

Keeping sustainable innovation on a leash? Exploring incumbents' institutional strategies

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ABSTRACT

This research aims to identify the institutional strategies of incumbent firms with regard to sustainable energy innovations that threaten their interests. This exploratory study contributes to the multi-level perspective by providing new insights into niche–regime interaction. The focus on actor behavior in transitions is informed by literature from institutional theory and strategic management. Based on semi-structured interviews with actors and on documents related to LED lighting and biofuels in the Netherlands, this study identified a preliminary set of empirical strategies: providing information and arguments to policy makers and the general public, as well as strategically setting technical standards. Incumbents are in a position to significantly influence the innovation's development by employing these strategies; thus temporarily *keeping sustainable innovation on a leash*. Copyright © 2013 John Wiley & Sons, Ltd and ERP Environment

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Introduction

THE PAST DECADE HAS SHOWN A GROWING INTEREST IN THE STUDY OF SUSTAINABILITY TRANSITIONS. THE MULTI-LEVEL perspective (MLP; Geels, 2002) is one of the main approaches related to this issue: conceptualizing transitions as interactions between niche, regime and landscape levels. Its insights have informed management and policy strategies, such as transition management (Rotmans *et al.*, 2001). The MLP has shown that transition processes require changes in technologies and technical artifacts as well as in user practices, policies, markets, industrial structures and supporting infrastructures (Geels, 2002).

Due to the stability of the regime, sustainability transitions tend to be slow and difficult. The path dependence of the regime is 'a powerful incentive for incremental innovations in socio-technical systems' (Geels, 2004, p. 911). Part of this can be explained by lock-in into the current system, due to economies of scale and scope (Arthur, 1989). Apart from economic lock-in, existing institutions also favor stability and thus hamper change (Unruh, 2000). However, 'Institutions are not necessarily or even usually created to be socially efficient; rather they, or at least the formal rules, are created to serve the interests of those with the bargaining power to devise new rules' (North, 1990, p. 16). While institutions tend to be presented as influencing the behavior of agents, they cannot

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survive without the support of agents (Beckert, 1999; Lawrence and Suddaby, 2006). Especially when contested, institutions need to be actively supported to stay in place (Lawrence and Suddaby, 2006; Maguire and Hardy, 2009).

Therefore, we cannot fully understand transitions by accepting institutions as 'given', but we need to investigate the power and interests that maintain those institutions. This implies that the stability of the regime is also partially dependent on the active support of powerful actors. To date, the existence of power in transitions has been acknowledged (Avelino and Rotmans, 2009; Voß *et al.*, 2009; Smith and Stirling, 2010; Walker and Shove, 2007; Meadowcroft, 2009; Smith *et al.*, 2005; Pinkse and Kolk, 2010). Powerful actors will be affected by shifting actor configurations and therefore power will play an important role in transitions. However, how exactly power manifests itself has remained understudied.

In addition, the MLP has been criticized for its lack of attention to the micro-level unit of analysis as well as an insufficient conceptualization of strategies at the actor level (Smith *et al.*, 2005; Markard and Truffer, 2008a; Stenzel and Frenzel, 2008). Farla *et al.* (2012), for example, stress that 'If we understand the struggles of actors with competing interests. . . we will better be able to assess the conditions for sustainability transitions to materialize'. A similar call is made in the field of environmental management: more attention should be paid to the pervasive trade-offs in terms of profit, people and planet that firms face when deciding on their strategy (Hahn *et al.*, 2010; Pinkse and Kolk, 2010; Winn *et al.*, 2012).

Therefore, to explain the stability of a regime, we need to investigate the strategies of powerful regime actors that are threatened by the process of change. Namely, innovations with significant sustainability gains tend to be non-incremental and are therefore likely to have adverse effects on the business interests of regime actors. We focus on the behavior of incumbents: the firms that mainly have competencies related to the current technological regime, and that (financially) benefit from existing practices. The innovations can be threatening to incumbents' interests for various reasons. For instance, the innovation can be competence destroying for the incumbent or increase risk of claims due to technical problems, or the innovation can create additional competition for adjacent markets. As a consequence, these regime actors are expected to engage in strategic behavior to safeguard their interests (Meadowcroft, 2009; Geels, 2010; Walker and Shove, 2007).

More specifically, we are interested in incumbents' institutional strategies: 'the patterns of action that are concerned with managing the institutional structures within which firms compete' (Lawrence, 1999, p. 162). Institutions include both 'hard' regulative institutions (e.g. laws, regulations, technical standards) and 'soft' normative and cognitive institutions (e.g. binding expectations, common beliefs) (Scott, 1995). Firms can influence these institutions by interacting with policy makers, the general public and social movements (Penna and Geels, 2012). Geels (2010, p. 502) indicates that these strategies matter in transition processes: 'The problem for sustainability transitions is that many unsustainable industries have many economic resources and good political contacts, which may hinder, delay or water down strict environmental regulations'. Despite the explicit acknowledgement of possible resistance to niche development by regime action, it is unclear what shape this resistance takes. Instead, niche level processes have been the main focus of MLP studies (Markard and Truffer, 2008b). Also, research on firms' environmental strategies is predominantly focused on how these actors *react* to the changing institutional environment (e.g. sustainability reporting or greening the value chain; e.g. Kolk, 2008; De Marchi *et al.*, 2013), thereby excluding the activities firms may undertake to *influence* the structure of this very institutional environment to their benefit. We would like to explore this gap.

Therefore, this paper aims to provide a first overview of institutional strategies employed by incumbents whose short-term interests are threatened by sustainable energy innovation. With sustainable energy innovation we mean those new products and technologies that produce renewable energy or result in energy savings. Consequently, the research question is 'What are incumbents' institutional strategies with regard to sustainable energy innovations that threaten their business interests?'

Both incumbents and new entrants may introduce sustainable energy innovations. According to the literature, most innovations that deviate from existing practices are introduced by new entrants. In this paper we focus on strategies of incumbent firms that are confronted with the latter situation.

Institutional strategies are directed towards influencing the external environment of the firm (cf. Pfeffer and Salancik, 1978) and should be viewed as complementary to technology or innovation strategies by which incumbents develop a technology themselves (cf. Bergek *et al.*, 2008, 2009; Karltorp and Sandén, 2012). The importance of this type of strategy in sustainability transitions was also observed by Farla *et al.* (2012): '...the observed

strategies. . . all reach out to the broader environment (or system) the actors are part of. This focus is relevant for the field of sustainable innovation, because sustainable innovations are likely to be more dependent on policy support than 'regular' innovations (van den Bergh *et al.*, 2011; Geels, 2011; Meadowcroft, 2011). As a consequence, actors willing to influence sustainable innovations need to direct an important part of their attention to the institutional environment.

The Netherlands provides a relevant case for this research because the Dutch economy is characterized by large vested interests in the fossil energy system as well as a very slow and tedious energy transition. It is home to oil and gas company Shell and the energy port Rotterdam, has large gas reserves and harbors several energy intensive sectors (e.g. oil refineries, steel, chemicals, paper and concrete). Activities in the energy sector (e.g. production, processing and transport of oil, gas and electricity) account for 6% of GDP (ELI, 2011). Taxes on oil products alone generate 5% of total government revenues (CBS, 2011a). This percentage goes up to 20% when including tax on income and profits from the energy and energy intensive industries (TNO, 2013). In terms of the energy transition, the country performs poorly. The Netherlands produced only 3.8% renewable energy in 2010 (missing its 10% goal) and consequently ranks very low on lists that compare European countries in terms of their relative production of renewable energy (EuroStat, 2010; CBS, 2011b). Moreover, the country is known for its consensus-oriented government–business relationship (the *poldermodel*). If we are to study institutional strategies, these factors suggest we are likely to find them in the Netherlands. Several authors show that incumbents have been able to (partially) capture the Dutch energy transition initiatives, which has reduced the potential for change (Avelino, 2009; Kern and Smith, 2008; Scrase and Smith, 2009; Voß *et al.*, 2009).

The strategies identified in this research show by which means regime actors are able to defend their interests and maintain regime stability. This paper has an exploratory and inductive nature due to the limited amount of empirical literature available on institutional strategies in the field of sustainability transitions. This gap in the literature may be related to the sensitivity of the issue: because of actors' interests, disclosure of information is limited. We use relevant theory from institutional theory and strategic management to complement the transitions literature. This paper will show a first indication of strategies aimed at sustainable innovation.

The paper is organized as follows. The following section describes the selection of literature that forms the theoretical framework for this research. In the next section the case selection and methodology is explained. The fourth section 4 presents the institutional strategies of incumbents in the cases of LED light and biofuel. The analysis in the fifth section reflects on the results in light of the theoretical framework and the sixth section concludes.

Multi-Level Perspective and Institutional Strategies

The interaction between niche and regime levels is central to the MLP. Against a background of landscape developments, the niche–regime interface is where systemic change occurs. It is acknowledged that incumbents are involved in this interaction, but insight into their exact role needs further elaboration. Geels and Schot (2007) elaborated on four possible pathways such niche–regime interaction can take, by distinguishing two dimensions: the *timing* of interaction and the *nature* of interaction. First, when landscape pressures create windows of opportunity, is the niche innovation sufficiently developed to influence the regime? Second, is the relationship between niche innovation and regime of a symbiotic or competitive nature? These two dimensions result in the following transition pathways: transformation, reconfiguration, technological substitution and, finally, de-alignment and realignment. In the latter case, incumbent actors lose faith in the regime due to much landscape pressure, and no longer defend the regime.

Incumbent actors do play a role in the other three pathways. In terms of technology strategies, incumbents can defend themselves by investing heavily in the current technology or by (partially) adjusting to niche pressure by redirecting their technological development. In terms of institutional strategies, the authors point out that incumbents defend regime rules and engage in 'power struggles' with newcomers (Geels and Schot, 2007, p. 410). However, it remains unclear what specific type of behavior incumbents display when defending regime rules, or engaging in power struggles.

To learn more about the types of strategy that incumbents can employ, we need to draw upon literature beyond (sustainability) transitions research. However, knowledge on strategic behavior is not covered by a coherent body of literature; it is dispersed amongst a wide variety of literature and often labeled differently. It is beyond the scope of this paper to provide a full literature overview of relevant incumbent strategies. Instead, we will present a selection of relevant literature from institutional theory and strategic management. Given that institutions are at the heart of regime stability, institutional theory is assumed to provide valuable insights. Not only does it cover the effects of institutions on society; this literature also addresses how actors shape institutions. In turn, the strategic management field is a very logical source to draw from when studying strategic behavior of firms, because it focuses on the strategies that firms employ in order to maintain their competitive advantage. Attention for transition issues is limited in either of the two fields.

As stated in the introduction, we are interested in institutional strategies that are directed towards the external environment of the firm. This focus is based on the idea that firms not only *adjust* to their environment, but also are able to *influence* their environment (see, e.g., Pfeffer and Salancik, 1978). Penna and Geels (2012) show that indeed a range of strategies exists beyond innovation and technology strategies. Despite the centrality of institutions in transition processes, institutional strategies have received limited attention in the field of transition studies. This knowledge gap is recognized not only in transition studies, but also in a wider set of literatures. For instance, in their 2003 introduction, Pfeffer and Salancik (1978) state that 'Unfortunately, the use of political means' by firms to improve their performance 'is not often investigated' (p. xviii).

Institutional Strategies

The rationale behind institutional strategies is that firm performance depends not only on dynamics in the market, but also on institutions such as 'government policies that affect the structure and functioning of markets and the competitive advantages of its participants' (Baron, 2001, p. 47). In other words, successful institutional strategies influence the (market) environment of the firm through the public policy process or the public debate. Indeed, 'Policy frameworks (regulations, taxes, policy programs) that influence economic frame conditions form an important dimension for struggle and conflict in socio-technical transitions. Incumbent regimes are often stabilized by corporatist networks with mutual dependencies between industry and policy makers' (Geels, 2010, p. 502, based on Meadowcroft, 2005).

An important part of the stability of regimes can be explained by the persistence of institutions, i.e. 'the rules of the game' (North, 1990, p. 3). While institutions are often presented as influencing actors' behavior, institutions also depend on agency. After all, institutions are constructed by the very same actors. In other words, 'The fact that a constraint exists indicates that sufficient social support has been mustered to bring it into existence. In the social context of organizations, behind every constraint there is an interest group that has managed to have that constraint imposed' (Pfeffer and Salancik, 1978, p. 18).

Research on agency within institutional theory offers important insights in this respect. Lawrence and Suddaby (2006, p. 217) emphasize that '[institutions] require the active involvement of individuals and organizations in order to maintain them over time'. These activities are called 'institutional work': 'the purposive action of individuals and organizations aimed at creating, maintaining and disrupting institutions' (p. 215). In the following we highlight such purposive action aimed at influencing the public policy process and at influencing technical standards, which are a form of self-regulation among market actors.

When institutions are threatened, actors engage in 'defensive institutional work' (Maguire and Hardy, 2009). As a consequence, proponents of institutional change have to overcome 'opposition and resistance from insiders whose interests are threatened by the abandonment of existing practices' (p. 150). These activities are partially aimed at 'reproducing existing norms and belief systems' (Lawrence and Suddaby, 2006, p. 230) and involve 'the authoring of texts that contest problematizations of practices by (a) countering assertions of negative impacts of practices; (b) countering categorizations of practices as unethical, undesirable, or inappropriate; and (c) countering calls for regulatory change' (Maguire and Hardy, 2009, p. 169).

Literature on corporate political activities (CPA; a subfield of strategic management) provides us with more insights of how corporate actors get their messages across to policy makers and the wider audience. CPA is defined as 'corporate attempts to shape government policy in ways favorable to the firm' (Hillman *et al.*, 2004, p. 838).

Hillman and Hitt (1999) show that, first, actors provide information to the political decision maker by 'lobbying, both by internal or external professionals and executives; reporting research and survey results; commissioning research/ think tank research projects; testifying as expert witnesses in hearings or before other government bodies; and supplying decision makers with position papers or technical reports' (p. 834). The core of this information strategy for firms is to link their interests or activities to the interests of the decision maker and to phrase them 'in terms of some national policy benefiting the common good' (Pfeffer and Salancik, 1978, p. 192).

A specific type of information strategy is described by Oreskes and Conway (2010) in their book *Merchants of Doubt*. Vested interests such as the tobacco industry have been confronted with consensus amongst scientists that their products are harmful to people and/or the environment. To counter the development of government regulation that would address these problems, the industries create an artificial debate about the very existence or cause of the problem. Oreskes and Conway show that they do so by focusing on the small uncertainties that remain. They establish this 'information' through pseudo-scientific journals and conferences, and diffuse it to their political connections and public media. Thus, many industries have managed to postpone government regulation for years (cf. Ruers, 2012, on Dutch asbestos regulation). Similarly, Kolk and Pinkse (2007) conclude that, by using the information strategy, multinationals facing climate change policies try to push policy makers towards market-based solutions (e.g. self-regulation), which are less threatening to firm interests than government regulation.

Second, corporate actors attempt to convey their messages to the general public (Hillman and Hitt, 1999). To reach out to the wider audience, the (mainstream) media are an essential instrument. Ways of communicating are 'advocacy advertising, wherein a particular policy position is advertised to the public; public image or public relations advertising; press conferences on public policy issues; and economic or political education' (p. 834). These tactics are aimed at gaining the support of individual voters and citizens, expecting them to express their policy preferences to political decision makers. This may also include 'constituency building': 'grassroots mobilization of employees, customers, suppliers, retirees, or other individuals linked to the firm' (p. 834). The above strategies can also be aimed at more generally improving the industry's perceived legitimacy, which is necessary to maintain public and political support (Pfeffer and Salancik, 1978; Geels and Verhees, 2011).

These strategies can be employed in four different arrangements. First, the approach can be relational (long term) or transactional (ad hoc). In addition, businesses can organize these activities individually or collectively (Hillman and Hitt, 1999).

Apart from influencing the institutional environment through the public policy process, firms can also shape their environment by engaging in the formulation of technical standards. Technical standards prescribe the technical specifications (e.g. related to quality or safety) that a product needs to fulfill in order to be accepted to the market (Mattli, 2001). The setting of standards is a form of self-regulation (Blind, 2010) in which relevant market actors develop standards in standard development organizations or firm consortia. The effects of standards can be significant. Strict quality or safety standards can raise the production cost of a particular product or even exclude it from the market: technical standards thus shape the respective market (Bekkers and Martinelli, 2010).

Standardization issues are especially relevant for sustainability transitions, because sustainable technologies often differ significantly from existing technologies and thus require new standards. However, existing standards reflect dominant designs (Bekkers and Martinelli, 2010) and so 'present hurdles for new technologies and products' (Blind, 2010, p. 226). The standardization process is characterized not only as a technical process, but also as a political process offering room for strategic behavior (Werle and Iversen, 2006). As a consequence, 'influential actors may use standards to block potential competitors' or 'hamper innovation' (Abbott and Snidal, 2001, p. 350). They may also complicate technological change by slowing down the standardization process (David and Shurmer, 1996).

In sum, the literature provides insights into how a firm can influence its institutional environment in order to defend its interests in the face of a threatening innovation or a supporting policy. Firms can attempt to influence public policy by engaging with policy makers and the general public through various channels. Specific information and messages are conveyed via lobbying, research reports and position papers, as well as via grassroots mobilization, various forms of advertising, contact with the media and educational activities. Furthermore, firms can engage with other market actors in the setting of technical standards.

We acknowledge that large incumbent firms cannot be regarded as unitary actors, due to e.g. the diversity of their business units. However, the main interest of the research is to identify actual behavior; it does not attempt to reconstruct the plans underlying strategic behavior.

Methodology

The research question was applied to the empirical fields of biofuels and LED lighting. Both innovations are relevant in the context of the energy transition: they produce renewable energy and/or result in energy saving. With these two cases we explore the supply side of the energy system (biofuels) as well as the demand side (LED). Second, both biofuels and LED are relatively radical substitutes for the current technology and therefore interfere with the interests of specific large incumbent firms, whose behavior we can study. LED lighting is especially interesting because it is a high-profile innovation that gets a lot of media attention and has large energy saving potential. Biofuels are specifically relevant because they make up for a large part of sustainable energy production in the Netherlands (CBS, 2012), so we expect data to be available. Finally, to help identify the type of strategy in which we are interested, we chose innovations that are policy driven and that are beyond the R&D phase (both factors making strategies towards the institutional environment more likely).

Data was collected from interviews and documents, following an iterative approach. Semi-structured interviews were conducted with 17 people (LED, five; biofuels, 12) from various backgrounds in order to obtain a variety of perspectives on the issue, in the period February 2010 through March 2012. We interviewed eight entrepreneurs, two policy makers, two standardization agents, two members of the Dutch Energy Transition Platform and one scientist. These interviewees were asked to describe the behavior of the relevant incumbent with regard to the particular innovation. Subsequently, we interviewed two incumbents (both managers of external affairs) asking them to describe their response to the development of the innovation and to react to statements made by the other interviewees. Most interviews were conducted in person; a few were conducted by phone. Interviews were recorded if the interviewee granted permission.

Analysis of the interview data was performed by open coding (Boeije, 2010). By labeling, categorizing and constant comparison of the data based on the theoretical framework, we identified recurring patterns of behavior of incumbents, i.e. their strategies.

Information from documents was used to prepare for the interviews and to triangulate interview data. In both cases, a preliminary timeline of incumbent behavior was constructed on the basis of newspaper articles and the incumbents' annual reports. Other documents included websites, government documents and incumbents' position papers.

Due to the sensitivity of the topic under study, disclosure of strategic behavior is limited. Therefore, all interviewees are anonymized. Moreover, it is important to keep in mind that the data used for the case studies is based on the interviewees' view on reality. Since there are no impartial players in this game, triangulation does not always provide decisive results. Therefore the aim of this study is to provide indicative insights into incumbents' strategies that will function as a starting point for further research. The findings of this study are not directly generalizable (e.g. to other sectors): more research is required. However, the information provided in the case studies allows the strategies to be understood in their context.

The Case of LED Lighting

LED light makes use of a fundamentally different technology to produce light as compared with traditional light bulbs or compact fluorescent light (CFL). Light emitting diodes (LEDs) have existed since the 1960s. Continuous development in terms of color and light intensity followed in the next decades, making the LED a competitor for conventional household lighting starting from the mid-2000s. The energy efficiency of LEDs is up to 80% higher than that of traditional light bulbs. Other advantages are the absence of toxic materials such as mercury and the dimming possibilities (Milieu Centraal, 2010; CE Delft, 2006). In addition, the LED produces a different type of light, so-called 'mesopic' light¹ (Taskforce Verlichting, 2008). LED lights with standard fittings (retrofit) for domestic use were introduced to the consumer market by a start-up firm in 2006. This represented a competence destroying

¹Within the spectrum of light that is visible to the human eye, mesopic light has a shorter wavelength than traditional light sources.

innovation for a European lighting incumbent, which was very much focused at CFL production and promotion (Elsevier, 2009) and did not yet produce a comparable LED product (de Volkskrant, 2006; Financiële Dagblad, 2007). Simultaneously, the incumbent started an initiative for a European ban on traditional light bulbs (entrepreneur 1, 2010; Taskforce Verlichting, 2008; Elsevier, 2009) in order to favor the sales of more profitable CFLs (Elsevier, 2009). However, a fast introduction of LED products (by others) might put the sales of CFLs at risk.

Institutional Strategies Related to LED Lighting

In order to delay the introduction of retrofit LED lamps, one strategy of the incumbent was to continuously make statements in the media that retrofit LEDs for domestic lighting would only be available after 2018 (entrepreneur 1, 2010; NRC Handelsblad, 2007). Similarly, it claimed that the LED does not yet provide a good alternative for the fluorescent tube (entrepreneur 2, 2011; De Telegraaf, 2009, 2010; ANP, 2010).

In meetings with the Minister of Environment, the incumbent repeatedly claimed that the entrepreneur's LED light was not ready for the market. During Taskforce Lighting meetings (issued by the ministry to increase energy efficiency), the incumbent brought along scientists who supported this claim. The minister only learned that this 'authoritative' statement was false when the entrepreneur actually demonstrated the functioning of the LED light in person during a meeting (entrepreneur 1, 2010).

In the same Taskforce Lighting, the incumbent made a fierce attempt to prevent any reference to the concept of mesopic light in their advisory report (entrepreneur 1, 2010). Namely, the different nature of mesopic light leads to bad scores on light intensity when following the lumen and lux measurement standard, even though people experience similar light intensity to traditional lighting (entrepreneur 2, 2011; Trouw, 2009). As a compromise, mesopic light was mentioned in an appendix (Taskforce Verlichting, 2008, p. 45). The absence of an explanation of this concept would set back LED light compared with standard light bulbs and CFL (entrepreneur 1, 2010).

Incumbents are strongly represented in the organizations that set these (measurement) standards (entrepreneur 3, 2010; standardization agent 1, 2010). The incumbents insist on the lumen and lux measurement standard, thus creating a barrier for the entrepreneur to prove the performance of the innovation (entrepreneur 1, 2010). In addition, an initiative to develop a comprehensive quality standard for LED lighting is stalled by the lighting incumbents (entrepreneur 2, 2011). This standard would reduce uncertainty by ensuring that only high-quality LED lighting is sold. However, for incumbents this standard would be disadvantageous for two reasons. First, they will no longer be able to claim that high-quality LED lighting is not yet available. Second, because the incumbents are not at the technological forefront of LED, their own products may not meet the requirements (entrepreneur 2, 2011).

While the above mentioned institutional strategies indicate that the incumbent tried to postpone LED market development, the incumbent also recognized the excellent market opportunities for this innovation. This becomes clear from a range of large acquisitions by the incumbent (LEDs Magazine, 2005, 2006, 2007), leading to the incumbent's involvement in all parts of the LED value chain.

Incumbent's Perspective

Incumbent 1 (2011) confirms that LEDs hardly contributed to the company's sales in 2006. Moreover, incumbent 1 (2011) states that CFL sales have 'only really taken off in the last 10 years, partially due to the attention for energy and climate, and the ban on traditional light bulbs in the latter 5 years'. This indicates that the incumbent still has large interests related to the sales of CFL and thus may benefit from prolonged CFL sales, as opposed to a fast market development of LED lighting.

However, incumbent 1 (2011) does not confirm that the introduction of LED light represents a threat to the sunk investments related to CFL. Instead, incumbent 1 (2011) states that the company 'has always taken all lighting technologies into account' and that, in general, companies should never limit themselves by 'perceived interests in the old technology'. More specifically, their LED related activities are driven by the efficiency and price development of LED technology (incumbent 1, 2011).

Nevertheless, incumbent 1 (2011) confirms they have made statements that retrofit LED does not provide an adequate alternative yet for traditional light bulbs and fluorescent tubes. These statements are said to aim at informing

the consumer about the quality and efficiency of products and to protect them from 'buying products that do not meet future standards or do not deliver the efficiency promised' (incumbent 1, 2011).

The Case of Biofuel

The main initial driver for the biofuel market is the EU Biofuel Directive of 2003 (Directive 2003/30/EC). Aiming to reduce greenhouse gas emissions from transport, this directive prescribes the blending of biofuels with fossil fuel. Table 1 shows the sharp increase in the blending of biofuels T1 from the year 2007, when the blending obligation took effect.

The use of biofuels affects at least two sectors, namely the fossil fuel industry and the international commodity industry, which are both characterized by large incumbent firms. For fossil fuel companies, blending biofuel first of all means a decrease in sales of fossil fuels (in mature markets) (policy maker 1, 2011). It requires additional effort and money to buy the biofuels from firms in the agricultural and commodity sector. Moreover, if fossil fuel companies want to produce biofuels themselves, they need to acquire a new set of competences related to biobased products.

The commodity sector is affected by biofuel use in an indirect manner. Biofuel production causes increased competition on markets for agricultural raw materials such as palm oil. This leads to higher input prices for the food industry, which reduces the margin on their products.

Multiple interviewees state that the above mentioned incumbents aim to keep the biofuel market as small as possible (platform member 1, 2010; platform member 2, 2010; entrepreneur 4, 2010; entrepreneur 5, 2010; policy maker 1, 2011; policy maker 2, 2012). Moreover, a major oil company was convinced it could prevent the blending obligation in the Netherlands. 'They could not believe it when this obligation was set' (entrepreneur 6, 2010). This corresponds to media statements of the VNPI, an association representing nine companies of the Dutch oil industry, which advocated persistently against policy support for biofuels (e.g. *de Volkskrant*, 2003a; *De Telegraaf*, 2003a).

Institutional Strategies Related to Biofuel

The oil industry has been involved in discussions concerning biofuels for about the past ten years. They pursued their interests through the provision of various arguments, focusing on the disadvantages of biofuel blending (entrepreneur 6, 2010). These arguments changed over time and were aimed at the general public and/or policy makers.

One type of strategy was to emphasize the technical disadvantages that are related to biofuel use. When the EU Biofuel Directive was in preparation, the European oil industry (united in CONCAWE) published a study together with the European automotive industry (represented by EUCAR) and the EU Joint Research Centre, which showed that the use of biofuels would lead to higher emissions compared with conventional fuels (standardization agent 2, 2010). Remarkably, the methodology of this research remained unclear (policy maker 2, 2012) and biofuel producers were not allowed to participate (standardization agent 2, 2010). According to policy maker 2 (2012), CONCAWE tried to create a picture of biofuels that was 'not very positive'. Nevertheless, the outcomes of this study became the basis for the default values with regard to biofuel emissions in the EU Renewable Energy Directive (Directive 2009/28/EC) (standardization agent 2, 2010; policy maker 2, 2012).

Year	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
Volume (million liters)	N.A.	N.A.	N.A.	N.A.	67	463	449	586	399	529
Percentage of total gasoline and diesel (on energy basis)	N.A.	N.A.	N.A.	N.A.	0.38	2.78	2.56	3.42	2.09	N.A.
Energy (TJ)	nil	nil	nil	100	1.766	13.031	12.048	15.606	9.577	13.438

Table 1. Blending of biofuels in the Netherlands. Data: CBS (2012, 2013)

Moreover, at the time the Dutch government had to transpose the Biofuel Directive into national law, the Dutch oil industry provided a study that concluded that CO₂ reduction could be obtained more efficiently by co-firing biomass than by blending biofuels (*de Volkskrant*, 2003a, 2003b).

Finally, oil companies expressed their concerns about technical problems with cars caused by blending biofuel. The incumbents stated their concerns that consumers will hold them accountable in case of damage (policy maker 2, 2012).

A second type of strategy was to focus on the disadvantages of the policy support for government and society. For this strategy, incumbents use the media and the general public as intermediaries between them and the government. The analysis of news articles shows that, when a policy window exists, many publications on the topic appear in the mainstream media. In contrast, when there are no policy developments, biofuels are barely covered. Thus, the VNPI argued that

1. EU targets will cause Dutch tax money to flow abroad due to biofuel import (*de Volkskrant*, 2003c);
2. the necessary tax exemptions on biofuels are too costly for the government (*De Telegraaf*, 2003b);
3. policy measures should be cost efficient (*Algemeen Dagblad*, 2003; *De Telegraaf*, 2003b; *NRC Handelsblad*, 2004; *FEM Business*, 2004) and
4. first generation biofuels do not contribute to the knowledge economy (*NRC Handelsblad*, 2004; *FEM Business*, 2004).

A third and important strategy was to demand that biofuels be sustainable. In 2006, environmental NGOs initiated a debate about possible competition for raw materials between food and fuel (policy maker 1, 2011; policy maker 2, 2012; scientist 1, 2012). The oil industry took up this concern and contributed to formulating sustainability criteria for biomass.

In response to the food versus fuel debate, the VNPI emphasized to 'take it easy with the development of biofuels' (policy maker 1, 2011). Their arguments concerned the availability of sustainable biomass and the availability of a certification scheme (policy maker 1, 2011; policy maker 2, 2012). Platform member 1 (2010) points to the enormous and persistent efforts of the oil industry to supply Dutch policy makers with information showing that not enough sustainable biomass was available. These efforts are said to take place in direct contact with the minister (policy maker 2, 2012) and within the Cramer Committee and the Corbey Committee (policy maker 1, 2011) that had been installed by the Dutch minister to investigate sustainability questions related to biomass. In 2008, the Netherlands indeed lowered the prescribed blending target for 2010 from 5.75% to 4% (Agentschap NL, 2012).

Furthermore, the food industry demanded sustainability criteria for biomass, more specifically for palm oil. Using palm oil for biofuels would lead to deforestation, especially in Indonesia (platform member 2, 2010). However, this conceals the fact that only a few percent of the world's palm oil is converted into biofuels, whereas the lion's share is used for the production of food and detergents (platform member 1, 2010; policy maker 1, 2011; policy maker 2, 2012). The real concern for Unilever seemed to be the increasing price for palm oil (policy maker 1, 2011; policy maker 2, 2012; *NRC Handelsblad*, 2008), which their European Director of External Affairs also acknowledged (*nrc.next*, 2007).

A fourth strategy was to advocate policy support for second generation biofuels (i.e. biofuels based on raw materials that do not compete with food production) (VNPI, 2006; IEA Bioenergy, 2008, p. 8; entrepreneur 6, 2010, platform member 2, 2010). Unilever proposed that part of the blending obligation be fulfilled with second generation fuels (policy maker 1, 2011). This would mean less competition in the commodity markets. Moreover, since second generation biofuels are still largely in the R&D phase, supporting these biofuels is likely to go at the expense of learning effects and further market development of first generation biofuels (platform member 2, 2010; entrepreneur 7, 2010; entrepreneur 8, 2010).

The fifth strategy is one that involves market actors and is to strategically set technical standards. Once the biofuel support programs were in place, attention shifted to specific technological characteristics of biofuels (entrepreneur 6, 2010; standardization agent 2, 2010). These technical details are worked out by a dedicated committee at the European standards development organization CEN. A majority of the committee participants comes from the fossil fuel industry, the automotive industry and the military industry. One example of how incumbents can influence the development of biofuels through technical standards is highlighted here.

Biodiesel tends to have some problems at low temperatures (i.e. in winter). Fossil fuel companies and car manufacturers took the lead on this issue and proposed solutions. However, the proposed solution tends to require extra investments from the biofuel producer, thereby raising the cost of biofuels (standardization agent 1, 2010). Interestingly, the incumbent itself did not produce biodiesel. Since biodiesel is used as a blend with fossil diesel, the other option would be to change the characteristics of the fossil diesel. However, that option was out of the question (standardization agent 1, 2010).

Despite the defensive institutional strategies mentioned above, some incumbents are also actively pursuing research in the field of biofuels or even producing biofuels. A notable example is Shell, which has been investing in various technology partnerships (e.g. Iogen, Codexis, Virent, Choren) over the years, focusing on second generation biofuels. Interestingly, in 2010, Shell entered into a joint venture with Cosan and thereby became a large scale producer of first generation bioethanol from sugar cane (platform member 2, 2010), thereby acting in contradiction with earlier statements condemning first generation biofuels.

Incumbent's Perspective

Incumbent 2 (2012) confirms that the idea of adding biofuels to their fossil fuels was received with resistance within the company: this obligation would disturb their smoothly running fossil fuel operations. Subsequently, the incumbent engaged in regular contact with the Dutch government, providing arguments why blending would be disadvantageous. Incumbent 2 (2012) confirms the use of the above mentioned arguments but emphasizes that these are real concerns for the company. For instance, the debate on the sustainability of biofuels was likely to get the incumbent caught between NGOs' sustainability demands and the governmental blending obligation. Whenever the government hints at increasing the blending percentage, the incumbent will again point at these arguments (incumbent 2, 2012). Furthermore, incumbent 2 (2012) confirms that the distinction between first and second generation biofuel has been 'oversimplified' in communication with the general public.

Analysis

In this section, the strategies mentioned with regard to LED and biofuels will be reflected upon in terms of the theoretical framework and in terms of their contribution to the MLP.

First of all, both case studies show that incumbents indeed employ a variety of strategies aimed at the external environment, as suggested by Pfeffer and Salancik (1978). By strategically influencing their environment, incumbents try to promote their interests. They address different parts of this external environment: the case studies show strategies aimed at policy makers, the general public and other firms. The main strategies are providing information and arguments to policy makers and the general public, as well as strategically setting technical standards.

Moreover, we observed that incumbents indeed make substantial efforts in terms of institutional strategies. This is in line with our expectation that institutions are an important target for incumbent strategies, due to the importance of policy support for the development of sustainable innovations. We will now discuss the strategies mentioned above.

The main institutional strategies concern influencing the public debate and lobbying policy makers. These strategies focus on bringing a message across and subsequently convincing the target group of this message. These observations are in line with the central tenet of institutional work and corporate political activities: firms mainly exert their influence by providing information to political actors and the general public. We have seven further remarks about this strategy.

First, the two cases also seem to indicate that lobbying is predominantly based on content-related arguments and not so much on the firm's power position. However, 'content related' does not mean that incumbents' arguments are necessarily objective or consistent. In their communication, incumbents seem to emphasize the disadvantages of the new technology (or policy), while staying away from the rationale behind supporting this technology. For instance, the arguments related to biofuel blending all focus on the disadvantages of the policy program or biofuel technology itself (risk of damaged cars), whereas the problems of climate change and energy security are ignored. This selection of arguments resembles 'defensive institutional work', except that the work is directed against a

new institution, instead of in defense of an existing institution. Just as Maguire and Hardy (2009) stated, incumbents make 'assertions of negative impacts of practices' and 'categorize practices as unethical, undesirable, or inappropriate' (p. 169). Also in the LED case, in its communication the incumbent focused on the said disadvantages or limitations of the new technology (e.g. 'LED does not provide a good alternative yet for the fluorescent tube'). In sum, the arguments incumbents provide do not draw a complete picture of the issue, but are a selection that suits their interests best.

Second, we observed that incumbents' arguments concern not only the particular innovation (as in the example above), but also broader societal beliefs that influence the environment in which the innovation has to develop. For instance, the VNPI emphasizes time and again that the Dutch government should not subsidize technologies that 'cannot compete yet' (*Algemeen Dagblad*, 2003; *NRC Handelsblad*, 2004; *FEM Business*, 2004). This statement conveys the idea that the government should let the market do its job and thus policy intervention is not desirable. This is another example of 'institutional work', which takes the form of 'reproducing existing norms and belief systems' (Lawrence and Suddaby, 2006, p. 230). Thus, the argument reinforces the belief that the market will bring about the energy transition. Because most sustainable innovations need policy support (see, e.g., van den Bergh *et al.*, 2011), this statement helps preserve the stability of the regime.

Third, incumbents tailor their arguments to general policy goals: they express their interests in terms of socially legitimate goals. For instance, the lighting incumbent makes negative statements about competitors' products, based on the premise that consumers should be protected against products that do not meet efficiency or other standards. Although this is a praiseworthy aim, it is not a logical task for an actor with related and conflicting commercial interests. Similarly, the oil incumbent states that it is very important that biofuels used for blending are produced from sustainable biomass. In itself, this is a legitimate argument. However, this criterion slows down the development of the biofuel market, due to the certification system that has to be put in place. This delay suits the oil industry: they were against the blending obligation in the first place. Now that the blending obligation has been coupled with compulsory sustainability criteria, it follows that enough sustainable biomass should be available to meet the blending target. However, it is difficult to determine the world's quantity of available sustainable biomass. This uncertainty allows oil incumbents to stress that not enough sustainable biomass is available, every time it is suggested to raise the prescribed blending target. In sum, a socially legitimate goal (biomass should be sustainable) seems to function as a tool to slow down a transition to alternative fuels. This translation of private interests into societal goals (an example of framing) is of central importance for firms that aim to influence policy makers or public opinion, as was also highlighted by Pfeffer and Salancik (1978).

Fourth, incumbents use media channels to convey their arguments to the general public. In the LED case, the negative statements about LED light quality seem to be aimed at directly postponing consumers' decisions to buy LED products. Thus, these statements may slow down the development of a mainstream LED market. However, the statements related to biofuels that were played out in the media are not so much aimed at individual consumers' decisions, but are aimed at indirectly influencing public policy through the general opinion. For instance, if the general opinion is that biofuels should be sustainable (also backed up by environmental NGOs), government will have less room to decide otherwise. The use of mainstream media for the above-mentioned aims differs slightly from the literature, since they are not meant to really build a constituency around the issue (Hillman and Hitt, 1999) or to increase the general legitimacy of the firm (Pfeffer and Salancik, 1978; Geels and Verhees, 2011).

Fifth, the complexity of many sustainability issues is central to the type of strategy discussed here. It is precisely the uncertainty and complexity that allow for a good deal of framing: incumbents are able to construct a discourse that provides much wanted order in these complex situations. However, this discourse aims to influence the general debate in such a way that it serves their interests. For example, the distinction between first and second generation biofuels was used consciously in communication with the general public, while the incumbent knew these categories were oversimplified. Leaving out nuances in the public debate may serve strategic purposes.

Sixth, in their communication, incumbents may apply double standards. Whereas sustainable energy technologies are obliged to meet the highest sustainability criteria, existing and polluting products and technologies remain outside the scope of these criteria. In this respect it is remarkable that sustainability criteria for biomass form such a central concern for the incumbent, while they do not apply such strict criteria to their other unsustainable production processes (e.g. tar sands). Partially, the incumbent's attention for the sustainability of biomass may have been induced by campaigns of environmental NGOs. However, the predominance of sustainability concerns related to

biofuels contrasts sharply with other operations, such as increased exploitation of tar sands. The use of different sustainability 'yardsticks' for energy technologies may serve to defend existing practices.

Finally, the strategies identified in this research seem to be mostly of a long term nature, given the continuous efforts incumbents in the LED and biofuel cases put in lobbying and participating in governance structures. The long term character may be the essence of these strategies. In contrast, the use of media channels to express certain arguments to the general public seems related to the presence of a policy window. It thus forms an additional ad hoc approach to the continuous lobbying efforts. Furthermore, the case studies indicate that incumbents interact with policy makers both individually and collectively. In the biofuel case, the incumbent was represented by lobby organization VNPI, but simultaneously also engaged with policy makers individually. Interestingly, the arguments put forward by the branch organization did not necessarily match those of the individual incumbent. Whereas the VNPI lobbied openly against biofuel blending, the incumbent took on a more constructive approach. The incumbent did not perceive this as problematic, probably because, if the VNPI were to succeed in averting the blending obligation, the incumbent's interests would be served as well. Moreover, the incumbent was able to remain a cooperative partner for the government. In sum, these findings correspond with the proposition of Hillman and Hitt (1999) that strategies can be relational (long term) or transactional (ad hoc), as well as individual or collective.

In accordance with the literature on technical standard-setting, it becomes clear from the case studies that this is not only a technical but also a strategic process (cf. Werle and Iversen, 2006). Decision making by consensus together with the predominance of incumbent firms in the standard setting committees create opportunities for incumbents to define standards that favor existing technologies. This study shows that incumbents can do so by passing on necessary adjustments of the fuel mix to the producers of biofuel, thereby raising costs of the new product. In relation to LED lighting, incumbents seem to stick to outdated measurement standards and are said to postpone a dedicated LED quality standard, which is in line with the strategy of postponing mentioned by e.g. Abbott and Snidal (2001) and David and Shurmer (1996). The resulting standards are likely to be a compromise of the various interests involved in the committee. However, newcomers tend to be underrepresented and do have to follow the incumbents' agenda setting.

The first insights into these standardization strategies show that incumbents are able to influence a technology's development through a process that is largely beyond the control of government institutions, but nevertheless plays an important role in shaping the market for a new technology. This situation enables incumbents to promote their interests, even after major political choices have been made, such as the EU biofuel blending obligation.

Effects of Strategies and Changes in Strategies over Time

The strategies incumbents employ with regard to the threatening innovation are logical and understandable from their point of view. However, very often the strategies negatively influence the innovation's development. In other words, the strategies originate from regime actors and also lead to outcomes that reaffirm regime structure and practices.

While the innovations in our cases are threatening to the incumbents in the short run, the incumbents do see business opportunities for these innovations in the long run. This is visible in their investments in the technology. So whereas incumbents' institutional strategies often do not support the development of the new technology, their cooperative efforts do contribute to the innovation.

Interestingly, our cases show that the supporting and the restraining behavior take place simultaneously. This observation suggests that incumbents attempt to constrain the formation of a new market as long as they do not have their own production capacity for the new technology in order. (This moment may come later for the incumbent than for entrepreneurs, due to the risk averseness and the preference for large scale production of the former.) This means that the constraining strategies are likely to be temporary and will be employed as long as the incumbent needs to prepare for the new technology, provided the incumbent sees a viable business case. This shows that incumbent strategies are not uniform, but vary over time and depend on the actors they target. Once the incumbent quits the defensive behavior, the implementation of the innovation is expected to speed up significantly.

Indeed, in both of our cases the incumbents get involved in the new technology through various forms of cooperation. Regarding biofuels, the incumbent enters into multiple technology partnerships and finally

participates in a joint venture. The lighting incumbent also invests in the new technology by acquiring multiple LED related companies.

Contribution to Transition Studies

The MLP asserts that innovation comes about through interactions on and between the landscape, regime and niche levels (Geels, 2002). It is assumed that the regime resists innovative pressures from the niche by defending regime rules or engaging in power struggles. However, it remains unclear what exactly this type of behavior by regime actors entails in practice.

The main contribution of this study is the identification of a number of strategies that incumbent firms employ with regard to innovations that threaten their interests. These insights show how regime actors try to prevent a fast development of the niche innovation. The knowledge of this micro-level behavior will help to understand processes on the system level. Generally speaking, this research shows that the agency of incumbent actors plays an important role in transitions. As a consequence, we need to keep our eyes open for issues of power if we want to understand transition processes. The literature on institutional work and on corporate political activities provides useful insights in this regard.

The two case studies show two different types of incumbent behavior in the face of a threatening innovation. Whereas both initially try to slow down or obstruct the development of the new technology alongside exploratory behavior into the innovation, the incumbent in the LED case later passes a tipping point and actively supports the new technology. The transition to LED lighting seems inevitable, but the incumbent needs time to build up the necessary capacities and therefore tries to restrain market development. On the other hand, the oil incumbent keeps promoting the status quo. If the incumbent is involved in the technology primarily because of society's demands, it is unlikely that the company's involvement will accelerate the transition. Whereas the incumbent appears to contribute to the transition, in reality they may promote the status quo by cleverly phrasing their interests in terms of societal goals. Further research may show us whether this might have to do with the nature of the new technology. If the incumbent would be able to exploit the technology itself in the future and expects the new technology to be their core business in the (near) future, the incumbent may speed up the transition considerably. In such a case, the firm will also be a valuable partner for public policy makers. Further research into these questions is a promising avenue for better understanding transition processes.

Conclusion

This study shows that incumbents use a variety of institutional strategies when they are confronted with a sustainable innovation that threatens their interests. By strategically influencing their environment, incumbents try to promote their interests, often at the expense of the new technology. They address different parts of this external environment: the case studies show strategies aimed at policy makers, the general public and other firms. The main strategies are providing information and arguments to policy makers and the general public as well as strategically setting technical standards. With these strategies, incumbents are able to influence the environment in which the innovation has to develop and diffuse, at least for a while. In other words, incumbents are able to temporarily *keep sustainable innovation on a leash*.

Existing innovation and strategic management literature emphasizes the innovative capacity of firms. However, this research demonstrates that firms do not always behave in ways that support the new technology. Defensive strategies of firms that see their interests threatened have to be acknowledged as an important aspect of innovation and transition processes. More research is required into this much overlooked area. An integration of innovation and transition literature with insights from corporate political activities and institutional work will be beneficial.

Public policy makers can also benefit from the insights into defensive firm behavior. For large socio-technical processes of change, policy makers often rely on studies highlighting the technical potential of innovations. This leads to overly optimistic projections, because the defensive strategies of affected firms decrease the real potential

for change. This article shows that, when trying to stimulate a transition, policy makers should pay ample attention to the socio-political potential of new technologies, which is lower than the technical potential due to the above-mentioned firm strategies.

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