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Assessing The Role Of Government Subsidies In Boosting Renewable Energy Adoption

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ABSTRACT

Renewable energy solutions (RES) often get support from the government in the form of teaching materials, institutional support, or financial assistance. The RES field participants have a significant challenge in the form of policy coherence. When investments are made, it is essential to offer a prognosis for whether or not future policies will be implemented. The appraisal of investments has to include larger risk buffers in situations when the future is uncertain. For a number of reasons, including abrupt and unexpected changes in legislation, uncertainty makes it more difficult to appeal to investors for financial backing. In this research, we investigate the consequences of policy support discontinuities by using a case study methodology throughout the investigation. In 2022, feed-in tariffs were implemented in Ontario, which resulted in a significant increase in the number of people participating in the program. The community of renewable energy sources suffered a loss of trust in the government's capacity to provide constant support for the sector when the subsidies were dramatically decreased in 2023. Several weeks before the announcement of a substantial change in bioenergy policy, the Minister of the Environment of Norway formally unveiled a vast new biodiesel factory. This event took place in Norway. The investors suffered a loss of virtually all of their cash as a consequence of this, which led to the closure and rearrangement of the new facility. Due to the fact that its political credibility has been weakened, the Norwegian government is now having a more difficult time attracting private investment in this sector. Although we do not disagree with the need of making changes to policies, we do feel that the procedure that is used to put these changes into effect is very important.

Keyword: - *bio-diesel; wind sector; solar PV sectors; feed-in tariff; policy economics.*

INTRODUCTION

The transition to renewable energy sources is absolutely necessary in order to address climate change, reduce dependency on fossil fuels, and ensure economic success over the long term. Despite the fact that renewable energy sources such as solar, wind, and hydroelectric power provide long-term benefits to the economy and the environment, there are significant financial and logistical barriers that prevent their widespread adoption. The expansion of the use of renewable energy sources may be significantly aided by the provision of subsidies by the government. Subsidies from the government are absolutely necessary in order to make projects using renewable energy sources financially viable. The initial investment costs are reduced as a result of these subsidies, which also include encouraging participation from the private sector and providing incentives for research and development. There are many different kinds of subsidies, some of which include financial assistance, tax breaks, feed-in tariffs, and credits for renewable energy uses. When competing with fossil fuel firms that have been in business for a considerable amount of time and have access to subsidies and infrastructure, renewable energy may be at a disadvantage; these financial strategies help level the playing field. Through the reduction of production costs and the greater accessibility of renewable

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technologies to individuals and businesses, subsidies contribute to the acceleration of the transition to greener energy sources.

The government's subsidies, in addition to being beneficial to the economy, encourage the production of energy inside the country and reduce the need to import fuels, both of which contribute to the security of the energy supply. As an additional benefit, they promote the creation of new environmentally friendly employment, which will ultimately result in sustained economic expansion and technological progress. Subsidies are a contentious issue due to the fact that they have the potential to induce market distortions and waste money if they are not dispersed appropriately or if they depend excessively on financial incentives. The purpose of this article is to examine the manner in which subsidies for renewable energy are implemented, how they influence the expansion of markets, how they influence the advancement of technology, and how they influence sustainability in general. In addition to this, it dives into the challenges and potential drawbacks of subsidy programs, so providing policymakers with useful knowledge that may help them maximise benefits while simultaneously minimising inefficiencies.

OBJECTIVE

1. To evaluate how government subsidies may increase the use of renewable energy.

2. To Assess Subsidies' Effectiveness.

THE GROWING ROLE OF GOVERNMENT SUBSIDIES IN SUSTAINABILITY EFFORTS

For a considerable amount of time, government subsidies have been an important component in the process of fostering innovation in businesses that are high-risk but highly advantageous, such as the energy sector. There are several types of subsidies, including as loans with low interest rates, feed-in tariffs, direct giveaways, and tax incentives. Also included in this category are direct handouts. The reduction of the barriers to entry for new technologies is made possible by these funding methods, which make it easier for businesses to invest in research and development and bring innovative products to market. When it comes to green innovation, subsidies are designed to alleviate the financial strain that is connected with the high initial costs of environmentally friendly technology. This is done in order to make it possible for a greater number of people to be able to afford to invest in these solutions. In addition, market actors are forcefully indicated the strategic relevance of sustainability and renewable energy by the subsidies provided by the government. It may be possible to develop a legislative environment that is more beneficial for environmentally friendly technologies, as well as to stimulate academic collaboration and investment from the corporate sector. The manner in which subsidies are organised and implemented, on the other hand, is what defines how effective they are. When subsidies are not properly targeted, it is possible that they may cause market distortions, inefficiency, and the inappropriate allocation of resources. Therefore, in order to make the most of subsidies, it is necessary to have an understanding of how they interact with other innovation drivers such as digital transformation.

DIGITAL TRANSFORMATION AS A CATALYST FOR INNOVATION

The term "digital transformation" refers to the process that occurs when digital technology become extensively integrated within an organisation. The company's operations and the value it offers to its stakeholders are both impacted as a result of this significant transformation. Providing resources that raise operational efficiency, promote customer contact, and allow the production of new products and services, digital transformation has emerged as a crucial facilitator of innovation in the energy business. This is because digital transformation provides these resources. With the help of technologies such as blockchain, artificial intelligence (AI), the internet of things (IoT), and big data analytics, energy companies are adjusting to new methods of managing operations, evaluating market trends, and designing new products and services. A variety of different benefits are available to firms who are involved in new energy via digital transformation. This makes it possible to improve asset management and predictive maintenance, as well as to monitor and regulate energy systems in real time. Additionally, it enables the capacity to monitor and control energy systems. Additionally, digital platforms have the potential to foster collaborative innovation by connecting companies with partners, customers, and other stakeholders. It is possible that the use of digital technologies will make government subsidies more effective. This is because digital technologies promote transparency, make it possible to distribute resources in a more focused and efficient manner, and give better data for monitoring performance.

OVERVIEW OF GREEN INNOVATION AND SUSTAINABILITY GOALS

When we innovate in a manner that is beneficial to both the economy and the environment, we are engaging in what is known as "green innovation." The creation and implementation of new products, services, procedures, and business models are all included in this undertaking. The reduction of emissions of greenhouse gases, the increase in the use of renewable energy sources, the improvement of energy efficiency, and the protection of ecosystems for future generations are all sustainability goals that are dependent on it. Technical advancements that are examples of "green innovation" in the energy business include solar panels, wind turbines, bioenergy solutions, energy storage technologies, smart meters, and grids. These are all instances of technological achievements that fit under the umbrella term "green innovation." In light of the fact that the use of energy throughout the globe is on the rise and the adverse effects of climate change are becoming more apparent, the application of technologies that are friendly to the environment is more necessary than it has ever been. The relevance of transitioning to low-carbon economies is brought to light by the Paris Agreement and other international frameworks. This confronts energy corporations with a number of challenges as well as opportunities. The expansion of new energy companies that place an emphasis on environmentally responsible business practices and renewable energy sources is a crucial component of this transition. There are a number of challenges that these companies need to surmount in order to be able to innovate. Some of these challenges include high costs associated with research and development, regulatory uncertainty, and the possibility of technological obsolescence. Not only does green innovation include the development of new technology, but it also involves the creation of adaptable business models in order to stay up with the always evolving energy market. By implementing sustainability into their business strategy, companies have the potential to raise their long-term earnings, differentiate themselves against competitors in the market, and attract investors. Businesses in the new energy sector have both the opportunity and the need to achieve sustainability via innovation.

Government Subsidies: Types and Impact on Innovation

When it comes to industries such as energy, where risks and costs associated with innovation are significant, government subsidies are absolutely necessary in order to encourage environmentally friendly innovation. In order to deploy new technology, support research, and expand operations, the initial expenditure that is necessary may be reduced by the provision of financial assistance in the form of subsidies. Among the many different types of subsidies, you have the option to select:

- **Direct Financial Grants:** These subsidies are provided to businesses so that they may make investments in research and development, bring new technologies to market, or implement existing technologies at a larger scale.

- **Tax Incentives:** It is possible for businesses to routinely take advantage of tax discounts or incentives provided by the government if they make investments in environmentally friendly technology or apply environmentally friendly activities.

- **Feed-in Tariffs:** The purpose of these legal measures is to give producers of renewable energy with long-term contracts at rates that are higher than the market. This is done to assure the sustainability of all renewable energy projects.

- **Loan Guarantees and Low-Interest Loans:** Subsidies like this make it possible for energy businesses to invest in innovation at a cheaper cost, which in turn reduces the load that they have to bear financially.

When it comes to environmentally friendly innovation, firms that deal with new energy confront significant financial challenges; subsidies help these enterprises make it through these obstacles. Companies are able to test out new concepts, technologies, and business models without taking any risks when they get money for research and development (R&D). Furthermore, subsidies have the potential to foster relationships between corporations and universities, as well as partnerships between the public sector and both private and public sectors. However, determining how subsidies will influence innovation is not always a straightforward task. Based on the findings of many research, the effectiveness of subsidies is contingent upon the manner in which they are organised and the degree to which they satisfy the requirements of certain businesses. One example of a situation that might lead to

inefficiencies and market distortions is when subsidies are not given the appropriate amount of attention. In light of this, it is of the utmost importance to delve into the ways in which subsidies influence innovation in order to guarantee that they really contribute to the expansion of the energy sector.

Digital Transformation in Energy Enterprises: Trends and Challenges

"Digital transformation" is a word that represents the process by which a corporation changes its operations, business models, and customer experiences by integrating digital technology into every aspect of the firm. When it comes to the energy business, digital transformation is not simply about increasing operational efficiency; rather, it is all about supporting new sorts of innovation that might support or contribute to sustainability.

Key digital technologies in the energy sector include:

- **Artificial Intelligence (AI):** The inclusion of environmental data into artificial intelligence algorithms enables these algorithms to foresee trends in energy use, optimise grid management, and improve the efficiency of renewable energy sources.

- **Internet of Things (IoT):** The monitoring and management of energy systems may be accomplished in real time with the assistance of sensors and smart devices that are connected to the Internet of Things (IoT). This results in increased efficiency and less waste.

- **Big Data and Analytics:** It is possible that energy businesses will be able to get a more in-depth knowledge of customer behaviours, system performance, and market trends via the use of big data, which will enable them to make more informed decisions.

- **Blockchain:** It is possible to utilise blockchain technology to construct decentralised energy trading platforms that are open, transparent, and safe. This would help to boost market liquidity and trust.

Businesses in the new energy sector may stand to benefit greatly from digital transformation. Businesses have the potential to achieve a variety of results, including improved data analysis, real-time asset monitoring, maintenance, and optimisation of energy production and distribution. With the help of digital technology, these companies are able to create their products and services more rapidly, reduce their operational expenses, and expand their solutions more efficiently. However, despite this, there are still challenges associated with the digital transformation processes. In order to succeed, new energy companies need to overcome challenges such as technological, legislative, and organisational settings that are complex. In order to facilitate the general use of digital technologies, substantial expenditures in people, infrastructure, and technological knowledge are required. Additionally, the incorporation of digital technology into traditional energy systems may be a bother and a costly burden. This is in addition to the reasons stated above.

Synergies Between Subsidies and Digital Technologies in Driving Innovation

It is possible that green innovation might profit from government subsidies and digital transformation on their own, but it is also possible that the two could work together to stimulate innovation in new energy companies even more. Subsidies from the government make it easier for firms to integrate cutting-edge digital technologies into their operations by reducing the risks that are associated with the adoption of new technology. It is possible that digital transformation may strengthen the impact of subsidies by facilitating more efficient resource allocation, enhanced monitoring of innovation performance, and simplified scaling of programs that have shown to be effective. One example is that digital platforms might be of assistance to new energy enterprises in terms of monitoring and reporting the utilisation of subsidies. This would be done in order to guarantee accountability and transparency. The real-time feedback on the effectiveness of subsidised programs that is supplied by advanced analytics may be beneficial to both businesses and members of the legislative leadership. Customers are able to pay for their energy use based on real-time data rather of the traditional set rates that were previously in place thanks to a new business model known as energy-as-a-service, which was made feasible by digital technology. These models have the ability to raise the demand for innovation by making environmentally friendly technology more accessible to consumers and opening up new

revenue streams for businesses. Therefore, the relationship between digital transformation and subsidies is one that is very dynamic. Through the combination of the two, new energy companies are able to deliver solutions that are superior, more scalable, and more long-lasting. On the other hand, governments may decide to enact legislation that encourage the utilisation of digital technology and provide financial assistance to the most ecologically friendly initiatives.

CONCLUSION

The rapidly shifting global energy landscape and the growing sense of urgency about sustainability are both contributing factors that are driving an increase in the need for innovative energy solutions. The reduction of carbon emissions, the enhancement of energy efficiency, and the transition to renewable energy sources are all long-term environmental goals that can only be accomplished via the implementation of green innovation, particularly in the field of new energy. A comprehensive analysis of the factors that influence the success of environmentally friendly innovation is provided by this study. Particular attention is paid to the role that digital transformation and government subsidies play in this regard. According to the findings of our empirical research, firms that deal in new energy are largely dependent on government subsidies to support research and development. This, in turn, helps to reduce the risks associated with innovation and accelerate the commercialisation of environmentally friendly technologies. For the purpose of overcoming the initial high costs and financial risks that are often associated with the development of new energy solutions, it is very necessary to have financial assistance from governments in the form of subsidies, tax incentives, and grants for specific environmentally friendly technologies.

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