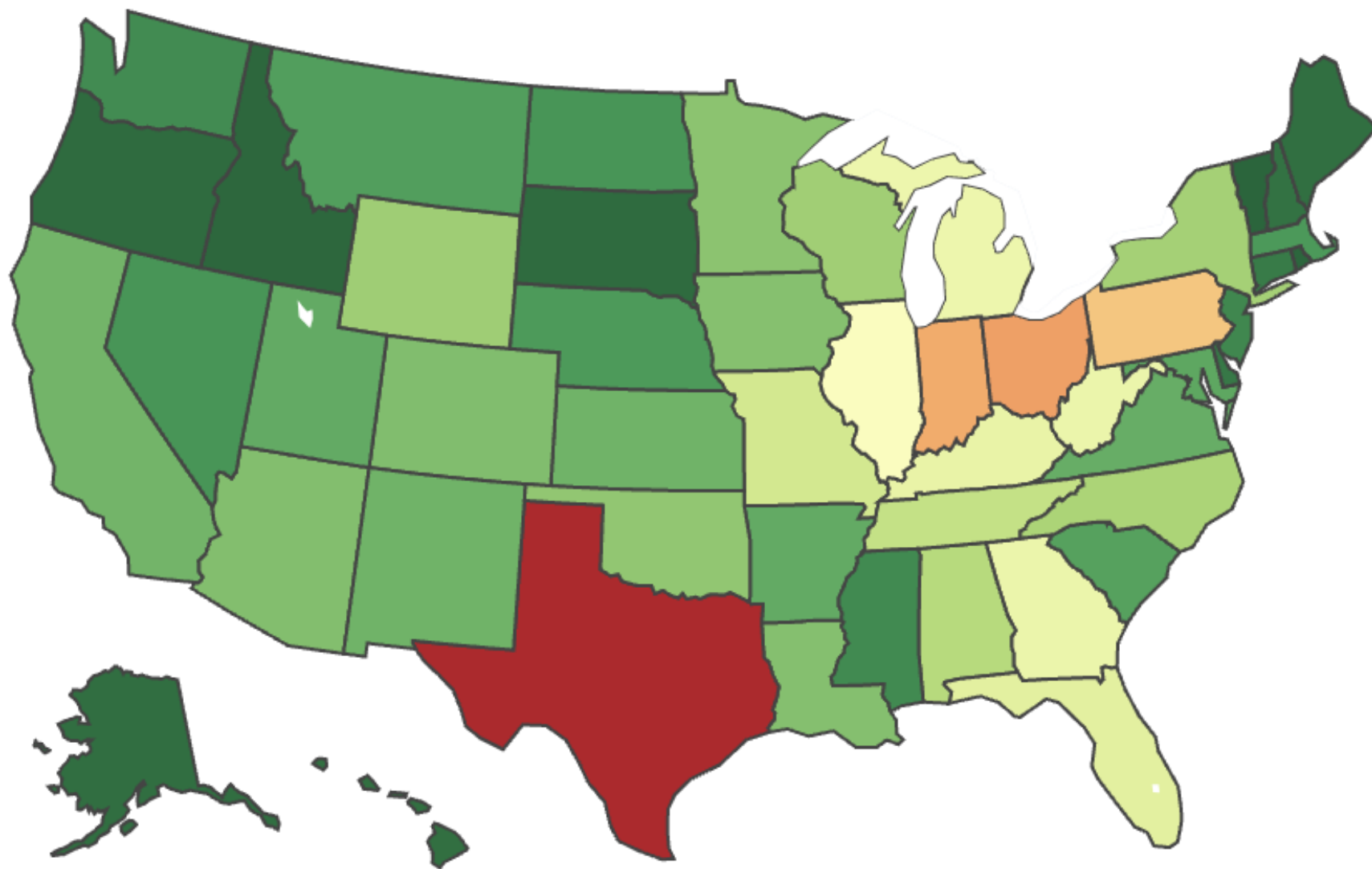
The Green Score has been improving over the years!

- Decision makers are pushing towards more greener sources of energy
- This essentially could be due to improved power generation techniques



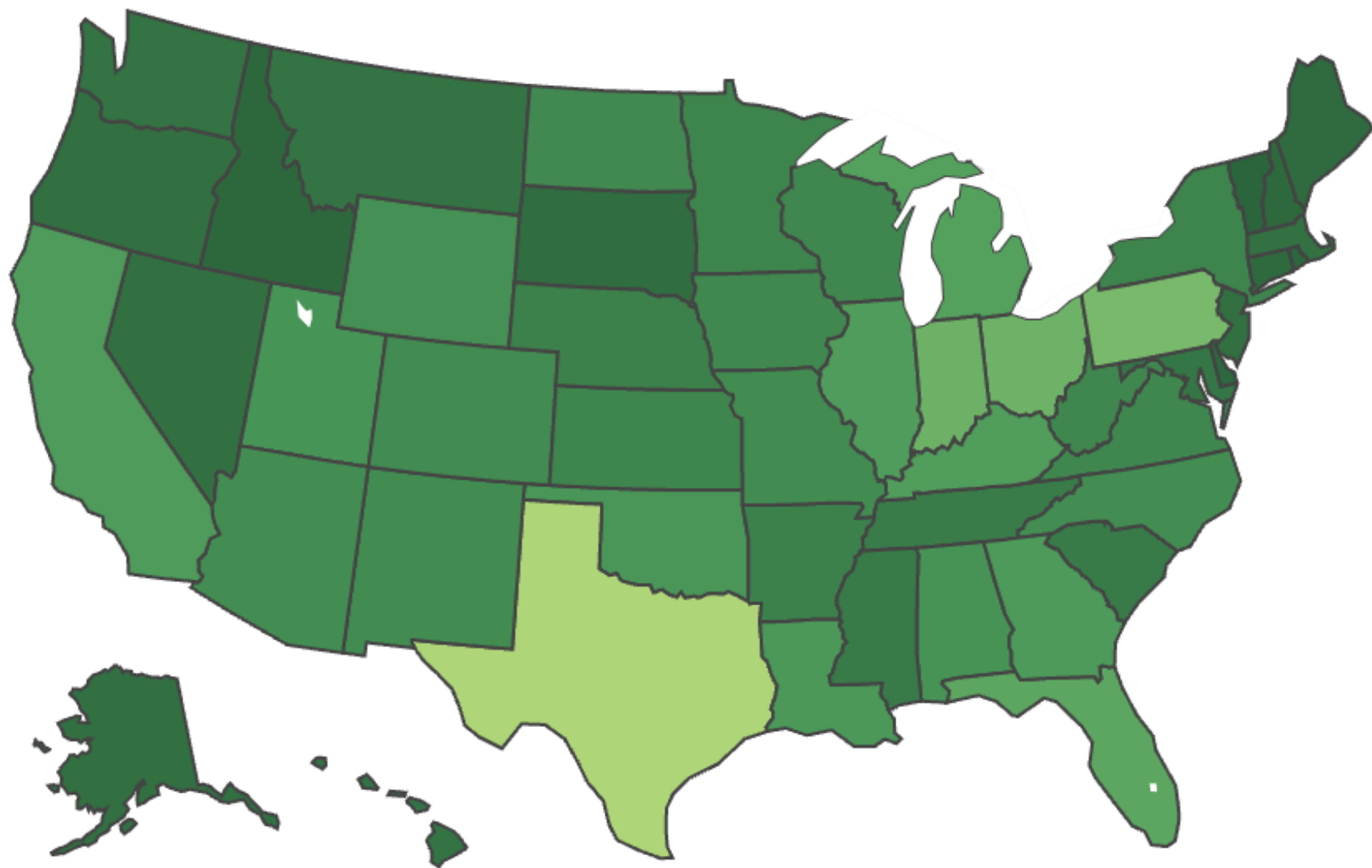
"Good Job Everyone!!!"







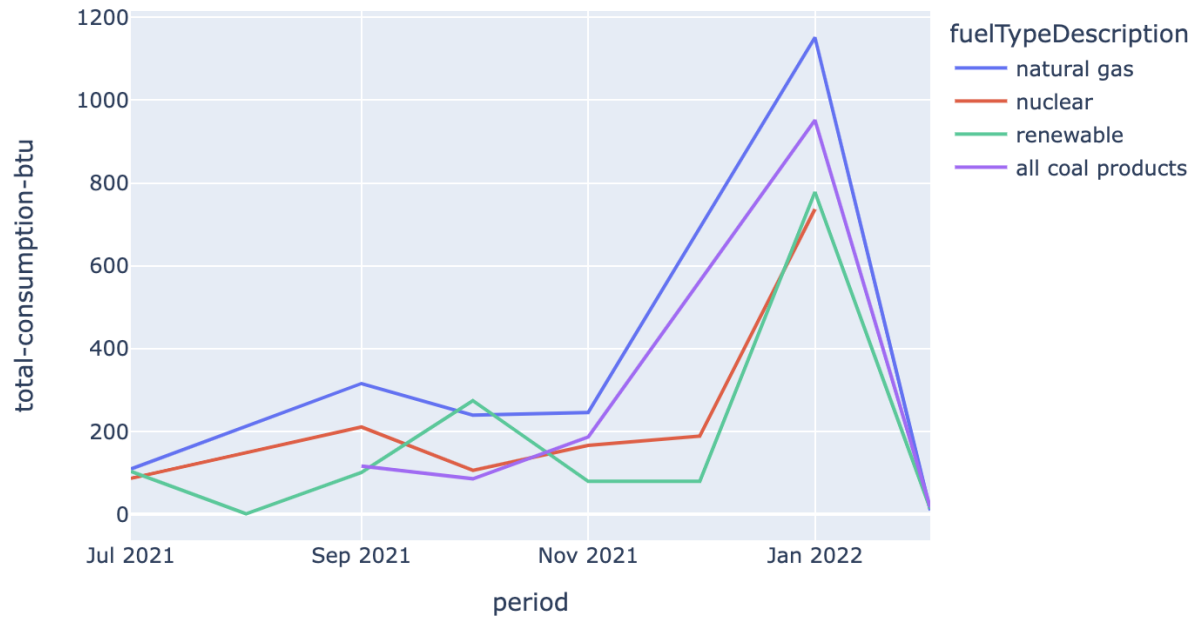
**Except
Texas**





"Good Job Texas!!!"

U.S. primary energy consumption by source (Jul 2021-April 2022)



Live Plot

SO2 Score

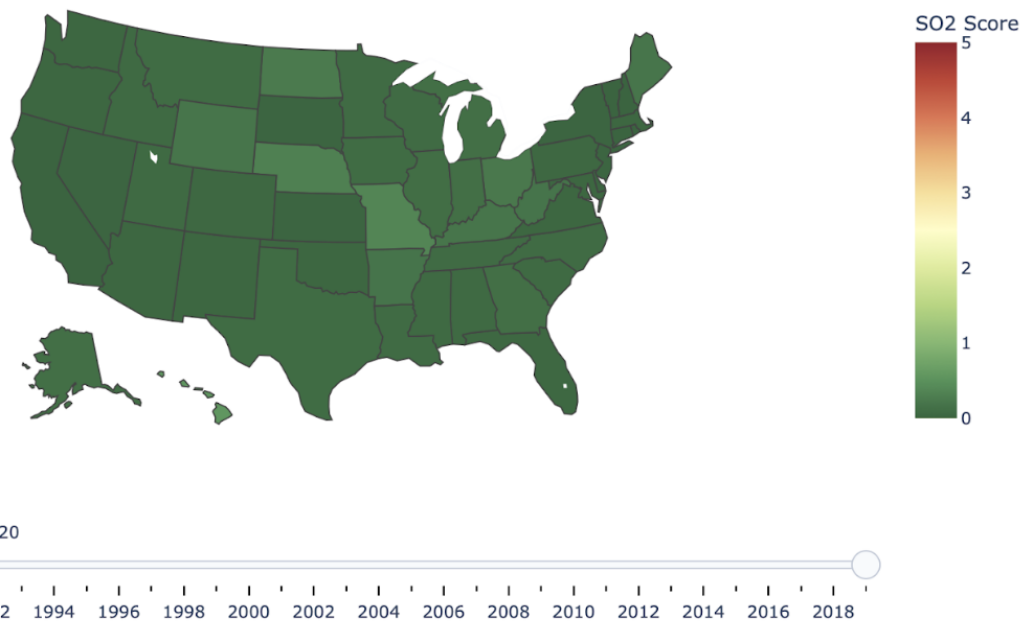
- SO2 is a secondary pollutant
- Separated for the primary score
- Scalar between 0 (Best) and 5 (Poor)
- SO2 emission during electricity generation.
- Again is normalised per unit of electricity generation

stateDescription	so2_index
Rhode Island	0.000000
District of Columbia	0.000000
Connecticut	0.000000
California	0.000000
Vermont	0.000000
New Hampshire	0.000000
Nevada	0.014409

Best 7 States

stateDescription	so2_index
Hawaii	0.547550
Missouri	0.360231
Nebraska	0.317003
North Dakota	0.244957
Ohio	0.216138
Wyoming	0.187320
Kentucky	0.187320

Worst 7 States



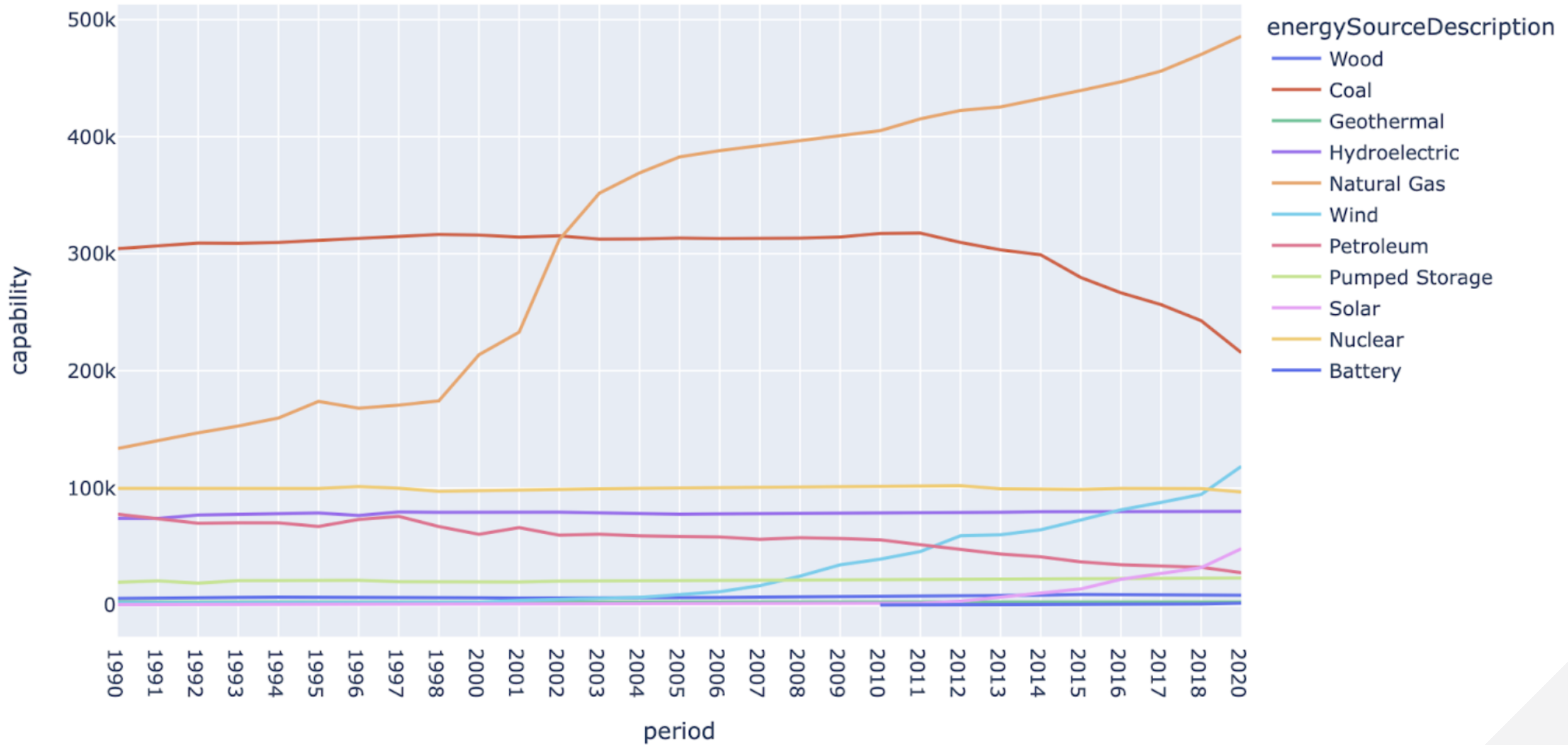
SO2 Score Over Time

[Link to the live plot on the dashboard](#)

Trend

The SO₂ score has been getting better over the years.

This could be due to using fuel sources with lower Sulphur content.



Self Sufficiency Index

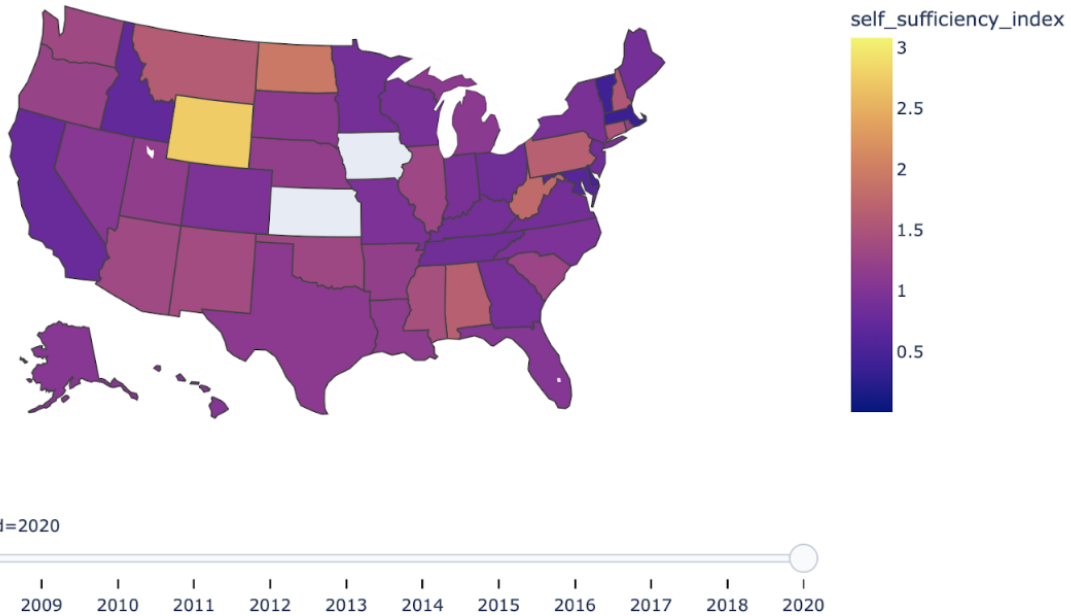
- a measure of energy independence of each state
- index of around 1 indicates that a state could be self sufficient
- many states fall under this category

stateDescription	self_sufficiency_index
Wyoming	2.740261
North Dakota	1.932974
West Virginia	1.766445
Alabama	1.649280
Pennsylvania	1.647165
Montana	1.601276
New Hampshire	1.529016

Best 7 States

stateDescription	self_sufficiency_index
District of Columbia	0.020551
Massachusetts	0.364215
Vermont	0.404469
Delaware	0.467728
Maryland	0.625192
Idaho	0.723024
California	0.771761

Worst 7 States

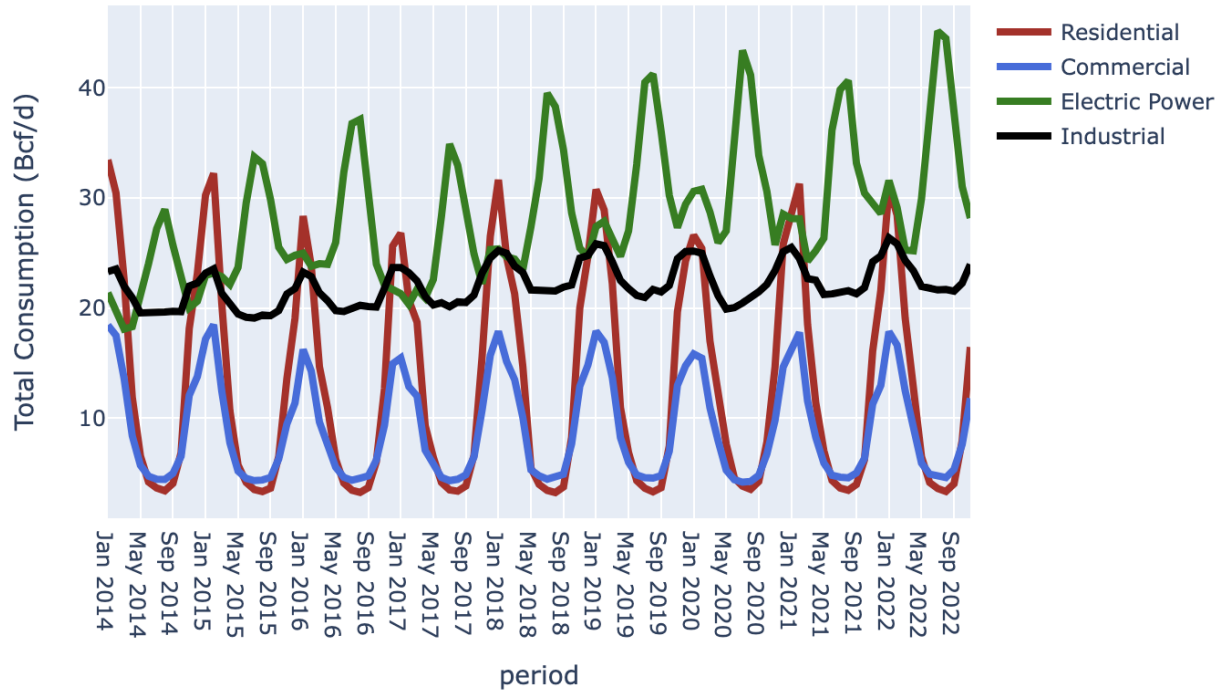


Self Sufficiency Index Over Time

[Link to the live plot on the dashboard](#)

Forecasting

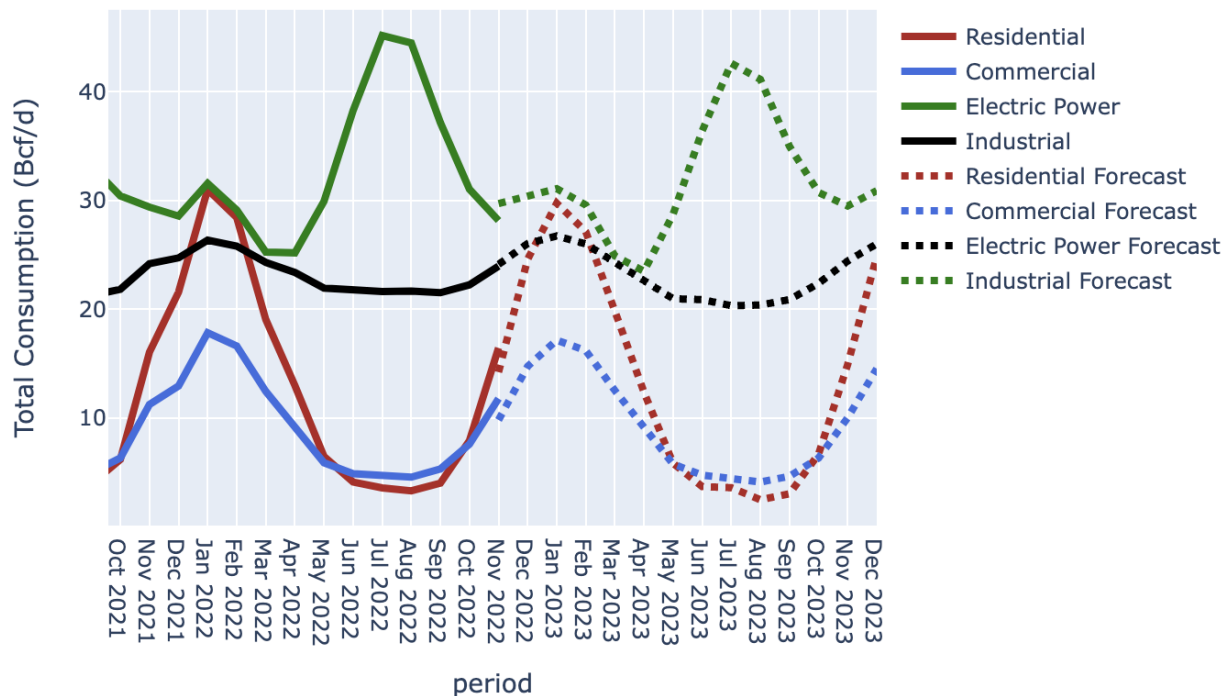
US natural gas consumption Forecast by sector (Jan 2014-Nov 2022)



- Real gas consumption (Jan 2014-Nov 2022)
- Note the seasonal peaks
- Electric power has two peaks, one in winter one in summer

Gas Consumption Forecast by Sector

- (Oct 2021-Dec 2024)
- Auto-regression model from the `statsmodels` package
- [Link to the live plotly plot](#)



Other Topics

- forecast of the real time organization (RTO) demand data
- covariance analysis



Thanks!

Any questions?