Strategic Fit of Energy Efficiency (Strategic and Cultural Dimensions of Energy-Efficiency Investments)

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Abstract
What are the drivers of businesses' energy-efficiency investments? Energy audits trying to promote, on a voluntary basis, energy-efficient technologies generally identify a significant energy-saving potential achievable in a cost-effective way. In addition, public support is often proposed in the form of subsidies, low-interest loans or fiscal deductions. Still, on average only 30-40 % of recommended energy-saving measures are implemented by companies on the demand side. Using neoclassical finance investment theory, energy economics fails to explain this situation.

In taking a different approach, management science decision-making research has shown that financial factors partially explain businesses' investments and has developed contingency models of decision-making: a decision is only one stage in a process influenced by individual, organizational and contextual factors and by the characteristics of the investment itself. These factors produce different decision-making situations.

Within this conceptual framework, our research tries to explain how and why firms act – or fail to act – on energy efficiency by testing three hypotheses: 1. the fact that energy-efficiency investments are often not perceived as strategic by the organizations is the main reason explaining negative decisions; 2. the cultural dimension of energy use partially explains why these investments are not perceived as strategic; 3. the level of energy management is an important driver of energy-efficiency investments decisions.

Undertaken in collaboration with the University of Geneva Business School (HEC) and the Geneva Energy Office Planning (SCanE), this research is based on interviews and questionnaires submitted to energy and finance managers of 70 major energy consumers participating in a free-of-charge audit campaign. Initial results, briefly presented in the third section of the paper, seem to confirm our hypotheses and open the way for a different approach to promoting energy efficiency and, more generally, to long-term market transformation, which is sketched in the conclusion.

Introduction
What are the drivers of businesses' energy-efficiency investments? No satisfactory or comprehensive answer has been given to this question until now. Energy economists have tried to explain investment decisions made by companies using neoclassical finance theoretical framework. They have concluded that the assumption of firms' optimal behaviour regarding energy-efficiency investments remains valid: when energy-saving investments are not undertaken by companies, this is because they are economically inefficient; in other words, not profitable. However, this analysis doesn't fully explain the (no-)decisions made by firms regarding energy-efficiency investments. Psycho-social research has investigated the behavioural and social aspects of energy use and the psychological barriers to an efficient use of energy. But it has focused on residential energy use by individuals and communities, giving little attention to organizational behaviour regarding energy use, or to individuals' and groups' energy behaviour within organisations (though

recent works have started filling this gap[1]). On the part of management sciences, no attention has been directed to energy-efficiency investments or, more generally, to energy and energy efficiency.

This brief survey of several perspectives - or absence of perspectives - on corporate energy-efficiency investments decisions highlights the need for a new theoretical framework to explain what drives firms' behaviour. The goal of the present paper is to propose such a framework. In this regard, we use management science decision-making research, which has shown that financial factors only partially explain businesses' investments: a decision is the result of a process influenced by interrelated individual, organizational and contextual factors and by the characteristics of the decision itself. These factors entail different decision-making processes and choices, which must be analysed using a processual/contextual approach, as explained in the first section of the paper.

Using this processual/contextual approach, we have built up a model of energy-efficiency investment decision-making, described in the second section of the paper, which shows numerous factors influencing companies' energy-efficiency investment decisions. Among these factors, we have identified the strategic and cultural dimensions of organizational energy use as the most important factors influencing energy-efficiency investment processes and choices, and we have formulated three hypotheses regarding the influence of these factors: 1. the fact that energy-efficiency investments are often not perceived as strategic by the organizations is the main reason explaining negative decisions; 2. the cultural dimension of energy use partially explains why these investments are not perceived as strategic; 3. the level of energy management is an important driver of investment decision

Undertaken in collaboration with University of Geneva Business School (HEC) and the Geneva Energy Office Planning (SCanE), our research, still on-going, is testing these hypotheses by means of interviews and questionnaires submitted to energy and finance managers of 70 major energy consumers participating in a free-of-charge audit campaign. The initial results of the research, briefly presented in the third section of the paper, seem to confirm our hypotheses. This opens the way for a different approach to promoting energy efficiency and, more generally, to long-term market transformation, which is sketched in the conclusion.

Decision-Making: Perspectives and Findings

NEO-CLASSICAL ECONOMICS ANALYSIS OF ENERGY-EFFICIENCY INVESTMENTS DECISIONS

The energy economics literature has been much occupied in the last few decades debating the question of why profitable energy-saving investments are not undertaken by businesses, as well as discussing the several barriers which could be responsible for this situation. The possible existence of cost-efficient energy savings challenges neo-classical economics theory by contesting, *ipso facto*, some of its founding assumptions: rationality of economic actors, goals of the firm, market efficiency. Energy economists, keen to reconcile organizations' real behaviour with economics theory, have studied investment decisions made by companies. Using neo-classical finance theoretical framework, they have concluded that the assumption of the firm's optimal behaviour regarding energy-efficiency investments remains valid: within the framework of admitted market failures (mainly imperfect information), barriers in fact reveal a behaviour 'indeed optimal from the point of view of energy users' (Jaffe & Stavins 1994:805). Imperfect information and bounded rationality augment the level of uncertainty and therefore the investment risk, which, added to its irreversibility, explains and justifies the high rate of return required by investors. In addition, certain hidden costs render the investment less profitable than it appears. Finally, the high level of risk and low real investment return lead to a negative decision and block access to capital. For a majority of economists[2], the cost-effective energy saving potential is not real: energy-saving investment would be energy-efficient but economically inefficient.

This answer is not satisfactory for three reasons: first, the estimated rate of return for certain projects is so high that none of the explanations provided can explain why potential investors reject them; second, the first step to reducing the energy gap is a simple adjustment of existing equipment, which is achievable at a negligible monetary cost; finally, it does not explain the differences in behaviour between similar firms operating in the same industry.

Energy economists have failed to explain businesses' energy-efficiency investment decisions, because traditional neo-classical finance is more prescriptive than descriptive, more interested in evaluation methods than in the reasons explaining why, in the real world, certain investment decisions are made. In order to go beyond its normative character and gain an explanatory validity, investment theory would have to demonstrate that its capital budgeting tools are actually used by the economic agents when making their investment decisions. But this is not the case: numerous studies on this issue have only shown a partial, or even secondary, influence of capital budgeting tools on investment decisions (Bower 1970; Butler *et al.*, 1993; Carr *et al.* 1998; Charreaux 2001; De Bodt & Bouquin 2001; Jensen 1993; Lu & Heard 1995; Mintzberg, Raisinghani & Theoret 1976; Pezet 2002; Segelod 1997; Van Cauwenbergh *et al.* 1996).

DECISIONS IN ORGANIZATIONS

Decision-making literature is very rich and useful in understanding investment decisions.

What is a decision? It is a psychological construct: we can never "see" a decision; we can only infer it from observable behaviour. To decide means making a choice between different projects and to translate this choice into action. A decision can thus be defined as "the selection of a proposed course of action" (Butler et al., 1993:6) or even as "a specific commitment to action (usually a commitment of resources)" (Mintzberg, Raisinghani and Theoret 1976:246).

What are the goal(s) of a decision? What are the means and limits of a decision? Individual and organizational behaviours - and the factors driving these behaviours - are the real issues

1. See for instance Lutzenhiser, Janda, Kunkle & Payne (2002) and Payne (2006).

2. With notable exceptions, such as Stephen DeCanio

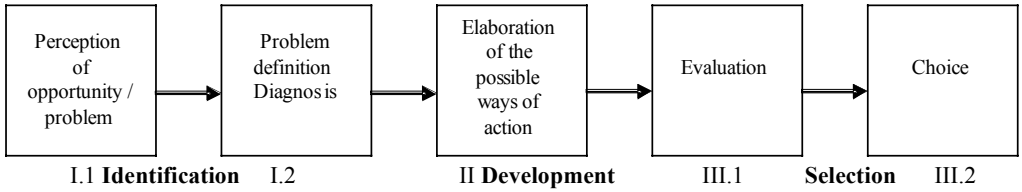

Figure 1.

at stake behind these questions. Two main perspectives are in opposition through their answers to these questions: the economic perspective and the behavioural perspective. They first conflict by their method: the economic perspective starts from an extreme theoretical simplicity and, because of the gap with observed reality, adds complexity through successive extensions of the neo-classical orthodox theory. The behavioural perspective departs from real-world complexity and tries to reduce it by identifying regularities in human or organizational behaviour. The economic perspective's focus is on the market, while the behavioural perspective focuses on individuals, considered alone or in a group. More fundamentally, these perspectives are in conflict through the varying importance given to determinism in driving human decisions.

Both economic and behavioural perspectives have produced models describing decision-making situations which can be summarized in four views, each adding complexity to the previous one: rational actor models, organizational views, political perspectives and contextual views (Schoemaker 1993).

- In the rational unitary actor model, the decision maker is choosing *the* optimal solution after having carefully analyzed and evaluated the available solutions, without any cognitive limits or bias and without any uncertainty regarding the decision consequences.
- The organizational views introduce constraints to this ideal situation (incomplete information, time pressure, cognitive bias and limits) which only allow a satisfying solution (the best known variant of organizational views is probably H. Simon's bounded rationality model). The organizational model presumes multiple players who pursue the same – organizational - objectives.
- The political perspectives introduce conflicts between actors' goals (actors meaning individuals or groups) and organizational goals.
- Finally, in the contextual views, people, problem perceptions and solutions meet in random ways, reflecting the changing organizational context, the "set of organizational forces that influence" the decision process (Bower 1970:71). The garbage can theory of decision-making (March and Olson, 1976) is the example most often cited of this perspective.

It is useful to keep in mind these different perspectives when reading decision-making literature or studying organizational decisions.

DECISION DRIVERS

Decision-making research applied to the fields of change management, innovation, strategy and investment, has shown that a formal decision is the result of a chain of events in which the first steps and the actors involved are especially important.

Decision is the Result of a Process

A decision must be considered, in a temporal perspective, as the result of a decision process, which can be defined as a dynamic chain of actions and events that begins with the "identification of a stimulus for action and ends with the specific commitment to action" (Mintzberg, Raisinghani et Theoret, 1976:246). Figure 1 represents the decision proces.

The rational actor model used by the neo-classical economics and finance theories[3] describes the decision as the logical outcome of a linear process, the different steps of which lead smoothly to the optimal solution. The decision-maker is using the analytical method to carefully and objectively evaluate the different solutions and choose the best one, with a clear vision of the choice's consequences. "Few variants of [the economic models] consider the possibility that preferences are shaped by social institutions and should therefore be the subject of analysis rather than taken for granted or assumed" (Pfeffer 1997: 44). The goals and the means being given or pre-defined, steps I. to II. of the decision process are, in a way, erased and the "evaluation" and "choice" steps are only considered by economics and investment theories (Desreumaux & Romelaer 2001).

Trying to understand how culture and power influence the whole process as well as the final choice, behavioural models give, as we could expect, a completely opposite view of the decision process which is viewed as "groping and cyclical"[4]. Building on H. Simon and Cyert & March works, Mintzberg, Raisinghani & Theoret (1976) propose a seminal model of the decision process, based on research on 25 strategic decisions (among which 22 investment decisions).

Mintzberg, Raisinghani & Theoret's model describes the decision process structure in terms of three central phases: identification, development and selection phases. The identification phase is especially important as it evokes decisional activity, through the influence of three types of stimuli - opportunities, problems and crises - which may come from inside or outside

3. "The rational consumer model is so deeply entwined in economic analysis, and in broad terms so plausible, that it is hard for many economists to imagine that failures of rationality could infect major economic decisions or survive market forces." Mac Fadden, 1999:74.

4. "By cycling within one routine or between two routines, the decision maker gradually comes to comprehend a complex issue. … The most complex and novel strategic decisions seem to involve the greatest incident of comprehension cycles. We found specific evidence of cycling and recycling in all 25 decision processes with a total of 95 occurrences." Mintzberg, Raisinghani and Theoret, 1976:265.

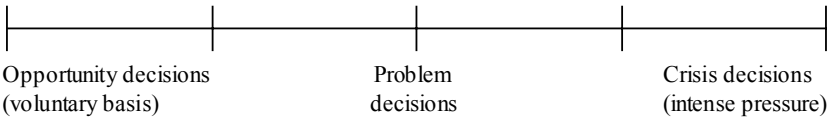

Figure 2. Stimuli of decision activity as per Mintzberg, Raisinghani & Theoret, 1976

the organization. The amplitude of each stimulus depends on the influence of its source, the interest of the decision-maker in it, the perceived payoff of taking action, the uncertainty associated with it, and the perceived probability of successful termination of the decision" (idem: 253). During the identification phase, a lack of organizational consensus on the need for action may block the decision process, induce political bargain or lead the issue to a dead end. Coming after the identification phase, the development phase is at the heart of the decision-making process, where solutions are elaborated upon. Finally, the selection phase is composed of the screen and evaluation-choice routines. As mentioned above, most of the economic-based rational actor models have focused on the evaluation-choice routine, which Mintzberg, Raisinghani and Theoret find "rather curious" since this step seems to be far less significant in many of the decision processes they studied than diagnosis or design. Moreover, their study reveals very little use of analysis during the evaluation-choice step, judgment being the most favored mode of selection, followed by bargaining (which is used in more than half of the decision processes studied).

The most important conclusion of Mintzberg, Raisinghani and Theoret research, confirmed by other works (such as, for example, Lu & Heard 1996; Segelod 1996), is the cyclical and groping characters of the decision process, in contradiction with the linear and smooth vision of the rational actor decision process. The importance of the identification phase is another major conclusion of their research.

Influence of the Context

The contextual approach (Bower, 1970, Dawson 1996; Pettigrew 1987) proposes to examine the interactions between organizational processes and the context in which they are embedded, where political games influence actors' perceptions and decisions. According to the contextual view, the context comprises three dimensions: the internal context includes the structure and the culture of the organization; the external context comprises clients' demands, competitors' moves and the general economic, legal, and social conditions, and is the source of threats and opportunities which must be dealt with. Past and present events also influence actors' perceptions and decisions.

Influence of the Actors Involved

Many actors, inside and outside the organization, influence the various phases of the decision process. Among them, the most influential are the top managers, for several reasons (apart from the fact that they ultimately accept or refuse the investment project in the final phase of the decision process): they define the organization's strategy; they define the investment projects' general orientation; they define the administrative and financial conditions framing the investment process (investment manual, capital budgeting tools, budget envelopes).

More generally, leaders are important because of their influence on the organizational culture (Schein 2004). The upper level perspective (Hambricks and Mason 1984) goes even further by considering the organization as a reflection of its top managers, because top managers' attitudes, behaviours, and decisions – including strategic choices – are influenced by their personality and culture.

Influence of the Characteristics of the Decision

Decisions may be categorized according to numerous criteria: stimuli evoking them, available solutions (ad hoc or ready made, internal or external); according to their importance to the organization; to their complexity, to the level of organizational change they would entail; according to the actors involved (decision processes involving several departments may be more complicated, as described by Desreumaux et Romelaer 2001). Decisions can also be categorized according to their functional object (production, human resources, etc.) or according to their level in the organization: operational, tactical or strategic. Finally, decisions may be categorized according to their level of uncertainty.

Of all decision characteristics, the level of uncertainty has the highest influence on the decision process and on its result. There may be uncertainty about preferences as to the ends to be reached, the preferred outcomes – this is end-uncertainty; or there may be uncertainties about the solutions used to achieve the desired ends – this is means uncertainty. (Butler, Davies, Pike & Sharp, 1993). Ends uncertainty may come as a result of conflicting interests involved in the decision. Uncertainty is increased by the duration of the decision effects and by the complexity and novelty of the choice to be made. Herbert Simon first drew the distinction between structured decisions – familiar, repetitive, programmed – and unstructured decisions – complex, new, unprogrammed. Unstructuration requires the design of a new solution instead of the use of a ready-made one. Therefore, unstructuration means a high level of uncertainty and, in turn, a longer and more political and cycling decision-making process.

Because they are important for the organization's survival, with long-lasting effects, strategic decisions, contrary to operational or tactical decisions, are considered as being generally highly unstructured (Bower 1970; Butler, Davies, Pike & Sharp, 1993; Hu and Heard 1995; Koenig 2001; Mintzberg, Raisinghani & Theoret 1976) and characterized by a high level of means and ends uncertainty. Non-strategic decision processes have not been studied. We hypothesize that issues perceived as non-strategic, with a low stimulus at the beginning of the decision process – which means a low consensus as to the necessity of making a decision – may lead as well to high ends uncertainty.

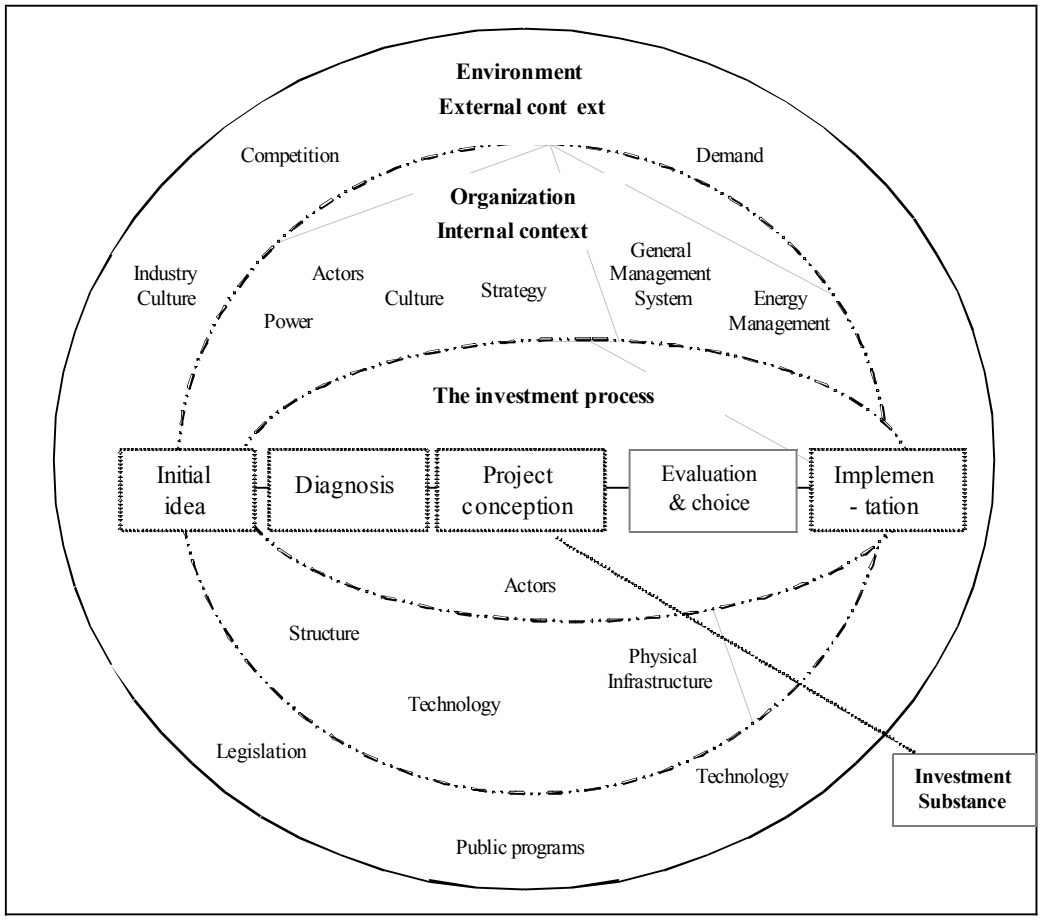

Figure 3. The Process and Context of Energy-Efficiency Investment Decision-Making

A Processual/Contextual Approach to Energy-Efficiency Investment Decisions

Our brief survey of organizational decision-making literature has shown that numerous factors influence decisional situations and choices. To understand what drives firms' decisions, we have to study these decisions in a double perspective: a dynamic perspective, where a firm's history and the processual flow of events are taken into consideration, and a contextual perspective, which considers the organizational process within its internal context (the organization) and external context (the organization's environment). This approach means considering where the investment idea is emerging, either within or outside the organization, who are the actors involved, what is the history of the company regarding similar decisions, etc. Secondly, the various contextual factors influencing the decision-making process must be identified and analyzed. Thirdly, the decision substance – or characteristics – must be analyzed: with regard to investment, this refers to the investment type (for instance, tactical or breakthrough, replacement or new type material, modular or non-modular, etc.) and to its technico-economic characteristics.

Applying this framework to energy-efficiency investments, for every case we have to ask, among other questions: where is the initial idea coming from (if from outside: public program or private consultant?). Is there a stimulus? Is it an opportunity/problem/crisis stimulus? What is the history of the organization regarding energy-efficiency? Does the top management support the idea? Is the technical manager or facility manager powerful enough to successfully lobby in favor of the energy-efficiency project? Above all, we have to analyze the substance of the investment considered and the uncertainty attached to it. Is it an operational investment (for instance, replacing a heating boiler), meaning a fairly structured decision with little ends and means uncertainty? Or is it an unstructured decision with high-ends uncertainty where bargaining will lead to cycling, or even to a dead-end for the decision process? We have built the figure shown next page to represent the processual and contextual factors influencing energy-efficiency investments' decision-making process and choices.

Within this framework, what are the most important factors driving energy-efficiency investments' processes and decisions? According to our analysis, the answer lies in the strategic and cultural dimensions of organizational energy use. We have formulated three hypotheses regarding the influence of these factors: 1. the fact that energy-efficiency investments are often not perceived as strategic by the organizations is the main reason explaining negative decisions; 2. the cultural dimension of energy use partially explains why these investments are not perceived as strategic; 3. the level of energy management is an important driver of energy-efficiency investments decisions.

Hypothesis 1: the fact that energy-efficiency investments are often not perceived as strategic by the organizations is the main reason explaining negative decisions

Strategy means to define the long-term activities and goals of an organization according to its internal resources and to external factors, in order to build a durable competitive advantage. To have a competitive advantage means to do better and/or to be less expensive than the competitors. In other words, competitive advantage is the relationship between the perceived value – meaning the value attributed to a product by the client – and the costs of production for the firm. Risk is the third dimension of the competitive advantage (for example, a firm cannot choose a new, less expensive supplier if the source is not reliable). Durable competitive advantage allows a firm to differentiate itself from the competition and to survive in the long term. In order to increase their competitive advantage, some companies will focus on cost, others on value; others will try both ways at the same time in a breakthrough move. According to this basic definition, strategy is a tool enabling a company to improve its performance and to successfully carry out its core business.

Research has shown that the strategic character of an investment is the primary reason for its approval, before its profitability (De Bodt & Bouquin 2001, Carr et *al.* 1994, Butler *et al.* 1991). Investments are thus analysed according to their contribution to the "big strategic picture" more than by their particular return, and an investment which is not perceived as fitting the strategy is generally not going to be decided upon.

Energy is not considered as a strategic issue by (most) companies for various objective reasons.: energy is part of the organization's physical component which is least valued nowadays by upper management, as opposed to non-material resources like information (Teece, Pisano & Shuen, 1997); this means that energy often contributes to activities which are considered secondary, and which are often outsourced. In addition, energy's indirect character and its peculiarities render it mostly invisible, and we know that an invisible element is the most easily forgotten (Stern 1992). For these reasons, most firms regard energy as a cost only and not as a potential source of risk reduction and value increase and they remain focused on energy supply and procurement rather than on energy use and management. This implies that, where its cost is low, or when the cost reduction is perceived as conflicting with core business activity, rational use of energy will be neglected and energy-efficiency investments won't be decided upon. Actually, most firms have a commodity view (Eyre 1997; Stern and Aronson 1984) as opposed to a resource view (in the strategic meaning) of energy. Firms do not consider energy as a strategic resource because they consider energy's contribution to their competitive advantage to be negligible.

Hypothesis 2: The cultural dimension of energy use partially explains why these investments are not perceived as strategic.

The fact that firms do not perceive energy as a strategic resource cannot be explained solely by the objective reasons discussed above: energy culture, underlying the dominant commodity view of energy, is another reason for this perception.

The meaning of culture has been a subject of debate for decades, even among anthropologists themselves. Culture has been defined as "shared pattern of behaviour" (Mead, 1953) however the same behaviour can have different meanings and different behaviours can have the same meaning. Culture has been defined later on as "systems of shared meaning or understanding" or "webs of significance", which drive or explain the behaviour observed (Levi-Strauss 1971; Geertz 1973). But meaning must be deciphered because it relates to some underlying basic assumptions (Kluckhohn & Strodtbeck 1961; Schein 2004, first published in 1985). Culture consists of "a pattern of shared basic assumptions", taken-for-granted perceptions, thoughts, and feelings, which are unconscious and therefore nonconfrontable (Schein, 2004). Basic assumptions underlie beliefs and values[5] which, in turn, influence attitude (people's ideas, convictions or tastes) and behaviour (what people are doing) (Schneider & Barsoux 1999: 22) Beliefs and values, attitudes and behaviours have been studied by behavioural research on the human dimension of energy use (Lutzenhiser 1993; Stern 1992; Stern and Aronson 1984), but not enough attention has been given to the cultural dimension of energy use and to the basic assumptions on which it is founded.

Basic assumptions constitute the solutions to the ultimate problems that any group faces: dealing with its external environment (how to survive) and managing its internal integration (how to stay together) (Schein, 2004). They have been categorized by scholars along several dimensions, of which two seem particularly relevant in analyzing energy culture: the relationship with nature, and human activity. The relationship with nature relates to the assumption of more or less control over the environment; it is connected to human activity ("doing" versus "being") as the assumption of control over the environment is connected to the desirability of taking action (Schneider & Barsoux 1999: 33). When people feel they don't have control over an issue, they are more likely not to take action. They become fatalists.

The basic assumptions underlying energy culture in industrialized countries have been slowly shaped by their highly centralized, monopolistic and remote energy system, producing energy far away from its place of consumption for almost two hundred years. This system has created what could be called a "fairy energy" culture. This term is borrowed from an old-fashioned expression, common in Western Europe a few decades ago - "Fairy Electricity"- to illustrate the general and unconscious assumption that energy is coming from an unknown, almost magical, source and can be consumed as a limitless commodity.

One basic assumption of a "fairy energy" culture is the association between energy and freedom, between energy and the "good life" (Stern & Aronson 1984: 46). Energy is the symbol of the "ever-increasing" way of life. A second assumption of industrialized countries' energy culture is the fact that energy is taken for granted (this was probably less the case in the 70s' and 80s'). This is especially true with electricity, unconsciously regarded as readily-available and as free as the air we breathe. Where does electricity come from? From the wall … The third basic "fairy energy" culture assumption, connected to the second one, is that energy is out of consumers' control (regarding production as well as consumption). For instance Tunnessen

5. "Beliefs are statements of fact, about the way things are. Values are preferred states about the way things should be, about ideals" (Schneider & Barsoux 1999: 27).

Source : Electrabel, www.electrabel.be

Image 1. Electrabel Advertising Campaign, 2004

(2004:50) mentions a survey conducted by the market research bureau of *CFO Magazine* in 1998 which found that 75 percent of high-level decision-makers viewed electric energy costs as the least controllable category of business expenses. Similarly, Payne (2006) points out that many decision-makers feel that energy cost reduction is difficult and unlikely to be worth significant effort to achieve. Feeling that they can't control energy, people become fatalistic. A fatalistic customer doesn't switch to another supplier or energy source. He doesn't think of producing his own energy. And, he is not interested in energy efficiency or energy-efficiency investments.

Therefore, in the industrialized countries' energy system, the final consumer is generally passive, and prisoner: freedom is only apparent as "the biggest business in the world"[6] has shifted control from individuals and local communities to large-scale corporate organizations. Energy-producers maintain the illusions of freedom and uncontrollability – and the passivity of their consumers (individuals and organizations) – in order to protect their industry against any competition detrimental to their profits. Publicity campaigns of European electricity producers brilliantly illustrate this strategy (as exemplified by the publicity shown in Image 1).

This influence of the energy system's characteristics on energy-efficiency decisions has been sometimes underlined (Eyre, 1997; Stern & Aronson, 1984) but not enough studied, because researchers studying decisions taken at the level of a building or an individual house don't usually put them in relationship with the global energy system and the strategies of its big players.

Rational use of energy, based on reason, cannot compete with the magic of fairy energy. A "fairy energy" culture, as kept alive by the energy industry, constitutes a second meta-barrier to an efficient use of energy, more important than the non-strategic character of energy for firms (first meta-barrier). An important consequence of these energy system's characteristics in industrialized countries is the fact that the debate regarding the evolution towards a more sustainable energy system is more a debate between centralization vs. decentralization than, as it is usually envisioned, a debate between fossil and renewable sources of energy.

Individuals' fatalism leads to organizations' fatalism towards energy, and to their passivity and lack of interest in energy management and energy (self-) production. It also leads to weak support by upper-level organizational managers for formal energy management programs in many organizations, even those with high energy costs. As a matter of fact, the same CFO Magazine study also revealed that more than half of upper-management respondents were not involved in their company's decisions regarding energy use (idem).

However, energy culture doesn't apply uniformly to all actors (individuals and groups) within organizations, as it interferes with other "spheres of culture": six interrelated spheres of culture - national, regional, company, industry, professional and functional – influence individuals and organizational behaviour (Schneider & Barsoux 1999). While each of these spheres of culture may interfere with "fairy energy" culture, we hypothesize that professional & functional cultures and company culture are the most influential ones in the case of energy use: it is likely that people assuming technical functions in an organization (i.e. technical support department, facility management, production) and/or people with a "technical" education (like engineers) will be less passive towards energy than, say, finance or commercial people, because they normally know how to control energy consumption, and their professional culture induces them to do their best to have technical systems working

6. *'If you had to name the world's largest industry, which would you pick? No, not the information technology or telecommunications, nor defence or car manufacturing. Lee Raymond, the chairman of ExxonMobil, has the answer: 'Energy is the biggest business in the world …'.'* The Economist, Feb. 8th 2001.

efficiently. Secondly, the company culture is also important, in two dimensions: the importance assigned to energy issues and the dominant organizational function, which will be the most powerful one in decision-making situations. These cultural differences could explain why, as also noted by Tunnessen (2004) with regard to the United States, within almost every industrial, commercial, and institutional sector, organizations vary widely in terms of their ability to manage energy use.

Hypothesis 3: The level of energy management is an important driver of investments decisions.

The general corporation's management system includes several sub-systems. The energy management system is one of them. Any management system is composed of four elements: goals, control, evaluation and rewards, information and communication. Without these elements, an issue doesn't exist in an organization. In the case of energy, the level of energy management can be considered as a reflection of the organisational energy culture. Organisational "fairy energy" culture and low strategic fit entail a low level of energy management. The peculiarities of energy make it invisible in physical terms; a low level of energy management makes energy invisible in managerial terms. This leads to a vicious circle in which energy, being invisible, cannot be considered a strategic issue, cannot become important in the company's culture and is not going to be managed. We hypothesize that a low level of energy management will entail a low level of energy-efficiency investments and, accordingly, a low audit success (meaning that a low percentage of the cost-efficient measures identified by the audit are decided and implemented).

If our hypotheses are valid, what could be the implications?

Here is our tentative explanation: low strategic and cultural importance, associated with a low level of energy management, lead energy issues to be a low priority in an organization, with little upper-management attention dedicated to them. Even in this case, however, an energy audit proposed free of charge by a public program is an opportunity which can be strong enough to initiate the decision process. Two problems may then arise: the project is initiated by a weak stimulus at the level of the technical or facility management department but the upper management and most of the employees are not concerned with it (sometimes they don't even know about it). This leads to a decision situation with a significant level of ends uncertainty, meaning a bargaining situation where the technical or facility management departments, championing the investment, are in conflict with other departments in the company. The decision process may be slowed or blocked. The result of this political decision-making process – the decision made – will then depend on the power of the technical or facility management department in the organization.

Empirical Study

The main goal of our empirical study, still on-going, is to test our hypotheses by assessing the role of strategic, cultural and managerial dimensions of energy-efficiency investments decisions, and comparing their influence in different industries and organizations. The second goal of our research is to increase the general knowledge - which is still pretty low - of companies' investment practices.

METHODOLOGY

Undertaken in collaboration with the University of Geneva Business School (HEC) and the Geneva Energy Office Planning (SCanE), the research is based on interviews and questionnaires submitted to major electricity consumers of the Geneva canton. These customers are participating in a peak demand-side management program (NOE, for "New Offer of Electricity"), organized jointly by the local electricity and gas utility (SIG) and the Geneva Energy Office Planning. The program is offering free-of-charge energy audits to any site consuming more than 1 GWh of electricity per year. About 150 sites belonging to 85 organizations are involved, including institutional sites, tertiary sector sites (banks, chain stores, parking lots, shopping malls, conference/exhibition centers) and industrial sites (metalworking, clock- and watch-making, chemical and pharmaceutical industries, food and beverage industries).

Data collection consists of a two-step survey: 1. On the occasion of a semi-directive interview with the company manager responsible for energy issues (usually the facility or technical manager), a questionnaire is filled in. 2. Another questionnaire is completed by a top finance manager. Some questions are identical to those of the first questionnaire in order to check for different views on the same issues between managers in charge of energy and finance managers.

PRELIMINARY RESULTS

So far, managers in charge of energy in 33 organizations (of which 17 from the tertiary sector and 16 from the secondary sector, occupying 58 sites), have been interviewed. As expected, it is more difficult to have the "finance questionnaires" completed: out of the 33 organizations seen, we could collect only 14 questionnaires (the next research step will certainly entail meeting personally with the finance managers). The data collected have not yet been submitted for statistical analysis. In most companies participating in the NOE program, the decision process is still in the identification phase (the preliminary audit has just been, or has not yet been, completed). Nevertheless, preliminary findings look interesting and seem to confirm our hypotheses.

Strategic Fit of Energy-Efficiency Investments

Hypothesis 1 seems a valid explanation of the no-decisions made by companies regarding energy-efficient investments.

Fit with business strategy is confirmed as the most important factor for making investment decisions. 100 % of finance managers have answered "yes" to the question: "*Above all, a project must contribute to the realization of the company's strategic goals*". Financing is generally not a problem if the project is considered strategic (we received 9 positive answers out of 14 to the affirmation "*One can always find money to finance a good project*"). Conversely, 13 finance managers out of 14 declare that the profitability of an investment is not sufficient to entail a positive decision. Regarding the role of formal investment analysis, 11 respondents consider it to be more a communication instrument than a decision instrument. However, financial evaluation techniques are still considered *important*

for the final decision by 8 respondents (*decisive* by 3, *marginal* by 1, with 2 no answers).

First results show a dominant commodity view of energy and a rather low perceived strategic importance of energy. "Technical" and finance managers were asked to rate (from 1 to 5) the strategic importance for their company of the adoption of energy-efficient technologies, broken down into several indicators: risks; costs; value; competition; staff motivation and loyalty; social responsibility; image. The maximum score, meaning the highest perceived strategic fit of an investment, is 40 points. Managers' answers range between 17 and 34 points (with an average score of 24 points) and show a huge variety between firms in the same industry but no significant differences in the answers between secondary and tertiary sectors (i.e. between more intensive-energy industries and other industries). Cost reduction is mentioned as by far the most important strategic factor. The second most important factor mentioned is a company's social responsibility, followed by a company's image.

Cultural Dimension of Energy-Efficiency Investments

Answers from actors located in different organizational departments (i.e. technical or facility management and finance) confirm the influence of professional and functional cultures on energy culture, even if unfortunately, due to the low number of "finance questionnaires" received, we couldn't yet test our sub-hypothesis: that energy efficiency is considered more strategic by technical departments than by finance departments.

"Technical" managers are highly concerned with the reduction of energy consumption, but they often feel that energy efficiency is not a priority in their organizations and that organizational barriers block the adoption of efficient technologies (organizational barriers which are never mentioned by finance managers). They are more aware than financial managers of the risks threatening the security of energy supply. A situation often encountered in companies is one of a fight between technical or facility management departments (trying to improve rational use of energy) and other departments more involved in the core business. "*They just don't care*"; "*I am always fighting against commercial people*"; "*they run away when they see us*" are some comments by managers in charge of energy giving a good illustration of this situation. They feel that energy is a non-issue for administrative and commercial functions. This is more the case in the tertiary sector than in the secondary sector, where the technical department, being also involved in the company's core business (industrial production), is generally in a stronger position.

An important finding is that uncertainty regarding energy-efficient technologies is much higher (often twice as high) among finance managers than among "technical" managers. While this may seem normal, it probably adds to the difficulty for technologies' adoption.

Energy Management

Our assessment of the energy management level is based on 18 criteria, of which 3 have been given a double weight: the energy intensity data availability (in relation to turnover, general expenditures or benefit), the commitment to reducing energy consumption and the existence of key energy performance indicators. Thus, according to our rating, the maximum score for a company's energy management is 21 points.

Out of the 33 organizations questioned, 7 received between 15 and 21 points, 1 between 10 and 14 points, 14 between 5 and 9 points, and 11 companies obtained less than 5 points. These results mean that about 75 % of the organizations surveyed had a poor level of energy management with no energy manager or team, no consumption baseline, no energy indicators, no consumption reduction commitment or goals, no human resources training or incentives. These preliminary results confirm those of Flint, Helgerud, Mydske (2005) which have highlighted a low level of energy management in many Dutch companies.

These results also show a huge variety of energy management levels between firms in the same industry, similar to what has been observed in the United States (Tunnessen, 2004). This indicates that the level of energy management is determined by the company's culture more than by its core business or industry. The level of energy management also seems to be correlated with the strategic importance assigned to energy.

It is also important to remark that industrial companies don't know exactly what is the breakdown of their energy consumption between administrative and production use. More important, they often don't know what their energy consumption by unit of production is, due to the complexity of their industrial processes. However, they could use other energy performance indicators which they usually don't, such as, for instance, the energy consumption by unit of raw material.

Conclusion

A lot of work remains to be done, but some lessons can already be learned from our research.

First, the processual/contextual approach is a valuable analytical tool for public programs (or ESCOs') which can be used to influence energy-efficiency investment choices, by taking into consideration the identification phase and the threshold for decision activity, the actors involved and the characteristics of the energy-efficiency project in terms of means/ends uncertainty.

Secondly, our preliminary results confirm the influence of the cultural and strategic dimensions of energy-efficiency investments on the decision-making process and choices. This leads to the necessity of broadening the corporate and public programs perspective on energy use: that is, switching from a technico-economic approach – the dominant commodity view of energy – to a strategic approach, emphasizing the possible contribution of energy *services* to firms' performance. It can - and it must - be demonstrated that energy is not only a cost: it is a key factor to adding value to companies' products, reducing the risks, and improving the way a company is performing its activities. In order to transform the market for energy efficiency, it is necessary to broaden the usual technico-economic perspective in two directions: improving energy management is the first one, essential for energy to become visible in managerial and performance terms. Highlighting the potential impact of energy-efficiency investments on competitive advantage is the second one

Companies, even those which are cost-driven, are not looking for cost reduction. They are looking for a better and safer way to carry out their business. How can energy contribute to this goal? How can energy match their needs? These are the real

questions to be answered by the audits to successfully selling energy efficiency.

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