

## Stock and Feature Selection

Here is a supplementary information file detailing the stocks and search terms we considered including in our analysis. We first list the search terms we considered, followed by the stocks we considered.

### 8 Selected Terms

- Climate change
- Fossil fuels
- Renewable
- Greenhouse gas
- Carbon tax
- Global warming
- Electric vehicles
- Oil

### All Considered Google Trends Search Terms

Search Term	Justification
<b>Climate Change</b>	As global temperatures continue to rise, there is an increasing level awareness being expressed towards the severity of the matter. The contributing factors of climate change are primarily those of fossil fuel emission, of which certain energy stocks are the producers/providers of. An increase in search popularity could expectingly be met with a proportional decrease in oil and gas stocks as people are educating themselves more on how these corporations are responsible.
<b>Fossil Fuels</b>	Same justification as above
<b>Renewable Energy</b>	Conversely to the answer above, certain energy stocks are focused on green energy production from renewable sources. Such as solar, wind, geothermal, etc. An increase in the general public's interest in these, as seen from search trends, could result in lots of 'hype' which would contribute to share appreciation.
<b>Greenhouse Gas</b>	Similar reasoning as with "Climate change" and "Fossil Fuels". Trends and reports published in news articles may generate interest in looking at Greenhouse emissions or companies in the energy sector may have heavy key advertising words regarding their greenhouse gas emission levels.
<b>Carbon Tax</b>	The proposal and implementation of carbon taxes on specific energy stocks can have a negative or positive impact on the stocks depending on the particular type of energy they produce (renewable vs Non-renewable)
<b>Global Warming</b>	Although this is a somewhat deprecated term for climate change it is still commonly used enough throughout the world that it can be used to gauge search and sentiment trends related to climate change.
<b>EV</b>	The electric vehicle market has seen an unprecedented boom in the past years. Industry leaders such as Tesla alongside others such as NIO, LI, XPeng are publicly listed companies categorized as energy stocks. Consumer sentiment increases towards electric vehicles, thanks to advancements in

	battery technology, charge time, vehicle range, etc. As such, electric vehicles are becoming a more viable option for more and more people. Thus, resulting in more people searching for electric vehicles to buy, thus increasing these EV stocks' sales, and thus increasing share price.
<b>Oil</b>	Oil is used as one of the primary sources of energy across the world. Many traditional energy companies rely on oil extraction as their primary source of revenue. In addition, oil has its own price index across every major stock exchange and is a heavily traded commodity.
Solar	Similar answer to that above, expect only for renewable solar energy.
Battery	Similar answer to that below. With the addition that as the world gets increasingly connected, there is an increased need and demand for technology. These products rely on batteries which are produced by energy companies.
Removal Unit/Carbon Credit	With the implementation of carbon credits for auto-manufactures across the world, it would be interesting to see if those have a visible impact on stock prices (For example, Tesla sells carbon credits to other auto manufacturers and those have accounted for \$1 billion in revenue)
Green New Deal	A proposal with origins stemming from the 'New Deal' proposed by Franklin Roosevelt in response to the great depression. The Green new deal combines public policy along with infrastructural expansion projects in which clean energy companies stand to benefit heavily.
Natural Disaster	With a continuous stream of multiple yearly disasters, many scientists are suggesting existing links between man-made climate change and current natural disasters. Do these Natural disasters have an impact on investment spending across the energy sector?
Desertification	Similar to natural disasters, however with more reports being released correlating desertification to climate change, will this have a negative or positive impact on energy stocks (could have a potential impact on food production companies as well)
Global Average Temperature	With more and more asset management firms announcing investments in clean energy companies, it would be interesting to observe if there is any measurable impact between the global average temperature and energy investments.
Biden Administration	Similar to global average temperature reasoning, however the Biden administration campaigned as an ally towards sustainable energy growth. With plans to invest in renewable energy infrastructure, will the election have a positive or negative impact on clean energy stocks.
Nuclear Energy	Nuclear energy is one of the greatest sources of renewable energy, and with advancements in nuclear technology, we should observe what kinds of trends in energy investment we can find.
Carbon Neutral	Carbon neutrality goals have been announced by several corporations, and with plans to replace existing infrastructure to meet carbon neutrality goals, it will be interesting to observe if there is a correlation between Carbon Neutrality and clean energy investments.
Natural Gas Pipeline	Natural Gas is still one of the most widely used forms of energy across the world. With pipeline projects such as the keystone XL pipeline project being cancelled, will there be a noticeable impact on energy investments?

Fracking	Over the past 5 years, the popularity of Fracking has increased dramatically. It is a method of injecting liquid at high pressures into rocks and holes underground to force open existing fissures and extract oil or gas. With the procyclical nature of stocks and the popularity of fracking, is there a correlation between fracking and energy stocks?
Infrastructure	With infrastructural expansions and updates being continually pushed in an attempt at economic recovery for the United States, Infrastructure spending can stand to benefit the prices of energy stocks.
Ozone Depletion	The thinning of the ozone layer is, at times, of great public concern and the level of concern around this may affect stock prices for energy companies which are contributing to ozone depletion. Conversely stock prices for clean energy companies may rise in times of increased concern about the ozone layer.
EPA	The Environmental Protection Agency (EPA) is the primary environmental regulatory agency of the United States. EPA activities and policies are sure to effect energy companies stock price due to their heavy involvement in regulating the energy sector.
Negative Emissions Technologies	Technologies which remove carbon dioxide from the atmosphere. Elevated search interest in these companies may affect the stock prices of companies working on this technology as well as companies producing emissions.
Hydroelectric Power	Hydroelectric power is projected to be the most lucrative segment of the renewable energy market in forthcoming years. Developments in this field will probably affect renewable energy stocks. It would be interesting to see if changes in renewable vs. Non-renewable changes in stock price are a zero-sum game.
IPCC	Similar to the EPA this is the UN's primary council related to climate change. New announcements or increased interest in the IPCC will likely affect outlook on energy stocks to some degree.

## Energy Stocks

The tables below outline the 'Top Stocks' from google search queries on the respective subsectors, alongside a description of the company and market cap. The highlighted stocks did not have price history dating back to 2015 and were therefore unusable in our experiments. Certain stocks were bolded if they did not meet a certain criterion; being a North American company, having a <1B market cap, and being directly involved in the subsector. However, these companies were used to avoid overfitting despite the differences. Moreover, Google Trends data pulls from international search volumes, and any effect from increases/decreases in public sentiment would likely also affect non-American companies.

## Green/Renewable Energy Stocks

### Solar and Renewable Stocks

Ticker	Market Cap	Description
CSIQ	2.83 B	Canadian Solar Inc. is a publicly traded company that manufactures solar PV modules and runs large scale solar projects.
SPWR	5.48 B	SunPower Corporation is an American energy company that designs and manufactures crystalline silicon photovoltaic cells and solar panels.
AQN.TO	11.85 B	Algonquin Power & Utilities Corp. is a North American renewable energy and regulated utility conglomerate actively invested in hydroelectric, wind and solar power facilities, and utility businesses.
DQ	5.17 B	Daqo New Energy Corp. is a <b>Chinese</b> company engaged in the manufacture of monocrystalline silicon and polysilicon, primarily for use in solar photovoltaic systems.
HYSR	<b>401.86 M</b>	SunHydrogen is developing a breakthrough, low-cost technology to make renewable hydrogen using sunlight and any source of water, including seawater and wastewater.
PLUG	18.4 B	Plug Power Inc. is an American company engaged in the development of hydrogen fuel cell systems that replace conventional batteries in equipment and vehicles powered by electricity.
SOL	<b>812.02 M</b>	ReneSola is a leading international manufacturer and supplier of green energy products.
NEE	145.07 B	NextEra Energy, Inc. is an American energy company with about 46 gigawatts of generating capacity and is the largest electric utility holding company by market capitalization
ENPH	20.12 B	Enphase designs and manufactures <b>software-driven home energy solutions</b> that span solar generation, home energy storage and web-based monitoring and control.
FSLR	8.53 B	First Solar, Inc. is an American manufacturer of solar panels, and a provider of utility-scale PV power plants and supporting services that include finance, construction, maintenance, and end-of-life panel recycling.
SEDG	14.36 B	SolarEdge Technologies, Inc. is a U.S.-domiciled, <b>Israel-headquartered</b> provider of power optimizer, solar inverter, and monitoring systems for photovoltaic arrays.
ORA	4.34 B	Ormat Technologies Inc. is an international company based in Reno, Nevada, USA. Ormat supplies alternative and renewable geothermal energy technology.

## EV and Battery Stocks

Ticker	Market Cap	Description
TSLA	635.58 B	Tesla, Inc. is an American electric vehicle and clean energy company based in Palo Alto, California.
NKLA	5.88 B	Nikola Corporation is an American company that has presented a number of zero-emission vehicle concepts since 2016.
XPEV	28.7 B	Xpeng or Xiaopeng Motors, also known as XMotors.ai, is a <b>Chinese</b> electric vehicle manufacturer.
LI	23.86 B	Li Auto Inc., also known as Li Xiang, is a <b>Chinese</b> electric vehicle manufacturer headquartered in Beijing, with manufacturing facilities in Changzhou.
NIO	64.77 B	NIO is a <b>Chinese</b> automobile manufacturer headquartered in Shanghai, specializing in designing and developing electric vehicles.
WKHS	20.83 B	Workhorse Group Incorporated is an American manufacturing company based in Cincinnati, Ohio, currently focused on manufacturing electric-powered delivery and utility vehicles.
RIDE	2.12 B	Lordstown Motors Corporation is an American company that plans to manufacture electric automobiles.
FSR	5.35 B	Fisker Inc. is an American electric vehicle automaker founded by Henrik Fisker and his wife Geeta Gupta-Fisker
BLNK	1.58 B	Blink Charging is a U.S. leader in EV equipment and stations, [which] will ease the adoption of electric vehicles around the
SOLO	501.63 M	ElectraMeccanica Vehicles Corp. is a Canadian designer and manufacturer of electric vehicles.
GPV	615.65 M	GreenPower Motor Company Inc. is a Canadian electric bus manufacturer.
FUV	535.92 M	Arcimoto is an American electric vehicle company that manufactures and sells a tandem two-seat, three-wheeled electric vehicle.
CHPT	6.37 B	ChargePoint Holdings is an electric vehicle infrastructure company that operates the largest online network of independently owned EV charging stations and makes the technology used in it.
LAC	2.03 B	Lithium Americas Corp. is advancing the Cauchari-Olaroz lithium brine project in Jujuy, Argentina and Thacker Pass lithium project in Nevada, USA to production.
GEOV	3.06 B	Canoo Inc., formerly known as Evelozcity, is an American manufacturer of electric vehicles.
MG	32.57 B	Magna International Inc. is a Canadian mobility technology company for automakers <b>focusing on AI and automation.</b>
KNDI	424.14 M	Kandi Technologies Group, Inc. is a <b>Chinese</b> battery and electric vehicle manufacturer.
NFI.TO	1.92 B	NFI Group Inc. is a manufacturer of transit buses and motorcoaches
BLDP	8.28 B	Ballard Power Systems Inc. is a <b>developer and manufacturer of proton exchange membrane fuel cell products</b> for markets such as heavy-duty motive, portable power, material handling as well as engineering services
AYRO	230.36 M	AYRO, Inc. designs and manufactures purpose-built, all-electric vehicles to enable sustainable fleets.

## Traditional Energy Stocks

Ticker	Market Cap	Description
LNG	17.97 B	Cheniere Energy, Inc. is a liquefied natural gas company headquartered in Houston, Texas and became the first US company to export liquefied natural gas.
OKE	21.11 B	ONEOK owns major natural gas liquids systems
BKR	23.21 B	Baker Hughes Company is an American international industrial service company providing the oil and gas industry with products and services for oil drilling, formation evaluation, completion, production, and reservoir consulting
WMB	27.95 B	The Williams Companies, Inc., is an American energy company whose focus is natural gas processing and transportation, with additional petroleum and electricity generation assets.
EQT	5.0 B	EQT Corporation is an American energy company engaged in hydrocarbon exploration and pipeline transport.
XEC	5.90 B	Cimarex Energy Co. is an American company engaged in hydrocarbon exploration, particularly shale oil and gas drilling.
XOM	233.78 B	Exxon Mobil Corporation, stylized as ExxonMobil, is an American multinational oil and gas corporation headquartered in Irving, Texas.
CVX	196.43 B	Chevron Corporation is an American multinational energy corporation.
BP	82.29 B	BP plc is a <b>British</b> multinational oil and gas company headquartered in London, England. It is one of the world's seven oil and gas "supermajors"
OXY	24.77 B	Occidental Petroleum Corporation is an American company engaged in hydrocarbon exploration
COP	70.05 B	ConocoPhillips is a multinational corporation engaged in hydrocarbon exploration.
EOG	40.65 B	EOG Resources, Inc. is an American energy company engaged in hydrocarbon exploration.
COG	7.17 B	Cabot Oil & Gas Corporation is a company engaged in hydrocarbon exploration.
CNQ	43.01 B	Canadian Natural Resources Limited, or CNRL or Canadian Natural is a Canadian company engaged in hydrocarbon exploration
SLB	37.29 B	Schlumberger Limited is an oilfield services company.
PTR	112.43 B	PetroChina Company Limited is a <b>Chinese</b> oil and gas company
TOT	120.18 B	Total SE is a <b>French</b> multinational integrated oil and gas company
ENB	73.58 B	Enbridge Inc. is a multinational energy transportation company headquartered in Calgary, Alberta.