



# **Innovation Studies Utrecht (ISU)**

## **Working Paper Series**

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ISU Working Paper #15.01

# Institutional entrepreneurship in the emerging renewable energy field: incumbents versus new entrants

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## Abstract

*An underexplored issue in the institutional entrepreneurship (IE) literature is the difference between incumbents and new entrants in promoting institutional change for innovative technologies. We study the IE activities: cooperation, framing, and political tactics in the case of biomethane development in the Netherlands, during 2006-2012. While for decades biogas farmers have been unable to build a supporting institutional framework, incumbents recently arranged substantial government support. Our theoretical contribution lies in defining dimensions of the three core IE activities. We present empirical evidence that new entrants and incumbents employ all three activities, but in distinct ways. Thus, the incumbents' IE activities lead to more substantial institutional change than new entrants' activities. As a consequence, production shifts from electricity to gas and the scale of installations increases. We conclude that incumbents can accelerate institutional change, however their focus on large-scale installations makes it difficult for biogas farmers to contribute to biomethane production.*

## 1. Introduction

Climate change and the depletion of conventional fossil fuels require societies to go through a transition towards a low-carbon economy (e.g. Blühdorn, 2011; Okereke et al., 2012) and a sustainable energy system (IPCC, 2014:28). Such an energy system requires the development and diffusion of new energy technologies. Institutional change is an indispensable element in the emergence of new technologies (e.g. Hargrave & Van de Ven, 2006). Institutions are 'the rules of the game' (North, 1990, p. 3) and structure behavior by enabling and constraining certain types of activities. Existing institutions tend to hamper the diffusion of innovations, and therefore, innovation requires the de-institutionalization of existing institutions, and the theorization and institutionalization of new ones (Greenwood et al., 2002). It entails the

process of ‘existing set of beliefs, norms, and practices [coming] under attack, [undergoing] delegitimation, or [falling] into disuse, [being] replaced by new rules, forms, and scripts’ (Scott, 2014:114).

The field of sustainability transitions (e.g. Van den Bergh et al., 2011) traditionally focuses on new entrants as the agents of change, while incumbents are often found to defend the status quo (e.g. Smink et al., 2015; Stenzel & Frenzel, 2008; Wesseling et al., 2014; Sarasini & Jacob, 2014). Incumbents are believed to be ‘restricted by their existing assets, which reflect past investments’ (Hockerts & Wüstenhagen, 2010: 487). However, Stenzel & Frenzel (2008) argue that if a firm’s resource base matches with future developments, ‘incumbents can be drivers of transformations of the energy system both in terms of technological development and regulatory adaptation’ (p. 2655). The benefit of incumbents promoting sustainable innovation is their ‘promise to achieve a broader impact, since they have the potential to reach out to a mass-market audience’ (Hockerts & Wüstenhagen, 2010:486). In sum, literature indicates that not only new entrants but also incumbents are able to be agents of change.

Actors aiming to change institutions can engage in institutional entrepreneurship, which entails ‘... activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones’ (Garud et al., 2007:957). We may expect that new entrants and incumbents have distinct starting positions in terms of resources, skills, and networks (e.g. Greenwood & Suddaby, 2006:43, Levy et al., 2009). Therefore, incumbents’ institutional entrepreneurship as well as the related institutional change is expected to differ from those of new entrants. For instance, incumbents may engage more with policy-makers, due to their stronger connections with the political system (e.g. Lalor & Hickey, 2014; Lin, 2014; Sühlsen & Hisschemöller, 2014). Furthermore, due to their stronger position in terms of resources, we expect

incumbents to be more successful in creating supportive system structures (e.g. Maguire et al., 2004: 658; DiMaggio, 1988:13).

However, the difference between incumbent and new entrant behavior is a relatively unexplored area. Levy & Scully (2007) state that ‘the strategic implications of their differential resources and locations have not been thoroughly explored’ (p. 975). With this paper we address the above knowledge gap. We aim to analyze institutional entrepreneurship activities by incumbents as compared to new entrants. Therefore, we build on the framework of Pacheco et al. (2010), which presents cooperation, framing, and political tactics as three main activities of institutional entrepreneurship.

We focus on the renewable energy case of biogas in the Netherlands. Negro et al. (2007) have shown that biogas producers have failed to create momentum for the development of biogas in the Netherlands in the time period 1970-2004. During this time span, actors were mainly new entrants to the energy market, in particular farmers with small co-digestion plants. Ever since the first production subsidy for electricity production from biogas was allocated in 2004, the profitability of biogas installations has been a concern [e.g. 29; 38]. From 2008 onwards, dramatic improvements occurred in the institutional framework for biogas and its upgraded version, biomethane (see Table 1). Firstly, financial support increased sharply, mostly in the form of a production subsidy and R&D tenders. Its pinnacle was the allocation of a striking 1 billion euros production subsidy to biomethane in 2011 (RVO, 2012). Secondly, government offered regulatory support (e.g. the setup of a sustainability certification scheme). Thirdly, government statements indicate that biomethane turned into a government priority. This watershed coincided with the entrance of large incumbents from the Dutch natural gas sector into the field of biomethane (NAM, 2005:17), which is complementary to the biogas value chain.

This case study provides an excellent opportunity to study incumbent and new entrant institutional entrepreneurship and their respective impact on the institutional framework for biomethane. We will also discuss how the institutional change affects changes in the number and scale of biomethane installations. Due to the government's central role in the development and diffusion of new energy technologies (cf. Stoddart et al., 2012), we focus on formal institutions. Our research question is: *How do incumbents and new entrants engage in institutional entrepreneurship to promote biomethane, and what are the effects on the formal institutions as well as impact on biomethane development?*

This study has the form of a case study covering the time period 2006-2012. Our analysis is based on a newspaper database including 250 news articles; policy documents; various other relevant publications; 15 expert interviews; and observations from gas industry conferences.

Our findings contribute to the institutional entrepreneurship (IE) literature by defining dimensions of the three main IE activities, on the basis of our distinction between incumbents' and new entrants' institutional entrepreneurship activities. Furthermore, our case study shows that activities of cooperation, framing, and political tactics build on each other to have an impact on institutional change.

## **2. Institutional entrepreneurship**

In a review of 100 institutional entrepreneurship studies, Pacheco et al. (2010) discuss the activities through which institutional entrepreneurs contribute to institutional change. These are: cooperation; framing; and political tactics. We take this categorization as the basis for our analytical framework, complementing it with innovation literature.

## 2.1 Cooperation for institutional change

Pacheco et al. (2010) show that to achieve institutional change, actors need to cooperate. Cooperation is defined as ‘sustaining a collective identity and finding ways to bring together the interests of different groups’ (Fligstein, 1997 cited in Pacheco et al., 2010:989). The resulting cooperation between actors is a crucial building block to create institutions that support institutional and technological change (Alexandrescu et al., 2014; Hahn & Pinkse, 2014; Bled, 2010). Namely, the framing and political tactics discussed below will be carried out mostly on behalf of these associations.

Successful cooperation also requires institutional entrepreneurs that are perceived as ‘[occupying a legitimate position] by diverse stakeholders and that [...] bridge those stakeholders, allowing the groups to access dispersed sets of resources’ (Maguire et al., 2004:674). The creation of legitimacy is a central element in institutional change, because legitimacy provides the social acceptance of and support for institutions (Bergek, 2008; Driscoll, 2006). Cooperation can increase actors’ legitimacy and thus increase the likelihood of achieving institutional change (Hahn & Pinkse, 2014). For instance, sociopolitical legitimacy is obtained by organizing ‘endorsements and the support of key constituents, such as financial investors, government officials, consumers, and others who play key roles in developing and implementing an innovation’ (Hargrave & Van de Ven, 2006: 875).

## 2.2 Framing for institutional change

A second activity of institutional entrepreneurs is framing, according to Pacheco et al. (2010). Framing is defined as ‘[depicting a] preferred institutional arrangement as appealing to the widest possible audience’ (p. 990). Institutional entrepreneurs do so ‘by closely integrating new ideas and processes with commonly accepted narratives’ (p.990). A narrative (Welcomer, 2010) or story usually begins with a particular problem definition (e.g. Alexandrescu et al., 2014), which “brings into focus a set of solutions associated with that

type of problem” (Bartel & Garud, 2009: 112). For example, Garud et al. (2010) show that when climate change became a prominent concern, the nuclear energy sector reframed nuclear energy from a low-cost to a carbon-free technology. A specific form of framing is ‘theorization’: the issuing of research documents that justify new institutions in terms of their benefit to society (cf. Pacheco, 2010; DiMaggio, 1988). Framing builds on the cooperation activities discussed above. Frames put forward on behalf of associations are likely to have more traction than those presented by individual actors.

If the frame is perceived as relevant to the realities of key audiences’ experiences and aligned ‘to the projects of their targeted groups’, Hung & Whittington (2001:528) speak of ‘frame resonance’. If a frame resonates with its audience, the proposed institutional arrangement obtains legitimacy. A specific form of legitimacy is cognitive legitimacy: ‘the taken-for-granted assumption that an innovation is desirable, proper, and appropriate within a widely shared system of norms and values’ (Hargrave & Van de Ven, 2006: 875). Furthermore, Klein Woolthuis et al. (2013) have found that positive frames are more effective. Actors ‘sell their ideas by attaching positive emotions to the endeavor of sustainable development (more beautiful, profitable, etc), rather than referring to negative reasoning (e.g., environmental degradation)’ (p. 95).

### **2.3 Political tactics for institutional change**

In Pacheco’s overview, political tactics are a broad category of activities. Since we focus on political tactics aimed at changing formal institutions, the government plays an important role in bringing about institutional change. The literature on corporate political activities deals exactly with how actors get their frame across to policy makers and the wider audience (e.g. Scherer et al., 2014; Dahan et al., 2013). Corporate political activities are defined as: ‘corporate attempts to shape government policy in ways favorable to the firm’ (Hillman et al., 2004:838). There are two, related, types of activities: namely lobbying policy makers and



influencing the wider audience, e.g. through the media. The latter activity influences public policy making indirectly.

Lobbying policy makers includes ‘employing 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’ (Hillman & Hitt, 1999:834). In their empirical study of the German energy transition, Sühlsen & Hisschemöller (2014) conclude that ‘regular and personal contact with politicians’ is the single most important element of an effective lobby (p.6). Moreover, having access to politicians in top positions (top-down lobbying) is more effective than contacting only Members of Parliament and the working-level of ministries (bottom-up lobbying) (p. 5).

The framing activity discussed above is a key element in influencing policy makers. The same is true for influencing public opinion, mostly via mainstream media. This happens through: ‘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’ (Hillman & Hitt, 1999:834).

### **3. Background on biomethane and actors’ motivations<sup>2</sup>**

Biogas is the product of a co-digestion process of manure and other organic materials, such as corn (step 1-3 of Figure 1). Traditionally, biogas is turned into electricity and heat by burning it in a cogeneration plant (not depicted in Figure 1). Often, more than half of the energy content is lost with cogeneration because there is insufficient heat demand at the production location (RVO, 2011:11). Since 2004, the electricity produced receives a renewable energy production subsidy.

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<sup>2</sup> For more information on the Dutch gas sector and biomethane, see Smink et al., under review

Another possibility is to upgrade biogas to Dutch natural gas quality by extracting CO<sub>2</sub> (step 4 and 5 of Figure 1). The resulting biomethane can be injected into the natural gas grid (step 6 of Figure 1). Using the existing infrastructure, biomethane can be transported to locations with sufficient heat demand (step 7 of Figure 1). Thus, if there is a useful application of heat at the end user, biomethane has a higher energy efficiency than biogas cogeneration (RVO, 2007:3). Moreover, biomethane can be used for the purpose of (centralized) electricity production and transport (step 7 of Figure 1).

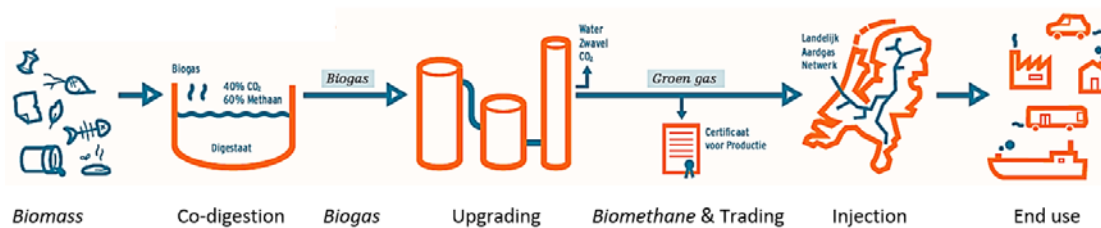


Figure 1. Biomethane value chain (adapted from Nieuw Gas Krant, 2010:4)

New entrants are actors that are new to the energy sector and include farmers and a few firms from the food industry that by producing electricity or biomethane enter the energy sector. New entrants' motivation to do so is to create value from available waste streams (Smink et al., under review). Most biogas installations are small-scale. Therefore, new entrants strive to create beneficial conditions for small-scale biomass digestion.

Incumbents are actors that are part of the energy sector traditionally and include energy trading companies and gas network operators. Network operators consist of two parts: a regulated natural monopoly that manages the network and a business unit that is allowed to engage in commercial activities such as building biogas pipelines or offering services for biomethane injection (see also Smink et al., under review). In addition, waste companies are categorized as incumbents because they often used to be part of the integrated energy companies (before liberalization). The gas incumbents do not produce biomethane themselves, but will trade and transport it (step 5 of Figure 1).

Incumbents have a broader goal than the new entrants, they aim to build up a biomethane value chain, including production, injection, trading, and using it for heat and electricity production and transport. By focusing on biomethane as an energy carrier, incumbents open up multiple ways of producing and consuming biomethane. Moreover, incumbents very deliberately focus on increasing cost-efficiency by promoting large-scale installations (PNG, 2007; PNG, 2010; Rijksoverheid, 2012). Producing biomethane through co-digestion is a prelude to large-scale biomass gasification. By 2050, gasification technology should produce large amounts of biomethane and should be complemented by large-scale biomass and/or biomethane import (PNG, 2007:14-16). The incumbents' ultimate motivation to promote biomethane is to maintain the central role of gas in the Dutch energy system (PNG, 2007:9-10; GasTerra, 2010:7-8). The gas sector is under pressure given the decline of the giant Groningen gas field (Ministry of Economic Affairs, 2014:10) and the negative impact of fossil fuels on climate change (PNG, 2007).

From the above it follows that new entrants and incumbents have partially overlapping and partially different goals. Their goals are complementary in that they cover different parts of the value chain: new entrants are involved in the first steps of producing biogas and biomethane from biomass, while incumbents cover the latter steps such as trading, injection, and transport of biomethane. Thus, increasing support for biomethane would be beneficial for new entrants. However, the incumbents' strategy to promote large-scale biomethane production does not fit with the needs of new entrants operating small-scale installations. Therefore, new entrants continue their own IE activities, next to those of incumbents.

An important characteristic of the Dutch gas sector is its historic intertwinement with the Dutch Government (Schippers & Verbong, 2000). In the period 2006-2012, gas production from the Groningen reserve and other fields has contributed between 10 and 15

billion euros to the Treasury annually (Rekenkamer, 2014:15). This equals 6 to 9% of Government's annual revenues (Rekenkamer, 2014:16). Biomethane is meant to contribute to the Government's policy to make the Netherlands the 'Gas Roundabout' of Northwestern Europe by capitalizing on existing skills and infrastructure (Rijksoverheid, 2012:3).

#### **4. Methods**

Given that institutional change is a complex process evolving over time and given our wish to give a rich description of institutional entrepreneurship, a qualitative research method best suits our research question (Bryman, 2008). Our analysis is based on a single case study, allowing us to shed light on the complex relations between actors' activities and institutional change (Yin, 2003). We chose the biomethane case, because the pronounced differences between incumbents and new entrants make it an excellent case to study and compare institutional entrepreneurship.

Our data consists of, firstly, a database of 250 news articles, based on a LexisNexis search in Dutch newspapers using the terms 'biogas', 'biomethane', and 'gas network' for the period 2006-2012. From this database we set up a timeline, starting in 2006, when the incumbents first showed their interest in biomethane and biomethane injection was first discussed in public, and ending in 2012. We complemented this database with archival data from RVO, the Netherlands Enterprise Agency (NEA: the Ministry of Economic Affairs' executive agency) on the number of subsidized biomethane projects and their production in terms of electricity or biomethane. Secondly, we analyzed policy documents and other sources such as branch organizations' publications, business publications, websites, newsletters, etc. Thirdly, one researcher attended the gas industry conference Energy Delta Convention in Groningen in 2011 and 2012, obtaining background knowledge on that sector. Fourthly, 15 semi-structured expert interviews were conducted with organizations identified

in the Background section. For each organization we interviewed the people that worked closely on the promotion of biomethane. These include four new entrants on the energy market: the biogas producers association (BGPA), biomethane producers association (BMPA), a sugar producer, and a regional sustainability consultant. Incumbents include: national biomethane association (BMNL) (4 interviews), regional energy association (ENNL) (1 interview), network operators (4 interviews) and their business development sections (3 interviews). Finally, two interviews were conducted with relevant Dutch government officials. We asked interviewees how their organization first reacted to the idea of biomethane production, what issues need(ed) to be addressed to increase biomethane production, and how they contribute(d) to a supporting institutional framework for biomethane. Many interviewees, especially incumbents' employees, have double roles, e.g. working for a network operator and an incumbents' association. This interrelatedness characterizes the gas sector. Annex I shows an overview of the interviewees. Interviews were predominantly face-to-face and took place between September 2012 and March 2013, with the exception of one follow-up phone interview in October 2014. Interviews lasted between 1-2 hours each, and were fully transcribed.

Data analysis for this paper followed a deductive approach, categorizing data according to the theoretical framework. NVivo was used to this end. Once the data was categorized in the three groups of IE activities we used an open coding approach (Boeije, 2010) to define the dimensions. We labeled, categorized and constantly compared the data, so as to identify the dimensions on which incumbent and new entrant IE activities differ. For each Findings section, we used multiple sources, thus assuring triangulation of the data. See Annex II for the types of sources per Results section. Two key actors in the biomethane field, employed at NEA, have checked both Table 1 and the rest of the Results section for (missing) data and validity of argumentation, enhancing the inter-observer consistency (Bryman, 2008).

Annex III lists the news articles that we refer to in this paper. In the text they are indicated by the number from the Annex between square brackets, e.g. [3].

## **5. Findings**

In this section we show how new entrants and incumbents engage in IE and how the combination of these activities contributes to institutional change. In section 5.1 we will first outline the main institutional changes related to biomethane in the period 2006-2012. Section 5.2 relates these institutional changes to proposals for institutional change by new entrants and incumbents, respectively. In the three subsequent sections we will describe and analyze the differences in IE between new entrants and incumbents based on the three activities identified by Pacheco et al. (2010): their style of cooperation; the way they frame their message; and the way they engage the wider audience and policy-makers (political tactics). The latter section on activities aimed at policy makers shows how the combination of cooperation, framing, and political tactics culminates in the institutional change presented in section 5.1. Section 5.6 presents an analysis of the effects of IE on institutional change, while section 5.7 ends with the impact on biomethane development.

### **5.1 Institutional change 2006-2012**

The formal institutions studied in this paper are set by the Ministry of Economic Affairs and are implemented by its executive branch NEA. The changes that occurred in the formal institutional framework for biomethane mostly relate to financial support, regulatory support, and government statements indicating the priority of biomethane. In terms of financial support, biomethane is added to the renewable energy subsidy scheme while subsidy for electricity from biogas is reduced. Moreover, biomethane receives support in the form of funding for scientific research, biomethane gas stations, and a biomethane knowledge center; two tenders for R&D; and the inclusion of biomethane hubs (large scale collection and

upgrading locations) in subsidy schemes. Regulatory support regarding biomethane includes the adoption of the Biomethane Action Plan of an incumbents' association; a change in measurement method for renewable energy favoring gas over electricity; active government support for a biomass certification scheme; and expansion of the list of substances that can be used as feedstock in biomass digesters, i.e. the 'positive list'. Finally, government statements on biomethane have also changed considerably: whereas in 2008, biomethane was judged 'too expensive' [14; 22], in 2009 it was 'a logical next step' [3], and in 2011 it was presented as 'sustainable, efficient, and offering plenty of economic opportunities' (Rijksoverheid, 2011a). Table 1 presents the main institutional developments. Each instance of institutional change will be numbered (IC X), to be able to link it to actors' IE activities in the next paragraphs.

**Table 1: Institutional change 2006 – 2012**

IC #	Year	Institutional change
1	Aug 2006	A subsidy for electricity production from biogas (MEP) was introduced in 2004, providing a fixed amount of subsidy per kWh. In 2006 this program was suddenly stopped because the aim of 9% renewable electricity had been achieved [10].
2	Mar 2007	The Minister of Economic Affairs states that it has not been decided yet whether biomethane will be subsidized. While biomethane contributes to lowering CO <sub>2</sub> emissions, the subsidy costs have to be compared with those of other forms of renewable energy [62].
3	Jun 2007	Farmers that already invested in production capacity before obtaining the MEP subsidy will still receive a subsidy under the new OVMEP program [12].
4	Jul 2007	A new subsidy program called SDE is set up, in which the market price for conventional energy will be complemented by a subsidy up to a fixed amount. In case of higher energy prices, the government will lower the subsidy, and vice versa. Each type of renewable energy has its own category and total budget [13].
5	Feb 2008	The Minister of Economic Affairs decides that biomethane will not obtain a category in the SDE 2008 subsidy scheme because biomethane is 'too expensive' [14; 22]. Subsidy for electricity from biogas will be lowered to 12 cents/kWh. The Minister aims to temper co-digestion development because no sustainability criteria for biomass exist at the moment [14].
6	Mar 2008	A majority in Parliament supports the motion to pay 15 cents/kWh for electricity from biogas, following the official advice [23].
7	Jun 2008	Nevertheless, the Minister of Economic Affairs decides to pay 12 cents/kWh for electricity production from biogas [15].
8	Jul 2008	As a result of negotiations between government parties, renewable gas is added to the scope of the SDE subsidy program [24].

9	Feb 2009	The SDE 2009 subsidy tariff for electricity production from biogas is increased to a range of 15-17 cents/kWh [16].
10	Apr 2009	The Ministry of Economic Affairs charges the national network operator with setting up a biomass certification scheme [2].
11	July 2009	The Minister of Economic Affairs states that 'We are now accustomed to green electricity. Green gas [biomethane] is a logical next step' [3].
12	Oct 2009	The Ministry of Economic Affairs allocates 10 million euro to a scientific research program on the role of gas in a sustainable energy system (including biomethane) [61].
13	Dec 2009	A number of Ministries establish an interdepartmental 'Acceleration team' to deal with cross-departmental biomethane issues (Platform Nieuw Gas, 2010:10).
14	Dec 2009	The Ministry of Economic Affairs promotes the use of gas for transport purposes by allocating 4,1 million euro to gas stations that are to sell natural gas and biomethane [4].
15	Jan 2010	Due to pressure from Parliament, the SDE 2010 subsidy tariff for electricity production from biogas is increased to a range of 16,5 to 19 cents. This is still below the official advice of at least 20 cents. The Minister explains this step by stating that co-digestion is not always cost effective and has limited potential for the future [30].
16	Jan 2010	The government sets up two tenders to subsidize research into increasing the efficiency of the digestion process as well as the construction of gasification demonstration plants (PNG 2010:4). The budgets are 7 million (Staatscourant, 2010) and 12 million euro (RVO, 2009), respectively.
17	Oct 2010	The executive branch NEA of the Ministry of Economic Affairs publishes a Biomethane Action Plan to create a biomethane market (RVO, 2010:13)
18	Dec 2010	The Ministry of Economic Affairs announces a new design for the SDE subsidy scheme, called SDE+. Energy technologies no longer have separate categories; there is one tariff for gas and one for electricity. Electricity receives a maximum of 15 cents/kWh. Given the rising prices for co-digestion materials, this reduction means production of electricity from biogas is no longer profitable [18]. By contrast, the minimum subsidy for biomethane increases from 63 to 79 cents/m <sup>3</sup> [19]. The new design aims to stimulate innovation and competition between different types of renewable energy by allocating money to the cheapest options first [18]. The Minister aims to 'focus exclusively on an efficient approach to meet the EU target of 14% renewable energy in 2020' (Rijksoverheid, 2010)
19	Dec 2010	Simultaneously, the government changes its measurement method for renewable energy production from based on primary energy to based on final energy (Ministry of Economic Affairs, 2010:5; G1, 2012) following the European Directive 2009/28/EC on renewable energy. The new method favors gas and heat production over electricity production (Ministry of Economic Affairs, 2010:5) by a factor 2,4 (Harmsen, 2014; European Commission, 2007:6). Biomethane now turns out to be the cheapest renewable energy option. The Ministry of Economic Affairs supported the new method, because it allows the government to subsidize more renewable energy based on the same budget. The Ministry now states that biomethane is an 'attractive option' to speed up renewable energy production (Ministry of Economic Affairs, 2010:5).
20	Jan 2011	Biomethane hubs now qualify for the EIA program, which offers a favorable tax regulation for energy investments [49] (I2, 2012). Biomethane hubs are central locations where biogas from multiple producers is collected and upgraded.
21	May 2011	The Ministry of Economic Affairs expands the 'positive list' with 23 products that can be co-digested and simplifies the procedure for adding new materials to this list [37].
22	Aug 2011	The new SDE+ subsidy scheme results in 1 billion euro for biomethane projects, or 2/3 of the total budget (RVO, 2012). Due to the large number of applications, the Ministry of Economic Affairs transfers 250 million euro initially allocated for renewable electricity, to biomethane



		(Staatscourant, 2011; Energiegids, 2011:17)
23	Aug 2011	In the SDE+ 2012, biogas projects running under the old MEP scheme can apply for a subsidy extension. Moreover, the new subsidy scheme will include subsidy for heat production, in accordance with the EU Renewable Energy Directive. Biogas projects can now only apply for subsidy for gas or heat production, there is no longer a category for electricity. However, the subsidy for heat is insufficient for small-scale biogas projects to run break-even [38].
24	Sep 2011	The government concludes 'Green Deals' with private parties to speed up sustainable innovation. The focus is on removing institutional barriers. The Ministry of Economic Affairs strikes a 'Green Deal' with actors working on biomethane and will include the sustainability certification scheme Vertogas into the Gas law. This means that every producer needs to register its production at Vertogas and that subsidy payment will occur through this mechanism. Biomethane Netherlands will monitor the implementation (Rijksoverheid, 2012).
25	Sep 2011	Moreover, as part of the Green Deal, the newly established Biomethane Netherlands receives 400.000 euro from the Ministry of Economic Affairs to start a knowledge center for biomethane [7]. The Minister states that biomethane is 'sustainable, efficient, and offers plenty of economic opportunities' (Rijksoverheid, 2011a). According to him, the knowledge center called Biomethane Netherlands is a 'dream scenario' in which various organizations work together to achieve a biomethane market (Groen Gas Nederland, 2011; [53])
26	Nov 2011	In the SDE 2012, also biomethane hubs qualify for the SDE+ subsidy [39].
27	Apr 2012	The Ministry of Economic Affairs puts another 87 substances on the positive list [43].

## 5.2 Proposed institutional change implemented by the government: incumbents vs. new entrants

This section relates the institutional changes that were implemented by the Ministry of Economic Affairs and the NEA (as listed in Table 1) to proposals for institutional change by both the new entrants and the incumbents, respectively. Tables 2 and 3 illustrate that a large number of the actual institutional changes are in line with the preferences and proposals of the incumbents, especially when compared to the relatively lower number of new entrants' preferences translated in institutional change. In addition, Table 2 shows that the majority of new entrants' proposals for institutional change do not result in institutional change.

**Table 2. Institutional change proposed by new entrants and institutional change implemented by government**

	Proposed institutional change by new entrants 2006-2012	Institutional change implemented by government as of Dec. 31st, 2012 (1)
1	Reintroduction of MEP subsidy programme [21]	IC 3
2	Increase in subsidy tariff for electricity from biogas [23; 29; 18]	IC 9, 15
3	Expansion of number of co-products on positive list [16; 30; 31; 34]	IC 21, 27
4	Level playing field in Europe (i.e. Germany) regarding subsidy tariff and substances on positive list [17; 35; 42]	-
5	Easing of digestate policy [17; 30]	-
6	Certification of co-products [30; 32]	-
7	Alternative for allocation through lottery in SDE scheme [33; 35]	-
8	Level playing field regarding subsidy tariff for new and existing biogas installations [35]	-
9	Leftover SDE subsidy should flow back into next SDE subsidy round [35]	IC 18
10	Inclusion of heat in SDE subsidy scheme [18]	IC 23
11	Level playing field regarding small and large-scale biogas installations [18; 41]	-
12	Increase in subsidy tariff for heat from biogas [40]	-
13	Inclusion of mono-digestion (only manure) in SDE subsidy scheme [20]	-

(1) Numbers refer to Table 1

**Table 3. Institutional change proposed by incumbents and institutional change implemented by government**

	Proposed institutional change by incumbents 2006-2012 (PNG, 2007: 8, 18; PNG, 2010:11-13)	Institutional change implemented by government as of Dec. 31st, 2012 (1)
1	Exploitation subsidy for biomethane	IC 8, IC 9, IC 14, IC 18, IC 22, IC 26
2	Level playing field for biomethane and renewable electricity in terms of subsidy (Taskforce Energie Transitie, 2006: 36)	IC 14, IC 19, IC 20, IC 22
3	Formulation of uniform quality requirements for biomethane injection into the grid	IC 12, IC 13
4	Establishment of biomethane certificates of origin	IC 10, IC 24
5	Ensure the sustainability of biomass	IC 10, IC 24
6	Facilitation of biomethane for transport purposes	IC 14
7	Useful application of digestate	IC 16
8	Start research into biomass gasification	IC 16
9	Form consortia that cover relevant sectors and organizations along the value chain	IC 13, IC 16, IC 25
10	Exchange knowledge and experiences	IC 25

(1) Numbers refer to Table 1

Table 2 shows that most of the new entrants' proposals have not been implemented by the government by the end of 2012. In contrast, Table 3 shows that all of the incumbents' proposals have been implemented by the government by the end of 2012. Moreover, incumbents do not only see *more* of their proposals addressed, the institutional change that they promote also entails more *fundamental* change. The two most impactful institutional changes are the introduction of the SDE+ subsidy scheme (IC18) and the new measurement method (IC19); together these caused a major shift of government subsidy towards biomethane. In addition, the two tables show that new entrants often propose institutional change that addresses details of the existing institutional framework (e.g. proposal 1, 2, and 3 in Table 2), whereas incumbents rather propose institutional change that transforms and goes beyond the existing institutional framework (e.g. proposal 2, 4, 6, 8, and 9 in Table 3).

In short, the incumbents have been more successful in translating their proposals into formal institutions. In the next sections we describe how incumbents have contributed to institutional change with their IE activities and how these compare to the activities of new entrants.

### **5.3 Cooperation for institutional change**

This section discusses the first element of institutional entrepreneurship: cooperation.

Cooperation in the biomethane case entails the formation of associations by new entrants and incumbents, respectively. It is the first step towards contributing to institutional change.

Table 4 presents a summary of the differences between incumbents and new entrants in their cooperation activities.

**Table 4. Cooperation by incumbents and new entrants**

	Incumbents	New entrants
Actor variety	Public-private	Only producers
Members' interests	Different interests	Shared interests
Relation to external environment	Continuous	Ad hoc
Management	Professional	Voluntary
Funding	Substantial	Limited

### 5.3.1 Incumbents

The most important feature of the incumbents' associations is that they are public-private arrangements. The incumbents joined forces in three associations: Platform New Gas (PNG), its successor Biomethane Netherlands (BMNL), and the regional energy organization Energy North Netherlands (ENNL). They involve a variety of actors: energy trading companies, gas network operators, waste companies, agricultural associations, the Ministry of Economic Affairs with its executive agency NEA, regional governments, and knowledge institutes. In PNG, the national government played an important role, while in BMNL and ENNL regional governments are more prominent. The gas incumbents increase their influence on policy makers by teaming up with organizations from the food and waste sector, thus creating an association that spans multiple sectors. The support of these various actors results in a high level of socio-political legitimacy.

Actors have different interests due to their different roles in relation to biomethane. Energy trading companies will trade it, gas network operators will transport it, government agencies will subsidize and facilitate it, while knowledge institutes will research it. In fact, very few members (3-4) actually produce biomethane (Groen Gas Nederland, 2014; NE3, 2012). Therefore, the aim of PNG, BMNL, and ENNL is not to promote the interests of specific actors, but to focus on promoting biomethane as an energy carrier. They aim for the broader goal of building up a biomethane value chain, including production, injection, trading, and using it in electricity and heat production or transport. BMNL and ENNL

summarize this aim in targets of 300 and 200 million m<sup>3</sup> biomethane production in 2014, respectively (Groen Gas Nederland, 2013:7, 17; Rijksoverheid, 2011b).

Because of the broad range of actors that participate, most cooperation takes place *within* the association. The associations form a broad ‘front’ and therefore encounter little external opposition. Instead of contacting government bodies on specific issues when necessary, the private actors cooperate continuously with public actors in the three associations. Objectives and efforts get aligned in a very early phase of policy making, which increases the potential for policies that benefit biomethane development.

Finally, BMNL and ENNL are professional associations operating with substantial funding. BMNL employs 21 people (Groen Gas Nederland, 2013:9) and ENNL has 19 fte (Hogeweg, 2013:24-26). Funding is drawn from national and regional government as well as from private actors. Members deciding on BMNL’s strategy contribute 100.000 euro each, whereas others primarily provide input in terms of identifying bottlenecks (Platform Nieuw Gas, 2011:12). None of the paying members are producers of biomethane. BMNL has a budget of 1,6 million euros for 2,5 years (Platform Nieuw Gas, 2011) and ENNL has a budget of 11,5 million euros for 2012-2015 (Energy Valley, 2011:21).

### 5.3.2 New entrants

Cooperation by new entrants takes the form of associations that bring together one specific type of actor with specific and shared interests. Biogas producers’ association BGPA promotes the interests of *biogas* producers, whereas biomethane producers’ association BMPA promotes the interests of *biomethane* producers.

BGPA has around 70 members, predominantly farmers with co-digesters as well as a sugar producer (NE1, 2014). BMPA represents all biomethane producers in the Netherlands (14), which are small- and large-scale producers from the food industry, waste sector, and agricultural sector (NE2, 2014). Due to this narrow focus, members of BMPA express this

association best promotes their specific interests (NE1, 2014; NE3, 2012). Some overlap with incumbents exists: a number of individual members of BMPA, as well as the association BGPA became partners of BMNL (Groen Gas Nederland, 2014).

The new entrants' associations relate to their external environment on an ad hoc basis: solving issues with the relevant actors, such as government, one by one. Due to the narrow member base, BGPA and BMPA cannot easily draw on the socio-political legitimacy or resources of other types of actors. Management of these two associations is carried out voluntarily by their members, next to their core business (e.g. farming). Their funding is limited: member contributions are the main source.

## 5.4 Framing for institutional change

This section analyzes the framing by incumbents and new entrants. Cooperation and framing reinforce each other in contributing to institutional change. A frame is stronger when backed by an association. Table 5 summarizes the different framing styles of new entrants and incumbents.

**Table 5. Framing by incumbents and new entrants**

	Incumbents	New entrants
<b>Alignment</b>	Emphasis on growth opportunities for Dutch (regional) economy	Emphasis on benefits for agricultural sector
<b>Problem definition</b>	Strong	Weak
<b>Tone</b>	Positive	Negative
<b>Level of abstraction</b>	High: competitive biomethane market	Low: financial effects for new entrants
<b>Summary narrative</b>	'You have a problem, we have a solution to help you'	'We have a problem, we deserve your help'

### 5.4.1 Incumbents

First, incumbents strongly emphasize the need for biomethane to meet national sustainability goals (PNG, 2007:9; PNG, 2011; GGNL, 2013; Topteam Energie, 2012; [6; 45; 1; 52; 8; 56]). Incumbents then emphasize that building on the strengths of the gas sector (PNG, 2007;

PNG, 2005; PNG, 2008:5; [56]) is a national interest. Incumbents thus align biomethane with new growth opportunities for the Dutch economy (Topteam Energie, 2012). Therefore, the government should (financially) ‘safeguard’ biomethane development [56; 46; 60]. Moreover, there is a specific regional twist to the framing: the Northern part of the Netherlands is supposed to become the center of biomethane, due to the presence of the natural gas industry and the agricultural sector in the region [56; 46]. This frame is particularly powerful because the Northern provinces have long lagged behind in economic development.

*The goal for biomethane is to become a substantial contribution to a sustainable energy system, and thus to provide a strong competitive position for Netherlands Inc. regarding knowledge, technology, innovation, and trade (Topteam Energie, 2012).*

*We have a reservoir of applications for biogas projects in the Northern part of the Netherlands. Right now there is no money for implementation. It is a wonderful opportunity to lead the way and to prove ourselves as gas region [46].*

Second, the incumbents’ problem definition is multifaceted. On the one hand, it emphasizes the importance of the gas sector for the Dutch economy, while on the other hand it points at the necessity of continued use of the Dutch gas infrastructure, and the necessity of low-carbon energy technologies (Platform Nieuw Gas, 2007:7-10). This problem definition logically leads towards a solution that takes the current gas sector as a point of departure, thus benefiting the Dutch economy. Biomethane is then presented as an indispensable solution for all the above-mentioned problems (Platform Nieuw Gas, 2007; [6; 45; 54; 58]).

Third, the tone of the framing is very positive. The incumbents emphasize the large potential production of biomethane (Taskforce Energie Transitie, 2006:39). Furthermore, it is

stressed that biomethane hardly requires changes to the gas system<sup>3</sup> (Taskforce Energie Transitie, 2006:39; PNG, 2008:4) and that biomethane is a second-generation biofuel, thus avoiding discussions about possible competition between food and energy production (PNG, 2007:10).

*In 12 years time, the Netherlands can replace 8 to 12 percent of natural gas [use] by biomethane, and in 2050 this can mount to 50 percent [1].*

Fourth, the abstraction level of incumbents' framing is high: they use an abstract 'market' frame. Biomethane is presented as a cost-effective way of meeting the renewable energy target (Rijksoverheid, 2011a; [54; 46]), and more so than wind energy [56]. Incumbents emphasize they are creating a 'biomethane market' (PNG, 2007); build a 'competitive sector' [59]; a 'well-functioning market mechanism' [47]; will 'bring down the price of biomethane' [60; 53; 45]; and in time biomethane will be 'profitable without government subsidies' [58; 54]. These types of arguments are likely to appeal to a large audience.

The incumbents make clear that something is to be won from biomethane for the government, as it addresses government's concerns related to the renewable energy target and economic growth. Therefore, incumbents' framing towards the government can be summarized as: 'You have a problem, we have a solution to help you'.

#### **5.4.2 New entrants**

First, framing by new entrants emphasizes the benefits of biogas to the agricultural sector. Similar to the incumbents, new entrants claim that biogas and biomethane contribute to CO<sub>2</sub>-reduction (Biogas Magazine, 2008b) and are necessary to meet the national renewable energy targets [e.g. 23]. However, new entrants' framing is most elaborate on how biogas helps develop a sustainable rural economy [30] and the agricultural sector by increasing the value

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<sup>3</sup> Biomethane injection into the natural gas grid turns out to be one of the main bottlenecks (Smink et al., under review).



of manure, byproducts and rest materials [23]; (NE4, 2012), as opposed to the Dutch economy as a whole.

Second, new entrants have not formulated a clear problem definition to which biomethane production provides the answer. Rather, their problem definition is that many biogas producers are in financial trouble and that government should act to prevent producers from going bankrupt (BBO, 2011). The incumbents' problem definition is stronger, because it shows why biomethane is beneficial for the Dutch economy. New entrants only show why biogas is beneficial for the agricultural sector, which relates to a more limited audience.

Third, the tone of new entrants' framing is strikingly negative. Attention is drawn to problems, such as negative effects of new regulation. Typically, new entrants sketch a scenario of what will be lost e.g. in terms of production capacity, and then make a request for government support.

*'The end of the MEP subsidy means 900 jobs are put on the line and over 16 million euros spent in vain. ... BGPA makes an urgent request to restore the MEP' [21].*

*'If front runners [first biogas producers] have no choice but to stop production ... this means a large destruction of capital' [about 100 MW capacity] (BBO, 2011)*

Fourth, the abstraction level is very low. Issues are very practical and take the producers' perspective. Effects of certain measures are expressed mostly in financial terms.

*'The biogas sector is in dire straits. Three quarters of installations run at a loss' [17].*

*'A bonus for heat [use] yields on average 60.000 euro and that is not sufficient' [40].*

In contrast to the incumbents' positive framing, new entrants focus on what will be lost if government does not provide more support for biogas installations. Therefore, new entrants'

framing towards the government can be summarized as ‘We have a problem, we deserve your help’.

## 5.5 Political tactics for institutional change

This section analyses how the actors that are involved in cooperation activities engage in political tactics to get their framing across to the wider audience and to policy makers, with the ultimate aim of contributing to institutional change. In section 5.5.1 we first discuss what channels new entrants and incumbents use to convey their framing to the wider audience. In section 5.5.2 we show how new entrants and incumbents engage with policy makers.

### 5.5.1 Political tactics aimed at wider audience

We observed that new entrants and incumbents adopt distinctly different approaches to communicating with the wider audience. Whereas new entrants mainly inform biogas producers of policy outcomes, incumbents target a national audience to create legitimacy for their plans. Moreover, incumbents are active in the media before policy decisions, rather than afterwards, and engage much more frequent in process communication. Table 6 sums up the findings of new entrants’ and incumbents’ political tactics aimed at a wider audience.

**Table 6. Political tactics aimed at wider audience by incumbents and new entrants**

	Incumbents	New entrants
Media outlet	Regional and national newspapers	Agricultural newspapers
Contact with wider audience	Magazine, biomethane day, sport clubs and schools	Magazine
Media purpose	Create legitimacy by presenting milestones	Inform peers about policy outcomes
Media timing	Policy window	After policy decision
Response to criticism	Discuss behind closed doors	Defend in public

### Media outlets

The incumbents and their associations focus on both regional and national newspapers, reaching a larger audience than the new entrants. Especially the national network operator

and ENNL are active in addressing biomethane in the media. In the period 2006-2012, the national network operator appeared 75 times in the two main newspapers of the Northern provinces and about 35 times in national newspapers. ENNL appeared 82 times in the Northern newspapers and about 15 times in national newspapers. PNG's vision document 'Stepping on the gas!' (PNG, 2007) received considerable media attention in 2007. Incumbents send out press releases to multiple media outlets [e.g. 1; 2]. Apart from a few exceptions in regional newspapers, new entrants are only visible in agricultural newspapers. BGPA has 50 articles in the agricultural newspaper in the time period 2006-2012. BMPA is not visible in the media at all, but rather focuses on direct interaction with policy-makers (NE2, 2012).

### **Contact with wider audience**

The incumbents make strong efforts to engage with a wider audience. This ranges from publishing a 'New Gas Newspaper' (PNG, 2010), organizing a 'National Biomethane Day' [50], and advertising biomethane through sports clubs and at schools (Energy Valley Topclub, 2013; I3, 2012). Conversely, new entrants' contacts with the wider audience are limited. Since 2007, BGPA publishes a newsletter called 'Biogas Magazine' to inform members and regional governments about (the importance of) biogas (Biogas Magazine, 2007; NE1, 2014).

### **Media purpose & timing**

Incumbents proactively reach out to the wider audience to create support for their plans, and advocate certain policy decisions in the media, e.g. for more subsidy for biomethane and biomethane hubs [46; 56; 60]. However, once the government made biomethane a priority, incumbents were much less active in advocating policy preferences in the media. Incumbents now provide input for the policy process through the Interdepartmental Acceleration Team (G1, 2012). Furthermore, incumbents are strong in process communication: highlighting

every milestone related to biomethane, adding to the optimism in their framing [e.g. 47; 49; 55; 61]. For instance, incumbents increase biomethane's socio-political legitimacy by having well-known public figures perform the opening ceremony of new biomethane installations [9; 55; 5; 50]. In contrast, the media is not a tool to create support for policy options for BGPA. Their strategy is to engage with policy makers directly: they believe this is the best approach for an emerging sector (NE1, 2014). Therefore, BGPA's news articles can be characterized as after-the-fact status updates about new policies and its consequences for agricultural peers [13; 16; 18].

### **Response to criticism**

Incumbents receive little criticism due to the broad network they created [e.g. 57]. Once, biomethane was openly criticized for being a 'very expensive right-wing hobby' [51] after which BMNL invited the critic for a meeting (Groen Gas Nederland, 2013:21). Instead, when biogas is criticized, new entrants defend themselves in the media. Regarding the use of illegal substances in co-digestion, BGPA replies that "We don't want to collect the agricultural sectors' trash" [44].

### **5.5.2 Political tactics aimed at policy-makers**

Cooperation, framing, and political tactics aimed at the wider audience all build up towards lobbying policy makers and contributing to institutional change. Changes in formal institutions are decided upon by the government, and therefore the political tactics aimed at policy makers are the culmination of the IE activities. Regarding political tactics, two very different pictures emerge. New entrants have limited access to the government, with which they have an antagonistic relationship. Moreover, they aim to solve problems ensuing from the current framework. In contrast, incumbents have excellent access to top-level

representatives of government, with whom they work in synergy. Incumbents provide input when opportunities for policy exist, presenting plans for a new institutional framework while simultaneously addressing government’s concerns.

Table 7 presents the different characteristics of new entrants’ and incumbents’ political tactics aimed at policy makers. We observed six dimensions of contact with policy makers: access to the political system, relation to the policy makers, timing of lobbying efforts, scope of proposals, style of lobbying, and lobbying tools.

**Table 7. Political tactics aimed at policy makers by incumbents and new entrants**

	Incumbents	New entrants
Access	Excellent, top-level	Limited, civil-servant level
Relation	Synergetic	Antagonistic
Focus	Opportunity-related	Problem-related
Scope of proposals	Change of framework structure	Change of framework parameters
Style	Provide a plan incl. funding solution	Request/ showing disappointment
Tools	Commissioned research	Third-party research

### Access to political system

The incumbents’ access to the political system is excellent, which is reflected in the public-private nature of their associations. The easy access is due to the interrelations and revolving door (GasTerra, 2014; ICE Endex, 2014; Onderzoeksraad voor Veiligheid, 2015:75) between the Dutch government and the gas sector, the incumbents’ intimate knowledge of the policy making process and various subsidy schemes (I2, 2012), and the political connections of regional politicians from BMNL and ENNL (G1, 2012). For instance, ENNL established a dedicated ‘Taskforce Biomethane’ (Energy Valley, 2010; Energy Valley, 2011:15) with regional politicians that lobby the national government, e.g. for subsidized biomethane hubs (I2,2012; G1, 2012). Furthermore, ENNL used existing procedures to request the inclusion of biomethane hubs into the EIA tax deduction scheme (IC 20) ([49]; I2, 2012) and the SDE+ subsidy scheme (IC 26) ([56]; I2, 2012).

New entrants' access to the political system is limited, which shows in their late involvement in the policy process and their dependence on formal meetings. For instance, they attempt to influence policy-making by lobbying individual Members of Parliament (MPs) (IC 6, IC 15) and by visiting political parties' conventions (Biogas Magazine, 2008d). Moreover, they meet civil servants in recurring meetings with the Ministries of Economic Affairs and Infrastructure & Environment (NE1, 2014; NE2, 2012). Moreover, in 2010, the Ministry of Agriculture merged with the more influential Ministry of Economic Affairs. New entrants are no longer represented by the Minister of Agriculture, but need to compete with the economic agenda of the new Ministry.

### **Relation to policy-makers**

The incumbents' interaction with policy makers is harmonious: they share an interest in building a biomethane value chain (G1, 2012). This shared priority shows in the establishment of the Interdepartmental Acceleration Team (IC 13) and makes that their activities get interwoven. In fact, it becomes unclear who is the driving force behind the biomethane agenda: who proposed what and who actually writes policy? For instance, PNG helps to write the design of new subsidy programs, such as the Tender Digestion and the Tender Gasification (IC 16) (PNG, 2011:4). Moreover, incumbents take up the coordination and monitoring of the implementation of the Green Gas Green Deal (IC 24) (I2, 2012), an agreement between government and incumbents to speed up biomethane development.

The most obvious sign of the interrelatedness of government and incumbents' goals is that the PNG 2010 Biomethane Action Plan (PNG, 2010:9) is literally adopted by NEA, the executive agency of the Ministry of Economic Affairs in 2010 (IC 17) (RVO, 2010). This means that a public-private proposal turns into a government action plan. In general, it hardly

happens that incumbents are dissatisfied with institutional change. Discussions about the level of the subsidy tariff are non-existent.

In contrast, government and new entrants often seem to have opposing interests, with the Ministry not answering to new entrants' requests (e.g. NE1, 2012, 2014). New entrants react to this situation by denouncing the government's decisions, e.g. stating that the government is 'cheap and narrow-minded' [17] (also [31], [25]).

### **Focus of proposals**

The incumbents' strategy is very proactive and is driven by opportunities. They link broader (inter)national developments, such as CO<sub>2</sub> policies, to the opportunities that policy windows offer. They combine these elements in their vision document 'Stepping on the gas!' (PNG, 2007), which is opportunity focused instead of problem focused. Instead, new entrant lobbying focuses on (potential) problems arising from the existing institutional framework, e.g. the financial viability of their installations (Biogas Magazine, 2007a; 2008a; BBO, 2011; NE1, 2014). BGPA's recurring meetings with the Ministry concern existing practical concerns, such as setting up a certification scheme for co-digestion substances (NE1, 2014). In short, lobbying does not build on a comprehensive vision document, but rather proceeds problem by problem.

### **Scope of proposals**

The incumbents' aim is not to solve current problems, but to make sure the institutional framework suits their needs. For instance, the incumbents suggest that renewable energy should be measured in terms of final energy (I2, 2012). This measurement improves the position of gas and heat production compared to electricity production (Harmsen, 2014), thus paving the way to subsidize biomethane on a large scale (IC 19). Moreover, they made a plea for spending more money on the cheapest forms of energy (IC 18). Both pleas contributed to ample opportunities for renewable gas production. Thanks to their strong connection with

political actors and their early involvement in the policy process, incumbents are in a position to propose policy changes of a higher order: changing the structure of the framework itself instead of adapting the parameters of the system.

New entrants' proposals have a limited scope (see also Table 2). Whereas the incumbents have been particularly strong in creating visions and higher-order institutional change; new entrants are involved with solving practical shorter-term issues, such as the specifics of regulation. Given their focus on problems within the existing institutional framework (Biogas Magazine 2007; 2008a; BBO, 2011, NE1, 2014), proposals are aimed at optimizing this framework, such as higher subsidy per kWh produced (IC 6, 9, 15) or permission for more substances to be digested (IC 21, 27). So while new entrants are proactive in solving potential problems within the institutional framework, their ability to fundamentally adapt the framework itself is limited. This may be a consequence of new entrants being involved in the policy process at a later stage than incumbents.

### **Style of lobbying**

Incumbents propose a plan to the government (or devise a plan together with the government). PNG's Vision Document (2007) and its follow-up report (PNG, 2010) outline such a comprehensive plan for biomethane development. Furthermore, plans are usually accompanied with a 'recipe' on how to organize the funding. For instance, to increase the subsidy for biomethane production, money should be transferred from wind power to gas [46] (IC 18 and IC 19).

Incumbents employ professionals that know how to translate their ideas into the language of policy makers (I2, 2012). They know which arguments influence policy makers: e.g. a plan should be efficient or more efficient than current programs and should concern innovative forms of technology or cooperation (I2, 2012).



Instead, new entrants' lobbying messages most often have the form of a request. They ask for government attention and support because of a problem at hand (e.g. increasing price of resources). More desperate attempts to make their voice heard are the organization of a petition in 2006 [11] and BGPA's encouragement to farmers to withdraw their grant application to send a clear signal to the Minister that the subsidy is too low (Biogas Magazine, 2008d).

### **Tools for lobbying**

To support certain points in their argumentation, incumbents conduct studies or commission research at renowned research institutes. For instance, on the basis of their own research, ENNL claimed that gas is cheaper to produce per kWh than wind energy. Therefore, it would be more efficient to subsidize gas instead of wind energy [56] (IC 18 and IC 19). Research institute ECN presented a study emphasizing that biomethane is indispensable to meet the renewable energy targets [6]. This research was commissioned by waste company HVC.

To support their lobby message, new entrants rely on research reports carried out by other organizations such as Rabobank [42] and Raadhuysgroep (NE1, 2012).

## **5.6 Effects of IE on institutional change**

This section links the IE activities of new entrants and incumbents to the institutional change mentioned in Table 1, thus illustrating how IE contributes to institutional change. We also describe these activities according to the IE dimensions we identified above. Table 8 concerns incumbents' institutional entrepreneurship and Table 9 deals with new entrants' institutional entrepreneurship.

**Table 8: Incumbents' IE activities linked to institutional change**

	Incumbents' IE activities	IE dimension	IC #	Institutional change
	Vision document 'Stepping on the gas' (PNG, 2007) argues for subsidy for biomethane production (p. 8).	Change of framework structure.	IC 8	Category for biomethane in SDE subsidy scheme
	Vision document 'Stepping on the gas' (PNG, 2007) proposes certificates of origin (p.8). National network operator proposes to set up certification system (Gasunie, 2008:51) High-level meeting between government and national network operator ([2]; I3, 2012)	Change of framework structure. Opportunity related. Excellent access.	IC 10	National network operator charged with setting up biomass certification scheme (later Vertogas)
	Vision document 'Stepping on the gas' (PNG, 2007) discusses biomethane's sustainability, efficiency and related economic opportunities (p. 9-13) Related framing in newspaper articles: e.g. [2; 46; 53; 54; 56; 57; 60]	Positive tone.  Creating legitimacy during policy window.	IC 11, IC 18, IC 25	Government adopts incumbents' framing: biomethane is sustainable, efficient, and provides economic opportunities
	Vision document 'Stepping on the gas' (PNG, 2007) urges all parties involved in biomethane to cooperate and solve remaining issues (p. 7).	Public-private cooperation.	IC 13	Government establishes Interdepartmental Acceleration Team
	Vision document 'Stepping on the gas' (PNG, 2007) proposes facilitation of biomethane for transport purposes (p. 8).	Opportunity related.	IC 14	Subsidy for gas stations selling natural gas and biomethane
	Vision document 'Stepping on the gas' (PNG, 2007) pleads for biomass gasification research (p. 8). PNG helped to set up the two tenders (Platform Nieuw Gas, 2010:4)	Opportunity related. Synergetic.	IC 16	Government sets up two tenders for research into biomass digestion and gasification. National network operator and waste company were eventually granted 4 million euro (Politek Archief, 2014).
	PNG publishes follow up to its 2007 vision document, including a Biomethane Action Plan, including actions regarding regulatory barriers, grid access, R&D, hubs, and knowledge center (PNG, 2010:9).	Provide plan.	IC 17	Executive agency NEA adopts PNG's Biomethane Action Plan a few months later
	ENNL argues subsidy for wind should be transferred to biomethane [46]. ENNL lobbies for more subsidy for biomethane. Their research shows that biomethane is cheaper than wind [56]. Waste company commissions study at research institute ECN. Study states that biomethane is	Provide plan & funding solution.  (Commissioned) research.	IC 18	New SDE+ subsidy scheme favors cheapest renewable energy technology

indispensable to meet renewable energy target [6].			
Vision document 'Stepping on the gas' (PNG, 2007) prioritizes a level playing field for biomethane and renewable electricity in terms of subsidy (p. 8), thus improving biomethane's relative position. ENNL argues that measurement method should be changed in favor of gas (I2, 2012).	Change framework structure.  Change framework structure.	IC 19	New measurement method favors gas over electricity production, making biomethane the cheapest option
Following a standard procedure, ENNL requests government to include biomethane hubs into favorable tax regulation ([49]; I2, 2012) Lobby by ENNL and its Taskforce Biomethane to include biomethane hubs in SDE+ subsidy scheme, justified by lower costs ([56]; I2, 2012). ENNL presents plan to build 4-5 biomethane hubs [48]	Change framework structure.  Change framework structure.  Create legitimacy through milestones.	IC 20, IC 26	Biomethane hubs apply for favorable tax regulation and SDE+ subsidy
PNG (and later BMNL) chairman argues Green Gas Green Deal needs to be implemented by dedicated organization to ensure swift development of biomethane (I2, 2012)	Public-private cooperation. Synergetic.	IC 24	BMNL charged with implementation of government-industry Green Gas Green Deal
PNG's follow-up document (PNG, 2010) mentions that Vertogas should be included in the Gas Law (p. 7), so that no biomethane can be sold without certificate (also I3, 2012).	Change framework structure.	IC 24	Certification scheme Vertogas becomes mandatory for biomethane producers
PNG's vision document (2007) makes a case for forming consortia and exchanging knowledge (p. 8) PNG's follow-up document (PNG, 2010) proposes the establishment of a biomethane knowledge center (p. 9).	Provide plan.  Provide plan.	IC 25	The newly established knowledge center BMNL receives 400.000 euro from the Ministry of Economic Affairs

**Table 9: New entrants' IE activities linked to institutional change**

	New entrants' IE activities	IE dimension	IC #	Institutional change
	Lobbying policy-makers for continued subsidy for biogas: pointing at investments put at risk [21] Publicly denouncing government [10] Offering petition to Prime Minister [11]	Problem related. Negative tone. Antagonistic. Antagonistic.	IC 3	OVMEP subsidy for farmers that already invested in production capacity before the MEP subsidy was discontinued
	Lobbying MPs (Biogas Magazine, 2008b, 2008d) and at political parties' conventions (Biogas Magazine, 2008d) for higher subsidy tariff, justified by biogas' contribution to agricultural sector [e.g. 23, 30] and renewable energy target [e.g. 23]. Publicly denouncing government [17, 25] and emphasizing biogas' difficult circumstances [17, 25] Survey amongst BGPA members and symbolic withdrawal of grant applications by biogas producers (Biogas Magazine, 2008d)	Limited access.  Antagonistic. Negative tone. Problem related. Antagonistic.	IC 6, IC 9, IC 15	Parliament accepts two motions to increase subsidy for electricity production from biogas, which is translated into SDE scheme
	Recurring meetings with Ministry of Economic Affairs [16, 31] Publicly denouncing government [31]	Limited access. Antagonistic.	IC 21, IC 27	New substances added to positive list
	Lobby for extending SDE+ subsidy scheme with heat production [18]	Problem related. Request.	IC 23	SDE+ subsidy scheme will include heat production

Tables 8 and 9 show that incumbents and new entrants engage in IE activities in a different way. Incumbents work together with the government in a proactive, positive and synergetic way. New entrants rather react to problems, use a negative tone and are the governments' antagonist. This different style of IE is related to different outcomes in terms of institutional change. The incumbents' IE activities are related to a higher number and degree of institutional change.

## 5.7 Effects of institutional change on biomethane development

This section discusses the influence of the institutional changes on biomethane development, in terms of the actual amount and scale of biomethane installations. The institutional change

effectuated between 2006 and 2012 had a profound influence on biogas and biomethane development. Before incumbents got involved in promoting biomethane, the institutional framework provided subsidy for the production of electricity from biogas. With the SDE+ 2011 subsidy scheme, the institutional framework's focus changed towards cost-efficient production of biomethane. Table 10 shows that by the end of 2013, new installations that produce biomethane had been constructed. All biomethane installations had a capacity of more than 1 MW, with 50% of the installations having a capacity between 1 and 5 MW. In fact, 36% of installations had a capacity between 5 and 10 MW, while 14% went beyond 10 MW.

**Table 10. Number and percentage of biomethane installations operating at the end of 2013 according to capacity class (RVO, 2015)**

Biomethane production capacity (MW) <sup>4</sup>	< 0,5 MW	0,5 – 1 MW	1 – 5 MW	5 – 10 MW	> 10 MW	Total
Number of installations	0	0	7	5	2	14
Percentage of installations	0%	0%	50%	36%	14%	100%

In contrast, Table 11 shows that by the end of 2013, 57% of biogas installations had a capacity smaller than 1 MW. More specifically, 21% of the total number of installations had a capacity of less than 0,5 MW. The remaining installations had a capacity between 1 and 2 MW (26%) or above 2 MW (17%).

**Table 11. Number and percentage of biogas installations operating at the end of 2013 according to capacity class (RVO, 2015)**

Electricity production capacity (MW)	< 0,5 MW	0,5 – 1 MW	1 – 2 MW	> 2 MW	Total
Number of installations	30	52	38	24	144
Percentage of installations	21%	36%	26%	17%	100%

<sup>4</sup> Biomethane production capacity has been calculated based on data of production in nm<sup>3</sup>/h and the calorific value of Groningen gas (35,17 MJ/nm<sup>3</sup> or 9,77 kW/nm<sup>3</sup>; GTS, 2015). For readability, some capacity classes have been rounded off to whole numbers.

In sum, the institutional change had two consequences. First, biogas is no longer only turned into electricity, but also into biomethane. Second, biomethane installations operate on a larger scale than biogas installations. Thus, in the Dutch institutional context, a shift from electricity to gas production is combined with an increase in the scale of installations. This implies that the recent changes in this industry are not favorable for the participation of farmers, with their small-scale installations, in biomethane production.

## 6 Discussion

Our contribution to the institutional entrepreneurship literature entails an analysis of how IE activities differ between incumbents and new entrants. We propose a set of dimensions for cooperation, framing, and political tactics on which incumbents' and new entrants' IE activities differ. We propose five dimensions for cooperation: actor variety, members' interests, relation to external environment, management, and funding. Framing can be described according to alignment, problem definition, tone, and level of abstraction. For political tactics we distinguished five dimensions of engaging with the wider audience: media outlet, contact with wider audience, media purpose, media timing, and response to criticism; and six dimensions of contact with policy makers: access, relation, focus, scope of proposals, style, and tools.

Our findings correspond with insights from case studies in the scientific fields on institutions, innovation, and sustainability transitions. Incumbents perform exactly the activities that are suggested to contribute to institutional change, in contrast to new entrants. In terms of cooperation, incumbents are strong in bridging stakeholders and accessing dispersed sets of resources (cf. Maguire et al., 2004) and in collecting endorsements of key constituents to obtain socio-political legitimacy (cf. Hargrave & Van de Ven, 2006). Incumbents' framing creates cognitive legitimacy (cf. Hargrave & Van de Ven, 2006) by

presenting biomethane as ‘building on the strengths of the gas sector’ and ‘contributing to Netherlands Inc.’. Incumbents also keep their framing positive (cf. Klein Woolthuis et al., 2013), in contrast to new entrants. Regarding political tactics aimed at policy makers, ‘regular and personal contact with politicians’ and preferably ‘politicians in top positions’ are important for an effective lobby (Sühlsen & Hisschemöller, 2014). Incumbents meet these criteria, whereas new entrants do not. Studies in the sustainability transitions field also highlight the importance of alignment between public and private actors as a condition for institutional change (Kern et al., 2014; Araposthatis, 2013; Klein Woolthuis et al., 2013). In terms of influencing policy through the media, Hillman & Hitt (1999) speak of advertising, press conferences, and economic and political education. In our case, incumbents also tried to influence institutions through newspaper articles. The implication of the incumbents’ IE activities that participation in biomethane production is difficult for small-scale installations, corresponds with Kern et al.’s (2014) findings in the UK offshore wind development: large incumbents became the dominant actors, replacing small new entrants (Kern et al., 2014: 639).

The data we collected comes with a number of limitations. Firstly, of the new entrant associations, most data was available on the biogas producers association BGPA. Therefore, this association is represented more strongly than other new entrant associations, which may have a slightly different approach. Secondly, our results are derived from a Dutch case study with its particular characteristics and are therefore not necessarily generalizable to other contexts. Nevertheless, our case study in the Dutch context proposes a theoretical contribution by offering a new and detailed categorization of IE activities, which future research may generalize to other contexts.

Future research can also investigate to what extent IE activities are linked to actors’ relative power position. In other words, would new entrants be able to copy incumbents’ IE

activities and enhance their influence on institutions? Or does the new entrants' relative power position force them to fulfill IE activities differently? In addition, it would be worthwhile to study the extent to which incumbents are successful in fulfilling their biomethane production goals. After all, institutional change does not automatically lead to increased production. To what extent are incumbents able to promote biomethane production by ways other than government-level institutional change?

## **7 Conclusion**

In this paper, we set out to investigate the differences between new entrants' and incumbents' institutional entrepreneurship and the subsequent effects on formal institutions as well as on biomethane development.

We show that incumbents fulfill the activities of cooperation, framing, and political tactics differently than new entrants. Regarding cooperation, incumbents form public-private associations that bridge different interests and that operate professionally and with substantial funding. In contrast, new entrants build associations with actors that share strictly the same interests (i.e. producers) and operate on a voluntary basis and with limited funding.

Incumbents use a proactive and positive framing that emphasizes biomethane's benefits to the Dutch economy. New entrants rather focus on problems of individual biogas installations and ask the government for help. Another difference is that incumbents use the (national) media to create legitimacy for their policy preferences and to show their milestones, whereas new entrants use the agricultural media to inform peers about policy outcomes. Incumbents build their political tactics on a comprehensive plan, supported by commissioned research reports, and take place in a synergetic relationship with top-level policy makers. New entrants, instead, focus on problems and request help from the government, while having limited access and being in an antagonistic relationship.



The incumbents' institutional entrepreneurship activities to promote biomethane correspond with more substantial institutional change than new entrants' activities. Incumbents have achieved changes in the setup of the policy framework itself, not just in the parameters of the existing framework. As a result there is a shift from electricity to gas production, and an increase in the scale of installations. This implies that the new institutional framework is not favorable for the participation of farmers with their small-scale installations in biomethane production.

## Funding

This work was supported by the Netherlands Organisation for Scientific Research (NWO) [grant number 434-09-242].

## References

- Alexandrescu, F., Martinat, S., Klusa ek, P., & Bartke, S. (2014). The Path From Passivity Toward Entrepreneurship: Public Sector Actors in Brownfield Regeneration Processes in Central and Eastern Europe. *Organization & Environment*, 27(2), 181–201
- Bartel, C. A., & Garud, R. (2009). The role of narratives in sustaining organizational innovation. *Organization Science*, 20(1), 107–117.
- Bergek, A., Jacobsson, S., & Sanden, B. (2008). “Legitimation” and “development of positive externalities”: two key processes in the formation phase of technological innovation systems. *Technology Analysis and Strategic Management*, 20(5), 18.
- Biogas Branche Organisatie (2011). Knelpuntenlijst. Aan de vast kamer commissie van EL&I. Available at: [www.bbo.nu/userfiles/bbo/uploads/files/BBO\\_conceptknelpunten.pdf](http://www.bbo.nu/userfiles/bbo/uploads/files/BBO_conceptknelpunten.pdf). Last accessed: December 31<sup>st</sup>, 2014.
- Biogas Magazine (2007). Biogas Branche Organisatie. Scholma Druk, Bedum.
- Biogas Magazine (2008a). Biogas Branche Organisatie. Scholma Druk, Bedum.
- Biogas Magazine (2008b). Biogas Branche Organisatie. Scholma Druk, Bedum.
- Biogas Magazine (2008c). Biogas Branche Organisatie. Scholma Druk, Bedum.
- Biogas Magazine (2008d). Biogas Branche Organisatie. Scholma Druk, Bedum.
- Bled, A. J. (2010). Technological Choices in International Environmental Negotiations: An Actor-- Network Analysis. *Business & Society*, 60(4), 570–590.

- Bluhdorn, I. (2011). The Politics of Unsustainability: COP15, Post-Ecologism, and the Ecological Paradox. *Organization & Environment*, 24(1), 34–53.
- Bryman, A. (2008). *Social research methods*. Oxford; New York: Oxford University Press.
- Dahan, N. M., Hadani, M., & Schuler, D. A. (2013). The Governance Challenges of Corporate Political Activity. *Business & Society*, 52(3), 365–387.
- DiMaggio, P. J. (1988). Interest and agency in institutional theory. *Institutional Patterns and Organizations: Culture and Environment*, 1, 3–22.
- Driscoll, C. (2006). The Not So Clear-Cut Nature of Organizational Legitimizing Mechanisms in the Canadian Forest Sector. *Business & Society*, 45(3), 322–353.
- Energiegids (2011). Subsidieaanvragen groen gas doorbraak voor het Noorden. October 2011.
- Energy Valley (2010). Taskforce Groen Gas opgericht. Available at: [www.energyvalley.nl/nieuws/Taskforce%20Groen%20Gas%20opgericht](http://www.energyvalley.nl/nieuws/Taskforce%20Groen%20Gas%20opgericht). Last accessed: May 5, 2015.
- Energy Valley (2011). Energy Valley 4. Energizing the Dutch economy. Strategieplan 2012-2015. Available at: [www.energyvalley.nl/uploads/bestanden/3621f0ef-e22f-44fa-aea3-88a9514aa822](http://www.energyvalley.nl/uploads/bestanden/3621f0ef-e22f-44fa-aea3-88a9514aa822). Last accessed: May 3<sup>rd</sup>, 2015.
- Energy Valley Topclub (2013). Samen duurzaam aan de TOP! Available at: [www.evtc.nl/](http://www.evtc.nl/). Last accessed: December 31<sup>st</sup>, 2014.
- European Commission (2007). Renewable energy road map. Renewable energies in the 21<sup>st</sup> century: building a more sustainable future. COM (2006) 848 final. Available at: [eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006DC0848](http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52006DC0848). Last accessed: February 16, 2015.
- European Commission (2011). Roadmap for moving to a competitive low carbon economy in 2050. Available at: [eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0112](http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52011DC0112). Last accessed: December 31<sup>st</sup>, 2014.
- European Directive 2009/28/EC (2009). On the promotion of the use of energy from renewable sources. Available at: [eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0028](http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0028). Last accessed: January 1<sup>st</sup>, 2015.
- Fligstein, N. (1997). Social Skill and Institutional Theory. *American Behavioral Scientist*, 40(4), 397–405.
- Garud, R., Gehman, J., & Karnøe, P. (2010). Categorization by association: Nuclear technology and emission-free electricity. *Research in the Sociology of Work*.
- Garud, R., Hardy, C., & Maguire, S. (2007). Institutional entrepreneurship as embedded agency: An introduction to the special issue. *Organization Studies*, 28(7), 957–969.
- Gas Strategies (2012). Viewpoint. European gas: shaping strategies for survival. Available at: [www.gasstrategies.com/files/files/EAGC\\_Viewpoint\\_2012.pdf](http://www.gasstrategies.com/files/files/EAGC_Viewpoint_2012.pdf). Last accessed: November 22, 2014.
- GasTerra (2010). De flexibiliteit van (aard)gas. Available at: [www.groengasinzicht.nl/fileadmin/groengasinzicht/user/Presentatie T. Wildenberg Groen Gas in Zicht 25-11 def.pdf](http://www.groengasinzicht.nl/fileadmin/groengasinzicht/user/Presentatie_T._Wildenberg_Groen_Gas_in_Zicht_25-11_def.pdf). Last accessed: December 31<sup>st</sup>, 2014.
- GasTerra (2014). CEO G.J. Lankhorst. Available at: [www.gasterra.nl/over-gasterra/corporate-statement-2/ceo-gertjan-lankhorst](http://www.gasterra.nl/over-gasterra/corporate-statement-2/ceo-gertjan-lankhorst). Last accessed: November 6, 2014.
- Gasunie (2008). Jaarverslag 2007. N.V. Nederlandse Gasunie. Available at: [www.gasunie.nl/uploads/bestanden/b2c06abdc908-43ad-aabb-68ac44c44d93](http://www.gasunie.nl/uploads/bestanden/b2c06abdc908-43ad-aabb-68ac44c44d93). Last accessed: May 2<sup>nd</sup>, 2015.
- Greenwood, R., Suddaby, R., & Hinings, C. R. (2002). Theorizing change: The role of professional associations in the transformation of institutionalized fields. *Academy of Management Journal*, 45(1), 58–80.
- Greenwood, R., & Suddaby, R. (2006). Institutional entrepreneurship in mature fields: The big five accounting firms. *Academy of Management Journal*, 49(1), 27–48.
- Groen Gas Nederland (2014). Partners. Available at: [groengas.nl/over-ons/partners/](http://groengas.nl/over-ons/partners/). Last accessed: December 31<sup>st</sup>, 2014.

- Groen Gas Nederland (2011). Nieuwsbrief Groen Gas Nederland, eerste editie. Available at: [gallery.mailchimp.com/f9c72ac8db1202184c3cdbf14/files/1e\\_editie\\_Nieuwsbrief\\_GroenGasNederland.pdf](http://gallery.mailchimp.com/f9c72ac8db1202184c3cdbf14/files/1e_editie_Nieuwsbrief_GroenGasNederland.pdf). Last accessed: January 1<sup>st</sup>, 2015.
- Groen Gas Nederland (2013). Evaluatie en plan 2013 en 2014 Groen Gas Nederland. Available at: [www.overijssel.nl/sis/16201333531301.pdf](http://www.overijssel.nl/sis/16201333531301.pdf). Last accessed: January 1<sup>st</sup>, 2015.
- GTS (2015). Gasunie Transport Services. Unit converter. Available at: [www.gasunietransportservices.nl/unit-converter](http://www.gasunietransportservices.nl/unit-converter). Last accessed: May 5, 2015.
- Hahn, T., & Pinkse, J. (2014). Private Environmental Governance Through Cross-Sector Partnerships: Tensions Between Competition and Effectiveness. *Organization & Environment*, 27(2), 140–160.
- Hargrave, T. J., & Van De Ven, A. H. (2006). A collective action model of institutional innovation. *Academy of Management Review*, 31(4), 864–888.
- Harmsen, R. (2014). “Interpreting cost-effectiveness: target definitions versus policy objectives.” *IEPPEC conference*, 9-11 September 2014, Berlin.
- Hillman, A. J., & Hitt, M. A. (1999). Corporate political strategy formulation: A model of approach, participation, and strategy decisions. *Academy of Management Review*, 24(4), 825–842.
- Hillman, A. J., Keim, G. D., & Schuler, D. (2004). Corporate political activity: A review and research agenda. *Journal of Management*, 30(6), 837–857.
- Hockerts, K., & Wüstenhagen, R. (2010). Greening Goliaths versus emerging Davids — Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship. *Journal of Business Venturing*, 25(5), 481–492.
- Hogeweg (2013). Energy Valley. The inter-organizational network and its effect on the regional energy transition. Master thesis. Rotterdam School of Management. Available at: [www.drift.eur.nl/wp-content/uploads/2014/01/199298844-Master-Thesis-Energy-Valley-RSM-Qhogeweg-Gmail-com.pdf](http://www.drift.eur.nl/wp-content/uploads/2014/01/199298844-Master-Thesis-Energy-Valley-RSM-Qhogeweg-Gmail-com.pdf). Last accessed: November 22, 2014.
- Hung, S.-C., & Whittington, R. (2011). Agency in national innovation systems: Institutional entrepreneurship and the professionalization of Taiwanese IT. *Research Policy*, 40(4), 526–538.
- ICE Endex (2014). Ulco Vermeulen. Available at: [www.iceendex.com/structure/ulco-vermeulen/](http://www.iceendex.com/structure/ulco-vermeulen/). Last accessed: November 6, 2014.
- IPCC (2014). Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
- Kern, F., Smith, A., Shaw, C., Raven, R., & Verhees, B. (2014). From laggard to leader: Explaining offshore wind developments in the UK. *Energy Policy*, 69, 635–646.
- Klein Woolthuis, R., Hooimeijer, F., Bossink, B., Mulder, G., & Brouwer, J. (2013). Institutional entrepreneurship in sustainable urban development: Dutch successes as inspiration for transformation. *Journal of Cleaner Production*, 50, 91–100.
- Lalor, B. M., & Hickey, G. M. (2014). Strengthening the Role of Science in the Environmental Decision-Making Processes of Executive Government. *Organization & Environment*, 27(2), 161–180.
- Levy, D., & Scully, M. (2007). The institutional entrepreneur as modern prince: The strategic face of power in contested fields. *Organization Studies*, 28(7), 971–991.
- Levy, D. L., Szejnwald Brown, H., & de Jong, M. (2009). The Contested Politics of Corporate Governance: The Case of the Global Reporting Initiative. *Business & Society*, 49(1), 88–115.
- Lin, H. (2014). Government-Business Partnership Formation for Environmental Improvements. *Organization & Environment*, 27(4), 383–398.
- Maguire, S., Hardy, C., & Lawton, T. (2004). Institutional entrepreneurship in emerging fields: HIV/AIDS treatment advocacy in Canada. *The Academy of Management Journal*, 47(5), 657–679.

- Ministry of Economic Affairs (2010). Kamerbrief Stimulering Duurzame Energie, November 30, 2010. Available at: [www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2010/11/30/stimulering-duurzame-energie.html](http://www.rijksoverheid.nl/documenten-en-publicaties/kamerstukken/2010/11/30/stimulering-duurzame-energie.html). Last accessed: January 1<sup>st</sup>, 2015.
- Ministry of Economic Affairs (2014). Kamerbrief over aardgasbeleid in Nederland. Bijlage: Aardgasbeleid in Nederland: Actuele ontwikkelingen. October 7, 2014. Available at: [www.rijksoverheid.nl/onderwerpen/energiebeleid/documenten-en-publicaties/rapporten/2014/10/07/aardgasbeleid-in-nederland-actuele-ontwikkelingen.html](http://www.rijksoverheid.nl/onderwerpen/energiebeleid/documenten-en-publicaties/rapporten/2014/10/07/aardgasbeleid-in-nederland-actuele-ontwikkelingen.html). Last accessed: February 17, 2015.
- NAM (2005). Maatschappelijk verslag. Available at: [www.nam.nl/content/dam/shell/static/nam/downloads/pdf/nam-maatschappelijkverslag2004.pdf](http://www.nam.nl/content/dam/shell/static/nam/downloads/pdf/nam-maatschappelijkverslag2004.pdf). Last accessed: December 31<sup>st</sup>, 2014.
- Negro, S. O., Hekkert, M. P., & Smits, R. E. (2007). Explaining the failure of the Dutch innovation system for biomass digestion-A functional analysis. *Energy Policy*, 35(2), 925–938.
- Netbeheer Nederland (2012). Netbeheerders als schakel bij verduurzaming van de gasvoorziening. Presentation at meeting 'Groen geeft gas', April 11, 2012.
- North, D. C. (1990). *Institutions, institutional change, and economic performance*. Cambridge; New York: Cambridge University Press.
- Onderzoeksraad voor Veiligheid (2015). Aardbevingsrisico's in Groningen. Onderzoek naar de rol van veiligheid van burgers in de besluitvorming over de gaswinning (1959-2014). Available at: [www.onderzoeksraad.nl/nl/onderzoek/1991/aardbevingsrisico-s-in-groningen](http://www.onderzoeksraad.nl/nl/onderzoek/1991/aardbevingsrisico-s-in-groningen). Last accessed: February 20, 2015.
- Okereke, C., Wittneben, B., & Bowen, F. (2011). Climate Change: Challenging Business, Transforming Politics. *Business & Society*, 51(1), 7–30.
- Pacheco, D. F., York, J. G., Dean, T. J., & Sarasvathy, S. D. (2010). The Coevolution of Institutional Entrepreneurship: A Tale of Two Theories. *Journal of Management*, 36(4), 974–1010.
- Platform Nieuw Gas (2005). Factsheet Platform Nieuw Gas. Available at: [www.registratieplatform.nl/UserFiles/File/Factsheet%20Platform%20Nieuw%20Gas.pdf](http://www.registratieplatform.nl/UserFiles/File/Factsheet%20Platform%20Nieuw%20Gas.pdf). Last accessed: January 1<sup>st</sup>, 2015.
- Platform Nieuw Gas (2007). Vol gas vooruit! De rol van groen gas in de Nederlandse energiehuishouding. Available at: [www.rvo.nl/sites/default/files/bijlagen/Vol%20Gas%20Vooruit%20-%20De%20rol%20van%20Groen%20Gas%20in%20de%20Nederlandse%20energiehuishouding\\_0.pdf](http://www.rvo.nl/sites/default/files/bijlagen/Vol%20Gas%20Vooruit%20-%20De%20rol%20van%20Groen%20Gas%20in%20de%20Nederlandse%20energiehuishouding_0.pdf). Last accessed: January 1<sup>st</sup>, 2015.
- Platform Nieuw Gas (2008). Vergezichten in gas. Available at: [refman.et-model.com/publications/618/download/RO%20ET%20Nieuw%20Gas%20200807\\_Vergezichten%20in%20gas.pdf?1297827229](http://refman.et-model.com/publications/618/download/RO%20ET%20Nieuw%20Gas%20200807_Vergezichten%20in%20gas.pdf?1297827229). Last accessed: January 1<sup>st</sup>, 2015.
- Platform Nieuw Gas (2010). Nieuw Gas Krant, december 2010. Vijfkeerblauw, Den Haag.
- Platform Nieuw Gas (2010). Op weg naar een volwassen groen gas markt. Stand van zaken en actiepunten.
- Platform Nieuw Gas (2011). Globaal werkplan & begroting 2010-2013 van Groen Gas Nederland. Available at: [www.fryslan.frl/1776/23-maaie-gearkomste-provinsjale-steaten/files/5.%20notitie%20groen%20gas.pdf](http://www.fryslan.frl/1776/23-maaie-gearkomste-provinsjale-steaten/files/5.%20notitie%20groen%20gas.pdf). Last accessed: January 1<sup>st</sup>, 2015.
- Politiek Archief (2014). Alkmaar > Commissie Ruimte 10-01-2013> 9. Raadsvoorstel Voorfinanciering ten behoeve van demo Milena-Olga. Available at: [www.politiekarchief.info/vergadering/27056/?sid=116517](http://www.politiekarchief.info/vergadering/27056/?sid=116517). Last accessed: May 5, 2015.
- Rekenkamer (2014). Besteding van aardgasbaten: feiten, cijfers en scenario's. Available at: [www.rekenkamer.nl/Publicaties/Onderzoeksrapporten/Introducties/2014/10/Besteding\\_van\\_aardgasbaten\\_feiten\\_cijfers\\_en\\_scenario\\_s](http://www.rekenkamer.nl/Publicaties/Onderzoeksrapporten/Introducties/2014/10/Besteding_van_aardgasbaten_feiten_cijfers_en_scenario_s). Last accessed: December 31<sup>st</sup>, 2014.
- Rijksoverheid (2010). Verhagen schoeit stimulering duurzame energie op nieuwe leest. Available at: [www.rijksoverheid.nl/nieuws/2010/11/30/verhagen-schoeit-stimulering-duurzame-energie-op-nieuwe-leest.html](http://www.rijksoverheid.nl/nieuws/2010/11/30/verhagen-schoeit-stimulering-duurzame-energie-op-nieuwe-leest.html). Last accessed: November 22, 2014.

- Rijksoverheid (2011a). Groen gas motor voor duurzame energie. Available at: [www.rijksoverheid.nl/nieuws/2011/09/06/groen-gas-motor-voor-duurzame-energie.html](http://www.rijksoverheid.nl/nieuws/2011/09/06/groen-gas-motor-voor-duurzame-energie.html). Last accessed: November 22, 2014.
- Rijksoverheid (2011b). Green deal van Noord-Nederland (vier provincies en zes gemeenten), Energy Valley, SER Noord Nederland met de Rijksoverheid (2011). Available at: [www.rijksoverheid.nl/bestanden/documenten-en-publicaties/convenanten/2011/11/17/bijlage-3-overeenkomsten-green-deal/bijlage-3-overeenkomsten-green-deal.pdf](http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/convenanten/2011/11/17/bijlage-3-overeenkomsten-green-deal/bijlage-3-overeenkomsten-green-deal.pdf). Last accessed: November 22, 2014.
- Rijksoverheid (2012). Green deal groen gas/ Stichting Groen Gas Nederland (Green Deal 33). Available at: [www.rijksoverheid.nl/onderwerpen/duurzame-economie/documenten-en-publicaties/brochures/2011/09/23/factsheets-31-45-van-green-deals-uit-de-1e-ronde-2011.html](http://www.rijksoverheid.nl/onderwerpen/duurzame-economie/documenten-en-publicaties/brochures/2011/09/23/factsheets-31-45-van-green-deals-uit-de-1e-ronde-2011.html). Last accessed: January 1<sup>st</sup>, 2015.
- RVO (2007). Groen Gas. Gas van aardgaskwaliteit uit biomassa. Update van de studie uit 2004. Available at: [www.rijksoverheid.nl/bestanden/documenten-en-publicaties/rapporten/2007/03/26/rapport-groen-gas/7032506-bijlage1.pdf](http://www.rijksoverheid.nl/bestanden/documenten-en-publicaties/rapporten/2007/03/26/rapport-groen-gas/7032506-bijlage1.pdf). Last accessed: March 10, 2015.
- RVO (2009). Innovatieve vergassingstechnieken. Available at: [www.rvo.nl/sites/default/files/bijlagen/Handleiding%20Innovatieve%20vergassingstechnieken.pdf](http://www.rvo.nl/sites/default/files/bijlagen/Handleiding%20Innovatieve%20vergassingstechnieken.pdf). Last accessed: May 5, 2015.
- RVO (2010). Groen gas. Symposium industriële vergisting 20 oktober 2010. Available at: [www3.energyvalley.nl/attachments/22215\\_Agenschap\\_NL\\_industriële\\_vergisting\\_20\\_okt\\_2010.pdf](http://www3.energyvalley.nl/attachments/22215_Agenschap_NL_industriële_vergisting_20_okt_2010.pdf). Last accessed: January 1<sup>st</sup>, 2015.
- RVO (2011). Evaluatie van de vergisters in Nederland. Available at: [www.rvo.nl/sites/default/files/bijlagen/Evaluatie%20van%20de%20vergisters%20in%20Nederland%20november%202011.pdf](http://www.rvo.nl/sites/default/files/bijlagen/Evaluatie%20van%20de%20vergisters%20in%20Nederland%20november%202011.pdf). Last accessed: February 17, 2015.
- RVO (2012). Jaarbericht 2011, SDE+, SDE en MEP. Available at [www.rvo.nl/sites/default/files/Jaarbericht%202011%20SDE+%20SDE%20en%20MEP%20%5Bkleurenversie%5D.pdf](http://www.rvo.nl/sites/default/files/Jaarbericht%202011%20SDE+%20SDE%20en%20MEP%20%5Bkleurenversie%5D.pdf). Last accessed: May 5, 2015.
- RVO (2015). Internal data.
- Sarasini, S., & Jacob, M. (2014). Past, Present, or Future? Managers' Temporal Orientations and Corporate Climate Action in the Swedish Electricity Sector. *Organization & Environment*, 27(3), 242–262.
- Scherer, A. G., Palazzo, G., & Matten, D. (2014). The Business Firm as a Political Actor: A New Theory of the Firm for a Globalized World. *Business & Society*, 53(2), 143–156.
- Scott, W. R. (1995). *Institutions and organizations*. Thousand Oaks: SAGE.
- Scott, W. R. (2014). *Institutions and organizations: ideas, interests, and identities*. Los Angeles: SAGE.
- Smink, M. M., Hekkert, M. P., & Negro, S. O. (2015). Keeping sustainable innovation on a leash? Exploring incumbents' institutional strategies. *Business Strategy and the Environment*.
- Smink, M., Negro, S.O., Niesten, E., Hekkert, M.P. (under review), How mismatching institutional logics hinder niche-regime interaction and how boundary spanners intervene. Submitted to *Technological Forecasting and Social Change*.
- Staatscourant (2010). Nr. 5545: Regeling van de Minister van Economische Zaken van 1 april 2010, nr. WJZ/10041846, tot wijziging van de Subsidieregeling energie en innovatie in verband met een effectieve en efficiënte vergistingketen. Available at: [zoek.officielebekendmakingen.nl/stcrt-2010-5545.html](http://zoek.officielebekendmakingen.nl/stcrt-2010-5545.html). Last accessed: May 5, 2015.
- Staatscourant (2011). Nr. 15181: Regeling van de Minister van Economische Zaken, Landbouw en Innovatie van 8 juli 2011, nr. WJZ/11105051, tot wijziging van de Regeling aanwijzing categorieën duurzame energieproductie 2011 (wijziging subsidieplafond hernieuwbaar gas). Available at: [zoek.officielebekendmakingen.nl/stcrt-2011-15181.html](http://zoek.officielebekendmakingen.nl/stcrt-2011-15181.html). Last accessed: February 2, 2015.
- Stenzel, T., & Frenzel, A. (2008). Regulating technological change-The strategic reactions of utility companies towards subsidy policies in the German, Spanish and UK electricity markets. *Energy Policy*, 36(7), 2645–2657.

Stoddart, M. C. J., Tindall, D. B., & Greenfield, K. L. (2012). “Governments Have the Power”? Interpretations of Climate Change Responsibility and Solutions Among Canadian Environmentalists. *Organization & Environment*, 25(1), 39–58.

Sühlisen, K., & Hisschemöller, M. (2014). Lobbying the “Energiewende”. Assessing the effectiveness of strategies to promote the renewable energy business in Germany. *Energy Policy*, 69, 316–325.

Task Force Energietransitie (2006). Meer met energie. Kansen voor Nederland. Advadi, Westervoort.

Task Force Energietransitie (2006). Tussenrapportage December 2006. In print.

Topteam Energie (2012). Gas in balans. Innovatiecontract gas. Available at: [topsectorenergie.nl/wp-content/uploads/2013/10/InnovatieContract-Gas-2012.pdf](http://topsectorenergie.nl/wp-content/uploads/2013/10/InnovatieContract-Gas-2012.pdf). Last accessed: Januar<sup>y</sup> 1st, 2015.

Van Den Bergh, J. C. J. M., Truffer, B., & Kallis, G. (2011). Environmental innovation and societal transitions: Introduction and overview. *Environmental Innovation and Societal Transitions*, 1(1), 1–23.

Welcomer, S. A. (2010). Reinventing vs. Restoring Sustainability in the Maine Woods: Narratives of Progress and Decline. *Organization & Environment*, 23(1), 55–75.

Wesseling, J. H., Farla, J. C. M., Sperling, D., & Hekkert, M. P. (2014). Car manufacturers’ changing political strategies on the ZEV mandate. *Transportation Research Part D: Transport and Environment*, 33, 196–209.

Yin, R. K. (2003). *Case Study Research: Design and Methods*. Thousand Oaks, CA: Sage Publications.

## Annex

### Annex I. Overview of interviewees

New entrants	Incumbents	Government
<b>NE1: Biogas producers association (BGPA)</b>	I1: Biomethane Netherlands (BMNL)	G1: Min. of Economic Affairs
<b>NE2: Biomethane producers association (BMPA)</b>	I2: Energy North Netherlands (ENNL) / BMNL	G2: Min. of Economic Affairs
<b>NE3: Sugar producer</b>	I3: Network bus.dev.* / BMNL	
<b>NE4: Sustainability consultant</b>	I4: Network bus.dev./ BMNL	
	I5: Network bus.dev.	
	I6: Gas network operator	
	I7: Gas network operator	
	I8: Gas network operator	
	I9: Gas network operator	

\*Business development unit of gas network operator

### Annex II. Data sources per section

Section	Topic	Data sources
5.1	Institutional change	News articles, policy documents, NEA archive
5.2	Proposed institutional change	News articles, policy documents
5.3	Cooperation	Interviews, other publications
5.4	Framing	News articles, policy documents
5.5.1	Wider audience	News articles, interviews
5.5.2	Policy makers	News articles, policy documents, interviews, other publications
5.6	Effects of IE on institutional change	News articles, policy documents, interviews, other documents

5.7	Effects of institutional change on biomethane development	NEA archive
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### Annex III. Overview of news articles

#	Source	Year	Date	Title	Page
1	ANP	2007	Dec 19	'Groen gas' kan veel aardgas vervangen	n.a.
2	ANP	2009	Apr 7	Kiezen voor groen gas dichterbij	n.a.
3	ANP	2009	Jul 2	Na groene stroom, groen gas	n.a.
4	ANP	2009	Dec 7	Miljoenen subsidie voor 'groen' tanken	n.a.
5	ANP	2010	Jun 28	Groen gas op grote schaal ingezet	n.a.
6	ANP	2010	Nov 25	'Groen gas is must in energiebeleid' (3)	n.a.
7	ANP	2011	Sep 6	Groen gas moet gewoon worden (3)	n.a.
8	Almere Vandaag	2009	Jan 23	'Groen' gas in Nederland	n.a.
9	BN De Stem	2011	Nov 9	Prins opent bio- massavergister in Dinteloord	n.a.
10	Boerderij	2006	Aug 29	Biogaswereld lamgeslagen	12
11	Boerderij	2006	Sep 19	Alsnog MEP voor vergisters	9
12	Boerderij	2007	Jun 5	Aantal biogasininstallaties verdubbelt	14
13	Boerderij	2007	Jul 24	Stroomprijs bepaalt MEP	9
14	Boerderij	2008	Feb 5	Biogas: 6 cent per kilowattuur	17
15	Boerderij	2008	Jun 10	Biogasboeren pessimistisch	6
16	Boerderij	2009	Feb 24	Nieuwe kansen en geld voor biogas	11
17	Boerderij	2009	Dec 1	Tarief vergisting oogst kritiek	14
18	Boerderij	2010a	Dec 7	Kabinet zet vol in op groen gas	12
19	Boerderij	2010b	Dec 7	Bundeling van boeren in biogas	5
20	Boerderij	2012	Jun 19	Biogasbubbel doorgeprikt	8
21	Boerderij Vandaag	2006	Aug 30	Einde MEP kost minstens 900 arbeidsplaatsen	1
22	Boerderij Vandaag	2008	Feb 26	Minister: groen gas uit co-vergisting in te duur	3
23	Boerderij Vandaag	2008	Mar 21	Biogas nodig voor groene energie	3
24	Boerderij Vandaag	2008	Jul 30	SDE voor groen gas open tot december	11
25	Boerderij Vandaag	2008	Aug 2	'Ontwikkeling biogas ligt stil'; Stagnatie subsidieregeling SDE oorzaak	3
26	Boerderij Vandaag	2009	Sep 2	Groen gas Suiker Unie gecertificeerd	3
27	Boerderij Vandaag	2009	Sep 3	Suiker Unie: meer SDE-geld nodig voor productie biogas	1
28	Boerderij Vandaag	2009	Sep 4	'Groen gas kan belangrijke nevenactiviteit worden'	8
29	Boerderij Vandaag	2009	Oct 22	'Biogasboer verdient erg weinig'	3
30	Boerderij Vandaag	2010	Jan 26	Positief over steun co-vergisting	3
31	Boerderij Vandaag	2010	Jun 12	Biogasbranche overlegt over witte lijst	2
32	Boerderij Vandaag	2010	Sep 22	'Controle van digestaat is efficiënter'	2
33	Boerderij Vandaag	2010	Oct 15	Loting SDE-regeling funest voor prachtige initiatieven	8
34	Boerderij Vandaag	2010	Oct 23	Organisaties werken aan snel toelaten co-producten	3
35	Boerderij Vandaag	2010	Nov 23	Biogassector: gelijk speelveld in nieuwe SDE belangrijk	8
36	Boerderij Vandaag	2011	May 13	Maarsingh: verplicht vergisten is absurd idee	3
37	Boerderij Vandaag	2011	May 19	Meer producten in de vergister	3
38	Boerderij Vandaag	2011	Aug 9	'ECN-kostprijs voor biogas te laag in subsidie voor 2012'	3
39	Boerderij Vandaag	2011	Nov 4	SDE+ begint met lager tarief, wel breder	3

				inzetbaar	
40	Boerderij Vandaag	2012a	Feb 10	'Vergoeding voor warmte nog niet hoog genoeg'	3
41	Boerderij Vandaag	2012b	Feb 10	Ekwadraat lost het op met vergisting	110
42	Boerderij Vandaag	2012	Mar 8	Veel kritiek op duurzame subsidieregeling SDE+	6
43	Boerderij Vandaag	2012	Apr 11	87 nieuwe stoffen mogen in co-vergister	1
44	Boerderij Vandaag	2012	Apr 17	'Biogasbranche is niet het afvalputje van de landbouw'	6
45	Brabants Dagblad	2011	Dec 14	Duurzame energie plannen ECN en Gasunie. 'Groen gas nodig voor halen doel'	n.a.
46	Dagblad van het Noorden	2009	Jul 2	Noorden wil groen gas-knooppunt worden	n.a.
47	Dagblad van het Noorden	2009	Jul 3	Vertogas gaat groen gas keuren	n.a.
48	Dagblad van het Noorden	2009	Sep 23	Noorden als kweekvijver energietoppers	23
49	Dagblad van het Noorden	2011	Jan 18	Produceren groen gas voordeliger	14
50	Dagblad van het Noorden	2012	May 31	Staatssecretaris Atsma opent Groengasdag	14
51	De Pers	2012	Jan 24	Groen gas is erg dure rechtse hobby	5
52	De Stentor	2009	Jan 9	Zwolle verwarmd duizenden huizen met 'groen gas' uit biobak	6
53	De Volkskrant	2011	Sep 7	Nieuwe impuls groen gas	23
54	De Volkskrant	2011	Feb 12	'Groen gas is een van de belangrijkste duurzame opties'	9
55	Forum	2011	Nov 17	Suiker Unie-gas voor ruim zeshonderd huishoudens	38
56	Het Financieele Dagblad	2009	Dec 11	Noorden bepleit hoger subsidieplafond voor ontwikkeling Groen Gas hubs	4
57	Het Financieele Dagblad	2010	Sep 18	Innovatie in Noord-Nederland is een kostbaar kasplantje	21
58	Het Parool	2011	Dec 14	Gasunie verwacht veel van groen gas	19
59	Leeuwarder Courant	2007	Jan 27	Aan het biogas	n.a.
60	Leeuwarder Courant	2009	Sep 25	Noorden wil 'hubs' voor groen gas	2
61	Leeuwarder Courant	2009	Oct 7	Topinstituut gasonderzoek naar Groningen	2
62	Reformatisch Dagblad	2007	Mar 27	Biogas kan aardgas deels vervangen	13