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Post-conventional energy futures: Rendering Europe's shale gas resources governable

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ABSTRACT

Following the shale gas boom in the United States, unconventional natural gas extracted from organic-rich shale rock formations has generated increasing attention in the European Union (EU). This considerable interest has been spurred by a range of optimistic volumetric appraisals of shale gas resource potential trapped beneath the European continent. The paper critically examines rationalities and practices through which states of resource availability and recoverability are made visible, measurable, intelligible, and thus rendered governable, namely open to new fields of possibilities to act upon. By implementing the concept of socio-technical imaginaries as governmentality approach, the analysis is guided by two objectives: first, to identify visions of shale gas potential contained in a range of resource estimates; second, to scrutinize rationalities of government, that is how shale gas resources are made knowable and purposeful, as well as technologies of government that operationalize these rationalities via practices of calculation, visualization, and inscription. The paper illustrates that, these highly speculative and uncertain assessments can forge powerful volumetric imaginaries of shale gas potential that yield specific governing effects concerned with securitization of unconventional hydrocarbons availability. Consequently, these imaginaries prescribe and legitimize techno-political hopes for certain post-conventional energy futures underpinning the fossil fuel abundance narrative.

1. Introduction

Since the 1970s, a growing number of concerned scientists and experts have been signalling that – due to the unprecedented exploitation of natural resources and unsustainable consumption patterns – humanity was increasingly closer to reaching planetary limits that would not be avoided if exponential economic growth continued [1,2]. Some scholars and practitioners have been particularly concerned with presumably unavoidable depletion of exhaustible energy resources, such as low-cost conventional fossil fuels, that the global economy has vitally relied on [3,4]. The fossil fuel scarcity narrative was notably bolstered by assertions raised by M. King Hubbert who accurately predicted that production of crude oil from conventional deposits in the United States (U.S.) would peak around 1970 [5,6]. Marking the near end of the 20th-century, Campbell and Laherrère famously warned that the entire world would soon meet the same fate, facing "the end of the abundant and cheap oil on which all industrial nations depend" [7,p. 83]. The looming end of the age of low-cost, conventional hydrocarbons together with the increasing dependence on supplies from a few, often politically unstable countries, have urged policy-makers to revise essential energy resource flows and counter potential scarcity by resorting to the logic of securitization: namely, framing energy as a matter of "security" and deploying a variety of calculative techniques and regulatory practices – e.g.: estimates, indicators, strategic planning and policy-making – to reduce risks and control uncertainty [8,88].

Simultaneously, however, pessimistic claims of inevitable depletion of vital conventional energy resources have been shrugged off by the camp of scholars and industry analysts who maintained that further economic development and application of novel technologies would allow for substitution of more abundant and cheap fuels for scarcer and more expensive ones. Hence, parallel to scarcity concerns raised by the "limits to growth"- and "peak oil"-alarmists ran the sanguine or "triumphalist", as Bridge [9] calls it, fossil fuel abundance narrative of inexhaustible geological possibilities facilitated by improvements in extraction techniques. Since the 1970s, optimistic analysts asserted that, instead of considering only presently *known* and recoverable deposits, most often expressed in reserve estimates, long-term policy planning necessitates inclusion of the *unknown*, namely uneconomic and undiscovered (or overlooked) resources that would be possible to extract in a technologically advanced future [10]. Such a techno-optimistic approach – based on the supposition of a continuous economic growth – would make it possible to surpass limitations of resource

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availability by broadening potentials of the earth's crust to future discoveries and innovations. This cornucopian narrative was affirmed particularly by energy system analyst Rogner who claimed in his widely cited assessment from 1997 that the potentially dramatic increase in access to fossil fuel resources is possible through the inclusion of *unconventional* hydrocarbons and mobilization of new techniques of extraction [11].

During the last decade, the argument for pushing the boundaries of resource availability outside the limits of conventional fossil fuels has not only returned to the debate on the future of global energy systems but it has also gathered significant momentum. In the United States (U.S.), the recent employment of innovative technologies involving horizontal drilling and hydraulic fracturing (known in short as "fracking") has made it possible to unlock and extract significant volumes of unconventional natural gas preserved within organic-rich, sedimentary shale rock formations. As a result, the combination of these advanced extraction techniques has allowed the U.S. to increase the share of shale in total domestic gas supply from 1% in 2000 to 20% in 2010 [12].

Following the U.S. shale gas "revolution", the potential of unconventional natural gas from shale formations have recently appeared on the geopolitical map of the European Union (EU). Since 2009, a growing number of optimistic but uncertain estimates, assessments and future energy scenarios of possible shale gas resource occurrences, stocks and recovery capacities [13] have triggered a political debate that epitomises some of the fundamental questions regarding the EU's future energy security and sustainable energy transition. On the one hand, shale gas has been perceived as a way to diversify energy supplies and reduce dependence from gas imports [14–16]. On the other hand, referred to as "clean" fossil fuel, unconventional gas production has been perceived as an option to help reduce greenhouse gas emissions and thus contribute to climate mitigation efforts [15,17]. Amid large uncertainties of currently available geological and economic data on shale gas production potential in the European subterranean region, these volumetric assessments and projections have been translated into (supra)national energy security strategies and decisions, consequently fuelling and legitimizing political and technological hopes for certain post-conventional energy futures in the EU and some of its member-states.

In this paper, I use the case of inventorying, anticipating and prescribing the future shale gas potential in the EU to critically analyze devices and practices through which states of resource availability and recoverability are diagnosed, assessed and thus rendered governable, namely strategized and securitized. By applying the concept of *sociotechnical imaginaries* [18–20] as a specific type of *governmentality* analysis [21–24] capable of interrogating the history of future projections, the study is guided by a dual objective. Firstly, I aim at identifying and mapping visions of shale gas potential contained in a range of resource estimates and assessments. Secondly, the objective is to scrutinize rationalities of government, i.e. how shale gas resources become knowable and their existence made purposeful, and technologies of government that operationalize these rationalities through practices of calculation, visualization, mapping and inscription deployed by a multiplicity of agents and institutions to produce evidence for these future claims.

The analysis is based on critical, in-depth reading of expertise concerned with estimates of shale gas resource potential in Europe. The point of analytical entry consists of key reports, assessments and technical papers issued by researchers, public institutions and private agencies (i.e. [11,25–29,72]). Resource estimates that were not publically available (i.e. [30–32]) were appraised through the scholarly work on unconventional gas in Europe (e.g. [33]). Particularly helpful in collecting estimates, as well as discerning definitions and methods of calculation, were reviews of regional and global shale gas resource estimates by McGlade et al. [34], McGlade et al. [13] and UKERC [35]. Additionally, the analysis also draws upon close reading of national geological surveys, national policy documents and energy analyses in selected EU-member countries.

The following study benefits from and contributes to two burgeoning strains of critical social science scholarship within the vast ocean of energy research: one related to the approach of sociotechnical imaginaries scrutinizing (in)ternational energy policy visions and futures [36–38,18–20,39–44]; the other increasingly concerned with interrogating powerful fossil fuel narratives and practices of resource estimates [45,6,5,46–49,51].

The following pages are organized as follows. In Section 2, I outline the analytical concepts of sociotechnical imaginaries and governmentality, by exemplifying how these two approaches are combined and deployed in the paper. In Section 3, I discuss the analytical findings in three subsections: the first examines how unconventional natural gas resources are made visible; the second scrutinizes how the shale gas extraction potential in Europe is made calculable; and the third discusses how powerful shale gas imaginaries are made governable, i.e. securitized and strategized. Finally, the conclusions are presented in Section 4.

2. Sociotechnical imaginaries and governmentality

In recent years, the concept of *sociotechnical imaginaries* – introduced and developed by Jasanoff and Kim [18,19,20] – has proliferated as an analytical approach in critical social science studies scrutinizing (inter) national energy policy visions and futures concerned with, e.g. nuclear power [18–20], bioenergy [37,39,41], smart grids [36,38], offshore wind industry [40], building energy use [42], and national energy transitions [43,44]. This scholarship has drawn attention to the significant role of new energy imaginaries – frequently shaped by energy choices of the past – in the challenge of reconfiguring both the surface and subsurface infrastructures of global energy systems.

The concept of sociotechnical imaginaries serves as an interpretative envelope that lets us consider *power to imagine futures* as a fundamental and productive element of the socio-political life, capable of facilitating and/or influencing techno-scientific trajectories through projections of what is considered desirable and attainable in terms of current and anticipated knowledge [18]. Such powerful visions, then, serve political ends and legitimate specific technological choices or responses to innovation [19,39]. Hence, imaginaries do not only have *descriptive* capabilities of projecting desirable and attainable futures but – as virtue of their performative dimension [52] – they especially possess *prescriptive* powers by envisioning "futures that states believe ought to be attained" [18,p. 120]. Jasanoff and Kim [18] emphasize that – unlike issue specific and goal-oriented policy agendas – sociotechnical imaginaries are inexplicit and unfixed, "as they reside in the reservoir of norms and discourses, metaphors and cultural meanings out of which actors build their policy preferences" (p. 123). Simultaneously, such imaginaries underpin grand societal narratives as they "offer a rationale for a society's long evolutionary course while also committing that society to keep performing the imagined lines in the story" [20,p. 20] Furthermore, these scholars associate their concept with "active exercises of state power" [18,p. 123], affirming the significant role of governments in stabilizing specific visions and mobilizing resources to attain desired techno-scientific trajectories.

However, while useful for identifying and illuminating visions that describe and prescribe desirable futures, the concept coined by Jasanoff and Kim [18–20] gives us few clues as to how such imaginaries come to existence, how they become visible, intelligible and accounted for, and how they are operationalized, transformed into practice and therefore made governable. In this sense, the approach lacks epistemic tools to answer the questions on: what type of prescriptive powers can make the state believe that some futures ought to be attained or how specific visions and expectations become ingrained in social practices and organization.

I argue that the concept of *governmentality*, introduced by Michel