

# Study on sustainable development of electricity resources in the United States

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**Abstract.** Relying on renewable electricity generation is critical to combating climate change and meeting long-term environmental objectives. In addition to discussing the Triple Bottom Line approach's practical applications, this essay delves into the approach's theoretical underpinnings. Companies like Tesla and the financial industry play crucial roles in encouraging the responsible growth of the nation's electrical power grid. This essay argues that sustainable behaviours and investments in renewable energy can benefit from fiscal and economic policies that give incentives in these areas. In addition to contributing to Tesla's market leadership and financial success, sustainable business practices can also help set an example for other companies. Incentives for renewable energy, increased energy efficiency, and a receptive regulatory environment are all recommended in this essay. The competitiveness of electric power companies may be increased, and their contributions to sustainable development may be increased via the incorporation of sustainability principles, circular economy practices, and stakeholder engagement.

## 1 Introduction

The globe is at a crossroads when environmental concerns are at an all-time high. One of the greatest difficulties of our time is the search for a sustainable future. The importance of renewable sources of electricity has come under the spotlight during this worldwide awakening. Alternative and more sustainable energy generation may be achieved using renewable resources, including solar, wind, hydroelectric, and geothermal power. These resources, in contrast to fossil fuels, do not contribute to the release of greenhouse gases during usage. Sustainable electric power supplies improve environmental conditions in ways that go beyond lowering greenhouse gas emissions. Switching to renewable energy protects public health by lowering pollution levels and raising air quality. Pollutants such as particulate matter, sulfur dioxide, nitrogen oxides, and mercury are released when fossil fuels are burned. They

all contribute to developing respiratory ailments, cardiovascular issues, and early deaths [1]. The world's communities may have a cleaner and healthier future if they adopt sustainable power generation. Equally important are the societal effects of using renewable electricity sources. Access to inexpensive, consistent energy is crucial for people's health, prosperity, and education. Opportunities presented by renewable energy projects allow local communities to participate in the energy transformation and reap the benefits of economic prosperity.

The United States needs to convert to sustainable power supply immediately, elevating the role of finance and the economy as primary drivers of this change. Large sums must be spent on renewable energy infrastructure, cutting-edge technology, and system upgrades to switch to sustainable electric power resources. Funding availability is a critical factor in this context since it allows for the redirection of resources to

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renewable energy initiatives. Banks, private equity companies, and impact investors benefit from channeling capital into renewable energy projects, accelerating the country's clean power sector [2]. Environmental and social concerns may be considered while raising funds through sustainable finance structures, including green bonds, green loans, and impact investments. Scaling up renewable energy projects is made possible using these financial instruments, which encourages investment from both local and foreign sources. Costs connected with implementing renewable energy sources can be significantly reduced with the help of appropriate financing. Governments and financial organizations may encourage to use renewable electricity by offering programs like tax credits, grants, and subsidies. Renewable energy projects benefit from these financial mechanisms because they encourage higher investment and decrease renewable energy technology prices.

The global energy landscape has shifted due to the fast expansion of electric vehicles (EVs) and renewable power sources. Tesla has emerged as a leader in the clean energy industry thanks to its game-changing inventions in electric cars, energy storage, and solar power, which is vital to achieving a sustainable and prosperous future. The arrival of Tesla's electric vehicles has shaken the automobile industry, posed a serious threat to the supremacy of internal combustion engines, and ushered at the age of pollution-free vehicular travel [3]. Tesla's electric vehicles have revolutionized the industry with its groundbreaking blend of battery technology, electric drive trains, and stylish aesthetics. As a result of Tesla's success, other automakers have begun investing in EV technology, expanding the market and significantly lowering emissions. As impressive as Tesla's electric vehicles are, the company has also made significant advances in energy storage. The business has revolutionized energy storage and utilization with its Power wall and Power pack battery technologies. Renewable energy sources can be more easily integrated with the help of these energy storage solutions since they may be used to store excess energy generated during times of low demand. Tesla's energy storage solutions improve grid dependability by making renewable energy more flexible and stable, decreasing fossil fuel dependency. This paper examines the sustainability of

electric power resources in the United States based on the influence of finance and government.

## **2 Case description**

### **2.1 Overview of U.S. electric power and sustainable development trends**

Declining costs, supporting legislation, and rising public demand have all contributed to a spectacular expansion of renewable energy capacity in the United States. Large-scale projects and distributed solar installations are becoming commonplace due to the fast deployment of solar and wind power, according to a study by [4]. Thus, renewable energy sources have become a major and rapidly expanding part of the power-generating mix in the United States. The electric power industry in the United States is increasingly adopting energy storage technology like batteries. Improved grid dependability, better use of renewable energy sources, and more options for managing load are all benefits of energy storage systems. Large-scale battery deployments and the development of novel storage solutions have been encouraged by the falling prices of energy storage systems and legislative incentives. To allow for the incorporation of renewable energy sources and to facilitate two-way energy flows, the grid infrastructure in the United States must be modernized as part of the transformation of the electric power industry [5].

### **2.2 Background and development of Tesla**

Involvement from Elon Musk has helped propel Tesla, which was created in 2003 by Martin Eberhard and Marc Tarpenning, to the forefront of the electric power industry. Through the creation of EV energy storage technologies, and solar energy systems, the business aimed at hasten the global shift to sustainable energy. The Tesla Roadster, the first fully electric vehicle with a legal highway range, was released in 2008. According to [6], this began Tesla's adventure. This development has challenged the conventional wisdom that EV could be more practical and impressive in performance. The Roadster's commercial success cleared the path for Tesla to build other mass-market vehicles aimed at expanding the availability of sustainable transportation to more people. Tesla's dedication to renewable energy did not

stop with cars. The corporation understood the significance of energy storage and its role in making renewable energy sources more easily integrated.

### **2.3 Current status of Tesla and other companies contributing to sustainable electric Power Resources**

In terms of market capitalization, Tesla is now the world's most valuable electric power firm, surpassing even the most well-known traditional manufacturers. The firm is expanding its energy storage and solar power operations, and it has created and enhanced its electric car possibilities via ongoing innovation. The broad adoption of environmentally friendly technology is facilitated by the mass production of electric cars, batteries, and energy storage devices at Tesla's Gigafactories in the United States and internationally [7]. The lack of easy and easily available charging infrastructure has been a key barrier to mainstream EV adoption; however, Tesla's Supercharger network has helped to solve this issue. Customers can take their Tesla's on cross-country trips without worrying about their vehicles' limited range thanks to the global network of Superchargers. Several companies, Tesla included, are making major strides in developing sustainable electric power resources. Automotive giants, including General Motors, Ford, and Volkswagen, have all ramped up production of electric vehicles and are investing heavily in EV technology and infrastructure [8]. To better integrate renewable energy into the grid, energy storage companies like L.G. Chem, Panasonic, and A.E.S, Energy Storage are developing cutting-edge battery technology and solutions.

## **3 Theoretical framework: the triple bottom line approach**

The Triple Bottom Line (TBL) is a well-known theoretical paradigm for evaluating sustainable development from the perspectives of the economy, the environment, and society.

### **3.1 Economic dimension**

The financial feasibility and economic advantages of sustainable electric power resource development are the

primary emphasis of the TBL framework's economic dimension. It considers initial outlay, ongoing expenses, and profit potential. The R.O.I and profitability of renewable energy projects are weighed against those of conventional fossil fuel alternatives by businesses and investors, according to an analysis by [9]. They consider things like long-term profitability, market competitiveness, and the levelized cost of electricity (L.C.O.E.). Renewable energy projects are encouraged via economic incentives, including tax credits, subsidies, and feed-in tariffs.

### **3.2 Environment dimension**

TBL's environmental component examines how expanding our access to electricity will affect the environment. It evaluates the efficacy of renewable energy in preventing global warming, slowing the progression of climate change, preserving natural resources, and limiting environmental deterioration [10]. The environmental advantages of renewable electricity sources may be determined by comparing their life cycle emissions across the extraction, manufacture, operation, and disposal stages. Assessing the environmental viability of renewable energy projects requires considering land use, water use, and ecosystem preservation.

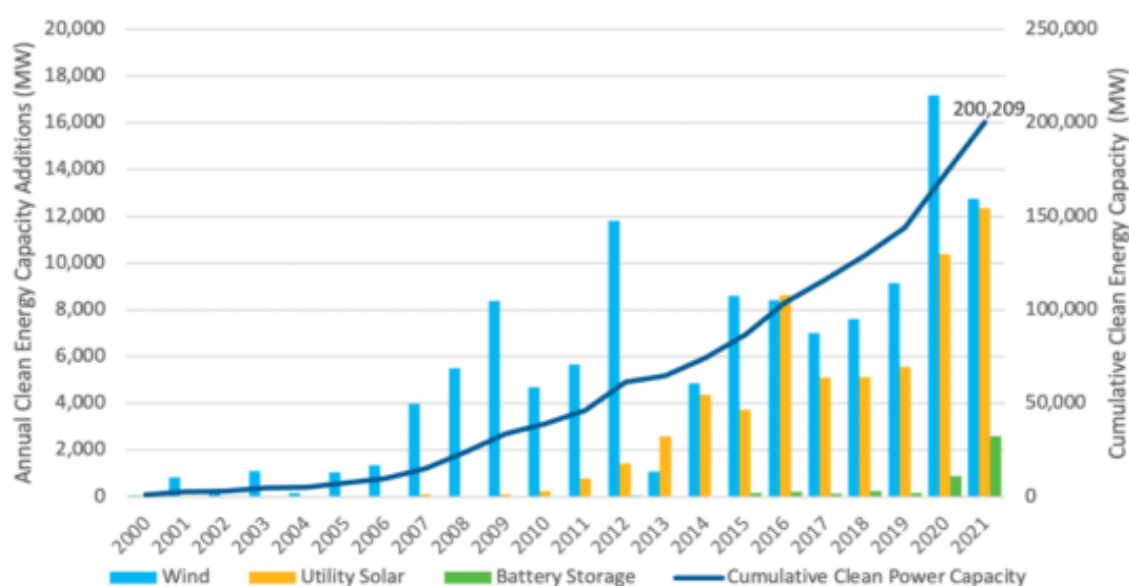
### **3.3 Social dimension**

The social component of the TBL paradigm considers the societal effects of expanding access to renewable forms of electricity generation. It considers things like energy availability, community involvement, and the generation of new jobs in the area. Employment, scientific advancement, and economic development are all possible outcomes of renewable energy initiatives [11]. In order to alleviate energy poverty and improve people's quality of life, it is crucial to guarantee that everyone has easy access to inexpensive and clean energy. Sustainable and socially responsible electric power resource development also requires to community involvement, resolving stakeholder concerns, and promoting inclusive decision-making processes. The TBL model considers the interconnectedness of economic, environmental, and social factors. To ensure long-term economic growth, environmental stewardship,

and social well-being, stresses that sustainable electric power resource development should strike a balance among these factors, according to [12]. In order to make smart choices, decision-makers and investors must weigh the interplay among these factors. A renewable energy project may help the planet somehow, but its financial sustainability and public support also matters. If these factors are considered, sustainable growth in the electric power industry may be evaluated as a whole.

### 3.4 Problem 1: The impact of financial and economic policies on electric power resource development

Argument: Sustainable practices in the electric power sector can be encouraged through financial and economic policies, which greatly influence resource development. The investment climate, market dynamics, and technical developments are all influenced by the design and implementation of these policies [13]. The adoption of renewable sources of electricity can be hastened by policies that offer incentives and foster favorable conditions.



**Fig. 1.** Clean Energy Installations in America (Sources:

<https://clean-energy-in-america-reaches-milestone-in-2021-but-installation-pace-must-accelerate-to-reach-emissions-goals/>)

Argument: Feed-in tariffs, tax credits, and renewable energy subsidies are all examples of economic and financial policies that encourage to use more environmentally friendly electric power sources. Renewable energy installations in the United States have expanded greatly because of the Investment Tax Credit (I.T.C.) and the Production Tax Credit (P.T.C.). Solar panel installation has increased by almost 10,000% since the L.T.C.'s launch in 2006, as reported by the Solar Energy Industries Association (S.E.L.A.) (see Figure 1). The I.T.C. has helped accelerate the adoption of renewable energy sources, which has been good for Tesla as a market leader in the electric power industry and for the environment. The electric power industry has benefited greatly from government funding of RandD projects. Government policies that provide funding for

research and development (R and D) through grants and subsidies bolstered innovation and technological progress. Government subsidies and loans have greatly aided the success of Tesla. The Advanced Technology Automobiles Manufacturing program of the United States Department of Energy provided Tesla with a \$465 million loan in 2009, as stated by [14]. This money was used to fund the development and manufacture of electric automobiles like the Model S. With this backing, Tesla has been able to improve the state of the art in electric car technology, lower production costs, and aid in the sustainable growth of the electric power industry as a whole.

Research Results: fiscal and economic policies are essential to promote long-term growth in the electric power sector. Governments may foster the development

of renewable electric power resources by promoting their use, funding research and development, and enacting renewable energy standards and objectives [15]. Feed-in tariffs, tax credits, subsidies, and grants have encouraged the development of renewable energy sources and hastened the spread of environmentally friendly technology. Tesla's rapid expansion and positive impact on the progress of sustainable electric power resource development is direct results of these measures.

### 3.5 Problem 2: Market dynamics and competitive landscape for electric power companies

Argument: Several market variables affect the development and competitiveness of businesses in the electric power sector. Market conditions for electric power suppliers are heavily influenced by developments in technology, government policy, consumer demand, and the presence of alternative suppliers, as per [16].



**Fig. 2.** U.S.U.S. Top 5 E.V.I.E.V.Automotive Groups' Sales Share, 2022  
 (Source: <https://www.counterpointresearch.com/us-ev-sales-2022/>)

According to market surveys and statistics, companies like Tesla have achieved impressive gains in securing market shares in the electric power industry. For instance, Tesla has become an industry leader in the electric vehicle sector. The International Energy Agency (IEA) predicts that by 2020, Tesla will have a sizable part of the worldwide EV market (see Figure 2). Tesla's technological advancements, expansive charging network, and well-known brand name are all reasons for the company's success. Sustainable electric power resources have a growing commercial potential, as seen by the rapid expansion of firms like Tesla. As shown in the company's financial reports, sales of electric vehicles and energy storage solutions have been major contributors to Tesla's consistent revenue growth. The year-over-year revenue increase for Tesla was 74% in Q12021 [17]. The rising demand for clean energy

options and the availability of renewable electricity sources drives this expansion. Numerous firms are fighting for customers in the increasingly competitive electric power industry. Consumers gain from increased product variety and lower prices, while sustainable development is pushed forward thanks to increased competition. Competition for Tesla comes from both established automakers and up-and-coming electric vehicle producers.

Research Results: the long-term viability of the nation's electrical power resources is profoundly affected by market dynamics and the competitive landscape. Several factors, including new technologies, government backing, consumer demand, and levels of competition, shape companies' fortunes in this industry. Companies like Tesla, with their cutting-edge innovations and dominant market positions, show how the electric power

sector may grow sustainably. Companies like Tesla's rapid expansion and market dominance reflect a rising interest in eco-friendly power options. Consumers gain from lower prices, higher quality, and faster adoption of renewable energy sources due to increased competition among electric power firms, as stated by [18]. Moreover, market dynamics and competition encourage businesses to engage in R&D, enhance efficiency, and investigate new business models, all of which add to the sector's long-term viability. Policymakers should keep backing market dynamics that encourage competition, innovation, and the uptake of renewable energy solutions in order to boost sustainable development. Supportive policies, a level playing field, and more market openness are all part of this.

## 4 Suggestions

### 4.1 Suggestion 1: policy recommendations for promoting sustainable electric power resources

Argument: Policymakers can implement policies that incentivize using renewable energy sources, improve energy efficiency, and establish a supportive regulatory framework to promote sustainable growth in the electric power sector. These regulations can speed up achieving climate and environmental targets by driving the switch to renewable electricity sources [19].

Evidence: Adopting sustainable electric power resources has been accelerated by implementing renewable energy standards (R.E.S.) and feed-in tariffs (F.I.Ts). In the early 2000s, Germany introduced a E.I.T. system, dramatically increasing the country's renewable energy capacity [20]. This meant that by 2020, more than half of Germany's electricity came from renewable sources. Success stories in renewable energy production and investment are also common in RES-enacted states in the United States, such as California and Texas. Financial incentives to reduce greenhouse gas emissions and switch to cleaner energy sources can be created by implementing carbon pricing mechanisms such as carbon taxes or emissions trading systems (E.TS.).

The electric power industry and businesses like Tesla might benefit greatly from implementing regulations that incentivize using sustainable electric power resources. Market stability, investment, innovation, and increased clean technology competitiveness are all possible results

of these measures, according to a study by [21]. Regulations that show support for these products may create a favorable market climate for Tesla's electric automobiles and energy storage solutions. Increased demand for Tesla's wares may be sped up with the use of incentives like tax breaks, subsidies, and enabling legislation. Opportunities exist for Tesla's solar energy business thanks to legislation encouraging the development of renewable energy sources, such as R.E.S. and F.I.Ts.

### 4.2 Suggestion 2: strategies for companies to enhance competitiveness and sustainability

Argument: Sustainable growth aided by good business practices. Businesses in the electric power industry may boost their competitiveness and contribute to sustainable development by using a few simple strategies and practices. These plans aim at hasten the shift to renewable energy sources by incorporating sustainability into their operations, products, and business models [22]. Businesses may lessen their environmental impact and aid sustainable energy development by funding renewable energy generation. Sustainable growth may be fueled by companies that use circular economy concepts. Product longevity, recyclable materials, and simple repairs are all goals businesses might strive towards. Using take-back programs and recycling activities can lengthen the product life cycle.

Evidence: Tesla's market leadership and rapid expansion directly results from the company's commitment to sustainable business practices [23]. With the success of the Model 3, the business has risen to the top of the electric car sales industry throughout the world. Tesla's success may be attributed in large part to the company's well-known brand name and a sterling reputation for manufacturing reliable, eco-friendly electric automobiles. Tesla's sustainable methods have paid well, as seen by the company's success. Investor trust in Tesla's long-term viability is reflected in the company's market valuation, which has surpassed that of more experienced manufacturers despite the company's youth. With its first year of profitability in 2020, Tesla proved that environmentally responsible electric power companies might be financially successful.

The role of corporate strategies in promoting the long-term growth of reliable electric power sources.

When it comes to the electric power sector, sustainable development is driven in large part by business strategies and practices. Businesses like Tesla have proven that sustainable practices integrated into daily operations may increase competitiveness and aid in the shift to renewable electricity sources [24]. Renewable energy sources, energy-efficient technology development, the adoption of circular economy ideas, and stakeholder involvement are ways businesses may improve the environment and their bottom lines.

## 5 Conclusion

Major firms like Tesla and the financial and economic sectors play crucial roles in promoting the sustainable development of electric power resources in the United States. The switch to renewable electricity sources is crucial to slow global warming and accomplish long-term environmental goals. The relevance of fiscal and economic policies in providing incentives for sustainable development has been underlined. Sustainable electric power resources have expanded thanks to policies like renewable energy subsidies, carbon pricing systems, and financing for research and development. These regulations provide a hospitable setting where businesses can make renewable energy investments and implement sustainable procedures. When it comes to electric power, Tesla is unrivaled, and the company's sustainable business practices are proof of that. Evidence of the positive effects of incorporating sustainability into core business operations may be seen in the company's market leadership, financial performance, and consumer demand. Not only has Tesla's commitment to renewable energy, energy efficiency, circular economy concepts, and stakeholder participation contributed to the company's rapid expansion, but it has also served as an example for other businesses. More objectives for renewable energy, stronger limits on emissions, and more access to sustainable funding are only some of the policy proposals offered in the report. When coupled with others like increasing the use of renewable energy sources, improving energy efficiency, adopting circular economy concepts, and involving stakeholders, these measures might significantly alter the power industry. If the recommended policies and tactics are implemented, sustainable electric power resources may become the norm. They have the potential to speed up the shift to renewable energy sources, cut down on emissions of

greenhouse gases, boost energy efficiency, and encourage the development of a circular economy. In addition to helping the environment, this would boost the economy, make electricity more reliable, and increase energy security.

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