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When controversies cascade: Analysing the dynamics of public engagement and conflict in the Netherlands and Switzerland through "controversy spillover"

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ABSTRACT

Energy controversies have been widely studied. Such studies are, however, generally based on either single case studies, providing rich and in-depth understanding of (local) dynamics of planning and implementation processes, or they focus on understanding responses to a specific technology (not bound to a location). Therefore these studies tend to overlook a key dynamic in controversy, namely that publics respond to projects by drawing on earlier experiences with a similar technology elsewhere, or with earlier experiences with other technologies in their vicinity. We refer to this dynamic as *controversy spillover*. The notion of controversy spillover helps to understand how the discursive space of controversy changes over time. In case studies, other controversies are usually considered as *context*, i.e. as an external condition. However, in order to understand the temporal dynamics of public engagement with energy projects, spillover from other controversies deserves to be investigated more as an object of interest, rather than as an external condition. The aim of this paper is to conceptualize controversy spillover as an important dynamic in controversies and to develop a research agenda. We identify three different types of spillover: 1) geographical (i.e. between the same energy technology in different locations), 2) historical (i.e. with respect to earlier experiences at the same location), 3) technology (i.e. between different technologies). Three empirical examples serve to illustrate the three types of spillover. We finalize the paper with a research agenda for further conceptualization and empirical analysis of the notion of controversy spillover.

1. Introduction

With increasing policy efforts to implement climate change mitigation measures, the number and scale of renewable energy projects is growing. Quite often these projects are confronted with local, or more widespread, public resistance. The focus of this paper is on such instances of *controversy*, i.e. social conflicts arising from the realization of a specific energy project at a specific location (e.g. a wind farm, a geothermal doublet, an electrical substation), where local communities organize advocacy and opposition. Such social conflict may be rooted in a variety of conflicting interests, expectations, or values [1,2]. Controversies are dynamic social processes: new action groups that put new issues or concerns on the agenda may emerge over time, support may be mobilized from (environmental) NGOs and often also from local governments or influential individuals. However, controversy about a local energy project typically also involves wider policy issues regarding the long term regional, national or global energy transition, as well as issues pertaining to local democracy, social cohesion, trust in institutions and so on. Thus, generally, it is not just a *local* conflict, nor just an *energy* conflict [3].

Policymakers, project initiators and society at large struggle to understand how public protest to energy projects comes about, and how these projects can be developed in such a way that the energy transition can be realized. After all, many energy projects have been stalled, delayed or cancelled due to protest or lack of support [4–6]. Many scholars have been studying public responses to energy technologies and (local) energy projects in disciplinary fields like environmental psychology and risk perception (e.g. [7–9]), as well as in policy and planning (e.g. [1,10,11], see [11] for an overview). From an instrumental perspective, it is very understandable that the main interest of policymakers concerns the question how to successfully realize these projects and meet their commitments. Yet, more recent literature is also pointing to democratic implications of the energy transition, showing that a purely instrumental perspective raises ethical concerns, including concerns associated with energy justice [12–16].

The energy transition has been typically studied as a complex sociotechnical process [17,18], where the normative end goal is to realize a successful transition to a sustainable energy system. However, the

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pace of this transition as well as the means to achieve it are subject to severe contention and power struggles [19,20]. Public engagement in the energy transition is generally considered a necessity, either to raise support, or to improve energy democracy. In addition to descriptive studies of public engagement, there is a rich body of literature on the development, application and evaluation of methods for public participation to be used by governmental bodies, companies, or research groups. This literature, however, seems to ignore the fact that there is a great variety in the forms of public engagement with energy transitions, beyond invited participation. So far, 'self-organised participation' such as protests and social conflict have received little attention in this literature [3,21–23].

Starting from the notion that controversy itself can be viewed as a form of participation and as a participatory assessment of a new energy technology or proposed project [3,13,95], we would like to contribute to a better understanding of the dynamics through which such assessments evolve. A better understanding is much needed to support effective and legitimate energy system transformation. The premise at the heart of our conceptual thinking is the acknowledgement that public engagement is a complex and dynamic process, that goes beyond "particular, pre-given and discrete [public engagement events]" ([24], p. 200), involving interrelated forms and instances of public engagement. In the many studies that analyse the dynamics of public engagement, the system boundaries are typically drawn around a single case (often a specific local energy project) or one type of technology, thereby excluding these wider systemic interactions ([24], also see the overview in [11]).

When reviewing several cases of controversies about the planning of local energy projects studied by the authors [19,25,96–98], we observed that in all cases the dynamics of the controversy were shaped to a large extent by what happened in *other* controversial energy projects. In the Netherlands, for instance, public resistance to all kinds of underground activities has become strongly influenced by the fierce protests against exploration for (unconventional) shale gas, and earthquakes due to (conventional) natural gas production in the northern part of the country. In this paper, we conceptualize this dynamic in controversies as *controversy spillover*. We argue that controversy spillover occurs when actors change the discursive space of a controversy by explicitly referring to experiences with a similar technology elsewhere, or with earlier experiences with other projects at the same location, thereby influencing the dynamics of the controversy. A controversy spillover could also take place when the discursive space around a controversy about a local energy project changes as a result of actors referring to issues or information from other controversial projects, applying the same or other energy technologies. Spillover focuses attention to how the discursive space of controversy changes over time.

The objective of our paper is to spell out the notion of controversy spillover such that it can help us to understand public engagement dynamics. Such understanding is needed to support effective and legitimate public engagement in light of the energy transition. To this end, in Section 2 we will first elaborate on the concept of controversy spillover. In Section 3, we will present three empirical examples (i.e. shale gas controversy in the Netherlands, Swiss controversy on deep geothermal energy and a wind energy case in the province of Groningen in the Netherlands), each to illustrate a specific type of controversy spillover. For these cases, we draw on our earlier analysis [19,95–99]. In Section 4, we use these empirical examples to further discuss the concept of controversy spillover. Section 5 presents our conclusion and four lines of research to further understand and analyse controversy spillover dynamics in light of the energy policy and planning.

2. Conceptualizing spillovers between energy controversies

The observation that publics in energy controversies draw on other experiences (in this case, other controversies) has been made before, but these other experiences are often considered as *context* (e.g. [1]), i.e. as external and independent of the data [26]. We argue that it is worthwhile to turn controversy spillover into an object of interest in the study on public engagement. We will elaborate on the problematic nature of context in Section 2.2, after we have discussed other usages of the term spillover in Section 2.1. In Section 2.3 we conceptualize controversy spillover as agendasetting and in 2.4 we will describe the three ideal types of controversy spillovers in energy controversies.

2.1. Usage of the term 'spillover' in other fields

We use the notion of *controversy spillover* to analyse how a controversy gets influenced by another controversy elsewhere in time or place. Spillover is a generic term that is used in many different domains to denote how one instance or situation influences a previously, or seemingly, unconnected other instance or situation. It has been originally introduced in the field of economics to describe the positive or negative external effects of economic activity on other apparently unconnected activities [27]. The term 'knowledge spillover' is a particular form of that, in which the output of Research & Development activities by innovators is quickly taken over and profitably used by other economic actors [28]. It has also been used in fields such as marketing and sociology, for instance to describe how a scandal or unethical behaviour by one firm can affect the image of a whole product category and even other brands [29], how political scandals can influence the attitude towards other political figures and institutions [30], how racial conflicts can influence social policies [31], and how the reputational crisis of one organization can spill over into other organizations [32]. Akin et al. [33] suggest that, in respect of citizen attitudes spillover, we might see spillover effects in the attitudes towards labelling of nanotechnology products which are influenced by attitudes towards genetically modified organisms. Also, in the social movement literature the concept has been used to describe how one social movement influences the other, for instance in terms of organisational structure and framing [34]. In environmental psychology, it has been used to analyse behavioural spillover between different domains or settings. Littleford et al. [35], for example, found no evidence of spillover between energy use behaviour in the office and at home, while Lanzini & Thøgersen [36] found a spillover from "green" purchasing to other (mostly low-cost) pro-environmental behaviours.

Although it does not literally refer to spillover, the "social amplification of risk" theory by Kasperson & Kasperson [37] describes a similar phenomenon. Labelled as a 'ripple effect', this theory describes how risk events can be 'amplified' by introduction of "substantial temporal and geographical extension of impact" ([38], p. 184).

2.2. Why 'context' is a problematic concept

The notion of context is widely used in social science research on energy infrastructure [39,40]. Although reference to context is less explicit in practice, it is quite common that certain features of a social or physical environment are presented as relevant for the siting of energy infrastructure [41–45]. Context accounts for spatial and temporal variation in the reactions to and acceptance of technologies by local publics.

While some disciplines like linguistics have a relatively well-defined understanding of 'context', the notion is ill-defined in many social science disciplines and most often consists of a collection of attributes that are specific to a situation: socio-economic, historical, cultural, institutional, physical, legal, and political aspects are often seen as contextual attributes. These attributes are then treated as independent external variables co-explaining the observed phenomenon [46]. Discussions in the fields of science and technology studies and sociolinguistics point to the problems of such a definition of context [26,47–49]. If one takes context as a set of external variables to the object of study, then "context, is precisely the sum of factors that make no difference to the data" ([26], p.144). A further issue linked to such an understanding is

who or what determines what belongs to the context and what not. That is, what should be considered as relevant to understand the object of study [46,48]? What one actor considers as relevant context, might be considered as irrelevant by another.

As underlined by Latour [26], actors involved in socio-technical controversies are always referring to elements which might seem external to the given situation to explain what happens: national laws, global market prices or manufacturing standards in another country. By doing so however, they are somehow redefining the boundaries of the controversy by bringing in contextual elements. In such an understanding, context does not exist independently of and external to the actors referring to it, and thus it cannot be defined by a set of objective variables [48]. Van Dijk [47] argues that context should not be defined as a situation that influences (or is influenced by) the phenomenon it relates to. Rather, context is the way participants define what influences (and is influenced by) the situation they are engaged with: "Contexts are thus not some kind of objective condition or direct cause, but rather (inter)subjective constructs designed and ongoingly updated in interaction by participants as members of groups and communities" ([48], p.XX). Latour and Van Leeuwen, for example, suggest to simply abandon any reference to context [26,49]. We propose to use the term 'controversy spillover' to describe the processes through which contextual elements, more specifically other controversies in time or place, become part of the discursive space of controversies. Firstly, as compared to context, spillover focuses attention to the *relation* between controversies as object of interest, rather than to a controversy itself. Secondly, it emphasises the temporal dynamics of controversies as social processes where context is not static, but where that what actors deem relevant as context is changing over time.

2.3. Controversy spillover as agenda-setting

To understand the role of controversy spillovers in energy controversies, we will relate them to the process of agenda-setting. This notion has been introduced in 1960 by E.E. Schattschneider to describe the way in which policies are made in a representative democracy [50], allowing factions to take position with regards to specific policy issues. Although the formalised institutional setting in which policymaking takes place is something different compared to the informal setting in which controversies emerge [51], applying the notion of agenda-setting makes sense, as it organises the process of negotiating conflicting views on a certain policy.

It is important to emphasise that policy agendas do not only convey the list of issues that are part of the discourse around a specific energy project (cf. [52]); they also articulate the way in which these issues are *framed* [53]. As such, policy agendas are decisive for decision-making on energy projects, as they shape the uptake of issues in further decision-making and execution. Controversy spillovers are a specific type of agenda-setting processes, where other controversies elsewhere in time or place become part of the policy agenda through the uptake of new issues derived from these controversies, or the (re)framing of the energy project based on other controversies.

This understanding of controversy spillover elicits important questions about the who and the how in respect of agency. Controversy spillovers, similar to conventional agenda-setting processes, can both involve *deliberate* attempts of reframing issues that are on the policy agenda or that will be added to that agenda, as well as *contingent* processes resulting in the linking of previously separated policy issues or information. With respect to the latter, our account of controversy spillover invokes the classic 'garbage can model' [54], which claims that issues on the political agenda have not been put there on a rational basis, but on the basis of chance. Metaphorically speaking, they are dropped from a 'garbage can' that contains all possible policy issues. This garbage can model has been given its most influential articulation in Kingdon's so-called streams model [55,56], which explains how a solution to a problem within a given political situation can be either the outcome of a series of unintentional events or of the deliberate efforts of a 'policy entrepreneur'.

2.4. Three ideal types of controversy spillover

We identify different kinds of controversy spillover in energy controversies. Based on patterns observed in manifestations of spillovers, we propose the following categorisation. First, controversy spillover may be spatial: a controversy in one place may spill over to another place. We refer to this type of spillover as *geographical spillover*. Second, controversy spillover may concern technologies: a controversy on one technology may spill over to another technology. We label this type of spillover as *technology spillover*. Technology spillover could occur at the same, but also at different locations. Third, controversy spillover may also be temporal: it may arise from earlier controversies about other policy issues within a region. We label this type of spillover as *historical spillover*. We propose these three categories as *ideal types*, in the sense that they are analytical reconstructions that help to disentangle the complexity of empirical reality so to convey a clearer understanding of the observed phenomenon. These categories are not exhaustive and in reality controversies may involve different and intertwined controversy spillovers reflecting particular socio-economic, cultural, physical, and/or political attributes.

To conclude, a controversy spillover implies a *changed policy agenda* of an energy project, either through adding new issues on the agenda, or through reframing. Such a controversy spillover occurs when actors explicitly refer to a controversy around a similar technology elsewhere, to earlier controversies at the same location, or to controversies on other technology, leading to discursive change regarding the specific energy project in question. In the next section, we will present three empirical examples, each of which illustrates one of the three types of controversy spillover.

3. Empirical examples of the three types of controversy spillover

The first example concerns geographical spillover in the Dutch shale gas controversy. The second example is a technology spillover in the Swiss controversy on geothermal energy. The third example is a historical spillover in a Dutch controversy on wind energy. In the presentation of the examples, we follow the conceptualisation of controversy spillover as agenda-setting. After giving a short description of the energy project, we describe the agenda before spillover, the spillover itself, and how it changed the agenda. These examples serve to empirically illustrate the three types of spillover.

3.1. Geographical spillover: The Dutch shale gas debate

3.1.1. The energy project

In 2009, the first plans were made for exploration of shale gas in the Netherlands, when the British oil company Cuadrilla requested exploration permits for two areas in the Netherlands. In 2011, Cuadrilla received a planning permit from the municipality of Boxtel, a small town in the south of the Netherlands, to start shale gas exploration. Later, when Cuadrilla requested the municipal construction permit for its production facilities, the municipality of Boxtel initially treated the request as a business-as-usual request for an industrial activity. It soon became a highly controversial project, however. Spillover from controversies on shale gas in the US and the UK played an important role in the evolution of the Dutch shale gas debate [57].

3.1.2. Initial agenda

Since the 1960s, The Netherlands experienced the benefits of large scale exploitation of natural gas reserves. In the first decade of the new millennium, interest in shale gas in the Netherlands increased, like in other countries all over the world. At that time, expectations were that shale gas was present in substantial volumes in Dutch soil [58,59]. This

was the main reason for EBN (Energie Beheer Nederland; the Dutch state-participant involved in all oil and gas production in the country) and Cuadrilla to invest in the exploration of this resource, as a test for the feasibility and profitability of shale gas production in The Netherlands. Shale gas was seen as a promising energy source that would fit in easily with the existing Dutch natural gas based energy system [60].

3.1.3. Spillover

The controversy started when residents of Boxtel began searching online for information on shale gas. They found Gasland (2010), a documentary on the impact of shale gas exploration and production in the US. Gasland informs about health problems and the death of animals which, according to the documentary, are related to the contamination of the air, water wells and surface water. In the most famous and compelling scene of the documentary, someone shows how his drinking water got contaminated with gas by igniting the water as it streams out of his tap. The threats staged in Gasland were reason for Boxtel residents to express their concern about the intended exploration activities, especially regarding safety and pollution.

In spring 2011, newspapers reported on earthquakes in Blackpool (UK) that were caused by fracking activities in a shale gas project, also operated by Cuadrilla. At a hearing in the Dutch Parliament, most questions referred to the earthquakes in Blackpool and the US. Experts, as well as Cuadrilla, responded to the questions by explaining that the situation in the Netherlands is not comparable to the UK or the US, that strict regulation would apply to mining activities in the proximity of water reservoirs, and that the geological conditions would make it unlikely for gas to contaminate ground water. In the Netherlands the distance between earth layers is over 2000 m, instead of only 100 m in the US. In February 2013, the director of Cuadrilla made similar claims in a national newspaper, stressing the different geological conditions of the location where the exploration would take place. In Blackpool, subsurface fault lines were drilled through, whereas this risk would be small in the Netherlands as fault lines have been mapped extensively [61].

3.1.4. Changed agenda

The initial policy agenda on shale gas exploration was shaped by national policy actors, particularly EBN, who framed shale gas as a promising energy source for the future, well aligned with the Dutch gas-based system. Without any actual exploration activities, the geographical spillover changed the agenda, which was then given shape by a plurality of societal actors and in which shale gas was framed as a risky technology for which a precautionary approach was deemed appropriate. Moreover, it was argued that it would take away resources that should be spent on a transition to renewable energy sources [19]. As a consequence, the policy agenda involved an increasingly wider set of local and national actors and was covering all kinds of new issues (e.g. environmental safety, seismic risks, role of shale gas in energy transition), while reframing shale exploitation from a promising technology to a risky technology with a debatable role in the energy transition. In August 2013, the Minister of Economic Affairs decided to put shale gas exploration on hold. Five years later, government decided that shale gas was 'no longer an option for the Netherlands' [62].

3.2. Technology spillover: The Swiss deep geothermal energy debate

3.2.1. The energy project

Since the mid-2000s, several Swiss local authorities and energy operators have launched deep geothermal energy (DGE) projects. One way to capture geothermal heat involves fracking to create artificial reservoirs at a depth of 3000 m or more, to enable the circulation of water injected in the bedrock. In 2015, in the town of Haute-Sorne in the Canton of Jura in western Switzerland, the construction of a DGE power plant was authorised. Local groups started demonstrating and up until now the controversy has not been settled [98]. The Swiss debate on DGE has been reframed by reference to shale gas technology, and therefore serves as an example of technology spillover.

3.2.2. Initial agenda

In its Energy Strategy 2050, the Federal government supported the development of DGE resources as a means to enhance the generation of renewable electricity [63]. There was (and still is) very little knowledge about the location of hot aquifers in the Swiss deep underground. Hence, producing geothermal electricity on a large scale in Switzerland requires the use of fracking to create an artificial geothermal reservoir independent from the presence of naturally formed hot aquifers [99].

3.2.3. Spillover

A report on the risks and opportunities of fracking from the Federal Expert Commission on Geology [64] triggered debates in the national and local parliaments about whether authorising DGE in Switzerland would open the way to fracking for the exploitation of shale oil and gas. Opponents of the DGE power plant in Haute-Sorne in the Canton Jura argued that DGE is a technology very similar to fracking, and that it will cause repeated induced earthquakes and groundwater pollution, like fracking did in US regions that have experienced a shale-boom [65]. It was also suggested that DGE projects might be a cover-up to develop shale gas exploitation ([66], p. 7).

The technology spillover from shale gas exploitation to DGE also surfaced in the parliamentary arena. The report from the Federal Expert Commission on Geology recommended that federal laws on the underground should not ban the technique [64]. The commission argued that this would support technological innovation for DGE. Furthermore, the commission intended to leave the door open to potential exploitation of oil and gas deposits, which are occasionally encountered in the process of drilling. At federal and cantonal levels, this sparked discussions about a ban on fracking and politicians asked the federal government to take position. The national debate inspired parliamentary debates in those cantons that were in the process of revising their law for the underground. In Zurich, for example, delegates of the Green Party tabled a motion asking the cantonal government to forbid fracking [67]. Although the title of the motion called for "No fracking in the Canton of Zurich", the text stated that this would not apply to DGE, but only to shale gas extraction. The motion was rejected in 2015.

3.2.4. Changed agenda

While in the initial agenda came DGE was framed as a renewable energy source and an important technology for achieving renewable electricity targets, this changed under influence of discursive links to shale gas technology. As in the previous example, a plurality of actors on several levels became involved in the case , who reframed DGE with explicit reference to risks of fracking based on experiences with shale gas production. As of December 2019, the project in Haute-Sorne was set on hold and the local parliament is considering legal possibilities to withdraw the authorisation. As in the same time frame several conventional deep geothermal projects for district heating moved forward successfully, the Federal government changed its policy to prioritise geothermal electricity production and increased financial incentives for geothermal heat production [99].

3.3. Historical spillover: The Dutch peat colonies

3.3.1. The energy project

In 2011 the formal planning procedures for two onshore wind farms in the north-east of the Netherlands ('De Drentse Monden & Oostermoer' (DDMO) and 'N33′) were initiated. Both plans triggered fierce local opposition. Opponents claimed that, in addition to the impact of sound and shadow flicker, the specific local landscape of the peatlands (the so-called peat colonies or '*Veenkoloniën*') would change drastically. The case is an example of historical spillover, because opponents explicitly drew from pre-existing sources of contention in the

region's past.

3.3.2. Initial agenda

Since the beginning of the 21th century, wind energy has become increasingly important in the Dutch energy transition policy. In 2000, the Province of Groningen designated a location next to the provincial main road N33 as one of the potential wind energy locations in their provincial plan. The municipalities Veendam and Menterwolde, where most of the wind turbines were planned, held the position that a wind farm next to the N33 and close to an urbanised area, was undesirable. The Municipality of Veendam had made this part of its official policy since a long time, already declaring a moratorium on the development of wind farms in their vicinity in 2002 [68]. Issues on the agenda were the spatial and environmental impact of wind turbines and targets for wind energy production.

3.3.3. Spillover

The north east of the Netherlands has faced several initiatives for large-scale wind-farms, as to achieve targets set by the national government [69]. In addition to DDMO and N33, in recent years multiple large-scale onshore wind farms have been developed in the northern region, and several more wind projects (aiming at a capacity of more than 100 MW) are in different stages of formal planning procedures [70].This has reignited a pre-existing sentiment amongst local communities that renewable energy production is yet another way for the rest of the country to profit from the region's resources. The northern region of the Netherlands has a long history of extraction of different types of energy and other resources for national and international purposes, which started in the 17th century, when peat was extracted from the peripheral Dutch provinces of Drenthe, Overijssel and Groningen. Generally, rich traders from cities in the central provinces of Holland invested in the exploitation of the Peat Colonies, thus securing the energy supply of wealthy Holland [71]. In later stages, the area became known for its large-scale production of cereals by a relatively limited number of wealthy landowners, 'exploiting' local labour [72]. In the 1950s, Groningen could be characterised as a peripheral area dominated by a labour-intensive agriculture and industry paying low wages. In 1959, a natural gas field was discovered below the province of Groningen, which turned out to be one of the largest gas fields in the world, containing 2800 billion cubic meters of gas and spreading out over 900 square kilometres [73]. The way in which the field was exploited reconfirmed the sentiment of the northern region being used as a colony. In 1972 a people's congress was organized in the city of Groningen with the main slogan being 'Groningen, not a colony!' (in Dutch: '*Groningen géén wingewest!*') [74]. Billions of gas revenues flowed directly to the state budget. In response to numerous and increasingly forceful earthquakes induced by gas extraction (the first one in 1986 in Assen [75]) and the way in which damages caused by these earthquakes were handled, mass public demonstrations and a fierce debate arose post-2012.

The notion of colony, i.e. the idea that this region has repeatedly been exploited by private entrepreneurs or the government for the benefit of other parts of the country, has spilled over into the public debate around the development of wind farms. The project consortia for both the DDMO and the N33 wind farm involved project developers and consortia of local farmers and land owners. On online media and in discussions, the farmers in the consortia, framed as historically wealthy land owners, are accused of yet again unjustly treating the local communities. The Ministry of Economic Affairs and Climate, overseeing the formal procedures for both proposed projects, is perceived as a top-down ruler, also (again) putting national above local interests. Meanwhile, all court cases against the construction of the wind farms have been decided in favour of the project developers.

3.3.4. Changed agenda

The initial agenda was already contentious. On the one hand, wind farms were seen as necessary to achieve renewable energy targets, but on the other, opponents were protesting against the environmental and spatial impact of wind farms. Due to explicit referencing to the region's history as a colony, where resources were extracted for the national benefit but with local burdens, the policy agenda changed. Local actors, opponents to the wind farms, referred to the piling up of multiple controversies around energy production in the regions, thereby adding the issue of justice to the policy agenda.

4. Discussion

The three empirical examples highlight spillover as an important mechanism in the temporal dynamics of controversy and the related policy agenda. The three types of spillover can be used as analytical categories to trace the dynamics of energy controversies. As said, controversies typically involve not just one, but several types of spillover. The Dutch shale gas case was not only characterised by geographical spillovers from shale gas debates elsewhere in the world. We also observe the spillover from controversies on other subsurface technologies, such as onshore carbon capture and storage in the Dutch town of Barendrecht [25] and later the natural gas extraction in Groningen in the north of the Netherlands. So, technology spillover also plays a role in this case. In the Swiss deep geothermal case, in addition to technology spillover, also geographical spillover played a role, as induced seismic risks in the US were discursively used by opponents to associate DGE with shale gas.

The notion of geographical spillover acknowledges that the geography of an energy project is not a given, i.e. its "environment" is not a fixed nor clearly demarcated space [76]. It highlights that the spatial extension of what might be taken into account during a controversy is not limited to the immediate surroundings directly impacted by a project, or even to the boundaries of the local administration that makes decisions about the project. Instead, the notion of geographical spillover points to the possibility of actors shaping the discursive space of a controvery by linking up with remote locations, such as the province of Northern Brabant in the Netherlands, or even the UK and the US.

The notion of technology spillover highlights a common pattern in controversies about emerging technologies, in which actors engaged in the controversy make more or less relevant analogies with 'problems' related to other technologies [77]. Such connections between different technologies are often ignored – or even rejected - by energy project developers assessing a project's context. They make formal distinctions between technologies, which on the contrary are seen as similar by other actors. Moreover, in situations of controversy, project developers as well as experts tend to dissociate different technologies to avoid 'contamination' by other controversies, arguing that they constitute a different context. We observed this in the shale gas case, where experts argued that the technologies used in the Netherlands considerably differed from those in the US. Likewise in the Swiss DGE case, the developers insisted that the techniques they are using to create artificial geothermal reservoirs, differ significantly from what is done in the shale gas industry.

Finally, historical spillovers point to the various ways in which actors might relate to a region's past. Here, past controversies experienced by the actors play an important role in their perception and reaction to new energy projects [78]. This past is, however, not limited to recent events or other project-related controversies. It may include a full repertoire of past socio-economic, historical, cultural and political ties, sometimes remote in time, that are mobilised by the actors to make sense of a current situation, as illustrated by the "peat colonies" case.

What is needed is a better and more detailed understanding of the ways in which controversy spillovers emerge and how that affects policymaking regarding a particular project. Yet, all three examples show that controvery spillover affects and is affected by wider policy dynamics. For instance, in the Dutch shale gas case the local

controversy in Boxtel triggered a nation-wide debate which eventually led to a moratorium on shale gas development. In the Swiss case the controversy led to parliamentary debates in those cantons that were revising their law for the underground. However, the examples also show differences with respect to the effect that spillover had on policymaking. In the Dutch shale gas case controversy spillover led to abandoning shale gas, whereas, in Switserland, the spillover from shale gas to geothermal energy did not lead to a ban on fracking at national level. Similarly in the case of the peat colonies, the addition of justice claims to the policy agenda did not result in court rulings against wind energy projects.

Controversy spillover involves both deliberate strategic attempts by actors to shape policy framing as well as unintentional and emergent spillovers. For instance, the historical spillover in the Peat colonies case was strongly shaped by opponents of the proposed wind farms who continuously mobilised the notion of exploitation in the '*wingewest*' frame. In the Swiss case references were available to actors enabling them to interpret the use of fracking technology as something controversial. This link becomes apparent when considering that, in 2006, a DGE pilot project in the city of Basel triggered a relatively significant earthquake, but there was no spillover from the the shale fracking debate at that time. The reason may be that fracking for shale gas had not yet received very wide media attention. This means that it is not only important to understand how controversy spillovers emerge, but also *why* they emerge in some, but not in other situations.

We started this paper by conceptualizing controversy as a complex and dynamic process of participatory assessment of a technology or (proposed) project. The three types of spillover are analytical categories that can be used to structure such complex and dynamic processes. Identifying spillovers in the early stages of decision-making has several practical implications. Firstly, as a dynamic form of assessment, controversy spillover puts emphasis on the necessity of having flexible and adaptive assessment approaches for decision-making, so as to accommodate new or changed issues, values or concerns. This may be at odds with formal assessment in energy planning, where there is typically a strict definition of what issues and values need to be assessed and how. Therefore, it may call for expanding the existing assessment repertoire. Secondly, the three types of spillover can help policymakers and planners to anticipate controversy spillover. For instance, technology spillover may be lurking for all subsurface energy and/or climate mitigation technologies, such as oil and gas production, geothermal energy and heat networks, carbon capture and storage, gas storage in empty gas fields and so on. In this respect, in the Netherlands it can be observed that particularly local authorities have learned from controversies about subsurface technologies. As a kind of institutionalized spillover, we see that municipalities, provinces and water boards, increasingly anticipate controversy by including issues such as earth movements, soil inclination, pollution of drinking water et cetera, in local procedures for spatial planning and construction permits, regardless which subsurface activity a permit involves. Elsewhere, we have referred to this phenomenon as 'backflow' [13]. Anticipating controversies thus requires policy-makers to have substantive awareness and alertness to controversies elsewhere in time and place. To anticipate, policymakers and planners could involve community engagement officers, who are tasked with communication and participation of local communities [79]. In this process they may be the ones who have (already) developed sensitivity for the local and and broader context. Thirdly, the empirical examples have shown that the way policymakers respond to controversy is key in how a spillover unfolds. Both the Dutch shale gas case and the Swiss DGE case for instance show that experts try to avoid 'contamination' by framing and reframing their technology. Saying that a technology is NOT like the one it is associated with by opponents (as in the shale gas case), is typically not a strong act of framing, as it implies stepping into the opponent's frame. Thereby, it basically strengthens the frame used by opponents [80]. Although reframing is typically a more effective strategy than stepping into the other person's frame [80], this was not successful in the DGE case: opponents felt proponents were trying to hide the risky nature of the technology.

5. Conclusion and research agenda on controversy spillovers in energy controversies

We argue that to understand controversy, as a specific form of public engagement in energy policy and planning, a shift is needed from studying single, discrete cases or events of controversy, to studying dynamics of interrelated controversies occurring in different places and times. For this, we propose and conceptualise the notion of controversy spillover as a form of agenda-setting, i.e. the deliberate or unintentional ways in which issues get reframed, or new issues get on the policy agenda. Controversy spillover, as compared to context, firstly focuses attention on the relation between controversies as object of interest rather than to a controversy itself. Secondly, it emphasises the temporal dynamics of controversies as social processes, the context of which is not static. Instead, what actors define as important context changes over time, also in reaction to what project developers and authorities do.

We identify three types of controversy spillover: geographical, technology and historical spillover, which serve as analytical categories for further empirical analysis. We propose four lines of research that support a more detailed understanding of the emergence and impact of controversy spillovers. These lines of research relate to: 1) the empirical and temporal analysis of the emergence and impact of spillover; 2) the *travelling* of issues and information, and the role of conventional and the new social media; 3) *meta*-analysis of the dynamics of controversies and 4) questions about political and democratic repercussions that come with controversy spillovers. We will subsequently discuss these research lines below.

5.1. Analysis of the emergence and impact of spillover

A first line of research concerns the empirical analysis of the conditions under which spillover may occur, what type of spillover emerges and its impact on policymaking. What characteristics of a controversy (technology, actor constellation, political climate, etc.) make it susceptible to spillovers in the first place? How do project initiators respond to controversy spillovers, what strategies (e.g. communication, public/community engagement, etc.) do they use and how effective are these? What types of impact of spillover can be identified (e.g. effectiveness, legitimacy, capacity building, policy learning, etc.) and under what conditions do these impacts occur?

In general, it can be said that controversy spillovers arise in different arenas, where different actors are active in (re)framing the policy issue, and these arenas and actors may all interact in some way or another. Some controversy spillovers are the result of deliberate framing strategies, others happen to be more accidental. Furthermore, our examples also show divergent responses to controversy spillovers. Faced with a 'contamination' by failed or heavily protested projects elsewhere, initiators deploy strategies of 'purification', i.e. attempts to dissociate what they do from the controversial technologies or projects they were associated with [81]. In the Dutch shale gas case, researchers have tried to stress the differences in geological as well as legal conditions between the Dutch situation and the situation in the UK and US. In Switzerland, promoters of DGE insist that the techniques they are using to create artificial geothermal reservoirs are different from what is done in the shale gas industry. They attempt to reframe their hydraulic fracturing technique as "hydraulic stimulation" or "hydraulic shearing", arguing that they operate in naturally faulted geological formations and only widen existing fractures. These strategies might backfire: opponents to the Haute-Sorne DGE project argued that the use of "hydraulic stimulation" by projects managers was an attempt to evade discussions on the consequences of fracking and thus a further indication of the

risky nature of the project.

5.2. Travelling of issues and information and the role of conventional and new forms of media

A second line of research involves the travelling of issues and information as part of controversy spillover dynamics. Information and issues can travel through various policy, advocacy or personal networks. In all three examples, the spillover seems to be largely shaped by the informational resources acquired by actors through different media. Residents of Boxtel were actively looking for information on shale gas on the internet and found the documentary Gasland, which was an important trigger for the protest. National newspapers reporting on local protests on shale gas induced a shift in the debate on shale gas, moving from a local safety risk to a normative discussion about the role of shale gas in the energy transition. Meanwhile, the protests against the proposed wind farms in Groningen were picked up by national media rather late, and not until opponents began to apply unusually aggressive methods of protest. Here the spillover strongly relied on regional media coverage, which also grew when the conflict intensified. Interestingly, the media play a rather paradoxical role in the analysis of controversy spillovers or controversies more general [82]. On the one hand, media coverage can be seen as an approximation of the public debate or a reflection of discourses [82–84]. On the other hand, in today's media landscape the role of the information providers is highly multifarious, with a huge variation in their coverage of audiences, objectives, strategies and business-models. In general, we observe that media analysis has focussed on the representation of technologies, so far [85,86]. However, the media also play a role as a collection of interacting, competing and cooperating journalists and businesses. It is about people with interests and preferences, who create, make or distribute pieces of information, and who, with their writing or sharing, participate in the public debate [87]. Moreover, the particular role of social media has been given only limited attention [88]. In our analysis of the cases discussed in this paper, we observe that journalists and the (social) media are important players who shape the course of the process [89]. Yet, whereas they carry controversies, enable spillover phenomena, and bring in new (groups of) actors [90], they are hardly ever considered as actors themselves in studies on public engagement.

5.3. Meta-analysis of dynamics of public engagement

A third line of research concerns the *meta*-analysis of the dynamics of controversies, especially in relation to dynamics of other forms of public engagement (e.g. invited participation or community energy initiatives). What are typical patterns in the way controversy spillovers emerge and how energy projects are framed and reframed, and what are the outcomes of such processes? How does one type of engagement (e.g. protest) spill over to other types of engagement (e.g. participation in energy production as prosumer)? This also entails investigating the dynamics of interaction between different types of actors on a meta level. Here, we should not only look at communities and stakeholders who are partaking in public engagement and participartion, but also include actors who organise and/or shape public engagement, like governmental actors at different levels (state, province, municipalities), project initiators, consulting firms and the media. For instance, an energy project sometimes becomes contested after project initiators organise some form of participation (e.g. a public meeting). Also, invited participation may trigger citizens to become engaged in energy projects themselves [91]. This allows for studying public engagement and the relation with spillover effects in a more holistic and/or systemic way [92].

This addresses the question as to how, or to what extent, controversy spillovers can be anticipated or 'turned into' other forms of public engagement. Knowing whether there are typical patterns and understanding what these patterns entail, may help to anticipate controversy spillovers. Patterns could be investigated with a *meta*-synthesis of existing literature, especially publications that include detailed descriptions of controversies and their context. Also, approaches such as qualitative comparative analysis and computational social science methods, such as modelling, GIS analysis and simulation, may be useful to explore typical patterns of controversy spillover. For this, large datasets need to be constructed that include data on indicators reflecting the three dimensions relevant to controversy spillover (temporal, spatial and technology).

5.4. Political and democratic repercussions of controversy spillovers

Finally, controversy spillovers give rise to a set of questions pertaining to issues of procedural justice and legitimacy that need to be addressed. Controversy spillovers can be seen as a manifestation of the democratic claim of societal actors for inclusivity and empowerment. With respect to this demand, a controversy could, for instance, give rise to renegotiating the way issues are framed on an initial policy agenda, making decision-makers more responsive to the needs and concerns of those actors who are affected by their decisions. As such, opening up to new issues and framings can be seen as a major democratic requisite (cf. [13,93]), directing our focus more towards the process instead of only the outcomes of policymaking. Existing experimental research suggests that the perceived fairness of decision processes matters more than the outcome [94]. Further research is needed in order to assess in what respect process legitimacy is affected by a changing agenda after the integration of concerns and demands resulting from a controversy spillover. The notion of spillover allows research of democratic policymaking as a dynamic and dialectical process in which proposed policies and projects invoke societal reactions, either or not giving rise to enhanced inclusivity or empowerment. This acknowledgment of democratic dynamics is largely absent in the literature, as the focus typically appears to be on the assessment of singular decision-making processes, such as specific agenda-setting activities or participatory processes. Our account of controversy spillovers underlines that research should not look at such processes as one-off events, but that the relation between policymakers and publics needs to be studied as an ongoing reiterative process.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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