

Analysis of Investment in Recent hot-topic companies in Renewable Energy Industry

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Abstract. Renewable energy is a forward-looking trend for the development of the energy industry. Recently, 5 renewable energy companies were found in Google search engine, which are highly researched by users, and there are also the 9 largest renewable energy companies. The study explores the question of whether these 5 top renewable energy companies are really remarkable or not compared with the 9 largest companies, and examines the question of which companies should be invested in and which should not. The study uses the residual income model and the multiples valuation model to evaluate the value of a company. The study concludes that the total 5 top companies all have higher risk than the 9 largest companies, which means that none of these 5 companies have a high probability of earning a high return. More specifically, Tesla Inc. is the company where investors have a chance to get a high return, while Gevo and Bloom Energy are two companies that need to be selected carefully. Plug Power and Sunrun are in the middle.

Keywords: Residual Income Model; Multiples Valuation Model; Business Risk; WACC; Renewable energy investment.

1. Introduction

1.1 Background

Renewable energy is a type of energy that is derived from renewable resources that can usually be renewed over time from the perspectives of humanity. There are a variety of options, such as solar energy, wind energy, the rise and fall of water, and hydrogen fuel cells. Both types offer people the opportunity to renew technology and lifestyle, especially because renewable energy can be used in many aspects of daily life. Renewable energy typically provides energy for electricity, to heat water, lighting systems, etc.

As climate change becomes more complex and severe, the need for clean and efficient energy becomes greater. According to a 2021 report by the International Energy Agency (IEA), renewable power generation is increasing dramatically at a rate never seen before in the world, suggesting the rise of a new global energy economy. In particular, with the recent outbreak of war between Russia and Ukraine, every country in the world has greatly increased its need for independent energy. Digital transaction platform CMC Markets recently published a list of U.S. renewable energy stocks that were most frequently researched by customers on Google. On the list are 5 companies named Tesla Inc, Tesla Inc, Plug Power, Sunrun and Bloom Energy. However, there is a problem: are these 5 companies really worth investing in? Or are they sufficiently different from the other companies?

In order to make a comparison, the 9 largest companies in the renewable energy sector are defined based on 12-month revenue (TTM). All data on the 9 largest renewable energy companies are used as of December 27, 2021. The Residual Income Model and the Multiples Valuation Model are two very practical tools to estimate the value of a company. Both have some impact on systematic risk and provide a better way to analyze a company's investment risk than other indices that focus only on systematic risk.

1.2 Related research

Yu et al. studied the stock market valuation of intellectual capital in the industry IT. The main objective and method are to use the residual income valuation models and the simplified two-period model as the basic models to determine the function of P/V ratio for intellectual capital valuation and

enterprise valuation. IT Companies with more intellectual capital are more likely to be mispriced by the stock market [1]. In the study on the valuation of companies that have made mergers and acquisitions in the pharmaceutical industry, Dierks, et al. pointed out that there are three ways to value a company. In the discussion, the key financial multiples of the pharmaceutical companies are used to compare them to the MSCI World Index, and based on these fundamentals, the post-merger value of the combined companies is determined. The main conclusion is that it can expect more mergers and acquisitions in the coming years, where the focus is on value rather than volume [2]. Woo focused on the stock valuation models for the restaurant industry and used two difference ways to assess the value of the company. The study concludes that analysts tend to underestimate restaurant stocks [4]. Hoffmann and Paetzmann studied the Investor protection and valuation methods in the German alternative funds industry. The main method is the use of the tatement of net assets according to KARBV and the reaction of market participants to the increased requirements. The research results mainly show that the market participants see the increased requirements as an opportunity and that the research has adapted to the new system [5]. Bancel and Mittoo conducted a survey among European experts from academia and practise on the methods that research uses for business valuation. The main models talked about in the survey are the Discounted Cash Flow (DCF) and Relative Valuation (RV) frameworks. And it is found that the two main users have different preferences for the models. The results suggest that a serious debate between academics and practitioners is needed to make the valuation framework more useful and practical [6]. These studies discuss some basic methods of business valuation.

Zou, et al. studied the evaluation of risk management in manufacturing industry with ERM method, which is divided into three parts: 1. identification of ERM activities, 2. measurement of enterprise performance, including efficiency measurement model and cost measurement model, 3. measurement of ERM effectiveness. And then after all these actions have been taken, it is found that an effective ERM programme may add value to manufacturing firms by mitigating firm cost and enhancing firm efficiency [3]. Wang, et al. mainly studied the environmental pollution factor affecting enterprise evaluation in China. The method is Event study and the steps are divided into five parts: First, defining the event day; second, calculating the normal return model; third, estimating the abnormal returns in the event window. By the fundation of third step, finding the average abnormal return; and finally, calculating the cumulative abnormal return and extending the cumulative abnormal return formula to form the final function used in the research [6]. The research finds that direct economic loss is an important reason for the negative market reactions to pollution events through the methods mentioned previously [7].

Jacob and Schütt did the survey on firm valuation and the uncertainty of future tax avoidance. The research's fundamental is the residual income model and focuses on the market-to-book ratio because it is often used as a proxy for Tobin's Q in the growing literature on the impact of tax avoidance on valuation. Depending on the basic formula for the market-to-book ratio, the researchers add firm-level control variables to the market-to-book ratio function to make it more fit for purpose. In their sample of 2,820 firms, the researchers empirically show that this signal-to-noise ratio amplifies the effect of pretax earnings on firm value. For firms with effective and persistent tax avoidance, pre-tax profits have a stronger impact on firm value. Companies with volatile effective tax rates receive a discount on their profits [8]. Farrugia, et al. focused on company valuation models applicable in a small stock market from a Maltese perspective. The study is structured based on the income model and the relative model. The income model mainly focused on the independent variables of CSRP. And the core part of the relative model is the PBV ratio. The study concludes that there was no single dominant valuation model for the selected listed companies [9]. McCarthy has provided a summary of customer-based business valuation with modeling using missing aggregate data. He first starts with a framework and considerations for model building based mainly on traditional financial valuation and customer base model. Second, he shows how to value contractual companies with publicly disclosed customer data. And then the research gives the way of valuing non-contractual companies

with common customer metrics. The research shows that there are five five extensions for future research [10].

1.3 Objective

This paper mainly focuses on the three aspects of value, business risk and weighted average cost of capital to calculate the descriptive data for 5 hot-topic companies and the 9 largest renewable energy companies in the world, and then compare the aggregate and individual companies in the 5 hot-topic companies with the 9 largest renewable energy companies as a whole to see which of the 5 hot-topic companies is the most valuable and worth investing in. The paper also discusses the possible reason behind each number and finally gives some suggestions on how to make an investment decision.

2. Method and data

2.1 Design for Valuation Models

2.1.1 Residual Income Model

$$P_e = SE_0 + \sum_{t=1}^2 \frac{RI_t}{(1+r_e)^t} + \frac{NI_2(1+3\%) - r_e SE_2}{(r_e - 3\%)(1+r_e)^2} \quad (1)$$

Where P_e = Share holder's total stock price at time2 ;time 0 assumed here is the beginning of year 2019; RI_t = residual income for the period ending at time t; $RI_t = NI_t - r_e SE_{t-1}$; r_e = a number which is estimated by Capital Asset Pricing Model demonstrates the amount of money spending on the equity ; SE_t = The general totaling of equity that the investors should deserve at the end of time t; NI_t = Income without taxes or interests represents at the final time t ;CAPM = $r_e + \beta[E(r_m) - r_f]$; r_f = a rate which is less likely to change is illustrated by the national authority; β = a probable number for the firm which is inclined to face an unexpected risk that is caused by the external environment ; $[E(r_m) - r_f]$ = that smallest requirement that the equity holders want from the market; Because of the rate of US 30-year bond according to the US treasury , the paper gives number of 3% increasing rate to the RI.

2.1.2 Multiples Valuation Model

First, the paper uses the EV/EBITDA which is computed by enterprise value divided into earnings before any possible interest, taxes, depreciation and amortization; The second index the papers consider is EV/BVOA where substitute for enterprise value and book value of assets respectively.

2.1.3 Business Risk

$$\beta_A = \beta_E \div \frac{1-TL}{1-L} \quad (2)$$

Where β_A is business risk ; β_E is the same as previous signal beta; T is corporate tax rate; L is Leverage which equals to book value of debt scaled by book value of assets.

2.1.4 The Weighted Average Cost of Capital (WACC)

$$WACC = (1-L)r_E + L(1-T)r_D \quad (3)$$

Where T is corporate tax rate; L is Leverage which equals to book value of debt scaled by book value of assets; r_E is the cost of equity; r_D is the cost of debt.

2.2 Data

2.2.1 Tesla Inc.

Tesla is the biggest company which manufactures cars which forced by electric power and as well a type of panel which can extract energy from the sun in the United States and makes a partnership with Panasonic in the battery business. The company manufactures and sells electric vehicles, on-board computers (FSD systems), solar modules, and energy storage devices and system solutions. Tesla was the world's first self-driving car manufacturer and became the world's best-selling plug-in car company in 2018. In October 2021, Tesla became the sixth giant company to exceed \$1 trillion in market capitalization.

2.2.2 Gevo

Gevo, Inc. is a renewable chemicals and advanced biofuels company headquartered in Douglas County, Colorado, in the Denver-Aurora metropolitan area. Gevo is active in the field of sustainability and follows a business model based on the concept of a circular economy. The company combines biotechnology and traditional chemistry to develop products.

2.2.3 Plug Power

Plug Power is an American company that develops and manufactures hydrogen fuel cell systems that can replace conventional batteries in electrically powered appliances and vehicles. The company is headquartered in New York and has employees in Spokane, Washington, Rochester and New York.

2.2.4 Sunrun

It is a U.S. provider which supplies a generation systems that are impulsed by electro-optic sun rays and stores battery primarily for customers who want their events. It was first set up in 2007 and its head office is located in California. Since its manipulation, the company has put their majority in the power purchase agreement business model.

2.2.5 Bloom Energy

It is a public listed company which is located in SAN Jose, California. It produces and sells cells which are driven by bunkers that is solid and made from oxide. Started running in 2001, the company get out of a mode that it can hide itself in 2010. Before its 2018 IPO, the company saved venture capital which is further more than 1000 million dollars. The government's Green Energy incentive scheme provides subsidies for its fuel cells.

2.2.6 Nine Biggest Renewable Energy Companies in the World

Orsted A/S, Iberdrola SA, JinkoSolar Holding Co. Ltd, Vestas Wind Systems A/S, Siemens Gamesa Renewable Energy SA, Brookfield Renewable Partners LP, First Solar Inc., Canadian Solar Inc., Renewable Energy Group Inc. and SunPower Corp. are the 9 largest renewable energy companies in the world that are pure players. Therefore, this study has decided to make a comparison.

3. Results

Table 1. Companies used in calculating.

Company's name
Tesla Inc.(TI)
Gevo(G)
Plug Power(PP)
Sunrun(S)
Bloom Energy(BE)

The study uses data from a total of 14 companies. 5 of these companies are tested to provide insight into whether it is worth investing in these 5 companies that are on an upward trend, while other companies, the 9 largest companies in the renewable energy industry, serve as benchmarks for the 5 companies. More specifically, the five new companies are Tesla Inc.(TI), Gevo(G), Plug Power(PP), Sunrun(s), Bloom Energy (BE).

Table 2. The data concerning 5 hot-topic companies.

Company's name	TI	G	PP	S	BE
systematic risk (Sep.2022)	2.00	2.96	1.62	2.29	3.05
Beta (5Y Monthly)	2.19	3.22	1.66	2.25	3.05
Value (2021)	2.60E+ 10	- 3.96E+0 8	- 3.85E+0 9	- 6.64E+0 8	- 9.44E+0 8
EV/EBITDA (Sep.2022)	54.49	-2.38	-15.73	-128.81	-27.61
Median industry EV/EBITDA (Sep.2022)	8.86	10.38	11.81	9.62	11.81
Enterprise value/Book value of assets (Sep.2022)	0.42	-0.59	-0.65	-0.04	-0.55
WACC (Sep.2022)	0.21	0.24	0.15	0.12	0.18

Table3. The description of statistics concerning 5 hot-topic companies.

Variable	Mean	Std. Dev.	Min	Max	25%	50%	75%
Systematic risk (Sep.2022)	2.39	0.61	1.62	3.05	2.00	2.29	2.96
Beta (5Y Monthly)	2.47	0.65	1.66	3.22	2.19	2.25	3.05
Value (2021)	4.03E+ 09	1.24E+ 10	- 3.85E+ 09	2.60E+ 10	- 9.44E+ 08	- 6.64E+ 08	- 3.96E+ 08
EV/EBITDA (Sep.2022)	-24.01	66.51	-128.81	54.49	-27.61	-15.73	-2.38
Median industry EV/EBITDA (Sep.2022)	10.50	1.31	8.86	11.81	9.62	10.38	11.81
Enterprise value/Book value of assets (Sep.2022)	-0.28	0.46	-0.65	0.42	-0.59	-0.55	-0.04
WACC (Sep.2022)	0.18	0.04	0.12	0.24	0.15	0.18	0.21

Table 4. The description of statistics concerning top 9 renewable energy companies.

Variable	Mean	Std. Dev.	Min	Max	25%	50%	75%
systematic risk (Sep.2022)	0.84	0.43	0.45	1.75	0.54	0.70	0.95
Beta (5Y Monthly)	0.97	0.42	0.52	1.76	0.69	0.75	1.33
Value (2021)	5.10E+1 0	1.07E+1 1	- 1.88E+1 0	3.19E+1 1	2.13E+0 8	2.75E+0 9	5.68E+1 0
EV/EBITDA (Sep.2022)	-4.10	38.37	-66.37	44.01	-24.01	12.02	18.78
Median industry EV/EBITDA (Sep.2022)	10.72	1.47	9.42	12.78	9.42	9.77	11.65
Enterprise value/ Book value of assets (Sep.2022)	0.28	0.66	-1.13	1.18	0.14	0.18	0.68
WACC (Sep.2022)	0.06	0.03	0.02	0.14	0.05	0.06	0.08

As the result indicate, systematic risk, Beta and WACC are significantly higher in 5 hot-topic companies than top 9 renewable energy companies. On the contrary, in terms of other indicators, which are EPS, Value, EV/EBITDA, Median industry EV/EBITDA, Enterprise value/Book value of assets, are all exhibited lower numbers in 5 hot-topic companies. In other words, all indicators are divided into two opposite sides according to the samples which are 5 hot-topic companies and top 9 renewable energy companies.

4. Discussion

4.1 Total results of 5 hot-topic companies

The systematic risk of the 5 hot-topic companies averages 2.39, about three times that of the 9 largest renewable energy companies (0.84). 0.61, the higher standard deviation of the 5 hot-topic companies, indicates that the risk is less stable. 1.62, the minimum number of the 5 hot-topic companies, is almost the same as the maximum number of the 9 largest renewable energy companies (1.75). The median value of the 5 hot-topic companies (4.03E+09) is smaller than that of the 9 largest companies (5.10E+10), and the fluctuations are also more dramatic/EBITDA, Median industry EV/EBITD, Enterprise value/Book value of assets and WACC these four indicators show the same trend as the systematic risk and value of companies. The mean value for the 5 hot topic companies is worse and the numbers are -24,01,10, 5, -0.28 and -0.28, while these indicators for the 9 largest companies are -4,1,10,72,0.28 and 0.28 and their volatility is higher.

In summary, the 5 hot-topic companies have a riskier and more unstable trend than the 9 largest companies in the renewable energy industry. The reasons for this phenomenon are mainly due to the individuality of these five companies themselves rather than the environment and industry. The median EV/EBITDA of the industry is almost the same for the 5 hot-topic companies (10.5) and the 9 largest renewable energy companies (10.72). It is easy to notice that the top 9 renewable energy companies are all pure players, which are supported by policy and no major events, such as legal or political problems, can affect their progress. Their guests are very constant, as they are almost

provided by the government, and their main business is traditional renewable energy, such as solar power and wind power. In contrast, 5 hot-topic companies focus on renewable energy batteries, which are a younger and immature technology. As for the other aspects, these 5 companies are facing some litigation and product quality problems. In addition, they do not have as strong support as the top 9 companies. That is to say, investors should really think twice before choosing these 5 companies.

4.2 Tesla Inc.(TI)

Tesla Inc.'s systematic risk is higher than the 9 biggest companies (maximum:1.75) in the renewable energy industry which is about the value of 2. It indicates that TI has a risk in current development. As we compare it with the other 4 companies, the risk is located in the 25% position, which means it has a relevantly small risk. For investors who want to invest in these 5 hot-topic companies, it can be accepted. In terms of corporate value, all Residual Income Model, EV/EBITDA, and Enterprise Value/Book value of assets displays that TI has the largest value of 5 hot-topic companies. And even compare with the 9 biggest companies, it still shows its competence. However, the WACC of the TI is kind of large (0.21), which is bigger than the 9 biggest companies and ranks second in 5 hot-topic companies.

That is to say, the cost of the finance and operation is high and the leverage is also large. The capital structure brings instability. The reason might be TI is the world's most valuable automaker which makes TI a quite large market value. And recently it has focused on clean energy development which means it needs to finance the capital and that has made its WACC gets higher. Besides, nowadays, TI has been the subject of many lawsuits, increasing government scrutiny, and public controversies arising from statements and acts of CEO Elon Musk. To be more specific, it has a legal fight with Twitter these days. These things just give some impairments on its operation and marketing matters. Nevertheless, TI is still worth investing in.

4.3 Gevo(G)

Gevo has a very high systematic risk(2.96) which ranks second and approximately gets close to the first Bloom Energy whose value is 3.05. In terms of corporate value, all Residual Income Model, EV/EBITDA, and Enterprise Value/Book value of assets are all below zero, which shows a negative signal though it ranks second among the 5 enterprises. G's WACC (0.24) is the highest in the 5 hot-topic companies which are 4 times bigger than the average of the 9 biggest companies and twice as large as the maximum amongst the 9 biggest companies. In general, Gevo is a highly risky, modest value, and high-cost operating company.

According to the development of Gevo, it can be seen very clearly what has made Gevo. One of the most significant reasons is Joe Biden's Green Energy Plan. Sustainable jet fuel is a very important part of the growth in Gevo. The needs of the airline industry allow pushing GEVO stock growth in the next years. But Gevo's financial situation is bad and recently it has had no positive income. To sum up, the reason why Gevo gets people's attention can be mainly attributed to the publication of politics. It used to be quite an ordinary corporate and its stock price is getting lower nowadays. To sum up, Gevo should be cautious before investing.

4.4 Plug Power(PP)

Plug Power has the lowest systematic risk (1.62) of the 5 hot-topic enterprises. However, the risk almost reaches the peak in the 9 biggest companies, which means it still has considerable uncertainty. In terms of corporate value, all Residual Income Model, EV/EBITDA, and Enterprise Value/Book value of assets are on the average level of 5 companies. Plug Power's WACC (0.15) is nearly the lowest level in the 5 corporates while it is still higher than the maximum of 9 biggest companies (0.15) which represents Plug Power has high leverage. To sum up, Plug Power is the most stable one amongst 5 hot-topic companies but still has a bad financial situation.

Plug Power performed not well. It has an operating loss of \$286 million on \$292 million in revenue in the first six months of 2022. Besides, On March 2, 2021, Plug Power sent information about Late

Filing to the U.S. Securities and Exchange Commission saying that it could not send its annual report timely for December 31, 2020. And on March 16, 2021, Plug Power claimed that they had to report financial statements for the years 2018 and 2019 again. It remains a long way for Plug Power to be rich. Overall, Plug Power can be invested but people need to be aware of recent events before decision-making.

4.5 Sunrun(S)

Sunrun has a fairly high systematic risk (2.29) in the 5 hot-topic corporates which indicates its recent declining market situation. In terms of corporate value, the Residual Income Model and Enterprise value/Book value of assets are below the average level of the 5 companies. Especially, EV/EBITDA is quite low (-128.81) which is over 2 times as small as the minimum in the 9 biggest companies (-66.37). And this phenomenon is due to the high negative value of the corporate and the small number of the EBITDA. The WACC of Sunrun (0.12) is the lowest of the 5 companies though it is still relevantly large as compared with the 9 biggest companies which show that it has a fairly high level of leverage.

The low risk may be due to Sunrun's focused mainly on PPA business strategy in that it sets up and preserves a heliocal approach on a client's house and after that, selling these things to the people who require them for a 20- or 25-year period. And this strategy gives Sunrun a very sustainable source of customers. The decline of market can be accounted for by some well-known people who have doubted Sunrun's accounting practices which may steal from U.S. taxpayers. In general, Sunrun(S) is on the average level of 5 companies in which investors may do investment but need to consider the recent news.

4.6 Bloom Energy(BE)

Bloom Energy has the highest systematic risk (3.05) of the 5 hot-topic corporates which indicates its uncertainty and recent difficult financial situation. Therefore, it needs to be carefully considered before doing any investment. In terms of corporate value, the Residual Income Model displays that it has the worst absolute value among the 5 companies (-9.44×10^8) though it is bigger than the minimum in the 9 biggest companies (-9.44×10^8). Other indicators of corporate values are on average amongst 5 companies' is fairly high (0.18) in 5 companies which are bigger than the maximal number in the 9 biggest companies (0.14). That is to say, Bloom Energy (BE) is taking an expanding strategy, therefore, leads to high leverage. To sum up, Bloom Energy is a high risk, high cost of capital and needs to think twice before decision-making.

Going back to the history of Bloom Energy, it was in stealth mode until the year of 2010. And its main development is due to the government incentive programs for green energy which means its fund may not be caused by its good operation and the company has no profit in its first 19 years of operation. These aspects all lead to harm to its reputation and market profile. Therefore might cause a high risk and low company valuation. But the solid oxide fuel cells need more cash to do further research which causes the high WACC. Overall, if investors want to buy the stock of this company, they need to consider the risk and be ready for the sudden shock.

5. Conclusion

The paper uses the Residual Income Model, Multiples Valuation Model, Business Risk, and The Weighted Average Cost of Capital to compare 5 hot-topic companies with 9 biggest corporates and then gives advice on which company should be invested among the 5 companies. It is found that the total 5 hot-topic companies all have a higher risk than the 9 biggest corporates, which means whatever the investors decide to lay out that they need to consider the recent environment changes due to these 5 companies either having abnormal events or high-risk industries. To be more specific, Tesla Inc. is worth investing in after a comprehensive analysis though it may now face some lawsuits. The second one that is worth investing in is Plug Power which has the lowest systematic risk but financial fraud

has pulled it down. Sunrun is in the middle place. Gevo and Bloom Energy are two companies that need to ponder before any investing decision.

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