Unpacking the strategy of an energy incumbent

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Abstract

In recent years a growing number of oil and gas companies have engaged in the energy transition. As a result, it has been claimed that these organisations have the potential to play a significant role in accelerating the energy transition. However, there remains a lack of research into the internal processes through which oil and gas companies establish and develop strategy for such engagement. This research aims to fill that gap through an in-depth, firm-level case study of a large Dutch oil and gas firm. The findings shed light on the internal reorganisation strategy of the firm, highlighting the role of embedded institutional contexts and organisational dynamics. By doing so, this research provides a deeper understanding of the internal processes and contextual factors affecting how and why an oil and gas company can adopt new and varied strategic responses within different low-carbon niches, as well as the boundaries of such engagement.

Keywords

Incumbents; oil and gas; sustainability transitions; low-carbon niches

1 Introduction

In recent years incumbent oil and gas companies have become increasingly engaged in the renewable energy sector through their involvement throughout the value chain of low-carbon projects and technology development [1,2]. As a result, it has been claimed by some within and outside the oil and gas industry that these organisations have the potential to play a significant role in the transition to low-carbon energy systems. As oil and gas incumbents become more involved in the energy transition through a range of different strategies, there is a pressing need to understand and critically analyse how such strategies are formulated and implemented, and their possible impacts on low-carbon energy systems. However, there remains a lack of research into the internal dynamics of oil and gas companies and the wider impacts of their strategic responses, particularly with respect to investment in low-carbon technology niches.

This research aims to fill that gap through an in-depth, firm-level case study of a large Dutch oil and gas firm, Nederlandse Aardolie Maatschappij B.V. (NAM). Due to a disruption in its core business, NAM has become active in a number of low carbon energy projects in the Netherlands. The case study examines the establishment of a dedicated business unit within the company as the main vehicle through which the incumbent has engaged with low-carbon innovation and the energy transition.

Our in-depth case study research enables an exploration and understanding of how an oil and gas firm can establish and develop a strategy for engaging in, and shaping, low-carbon niches. We refer to this as the 'strategic response', which forms the core unit of analysis in our empirical study. Through the case study and subsequent analysis, we identify three key factors which shaped NAM's strategic response: 1) the internal organizational dynamics of the firm and the creation of a dedicated energy transition unit; 2) how it engaged with low carbon technology niches and associated supply chains; and 3) how the broader governance structure, policy environment and infrastructure context enabled, constrained and conditioned its overall strategic response.

This firm-level study is situated in the broader field of sustainability transitions and a particular strand of that literature which has been about interrogating the role of incumbent firms in driving - or inhibiting - systemic change [3–6]. As incumbent firms have significant existing resources and organisational abilities, including in R&D, a pool of highly skilled and trained human resources, existing supply chain experience and international market presence,

they can resist change and perpetuate lock-in to unsustainable production patterns. It has been observed in a number of studies that incumbents can operate across levels, adopting strategies to protect market share and their position within the existing industry regime, whilst engaging in niche-level innovation, for example through diversification, takeovers of new entrants, and lobbying [7].

On the other hand, strands of this literature also observe that incumbent firms can be key innovators, developing new products, services, values and business models which in turn contribute to the creation of new industries and markets [8,9,7]. Firms also engage in shaping their institutional environment through discourse activities and framing, creating new industry standards, building political coalitions, lobbying for certain policies and regulations, introducing and legitimising new technologies and practices, or strategically influencing collective expectations [10–14]. If new industry developments match the existing resource base of incumbents, then they can drive technological and regulatory change [15]. These observations can be seen as a response to a critique that the early literature in this field was over-reliant on broad and simplistic categorisations of incumbent firms with large market shares [16].

As a contribution to this ongoing debate about the role of incumbents in sustainability transitions, we emphasise the 'bounded' nature of an incumbent's innovation strategy. Rather than frame incumbent strategies as enablers or barriers to sustainability transitions, we emphasise the limitations that are placed on strategic responses which are associated with self-imposed resourcing constraints and broader institutional contexts. Based on the empirical study of NAM in the Dutch context, we argue that by understanding how an incumbent firm sets and navigates the boundaries for engagement with low-carbon energy systems, as well as how such boundaries change and evolve over time, we provide a deeper insight into, and more realistic appraisal of, the potential roles that such firms can play in the energy transition.

The remainder of the paper is structured as follows: The next section (Section 2) will provide an overview of the research fields from which this research draws to inform the analysis, as well as an overview of relevant published literature relating to the topic. In Section 3 the methodology of the paper is outlined. This is followed, in Section 4, by a presentation of the empirical results; finally, in Section 5 there is a discussion and analysis of key insights for improving our understanding of the role of incumbents in sustainable energy transitions.

2 Literature Review: Incumbent oil and gas firms in sustainability transitions

Within the sustainability transitions literature, incumbents have often been viewed as actors opposed to the energy transition [8,17,18]. Studies have shown how incumbents actively resist new technologies through political lobbying opposing renewable energies [19], strategically protecting the status quo against challengers [20], and forming alliances with politicians [17]. Furthermore, in instances where incumbents have engaged in environmental practices in the past, this has traditionally been through promoting a greening of their existing fossil fuel business and improving their sustainability practices, instead of promoting radical innovation in low-carbon technologies [21,22]. As such, some studies have suggested that the reason for the slow deployment of renewable technologies in some countries is due to the dominant role of the fossil fuel incumbents in those regions [23,24].

However, studies have also highlighted that incumbent actors can also engage in niche-level innovation [7,25]. A number of recent studies have shown that incumbents are engaging in the development and diffusion of cleaner technologies in a variety of sectors, including transportation [7] and power generation [26], while studies have shown that oil and gas incumbents do not follow the traditional strategies of incumbents prescribed in theories of innovation [27,28]. Evidence suggests that oil and gas companies have deployed a range of strategies when engaging in low-carbon innovation, but with mixed success [29]. Such engagement has often been erratic and determined primarily by the market conditions of the core industry, rather than that of the low carbon market [30].

The type of resources redeployed and the size of the resource base can have a crucial role in sustained engagement by oil and gas firms in low-carbon markets [31,32]. In the oil and gas industry, competitive advantage results not only from a firm's tangible assets but also from its intangible assets and capabilities, including reputation, abilities and organisational structure [33–35]. A key factor influencing a firm's technological diversification strategies is therefore the knowledge relatedness between the existing and new sectors [36]. In the oil and gas sector, a low level of relatedness between the core business and low-carbon technologies poses a key challenge, as well as institutional differences in the organisation of innovation, contracts and funding in the diversified markets [37].

Several studies in the sustainability transitions literature have found positive impacts of oil and gas companies on promoting low-carbon energy systems. Mäkitie [38] highlight how

technological overlaps and firm diversification from oil and gas have assisted the development of a nascent offshore wind industry in Norway (see also Normann and Hanson [39]. Technological overlaps have also allowed the transfer of human resources, with many dedicated offshore wind firms using personnel with previous oil and gas experience. This is supported by Steen and Weaver [28] who found that the main motivations for diversification are "to position themselves for the future, reuse resources and capabilities, and lastly follow their customers" (p. 1079).

Despite several positive impacts of oil and gas diversification into renewables, studies have also highlighted several negative impacts. While the volatility of the oil and gas industry drives diversification, it can also bring risks to the renewable sector if the oil and gas output stabilises or increases in profitability, causing the firms to withdraw [28,38]. As investment in diversification is often small in comparison to the core business, the renewable energy supply chain has been found to be vulnerable to the unstable commitment by incumbents which can hamper early industry formation and institution building [39]. As a result, certain renewable industries could be vulnerable to a withdrawal by oil and gas firms [40]. Furthermore, oil and gas involvement may result in conservative innovation policies which may hamper radical innovation in the long term [41]. As such studies have highlighted the potential downsides of relying on diversified oil and gas incumbents alone for the sustainable energy transition [42].

The starting point for this paper, and its main contribution to the literature, is that a closer look at the internal processes and dynamics of strategic responses can shed light on the role (or multiple roles) of oil and gas companies in sustainability transitions. An empirical, firm-centric, approach can provide particular insights about the motivations for engaging in renewable technology niches, the centrality of such a strategy to core business functions and the future trajectories of incumbent reorientation in particular contexts. There is no fixed or single answer to the questions raised here about the nature of oil and gas incumbency with respect to sustainability transitions; rather, responses and strategies are likely to be heterogeneous and shaped by sector context and wider contingencies.

While several studies have also highlighted that oil and gas incumbents often do not follow the traditional strategies of incumbents as predicted in innovation theory, instead adopting a heterogeneity of responses, to date there remains a lack of research examining the internal dynamics of formulating and developing incumbent transition strategies in this sector. This research aims to fill that gap.

Our contention is supported by the recent calls for more research in the variation of energy incumbents [28,16,6], as well as more research to examine non-traditional profit maximising motivations in diversification activities [40]. It is also supported by the growing research field in the study of firm behaviour that has emerged at the intersection of sustainable transitions and strategic management [43]. Key innovation and transition processes in socio-technical systems are often shaped by such deliberate strategic initiatives of firms and other actors [8]. Such strategies – the specific goals, and the actions and activities employed to pursue those goals – are not just focused narrowly on individual firms, but also on wider system-level collaborations with other actors.

3 Methodology

Drawing on these theoretical insights from the strategic management and sustainability transitions literatures, we undertook a single case study at the firm level. Single, in-depth, case studies are useful to study how new processes and strategies emerge and develop over time, with the aim of reflecting and elaborating on existing theory [44]. This was designed as a process study; the focus is on the temporal sequence and structure of events that occurred, as constructed through a narrative, helping to reveal, explain and further understand the underlying dynamics of the case [45]. Empirically, the study contributes to the literature by widening the geographic scope of the research – as many studies into oil and gas engagement with low-carbon systems have focused on Norway, a country that experiences distinct market, regulatory and socio-political conditions which are unlikely to be found in other oil and gas producing countries [46].

To minimize the level of subjectivity and partiality in the study, data was collected from multiple sources to triangulate amongst various points of view. Data was collected from 25 semi-structured interviews which were conducted in two stages; initial interviews were held with a range of employees of the incumbent firm, as well as those involved in the creation and management of low-carbon projects. The interviews were conducted with a view to explaining why and how the firm established its strategic response, and to help identify and order a sequence of events and interactions that occurred over the course of this process. In addition, the interviews also explored how NAM engages with renewable technology niches, and the relationship between this niche development and its core business.

As a company's strategy is influenced by its policy and regulatory environment, a second stage of interviews was held with key actors in the Dutch energy sector, including policymakers, gas production and supply companies, industry lobbyists, energy companies, municipalities, research organisations and technology developers. These interviews charted the policy and industry backdrop for the company's efforts to re-orientate itself within the energy regime. Finally, interviews were held with actors from other organisations involved in several of the key energy transition projects with which NAM was operating.

All interviewees held senior positions in their respective organisations or were responsible for the management of energy transition projects. Interviews lasted approximately one hour and were held during November-December 2019, either in person or via telephone. In addition, secondary data was collected and analysed. This included data from annual reports, company websites, industry media, policy reports and other relevant documents. Interview data was transcribed and analysed using NVivo 12 software. This coding was based on existing themes from the literature, however the interview process also allowed new themes to emerge. Following an inductive approach [47], the key themes we identified are explored in Section 5 which follows the case study description below.

4 Case study: Nederlandse Aardolie Maatschappij (NAM)

4.1 Background and context

Nederlandse Aardolie Maatschappij (NAM) is a Dutch upstream oil and gas exploration and production company. It is a 50:50 joint venture between Royal Dutch Shell and ExxonMobil, founded on September 19th 1947 as a direct result of the discovery in 1943 of an oil field near Schoonebeek. In 1959 it established an exploratory gas well at Slochteren, in Groningen, and started extracting natural gas in 1963. The Groningen field was one of the world's largest gas fields and transformed the Dutch domestic energy supply. Over the following decades, natural gas became a key energy source in the Netherlands, with 93% of all Dutch households using the fuel [48]. The Groningen field covers approximately 900 km^2 and it is now known that it contained 2,800 billion m^3 of gas when production commenced. At the end of 2018, some 780 billion m^3 remained, arguably sufficient for another 50 years of production, depending on the rate of extraction. The Groningen field is by far the largest asset NAM operates, contributing to around 75% of the company's total production. As a result, NAM is the largest gas production company in the Netherlands, supplying 75% of the natural

gas required by Dutch households and businesses. Natural gas accounts for 45% of all the energy that is used in the Netherlands and the company is responsible for around 1/3 of all energy produced in the country [48]. In 2019, NAM posted a net turnover of 2.3 billion euros and a profit of 177 million euros.

The management of the Groningen gas field is conducted through a partnership with NAM and the state-owned company Energie Beheer Nederland (EBN) called Maatschap Groningen (Partnership Groningen), in which NAM has a 60% financial stake and EBN 40%. As a result, the Dutch government participates financially in oil and gas extraction. The gas extracted from Maatschap Groningen is sold to GasTerra, a joint venture between EBN (40%), the Dutch Government (10%), Shell (25%) and ExxonMobil (25%). GasTerra sells the gas to domestic energy suppliers and industries, as well as trading gas internationally. Responsibility for the transporting of gas lies with state owned company Gasunie.

In August 2012 an earthquake occurred in the village of Huizinge in the province of Groningen in the Northern Netherlands. The earthquake measured 3.6 on the Richter Scale and was attributed to the extraction of natural gas. Although there had been previous earthquakes in the region, the magnitude and reported damage put the earthquake high on the political agenda, with calls from politicians for reductions in gas extraction volumes [49,50]. During this time media attention had also increased, with a rapid rise in articles framing the earthquakes as safety risks [51]. Public trust in both NAM and the process of gas extraction as an acceptable form of energy production began to decrease [52]. Despite this increased pressure, NAM and other institutional actors maintained that the increase in earthquakes possessed no new safety risks [50]. During this period NAM preferred to maintain its previous extraction rates, and only gradually adapted to lower annual volumes, according to the government's safety-driven strategy [53]. In addition NAM started to engage more in public relations with affected residents to restore trust and legitimacy, as well as announcing a fund for improving building safety and damage restoration [50].

In 2016, the Dutch government decided to limit gas extraction from the Groningen field to 24 billion m^3 per year for the next five years, with extra gas only to be produced in exceptionally cold winters. However, after another earthquake in 2019 at Westerwijtwerd – measuring 3.4 on the Richter Scale – the decision was taken to further limit Groningen gas extraction. On 10th September 2019, the minister responsible set a ceiling at 11.8 billion m^3 for 2020

/21 and announced that gas extraction from Groningen will, in principle, come to an end in 2022.

After the Groningen field closes, NAM will maintain its conventional oil and gas extraction while gas demand in the Netherlands remains high. This is to be achieved through the development and production of small fields, both onshore and offshore. The Dutch government has granted NAM an exploration permit for an area of almost 1,100 km^2 in the North Sea to investigate the possibility of gas extraction from small fields [54]. However, the government has also stated that the termination of gas extraction in Groningen will not lead to higher production from the small fields, and that while extraction from the small fields is still necessary, it will also be phased out over the coming years.

4.2 NAM's strategic response (2015-2019)

4.2.1 Initial phase and building the Energy Transitions Team

In 2015 NAM was active in a number of societal and industry responses to the earthquakes in Groningen. During these engagements, there was an increasing focus from external stakeholders on climate change and the role of NAM. The Paris Climate Accords had just been signed, and as one interviewee from the gas sector recalls, the discourse was moving from getting the Netherlands off Groningen gas, to getting the Netherlands off gas altogether:

"There came a moment in the Netherlands where everyone said we had to get rid of the natural gas. And originally it was meant that we have to get rid of the Groningen gas … in Holland that was framed [by environmental groups] that we have to get rid of natural gas as such." (Gas infrastructure company interviewee)

At the time NAM did not have a position or strategy regarding the energy transition. It was largely viewed within the company as a dissociated event that was happening outside of the core business. However, senior management at NAM decided that it needed to have a more structured response, and started to formulate initial answers to these emerging questions about the future of the company in the Dutch energy transition.

The first step NAM took was a strategy exercise, examining the risks as well as the opportunities for such an organisation in the energy transition. This was an externally-orientated exercise, with discussions held with different parties that NAM was involved with through existing networks and collaborations. The main aim of this was to establish what the current landscape was, as well as a vision of where the Netherlands was heading. At the same time, Shell Netherlands, NAM's parent company, was also considering this issue, although

from a downstream perspective. NAM latched onto this and in so doing became the upstream component of the wider Shell Netherlands energy transition discussion.

After this initial strategic exercise, NAM held meetings with its shareholders to discuss the development of an energy transitions team as part of the company's emerging strategy. It became clear that NAM's shareholders were not in agreement over whether the company should engage with low-carbon technologies or remain focused on oil and gas. After discussions it was agreed that NAM could pursue such technologies, as long as the opportunities had either a clear synergy with the core business, or they built on the existing skills and capabilities. As one interviewee involved in the process outlined, the remit given was to develop a strategy for the energy transition, prioritising synergies with existing capabilities and geographic locations where NAM was already active.

> *"So what was agreed was that we were going to look for opportunities that would have a clear synergy or build on the skills and capabilities in the NAM organisation – the assets, type of assets that we are used to running and the locations where we are active. So if we were to come with a proposal to build a battery factory in the south of the Netherlands that would be a totally different line of business and a totally different location and would not fit in the NAM portfolio. So it should be a logical extension to the stuff we already do … that was the remit we got from our shareholders to develop a strategy." (NAM)*

By then it had become clear to NAM that, as the biggest primary energy producer in the Netherlands, they would be required to have an active role in the energy transition – it could no longer be considered a dissociated event. Although this became obvious, at first this was seen as a big change for the company. It was also clear at the time that the wider oil and gas industry in the Netherlands was beginning to lose political support; this was experienced first-hand by a representative of the Dutch oil and gas industry association, NOGEPA:

> *"I think that [until 2015], gas production in the Netherlands wasn't a problem at all. It was a very stable policy. One of the benefits in the Netherlands compared to the UK was a stable policy, very predictive. Due to the big earthquakes, after that the whole permitting process collapsed, the whole political climate went down, there was a lot of resistance towards any form of production. The permitting organisation didn't dare to stamp the new permits, for example. The predictability of the process was decreasing in a very hard way, very fast – longer permitting processes, more resistance." (NOGEPA interviewee)*

This societal and political pressure prompted a response from the industry. An early example of this was when NOGEPA began shifting their focus from technical and health and safety issues towards long-term transition questions. Using advocacy and lobbying, the organisation began to seek the creation of joint strategies and visions on the role of oil and gas operators in the Dutch energy transition.

"We are transforming from a more technical organisation with standards and best practices to a more advocacy-orientated organisation, because the [societal] licence to operate in the Netherlands is quite at stake due to the Groningen issue." (NOGEPA interviewee)

In addition, it was not just the operators that found themselves under greater pressure. The wider oil and gas industry and supply chain had experienced a sudden loss of political support, as outlined by a representative of the offshore energy industry association.

"all of a sudden we were disconnected with government and the support we used to receive, for instance with trade missions with ministers, as they didn't want difficult questions from members of parliament, who say 'well you are supporting the fossil fuels industry and we were supposed to stop with that'. That is the extreme result of what happened in Groningen". (Dutch energy supply chain association interviewee)

However, despite the shock and disruption to the oil and gas industry, only a few operators responded by engaging in low-carbon technologies. An oil and gas industry representative we interviewed outlined that instead of driving diversification, operators instead focused on either improving the efficiency of their Dutch operations, or shifting their focus to countries with more stable and attractive markets.

"... it was more a driver to invest in other countries. There aren't a lot of organisations, members of our industry, on the way of creating new business opportunities in renewables ... they stay at their core business and look at what way they can lower the emissions, at the same time increase the business case ... NAM is one of the few organisations that is investing in renewables.

...with a few exceptions this did not lead to operators diversifying. Instead many of the oil and gas operators increased their investment overseas or focused on reducing emissions in the core business, improving the business case and licence to operate." (NOGEPA interviewee)

4.2.2 Identification of key themes

After further internal and external consultations, three key themes emerged. The first was improving the energy efficiency of their operations. This was not a new strategy in itself, NAM had already been committed to this for over 20 years – since 1998 – through multi-year industry agreements. NAM had an existing programme running until 2020, organised in tranches of five years in which it reported to the government on their selection of low emissions and energy-efficient technologies.

The second theme to emerge was the electrification of production facilities, a process that had already begun within the organisation. NAM had moved away from local power generation via diesel generators at many of its locations. This was driven primarily by more stringent regulations regarding emissions from the industry.

> *"We are under pressure of more stringent NOx emission regulations and pressures of increasing CO_2 cost etc, [so] we have decided to change the production system from gas to electricity driven system. That will make a massive dent in the CO_2 emissions of our facilities there." (NAM interviewee)*

The third theme identified was geothermal energy projects. NAM worked on the business case for geothermal and presented it to shareholders. Although Exxon did not see a lot of value in it as a NAM activity, for Shell it fitted within the broader concept of their energy transition operations in the Netherlands. The business case was favourable for Shell for a number of reasons: first, geothermal in the Netherlands is a new industry, so it had growth potential. Secondly, the financial risk profile was favourable, with a low initial investment and the possibility to incrementally size up. Having such relatively small financial exposure fitted with the shareholders' remit. As a result, the decision was taken to pursue geothermal. However, NAM was also very conscious of accusations of 'greenwashing'. These concerns were one of the principal reasons behind the establishment of a separate geothermal company. At this time other oil and gas companies in the Netherlands also established geothermal businesses, setup as 'dual plays', in which a company drills a well and, if natural gas is found, gas is produced, but if hot water is found instead of gas, then the well is used for geothermal. NAM discussed this with its shareholders but eventually decided against it.

> *"We tested that … and thought this is not going to work … the risk [is] that you are going to be accused of … just using geothermal … as an excuse to drill … that is why we said we will do it as a separate entity." (NAM interviewee)*

By 2016 NAM had begun working on key themes for the energy transition and began to build an Energy Transitions Team (ETT) to work on developing topics. The motivation for this, as an interviewee outlined, was a recognition of the need for a different organisational and innovation culture for meeting the challenges of the energy transition.

> *"We [were] already thinking about the whole culture in the company, so we said 'ok, this is going to be a different game'. We need to be a lot more entrepreneurial, and were going to be dealing with parties we have never been dealing with before, business models that we are not used to. Profit margins may be different, but also risks are very different. So we said we need to instil this entrepreneurship in the organisation." (NAM interviewee)*

When establishing the ETT, NAM considered whether to build a new team that runs all the new projects itself, or try to embed this new innovation agenda in the normal workings of the company. In the end, it was decided that NAM's existing capabilities would be of use beyond oil and gas exploration and production. As such, the NAM ETT comprised around 10-12 full-time employees, with another 100 working part-time across the organisation. The envisioned role of the ETT within NAM was highlighted by our interviewee:

> *"ETT should be perhaps the catalyst towards this new future, but it shouldn't be doing it all by itself. We put a lot of effort into drawing the wider organisation into our activities." (NAM interviewee)*

Within the team, the personnel were selected based more on their entrepreneurial mindset than on their technical capabilities:

> *"The capabilities are important, but if we need to choose between people we would much rather have someone that is in their earlier career and has run their own business, than someone that simply followed a standard Shell career. So we were very consciously … going into uncharted territory." (NAM interviewee)*

This emphasis on a broader set of capabilities was due to concerns about an overly institutionalised approach to projects in the oil and gas business.

4.2.3 Engaging with renewable technology niches

Following the identification of the key themes, the next stage was to initiate and invest in projects. With no previous experience in low-carbon innovation, it was agreed that NAM needed to learn-by-doing. The initial focus was on small projects that required relatively low

investment and risk. For example, NAM approached a number of companies to develop solar panels, both at a location in Groningen, as well as on the roof of their HQ offices in Assen. A cooperation with a large energy company on solar PV emerged from this; the basis of the agreement was that if NAM could create a blueprint in one location, this could be replicated across potentially hundreds of locations around the Netherlands, creating economies-of-scale. As an interviewee described, the project proved to be a significant and valuable learning experience for NAM, with low levels of financial exposure:

"The agreement was that we would work with ... on an in-kind basis. So they would have some time of their people and expertise. We would put in time from our people. We would run 'open book' economics because one of the things we want to learn and better understand how this business runs." (NAM interviewee)

"The outcome of that was almost every stone we picked up had a surprise under it, so it was a huge learning curve with relatively small investments, other than time from some people in the building." (NAM interviewee)

After the exercise it was decided that NAM should not itself become a solar project developer, rather, if it has a power connection on a suitable location, the company's role should be in facilitating that and contracting with a third party. Discussions then began on the future of a soon-to-be decommissioned gas plant in Emmen. This was a far larger area, covering 35 hectares and importantly, as our interviewee outlined, NAM owned the land:

"One of the things we came into which was a huge hassle was most of the locations we actually lease the land ... so we have to make additional agreements with landowners – the lease contracts we have aren't fit for [re-use]. That was one of the many things on the list we learnt, so actually this is pretty tough." (NAM interviewee)

Following decommissioning, NAM was faced with two possible options: either sell the land or lease it to developers of a hydrogen plant. NAM's shareholders held very different views. For one of them, the hydrogen proposal was seen as too risky: if something did not go to plan, it would reflect badly on them. As a result, they wanted to make a clean break and sell the land, cleared of future liabilities, as is often the case regarding oil and gas wells:

"Now, there [are] different views with different shareholders. It was agreed that if a new business develops we will make as clean a break between the two businesses." (NAM interviewee)

Shortly after, NAM approached a group in Shell called 'Future Energy Lions' (FEL). FEL was a group of 40-60 Shell staff from all departments of the company interested in energy transition and new technologies, and working on a voluntary basis in their own time. The FEL team focused on developing a range of new energy technologies, including wave energy, kites and algae production. NAM invited FEL to pitch their ideas, in similar fashion to a 'Dragon's Den' – the notion being that if the idea seemed like a good proposal, and it fitted within the NAM strategy, then NAM would adopt that idea and put resources behind it. The aim was to access the FEL's entrepreneurial skills and create some momentum in the organisation.

However, despite several new technologies and ideas emerging from the interaction, the innovation process was still based on oil and gas innovation thinking. The ideas were seen as too technological and engineering-focused, and lacking in the commercial focus that NAM was looking for. Secondly, it became very clear that the FEL were quite reluctant to engage beyond the Shell organisation.

> *"[There was an] obstacle about going external … we really had to push people." (NAM interviewee)*

Also, as almost all of the energy projects the ETT was developing relied on subsidies to make them commercially viable, it became clear that there was a lack of knowledge of the policy landscape and process within the organisation.

> *"To make a project like this fly we actually needed to start looking at subsidies, we've never done subsidies in the gas production business… [it's a] commercial capability we have never needed in this building." (NAM interviewee)*

> *"In terms of capabilities and how you build a constructive proposition with external stakeholders, that's a capability area we recognise we should get better at … by recruiting the right people or training people." (NAM interviewee)*

Over time, NAM's portfolio of projects and technologies expanded through several ambitious targets for investing in low carbon projects in the Netherlands. By the end of 2019, NAM was engaged in developing around 80 potential projects linked to a wide range of low carbon technologies. The majority of these were on the reuse and repurposing of assets and infrastructure, but the portfolio also included solar and green gas, with CCS and hydrogen identified as key strategic technologies.

NAM's existing capabilities were relevant to many of these types of projects – capabilities which include expert knowledge of the Dutch subsurface, existing partnerships, strategically located infrastructure, the largest underground storage site in the Netherlands, the proven ability to carry out complex energy projects and an established safety culture.

In relation to CCS, NAM developed an ambition to be a 'fast follower', utilising its extensive offshore storage capacity to secure a substantial share of the Dutch market. This would also help to facilitate important long-term abatement options for Shell downstream. By re-using existing infrastructure such as pipelines, platforms and wells, the idea was that this could create a competitive advantage in the provision of CO_2 transportation and storage services. For hydrogen, NAM also set the ambition of being a significant actor in the Dutch market, through utilising existing upstream capabilities and developing pilot projects in both green and blue hydrogen. This offered potential synergies with Shell, as NAM's upstream business could help provide an 'end-to-end value opportunity', with further potential upsides around storage, trading, Shell capture technology and hedging stranded gas volumes.

Another driver for NAM to engage with low-carbon innovation has been to improve its existing oil and gas business. Through integrating low-carbon technologies such as hydrogen, CCS, geothermal and electrification with existing oil and gas businesses, NAM aimed to reduce costs and increase gas production. For example, through the electrification of oil and gas platforms with renewable technologies, NAM could reduce its own gas consumption in a way that outweighs the costs of electrification. This prolonging of the economic lifetime of fossil fuel reserves may, however, lead to a higher volume of hydrocarbons recovered – increasing total production revenues. Finally, the reduction of CO_2 emissions through electrification would reduce the need to purchase CO_2 certificates – further reducing the OPEX of oil and gas platforms.

5 Case analysis and discussion

During the period of study covered here (2015 to 2019), NAM was faced with a major strategic choice: whether to accept the decline in revenue through the closure of Groningen, or to seek to replace lost revenue by developing low-carbon projects. NAM committed to its shareholders that it would aim to maintain revenue levels through investment in low-carbon technologies. In addition to establishing its own projects, NAM also supported niche start-ups engaged in low-carbon technologies. Within NAM itself, there is no innovation or R&D

department, and as a result it outsources specific innovation requirements, either through the wider Shell organisation, external partners or start-up companies. NAM aims to be a prominent sponsor of and investor in start-ups working on sustainable energy, and promising projects relating to the energy transition. Experimenting, testing and learning in small-scale projects have emerged as key to the company's emerging strategy.

Figure 1 summarises and formalises our key findings about the nature of NAM's strategic response – its main features and limitations – and the key factors which influenced it.

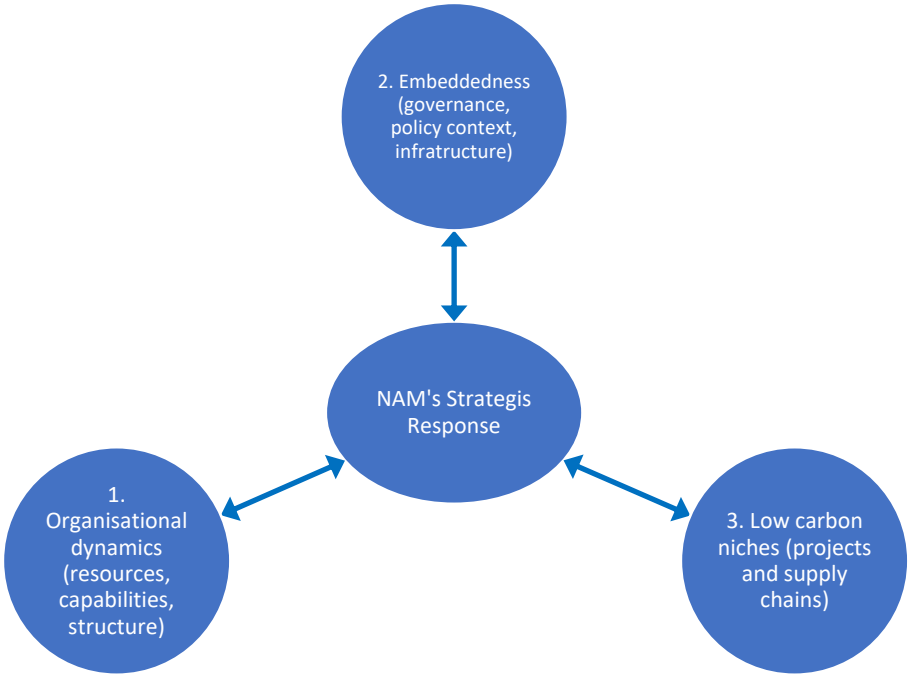

Fig. 1. Overview of NAM's strategic response

Each of these three drivers of incumbent responses to transition challenges has been discussed elsewhere in the literature (see also Section 2):

1. *Organisational dynamics*: The ability of firms to develop internal organisational responses to regime shifts has been identified as an important theme in research on incumbents and transitions [11]
2. *Embeddedness:* As has been proposed by Geels in his 'Triple Embeddedness Framework', incumbent industries are embedded within the economic and socio-political environments, as well as the industrial regime in which they operate [3].
3. *Low carbon niches*: The role of incumbent firms in the development of low carbon niches is a key theme in sustainable transitions research. Incumbents can adopt

different strategies in relation to niches [5]. In addition, the motivation for incumbent actors to engage in niches can also vary from intentions to become leaders and facilitate market creation, gain experience and learning, or improve corporate image [55].

Analysing NAM's strategic response across these three dimensions, we found that the establishment of an energy transition strategy (*organisational dynamics*) enabled the company to identify and pursue new technologies, and a trial-and-error learning process. This not only allowed the company to better identify how its resources and capabilities could be redeployed, but also triggered new search processes in other markets.

The initial strategy of NAM to engage in innovation (*low carbon niches*) can be seen as driven primarily by strategic rather than financial goals, allowing it to identify and gain knowledge of new markets outside its core business [56]. However, this process of innovation and experimentation is bounded. The boundaries here originate from a shareholder preference to engage in technology projects with clear synergies with the oil and gas business, based on existing resources and capabilities, and in certain favoured geographical locations (*embeddedness*).

Whether or not an energy transition project fits within the strategic boundaries set by the company is the primary consideration here, with the more detailed business case and technical potential explored after. In addition, the technology has to have the potential to be scaled up, whilst providing a certain revenue or cost reduction. The requirement for returns of a certain scale rules out investment in projects seen as incapable of matching the revenue lost through a decline in the oil and gas business. These factors also helped determine what role NAM play in the projects: whether it is the owner, financier or facilitator.

This bounded engagement creates path dependencies in relation to the scope of reuse and repurposing of existing infrastructure and investment strategies in low-carbon niches. However, the boundaries are not fixed: in NAM's case, the initial boundaries were extended over time, as the firm gained new knowledge and experience of the different institutional and market conditions involved, using existing assets and partnerships, and only committing low levels of financial and human resources. Although it acted as a boundary-setting mechanism, the need to secure shareholder agreement provided a clear mandate, and enabled the firm to adapt to changing conditions and identify new markets. Entry into new and incomplete

markets meant that there were disagreements regarding selection criteria, including risk and investment profiles [57].

Differences regarding the business strategy of NAM between its shareholders are not a new occurrence [58], and in some cases shareholder agreement was reached through compromise. However, in other cases shareholder visions over future business cases and risk profiles were so divergent that they created a need for separate business units. These outcomes had a significant impact on the role of the firm in the energy transition, including on whether it should retain and reuse its assets and infrastructure – or sell them.

This highlights the important conditioning role that shareholders play in the strategic decision-making of established firms when diversifying into new markets. Further attention to the role of shareholders in the internal dynamics of strategy formation should further improve the understanding of how incumbent firms engage with such societal challenges [3].

In sum, based on our observations, an integrated approach which draws insights from across the three literatures on incumbents in transitions – spanning organisational, embeddedness and low carbon niches – is required to explain fully the nature of the incumbent's response and, in our case, the boundaries and limitations which have constrained it.

6 Conclusions

In line with recent developments in the sustainability transitions literature, the paper set out to develop a more in-depth understanding of incumbent firms in the energy transition [6]. The aim was to fill a gap in the literature – specifically a deficit of research into the internal dynamics of how an oil and gas company establishes and develops a strategy for low-carbon engagement. To achieve this, the paper examined the internal responses and decision-making of an incumbent oil and gas firm engaged in low-carbon niches, through interviews with the incumbent firm and other institutional actors. Through this explorative approach of firm behaviour, our aim was to contribute new insights into existing sustainable transitions and incumbency theory.

The findings shed light on the internal dynamics and reorganisation strategies involved when an incumbent faces a disruption to its core business [5,26]. In particular, the study highlights the role of embeddedness and organisational dynamics in formulating the strategic response

to disruption, and identifies factors contributing to the bounded engagement of an incumbent, and how such boundaries evolve over time.

This includes the initial stages of constructing shareholder alignment and vision creation, through to the development and establishment of a small dedicated transition unit within the organisation, with a portfolio of multiple, diverse low-carbon projects. The study identified path dependencies in relation to how the established approach to innovation within the oil and gas industry shapes strategic responses to energy transition pressures, and how it engages with niche-level actors – thus contributing to insights on 'regime to niche' interactions in the sustainability transitions literature [59]. Finally, the research shows how a fossil fuel company can adopt new and varied roles within different low-carbon niches, and identifies a set of conditions that shape these roles [60–62]. However, the findings also highlight the boundaries of and barriers to such engagement, with implications for the role and position of incumbent energy firms in low-carbon systems, and the wider energy transition.

By addressing how such embeddedness and organisational dynamics can help or hinder diversification efforts, further research may be better able to understand and critically analyse firm strategies to meet future emission reduction targets. This includes not only which strategies incumbents deploy, but also how such behaviour and strategic responses change and evolve over time [7,63,64]. Theoretically, future research could include a deeper understanding and conceptualisation of organisational dynamics in the role of firm strategic behaviour.

While this case study has revealed in-depth insights on firm behaviour, the conditions regarding ownership structure and national contexts may lack generalisability. This issue points to a limitation of single-firm studies of incumbents in transition. To address this, future research may benefit from comparative, multi-case studies of the organisational characteristics and ownership structures of incumbent firms. By expanding the scope to firms in other national contexts and institutional environments, issues over the current lack of comparability may be overcome. Finally, while in our case the managed decline of the incumbent's core business reflected specific factors – geophysical shocks and a resulting government prohibition – the findings may also contribute to growing attention on responses of energy incumbents to phase-out policies.

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