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Evaluating the impact of Mergers and Acquisitions on Corporate Value: A Case Study of Total Energies' Transition to Sustainable Energy

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ABSTRACT

This study examines the impact of four major acquisitions related to renewable energy on the stock value of Total Energies (TE). A mixed method approach was adopted, combining qualitative analysis to understand the drivers behind these acquisitions and generate hypotheses about the impact of acquisition events on stock prices, followed by an event study approach to examine abnormal returns on the company's stock price in the short and long term. Findings indicate that, in the short term, these acquisitions resulted in positive returns for TE indicating that the market recognised TE's transformation efforts, but the long-term results were mixed, which may be due to model and data limitations. The study also identified the key role of market forces in driving the energy transition and the importance of synergies and diversification of technology paths in constructing a long-term energy transition strategy. By conducting a clinical study focused on a specific energy company, this research aims to provides in-depth insights and valuable guidance for other companies in the sector on using M&A to facilitate energy transitions, thereby supporting the green transformation of the energy industry.

Table of Contents

Lists of abbreviations

AR – Abnormal Return

CAR - Cumulative Abnormal Returns

Clearway – Clearway Energy

Direct - Direct Energies

ET – Energy Transition

EMH - Efficient Market Hypothesis

M&A – Mergers and Acquisitions

TE - TotalEnergies

List of illustrations

Figure

Table

Chapter 1: Introduction

Energy crises and sustainability issues have made the structural transformation of the global energy sector ever more imminent. Meeting the growing demand for energy in an environmentally friendly and sustainable way is one of the biggest challenges the world faces today (Elad and Bongbee, 2017). Yet, there is still a long way to go to meet this goal. Data shows that traditional fossil fuels will still provide over half of the energy demand even in the best-case scenario projections (Lu et al., 2019; Our World in Data, 2022; IEA, 2023b). The excessive reliance on fossil fuels causes significant environmental damage. To be specific, Fossil fuels are responsible for the majority of carbon dioxide produced by human activity in a year (Luo, 2024). If the current level of use is continued, it will lead to an increase in global temperatures of 2.5-2.9 degrees in this century compared to pre-industrial levels (UNEP, 2023). Therefore, to create a more sustainable future for the next generation, Energy Transition (ET) is strongly needed.

Energy transition is recognised as a strategic way for the energy sector to meet the challenges of sustainability (Kozar and Sulich, 2023). In recent years, in order to meet the low carbon goals, international oil firms have begun to shift towards investing in low-carbon emission transitions (UNEP, 2023; Lu et al., 2019). Indeed, a BloombergNEF report (2024) states that worldwide investment in the energy transition reached a record of $1.8 trillion in 2023, which is a 17% increase compared to the previous year. However, the evidence suggests that such efforts are still insufficient. Zhong and Bazilian (2018) points out that that international oil firms are investing only 5% in the renewable energy field out of their total investments.

Yet in any case, the global energy sector is experiencing a dramatic change, and moving towards a more sustainable future (Schaeffer, 2015). Therefore, understanding how the energy sector is conducting its ET is becoming increasingly important. At the managerial level, transformation can be achieved in a variety of ways, such as mergers and acquisitions, research and development, and innovation. Among these, M&A remains one of the primary means of achieving ET, with transactions in the energy sector accounting for 18% of the total M&A activity across all industries (Hawkes et al., 2023). Indeed, acquisitions provide a key route for companies to enter the renewable energy industry and thrive amid expected growth (Palmquist and Bask, 2016). Through M&A, energy companies can restructure their divisions, improve performance, and scale up for sustained change in a changing business environment.

Many studies analyze the reasons behind mergers and acquisitions (M&A) and their varying impacts on company stock prices (Calipha, Tarba, and Brock, 2011; Sorescu, Warren, and Ertekin, 2017). Based on this, a significant number of studies have highlighted event study methodology as the preferred approach to examine the abnormal stock price fluctuations caused by such events (Mackinlay, 1997; Shah and Arora, 2014; Rani et al., 2015; EI Ghoul et al., 2023). However, ET has only recently garnered attention in academia, resulting in relatively limited research on renewable energy-related M&A in the traditional energy sector (Eisenbach et al., 2011; Yoo, Lee, and Heo, 2013; Palmquist and Bask, 2016); And existing research on renewable energy acquisitions tends to adopt large-sample approaches, with few studies focusing on specific companies.

Therefore, this paper will use a mixed-methods approach to analyze several major M&A events related to renewable energy undertaken by a large global traditional energy company—Total Energies (TE). Through a clinical study, this research will examine the company's motivations for acquisitions, the impact of subtle differences across various acquisition events on the acquiring firm's stock price, and the potential factors contributing to these outcomes. By focusing on a specific energy company, this study aims to provide insights for other firms in the industry and contribute evidence supporting the green transition of the energy sector. The following are the three main questions this paper seeks to address:

Research questions

a) What were the specific motives and strategic goals behind TotalEnergies' acquisitions of the selected renewable energy firms?

b) What is the short-term and long-term impact of selected acquisition on TotalEnergies' shareholders values?

c) What are the potential factors contributing to this outcome?

This thesis consists of seven interrelated chapters. In the first chapter, the research background, motivations behind the study, and the research objectives and methodology will be briefly introduced. Chapter 2 presents a literature review covering theoretical foundations and empirical findings. Then, methodologies will be introduced in Chapter 3. In Chapter 4, the qualitative analysis will be carried out, predicting abnormal fluctuations for each acquisition event based on the findings. Following this, in Chapter 5 the event study method will be applied to test the hypotheses, with a detailed analysis of the results. Chapter 6 will discuss the findings of the mixed-methods approach and research limitations. The final chapter, Chapter 7, concludes the paper by summarizing the key findings and offering suggestions for future research directions related to the green transition in the energy sector.

Chapter2: Literature Review

2.1 Green Transformation

2.1.1 The Global Energy Industry

The energy industry is a crucial part of the current global economy, not only powering various industries but also playing a vital role in driving economic growth (Stevens, 2016; Alagoz and Alghawi, 2023). This industry covers multiple sectors, including fossil fuels like oil and natural gas, as well as the rapidly growing renewable energy sectors such as solar and wind power (Gielen et al., 2019). The entire value chain of oil and natural gas account for nearly 15% of global energy-related greenhouse gas emissions, which equivalent to the total energy-related emissions of the United States (IEA, 2023). Therefore, the environmental impact of this industry and its influence on the global economy make it a focal point for policymakers and stakeholders worldwide.

2.1.2 Current Situation

In the past decade, the global energy industry has been in turmoil, facing impacts from the following three aspects:

<u>The Rise of Renewable Energy Technologies:</u>

The significant reduction in renewable energy costs in recent years has been nothing short of a revolution for the global energy industry. Now wind and solar power have become highly competitive energy sources globally (Schaeffer, 2015; Fattouh, Poudineh, and West, 2019). Petrenko (2021) and Schaeffer (2015) highlight that the renewable energy sector now offers more cost-effective methods of electricity generation, which is seen as the ultimate direction of energy flow in the ongoing transition.

<u>Climate-Related Policies:</u>

The continuous focus on sustainability issues by non-governmental organizations and government regulations has compelled the private sector to swiftly change its behavior to reduce carbon emissions (Doh, Budhwar, and Wood, 2021). Following the 2015 Paris Agreement, pressure from consumers and investors on climate change has significantly intensified, particularly for the oil and gas industry. A clear trend is that consumers are increasingly favoring companies that have established emission reduction targets, while internal shareholders are supporting the disclosure of climate-related financial risks (Zhong & Bazilian, 2018). Scott (2018) observed that between 2014 and 2018, the volume of shareholder votes on climate-related resolutions at annual general meetings doubled.

<u>Geopolitics:</u>

Political factors also have a substantial influence on the energy sector. A prominent example is the recent Russia-Ukraine war, which has driven European countries to reduce their reliance on Russian gas. On the other hand, Russia's economy is heavily dependent on fossil fuels, making it highly susceptible to the negative impacts of falling energy prices (Schaeffer, 2015).

2.2 Energy Transition

Despite the undeniable role of the energy sector (Schaeffer, 2015), the traditional energy sector, which clearly contradicts the principles of sustainability, has become a primary target of criticism. In 'The Brundtland Report', Keeble (1988) emphasizes that sustainable development requires meeting the needs of the present without compromising the ability of future generations to meet their own needs. This means that the current generation must ensure that future generations have the same rights to development as the present generation (Keeble,1988).

As a result, calls for an energy transition have emerged, typically seen as a shift towards cleaner, low-carbon systems and renewable energy sources (Zhong & Bazilian, 2018). Since more than half of global CO^2 emissions come from the oil and gas sector, the transition is expected to significantly reduce CO^2 emissions (Scott, 2018).

Fattouh, Poudineh, and West (2019) approach energy transition from the perspective of transition speed, defining it as a fundamental shift from existing models to new ones. This change is a multidimensional, uncertain, and multi-level process involving various participants. Therefore, the energy transition is not simply a switch from fossil fuels to renewable energy. Its success depends on three interrelated dimensions driven by multiple levels: "(1) the tangible elements of the energy system, (2) actors and their behaviors, and (3) socio-technical regimes" (Sovacool and Geels, 2016; Fattouh, Poudineh, and West, 2019).

Although the energy transition appears to align with future trends, some scholars have raised concerns about its current trajectory. Schaeffer (2015) points out that there are policy inconsistencies regarding energy transition globally, which could exacerbate market uncertainty, significantly increasing the risk of price distortion (Schaeffer, 2015). Additionally, given the energy sector's close ties to the economy, some scholars worry that these disruptions could affect international financial markets (Fattouh, Poudineh, and West, 2019).

2.2.1 Corporations and Energy Transition

International oil and gas companies now face a range of challenges, including increased competition, declining demand for traditional energy products, technological barriers to adopting renewable energy, and incomplete regulatory frameworks (Fattouh, Poudineh, & West, 2019; Alagoz and Alghawi, 2023). Specifically, these companies must make critical decisions about their role in the global energy system and how to incorporate low-carbon assets into their portfolios while their business models face disruption (Fattouh, Poudineh and West, 2019; IEA, 2023b).

Initially, oil and gas companies resisted the energy transition. Ten years ago, Europe's ten largest energy companies publicly advocated for traditional power plants, but by 2013, they shifted their focus to renewable energy, as the result by regulatory and international pressures (Schaeffer, 2015). However, these efforts have not yielded the expected results. According to IEA (2023b), as of 2024, most traditional energy companies remain hesitant, with only four multinational corporations actively pursuing energy transition. For companies sticking to their traditional approaches, the outlook is grim: fossil fuel price fluctuations and accelerated net-zero emission targets may increase profit risks over time (IEA, 2023a). As a result, this urges the company to make a choice as soon as possible.

However, the timing of entry into the renewable energy sector presents a strategic dilemma. Delaying adaptation risks allowing competitors to gain an advantage, while early investments in unproven technologies could lead to asset write-downs (Fattouh, Poudineh, & West, 2019). Given the uncertainty in global markets, particularly for multinational corporations facing differing national policies, the ability to predicate the future trajectory of the energy sector poses significant challenges for strategic planning (Kolk and Jonatan, 2012).

In fact, this hesitancy suggests that many energy companies are being 'forced' into the transition or are taking a passive stance (Zhong and Bazilian, 2018). Pickl (2019) notes that companies currently engaging in the transition aim to gain early profits in the renewable energy market through new strategies. However, these companies still struggle to understand the value proposition of renewable energy. As a result, many decisions are made under external regulatory pressures. Notably, some oil and gas companies continue to support activities that oppose climate change action to protect their core business interests and try to divert attention from critical issues (Hawkes et al., 2023).

The decision for companies to embrace energy transition is largely driven by profitability (Schaeffer, 2015). Historically, some large energy companies resisted the transition because it did not offer immediate economic benefits. Long-term projections suggest that energy transitions could backfire and incur high costs (Wright and Nyberg, 2017). To maximize shareholder returns, companies disregarded the transition option. However, as policies tighten and renewable energy develops, market prices have become distorted, particularly with excess capacity in the power sector (Schaeffer, 2015). The chaotic competitive environment has reduced profits for traditional energy companies, making their previous business models unsustainable. With carbon taxes, carbon trading, and renewable energy subsidies gaining prominence, companies must now drastically reduce emissions while maintaining profit growth (Gielen et al., 2019).

Additionally, Stevens (2016) highlights that the challenges in the energy sector go beyond recent turbulence. It reflects a fundamental issue with an outdated business model that poses structural barriers to decarbonization (Hawkes et al., 2023). Since the early 1990s, the traditional business model of energy companies has been centered on oil price fluctuations, maximizing shareholder returns, increasing oil reserves, and cutting costs. However, the renewable energy sector operates under a completely different business model than traditional energy (Pickl, 2019). The most notable difference is the high upfront cost of renewable energy projects, which also experience less price volatility compared to oil.

2.2.2 Energy Transition and M&A

Hawkes et al. (2023) noted that energy companies are increasingly shifting their M&A investments from core business areas to renewable energy assets. Verde (2008) explains that the growing instability in the market has undermined confidence in foundational investments, leading companies to invest additional funds in new M&A opportunities. Niemczyk et al. (2022) further suggest that many traditional energy companies view these investments as a way to transform their business models and create long-term value (Pickl, 2019; Hawkes et al., 2023). Consequently, M&A appears to offer a significant pathway for energy companies to rapidly enter the renewable energy sector and achieve structural diversification (Stevens, 2016). However, given the complexity and potential consequences of M&A activities, companies must approach these decisions with careful consideration.

2.3 Merger & Acquisition

2.3.1 Merger and Acquisition

Since the 1920s, mergers and acquisitions (M&A) have been a major focus of research. A merger involves combining two companies into a new entity, with one of the companies disappear after the merger. In contrast, an acquisition focuses on gaining control over another company's shares or assets, resulting in one company obtaining a majority stake or ownership through transfer or purchase. This process can involve both friendly and hostile takeovers (Reed, Lajoux and Nesvold., 2007).

As a process of corporate restructuring, M&A can be categorized in various ways. The most common classification is based on the relationship between the acquiring and acquired companies, including horizontal integration, vertical integration, and conglomerate acquisitions (Aluko and Amidu, 2005). Horizontal integration occurs when the acquiring company is in the same industry as the target company. Vertical integration involves either forward or backward integration to streamline the supply chain (DePamphilis, 2018). Additionally, conglomerate acquisitions occur when multiple companies jointly acquire a target company, often spanning different industries and managed by private equity firms (Hariyani, Serfianto and Yustisia, 2011).

2.3.2 Framework for Predicting the Impact on Stock Prices

During the M&A process, various motivations drive the involved companies (Gifford and Williams, 1939). Currently, there is a substantial amount of research attempting to explain why companies pursue M&A and what factors influence the success of these activities

(Tamosiuniene and Duksaitelet, 2009; Calipha, Tarba, and Brock, 2011; Gomes et al., 2013). These scattered motives have been consolidated into different theories that aim to explain corporate acquisition behaviors and outcomes. However, despite years of research, no single theory fully explains the complete motives behind corporate M&A activities or perfectly predicts M&A outcomes (Calipha, Tarba, and Brock, 2011).

The motives and outcomes of M&A are complex and are influenced by various factors (Gomes et al., 2013). Historical data and evidence show that in M&A events, the stock price reaction for bidders (the acquiring companies) is usually neutral or even negative. In contrast, the positive stock price fluctuations on target (the acquired companies) are observed most of the time (Bradley, Desai and Kim, 1988; Kaplan and Weisbach, 1992; Andrade, Mitchell and Stafford, 2001). Given that the energy industry is currently in a critical period of liberalization, understanding the reasons and impacts of mergers is essential for reshaping future market structures (Verde, 2008). Therefore, it is necessary to explore the motivations behind traditional energy companies' choices to pursue M&A within the renewable energy sector and to understand how various factors influence M&A performance.

It is clear that identifying the motivations behind M&A and the factors that affect M&A performance serve as strong indicators for predicting how acquisition events may impact stock prices. Therefore, by integrating motives theory with the factors influencing performance, and taking into account specific factors related to acquisitions in the renewable energy sector, we can establish a framework that predicts the potential outcomes of M&A events. It will enable us to use the collected information to forecast the stock price impacts of various M&A events before employing the event study methodology (Wårell, 2007).

2.3.3 M&A motive

M&A motive theories that influence stock prices can be grouped into three categories: value-creating, value-reducing, and value-neutral.

Value-Creating: The core premise is that companies operate with the goal of maximizing shareholder value. Consequently, it is reasonable to assume that M&A activities are intended to generate profit for the firm. The well-known synergy theory fits within this framework (Bradley, Desai and Kim, 1988).

Synergies Theory: This effect mainly arises from three aspects: economies of scale, economies of scope, and market power (Kumar and Sharma, 2019).

- Economies of Scale/Scope: Synergies arise from the expansion of a company's operational scale, which can positively impact stock prices by increasing revenue and reducing costs (Kumar and Sharma, 2019). Companies involved in mergers can improve efficiency through scale expansion or complementary relationships, sharing resources, technology, and knowledge, which leads to enhanced expected profitability. Therefore, mergers tend to have a positive effect on stock prices. In the context of the energy transition, this is reflected in the sharing of resources such as managerial expertise, technology, or transportation between participating companies, benefiting both sides of the M&A event (Wårell, 2007).

- Market Power: An increase in market power implies greater control over the market. With reduced competition, companies are expected to have more influence over product pricing (Trautwein, 1990). Increased market power allows companies to pressure raw material suppliers, reduce production costs, and enhance profitability. This leads to positive profitability expectations, which drive stock prices higher. In the context of the energy transition, this could mean a decline in the fossil fuel market and greater dominance over renewable energy, making it a double-edged factor.

Value-Reducing: The outcomes of mergers are often complex and do not always lead to positive results, which has given rise to negative theories. In this context, attention is drawn to Agency Theory (Amihud and Lev, 1981) and the Managerial Hubris Hypothesis, which stems from irrational behavior (Roll, 1986).

- Agency Theory: Due to information asymmetry between the two parties, managers may not act in the interest of maximizing shareholder value but rather prioritize their own benefits for various reasons (Trautwein, 1990). Extending this idea further leads to the Empire Building Theory (Trautwein, 1990). As a result, this behavior is often seen as having a negative impact on performance.

- Managerial Hubris Hypothesis: It explains the irrational behavior of overconfident managers (Roll, 1986). Due to cognitive biases, managers may believe they understand the value of the target company better than the market does, leading to overly optimistic expectations about the outcome of the merger. This often results in overpaying for the acquisition, which negatively impacts stock prices.

Value-Neutral: The Neutral Theory posits that mergers neither inherently create nor destroy value (Kumar and Sharma, 2019). According to the Winner's Curse (Varaiya, 1988), M&A does not result in any overall market value growth but merely represents a transfer of value between the acquirer and the target, making it a zero-sum game.

2.3.4 Critical factors for M&A

Additionally, based on the critical factors influencing M&A success, the following part discusses the issues from the perspectives of strategy, finance, culture, and shareholder reactions.

Strategic Motives and Fit:
Mergers and acquisitions must start with a value-creation logic that aligns with the company's strategy, driven by strategic motives (Calipha, Tarba, and Brock, 2011). For

the bidder, M&A driven by clear strategic objectives can help avoid situations where intentions and outcomes are misaligned (Brockhaus, 1975).

The degree of compatibility between the acquiring and target companies in terms of business models, resources, and market positioning affects whether the merger will produce strong synergies, which is crucial for the success of M&A (Calipha, Tarba, and Brock, 2011). The strategic fit between the competitive strength and market growth rates of the acquiring and target companies determines the new impacts of the M&A (Lubatkin, 1983). Therefore, a high degree of strategic fit is a positive factor if the M&A can provide long-term benefits to the company.

Payment Method:
If the acquisition is financed by the bidder company through debt issuance or cash rather than equity, it can have a positive impact on the post-acquisition performance of the company (Kumar and Sharma, 2019). This is because debt financing or cash financing prevent the dilution of existing shareholders' equity (Gomes et al., 2013).

For the target company, research by Andrade, Mitchell and Stafford (2001) shows that the impact on stock prices tends to be positive regardless of the payment method used.

Geographic Distance / Cultural Differences:
Geographic or cultural differences can present challenges to company integration, hindering the process and increasing acquisition costs (Brock, 2005; Cartwright and Price, 2003). In contrast, a compatible business culture can even influence the development of shared beliefs and values among management (Schein, 1985). As geographic distance increases, the difficulty of integration also rises, which can negatively impact efficiency for both parties. This effect is particularly pronounced in cross-border acquisitions.

Friendly Takeover and Hostile Takeover:
A friendly takeover occurs when the two parties agree on the terms of the transaction through negotiation and consultation, receiving the approval of the target company's board and management (Kaplan and Weisbach, 1992). In contrast, a hostile takeover involves bypassing the management to acquire control directly through purchasing shares, often against the wishes of the target company.

Experience shows that friendly takeovers can negatively impact the bidder, as they may end up paying a higher price to secure the deal. On the other hand, while a hostile takeover might allow the bidder to gain control of the target at a lower price, it significantly increases the difficulty of subsequent integration and may prevent the realization of synergies.

Energy Transition:

In the context of energy transition, there are additional M&A drivers. Yoo, Lee, and Heo (2013) found that in cross-industry acquisitions, risk diversification and green premiums are major motivations for traditional energy companies to undergo transformation. Oil and gas companies face industry risks due to volatile oil prices, policy changes, and public opinion pressures. As a result, they acquire assets and technologies from emerging industries to diversify their portfolios and mitigate the negative impact of traditional energy sector fluctuations on stock prices. Green premiums are also significant. Due to regulatory and societal pressures on the oil and gas industry, engaging in sustainability-related activities can help companies offset these pressures by gaining benefits such as subsidies and consumer favor. Evidence suggests that such actions can even have a positive long-term effect on stock prices (Cao, Li, and Yan, 2022).

In summary, the impact of various factors on the stock prices of both bidders and targets can be summarized in the table below:

Impact of different factors on companies value for bidder and target companies			
		Bidder	**Target**
M&A motives-related	Synergy effect	(+)	(+)
	Agency theory	(-)	
	Managerial hubris	(-)	(+)
Critical success factors	Strategic motives and fit	(+)	(+)
	Payment methods	(/)	(+)
	Geographic distance	(-)	(-)
	Friendly takeover	(-)	(+)
	Hostile takeover	(/)	(-)
Energy Transition-related	Risk diversification	(+)	
	Green Premium	(+)	

Table 1: Impact of different factors on companies' value

2.4 Event study

2.4.1 What is event study and why

The objective of an event study is to assess the extent of abnormal returns (excess returns) that investors gain from an event introducing new information. Abnormal returns are defined as the difference between the actual returns of a stock and the returns that would have been realized if the event had not occurred (Sorescu, Warren, and Ertekin, 2017). EI Ghoul et al. (2023) indicate that the event study method is particularly effective for evaluating the effects of acquisition events on stock prices and market reactions. Therefore, this study aims to apply this method to analyze the impact of cross-sector acquisitions by traditional energy companies in their pursuit of energy transition strategies on shareholder value.

There are several benefits of event study method. For example, it captures the immediate market reaction to the event, making it suitable for assessing the market's response to acquisition announcements and their impact on shareholder value (MacKinlay, 1997). Moreover, this method is adaptable to various time spans. It can be used for large-scale studies analyzing similar events within a specific region or sector simultaneously (Lu et al., 2019), or for long-term clinical studies examining a single company's performance over time in relation to similar events. Wårell (2007) notes that clinical studies can track changes in a company's stock price across different acquisition events and the market's long-term response to specific strategies, providing a deeper analysis of case-specific information and the underlying motives for mergers.

2.4.2 Theory Historical

In fact, academic research on the impact of acquisition events on company value began as early as the 1930s (MacKinlay, 1997). The development of the event study methodology, which focuses on returns, was significantly influenced by Ball and Brown's (1968) study on the impact of annual earnings announcements on stock prices and by Fama et al. (1969), who introduced the method for capturing short-term impacts of events on stock prices. Since then, the event study method has become one of the most widely used empirical research tools in finance and accounting, particularly for examining the effects of acquisition events on stock prices (MacKinlay, 1997; Yoo, Lee, and Heo, 2013).

Interestingly, many researchers view the event study method as a test of the semi-strong form of the Efficient Market Hypothesis (EMH) (Dimson and Mussavian, 2000). As Fama (1970) noted, event studies provide a joint test of market efficiency and return prediction models, illustrating how quickly stock prices adjust to new information. The method is closely related to Fama's market efficiency hypothesis. Specifically, under the semi-strong form of EMH, a company's stock price already reflects all publicly available information, and when new information emerges, the stock price adjusts immediately (Fama, 1970; MacKinlay, 1997; Dimson and Mussavian, 2000). This implies that investors cannot achieve abnormal returns through any form of technical analysis. Therefore, if the hypothesis holds, there should be no persistent abnormal returns during the event window period.

However, if persistent abnormal returns are observed, it suggests that the market did not react quickly to the event, indicating the potential for excess returns. This represents a failure of the Efficient Market Hypothesis and reflects market inefficiency (Jarrell & Poulsen, 1989). Such failures could arise from market inefficiencies, asymmetric information (e.g., insider information), or other irrational factors affecting price formation. De Bondt and Thaler (1985) found that using long-term event studies revealed frequent overreactions to information releases, particularly after stock price corrections. This long-term reversal of returns clearly contradicts the assumptions of the EMH, indicating that the market does not respond rationally to information over the long term. Based on this, they proposed that irrational factors also influence market prices.

The debate over Fama's famous Efficient Market Hypothesis has persisted. The controversy primarily stems from the substantial evidence of abnormal stock price fluctuations observed in research, which challenges market efficiency (Fama, 1991; Kothari and Warner, 2007; EI Ghoul et al., 2023). However, the occurrence of numerous abnormal returns in long-term tests seems closely related to model selection, specifically the model's ability to capture risk (Fama, 1991). Insufficient risk control in the model is a major cause of abnormal returns. Therefore, the high sensitivity of long-term models to risk provides evidence against the failure debate of market hypothesis (Fama, 1991). Fama (1991) argued that abnormal stock prices are likely to be a random phenomenon, but if the model accounts for all potential risks, such anomalies are likely to be eliminated (Fama, 1998; EI Ghoul et al., 2023). He noted that CAPM, used for long-term testing, is incomplete because it only considers market risk. Consequently, he and French later developed the Fama-French Three-Factor Model (Fama and French, 2004).

2.4.3 The Model

Numerous studies have examined how the choice of model in event studies can affect results, with many acknowledging that model selection is crucial for the outcomes of abnormal returns (Brown and Warner, 1980; MacKinlay, 1997; Kothari and Warner, 2007). In the short term, most scholars agree that the market model is generally adequate (Brown and Warner, 1980). However, there is no consensus yet regarding long-term studies (Fama, 1998).

Short-term studies typically focus on an event window of 10 days before and after the event, while long-term studies usually cover a window of at least one year or more (Kothari & Warner, 2007). In some cases, after specific types of corporate events, there may be persistent, systematic non-zero abnormal returns. Hence, conducting long-term event studies provides an opportunity to observe the extended impact of an event.

Moreover, Kothari and Warner (2007) argue that although short-term event study methods are relatively simple, they can still yield reliable results compared to long-term studies. This is why event studies often prefer short-term tests, where results are more reliable (Brown and Warner, 1985). Fama (1991, p. 1602) noted that short-term tests offer "the cleanest evidence we have on efficiency," but long-term tests face many challenges due to their complexity, including the need to consider more factors and longer time spans.

A significant issue is that there is still no clear consensus on the most suitable predictive regression model for long-term studies. Consequently, the choice of model tends to be diverse and sensitive (Kothari and Warner, 2007). This aligns with Fama's (1998, p. 291) observation that "all expected return models are incomplete descriptions of systematic patterns in average returns".

In summary, to fully understand the impact of events on stock prices and to mitigate biases from using a single model, it is essential to conduct both short-term and long-term studies.

2.5 Empirical Study

Many studies use event studies to test acquisitions in the renewable energy sector. In Yoo, Lee, and Heo's (2013) study, they examined 47 acquisition events using the event study method and found that acquisitions between two renewable energy companies with different technological paths had the most significant positive effect on stock prices. This result is supported by Palmquist and Bask (2016), who analyzed 273 announced and 54 completed acquisitions from the perspective of market dynamics in the renewable energy M&A market. They found that the abnormal returns generated by M&A within the renewable energy sector were higher than those in the traditional energy and mining sectors. However, Eisenbach et al. (2011) found that acquirers from outside the industry often achieved positive abnormal results, attributing this to the sustainable signal of returns sent to investors by traditional energy companies when they diversify through acquisitions.

Moreover, the research on the factors influencing M&A performance has not reached a consensus, especially regarding which factors have the greatest impact. Yoo, Lee, and Heo (2013) pointed out that financial synergies and risk diversification have the most positive effects on M&A performance. However, it appears that market power and overall synergy effects were also considered the primary motivations driving companies to engage in M&A (Wårell, 2007). Additionally, some research suggests that when large companies are involved in acquisitions, the benefits derived from synergies are more likely to increase (Eisenbach et al., 2011). Also, surprisingly, although geographical distance and cultural differences pose negative impacts on M&A, some studies have shown that the returns from cross-border M&A announcements are much higher than those from domestic (Sorescu, Warren, and Ertekin, 2017). This result could be due to the permanent nature of the CAR (cumulative abnormal returns) generated by cross-border acquisitions.

Although the number of studies on M&A in the renewable energy sector has increased significantly in recent years, most studies focus on multiple acquisitions within a specified time frame, with few focusing on a single company. Among the studies mentioned above, only Wårell (2007) used the event study method to assess the motives and effects behind a specific acquisition event for both the bidder and the target. However, a single acquisition event is insufficient to provide effective recommendations for the long-term issues posed by energy transition (Wårell, 2007).

Therefore, this study proposes three research questions and selects one company—Total Energies (TE)—as the subject of investigation. It expands on previous research by increasing the number of events and analyzing acquisitions over a 14-year strategic timeframe, comparing the impact of acquisitions at different times on company strategy and stock prices, and exploring the potential factors influencing these impacts. This study is designed to deeply investigate how acquisitions with different technologies and purposes reflect in company value, thereby providing a basis for strategic planning. It is hoped that this research can offer some impetus to accelerate the green transition activities of traditional energy companies.

Chapter 3 Methodology

3.1 Brief Research Setting

This chapter presents the research methods, data, and models utilized in the study, alongside the essential settings for process testing. This research seeks to analyze the impact of various M&A events on corporate value, offering insights into the driving forces behind companies' decisions to pursue transformation. Focusing on a single case, TotalEnergies, the study examines, at a micro level, how the oil and gas industry's transition towards the sustainable energy sector influences the company's value and the key factors driving this effect.

The research adopts a mixed-methods approach, combining both qualitative and quantitative methods. This design allows for cross-verification of conclusions drawn from both types of data, which enhances the credibility and comprehensiveness of the research—a process known as "triangulation" (Fakis et al., 2014). Previous studies in the field of energy transition have predominantly relied on purely quantitative methods, such as testing the effects of large-scale acquisition events over a given period, or purely qualitative methods, which analyze textual data from news reports to investigate the drivers and impacts of acquisitions (Verde, 2008; Yoo, Lee, and Heo, 2013; Palmquist and Bask, 2016).

Thus, this research adopts the less common mixed-methods approach to fill gaps in existing studies. Additionally, considering the difficulty in obtaining data and the fact that some information is not available in numerical form, qualitative research is used to process textual data and derive fact-based conclusions. Combining this with quantitative validation offers a deeper perspective on traditional energy companies' challenges and opportunities during their transition, the impact of acquisitions on corporate value, and the factors contributing to abnormal returns.

3.2 Research Design

An exploratory approach was adopted in terms of research design, which is considered flexible and open, making it well-suited for deeply exploring topics that have not yet been extensively studied (Creswell, 2014).

The following Figure 1 overviews the research approach and process.

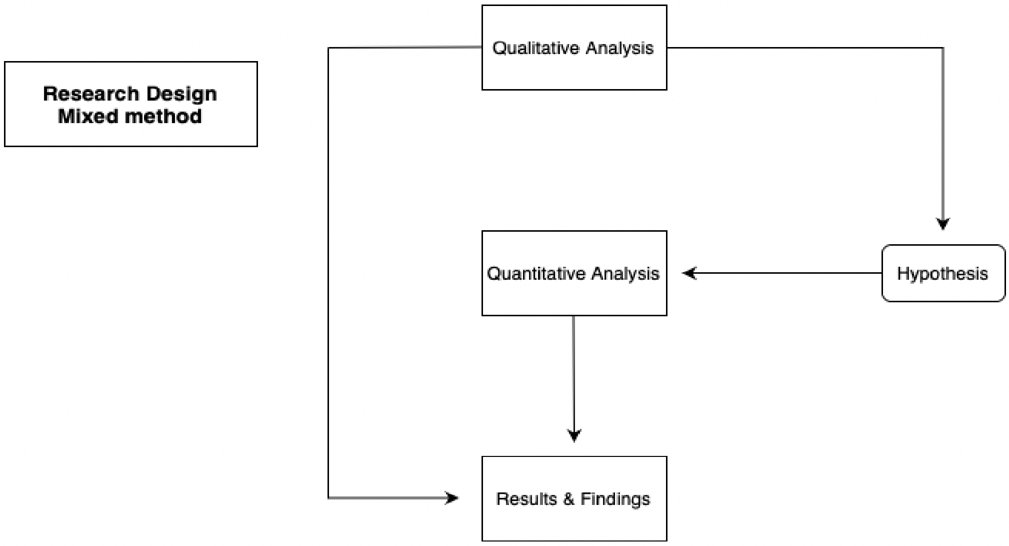


Figure 1 Research Design

The research process is divided into three main parts. The first part involves using traditional business analysis frameworks, such as PESTEL and SWOT, to qualitatively assess both the internal and external conditions of the oil and gas market and the companies involved in the acquisitions. Additionally, data related to TotalEnergies' energy transition is examined to provide further context for the analysis. By analyzing textual patterns, relevant information for each case was identified to evaluate the impact of the four acquisitions on Total Energies' stock price and to generate hypotheses.

Once the hypotheses for each case were established, the second part employed quantitative methods to test the abnormal returns generated by the four acquisition events and the results of hypothesis testing. By analyzing the short- and long-term stock price effects of these four distinct M&A events, each occurring under different circumstances, the study aims to provide a more nuanced understanding of how acquisitions driven by diverse objectives can have varying impacts on corporate value.

Finally, the qualitative and quantitative research results were integrated to form a unique and robust conclusion to the main research question.

3.2.1 Qualitative analysis

Two commonly used business analysis frameworks were employed in the qualitative analysis section to examine the company's transition strategy from external and internal perspectives.

These frameworks were used to evaluate the company's motivations for acquisitions and the impact of these acquisitions on corporate value.

The PESTEL framework, initially proposed by Francis Aguilar in 1967, began as the ESTE model (Kansongue, Njuguna, and Vertigans, 2023). Over time, it has evolved to include social, economic, political, legal, technological, and environmental factors. The PESTEL framework helps identify macro factors in the external environment that may influence a company's operations, offering insights into market conditions (Aguilar, 1967). Applying PESTEL analysis helps explain why TotalEnergies pursued these four M&A events and assesses how external factors influenced the returns from these acquisitions.

The SWOT framework, popularized by Albert Humphrey in the 1960s (Pickton and Wright, 1998), was initially designed for business purposes and has since become one of the most widely used tools for organizational decision-making. Unlike PESTEL, SWOT focuses on the organization, analyzing its strengths, weaknesses, opportunities, and threats. This framework helps businesses understand the interaction between their internal capabilities and the external environment (Kansongue, Njuguna, and Vertigans, 2023). In this study, SWOT analysis is employed to evaluate TotalEnergies' current energy transition strategy, highlighting areas of strength while offering recommendations for strategic improvements.

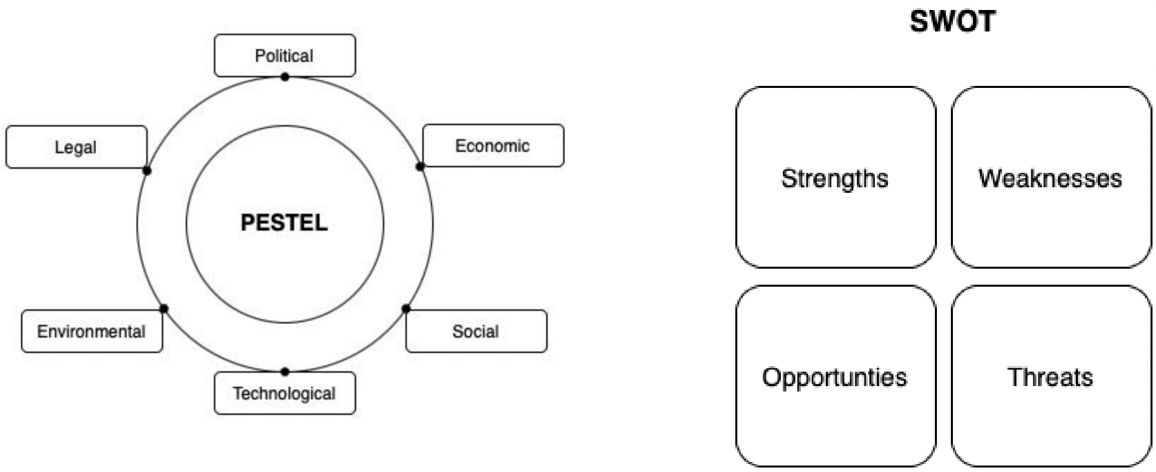


Figure 2 PESTEL & SWOT framework

3.2.2 Quantitative Analysis

The quantitative research section employs a method known as the event study, which is extensively used in research on M&A effects (Brown and Warner, 1980; Mitchell, Pulvino, and Stafford, 2004; Rani et al., 2015; El Ghoul et al., 2023). The event study provides a joint test of market efficiency and expected return models, making it particularly suitable for examining the impact of significant, unexpected events, such as M&A, on corporate value (El Ghoul et al., 2023).

This study uses the event study method to analyze the impact of four major acquisitions made by Total Energies over 14 years on its stock price. Based on the methodologies outlined by MacKinlay (1997), Campbell et al. (1997), Kothari & Warner (2007), Wårell (2007), and Yoo, Lee, and Heo (2013), the research is divided into short-term and long-term tests. The analysis follows six stages, as Figure 3 below illustrates. The subsequent sub-chapters will describe the detailed content and formulas related to these steps.

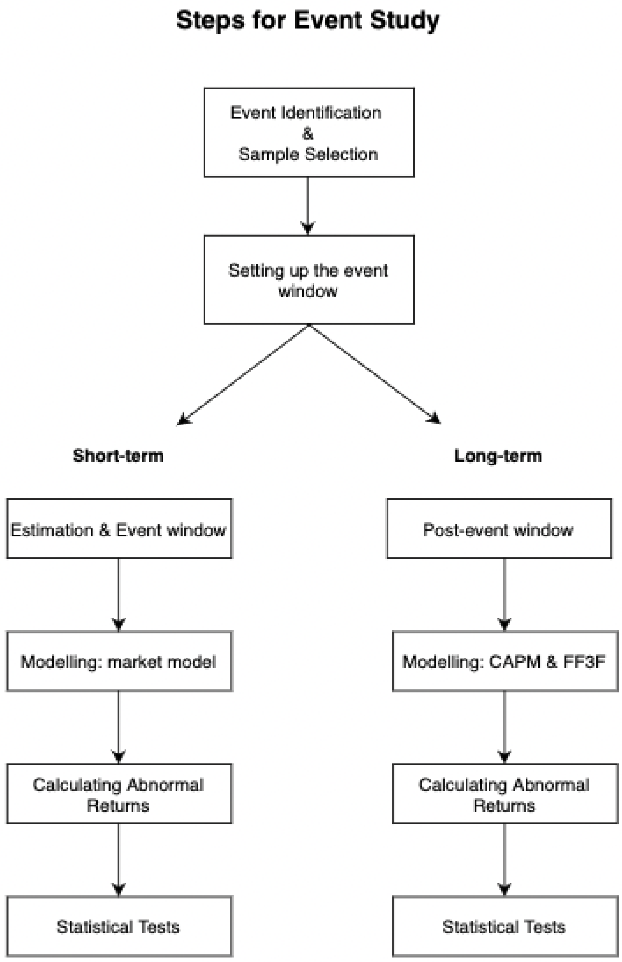


Figure 3 Steps for event study

3.3 Data Set

3.3.1 Data collection

This study is based exclusively on secondary data. Qualitative data was gathered from a variety of sources, including academic literature, corporate documents, news articles, and reports from governments and international organizations. Additionally, the websites of both the acquiring and acquired companies, as well as interviews and video content, were carefully reviewed. These data were collected and organized through a combination of desk research and literature review, allowing the study to benefit from a broad range of information sources while maintaining relatively low time and cost investments.

For quantitative data, the study analyzed daily and monthly average stock prices, trading volumes, and the S&P 500 index's daily or monthly average market prices during the periods of Total Energies' acquisitions. Daily returns were used for short-term analysis, as they have been shown to provide more precise measurements of abnormal returns (Khotari & Warner, 2007). Monthly returns were chosen for long-term analysis to mitigate data complexity and length (Brown and Warner, 1980). In event studies, a market index is required to estimate expected returns, with a broad market index often preferred (MacKinlay, 1997). The S&P 500 index, serving as a broad benchmark for the U.S. stock market, is well-suited for this research because it includes 500 companies from a wide range of industries, providing a comprehensive representation of market trends and corporate performance.

Quantitative data was downloaded from Wharton Research Data Services (WRDS) and Kenneth R. French's website. WRDS is a leading academic research data platform developed and maintained by the Wharton School, known for its authority and wide influence (Mackinlay, 1997). Kenneth R. French's website, managed by the renowned financial scholar Kenneth R. French, who co-developed the famous FF3F model with Fama, provides data relevant to this study. Most data analyses were conducted using Microsoft Excel, with diagrams created using online tools like Diagrams.net.

Although the researcher acknowledges that relying solely on secondary data may face criticism for being limited, the ease and speed of secondary data collection allowed the research to proceed within a constrained timeframe. Future studies could incorporate primary data collection to ensure more timely and comprehensive findings.

3.3.2 Screening events

The study narrowed its focus to four cases over the past 14 years, involving acquisitions by Total Energies that claimed to serve the purpose of energy transition. These cases are the 2011 acquisition of SunPower, the 2016 acquisition of Saft, the 2018 acquisition of Direct Energies, and the 2022 acquisition of Clearway Energy.
These acquisitions were selected based on the following criteria:

- The acquisitions must be related to the energy transition, as this forms the foundation of the research.
- For research feasibility, only M&A transactions with full disclosure were considered.
- Large-scale transactions were chosen due to their potential for significant impacts on stock prices.
- To ensure the comparability of research results, the selected cases should not have completely overlapping characteristics.

• Lastly, the M&A events should not overlap in time to ensure that any abnormal price fluctuations can be attributed to a single event, enhancing the credibility of the conclusions.

3.3.3 Window setting

The setting of event windows is crucial for event studies (MacKinlay, 1997). In this experiment, the announcement day of each acquisition is set as day 0. Two event windows, [-10, +10] and [-1, +1], are used for short-term tests, providing deeper insights into the abnormal returns caused by the events.

A shorter event window enables us to detect the immediate impact of the acquisition on stock prices, while minimizing the chances that other company activities during the same period might affect stock performance (MacKinlay, 1997). Conversely, a longer event window can capture potential abnormal returns related to the acquisition, such as insider information leaks, which are often observed (Keown and Pinkerton, 1981).

Additionally, short-term tests require an estimation period to measure normal returns during the event window. This period is typically chosen before the event window, ensuring it does not include stock prices influenced by abnormal returns related to the event. The estimation window should not be too short, as it may lack sufficient observations for the model to be effective, nor too long, as it may lead to inaccuracies due to changing risks over time. However, longer windows generally improve the precision of parameter estimates (El Ghoul et al., 2023). According to Armitage (1995), an estimation period of 100 days or longer for event studies based on daily returns is reasonable. Given these considerations, this experiment sets the estimation window at [-20, -100], covering 80 days to ensure that the predicted returns are unaffected by the event while maintaining model accuracy.

For long-term tests, only the post-event window is necessary to detect abnormal returns. This window typically spans from 12 to 36 months after day 0, with its length adjusted according to the study's objectives.

A general event study timeline for this research can be seen in Figure 4 below. The timelines for each case are included in the appendices.

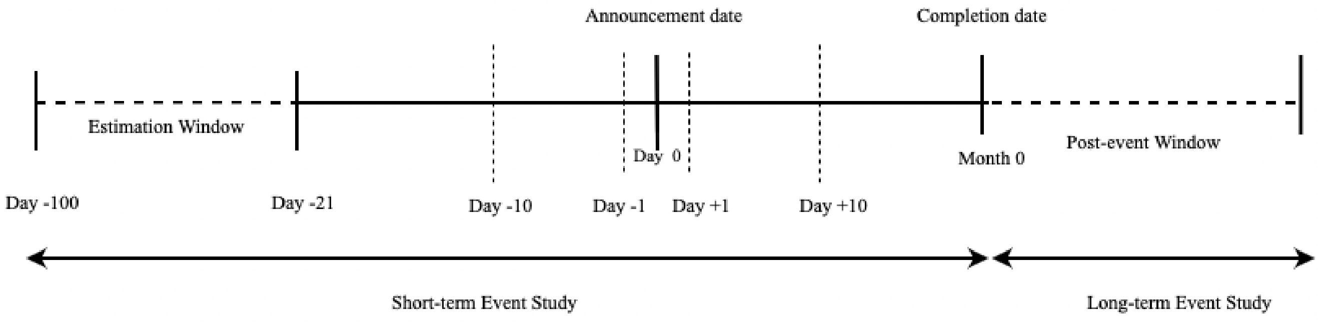


Figure 4 Event study timeline

3.3.4 Data cleaning

In event study research, the raw data collected is typically presented as share prices, which must be converted into returns. This conversion was applied to the short-term data in the study using the following formula:

$$R_{it} = \frac{P_t - P_{t-1}}{P_{t-1}}$$

For the long-term data, due to different unit settings on the two websites, the company's monthly returns and the market index were in different units. The company's monthly average stock price was divided by 100 to standardize the data.

Additionally, to enhance the robustness of the conclusions, a simple data cleaning process was conducted on the short-term test data before establishing the regression model. Specifically, for the company returns data during the estimation window for short-term acquisitions, the five largest and five smallest values were removed from the data series, reducing the number of observations from 80 to 70. A detailed comparison of results will be presented in the results section.

3.4 Modelling

This study established two distinct time frames for each acquisition event. For the short-term analysis, a single model was chosen for testing. In contrast, multiple models were used for the long-term analysis to account for the sensitivity of results to model selection and to facilitate comparison.

3.4.1 Short-term

For the short-term study, this study chose to use the Market Model. Although it is the simplest return prediction model, it is also the most widely used and has been shown to yield results comparable to those of more complex models that incorporate additional independent variables (El Ghoul et al., 2023). Fama (1998) and Brown & Warner (1985) also support this perspective, arguing that the Market Model is sufficient and reliable for detecting the impact of an event on a firm in short-term analyses. This is because the variability of abnormal returns does not change with more sophisticated models (MacKinlay, 1997).

Modelling Process: Market model

The market model is the most common expected return model for short-term event studies. It is based on the correlation between a stock's actual returns during the estimation window, and the market returns over the same period. The model is presented in Equation (1):

$$R_{it} = a_i + \beta \times R_{mkt} + e_{it} \qquad (1)$$

Where, Rit is the actual return of firm i at time t, and Rmkt is the actual return of the market at time t. ai is the intercept, β represents the regression slope (how sensitive Rmkt is to Rit), and e_{it} is the residual.

During the event window, abnormal returns appear when there is a difference between the actual return (Rit) and the expected return (E(Rit)) produced by the regression model. Equation (2) shows the abnormal returns of stock i at time t:

$$AR_{it} = R_{it} - E(R_{it}) \qquad (2)$$

It's worth noting that we can substitute Equation (1) into Equation (2), generating Equation (3):

$$AR_{it} = R_{it} - (a + \beta \times R_{mkt}) \qquad (3)$$

Next, to determine the event's overall impact during the event window, the abnormal returns from individual days are summed to create the cumulative abnormal return (CAR) for the entire event window. Equation (4) below shows the formula for cumulative abnormal returns, which forms the basis for short-term hypothesis testing in this study:

$$CAR_i = AR_{i,t1} + \cdots + AR_{i,t2} = \sum_{t1}^{t2} AR_{it} \qquad (4)$$

Where, T1 and T2 represent different event windows, [-10, +10] and [-1, +1].

The final step is to use a t-test to confirm the statistical significance of the CAR. To ensure the robustness of the results, I explored the t-statistics at significance levels of 1%, 5%, and 10%. If the tests are passed, we can confirm that abnormal returns are likely related to the acquisition event.

3.4.2 Long-term

Three common methods exist for measuring long-term stock performance (El Ghoul et al., 2023). However, due to the limitations of the cumulative abnormal return and buy-and-hold abnormal return methods, Jaffe (1974) and Mandelker (1974) proposed Jensen's alpha method as an alternative. As a result, I chose Jensen's alpha as the standard for evaluating abnormal returns over the entire event window.

Jensen's alpha is a widely used metric for assessing a portfolio's or specific asset's performance (El Ghoul et al., 2023). Using incorrect factors or failing to account for time-varying betas can result in a non-zero alpha. Leveraging this principle, historical data is utilized to estimate the return model and test whether Jensen's alpha is non-zero, thereby identifying abnormal performance (Jarrow and Protter, 2013).

Additionally, as noted earlier, long-term study results are more sensitive to the choice of model. Therefore, I applied two models for testing: the Capital Asset Pricing Model (CAPM) and the Fama-French 3-Factor Model (FF3F). In the following sections, I will describe these two models and discuss their limitations.

3.4.2.1 Capital Asset Pricing Model (CAMP)

Without accounting for the risk undertaken, evaluating investment returns offers little insight into the actual performance of securities (Fama, 1991). When considering systematic risk, the Capital Asset Pricing Model (CAPM) was originally developed to analyze the relationship between expected stock returns and market risk. Systematic risk, or undiversifiable risk, affects all sectors in the market equally and cannot be avoided or mitigated.

In theory, once risk is adjusted for, actual returns (realized returns) should align with those predicted by the CAPM model, resulting in an alpha of zero, indicating no abnormal returns. However, if stock returns exceed the expected risk-adjusted returns, alpha will be positive, and if they fall short, alpha will be negative.

It is important to note that CAPM relies on several key assumptions (Fama, 1991; Fama and French, 2004). For instance, it assumes a perfect market with no transaction or tax costs, shared information among all participants, and rational and risk-averse investor behavior. Although these assumptions significantly simplify reality and often result in poor empirical performance, drawing criticism (Fama and French, 2004), they also help maintain the model's simplicity, providing a foundational framework for modern portfolio theory.

Modelling Process: Capital assets pricing model

The CAPM adjusts for overall market risk, considering the relationship between market and company returns. The formula used in this study is shown below (Equation 5):

$$R_{it} - r_f = a_t + \beta \times \left(R_{mkt} - r_f\right) \qquad (5)$$

Where[1], r_f is the risk-free rate, and (R_{it} −r_f) represents the excess return of firm i at time t; (R_{mkt} −r_f) is the market's excess return, representing the risk premium or the compensation for accepting the risk of market loss; β measures the systematic risk of the security relative to the overall market.

In the CAPM model, we look at Jensen's alpha and its t-statistics to confirm whether the stock's long-term performance shows abnormal returns due to the event. The formula for calculating alpha is as follows (Equation 6):

$$a_t = \left(R_{it} - r_f\right) - \left[\beta \times (R_{mkt} - r_f)\right] \qquad (6)$$

The final step is to determine whether the alpha is statistically significant.

3.4.2.2 Fama-French 3-Factor Model (FF3F)

As previously mentioned, although CAPM offers the simplicity of a single-factor model, empirical studies have increasingly uncovered evidence of abnormal returns (Fama and French, 2004; Khotari & Warner, 2007). This growing body of evidence has prompted researchers to search for better alternatives. Fama and French (2004) found that value stocks tend to outperform growth stocks, and small-cap stocks often outperform large-cap stocks. These findings led to the FF3F, which expands CAPM by incorporating value and size risk factors, providing a more comprehensive explanation of stock market performance (Fama and French, 2004).

The rationale for transitioning from CAPM to the FF3F is clear. In short event windows, the size and value premiums may remain relatively stable, enabling alpha to capture additional factors that CAPM may overlook more effectively. However, as the event window extends, alpha may fail to account for changes in size and value premiums over time. In such cases, continuing to rely on CAPM could significantly impact the measurement of abnormal returns, exacerbating joint hypothesis testing issues due to unaccounted-for premiums (El Ghoul et al., 2023).

[1] Note: If the elements are consistent with those explained in the market model above, they will not be re-explained here.

Modelling Process: Fama-French 3-Factor Model

The Fama-French Three-Factor Model calculates the expected return on investment based on three factors: overall market risk, the degree to which small companies outperform large companies, and the degree to which high-value companies outperform low-value companies. The formula is shown below (Equation 7):

$$R_{it} - r_f = a_t + \beta_1 \times \left(R_{mkt} - r_f\right) + \beta_2 \times SMB_t + \beta_3 \times HML_t \quad (7)$$

Where[2], SMBt is the size factor, representing the excess return between the market capitalization of small and large firms during time t. HMLt is the book-to-market factor, indicating the excess return of high book-to-market firms over low book-to-market firms during time t.

The formula for Jensen's alpha in the FF3F model is:

$$a_t = \left(R_{it} - r_f\right) - \left[\beta_1 \times \left(R_{mkt} - r_f\right) + \beta_2 \times SMB_t + \beta_3 \times HML_t\right] \quad (8)$$

Similarly to CAPM, we need to confirm whether alpha is statistically significant.

3.5 Limitation

The main limitations of this study can be summarized in two points. First, since all the data used in this study was sourced from a single database, without cross-verification for accuracy, data errors could impact the results. Second, the data was not checked for compliance with necessary statistical assumptions before conducting the OLS regression, which poses a significant risk to the model's credibility.

3.6 Ethical consideration

Since only secondary data was used, the researcher believes that the risk of ethical issues in this study is minimal.

[2] Note: If the elements are consistent with those explained in the market model above, they will not be re-explained here.

Chapter 4 Qualitative Results

4.1 Introduction to Global Energy Companies

The private oil and gas giants active globally, often called “Big Oils”, typically include ExxonMobil, Chevron, BP, Shell, Eni, and TotalEnergies—six large multinational oil and gas companies. These companies’ operations span the upstream sector of crude oil extraction, the midstream sector of oil transportation, and the downstream sector of product refining and sales (Stevens, 2016). The global market share of oil and gas companies is shown below.

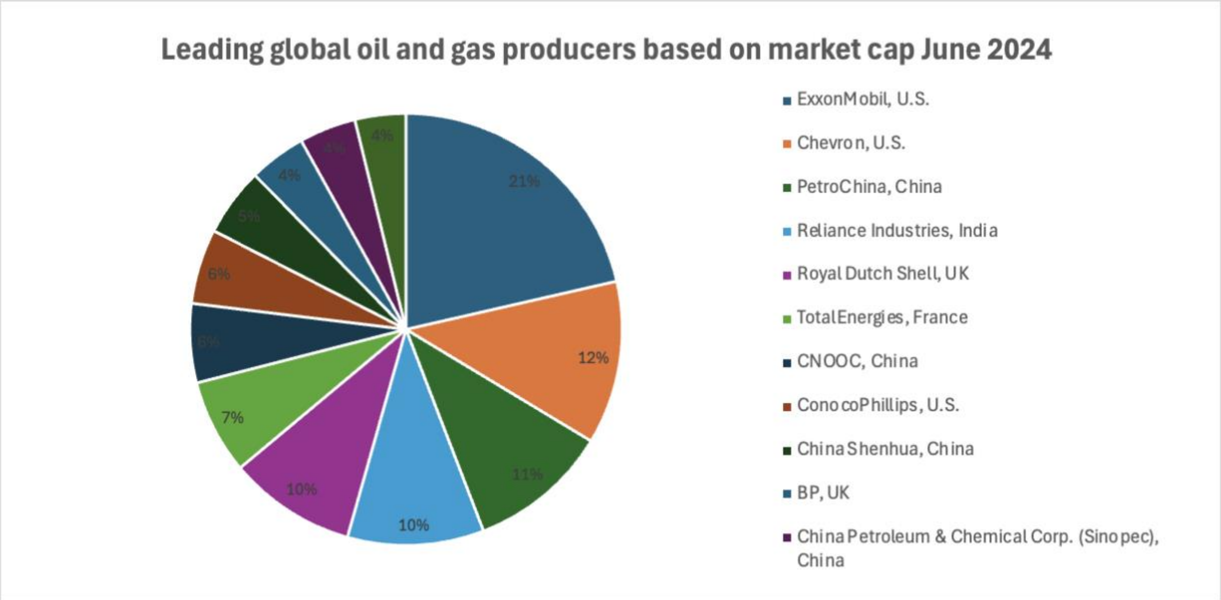


Figure 5： The market cap for leading global oil and gas producers

Sources: (Statistic, 2024)

Since around 2005, some oil and gas companies have begun to acknowledge the unsustainability of the current energy model—both from a business standpoint and in terms of its environmental impact and resource depletion (Stevens, 2016). In response, they began focusing on enhancing economic efficiency and addressing environmental concerns, with significant actions starting around 2010 (Scott, 2018).

Currently, there are two primary pathways for energy transition: 1) gradually increasing the share of renewable energy in their asset portfolios through mergers and acquisitions (M&A) and investments, as seen with BP, Shell, and TotalEnergies; or 2) continuing to invest in oil and gas while improving energy efficiency, as exemplified by ExxonMobil and Chevron (Lu et al., 2019). Among these strategies, developing and utilizing renewable energy is the most comprehensive yet challenging path to achieving a low-carbon transition.

However, substantial evidence indicates that the French energy giant TotalEnergies (TE) has become one of the leaders in transitioning from a traditional oil and gas producer to a fully integrated energy company (Mackenzie, 2017; Scott, 2018). TE's commitment to energy transition stands out as ambitious compared to its more hesitant competitors (Zhong & Bazilian, 2018; IEA, 2023). TE has developed a comprehensive long-term emissions reduction strategy aligned with the Paris Agreement, aiming for a gradual transition by significantly lowering carbon emissions and improving baseline levels (Scott, 2018). The company plans to increase the share of clean energy in its investment portfolio from 3% to at least 15% by 2035 (Mackenzie, 2018).

As shown in the following charts, in 2023, TE allocated $5.88 billion of its capital expenditure to renewable and other low-carbon energy sources, compared to its total assets of $16.8 billion. In contrast, Chevron, with a similar total asset value, invested only $2 billion in low-carbon energy. Meanwhile, ExxonMobil, despite holding the largest total assets at $26.33 billion, allocated just $0.62 billion toward low-carbon initiatives (Statista, 2024).

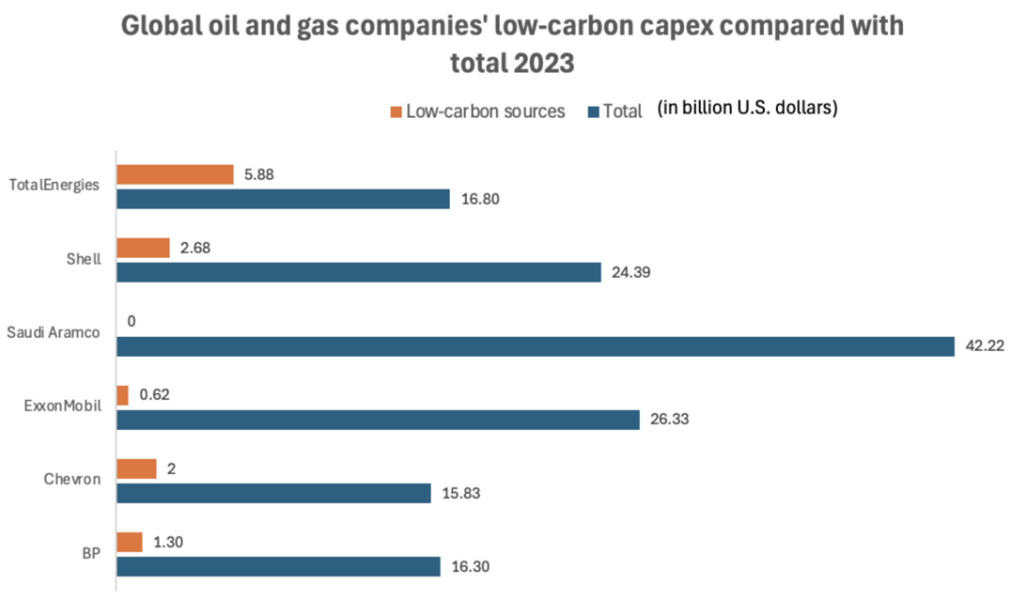


Figure 6 Global oil and gas companies' low-carbon capex compared with total

Sources (Statistic, 2023a)

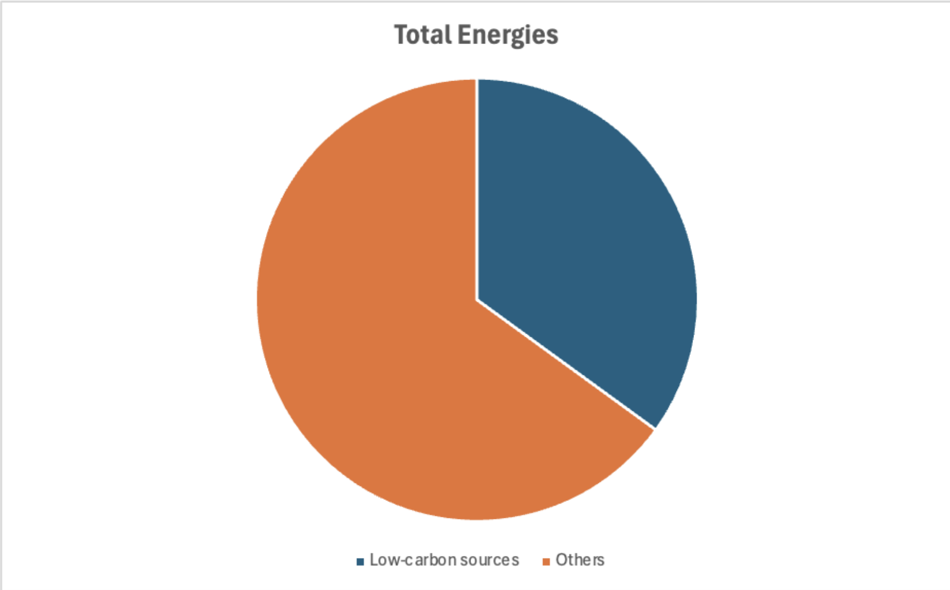


Figure 7 Total Energies capital expenditure

Sources (Statistic, 2023a)

According to Lu et al. (2019), Total Energies (TE) has the most diversified investments in the low-carbon transition among the seven largest global oil and gas companies. TE has significantly invested in reducing direct emissions, renewable energy, energy storage technologies, carbon capture and storage, and new energy transportation (Deign, 2017). The company plans to allocate around $500 million annually to renewable energy investments, representing approximately 3% of its total capital expenditure (Hurley, 2017). It is clear why mergers and acquisitions (M&A) are seen as a key strategic tool in achieving TE's low-carbon transition. This study, therefore, focuses on TE, a leader in the energy transition with substantial experience in renewable energy M&A.

4.2 Introduction to TotalEnergies (TE)

Introduction to TE (Non-financial)

TotalEnergies SE (ticker: TTE) was founded in 1924 and is headquartered in Courbevoie, France. It is listed on both the Euronext and New York Stock Exchanges. TotalEnergies (TE) has been engaged in oil and gas production for nearly a century and is one of the largest international oil and gas companies (TotalEnergies, 2023, p.10). TE operates in over 130 countries across five continents, including oil and gas exploration and production, refining, petrochemicals, and the distribution of various forms of energy to end customers (TotalEnergies, 2023, p.10).

In recent years, in line with its ambition to "contribute to global net-zero emissions by 2050," TE has been striving to transform into an integrated energy company. It aims to meet the growing energy demand while fundamentally reshaping its production and sales models, positioning itself as a key player in the global energy transition (TotalEnergies, 2023, p.27). In 2021, the company rebranded from Total to TotalEnergies to signal its commitment to a low-carbon transition. TE has also introduced a strategy known as the "two-pillar multi-energy" strategy, focusing on oil, gas, and electricity as the core energy sources for its transition (TotalEnergies, 2024e). The company has formally placed renewable energy on par with fossil fuels and has laid out a comprehensive long-term transition plan (TotalEnergies, 2024a).

Specifically, TE's transformation strategy can be divided into five key areas:

1. TE is gradually decreasing the share of oil in its portfolio, with a target of reducing oil product sales to 30% by 2030 (TotalEnergies, 2024b).

2. Expanding LNG Holdings: TE is significantly increasing its investments in liquefied natural gas (LNG) (TotalEnergies, 2024d). The company plans to boost its oil and gas production by 2%-3% annually over the next five years (TotalEnergies, 2024e).

3. Electricity Integration: TE positions electricity as a new strategic pillar (TotalEnergies, 2023). With global electricity demand projected to rise sharply, TE is developing and integrating a full value chain from power generation to distribution. The company aims to become one of the world's top five renewable energy producers by 2030 (Lazard Frères Banque and Société Générale, 2018).

4. Growing Biofuels: TE is also increasing its focus on biofuels, viewed as an immediate alternative to fossil fuels (TotalEnergies, 2024b).

5. Collaborating with Customers on Decarbonization: TE is actively encouraging its customers to participate in the decarbonization process by offering an increasingly low-carbon energy mix (TotalEnergies, 2024d).

Introduction to TE (financial)

According to TotalEnergies' 2023 annual report (2023, p.7), net income 2023 was $21.4 billion. Net investment amounted to $16.8 billion, with 35% allocated to low-carbon energy, primarily focused on electricity-related investments. TE's 2023 revenue, as shown in Figure X, was $237.13 billion, marking a decline compared to the previous year. In 2022, oil prices surged dramatically following the COVID-19 pandemic and the ongoing Russia-Ukraine conflict, resulting in the highest prices seen in a decade and pushing TE's revenue to a ten-year high. Overall, the value of TE's assets has experienced a net growth trend from 2010 to 2023 (Statistic, 2024).

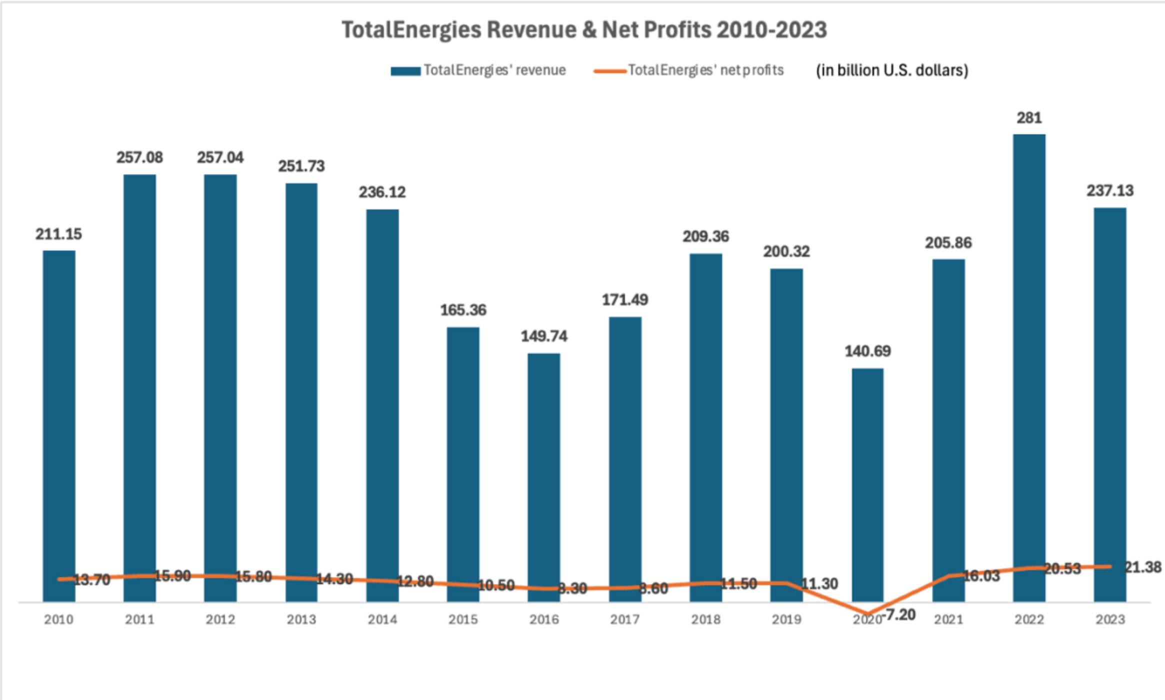


Figure 8 Total Energies Revenue & Net Profits 2010-2023

Sources: (Statistic, 2023b; Statistic, 2023c）

Figure 9 Total Energies stock price

Sources: (Yahoo, 2024)

Figure 9 shows TE's share price from 2011 to 2023. The oil and gas industry is well known for its sensitivity to oil prices, and TE's share price followed an upward trend between 2010 and 2014, gradually recovering from the effects of the 2008 financial crisis. However, between 2014 and 2016, a global drop in oil prices led to a significant decline in TE's share price. Similarly, the COVID-19 pandemic in 2020 led to a steep drop in oil prices, causing another sharp decline in the company's share price. These price troughs are directly reflected in the company's annual revenue. Over the past decade, TE's financial performance has shown considerable cyclicality, a common industry characteristic. TE's share price is highly sensitive to global economic conditions and has responded strongly to events such as the COVID-19 pandemic and the Russia-Ukraine war. Given these market risks, reducing the impact of oil price fluctuations on corporate value—or hedging against such risks—may be a key driver behind TE's commitment to its renewable energy strategy.

4.2.1 PESTEL and SWOT Analysis

Given that this paper focuses on a traditional energy company, PESTEL and SWOT analyses were applied to TE's energy transition strategy to gain valuable insights. The results are as follows (See appendix for a larger version):

PESTEL		
Factors		**Details**
Political	Government support and policy promotion	Government regulations and subsidies are important drivers of the energy transition; policies have led to a sharp learning and absorption of emerging renewable energy sources. Policies to reduce carbon emissions are booming worldwide
	Geopolitics	Europe chooses to use renewable energy in order to break away from its dependence on gas from
Economical	Global economic growth slowdown	A macroeconomic environment of high interest rates and rising raw material costs presents challenges for companies' capital allocation and clean energy investments
	Decrease in costs	The rapid decline in the cost of renewable energy technologies could make companies economically competitive
	Industrial transformation	The slowdown in the growth of oil demand has forced many companies to enter a period of transition, reassessing and planning their business models and strategies in response to the changing energy landscape
Social	Pressure from public and shareholder	Consumers are increasingly concerned about climate change and cause society has an increasing demand for sustainable energy Shareholders are also demanding disclosure and action on climate-related financial risks
Technological	Technological progress	Technological progress and innovation in the renewable energy sector are making it increasingly accessible and cost-effective Technologies associated with extending the use of fossil fuels are unable to meet the challenge of creating affordable energy systems to combat climate change
Environmental	Climate change	Public awareness and concern about the environmental impact of fossil fuels is increasing Increasing the risk of extreme weather
Legal	Environmental regulations and carbon trading	Companies face a stricter legal environment due to increasingly stringent carbon emission regulations and carbon trading markets in various countries
		Sources: Schaeffer, 2015; Alagoz and Alghawi, 2023; Zhong & Bazilian, 2018; Macalister, 2015; Fattouh, Poudineh and West, 2019; Gielen et al., 2019;

Table 3 PESTEL

SWOT		
Factors		**Results**
Strengths	Vertically integrated business model	TE has extensive operations across the entire energy value chain, from the exploration, production and refining of oil and gas to the development of renewable energy sources such as solar and wind power, enhancing its competitiveness in the energy transition
	Expertise in renewable energy	TE has over 40 years of experience in the solar energy sector and leads the global solar market through its subsidiary SunPower
	Global business presence	TE operates in 130 countries, and its global presence helps it to develop renewable energy in different regions using local resources
	Government-backed policy framework	National policies in France, such as the Energy Transition for Green Growth Law of 2015, provide strong support for TE's energy transition and encourage companies to accelerate the reduction of fossil fuel use
Weaknesses	Historical dependence on traditional energy sources	Despite progress in the energy transition, TE's current heavy reliance on oil and gas may limit its ability to achieve a rapid and comprehensive transition in the short term
	Complex regulatory environment	France's complex bureaucratic culture and multi-level decision-making processes may slow down policy implementation and the advancement of energy transition projects
Opportunities	Decreasing costs of renewable energy technologies	As the cost of technologies such as wind and solar power continues to fall, TE has the opportunity to further consolidate its leadership in the clean energy sector through large-scale investment
	French energy independence policy	The French government has set a target of 40% renewable energy by 2030, providing TE with huge market opportunities
	Global energy transition trends	The global demand for low-carbon energy and the promotion of national policies have enabled TE to expand its renewable energy business by participating in international energy transformation projects
Threats	Social and environmental pressures	TE is facing pressure from social and climate activists
	Increased global competition	TE is facing increasing competition in the global market as more and more international energy companies are investing in clean energy
	Policy uncertainty	France's complicated policy implementation and competing interests may delay progress
		Sources: TotalEnergies, 2023; Gielen et al., 2019; Pickl, 2019; TotalEnergies Sustainability Climate progress report, 2022; IEA,2021; Bonneuil et al., 2021; SGI, 2020; Gouvernement, 2022; Jacque & Cossardeaux, 2021;

Table 2 SWOT

From the PESTEL and SWOT analyses, it is clear that TE is facing strong external drivers for its energy transition. On the positive side, political and regulatory forces present significant opportunities for TE to expand its share in the renewable energy industry further. On the other hand, social factors exert growing external pressure, requiring the company to act swiftly.

Internally, TE's vertically integrated business model and global presence offer considerable long-term opportunities for business expansion. However, replacing traditional energy with renewable energy in the short term remains a significant challenge. Furthermore, critical technologies supporting TE's future operations in renewable energy, such as battery storage will play a pivotal role. TE has already positioned itself ahead of many competitors in the renewable energy transition, especially in the solar sector. As costs continue to decline, TE can solidify its position in the clean energy market by maintaining or expanding its investment. However, with more competitors entering the industry, TE will likely face intensifying competition.

4.3 Introduction to Targets

This section introduces four significant acquisitions made by TE over the past 14 years. I will begin with a summary of the key details related to these acquisitions, followed by a brief overview of each target firm and their motivations for joining the M&A.

Information of 4 acquisitions

	SunPower	Saft	Direct Energies	Clearway Energy
Announcement date	April 28,2011	May 9,2016	April 18,2018	May 25,2022
Completion date	June 15,2011	July 12,2016	July 6,2018	Sep 12,2022
Amount	Approximately $1.3 billion	€950 million	Approximately €1.4 billion	pay $1.6 billion in cash and an interest of 50% minus one share in the TotalEnergies subsidiary that holds its 50.6% ownership in SunPower Corporation
Payment method	Cash	Cash	Cash	Mixed
Details of the deal	30,220,701 shares of Class A common stock and 25,220,000 shares of Class B common stock at a purchase price of $23.25 per share	23,456,093 Saft Groupe shares representing 90.14% of the capital at a purchase price of €36.50 per share, ex-dividend of €0.85 per share	the final acquisition of 33,311,459 Shares approximately 74.33% of its share capital, at a price of €42 per share, ex-dividend of €0.35 per share,	Not listed, public share price information not available

Table 4 Summary of acquisition details

SunPower:

SunPower (SPWRQ), founded in 1985 and headquartered in Silicon Valley, USA, is a renewable energy company specializing in residential and solar energy storage solutions. Its growth is closely tied to advancements in solar energy, with its high-performance solar panels being a notable example (Singh, 2021). As a breakthrough technology, solar energy is a cornerstone of renewable energy solutions (Singh, 2021).

In 2011, SunPower's friendly acquisition by TotalEnergies significantly accelerated its long-term growth plans, supported by a $1 billion credit agreement. This partnership with TotalEnergies also expanded SunPower's market access (SunPower, 2011). Despite the acquisition, SunPower remained publicly traded, and its original management team continued to lead the company. The acquisition provided SunPower with essential resources to advance its development and achieve its vision of transforming the global energy supply (SunPower, 2011).

Saft:

Founded in 1918, Saft is a leading battery company that provides long-lasting batteries and systems for various applications. Its products are widely used in storage systems, telecommunications, rail transport, and aerospace. Saft aims to deliver innovative, safe, and reliable high-performance battery solutions for land, sea, air, and space applications (Saft, 2017). The company generates most of its revenue from Europe and the United States and offers a broad range of technologies, including nickel-based, lithium primary, lithium-ion, and silver-based batteries.

The friendly acquisition by TotalEnergies provided Saft with the expertise and resources necessary for future growth, especially in enhancing business capabilities (TotalEnergies, 2016a). TotalEnergies also ensured that Saft retained a high degree of autonomy, preserving the company's original culture and strategy (BNP Paribas, 2016). Consequently, Saft continued to advance its pre-acquisition "Power 2020" plan, which focuses on growth in transportation, telecommunications, power grids, and emerging markets.

Direct Energies:

Direct Energie (DIREN), founded in 2003, is an international utility company involved in electricity generation, distribution, natural gas, and renewable energy. It specializes primarily in distribution services. Operating in France (mainland and overseas territories) and Belgium, Direct Energie supplies electricity and natural gas to over 2.6 million residential and commercial customers. The company generates electricity through renewable facilities such as onshore wind, solar, hydropower, biogas, and flexible plants like natural gas combined cycles. Before its acquisition, Direct Energie was one of France's major electricity suppliers, recognized for its competitive pricing, high-quality customer service, and expanding energy production capabilities.

The acquisition by TotalEnergies significantly accelerated the development of both companies in the energy supply market, creating strong synergies (Lazard Frères Banque; Société Générale, 2018). Direct Energie faced pressure from large energy corporations and emerging suppliers as the energy market became increasingly competitive. The acquisition by a global energy leader like TotalEnergies alleviated this pressure and provided Direct Energie with access to substantial financial resources and a worldwide network. This arrangement offers Direct Energie enhanced opportunities for long-term growth, particularly in expanding international markets, advancing innovative technologies, and accelerating the energy transition (Lazard Frères Banque; Société Générale, 2018).

Clearway:

Clearway Energy Group is a U.S.-based energy company founded in 2018, following the spin-off of NRG Energy's renewable energy assets. The company is managed by Global Infrastructure Partners (GIP). Clearway is a leading renewable energy firm, owning and operating a substantial portfolio of clean energy assets across the United States. Its main activities include developing, constructing, operating, and managing wind, solar, and energy storage projects (Clearway Energy, 2023).

Like Direct Energie, this acquisition has created strong synergies between the two companies, particularly in resource and technology sharing. With the support of TotalEnergies, Clearway will be able to accelerate the deployment of cost-competitive renewable energy in the U.S. and continue to lead the country's energy transition (TotalEnergies, 2022). Furthermore, Clearway can leverage TotalEnergies' global network and market expertise to expand its operations internationally. The premium acquisition also provided increased benefits to shareholders.

4.4 TE and the Four Acquisitions

SunPower

The major acquisition of SunPower, a leading solar technology company, marked the start of TotalEnergies' entry into the renewable energy sector. After reviewing over 200 potential photovoltaic partners, TE identified that SunPower's shared values, advanced technology, aligned strategic vision, and strong management and employee culture would create substantial positive synergies (TotalEnergies, 2011a). This acquisition provided significant vertical integration, granting TE access to photovoltaic expertise across the entire value chain, from panel manufacturing to project development. This move aligns with TE's strategic goal of becoming a global leader in solar energy (TotalEnergies, 2011b).

Saft

TE's strategy to expand into the electricity and renewable energy sectors began with the 2011 acquisition of SunPower. The subsequent acquisition of Saft advanced this strategy by enabling TE to enter the battery manufacturing industry (TotalEnergies, 2016a). Batteries and storage products are crucial for addressing the intermittent nature of renewable energy supply, making this acquisition pivotal for accelerating TE's renewable energy development. By acquiring Saft, TE positioned itself as a leader in energy storage, integrating storage solutions into its portfolio to complement its renewable energy business, particularly in solar energy, a key growth area (BNP Paribas, 2016). Moreover, batteries are integral to the oil and gas sector, supporting offshore and subsea infrastructure, which aligns well with TE’s existing operations (Be, 2016).

Direct Energies

Total's acquisition of Direct Énergie represented an excellent opportunity to accelerate the growth of both companies in the energy supply market. Through this transaction, TE gained the capacity to rapidly expand its natural gas generation and distribution in France and Belgium. This acquisition was part of the group's strategy to expand the natural gas value chain and develop low-carbon energy. Direct’s power generation activities complemented TE’s operations, enabling further development in the power generation market and increasing customer service (TotalEnergies, 2018a).

In addition, TE aimed to provide more affordable, available, and cleaner energy to as many people as possible, particularly by offering customers mixed energy products with reduced carbon intensity. To achieve this goal, TE developed an integrated strategic model that applies across the entire natural gas-renewable energy-power value chain (Lazard Frères Banque; Société Générale, 2018). This acquisition was part of that strategy, supporting TE’s ambition to become a large, complex energy company.

Clearway Energy

The acquisition of Clearway complemented the portfolio TE had been building since 2021 to expand in the U.S. market, which significantly pushed toward establishing its position in the U.S. renewable energy and energy storage markets (TotalEnergies, 2022). This was TE's largest renewable energy acquisition in the U.S. to date, allowing the company to partner with leading Global Infrastructure Partners (GIP), further accelerating its growth in the U.S. renewable energy sector.

The table below consolidates the information from the four acquisitions mentioned above, identifying and integrating the M&A motivations and potential factors that influenced stock prices during these events. The table corresponds to Table 1 from the literature review.

Potential Factors Affecting M&A Performance				
	SunPower	Saft	Direct Energies	Clearway Energy
Synergy effect	(+)	(-)	(+)	(+)
CSR-related activities	(+)	(+)	(+)	(+)
Original management team/board of directors	(/)		(/)	(-)
Technological diversification	(-)	(/)	(/)	(/)
Technical supplements	(+)	(+)	(+)	(+)
Payment Methods	(-)			(-)
Excessive premium	(-)	(-)	(-)	
Geographic distance	(-)	(+)	(+)	(-)
Risk diversification	(/)	(+)		(+)
Market conditions	(-)			

(+) indicates a positive impact on the share price
(-) indicates a negative impact on the share price
(/) indicates a mixed impact on the share price

Table 5 Potential Factors Affecting M&A Performance

The Table 5 above shows that, due to the complexity of the information, it's not feasible to simply analyze the presence of certain factors or their general impact on stock prices to determine how these four acquisitions specifically influenced TE's stock performance. Combining qualitative reasoning with quantitative evidence strengthens the persuasiveness of the results. Therefore, it becomes necessary to further verify the impact of these four acquisitions on stock prices through real stock price data.

4.5 Hypothesis

This section introduces the hypothesis testing for both short-term and long-term regression models. As described in Chapter 3 (Methodology), the short-term tests focus on examining CAR, while the long-term tests evaluate Jensen's alpha.

SunPower:

The market appeared to respond positively to the establishment of a broad strategic relationship between the two companies. Given that both parties recognized solar energy as becoming an indispensable component of the future global energy system, SunPower and TotalEnergies exhibited potential synergies in various areas, with expectations that SunPower would help accelerateTE's research and development in solar energy field (TotalEnergies, 2011a; Kumar and Sharma, 2019). Additionally, the combination of these two companies was expected to provide consumers with an efficient, competitive, and sustainable energy platform in the future.

However, there were also market concerns about TE's overpayment for the acquisition, especially during a period when the solar industry was facing overcapacity and declining subsidies, leading to significant drops in the stock prices of many solar companies (Reuters, 2011). Furthermore, as solar energy directly competes with fossil fuels, the declining cost of solar panels posed a threat to TE's natural gas business, potentially contributing to a diversification discount due to TE's diversification strategy (Yao, 2014).

From a long-term perspective, TE's decision to retain many of SunPower's original board members after the acquisition raised concerns about potential cultural conflicts between the two companies. At the time, most investors viewed this as a poor decision.

As this was TE's first major investment in the renewable energy sector, market concerns seemed to outweigh the perceived benefits of the transaction. Therefore, the hypotheses for the SunPower acquisition case are as follows:

Short-term Hypothesis:
H0: $CAR \geq 0$

H1: $CAR < 0$

Long-term Hypothesis:
H0: Jensen's Alpha ≥ 0

H1: Jensen's Alpha < 0

Saft:

The market reaction to this acquisition was mixed. On one hand, the combination of Saft and TE allowed for technological complementarity. It enhanced TE's capabilities in battery storage, enabling it to offer more comprehensive solutions to customers (Paribas, 2016). Additionally, since both companies are based in France, the minimal geographic and cultural distance contributed positively to the M&A. However, concerns were raised regarding the high premium paid for Saft and the potential negative effects of product diversification (TotalEnergies, 2016a). Furthermore, the vertical transaction documents indicated that the acquisition was not expected to generate cost or revenue synergies (Paribas, 2016).

From a long-term perspective, the most notable benefit was providing TE with a hedge against the future risk of declining fossil fuel demand (De Clerca and Felix, 2016).

The news surrounding the Saft acquisition did not show a clear market bias, as both positive and negative signals impacted the stock price. Therefore, the hypotheses for the Saft acquisition case are as follows:

Short-term Hypothesis:
H0: CAR=0

H1: CAR≠0

Long-term Hypothesis:
H0: Jensen's Alpha=0

H1: Jensen's Alpha≠0

Direct Energies:

In the short term, this acquisition provided significant support to TE's electricity and natural gas businesses (TotalEnergies, 2018a). It greatly expanded TE's commercial footprint and customer base, allowing the company to grow its operations in France and Belgium. Additionally, it positioned TE as the third-largest energy supplier in the world, which could generate additional revenue (Bellini, 2018; De Clerca and Felix, 2018). Moreover, Direct Energie had strong financial performance and growth potential, which further enhanced the appeal of the acquisition (Bsic, 2018).

From a long-term perspective, the acquisition aligned with TE's strategic goal of expanding the natural gas-to-power value chain and advancing its renewable energy development as part of its low-carbon energy strategy (TotalEnergies, 2018a). The deal received unanimous approval from Direct Energie's board of directors, and since both companies were based in France, concerns about cultural conflicts from strategic and geographic differences were minimized (TotalEnergies, 2018a). Furthermore, TE had already completed two similar large acquisitions in the renewable energy sector in previous years. While the premium paid for the acquisition had some negative impacts, overall, the factors strengthened investor confidence, leading the market to take an optimistic view of the deal.

For the 2018 acquisition, most market information reflected a positive outlook. Therefore, the hypotheses for the Direct Energies acquisition case are as follows:

Short-term Hypothesis:
H0: CAR≤0
H1: CAR>0

Long-term Hypothesis:
H0: Jensen's Alpha$\leq$0
H1: Jensen's Alpha >0

Clearway:

The market did not show a clear preference regarding this acquisition. In the short term, the most obvious positive news was the strong synergies created by the complementary technology and resources between the two companies (Kumar and Sharma, 2019). Additionally, as TE's largest investment in the U.S. renewable energy sector to date (Hunt et al., 2022), this acquisition aligns with TE's long-term emission reduction strategy and significantly strengthens its position in the U.S. market.

However, what makes this acquisition unique is that, unlike others, it involved a mixed payment method, resulting in TE relinquishing partial control of its subsidiary SunPower (TotalEnergies, 2022). Furthermore, since Clearway was not fully acquired, joint management with GIP, Clearway's controlling shareholder, could potentially lead to conflicts in management and strategy (TotalEnergies, 2018). These factors could negatively impact TE's stock performance.

Due to the mixed market reactions, the hypotheses for the Clearway Energy acquisition case are as follows:

Short-term Hypothesis:
H0: CAR=0
H1: CAR$\neq$0

Long-term Hypothesis:
H0: Jensen's Alpha =0
H1: Jensen's Alpha$\neq$0

Chapter 5: Quantitative Results

In this section, we will detail and analyze the results of the quantitative methods outlined in the methodology, specifically focusing on the regression model. The analysis will begin with an overview of the data, including an explanation of the data cleaning process. Following this, this paper will examine the impact of acquisitions on stock prices in both the short and long term.

5.1 Summary Statistics

Figure 6 shows the exploratory analysis of the data used for both short- and long-term studies. Exploratory data analysis is a preliminary examination of a dataset which can help us grasp the structure of the data, identify patterns and trends, and detect any outliers or irregularities (Tukey, 1977).

Summary of descriptive of stocks returns				
Name	SunPower	Saft	Direct Energies	Clearway energy
Mean	0.00024153	6.02342E-05	6.02342E-05	-0.000100341
Median	-0.0001834	0	0.000533012	0.001781532
Maximum	0.03845497	0.059871403	0.037346563	0.080949438
Minimum	-0.0398253	-0.08653846	-0.054120086	-0.076234039
Std.Deviation	0.01532829	0.018665932	0.011717656	0.021660501

Table 6 Summary of descriptive of short-term stock returns

The figure above summarizes the statistical information for daily stock returns used in the short-term model. The first three acquisitions provide data for 208 days, whereas the last acquisition includes 230 days due to a larger gap between the completion and event dates. However, this discrepancy should not affect the short-term model analysis, as the estimation windows used to build the model remain consistent across all acquisitions.

These data summarize TotalEnergies' stock returns across the four acquisitions. The overall returns appear relatively modest, likely due to the fact that the original data reflect stock returns rather than stock prices. The returns for the SunPower and Direct Energies acquisitions appear relatively stable, with these two showing the smallest standard deviations. In contrast, the other two acquisitions demonstrate weaker overall performance. Saft records the lowest minimum return (min = -0.0865), while Clearway exhibits the largest range of return fluctuations, with a standard deviation of 0.02166.

Summary of descriptive of stocks returns				
Name	SunPower	Saft	Direct Energies	Clearway Energy
Mean	0.00522127	0.00642614	-0.006688613	0.027285044
Median	0.00598809	0.00083859	-0.005457986	0.021771841
Maximum	0.19215866	0.0694503	0.389383432	0.177343077
Minimum	-0.1066482	-0.0518164	-0.136763973	-0.119349304
Std. Deviatio	0.06878324	0.02772673	0.091560493	0.071030933

Table 7 Summary of descriptive of long-term stock returns

Similar to the short-term data, the figure above includes the monthly stock price data for the post-event period. The comparability between the datasets is relatively weak due to the differences in the number of months covered in the long-term tests: two groups include 37 months, while one group spans 15 months, and another covers 13 months.

5.2 Regression

5.2.1 Elements

In the analysis of the results, this study focuses on the following elements as a preliminary confirmation of the feasibility and validity of the regression model, which will also help in selecting a more effective model:

- Multiple R:

This is the correlation coefficient between the two variables of interest. It represents the degree of linear relationship between the variables, assuming a linear connection. A value closer to 1 indicates a stronger correlation between the independent and dependent variables.

- R Square:

This metric indicates how much of the variance in the dependent variable (Y) is explained by the independent variable. A value closer to 0 suggests that other factors may influence the dependent variable.

- Standard Error (SE):

This shows the average distance the observed values fall from the regression line, indicating the model's precision. A smaller SE reflects less error and a more precise model.

- Significant F:

This is the p-value for the regression model, representing the probability that the model is incorrect. We aim for the F-significance to be as low as possible, typically requiring a significance level of 95%.

• P-values (following each coefficient):
The p-value indicates the probability that the estimated coefficient is incorrect or unreliable. It reflects the likelihood that the coefficient of the independent variable in the regression model is zero. A smaller p-value is preferred, with a default significance level of 5% in this study.

5.2.2 Data Selection

Selection of Data Representing Market Returns:
There are two data sets representing the S&P 500 index on the website, value-weight CRSP and equal-weight CRSP, both popular choices for market index selection (MacKinlay, 1997). To make a decision between the two options, this study conducted regression analyses using both sets of market returns data and evaluated the results based on the explanations provided in the previous chapter. Below are the comparison results for the short-term model using value-weight & equal-weight data:

market returns								
	SunPower		Saft		Direct Energies		Clearway Energy	
	Value-weight	Equal-weight	Value-weight	Equal-weight	Value-weight	Equal-weight	Value-weight	Equal-weight
Multiple R	0.76925012	0.703618233	0.701141126	0.727786318	0.604908391	0.600763344	0.288587364	0.3418812
R Square	0.591745748	0.495078618	0.491598878	0.529672924	0.365914162	0.360916595	0.083282666	0.116882755
Standard Error	0.009094011	0.010113512	0.015832598	0.015228213	0.009840931	0.009879635	0.021062366	0.020672767
Significant F	7.78146E-17	3.36911E-13	4.41877E-13	2.04833E-14	2.80304E-09	3.83176E-09	0.009429823	0.001910201

Table 8 Market Returns

As seen in Table 8, while value-weighted data has a distinct advantage in analyzing the SunPower case, regression models built using equal-weighted data generally exhibit higher Multiple R and R-square values and a smaller Standard Error. This indicates that the equal-weighted model likely performs better, with the independent variable explaining a higher percentage of the variance in the dependent variable and exhibiting greater precision. Thus, for the short-term event tests, the regression model results utilize equal-weighted data as the market index.

Data Cleaning:
Cleaning the data can improve the quality of the results and reduce the interference of outliers. As such, I attempted a simple data cleaning process. Figure 9 shows the results. After removing the top 5 and bottom 5 values from the series, the regression results for all four acquisitions using the cleaned dataset showed lower Multiple R, R-squared, and Standard Error (SE) than the original data. However, the magnitude of differences between using 80 observations and the cleaned data varied, with some cases showing a significant difference while others showed only a small gap. Therefore, the impact of using 80 observations on the

effectiveness of the regression model seems minimal compared to using the cleaned data, leading the study to choose 80 observations for model generation.

	observations							
	SunPower		Saft		Direct Energies		Clearway Energy	
observations	70	80	70	80	70	80	70	80
Multiple R	0.419738406	0.703618233	0.609486374	0.727786318	0.496680969	0.600763344	0.33101871	0.3418812
R Square	0.176180329	0.495078618	0.371473641	0.529672924	0.246691985	0.360916595	0.10957339	0.11688275
Standard Error	0.008866094	0.010113512	0.013084712	0.015228213	0.006518345	0.009879635	0.09647888	0.02067277

Table 9 The Number of Observations

5.2.3 Results

5.2.3.1 Short-term

Regression Results Summary:
The table below summarizes the regression results, while the original regression summary output is provided in the appendices.

Market Model					
Firm	**Observation**	$\hat{\alpha}$ (p-value)	$\hat{\beta}$ (p-value)	R^2	**Adjusted** R^2
SunPower	80	0.0009 0.4485	1.2671 3.36911E-13	0.4951	0.4886
Saft	80	-0.0004 0.8015	1.2848 2.04833E-14	0.5297	0.5236
Direct Energies	80	0.0001 0.903289882	0.8084 3.83176E-09	0.3609	0.3527
Clearway Energy	80	0.0002 0.9197	0.6023 0.0019	0.1169	0.1056

Table 10 Estimated Coefficients for Short-term

The most notable difference is the p-values of alpha and beta. The p-value indicates the significance of the independent variable. In our results, the p-values for alpha in all four acquisitions are insignificant at the 5% level, whereas the p-values for beta are highly significant. This may be because beta, the only variable in the market model, should explain a significant portion of Total Energies' stock returns. The results also suggest that the coefficient a has a high unreliability rate and should be interpreted with caution.

The table also includes R^2 and adjusted R^2. The latter adjusts the R^2 value by accounting for the number of independent variables, which is useful when multiple variables are present in the regression. Multiple variables can inflate the R^2, leading to bias. The adjusted R^2 offers a more precise measure. After adjustment, the explanatory power of each independent variable on the dependent variable decreases. The variable related to the Saft acquisition has the highest explanatory power for Total Energies' stock price at 52.4%, whereas the Clearway acquisition exhibits the lowest explanatory power at just 10.6%. This suggests that other factors may influence stock price fluctuations beyond what is captured by this variable.

Analysis of Test Results

Market Model			
Firm	**Event Window**	**CAR**	**T-statistic**
SunPower	[−1, +1]	0.0282***	2.7929
	[−10, +10]	-0.0971***	-9.6049
Saft	[−1, +1]	-0.0073	-0.4823
	[−10, +10]	0.0036	0.2355
Direct Energies	[−1, +1]	0.0277***	2.7996
	[−10, +10]	0.0567***	5.7370
Clearway Energy	[−1, +1]	0.0192***	0.9271
	[−10, +10]	0.1303***	6.3019

Table 11 Results for the short-term

From the significance of the results, only the acquisitions of SunPower in 2011 and Direct Energies in 2018 show significance across all three significance levels and both event windows in the short term. This indicates that the results are highly robust. For both acquisitions, the null hypothesis (H_0), which assumes that the cumulative abnormal returns (CAR) of Total Energies (TE) are greater than or equal to zero for SunPower and less than or equal to zero for Direct Energies, is rejected at the 90%, 95%, and 99% levels. This confirms that the acquisitions of SunPower and Direct Energies resulted in non-zero abnormal returns for TE.

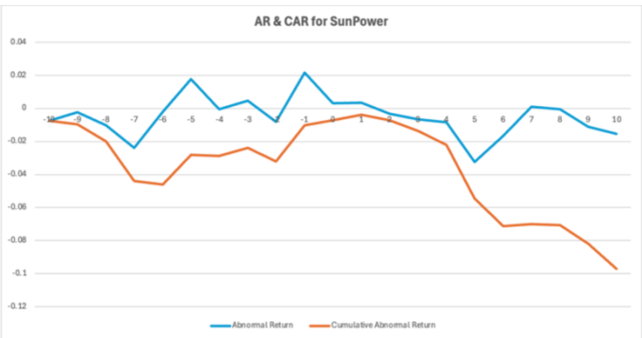
Specifically, for SunPower, the CAR is -0.0971 in the [-10, +10] window and 0.0282 in the [-1, +1] window. The negative CAR confirms the hypothesis, suggesting that TE's $1 billion credit support for SunPower, coupled with the high acquisition premium, may have been viewed by investors as a potential strain on TE's cash flow. This exposure highlights the disadvantages of cash payments, such as pressure on the company's liquidity (Gomes et al., 2013). However, the market's initial positive expectations also had an impact, as reflected by the positive CAR in the [-1, +1] window. This may be attributed to anticipated synergy effects from the acquisition. However, the overall market reaction appears to be more negative than positive, with positive abnormal returns only observed in the shortest event window.

For Direct Energies, the CAR is positive in both event windows, at 0.0567 in the [-10, +10] period and 0.0277 in the [-1, +1] period. These results align with the hypothesis and show even greater abnormal fluctuations in the longer event window. This acquisition represents the realization of synergies, corresponding to economies of scale and enhanced market power (Kumar and Sharma, 2019). It contributed to TotalEnergies' expansion across production chains, geographies, and customer bases, enabling the company to further diversify its products and mitigate the increasing risks associated with the fossil fuel sector. Although the acquisition premium could have had negative effects, both theoretical and empirical results indicate that the positive aspects outweighed the negative, as reflected in the positive market response across both event windows.

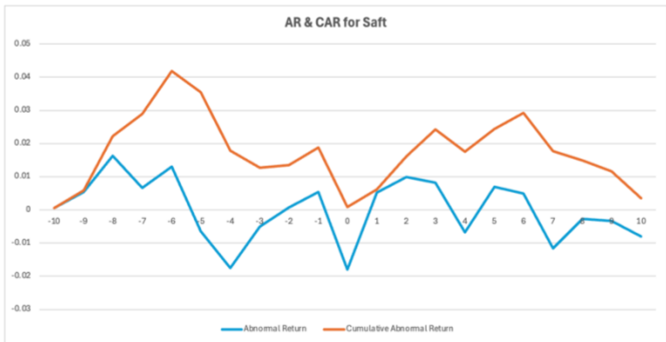
For the remaining two acquisitions, Clearway Energy showed significance only in the longer event window, [-10, +10], where the null hypothesis of CAR being equal to zero is rejected, indicating abnormal price fluctuations within this period. The CAR was 0.1303 between [-10, +10]. However, the results were insignificant in the very short event window [-1, +1], failing to demonstrate abnormal price fluctuations. This suggests that the model captured price expectations effectively, supporting the semi-strong form of the Efficient Market Hypothesis. However, biases from the data or model limitations cannot be entirely ruled out. Although many studies suggest that the choice of model in short-term tests does not significantly impact the results' explanatory power, it remains a possible factor to consider (Fama, 1998).

Regarding Saft, unfortunately, the results are not significant in any of the event windows, indicating no abnormal price fluctuations due to the acquisition. This suggests that the market model effectively explains the stock returns. The reasons for this may be similar to those for Clearway, such as the validity of the Efficient Market Hypothesis or data-related biases.

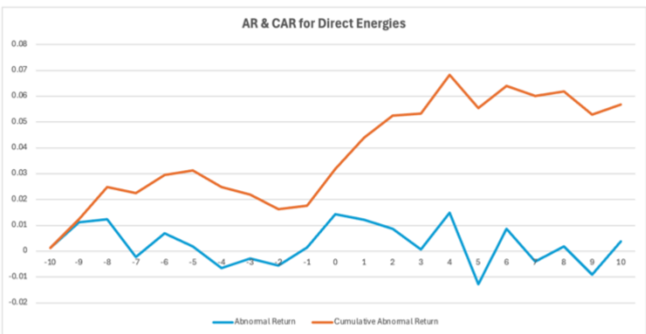
AR &CAR



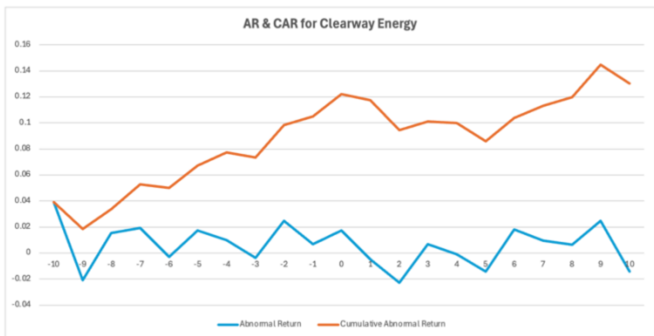
SunPower



Saft



Direct Energies



Clearway Energy

Figure 10 AR & CAR for four acquisitions

Additionally, we can derive some insights from the line charts of AR (Abnormal Returns) and CAR (Cumulative Abnormal Returns). The four AR and CAR charts display daily abnormal fluctuations during the test window and the cumulative values over the event window. Notably, SunPower's CAR is the only negative value among the four acquisitions, indicating that the market did not view this acquisition favorably at the time, with significant negative information surrounding it.

This is likely because the acquisition was a diversification move that did not align well with TE's core business. Additionally, the solar energy sector was experiencing overcapacity at that time, leading the market to perceive the acquisition as a potentially reckless decision, resulting in an unfavorable outlook. In contrast, the CAR for Saft shows fluctuating trends, which sharply contrasts with the clear upward trend observed in the CAR for the subsequent two acquisitions. This fluctuation may be explained by the increasing acceptance and even positive reception of TE's acquisitions in the renewable energy sector over time, particularly as global environmental protection awareness grew. Consequently, there was a growing positive response from the market.

5.2.3.2 Long-term

Regression Results Summary:

CAMP					
Firm	**Observation**	$\hat{\alpha}$ (p-value)	$\hat{\beta}_{mkt}$ (p-value)	R^2	Adjusted R^2
SunPower	37	-0.0119 0.1585	1.3571 2.6323E-07	0.5358	0.5225
Saft	13	0.0061 0.5596	-0.0037 0.9941	5.2214E-06	-0.0909
Direct Energies	37	-0.0233 0.0675	1.0293 3.2206E-05	0.3938	0.3765
Clearway Energy	15	0.0163 0.4190	0.4129 0.3077	0.0798	0.0090

FF3F							
Firm	**Observation**	$\hat{\alpha}$ (p-value)	$\hat{\beta}_{mkt}$ (p-value)	$\hat{\beta}_{SMB}$ (p-value)	$\hat{\beta}_{HML}$ (p-value)	R^2	Adjusted R^2
SunPower	37	-0.0121 0.1857	1.3470 2.8577E-05	-0.0137 0.9788	0.1064 0.8464	0.5364	0.4942
Saft	13	0.0029 0.8012	0.2346 0.7028	-0.3631 0.4055	0.0583 0.8361	0.0794	-0.2275
Direct Energies	37	-0.0164 0.1945	0.8036 0.0018	0.6287 0.1748	0.4093 0.1545	0.4683	0.4199
Clearway Energy	15	0.0102 0.3452	0.5271 0.0355	-1.1586 0.0041	1.2772 0.0002	0.7930	0.7366

Table 12 Estimated coefficients for long-term

We can see that, apart from the Direct Energies acquisition, which is significant at the 5% level under the CAPM model, all other results for α are insignificant. Comparing the beta values from the two models, it is apparent that the two additional variables in the FF3F model are affected by the number of observations. For the Saft acquisition, which has the fewest observations, both newly added variables are insignificant. However, when the number of observations increases slightly, as seen in the Clearway acquisition, both variables become significant, and the reliability of ($R_m - R_f$) under CAPM is greatly improved. This may suggest that the three variables in the FF3F model have stronger explanatory power for stock price fluctuations in this case. However, it is also possible that this is merely a result of the change in the number of observations.

The changes in R^2 and adjusted R^2 in the two long-term models are similar to the short-term results, with explanatory power decreasing after adjustments. However, it is worth noting that both the Saft and Clearway acquisitions, with fewer observations, experienced a significant decline in explanatory power in both models. This suggests that a small number of observations could undermine the reliability of long-term test results and hinder the generation of valid conclusions.

CAMP			
Firm	**Jensen's alpha**	**T-statistic**	**df**
SunPower	-0.0119*	-1.4408	35
Saft	0.0061	0.6017	11
Direct Energies	-0.0233**	-1.8867	35
Clearway Energy	0.0163	0.8347	13

FF3F			
Firm	**Jensen's alpha**	**T-statistic**	**df**
SunPower	-0.0121*	-1.3517	33
Saft	0.0029	0.2593	9
Direct Energies	-0.0164*	-1.3243	33
Clearway Energy	0.0102	0.9864	11

Table 13 Results for the long-term

Analysis of Test Results

According to the results, only the SunPower and Direct Energies acquisitions show significance under the CAPM model. Specifically, at the 10% significance level, the null hypothesis for SunPower is rejected, indicating that Jensen's alpha is smaller than 0, meaning the acquisition had a negative impact on TE's long-term stock price, with Jensen's alpha of -0.0119. The Direct Energies result is significant at both the 5% and 10% levels, with a Jensen's alpha of -0.0233. It indicates that, unlike the short-term effects, the acquisition had a negative impact on the stock price in the long term, resulting in performance below expectations. The other two events are not significant. In the FF3F model, which accounts for more risk factors, the results are similar to CAPM, except that the significant results are now limited to the 90% level, with SunPower and Direct Energies showing significance, with Jensen's alphas of -0.0121 and -0.0164, respectively.

The large number of insignificant long-term results reinforces the notion that the event study method is less effective in long-term tests, likely because no model can perfectly account for all potential risks. According to Fama and French (2004), future studies could improve the effectiveness of the event study method in long-term analyses by selecting models that account for a wider range of risks, such as the FF5F model, which includes profitability and investment factors.

Another possible explanation for the large number of insignificant results could be related to the characteristics of the data. Coutts, Mills, and Roberts (1994) pointed out, in event studies, which predominantly use time series data, the occurrence of autocorrelation and skewness is quite common. The findings of McDonald and Lee (1988) align with this observation, as they documented extensive evidence of heteroscedasticity and non-linearity, much of which was attributed to excessive skewness and kurtosis in the residuals. Additionally, regression analysis is based on fundamental assumptions. In this study, while using event studies, the statistical assumptions of the models were asserted without conducting a rigorous econometric investigation and testing of the data. Therefore, issues such as autocorrelation, non-normal distribution, non-linearity, and heteroscedasticity in the data may have led to the prevalence of insignificant results (Coutts, Mills, and Roberts, 1994).

Furthermore, MacKinlay (1997) noted that a small sample size can lead to a loss of model effectiveness, thereby affecting significance. He suggested that increasing the sample size, controlling for outliers, and extending the event window could enhance significance. The results of the long-term tests in this study seem to support this point. Under the same models, the acquisitions of SunPower and Direct Energies had longer sample sizes and event windows compared to the other two acquisitions. The results thus provide support for MacKinlay's (1997) research.

Chapter 6 Discussion & Limitation

This chapter will discuss the findings from both the qualitative and quantitative analyses and explain how these results address the main research questions: 1) the driving forces behind TE's four acquisitions and their strategic significance; 2) the differences in the impact of these four M&As on TE's value in the short and long term; 3) the reasons for these differences and the implications for the energy sector's transition.

First, this study found that while the motivations behind TE's four acquisitions varied, market forces might be a significant underlying driver. Market forces, including government policies, public awareness, and economic conditions, have played a key role in driving the energy sector's transition. The study highlights two main impacts on TE: sticking with traditional energy sources could harm the company's corporate value due to market pressure, while transitioning to cleaner energy might boost stock prices, reflecting positive market preferences. Therefore, TE, along with other energy companies, must weigh the trade-offs between short-term costs of transitioning and the long-term benefits of aligning with market trends.

In TE's specific case, four acquisitions appear to have had a positive impact on stock returns. According to the short-term event study, these acquisitions, spanning from 2011 to 2023, show a trend of growing market support for TE's renewable energy efforts. Over time, the abnormal fluctuations and CAR caused by these events shifted from negative to positive. The growing market force (positive power) seems to be a plausible explanation for this change.

Looking at the broader picture, TE has strategically acquired companies across different technologies to advance its energy transition and strengthen its position in the renewable energy sector. In 2011, TE acquired SunPower to enter the solar energy sector and fully launch its energy transition strategy. In 2016, it acquired Saft to strengthen its storage technology, laying a solid foundation for the future growth of the renewable energy sector. In 2018, TE acquired Direct Energies to integrate and expand its power and natural gas businesses, particularly downstream. Finally, in 2022, it acquired Clearway to enhance its competitive edge in the U.S. integrated energy market. TE's progression from acquiring individual renewable energy technologies to expanding across all areas of the sector shows its dedication to becoming a fully integrated energy company. This commitment is clear in its recent acquisitions of businesses within the renewable energy field.

The evidence from the findings exemplifies the importance of such a strategic vision in achieving a successful transition. Therefore, for companies aspiring to undergo an energy transition, having a long-term strategic plan appears crucial for ensuring consistency in their objectives.

The short-term impact of TE's acquisitions reveals significant positive abnormal returns in general, offering valuable insights into market reactions. These results align with Wårell (2007), but challenge the Efficient Market Hypothesis (EMH), as the market failed to immediately adjust the stock price after the M&A announcements. This delayed positive response suggests that strategic moves toward energy transition can lead to favorable market outcomes, encouraging other companies to consider similar paths.

However, in the long term, the two significant results indicate a negative impact on stock prices. Although the study cannot confirm the exact cause, long-term tests are known to be heavily influenced by both the model and the data used (Coutts, Mills, and Roberts, 1994; Fama, 1998). While the results may seem unfavorable for promoting energy transition, the possibility of statistical errors cannot be ruled out. Moreover, as mentioned in the results analysis, the frequent insignificance in long-term test outcomes is likely influenced by these two factors as well.

The study also highlights that specific factors in energy transition-related acquisitions play a critical role and require close attention. The first key factor is synergy. According to our empirical results, apart from the Saft acquisition, the other acquisitions exhibited positive impacts on stock prices due to synergy effects. Interestingly, in the context of energy transition, companies seem to focus more on the value generated by sharing technology and resources with renewable energy companies after the acquisition rather than on enhancing profitability by increasing market power. This finding contradicts Yoo, Lee, and Heo (2013), who concluded that financial value augmentation within synergy provided the most significant positive impact. Discussions about synergy also appear in other studies on renewable energy sector acquisitions (Wårell, 2007; Eisenbach et al., 2011). Therefore, although some evidence contradicts this study's findings, it is undeniable that synergy receives considerable attention and likely plays a critical role in energy transition-related acquisitions.

Yoo, Lee, and Heo's (2013) study also highlights the positive effect of risk diversification on stock prices, which is reflected in TE's decision to pursue four major acquisitions, each focused on a different technology. TE's diversification strategy seems aimed at hedging risks tied to the uncertainty of renewable energy technologies, which evolve rapidly. This uncertainty can make companies cautious when selecting the most cost-effective pathway for cross-sector mergers. TE's approach to diversifying its acquisitions appears to be a viable strategy when considering its positive impact on stock prices.

An interesting observation is the common occurrence of premium acquisitions in the renewable energy sector. Traditionally, premium acquisitions are perceived to have a negative impact on the acquiring company's value. However, in the renewable energy sector, this negative effect seems less pronounced. The frequent occurrence of premium acquisitions suggesting that in the context of energy transition, paying a premium may be more acceptable than in other industries.

Overall, the results of M&A activities aimed at energy transition appear consistent with the predictions of M&A motive theory and the critical factors outlined in the analytical framework. Consequently, it is essential to consider how these aspects can influence M&A performance when making strategic decisions. It is important to note that while this study cannot precisely quantify how these factors influence the acquirer's stock value, the findings still provide valuable insights for companies developing long-term energy transition strategies and forecasting acquisition outcomes.

Limitation & Suggestion

Since this study used secondary data, the results are at risk of being influenced by subjectivity. Moreover, the inability to access certain internal information meant that the study could only use simplified data, which poses a significant limitation when analyzing the complexities of the energy market. Additionally, as Wårell (2007) pointed out, while a single case allows for a more in-depth analysis, the results of a clinical study lack broad representativeness and are susceptible to sample bias due to the absence of a comparative framework. Therefore, future research could consider expanding the scope by increasing the number of cases, extending the time frame, or including more companies, thereby enhancing the credibility of the findings.

Furthermore, the study did not conduct econometric statistical tests on the data, which could have compromised the reliability of the results and introduced bias. Therefore, when using the event study method, it is recommended to perform such test on the raw data to minimize potential biases.

In addition to focusing on Total Energies, this study dealt exclusively with heterogeneous transactions since TE itself is part of the traditional energy sector. Future research could consider examining homogeneous transactions (Palmquist and Bask, 2016). For example, selecting a company within the renewable energy sector and investigating the impact of its acquisitions within this domain could provide further insights.

Chapter 7 Conclusion

This study adopted a mixed-method approach to explore in depth the impact of TE's four major renewable energy-related acquisitions on its corporate value. The qualitative analysis found that all four acquisitions were in line with TE's strategic layout for energy transition and helped TE's transformation from different perspectives. However, due to the significant differences in motives and transaction characteristics among these acquisitions, qualitative analysis alone was insufficient to fully understand the impact of each event on the company's value. The study employed an event study methodology to analyze abnormal returns before and after the acquisition announcement, assessing its impact on corporate value in both the short and long term. The results showed that, in the short term, most acquisitions positively impacted TE's company value. The long-term results revealed a large number of insignificant outcomes, indicating a lack of abnormal fluctuations and suggesting that the acquisitions did not contribute to value growth for TE. This is consistent with existing research, which highlights that long-term event studies often yield insignificant results due to model and data limitations. The integrated findings of this study suggest that market forces may have played a crucial role in driving TE to pursue these four acquisitions and commit to its energy transition efforts.

The findings of this study provide valuable insights for companies pursuing energy transition. First, it is essential to establish a clear, long-term strategic plan for transition efforts. When using M&A as a tool for this purpose, a key focus should be on ensuring strong synergy between the technologies and resources of both companies involved. Also, given that the industry is still in a developmental phase, companies may consider diversifying their technological pathways in renewable energy to hedge against the risks associated with a single technology. Therefore, the transition does not necessarily have to focus on one technology, but it should not be too scattered either and needs to be guided by clear objectives. Interestingly, premium acquisitions may be the norm in the renewable energy sector, so the negative impact of such acquisitions on company value may be relatively smaller compared to other sectors.

The study builds on and improves Wårell's (2007) research by examining a larger number of acquisition events. It adopts a clinical study approach, focusing on a single company and tracking its transition-related acquisitions over more than ten years. While this method allows for a deeper exploration of the occurrences, motives, and impacts of the acquisitions, it lacks the ability to produce universally applicable results. Future research could expand the scope by analyzing a broader range of acquisition events or comparing the M&A performance of two traditional energy companies undergoing transition. Such comparisons would help identify differences in the impact of various M&A strategies on company value in both the short and long term, and reveal the factors driving these outcomes.

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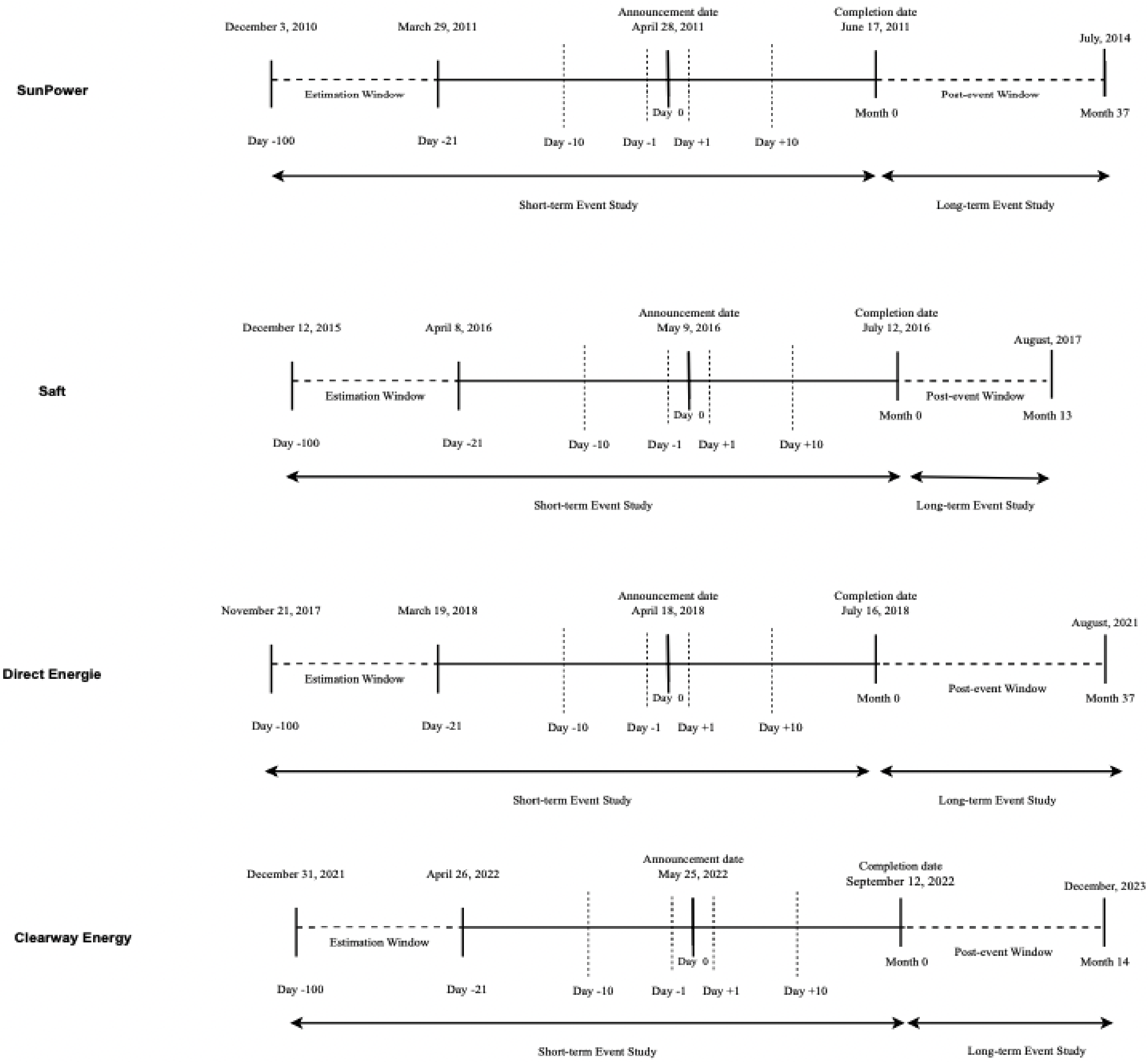
Appendices

Timeline of the four acquisitions



SWOT

SWOT		
Factors		**Results**
Strengths	Vertically integrated business model	TE has extensive operations across the entire energy value chain, from the exploration, production and refining of oil and gas to the development of renewable energy sources such as solar and wind power, enhancing its competitiveness in the energy transition
	Expertise in renewable energy	TE has over 40 years of experience in the solar energy sector and leads the global solar market through its subsidiary SunPower
	Global business presence	TE operates in 130 countries, and its global presence helps it to develop renewable energy in different regions using local resources
	Government-backed policy framework	National policies in France, such as the Energy Transition for Green Growth Law of 2015, provide strong support for TE's energy transition and encourage companies to accelerate the reduction of fossil fuel use
Weaknesses	Historical dependence on traditional energy sources	Despite progress in the energy transition, TE's current heavy reliance on oil and gas may limit its ability to achieve a rapid and comprehensive transition in the short term
	Complex regulatory environment	France's complex bureaucratic culture and multi-level decision-making processes may slow down policy implementation and the advancement of energy transition projects

Opportunities	Decreasing costs of renewable energy technologies	As the cost of technologies such as wind and solar power continues to fall, TE has the opportunity to further consolidate its leadership in the clean energy sector through large-scale investment
	French energy independence policy	The French government has set a target of 40% renewable energy by 2030, providing TE with huge market opportunities
	Global energy transition trends	The global demand for low-carbon energy and the promotion of national policies have enabled TE to expand its renewable energy business by participating in international energy transformation projects

Threats	Social and environmental pressures	TE is facing pressure from social and climate activists
	Increased global competition	TE is facing increasing competition in the global market as more and more international energy companies are investing in clean energy
	Policy uncertainty	France's complicated policy implementation and competing interests may delay progress

PESTEL

PESTEL		
Factors		**Details**
Political	Government support and policy promotion	Government regulations and subsidies are important drivers of the energy transition; policies have led to a sharp learning and absorption of emerging renewable energy sources. Policies to reduce carbon emissions are booming worldwide
	Geopolitics	Europe chooses to use renewable energy in order to break away from its dependence on gas from
Economical	Global economic growth slowdown	A macroeconomic environment of high interest rates and rising raw material costs presents challenges for companies' capital allocation and clean energy investments
	Decrease in costs	The rapid decline in the cost of renewable energy technologies could make companies economically competitive
	Industrial transformation	The slowdown in the growth of oil demand has forced many companies to enter a period of transition, reassessing and planning their business models and strategies in response to the changing energy landscape

Social	Pressure from public and shareholder	Consumers are increasingly concerned about climate change and cause society has an increasing demand for sustainable energy Shareholders are also demanding disclosure and action on climate-related financial risks
Technological	Technological progress	Technological progress and innovation in the renewable energy sector are making it increasingly accessible and cost-effective Technologies associated with extending the use of fossil fuels are unable to meet the challenge of creating affordable energy systems to combat climate change
Environmental	Climate change	Public awareness and concern about the environmental impact of fossil fuels is increasing Increasing the risk of extreme weather
Legal	Environmental regulations and carbon trading	Companies face a stricter legal environment due to increasingly stringent carbon emission regulations and carbon trading markets in various countries

Regression

Short-term Summary Output

-SunPower

Equal-weight

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.7036182
R Square	0.4950786
Adjusted R Squ	0.4886053
Standard Error	0.0101135
Observations	80

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0078226	0.0078226	76.479495	3.369E-13
Residual	78	0.0079781	0.0001023		
Total	79	0.0158006			

	Coefficients	*Standard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.0008711	0.0011434	0.761814	0.4484684	-0.001405	0.0031474	-0.001405	0.0031474
X Variable 1	1.2671469	0.1448954	8.7452556	3.369E-13	0.9786824	1.5556114	0.9786824	1.5556114

-Saft

Equal-weight

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.7277863
R Square	0.5296729
Adjusted R Squ	0.5236431
Standard Error	0.0152282
Observations	80

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0203704	0.0203704	87.842036	2.048E-14
Residual	78	0.0180881	0.0002319		
Total	79	0.0384585			

	Coefficients	*Standard Erro*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.00043	0.001704	-0.252253	0.8015093	-0.003822	0.0029625	-0.003822	0.0029625
X Variable 1	1.2848373	0.1370872	9.3724082	2.048E-14	1.0119176	1.557757	1.0119176	1.557757

-Direct Energies

Equal-weight

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.6007633
R Square	0.3609166
Adjusted R Squ.	0.3527232
Standard Error	0.0098796
Observations	80

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0042996	0.0042996	44.049797	3.832E-09
Residual	78	0.0076134	9.761E-05		
Total	79	0.0119129			

	Coefficients	*Standard Erro.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.0001349	0.0011068	0.1219023	0.9032899	-0.002069	0.0023384	-0.002069	0.0023384
X Variable 1	0.8083842	0.1217996	6.6370021	3.832E-09	0.5658998	1.0508686	0.5658998	1.0508686

-Clearway

Equal-weight

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.3418812
R Square	0.1168828
Adjusted R Squ.	0.1055607
Standard Error	0.0206728
Observations	80

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.0044119	0.0044119	10.323493	0.0019102
Residual	78	0.0333343	0.0004274		
Total	79	0.0377462			

	Coefficients	*Standard Erro.*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.0002345	0.0023189	0.1011306	0.9197063	-0.004382	0.004851	-0.004382	0.004851
X Variable 1	0.6023154	0.1874609	3.2130193	0.0019102	0.2291095	0.9755213	0.2291095	0.9755213

Long-term Summary Output

CAMP

-SunPower

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.73196939
R Square	0.53577918
Adjusted R Sq	0.52251573
Standard Erro	0.04753235
Observations	37

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.09126577	0.091265766	40.395154	2.6323E-07
Residual	35	0.07907636	0.002259325		
Total	36	0.17034213			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-0.0119082	0.00826502	-1.440793699	0.15852991	-0.0286871	0.00487069	-0.0286871	0.00487069
Rm-Rf	1.35710518	0.21352507	6.355718209	2.6323E-07	0.92362624	1.79058412	0.92362624	1.79058412

-Saft

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.00228504
R Square	5.2214E-06
Adjusted R Sq	-0.0909034
Standard Erro	0.02893401
Observations	13

ANOVA

	df	SS	MS	F	Significance F
Regression	1	4.8084E-08	4.8084E-08	5.7436E-05	0.99408887
Residual	11	0.00920894	0.000837177		
Total	12	0.00920899			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.00605682	0.01006657	0.6016763	0.55958588	-0.0160996	0.02821318	-0.0160996	0.02821318
Rm-Rf	-0.0037331	0.49257592	-0.007578646	0.99408887	-1.0878854	1.08041924	-1.0878854	1.08041924

-Direct Energies

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.62756165
R Square	0.39383362
Adjusted R Sq	0.37651458
Standard Erro	0.07242529
Observations	37

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.1192805	0.119280498	22.7399227	3.2206E-05
Residual	35	0.18358978	0.005245422		
Total	36	0.30287028			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.0233047	0.01235208	-1.886700401	0.06751838	-0.0483807	0.00177138	-0.0483807	0.00177138
Rm-Rf	1.02927134	0.21584172	4.768639504	3.2206E-05	0.59108936	1.46745332	0.59108936	1.46745332

-Clearway

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.28245924
R Square	0.07978322
Adjusted R Sq	0.00899732
Standard Erro	0.07097812
Observations	15

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.00567824	0.00567824	1.12710604	0.30771899
Residual	13	0.06549261	0.005037893		
Total	14	0.07117085			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.01630765	0.01953804	0.834661737	0.41898277	-0.0259017	0.05851702	-0.0259017	0.05851702
Rm-Rf	0.41294351	0.38896297	1.061652507	0.30771899	-0.4273599	1.25324692	-0.4273599	1.25324692

FF3F

-SunPower

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.73238915
R Square	0.53639387
Adjusted R Sq	0.49424786
Standard Err	0.04891912
Observations	37

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.09137047	0.03045682	12.7270374	1.09E-05
Residual	33	0.07897166	0.00239308		
Total	36	0.17034213			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.0120958	0.0089483	-1.3517368	0.18565278	-0.0303012	0.00610971	-0.0303012	0.00610971
Rm-Rf	1.34698806	0.27765909	4.85122976	2.8577E-05	0.78208638	1.91188973	0.78208638	1.91188973
SMB	-0.0137433	0.51341862	-0.0267681	0.97880588	-1.0583013	1.03081477	-1.0583013	1.03081477
HML	0.10642638	0.54522484	0.19519723	0.84643543	-1.0028419	1.21569465	-1.0028419	1.21569465

-Saft

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.28179384
R Square	0.07940777
Adjusted R Sq	-0.2274563
Standard Err	0.03069152
Observations	13

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.00073127	0.00024376	0.2587718	0.85331013
Residual	9	0.00847773	0.00094197		
Total	12	0.00920899			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.00292111	0.01126584	0.25928915	0.80124555	-0.022564	0.02840621	-0.022564	0.02840621
Rm-Rf	0.23457572	0.59554619	0.39388333	0.70283649	-1.1126434	1.58179479	-1.1126434	1.58179479
SMB	-0.3630741	0.41603444	-0.8727021	0.40550653	-1.3042094	0.57806115	-1.3042094	0.57806115
HML	0.05834711	0.27400772	0.21293965	0.83611912	-0.5615014	0.67819564	-0.5615014	0.67819564

-Direct Energies

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.68431198
R Square	0.46828289
Adjusted R Sq	0.41994497
Standard Err	0.06985728
Observations	37

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.14182897	0.04727632	9.68769221	9.8477E-05
Residual	33	0.16104131	0.00488004		
Total	36	0.30287028			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.016423	0.01240162	-1.3242627	0.19451507	-0.0416543	0.00880828	-0.0416543	0.00880828
Rm-Rf	0.80364121	0.23672195	3.39487404	0.00180285	0.32202678	1.28525565	0.32202678	1.28525565
SMB	0.628684	0.4533826	1.38665224	0.17484471	-0.2937298	1.55109783	-0.2937298	1.55109783
HML	0.40931718	0.28087714	1.45728194	0.15448951	-0.1621317	0.98076602	-0.1621317	0.98076602

-Clearway Energy

SUMMARY OUTPUT

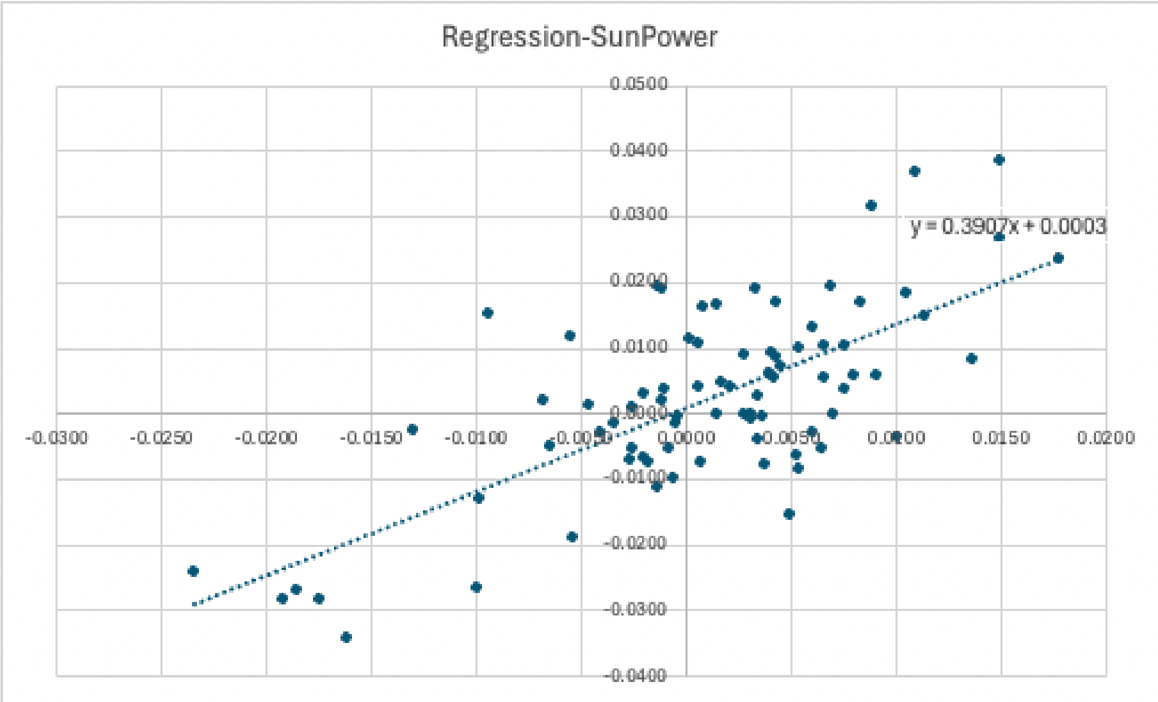
Regression Statistics	
Multiple R	0.8905313
R Square	0.793046
Adjusted R Sq	0.73660399
Standard Err	0.03659246
Observations	15

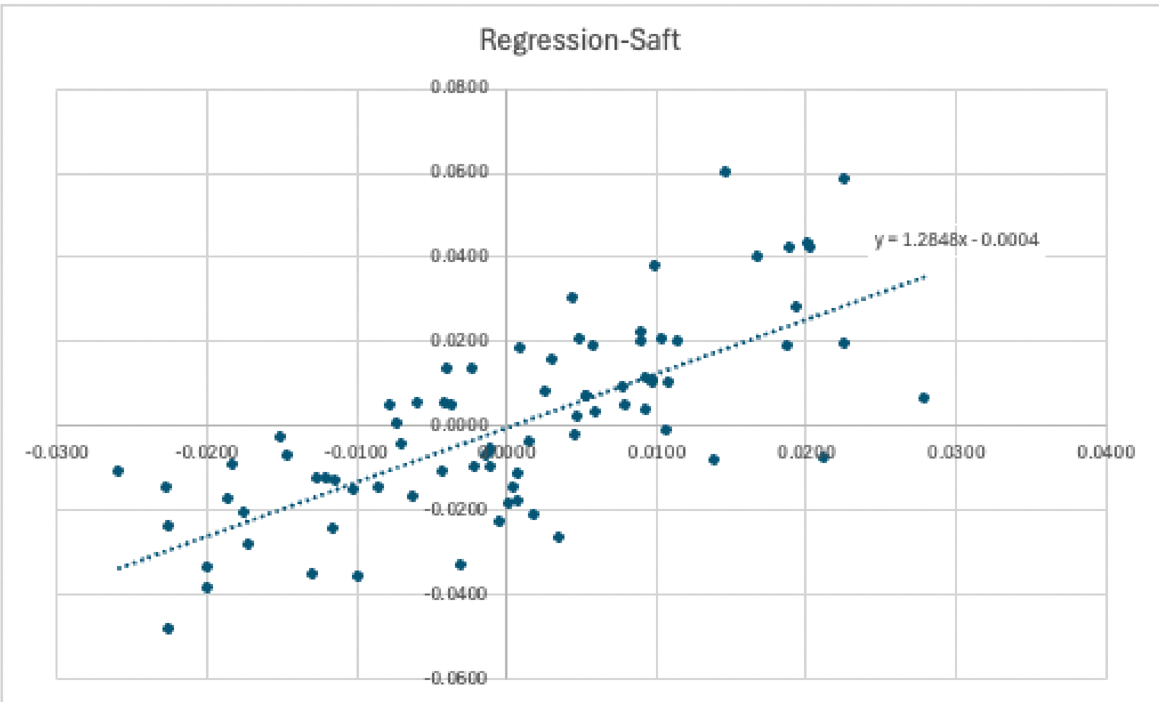
ANOVA

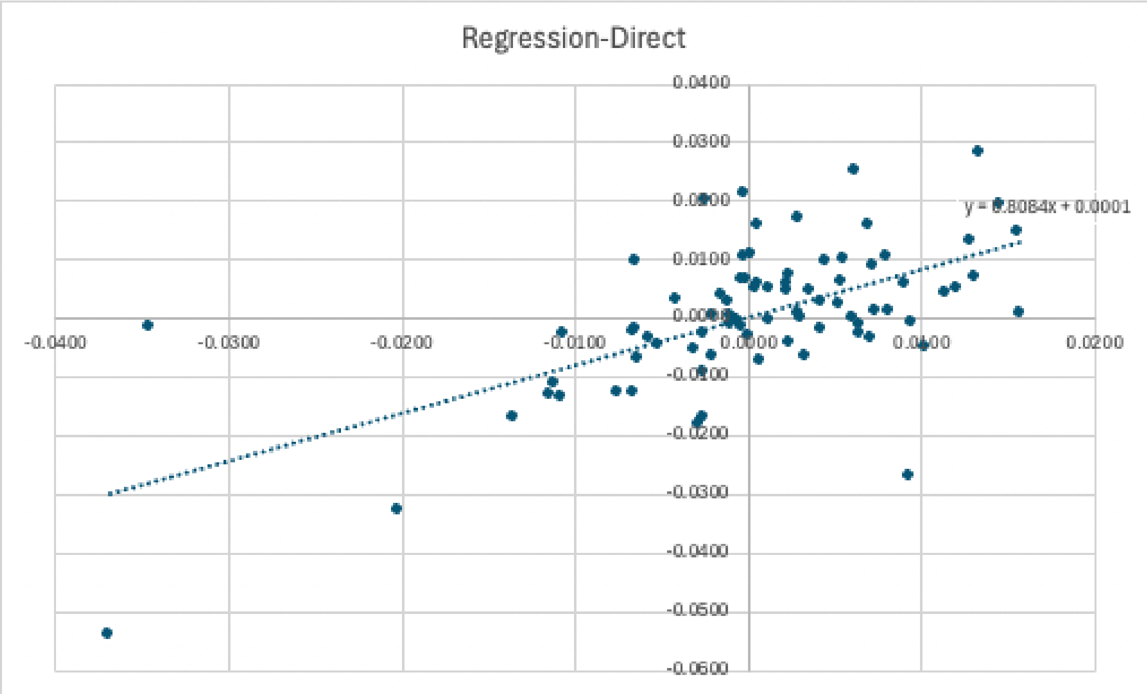
	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	0.05644176	0.01881392	14.0506356	0.0004426
Residual	11	0.01472909	0.00133901		
Total	14	0.07117085			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.01024898	0.01039079	0.98635325	0.34515893	-0.012621	0.03311895	-0.012621	0.03311895
Rm-Rf	0.52707704	0.22002375	2.39554608	0.03551131	0.04280802	1.01134605	0.04280802	1.01134605
SMB	-1.1585813	0.32084252	-3.611059	0.00408996	-1.8647509	-0.4524117	-1.8647509	-0.4524117
HML	1.27722278	0.22992724	5.55489982	0.00017149	0.77115634	1.78328923	0.77115634	1.78328923

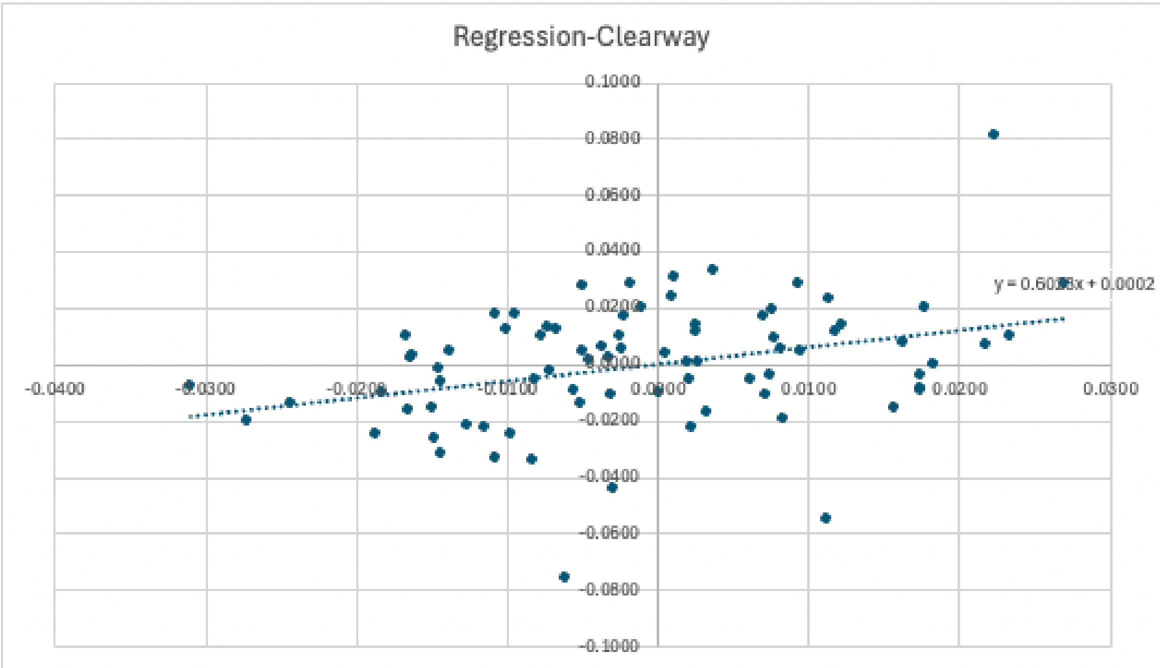
Regression Graph





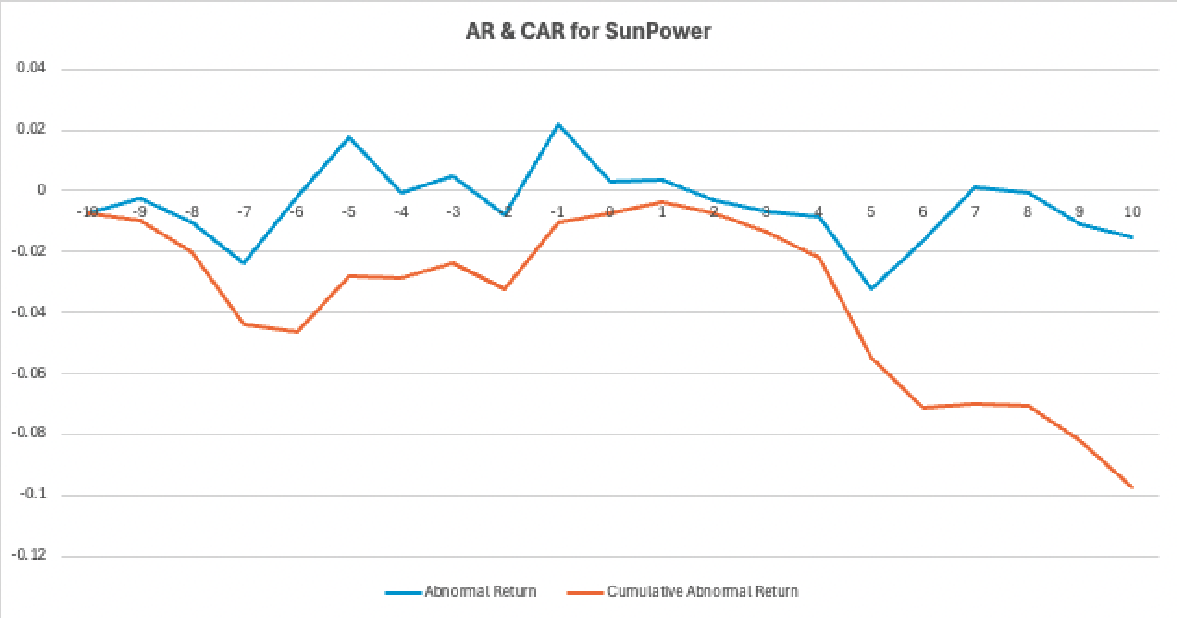


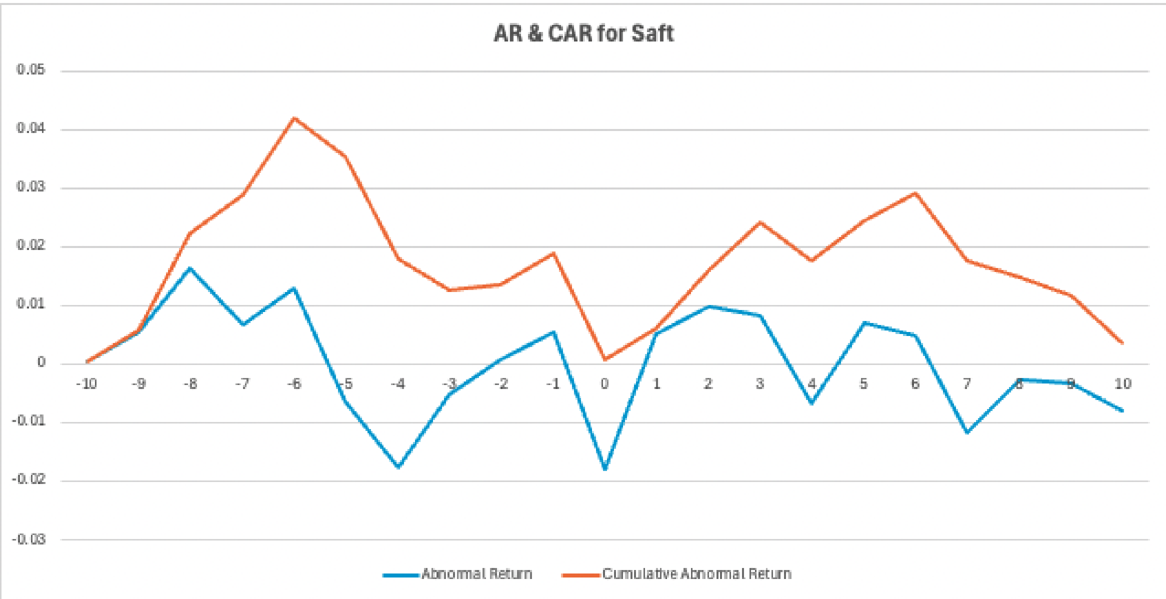
Regression-Direct
y = 0.8084x + 0.0001

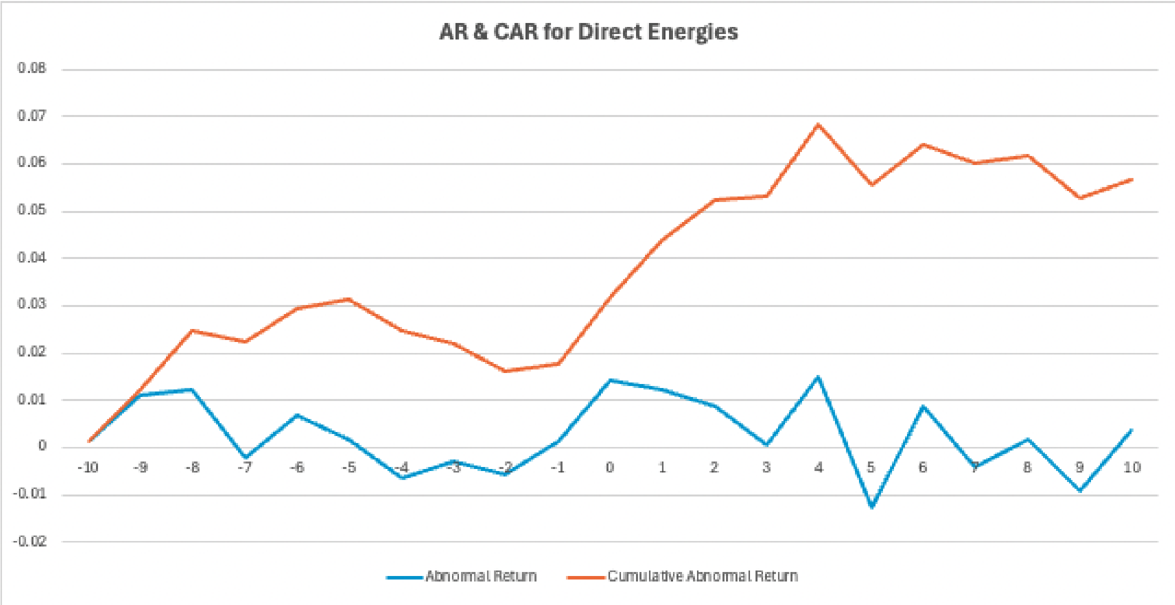


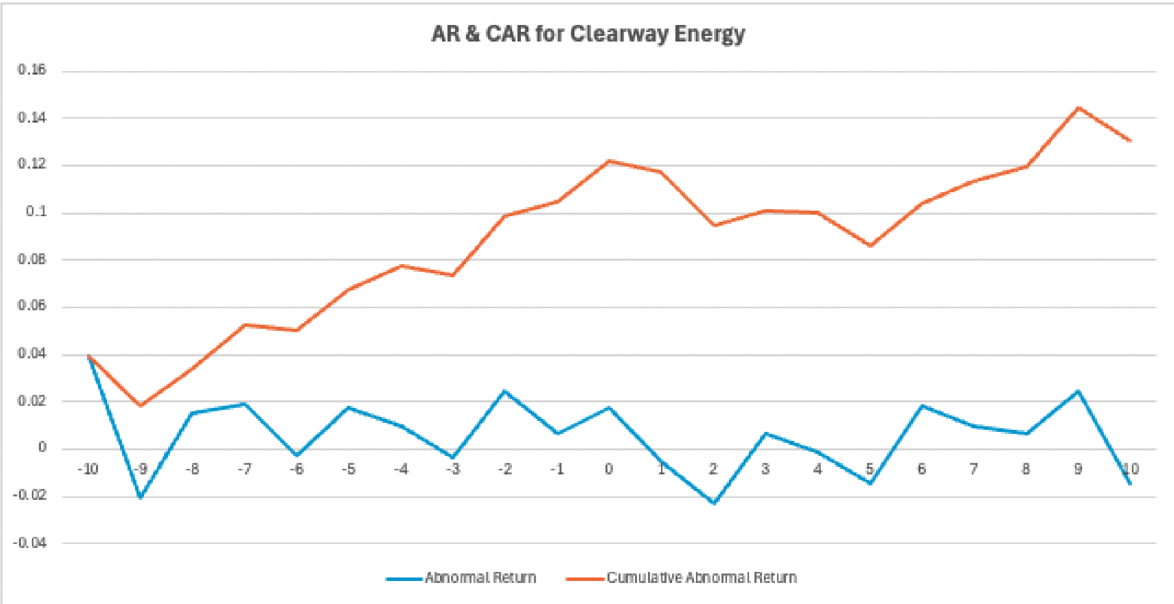
Regression-Clearway
y = 0.6038x + 0.0002

AR & CAR


AR & CAR for SunPower
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
-0.12
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
Abnormal Return
Cumulative Abnormal Return


AR & CAR for Saft
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-0.03
-10
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9
10
Abnormal Return
Cumulative Abnormal Return


AR & CAR for Direct Energies
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10
Abnormal Return
Cumulative Abnormal Return


AR & CAR for Clearway Energy
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10
Abnormal Return
Cumulative Abnormal Return