

Topic- Sustainable Energy: Renewable Energy and Energy Efficiency

More than Dollars and Cents: Why Renewable Energy has been Slow to Take-off in the Caribbean

Authors: David Ince and Harrie Vredenburg

Presenting Author Contact Information:

David Ince, PhD Candidate,

Haskayne School of Business, University of Calgary, 2500 University Drive N.W, Calgary AB, Canada T2N 1N4

Telephone: 403-809-3639

Fax: 403-282-0095

Email: david.ince@haskayne.ucalgary.ca

Additional Author Contact Information :

Harrie Vredenburg, PhD Suncor Energy Chair in Competitive Strategy and Sustainable Development

Haskayne School of Business, University of Calgary, 2500 University Drive N.W, Calgary AB,

Canada T2N 1N4

Telephone: 403-220-7450

Fax: 403-282-0095

Email: harrie.vredenburg@haskayne.ucalgary.ca

Introduction

Renewable energy has for many years been considered as part of the answer to the Caribbean's sustainability problems. The potential of these technologies to reduce overall carbon dioxide emissions and associated climate change impacts has been a significant driver. From an economic standpoint, use of indigenous renewable energy sources can reduce foreign exchange in many countries where petroleum products make up a sizeable proportion of imports. In terms of energy security, a more diverse energy supply will reduce the overall vulnerability of the sector. Of course, record high oil prices in 2008 reminded all that failure to develop renewable technologies could one day mean that energy could be simply unaffordable to segments of populations. On the other side of the coin the Caribbean is endowed with an abundant supply of renewable energy resources which include solar, wind, hydro and geothermal.

In recognition of the foregoing, there have been a number of initiatives in the Caribbean to promote the use of renewable energy but progress in implementing renewable energy projects has been limited. We consider the reasons for this in the paper.

Research Method

The data for this study was collected via analysis of government and electricity utility documents, participant observation and exploratory semi- structured interviews with electricity utility and government officials in three Caribbean states between June and July 2009.

Economic Factors

Economics is undoubtedly a barrier to renewable energy development. Technologies such as solar and wind require significant upfront investments to establish them. When compared to conventional diesel or natural gas generation adopted in the islands it is often significantly more expensive on a per kWh basis. This argument was made by a senior manager in one island utility. He emphasized in discussions that the issues related to renewable energy development are “all about money,” and added that economic incentives are what is needed for the industry to flourish. He further stated that ; *“The utility would have to justify, for example, why it would put in renewable energy generating plant at a cost of 40 cents per/kWh, when a conventional generation plant could produce energy for about 15 or 20 cents.”*

This senior manager went on to reveal that in 2008 the price of electricity reached over 35 cents/kWh when oil prices were at their highest. When questioned on whether there was any impetus to consider renewable energy sources at these prices, the manager responded with the following statement. *“The issue at that point relates to the regulatory scheme, where the utility is expected to account only for known and measurable changes relying to a large extent on historical prices or test years. The utility therefore will ultimately not be penalized if conventional fuels suddenly increase to unexpected levels.”*

This is an example where the institution in the form of the regulatory framework constrains the decision making even when the economics favour change. We discuss these institutional factors in more detail in the following sections.

Economics or Institutions- Insights from Management Theory

It is apparent that economics is a barrier to development but as illustrated in the example above, many barriers appear to be caused by organizational and institutional structures. These more tacit variables tend to be ignored or dismissed in designing energy programs or formulating policy. Institutions can be defined as the rules and norms that shape behavior (Hollingsworth, 2000); they may be formal or informal. Examples of formal institutions are legislation, regulations, education system and written policies. Informal institutions refer to less tangible aspects such as traditions, culture, societal attitudes and beliefs and effects of individual champions or entrepreneurs (Espinoza & Vredenburg, 2010).

Organizations become institutions through embracing organizational values which relate to the whole society (Selznick, 1957). Hollingsworth (2000) suggests that organizations shape institutions at the same time that institutions shape organizations. Di Maggio (1998) has expressed the view that organizations tend to have similar structures in similar environments and refers to this as institutional isomorphism. We can apply this model to the energy sector as utilities are subject to institutions which include government policies, structure of the sector, society perceptions and influential champions in different spheres. DiMaggio & Powell (1983) suggest that entities that conform to the constraints of institutional isomorphism are rewarded by enjoying increased legitimacy. It means that such agencies will garner greater support and acceptance from the society than the bodies that do not conform to surrounding institutions. Entities that attempt to defy the isomorphism, and break away from existing structures and norms, are known as institutional entrepreneurs (Garud, Hardy, & Maguire, 2007). In breaking existing institutions, such entrepreneurs need to form new ones in the process.

Unfortunately as an institutional entrepreneur sets up the conditions for innovation and institutional change, it suffers from reduced legitimacy in the existing institution. This sets up a conundrum, greater innovation often means reduced industry legitimacy. Elliott (2000) outlines the changes that are identified by this paradigm shift which is in itself a significant institutional change; upfront cost of installation takes on a greater importance than the running cost of production; decentralized production replaces more centralized generation and there is more of

an emphasis on cycles and systems and less on the conquer and plunder attitude that generally defines fossil fuel development.

A renewable energy proponent can be considered an institutional entrepreneur as he will need to confront many of the formal and informal institutions to implement projects. In seeking to break through these institutional barriers a considerable degree of legitimacy is lost. This effect may be part of the reason why many alternative fuels are generally not explored in the Caribbean as much as they could be. Regulatory systems that stipulate that decisions be based on known and measurable changes or historical prices confer a degree of institutional isomorphism on many Caribbean utilities. It is easier to justify a failure due to “unforeseen” conventional energy effects than to have a failure due to a new technology with less legitimacy in the system. Legitimacy would be lost if the utility moved away from its traditional mode of generating electricity.

Institutional isomorphism should not be seen as always a negative effect. It can promote the development of a sector through establishing standards and best practices and confers a stability on industry that is important for industry growth (Di Maggio, 1998). It generally leads to more efficiency, improved communication and facilitates trade. A renewable energy developer must therefore be able to balance the legitimacy obtained from being associated with existing institutions with the innovativeness to establish new institutions in the process around the new paradigm. An entrepreneur that is too far removed from existing institutions may lack the legitimacy to make meaningful change. Meanwhile, the entrepreneur that locks himself in too closely to existing institutions may find himself being constrained from making innovative decisions by institutional isomorphism.

Although existing institutions can restrict change, new institutions once formed can lead to rapid growth of an innovation. For example, Costa Rica and Denmark are cultures where there is an emphasis on the environment deep within the institutions (Espinoza & Vredenburg, 2010). To a considerable extent such culture is set by the government’s formal institutions and policies (Jacobs, 1994). The Costa Rica model is an interesting one for the Caribbean to follow since it has similarities to the region from a socio economic perspective and is also not dissimilar in terms of the natural resources at its disposal.

In countries such as Costa Rica the institutional isomorphism works as a facilitator rather than an inhibitor to environmental action. Renewable energy industries such as wind and solar are rewarded with legitimacy by responding to these institutional pressures. In these countries, it is not in a company's interest to seek to resist institutional isomorphism by not incorporating environmentally sound practices or technologies in business. It is therefore not surprising that renewable energy technologies have taken root in these jurisdictions (Espinoza & Vredenburg, 2010).

It seems prudent to investigate the institutional factors at work within the Caribbean, which direction there are going and how different countries are responding. In the following sections we take a look at some formal and informal institutions in the Caribbean.

Formal Institutions: Written Policies

One consequence of the Caribbean Renewable Energy Development Program (CREDP) is that many countries in the region are now developing written energy policies. Written policies are useful in setting direction and establishing institutions but if they are not focused on introducing some level of institutional change they may not facilitate a change of energy paradigm. For example, one of the policy statements in Jamaica's 1995 energy policy restated in the 2006 policy was to "*diversify the energy base and encourage the development of indigenous energy resources where economically viable and technically feasible* (Government of Jamaica, 2006)." Developing indigenous energy resources only when "economically viable" does not take into consideration that policies in themselves can play a part in increasing the economic viability of technologies which have sustainability advantages in the national context.

Policies if designed to address many aspects of economic development can at times produce a level of ambiguity that can also restrict change to new forms of energy sources. For example, the Barbados Draft National Energy Policy 2006 highlights the following inter alia in overall policy guidelines.

- *Reduced dependence on fossil fuels with more emphasis on renewable energy technologies as the primary energy sources.*

- *Increased exploration for oil and gas resources and usage of found resources in such a manner as to ensure at least 50% transfer of known reserves of fossil fuels to the next generation.*

The policy shows a commitment to reducing the dependence on fossil fuel while at the same time increasing research and development of fossil fuel resources. It is difficult without specifying priorities to arrive at a clear energy development path. Should the focus be on maximizing fossil fuel development or shifting the emphasis to renewable energy?

Informal Institutions

North (1990), Hollingsworth (2000) and Schotter (1981) consider that institutions and agencies evolve together with influence going in both directions. It is useful to reflect on the informal institutional effects in the Caribbean energy situation through this lens. Russo (2003) looks at social capital as an important aspect of the informal institution. He postulates that geographical concentration helps development as it strengthens social capital allowing people to communicate positive experiences relating to an innovation. Social capital can help in weeding out the “naysayers” in the community and therefore reduce potential resistance to projects at the onset. The other side of this argument is that social capital can also keep out new technology if internal social bonds are too tight (Granovetter, 1973; Rogers, 1962). Therefore, a network that can be a facilitator can also be a block in certain circumstances. Hollingsworth (2000) suggests that the more set an institution is, the harder it will be to bring in innovation. This can be a significant barrier to the adoption of emerging renewable technologies which have low legitimacy.

It is interesting to apply Russo’s analysis to Barbados’ development of renewable energy. Barbados has experienced success in the renewable energy industry with solar water heaters but has been less successful in developing other renewable technologies. One may wonder why this has happened if geographical concentration, as Russo suggests is a benefit to developing environmental innovation. Barbados is listed as the eighth most densely populated country in the world (worldatlas.com 2009). It may mean that the institutional network in high geographically concentrated area leads to one extreme or another. Projects therefore may tend to completely

work as in the solar water heaters or have significant barriers as in the wind development project being considered for Lamberts, St. Lucy.

A senior utility official in a Caribbean island described the phenomenon.

“People know what fossil fuel generation is like, they can drive up to one and see it, there is an element of uncertainty when it comes to wind. Also there is the fact that there was a turbine there in 1982 and the housing had kept some noise and it was inconvenient to some people living in the area.....writing something on paper is one thing, there is nothing like seeing something operating and being able to touch and feel. That fear that is there is difficult to overcome.”

Word of mouth may be as effective as spreading negative messages as it is in spreading positive ones. In the case of the solar water heater, early positive experiences were communicated to friends and family members even as financial incentives were present (Ince, 1999). In the case of wind, bad experiences or memories of the old technology have caused influential members of the community to rally others in protest of the development. In Barbados the geographical concentration and close familial ties may have basically led to an amplification of effects.

Institutions and Impacts on Innovation

The negative influence of institutional structures that are too rigid are addressed by writers such as Hollingsworth (2000) and Rogers (1962). These writers suggest that rigid institutional structures do not foster innovation. Given these arguments, it may be useful to investigate whether benefits in the energy sector can be gained from changing existing institutional structures more regularly or having a more dynamic and fluid formal institutions. This change may not be necessarily undertaken with efficiency considerations at the forefront but to develop an environment more beneficial to innovation, reducing chances of institutional lock-in (Pool, 1997). Changes may be needed simply to make sure that modes of thinking within organizations do not become stagnant (Hollingsworth, 2000).

Hollingsworth (2000) suggests that one of the reasons that USA is an innovative society is because they tend to have more of a “hire and fire” policy. Employees tend not to have long term security. The Caribbean tends not to have this type of policy. One other constraint that can work against innovation is an over commitment to history, following the path of what has

worked in the past (Hollingsworth, 2000; Pool, 1997; Rogers, 1962). In Barbados it will be tempting to look at the solar water heating technology and try to use strategy similar for other technologies, but this may not be appropriate.

Institutional Implications for the Caribbean

In the Caribbean there has been a considerable effort put in to institutional development of the energy sector in a way that promotes renewable energy. This can be seen in the resources being put towards formal policies and legislation to direct development of renewable energy technologies. This may however not be the best approach given the discussions above. The Caribbean energy sector may be better served focusing on institutional change rather than institutional development. It might be that formalizing the institutions more is not what is needed, more structure may not be the answer. Granovetter (1973) points out that the more intricately linked the sectors the less choices the actors have to devise new institutional arrangements while if the sectors are too isolated they may be too weak to bring change.

One of the risks in the current processes in the Caribbean is institutionalizing a structure which is not desirable. Considering the effect of institutional isomorphism which suggests that institutions in industries tend to form similar structures, unwanted institutional arrangements could be difficult to change (Di Maggio, 1998). A senior economist involved in energy policy in the ministry of energy in one territory spoke to this issue.

“Policies here generally tend to be done ad hoc. Minister wants solution, minister gets solution. Swiftiness is built in with this approach to government policy but if you move quickly you might not have thought things through.”

What may be needed is a process where the exact structure needed is determined before it is “solidified.” A bad structure may actually be worse than no structure. There are situations where it may be better to leave something unstructured rather than structure it too early. An inappropriate structure means at some later date it is necessary to go through the two steps; breaking down the existing structure and setting up something different. A senior representative from OECS reiterated with the following comment *“Nevis for example, appears to have benefitted from waiting until activities in the geothermal are imminent to structure its strategy and policy accordingly.”*

In promoting sustainable development there is literature which suggests that domain approaches are better due to the multidisciplinary nature of the relationships that need to be addressed (Trist, 1983; Westley & Vredenburg, 1997). In renewable energy the change from fossil fuel is a paradigm shift and therefore current relationships and networks may not be appropriate as relationships between stakeholders involved will undoubtedly change (Wittneben, Okereke, Banerjee, & Levy, 2009). In renewable energy development different institutional structures may be needed because different aspects are important in renewable technologies and goals such as reduction of climate change impacts and sustainable development will require new modes of operation and communication.

Important in dealing with sustainability is to recognize that there is a potential conflict of paradigms and organizations may have such conflicting paradigms within their objectives (Hollingsworth, 2000). This may lead to ambiguity and more contradictions within organizations (Field, 1984). Often the stronger paradigm wins, which usually means the economic short term commercial desires outscore longer term environmental goals.

Many policies, for example have as objectives development of both renewable and fossil fuel technology as much as possible (Energy Policy Committee, 2007). However sustainability will be aided by increasing the share of renewable energy in the mix rather than by increasing the amount of development of renewable energy in absolute terms. A doubling of oil production and a doubling of renewable energy production at the same time will achieve nothing with regards to increasing sustainability of the fuel source. The only way to increase the sustainability of the fuel source is to remove or reduce the institutional protection surrounding oil and gas and increase the institutional systems that protect renewable energy (Mallon, 2006). This may mean governments have to consider not developing the conventional fuels to the fullest extent possible and make the bold decision to make developing renewable energy sources their priority.

REFERENCES

Di Maggio, P. (1998). *Interest and Agency in Institutional Theory, Institutional Patterns and Organization*: Cambridge

DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2), 147-160.

Elliott, D. (2000). Renewable Energy and Sustainable Futures. *Futures*, 32, 261-274.

- Energy Policy Committee. (2007). *Barbados National Energy Policy- Draft*.
- Espinoza, J. L., & Vredenburg, H. (2010). The Development of Renewable Energy Industries in Emerging Economies: the role of economic, institutional and socio cultural contexts in Latin America. *International Journal of Economics and Business Research*, 2(3-4), 245-270.
- Field, A. J. (1984). Microeconomics, Norms, and Rationality. *Economic Development and Cultural Change*, 32(4), 683.
- Garud, R., Hardy, C., & Maguire, S. (2007). Institutional entrepreneurship as embedded agency: an introduction to the special issue. *Organisation Studies*, 28(7), 957-969.
- Government of Jamaica. (2006). *Green Paper: The Jamaica Energy Policy 2006-2020*.
- Granovetter, M. S. (1973). The Strength of Weak Ties. *American Journal of Sociology*, 78(6), 1360-1380.
- Hollingsworth, J. R. (2000). Doing Institutional Analysis: Implications for the study of Innovation. *Review of International Political Economy*, 7(4), 595-644.
- Ince, D. (1999). *The Solar Water Heating Industry and Other Renewable Technologies in Barbados*. Paper presented at the Global Renewable Energy Islands Conference.
- Jacobs, J. (1994). *Systems of survival : a dialogue on the moral foundations of commerce and politics* (1st Vintage Books ed.). New York: Vintage Books.
- Mallon, K. (2006). *Renewable Energy Policy and Politics : A Handbook for Decision Making*. London: Earthscan.
- North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge, UK: University of Cambridge Press.
- Pool, R. (1997). *Beyond Engineering: How Society Shapes Technology*. New York, Oxford: Oxford University Press.
- Rogers, E. (1962). *Diffusion of Innovations*. New York: The Free Press.
- Russo, M. (2003). The Emergence of Sustainable Industries: Building on Natural Capital. *Strategic Management Journal*, 317-331.
- Schotter, A. (1981). *The economic theory of social institutions*. Cambridge [Eng.] ; New York: Cambridge University Press.
- Selznick, P. (1957). *Leadership in Administration*. New York: Harper & Row.
- Trist, E. (1983). Referent Organizations and the Development of Interorganizational Domains. *Human Relations*, 36(269-284).
- Westley, F., & Vredenburg, H. (1997). Interorganizational Collaboration and the Preservation of Global Diversity. *Organisation Science*, 8(4), 381-403.

Wittneben, B., Okereke, C., Banerjee, B., & Levy, D. (2009). 'Climate Change and the Emergence of New Organizational Landscapes'. *Organization Studies*, 30(7), 813-815.

worldatlas.com (2009). Countries of the World by Highest Population Density. from <http://www.worldatlas.com/aatlas/populations/ctydensityh.htm>