THE CONFRONTATION BETWEEN LIBERAL THEORIES AND PRACTICE WITHIN THE RENEWABLES SECTOR

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Abstract

In the context of the political and environmental changes seen throughout the last four decades, two issues have arisen that are driving significant transformations in the structure of the energy sector: the growing risk of limited access to energy resources and the increased risk of damaging the environment through power generation. One of the most popular solutions that were chosen to address these issues globally, but one seen especially in Europe, was to increase energy production from renewable sources and to limit or penalize the use of fossil fuels.

These measures were implemented directly by governing entities through energy policies and managed to provide support for the development of renewables. However, several economists do not agree with such interventionist actions and propose that policy making needs to become more flexible and decentralized, some even proposing a "free market" model for the renewables sector.

This paper aims to present these theoretical discussions in a critical manner and confront them with practical examples of investment and generation costs observed within the energy industry. The objective of the paper is to determine whether the renewables sector can successfully evolve based solely on "free-market" mechanisms, without state intervention through hard or soft regulations.

Key words: *renewable energy, free market environmentalism, regulations, external costs, generation costs*

1. Introduction

The development of the energy sector was the cornerstone for the industrial revolution of the nineteenth century acting as a driver for the expansion of economic activities at a global scale (Wrigley 2010, 9). In time, the components of this sector, particularly the generation of electrical energy, gained an ever increasing relevance in the daily life of the individual, starting with the electrical light bulb, that replaced candles as a source of light, and continuing with all the home appliances that are now an integral part of an individual's home. Today we can state that energy is the foundation of humanity's development from a technological, social and intellectual standpoint.

In the context of the political and environmental changes seen throughout the last four decades, two issues have arisen that are driving significant transformations in the structure of the energy sector: the growing risk of limited access to energy resources and the increased risk of damaging the environment through power generation. One of the most popular solutions that were chosen to address these issues globally, but one seen especially in Europe, was to increase energy production from renewable sources[i] and to limit or penalize the use of fossil fuels.

As with most innovative industries, large renewables projects generated only limited interest among investors, likely due to low profit margins and high uncertainty. To compensate for this, several hard and soft (or hard-path and soft-path) regulations were implemented at a national or regional level by the governing entities to promote the development of the renewable energy sector. Hard regulations are those that impose economic costs for non-compliance and soft regulations make some options more appealing than others

in order to change behavior without imposing additional costs (Attari et al. 2009).

However, several economists do not agree with such interventionist actions and propose that policy making needs to become more flexible and decentralized, some even proposing a "free market" model for the renewables sector (Anderson and Leal 2001).

Because transformations within the energy industry will have important implications for businesses and individuals alike, it is important to be able to predict and understand how this sector may evolve in the future.

The aim of this paper is to analyze the current theories in the field of Ecological Economics that criticize the centralized policymaking in the energy field and to discuss whether the renewables sector can successfully evolve based solely on "free market" mechanisms, without state intervention through hard or soft regulations.

In order to achieve this objective, the paper will present these theoretical discussions in a critical manner and confront them with practical examples of investment and generation costs observed within the energy industry.

2. Literature review

The trans-disciplinary field of ecological economics is relatively young, considering that the first formal meetings on this topic were organized in the 1980's and that the International Society for Ecological Economics was founded only in 1989 (ISEE 2011; Costanza 2003). And while the energy sector has been studied extensively from an economical and technological standpoint, research papers providing an integrated theoretical and practical analysis of the renewables sector are limited.

One paper in particular (Slavikova et al. 2010) provides valuable insights regarding the fields of ecological and environmental economics by comparing and attempting to bridge theories that support free-market approaches and institutional development respectively.

Slavikova provides a brief overview regarding the views of institutional ecological economists such as Söderbaum, Røpke, Gowdy and Erickson. The field in question uses an empirical and pragmatic approach to analyze the regulations and interactions between environmental resources and their users. These findings are generalized and used to generate recommendations regarding the need for additional sustainable institutions. The common view is that a group of independent centers of decision can generate better policies than fully centralized or decentralized systems. Institutional ecological economists consider that the government should primarily focus on creating and defending institutions for sustainable governance (Slavikova et al. 2010).

However, the main focus of this paper is to analyze models that distance themselves from governmental interventionism, be it direct or indirect, through the use of institutions. The prevailing theoretical model that meets these requirements is that of Free Market Environmentalism (FME), influenced by the research of economists such as R. Coase and F.A. Hayek (Regan 2011). The main proposition that it brings is that the governmental mandate should be replaced by free market mechanisms and that regulatory prohibitions should be replaced with property rights (Anderson and Leal 2001; Adler 2011). Supporters of FME consider that the self-interest of private owners can ensure a high quality for environmental resources if this quality is desired by other people. However, "if individuals in the society do not demand a high quality of the environment, it is not (and should not be) provided" (Slavikova et al. 2010, 1369).

In addition to FME, there are several recent research papers that address the issues of pro-environmental attitudes and voluntary adoption of green technologies and services (Attari et al. 2009; Coad et al. 2009; Owen and Videras 2006), as well as one paper that describes how governmental interventions in the past actually led to the decline of the US renewables sector at the middle of the twentieth century (Stroup and Baden 1979).

3. "Free market" approaches to renewables

The idea of relying on the free market to drive the development of the renewables sector may seem ludicrous to an industry specialist who is aware of the costs and benefits implied by a project in this field (but more references to these issues will be brought in the next section of the paper). However, Anderson and Leal, along with the members of the Propriety and Environment Research Center (PERC) in Montana took a bold step in 1991 by proposing that such an approach could be used successfully to limit damage to the environment while ensuring an equitable trade-off between the exploitation of natural resources and the creation of wealth (Anderson and Leal 2001; Adler 2011).

The ideas put forward by the two PERC members were inspired by the revolutionary views of Ronald Coase. He proposed that the traditional perception that a polluting entity should automatically be eliminated or penalized is inefficient and that such decisions should be made with regard to the total effect (Coase, 1960). Coase quotes G. J. Stigler on the contamination of a stream: "If we assume that the harmful effect of the pollution is that it kills the fish, the question to be decided is: is the value of the fish lost greater or less than the value of the product which the contamination of the stream makes possible." (Stigler 1952, 105)

After considering the points made by Coase and Stroup (1979), Anderson and Leal state that "At the heart of free market environmentalism is a system of well-specified propriety rights to natural and environmental resources" (Anderson and Leal 2001, 4).

In order to support this idea, they give the example of the confrontation between environmentalists and energy companies regarding the Arctic National Wildlife Refuge (ANWR) in northern Alaska. While the region is home to a large number of brown bears, wolves, musk oxen, geese, caribous, some marine species, as well as other wild animals, it is estimated that the area could provide up to 11 billion barrels of oil. In response to the recommendations that the area be made available for energy development, a strong opposition was mounted by environmentalists. Ecologists will lose nothing if they demand that any potential exploitation be done with the highest possible protection to the environment, thus the highest possible production cost, as risk avoidance does not generate any costs to them. The energy companies will be interested in choosing the lowest possible protection as allowed by regulation standards, thus generating the lowest production costs. In such a situation there is no perceived opportunity cost and thus no reason for the two sides to negotiate and both are locked in a zero-sum game, where the loss of one party is the gain of the other.

In a similar situation, if a family with an ecological inclination owns a piece of land with potential oil deposits and an energy company offers them a payment for the right to extract the resources, their decision to protect the environment will bear the opportunity cost of the money they can receive from the oil company. Thus, the ecologists will be more likely to allow limited or full access to the resources.

In a similar manner, Anderson and Leal propose that the establishment of clear propriety rights, voluntary exchange and

common law liability, would allow for a solution to the ANWR issue. For example, if the propriety rights to the area were given to an environmental organization, it is likely that they will allow limited exploitation of the oil and gas resources, as was seen in other similar cases throughout the US. Alternatively, if the oil company would own the rights to the area, the environmentalists would be able to buy them partially or completely in order to prevent damage to the environment.

These points have more extensive explanations and exemplifications within the book itself. Still, the chapter on energy, due to its complexity, is considered to be much more theoretical than other parts of this work (Adler, 2011)

While institutional ecological economists use empirical observation to generate theories and recommendations, free market environmentalists first propose a theoretical model that is subsequently tested to provide empirical evidence of its validity. Such was the case with Anderson and Leal's "*Free Market Environmentalism*" from 1991, which was printed in a revised edition in 2001, that now included empirical evidence of how the theories that they proposed one decade earlier have been successfully implemented in the fishing and farming sectors.

Thus, while they still did not have enough empirical data to fully develop the chapter on energy, Anderson and Leal do provide valid examples in which the implementation of FME was successful. One such example is the creation of individual transferable quotas for fishermen in New Zealand. Each of them would thus own a percentage of the fishing quota for the season. The result was a rise in the efficiency and the industry, as there was a shared interest by each fisherman to increase the fish population for next season, thus increasing their propriety. Similarly, the creation of water rights for inflow streams allows environmentalists to purchase water from farmers with more efficient irrigation to increase the water level in rivers and streams.

In their paper on "Propriety Rights and Natural Resource Management", R. Stroup and J. Baden give an example on how a government intervention led to the severe decline in the US renewables sector at the middle of the twentieth century. The Rural Electrification Administration was established in the 1930s to subsidize power delivery to residents of rural areas. Previously, these people would rely on off-grid renewable energy equipment such as wind turbines. However, given access to the less expensive grid electricity, the consumers soon stopped purchasing renewable energy equipment, thus leading to the demise of developing companies such as the Jacobs Wind Electric Company (Stroup and Baden, 1979; JWEC 2011). Through this paper, Stroup and Baden both paved the way to the current theories on FME and provided additional arguments for liberal economists regarding the risk of government failure in the case of interventionist measures.

In addition to the FME trend, several independent researchers in the field of ecological economics have produced papers that support the possibility of generating voluntary pro-environmental behavior without the need for government imposed regulations.

Using data from a study performed on 30.000 individuals from 30 countries, A. Owen and J. Videras conclude that there is a direct correlation between the growth of GDP per capita and the willingness of the individual to sacrifice economic growth in favor of environmental protection. Thus, in developed countries, the perceived value of renewable energy will be higher and people will be willing to pay more for it. However, in the case of low income countries, only a developed spirit of civic-cooperation could lead to an increase in willingness to sacrifice income in favor of

environmental protection. (Owen and Videras 2006)

The findings of Coad et al. show that information provision policies can be a viable non-interventionist measure that either the government or various environmental NGOs can implement. "Providing information about ecological problems and giving consumers ideas on how to relieve the situation is a very 'democratic' approach towards environmental protection" (Coad et al. 2009). The research also showed that information provision policies and financial policies on the subject of environmental protection are not perceived as complementary and, if combined, will have a disynergy effect.

Finally, a study by Attari et al. in the US showed that people tend to prefer soft regulations over hard regulations and, in some cases, voluntary actions over soft regulations in the case of environmental protection. The main reason for rejecting hard regulations was the limitation of personal freedoms (Attari et al. 2009). The lack of preference between voluntary actions and soft regulations in certain cases could be motivated by the desire to eliminate the risk of free-riding, where some people would take advantage of the clean environment provided by others without making any sacrifices themselves.

There is still a theoretical debate on whether the development of renewable energy can be sustained through the use of "free market" principles and institutions (Regan 2011; Williams-Derry 2011). While institutional ecological economists and neoclassical economists would argue that the state is an essential player in the development of the energy sector, free market environmentalists consider that its only role should be to establish clear institutions, such as freely transferrable propriety rights on natural resources, thus providing the framework for a viable "free market" to evolve. The examples given by Free market environmentalists (Anderson and Leal 2001; Adler 2011), along with research showing that state interventions in the energy sector can have clear negative effects on the development of renewables (Stroup and Baden, 1979), provide strong arguments to support their ideas. In addition, recent research showed that the public already tends to demonstrate a pro-environmentalist value set and that voluntary action or informational campaigns are generally preferred to governmental ecological regulations (Owen and Videras 2006; Coad et al. 2009; Attari et al. 2009).

However, theoretical concepts should always be confronted with practical realities in order to adequately test their applicability. The following section will provide such an analysis by presenting the economics specific to the energy sector.

4. The economics behind the generation of electricity

During the ninth session of the UN Commission for Sustainable Development, one of the first international forums to discuss nuclear energy as a component of sustainable development, the following conclusion was reached: "energy is only a means to an end. The end is good health, high living standards, a sustainable economy and a clean environment. No form of energy — coal, solar, nuclear, wind or any other — is inherently good or bad, and each is only valuable in as far as it can deliver this end." (IAEA 2005) The statement shows how global strategists do not regard the issue of renewable energy strictly from an environmental perspective, an approach specific to some ecologists, but in a holistic view that includes social, environmental and economic factors. This procedure is also observed in the field of ecological economics.

The current section of the paper will provide a comparative analysis of investment, generation and externality costs for various electrical energy sources.

Firstly, the investment cost of the various technologies will be analyzed. The comparison is illustrated in the graph (figure 1). The lowest points are specific for investments in large developing countries, while the top ones are specific to difficult site conditions. However, most projects will have an investment cost close to the median point.

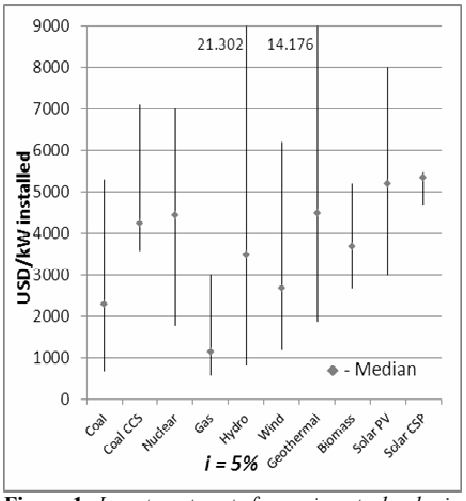

Figure 1: *Investment costs for various technologies considering a 5% discount rate*
Source: Adapted from Rogner, Holger H. 2010. "Nuclear Power and Sustainable Development". *Journal of International Affairs* 1 (64): 141

As can be seen in the graph, investments in fossil fuel generation incur much lower costs than most "green" technologies. Wind is the renewable with the lowest investment cost, while solar is the most expensive. Considering the relatively low rate of return specific to the energy sector, traditional thermal technologies will clearly attract more investors than renewables.

The next component to be analyzed is the so called "generating cost" (GC). This can be paralleled with the "production cost" specific to other industries and includes the following components: additional investments, operation and maintenance (O&M), fuel and decommissioning. In the energy sector, GCs are generally considered more important than investment costs due to the long operation lifetime of projects. Figure 2 illustrates the share of each cost component within the GC, while figure 3 shows the absolute values for the different technologies.

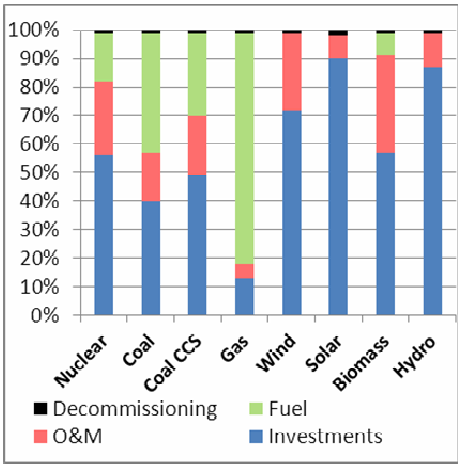

Figure 2: Cost *components of generating costs*
Source: Adapted from Rogner, Holger H. 2010. "Nuclear Power and Sustainable Development". *Journal of International Affairs* 1 (64): 142

Figure 2 shows that fuel costs represent between 40% - 80% of generating costs of conventional thermal units, while in the case of most renewables, there are no such expenditures. The implication of the expense structure is that long term uncertainty regarding generation costs is a key disadvantage for traditional thermal technologies, especially in the context of the fluctuations in oil and gas prices seen throughout the last decade. In the case of renewables however, the expense structure represents a key advantage, as investments and O&M are, generally, the only relevant cost components and they are clearly more predictable than fossil fuel prices.

Figure 3 shows that the generating costs for renewables are generally much higher than those of conventional thermal and nuclear energy. Depending on the country and the site conditions, wind and biomass

are the most attractive "green" technologies, while solar has the highest GCs. This means that, even though the costs are hard to predict in the long term, conventional thermal generation based on fossil fuels will likely be more attractive for investors until the GCs of renewables are reduced through technological refinement.

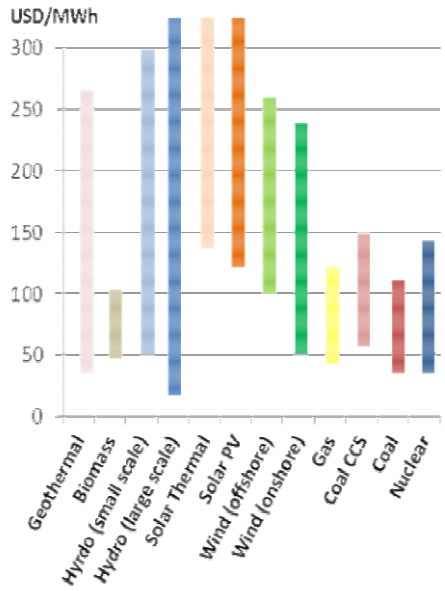

Figure 3: *Absolute values for generating costs*
Source: Adapted from Rogner, Holger H. 2010. "Nuclear Power and Sustainable Development". *Journal of International Affairs* 1 (64): 144

The final cost category that needs to be discussed – externalities or external costs – is also the most difficult to assess, but it does seem to tip the balance in favor of renewables. The external costs of electricity generation result mainly from damage to the environment and the degradation of human health. They do not affect energy producers directly, but are supported by the community and the government. Providing estimates of these costs is difficult due to the constant evolution of technology, the geographical spread of the measurements and the different methodologies used in collecting and analyzing data. However, the European Commission performed and published a study of external costs of electricity generation and transport in 2003. The findings that are of most relevance for the current analysis are illustrated in figure 4.

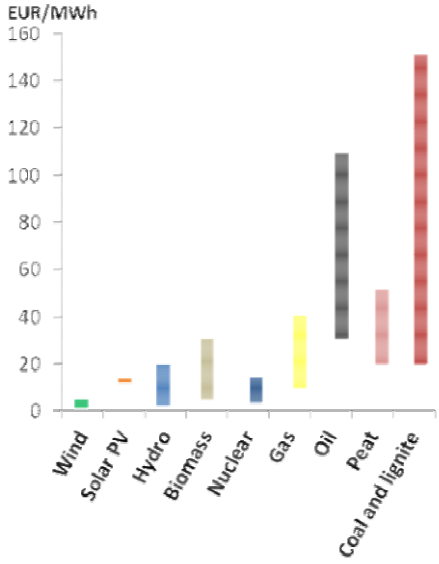

Figure 4: *External costs of electricity generation*
Source: Adapted from European Commission. 2003. "External Costs: Research Results on Socio-Environmental Damages due to Electricity and Transport". *Europa*. http://ec.europa.eu/research/energy/pdf/externe_en.pdf

Figure 4 shows that the external costs of renewable and nuclear energy are considerably lower than those specific to traditional thermal units. If a methodology existed of imposing these costs directly on the production of electricity, it would dramatically change the competitiveness of renewables from a GC perspective e.g. onshore wind and biomass will have lower GCs than coal and gas.

When considering the three cost categories (investment, generating cost and external cost), fossil energy does have a clear competitive advantage over renewables. However, in a long term perspective, it is possible that, due to the

refinement of technology and the rising fuel prices, "green" energy will become more competitive and will attract a growing number of investors.

5. Conclusions and implications

The theoretical discussions and the research presented in section 3 suggests that it is possible for the renewables sector to continue its development even without the intervention of the government through hard regulations. Free market environmentalism makes a strong case for the use of clearly defined and freely transferrable propriety rights instead of the arbitrary subsidizing or taxation of certain technologies. In addition, other research presented above suggests that voluntary actions for protecting the environment and using green energy, even considering the higher cost, are intrinsic to a growing number of people, especially in developed countries. These individuals seem to prefer soft regulations and taking voluntary actions rather than the alternative of hard regulations.

However, these studies are neither extensive nor specific enough to provide sufficient evidence that the adoption of renewables would continue to grow in the absence of the various governmental support programs. Moreover, even the strongest advocate of this idea – Free Market Environmentalism – is not so much about markets as it is about institutions (Adler 2011). Clearly defined private propriety and the free transfer of propriety rights are indeed crucial institutions for the existence of a free market. However, they are not sufficient. In the absence of "complete information" (an ideal concept) and a functional centralized marketplace for transactions, the transfer of rights is simply a set of bilateral negotiations (Williams-Derry 2011), very different from a "free market".

Furthermore, the economic data shows that conventional thermal generation is still more attractive to investors both in terms of investment and generation costs. The implementation of a free-market model within the energy sector will likely deal a severe blow to the development of renewables.

A true free-market approach is currently not a viable option for supporting the continued development of "green" energy. There are two key requirements that needed to turn this vision into a reality. Firstly, further refinements of the technology are necessary. These would need to reduce the investment and generating costs or significantly increase efficiency. Secondly, the continued destabilization of fossil fuel prices would gradually reduce the cost advantages of conventional thermal technologies. Once met, these two conditions, would, in the long term, eliminate the need for government incentives for renewables.

As an opportunity for further research, the popular support for renewables, in spite of the additional costs to energy, need to be confirmed through more extensive and focused research. In addition, it would be interesting to observe how the economics of the renewables sector will change in the following years, considering the fast paced R&D and synergy projects seen within the industry.

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[i] As defined within the Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009, "<<energy from renewable sources>> means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases"