

Dalya GUÉRIN

[dalya.guerin@malix.univ-paris1.fr](mailto:dalya.guerin@malix.univ-paris1.fr)

0033 (0)1 55 79 08 119

0033 (0)6 30 82 81 18

Post-Graduate Student

Université Paris 1 Panthéon-Sorbonne

Agence de l'Environnement

et de Maîtrise de l'Energie (ADEME)

University of Aberdeen

## **British and French environmental approach of energy technologies: renewable energy plants and nuclear power plants dealing with their environment**

*“Entre la nature toujours identique à elle-même dans l'espèce humaine, et les arrangements que peuvent lui faire subir les facultés de complément, c'est bien une attitude politique à la fois ouverte sur de multiples stratégies (mais toutes légitimes eu égard à la naturalité de ces facultés) et repliée sur sa propre nature, bien que celle-ci soit souvent inapparente sous les arrangements qu'elle a subis”<sup>1</sup>(Sfez, 323)*

### **Introduction**

Environmental protection is one of the main targets of France's energy policy. This attention can be noticed with the Livre Blanc sur les énergies<sup>2</sup> in 2003 or with the organization of a National Debate on Energy the same year. The International Energy Agency stressed in its review *Energy Policies of IEA Countries*<sup>3</sup> on France the fundamental link between energy and environment. It is said *“it is important that France's energy policy developments seeks to achieve the environmentally sustainable provision and use of energy. This means seeking to minimise the adverse environmental impacts of energy activities. In the French context, this largely means reducing GHG emissions from the production and use of energy to mitigate climate change risks, and in parallel, managing appropriately the risks associated with nuclear energy to avoid negative impacts on the environment.”*<sup>4</sup> In the 2002 issue on the UK<sup>5</sup>, the IEA reported on the British energy situation that *“The government's policy is to stimulate the development of renewable and sustainable energy technologies where they have the prospect of being economically beneficial and environmentally attractive.”*<sup>6</sup> But one of the main drawbacks to this development lies in the limits of the electrical grid. *“A number of initiatives address concerns that technical, commercial and regulatory issues in the UK electricity network could compromise the achievement of the government's target for generation from renewable energy sources and CHP.”*<sup>7</sup>

The intent of my proposal is to analyse the environmental approach of energy technologies in the United Kingdom and in France in comparing renewable energy plants with nuclear power plants. My method is a “bottom up” one, which does mean I began first to meet experts and influent characters of my both fieldworks before to interview people who have launched from the top some global policies trends in

---

<sup>1</sup> *“Between the nature, always the same in the human specie, and the arrangements which are felt under complementary abilities, it is really a political attitude meanwhile opened to multiple strategies (but all legitimate regarding the natural character of these abilities) and folded down on its own nature, despite this one appears unobvious under the arrangements the nature has felt under.”* Lucien Sfez, *Technique et Idéologie, Un enjeu de pouvoir*, Ed. Seuil, 2002, p.118.

<sup>2</sup> Ministère délégué à l'industrie, *Livre Blanc sur les énergies*, 7 novembre 2003

<http://www.industrie.gouv.fr/energie/politiqu/pdf/livre-blanc-integral.pdf>

<sup>3</sup> International Energy Agency, *Energy Policies of IEA Countries, France*, Review, OECD, 2004.

<sup>4</sup> Ibid

<sup>5</sup> International Energy Agency, *Energy Policies of IEA Countries, The United Kingdom*, Review, OECD, 2002.

<sup>6</sup> Ibid

<sup>7</sup> Ibid

favour of environment in the energy sector. My research is based on interviews of different experts and the “key” actors (as local advisers, owner of the field where the wave power station where built, director of the greenhouse receiving water from its nuclear neighbour) who have been witness and/or participants of the different case studies of energy system.

What implied the comparison on theoretical level: Who or what can be compared? How can we compare? What limits does my comparison have met? I would remind what Durkheim was telling about the comparative method in its chapter 6 “Rules for the Demonstration of Sociological Proof”(Durkheim 1964, 146) *“We have only one way to demonstrate that a given phenomenon, viz., the cause of another is to compare the cases in which they are simultaneously present or absent, to see if the variations they present in these different combinations of circumstances indicate that one depends on the other [...] the method employed is that of indirect experiment, or the comparative method.”*<sup>8</sup> To the question of who or what can be compared and how, I would reply that my cases studies are reflecting an inversed situation as the first one is an energy system dedicated to the protection of environment but which has to deal in a second time with some technological obstacles, and the second one are two energy systems constituting one of the main technological progress of the western societies but which has to deal with environmental enmities. My choice of these both fieldworks for the comparison is partly inspired by the comparative approach of Przeworski and Teune (Przeworski and Teune 1982, 153) in the selection of the “Most Different” cases. Renewables and nuclear energy have to deal with their environment but their expert have to face this challenge in different social posture depending on energy context on national and local level. Characteristics and specificities of both types of technology will be reminded for explaining the context of studied cases. But my posture toward the assessing of energy policy as not only a matter of global political trends subordinate to market and institutional structure are referring to ideas found in writings of Winner for example. *“Energy policy is perceived as a political process, even when it does not take place in the arena of formal politics (Winner, 1982). The core argument of this perspective is that energy policy choice is constrained by existing institutional structures and political traditions. As a result, energy systems having characteristics that do not match the prevailing institutional and political frameworks are difficult to establish and face serious challenges in their growth. The implication such arguments have for policy making is that energy choices which depart substantially from the status quo may require extensive social change if they are to be successful”.*(Hadjilambrinos 2000, 1111) And this point makes more sense when it implies the attention to the environment, because this necessary social change is more obvious. My posture is the refusal of an opposition between ecology and technological modernity which is in most of the case a sterile opposition to understand social concerns of the science and the technology. I am more likely to think there is a new hybrid vision of intermingled *nature-culture*. (Bess )

To present shortly my both fieldwork, I would focus on the technological and environmental aspect of studied cases. In France, my work concerns two nuclear sites, belonging to EDF (Electricité de France), the national electricity utility and the majority owner and operator of all the commercial nuclear power plants in France. Since 1989, the nuclear power plant of Bugey has provided tepid water to greenhouses, located near the site. These greenhouses belong to the Roozen company specialized in horticulture. These greenhouses are connected to manufacturing units of the nuclear power station. These units deliver the water of the river the Rhone to the greenhouses after its passage in the condenser. The condenser is an independent circuit of the nuclear part ensuring the condensation of the vapor. For Roozen, this tepid water is an energy saving averaged 20% per annum of the propane consumption. Since 1991, the nuclear power plant of Chooz has a partnership with Symbiose, a conservation association of nature. There are now several events thanks to this partnership taking place each year since 1997, like grubbing of land, deforestation or birds ringing... The headlight action is the creation of a playful and teaching walk called the “path of the otter” on 3,5km and includes a 20 hectares area with a rare and protected fauna and flora. You should find there otters, beavers, peregrine falcons or fishing eagles. Indeed all around the nuclear site, there are no dwellings or infrastructures of leisure for example. For the association, bio-diversity of the site is exceptional. The nuclear power plant of Chooz gives around 15 000euros per annum for installation, maintenance and organization of different conservative activities.

---

<sup>8</sup> Ibid

In the United Kingdom, my fieldwork was on a renewable energy, a wave power plant. Since December 2000, the wave power station of energy Limpet (Land Installed Marine Powered Energy Transformer) works on Islay, one of the Scottish western isles. This wave power station is the first system of energy production by wave in the world being connected to a national electricity grid, that of the United Kingdom. It is the first wave power station which is commercially exploited too. Designed and manufactured by the company Wavegen and by Queen's University from Belfast. The European Union also subsidized the project. Previously a smaller device at the beginning of the nineties was tested by Queen's University and for producing 75 kilowatts of electricity. For Limpet, the target was to produce 500 kilowatts to provide approximately electricity for 400 houses. Actually the production is today only to an average of 10 to 15% of the forecasted aim. Inhabitants of the island have very welcomed this wave power station in comparison with a former project of wind farm implementation, which caused a lot of polemics few years before. But the power plant meets now its technical limits as the cable connecting Islay to the national network cannot support other connections.

Both fieldworks are as opposed as possible because a study of an environmental approach in renewable context and in nuclear one can highlight representations of the nature and the technique of British and French experts. This paper explores these representations to understand to what extent it implies political concerns in the energy sector. I would try to bring some elements of answers to the following questions. Can we consider that the difference of trainings between British and French engineers play a part in their representation of the nature and the technique? To what extent do these representations take place in the implementation and the management of the case studies? Which place occupies the expert in the political game which governs these "sustainable" aspects of these energy systems, from a renewable type (wave energy for the United Kingdom) or from a nuclear one (tepid water supplying to greenhouses located near the power station of Bugey or the aid brought for reintroduction of the otter by the power station of Chooz)? What influences have these projects on the representations of the experts? Does a study of these representations on a local level (which makes it possible to circumscribe at least with a place and a given project the shape of these representations) make it easy to mark the part of common sense in their scientific representations?

- First, I would try to identify some common views of the technology which can lead to different vision of the relation between representations of the nature and the technology, for asking then how much scientific and political concerns are underlying the environmental approach in both fieldwork.

# 1. Common views of technology can be identified in spite of differences between energy sources.

## *1.1. The “experience” value for engineers and the concept of “mature technology” are recurring references in the discourses of main actors concerned by these technologies.*

One of my first assumption was “In the representations of the experts, is there a common vision of a technique supporting the economic development and two visions of nature, a French one of a nature to be arranged and a British one of nature to be protected?” But in my work, I faced rather to two main visions of the technique than one common.

The first one is based on the value experience. It appeared in many talks in the UK but it seems not being limited to the field of renewable energies. The interviewed people were referring to experience for other matters than the wave power station. For example, the Wavegen project manager of explained that when he was working in the oil sector, knowledge and experience were already acquired, and there was no room for discovery of new processes, no room for experiment. An ADEME engineer feels the same but on a different matter. He was speaking on reduction of the GHG. For him, the ADEME experts get plenty of ideas which only waited to be able to be tested. As far as I’m concerned, my hypothesis is that this importance of experience may be related to the background of a majority of energy experts. For example Colin Divall<sup>9</sup> argued how debates between academics, engineers and industrialists had built different options on the question “what an engineer must know?” *In fine* this includes which representations of technique future mechanical or electrical engineers would have in their work. The point lies in the part given to experiment and/or to fundamental research in the training of the future engineers. If their training gives the priority to experience, we can wonder consequently about the influence over these future energy experts of an exposure to less scientific and more industrial representations of the technique and the nature. As industrial representations are dealing mainly with economic stakes, common sense representations of the technique and the nature do matter for example very much in the industrial area. They have to get acceptable their behaviour and representation for the consumers. Having obligatory internship means a lot in the construction of the future energy experts’ representation. My assumption is that this practical time in the training is one of the evidence of the connection between scientific representations, industrial representations and common representations. The contact points between laymen, industrialists and scientists are for me the origin of the superimposition of various types of representation of the technique and of the nature.

The second vision is that of a “mature” technology, who thus presupposes the idea of technical progress. I noticed this vision of the technique in both countries but it looked like deeper in the United Kingdom. A shade can be introduced between the both countries because the immaturity of renewable technologies is portrayed more as a temporary excuse to carry on nuclear policy in the United Kingdom and more as a sense reason to justify nuclear option in France. We could almost introduce a third kind of representation of the technique. I observed this representation in motion, I mean through the practice of energy experts. I called it “technicist” technique. This technique appeared paradoxically on a “hyper-communicating” mode. My interviews are full of technical data, of schemes, of statistic, of test results, as the project can be summarized in numbers and figures. But certain actors transcended this representation of the technique as a procedure. Thus of the professor of civil engineering of Belfast, who led many marine energy projects in the United Kingdom. He preferred to praise the virtues of a marine energy market rather than to overspeak of technical matters. For him, this market is promising without any doubt and will reach the profitableness criteria of one day. Its vision of the technique does not belong to this third “pseudo-category”. Another interviewed expert transcended this kind of representation of technique. He was not a scientific or an engineer, but the communication director of the Chooz nuclear site, with a background in human science. He may have searched to appear more legitimate in his talk in referring to technical matters, but he chose to give me a global vision of the project, where the local level has achieved

<sup>9</sup> Colin DIVALL, « Professional Organisation, Employers and the Education of Engineers for Management: a comparison of Mechanical, Electrical and Chemical Engineers in Britain », *Minerva*, vol.32, 1994.

some of the environmental targets thanks to the economic power of the nuclear industry (here the preservation of biodiversity).

One of my conclusions is that there is a tension between a built scientific value of the experience and a very immediate political and social value of the experiment. Representations of the nature and the technique mark with the wave power station on Islay a transition from a promotional speech for technology to a speech on an experimental value of the project. Debates on the interpretation of the experiments prevent not only economic but political stakes which are crucial for the inhabitants and the concerned energy companies (renewable or nuclear). National level also is interested in legitimating interpretations of the local energy experiments. Interpretation of the experiment of the wave energy results according on an economic and social level (the power station generates only 15 to 20% of what was announced at first and did not create any sustainable local job) and not on a scientist level would have been illegitimated and devastating in relation to assess efficient uses of government funds.

### ***1.2. Visions of technology play a part in the choice of the environmental approach.***

The first main vision of the technique I found is based on the representations of the technique and the nature of the energy experts crossed by an ideology of a technique using nature for the society. In a paper on the relationship between conservation and the scientific idea of nature in the conservation association, Adams reminds, following Katz and Kirby<sup>10</sup>, this paradoxical domination of human on nature in the discourses of conservationists. *“Human power over nature, and the propensity to plunder, are the fruit of rationalization. There is a potential conflict in a conservation based on ideas of nature and practices of engagement with nature that are driven by the same rationalist project that has generated the damage that conservationists wish to oppose”*. In my research, I met this tension several times. For example, an engineer from the New and Renewable Energies Centre (Newcastle) showed me a video of the world situation on renewable energies and more particularly on wave energy. He insisted oftentimes on the amazing unexploited potential of the energy produced by waves on earth. Nature, here oceans and streams, constitutes in its representation an available energy. This “available” energy would be to his point of view a wasted energy if the technique was not playing its part. It is besides what he implies when he indicates there are few projects compared to potentialities for this kind of renewable energy. Its representation of the technique is based on a feeding vision of the nature, and companies must take advantage of this technology. Another example of this ideology of the technique using nature comes from one of the expert from Bugey. This one explained me why if water were not distributed to this horticulture company, it would have been unused. In serving nature (exotic plants of the greenhouses of the Roozen company) whereas there were no obligation, the nuclear site opens up in fact a privileged relation with its surrounding promoting its close attention to environment. Even if we have with this case an industrial partnership, the representation of nature is an useful one you can serve too. There is a kind of exchange; you give in return for something you received. Nuclear power plant provides water to exotic plants; greenhouse reflects a green ethic of the nuclear site. The feeding vision of nature is found here but under a symbolic system plan and either simply “energy”. A decision of 1998 from the Chooz power station lies in the same kind of idea. It was a matter of widening the platform of one of the cooling chimney. The aim was to support the return of peregrine falcon. This bird has reappeared and was using the chimney as a nest.

The second main vision of technology influencing the environment approach is an aesthetic technology. This is a technology taking into account the landscape in which the energy site is located. I found this representation several times in my fieldworks. On Islay, in an interview of the journalist of the local newspaper, I first noticed this remark on the aesthetic dimension the technology was supposed to have. He was mentioning the debate over the wind farm project taking place some years ago before the Limpet project. One of the main matters he was remembering was the misunderstood between all the participants on the beauty of wind farm technology. It was not depending necessarily on the direct daily

---

<sup>10</sup> Katz C and Kirby A, 1991, In the nature of things : the environment and everyday life, *Transactions of the Institute of British Geographers* 16 259-71.

visual impact wind farm would have on them, but of the conjunction of several datum. Some of inhabitants found the technology unacceptable for the scenery, for the birds, for the industrial stakes coming on the isle promising economic improvements, but following as a matter of fact global economic interests from the mainland with no true new jobs for the inhabitants...Others were proud to see their isle becoming one of the alive sign of the green technological progress and thought they could take advantage from their natural energy resources. In my various sources, I found that this aesthetic aspect appeared as translated in a scientific form. For example, one of the technical reports on Islay reminds the caution taken by Wavegen to the noise<sup>11</sup> and to the invisibility of the device from the isle. *“Whilst all power generation technologies have an environmental impact it is increasingly recognizes that shoreline wave energy is amongst the most benign of all methods of power generation. By virtue of its placement the generating plant has a low visual intrusion and minimal impact on local flora and fauna. This minimal disturbance is a result of the structure replicating existing natural phenomena rather than imposing an alien culture on the locality. The low environmental impact was further demonstrated by the QUB 75kw prototype that was recently successfully decommissioned, returning the site to nature.”*<sup>12</sup>

---

<sup>11</sup> “The operational experience of QUB on the 75kw prototype unit had highlighte noise as a factor to be considered in the design of the turbo generation equipment. The approach taken with LIMPET was to construct the unit in a secure housing, but without any specific acoustic treatment, to measure the noise output of the plant and then to retrofit attenuation.” in “Research into the further development of the Limpet shoreline wave energy plant”, Wavegen, ETSU V/06/00183/REP, 2002, <http://www.wavegen.co.uk/pdf/devlimpetshoreline.pdf>

<sup>12</sup> "Islay LIMPET Wave Power Plant," The Queen's University of Belfast. JOR3-CT98-0312, 2002, <http://www.wavegen.co.uk/pdf/LIMPET%20publishable%20report.pdf>

## **2. Experts translate European and national policies to the local level depending not only on their background or their culture, but also according to the way they think that inhabitants are going to understand this technology.**

### ***2.1 Environmental approaches are therefore in part the result of a symbolical negotiation leading not to a consensual view but to a federalist view of the environment.***

I would remind the report from the Alliance for global sustainability on status of engineering education for sustainable development in European higher education in 2006.<sup>13</sup> The stress is on the concept of re-engineering the engineers; *“modern engineers must have a holistic approach and be the agents of change for sustainable global development [...] Modern engineers must have a holistic approach, so they can not only use their expertise in a scientific or technological context but are also sensitive to social, environmental and political needs. The best technical solution of a challenge is not always the one most acceptable to society. Therefore engineers must also be skilled communicators, able to translate challenge and possible solutions between society and science.”*<sup>14</sup> The focus on the global approach means a lot in the case of our comparison. Indeed, I interviewed two kinds of experts. The first kind came from British or French universities in which environmental concerns are not taught through general courses of philosophy or history of science for instance, but through an implicit set of questions and application cases about the natural and physical rules. And all these ways to understand natural rules are inherited from construction of physics, biology and other fields of the knowledge during past centuries. And the second type of experts has had a more explicit knowledge of the stakes on the question of the technology and the nature. It may be true courses of epistemology of science or practical courses on how to deal with the environmental questions when you are managing a project. It introduces a shade because some of them would have really understood what representation of the world would be at stake during their careers. And some others would just think of natural and technological matter as a couple of instructions to success in their future jobs. The training aspect is essential as it can help to assess the degree of beliefs and of awareness of environmental and technological stakes. In some cases, the lack of theoretical background gets easier to develop a more systematic and utilitarian view of the nature. The bio-physics engineer in charge of the partnership between the nuclear site and the greenhouse was having a vision of the nature in which environmental obligations were one of the different matters that a nuclear site has to face. More personal and emotional representations of the nature at the opposite were remarkable in my interview of the communication director with a background in human science and of the project manager, doctor in Mechanical Engineering who told me at lunch about its interest in landscape and nature...

There are consequently more than two representations of the nature and in each of the both countries. But the mixture of these representations gets their reading quite uneasy. Its success is depending on what stake are underlying at the moment and at the place of the expertise. For example, the experts of the power station of Islay were dealing with different kind of representations according to the projects (wind farm or wave power plant) and even according to the moments inside its projects. It may be successively or meanwhile a destroying nature, a fragile nature, a Feeding Mother Earth or Sea, an unforeseeable nature or an astute nature.

---

<sup>13</sup> The Alliance for Global Sustainability, *Status of engineering education for sustainable development in European higher education*, The Observatory, 2006.

<sup>14</sup> Jeroen van de Veer, Chief Executive, Royal Dutch Shell in *ibid.*

**2.2. As a result of this conclusion, a confrontation of the different environmental approaches with political concerns brings some proofs of explanation of a more environmental federalist approach than a consensual one.**

This federalist approach is more a temporal one in the UK and a spatial one in France. In the UK, the environment was portrayed at different time of the project by the experts as a beautiful island, as an island with wave energy potential, as an island with inhabitants with a “green” consciousness, as they were very much in favor of Renewable, as they need new kind of energy and a cheaper energy, as the wave project was likely to bring some jobs for the population... Stories on the environment are to the heart of the project where different chronologies are meeting. The federalist approach in France is a more spatial one as interviews emphasized the idea of distinct scales supporting the environment with different kind of attention. The federalist view of the environment is in France a way to legitimate various representations of the nature and the technology depending on the level on the place you are appreciating its importance. But in the UK, the environment is more described with different representations of the technique and the nature depending on the time you want to speak about (before, during or after the projects).

The analysis of the representations of energy experts shows a kind of tearing between the ideology of a “consumer society of mass” and an utopian expectation to autogestion, to a return to a self-managed society. This kind of tearing has been highlighted for the western isles in wind farm projects<sup>15</sup>. *“There is a long history of symbolic and economic exploitation of rural areas by urban centres. Rural areas have been the source of raw material finished elsewhere, they have provided food appropriated by culinary codes established in urban localities for the glorification of these power centres, and they have been invented thus circumscribed as the location of the nation through the ages of globalisation. We suggest that the wind farm debates in our study area must be seen in this context.”*<sup>16</sup> In the French example, the “green” policy of the studied nuclear sites is designed for reenchanting a scary technology with its support to nature. In the British example, the cost of to provide energy to the remote areas of Scotland is a problem. The project Limpet is supposed to be one of the solutions. In the analyzed discourses, the energy project was portrayed as an answer to the limits of the electrical grids during public meetings but when technical and commercial difficulties grows, experimental and “high-tech” aspects of the device was more highlighted. The interviewed experts however explained that this type of plant was at last not standardizable, i.e. each device would be subjected to too many obstacles depending on the conjunction. Geographical differences of coasts, number of power stations which would be necessary to install to answer the exponential growth of the energy demand are concerning real political options. What I mean is the natural rules are less plastic, less malleable than the technologic ones. You can reproduce technologies as long as the conjunction of natural rules is allowing you to do so.

---

<sup>15</sup> Joe Lee and Arnar Árnason, “Wind farms and natures in rural development a Scottish Case study”, University of Aberdeen, 2003.

<sup>16</sup> Ibid

## Conclusion

To conclude I want to remind the consequence of the last point. Facing not a consensual approach but a federalist approach of environment implies two difficulties. The first one is the meeting point of the temporal and spatial axes of representation of technique and nature. Indeed we can wonder that if the French trend seems to be more spatial and the British one more temporal, the case studies are crossed by the both lines. And if a representation on the temporal line crosses its contradictory on the spatial one, it would turn into a conflict or a crisis, depending on how important is the stake supporting this representation and on the extent to which the protagonists could find an arrangement. The wind farm projects brings an example of crisis on Islay, as the representation of inhabitants were filled of reject of an industrial vision of renewable energy at the time of the public meetings with inhabitants, politics, associations and industrialists, and that is how the wind farm lobby introduced itself to the population and especially to the politicians for stimulating their support...

This aspect leads me to open the discussion on the influence of political concerns on the way whom these technologies are facing the environmental issue. In fact, some of my researches are progressing now towards this kind of questioning, as I am working on the assumption of the re-translation at a scientific level of common sense representations of the nature and the technique. My assumption would be a direct consequence of researches interested in civic science and democratization of scientific issues<sup>17</sup>. "*Civic science as democratization challenges the conduct of scientific problem solving by aspiring to transform the institutions of science to incorporate democratic principles. Proposals to increase representation and participation in science do not necessarily entail a transformation of scientific norms, methods and practices. However, the aim to democratize science is a more challenging issues that goes beyond the issue of stakeholder representation and participation. Can the rules of modern democracy be readily transferred to the heart of scientific inquiry without compromising scientific quality and politicizing scientific expertise?*"<sup>18</sup> My ambition would be to see how in my case studies I could find evidence of common sense in the representation of the experts, not necessarily as a compromise but more as a social rule in which scientific and common representations are superimposed and not exclusively used.

### *Indicative bibliography*

Bess, Michael. *The Light-Green Society Texte Imprimé Ecology and Technological Modernity in France, 1960-2000*. Chicago (Ill.) London: University of Chicago press, .

Durkheim, Émile. *The Rules of Sociological Method*. A Free Press Paperback. [Règles de la méthode sociologique.]. 8th , ed. New York: Free Press of Glencoe, 1964.

Hadjilambrinos, Constantine. "Understanding Technology Choice in Electricity Industries : A Comparative Study of France and Denmark." *Energy Policy* 28, (2000): 1111.

Przeworski, Adam and Henry Teune. *The Logic of Comparative Social Inquiry*. Malabar, Fla.: R.E. Krieger Pub. Co., 1982.

Sfez, Lucien. *Technique Et Idéologie Texte Imprimé Un Enjeu De Pouvoir*. La Couleur Des Idées. Paris: Éd. du Seuil, 2002.

---

<sup>17</sup> Bäckstrand Karin, Civic Science for Sustainability: Reframing the Role of Experts, Policy-Makers and Citizens in Environmental Governance, *Global Environmental Politics* , Volume 3, Number 4, November 2003, pp. 24-41

<sup>18</sup> Ibid