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A situated governmentality approach to energy transitions: technologies of power in German and Indian smart grid strategies

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Abstract. Around the world, smart grids are emerging as a universal tool to address a wide range of social and technical problems facing energy systems. Despite considerable research on these systems, the ways they differ in the local (re)production of power relations have so far been little discussed. This paper fills this gap by developing a "situated governmentality approach" in conversation with the critique of Foucauldian governmentality studies. By applying this approach to smart grid strategies in Germany (Smart Energy Showcases – Digital Agenda for the Energiewende, SINTEG) and India (National Smart Grid Mission, NSGM), we identify different ways in which power is mediated through situated governmentalities. While SINTEG employs technologies of power that promote a disciplinary regime, the exercise of power in the case of the NSGM displays many elements of a digitally enhanced sovereign approach. The findings reveal the range of governmental programmes that can be realized through smart grids and open up a perspective on the situated functioning of smart grids in energy transitions.

1 Introduction

For the future of energy distribution systems worldwide, scholars have highlighted a remarkably unanimous consensus among policymakers and technology developers: the future energy grid must be smart (Quitzow and Rohde, 2021; Skjølsvold et al., 2015). Smart grids are considered not only a promising path towards low-carbon transition, but also capable of increasing economic prosperity and attracting well-paying jobs (Envall, 2021; Quitzow, 2022). Furthermore, against increasing geopolitical instability, the ongoing liberalization of energy markets, and climate change, smart grids appear as a universal tool capable of addressing numerous social and technical challenges of our times. Nonetheless, the political aspirations behind and prevailing definitions of smart grids differ significantly (Vesnic-Alujevic et al., 2016), making it unclear what smart energy systems will look like in various contexts, what policy goals and interests will be pursued through them, and how power relations and dynamics in the energy sector will change.

Despite considerable research on these systems and the different visions associated with the digitalization of the energy system by smart grid advocates (see e.g. Ballo, 2015; Vesnic-Alujevic et al., 2016; Quitzow and Rohde, 2021), there is still little discussion of how smart grids differ in the local (re)production of power relations. This paper fills this gap by proposing a "situated governmentality approach". We develop this approach against the background of the theoretical critique of Foucauldian governmentality studies and along two empirical examples from national smart grid strategies, the Smart Energy Showcases – Digital Agenda for the Energiewende (SINTEG) in Germany and the National Smart Grid Mission (NSGM) in India.

In light of recent criticisms of governmentality research for simplifying politics to rationalities, neglecting the situatedness of governmental programmes, and thus ignoring the "messy actualities of the empirical world" (Mc-

Kee, 2009:482), we seek to move beyond a purely discursive understanding of governmentality. Our research helps to explore how smart grids are socially constructed and how power relations are stabilized and enacted locally. In doing so, we examine how "technologies of power" (Foucault, 2007:158) – understood as governmental technologies in the Foucauldian sense and as a material component of the energy system – are used to reconfigure relations of supply and demand across the electricity grid. In this way, we both follow the call for a more "realist" approach to the world (e.g. Hobson, 2010; McKee, 2009) and take up the debate in political geography about how the material turn can be further incorporated into discourse theoretical considerations (e.g. Lemke, 2021) – a debate also being conducted in this journal (e.g. Korf et al., 2022).

Our analysis of situated governmentalities in the context of the two national smart grid strategies involves interpreting a text corpus that includes website material, strategies, funding appeals, project reports, grey literature and press releases. We consider these cases comparable as both programmes developed several local pilot projects with a somewhat similar budget. Furthermore, we argue that the very different contexts of energy systems in India and Germany provide a rich contrast for the situations in which smart grids are established. Yet we do not intend to make claims about structural underlying factors or draw broader conclusions about large-scale national implications. Rather, our focus is on exploring the empirical diversity of smart energy futures with the aim of challenging the prevailing notion of smart grids being the only solution for various problems in the energy system. Our findings reveal different ways in which power is mediated through situated governmentality in the case studies and provide insights into the range of governmental programmes that can be realized through smart grids.

The article begins by introducing Foucault's concept of governmentality and by reviewing the main critiques of governmentality studies. We then argue why, despite the criticism, governmentality can be a fruitful research perspective for the study of socio-technical change and discuss key aspects of a situated governmentality analysis. We then outline our methodological approach, before we present the research findings and discuss similarities and differences between the two cases. Finally, we conclude with reflections on the situated governmentality approach for analysing the particularities of energy transition projects, as well as the challenges posed by this approach.

2 Governmentality and its critics

The concept of governmentality was developed by Michel Foucault in a later phase of his work, mainly in his lecture series "Security, Territory, Population" and "The Birth of Biopolitics" in 1978–1979, and can be broadly understood as a concern with power relations, linking his previous focus on the macro dimensions of discourse and the state with his attention to the micro dimension of the subject (Bues and Gailing, 2016:74).

The term governmentality is composed of the French *gouverner* and *mentalité*, loosely translated as governing and thought, and refers to the relationship between power and political rationalities (Lemke, 2000:32). Foucault's notion of governing, however, is not limited to what we understand as formal (e.g. national) governments but refers more broadly to ways of "directing human behaviour", such as the "[g]overnment of children, government of souls and consciences, government of a household, of a state, or of oneself" (Foucault, 1997:81). With the concept of governmentality, then, Foucault developed a perspective that helps us examine how people govern their own behaviour and that of others.

In order to understand how governmentality works, Foucault coined the term "technologies of power" (Foucault, 2007:158), which indicates that in modern society in addition to the exercise of sovereign power characterized by coercion (e.g. energy laws), numerous other governmental technologies of power are used to discipline and rationalize the population (e.g. energy infrastructures, energy discourses or energy pricing mechanisms) (see Gailing, 2016:249). These technologies of power "are inextricably linked to knowledge and truth orders" (Mattissek and Sturm, 2017:128) and serve to consolidate power relations so that one and the same technology of power can serve different governmental projects, depending on which knowledge and truth orders they are based on and which rationalities they follow.

Following Foucault's conceptualization of the term governmentality in the late 1970s, a whole field of research – governmentality studies – emerged in the 1990s (Lemke, 2000:34). While the concept was first taken up in sociology and political science (e.g. Dean, 2010; McDonald and Marston, 2005; Rose and Miller, 1992), it has since spread to most branches of the social sciences (see Bröckling et al., 2011). Also in energy geography (e.g. Bues and Gailing, 2016; Mattissek and Sturm, 2017) and especially in smart grid research (e.g. Bulkeley et al., 2016; Hargreaves, 2012; Levenda, 2016, 2018; Lovell, 2018; Pilo', 2021), the concept of governmentality has been used for some time now as a research perspective.

Although governmentality studies can be seen less as a "coherent research program or a homogeneous approach than a loose network of researchers using the concept in various ways and with divergent theoretical interests" (Bröckling et al., 2011:9), governmentality studies have been the subject of criticism ever since. This relates to two aspects in particular.

First, critiques of governmentality studies have identified a tendency to focus mainly on macropolitical rationalities such as neoliberal governance, resulting in an abstraction of forms of governance (McDonald and Marston, 2005; McKee, 2009; O'Malley et al., 1997). Examples of this macro view include work on the ordering of large knowledge systems in the energy sector (Ballo, 2015; Levenda, 2016; Sadowski and Levenda, 2020; Vesnic-Alujevic et al., 2016) and the use of the concept of governmentality to analyse new logics of a digital governmentality (Badouard et al., 2016; Radtke, 2022). While we believe that this focus is highly productive in understanding how and why certain phenomena are made a matter of government and how political systems of thought such as neoliberalism manifest themselves in the micro-practices of everyday life, we agree that this focus tends to overlook the "messy actualities of governmental practice" (Bulkeley et al., 2016:12). Using empiricism only to underpin analysis ignores the specific means, sites and particularities of the exercise of power (Hobson, 2010). This leads to the assumption that smart grid interventions will transform the energy system globally in a similar direction, with neoliberal forms of governance appearing to be central. Foucauldian governmentality studies have therefore also been criticized for their Eurocentrism and a generalization of Western governance, accusing them of a lack of sensitivity to the relationships between different forms of power (Rodin, 2017) and of underestimating the exercise of power inherently involving contestation and resistance (McKee, 2009). Nor are governmental programmes homogeneous (Lemke, 2000), and nor do subjects, such as users of digital technology, unquestioningly accept their assigned position, as they can reject and resist it (McDonald and Marston, 2005; McKee, 2009). The implementation of governmental programmes is therefore fraught with conflict and instability, with no guarantee that the intended plan will be followed (McDonald and Marston, 2005; O'Malley et al., 1997). Moreover, this focus on the analysis of changes in the "mentalities of rule" (O'Malley et al., 1997:504) tends towards what Bröckling et al. (2011:16) call "implicit finalism" (i.e. the assumption that governmental technologies are constantly being rationalized and optimized with no possibility of evading or opposing governmental strategies) and the pervasive idea of a universal (neoliberal) development trajectory. In smart grid research, this emphasis can be seen, for example, in the affirmation that it is "the dominant neoliberal political rationality shaping urban smart grid experiments" (Levenda, 2018:58).

The second, and related, point of criticism of governmentality studies emphasizes its disregard for materiality or the perception of the world as purely discursive. This is not surprising given that Foucault, a central proponent of poststructuralism, placed the role of discourse and language at the centre of his work, understanding discourses "as systems of ideas and practices that construct 'truths' about objects, subjects and social realities and, therefore, are a medium of power relations" (Leipold et al., 2019:447). Accordingly, like other social constructivist approaches, much of governmentality literature seeks to understand how society gives meaning to phenomena such as smart grids and consequently produces "truths" about appropriate and inappropriate practices and policies (Hajer and Versteeg, 2005; Leipold et al., 2019). Although numerous proponents of the governmentality literature have also focused on the technologies of power, that is, the apparatuses, practices, institutions, materialities or techniques that allow a society to be governed (O'Malley et al., 1997), these have generally been interpreted in the social constructionist tradition as manifestations of discourses. Thus, within governmentality studies, technologies of power are generally assumed to be used to support governmental programmes (Lovell, 2018). However, technologies of power are not simply expressions of discourses, nor do they always operate in accordance with prevailing rationalities. Instead, as Lemke (2000:43) elaborates, they have their own inherent materiality. Accordingly, technologies of power do not serve a very specific goal; rather, they are used for different goals (Lemke, 2000). This is in line with Lovell's (2018:1) observation that the mobilized technologies of power within two smart grid initiatives in Australia "have not 'behaved' in the way originally planned" (see also Mattissek and Sturm, 2017; Rohracher and Köhler, 2019). Thus, in order to examine power relations in energy transitions, it is crucial to acknowledge not only that subjects can resist the subject position discursively ascribed to them, but also that "things", such as technical apparatuses, exist beyond discourse and can thus evade, resist and influence discourses (Korf et al., 2022:435). This requires an openness to the agency of things and the different trajectories of technological development that is not evident in governmentality studies.

3 A situated governmentality approach

The previous section delved into the concept of governmentality and critically evaluated governmentality studies at two levels. Firstly, we highlighted the tendency of these studies to focus on macropolitical rationalities while losing sight of the situatedness of governmental programmes. Secondly, we noted a strong emphasis on discourse and language of governmentality studies while disregarding non-human relations. Although we share the above criticisms, we do not see them as an impasse for Foucauldian studies. On the contrary, we argue that Foucault's work provides numerous starting points for analysing socio-technical change such as energy transitions. In response to the critiques of governmentality studies and as a proposal for examining the particular discourses and technologies of power employed in energy transitions, we have developed a situated governmentality approach. Two aspects of our approach that correspond to the two levels of criticism introduced earlier are of particular importance to us.

First, following scholars who argue for a "realist" approach to governmentality (e.g. Hobson, 2010; McKee, 2009), a situated governmentality analysis seeks to move beyond a purely discursive understanding of governmentality, raising the question of how policy interventions, such as national smart grid strategies, are realized and of "how governmentality operates" (Bulkeley et al., 2016:12). Although we see energy transition projects being realized worldwide, often with similar narratives, we argue that they are assembled in and with their local context. An inspiration for this position is the recent literature on policy mobility, which argues "that policies do not travel from place to place unmodified, but are transformed in the process of their implementation" (Mattissek and Sturm, 2017:123). Furthermore, studies have shown that the design of energy infrastructure has been "shaped by multiple political, cultural, economic and environmental factors specific to each locale" (Becker et al., 2016:95). While several governmentality studies have analysed "how systems of political thought such as ... neoliberalism are manifest in the micro-practices of daily social life" (McDonald and Marston, 2005:378), a situated governmentality approach, in contrast, aims to openly examine modes of governance and their (social and material) enactment and actual governmental (micro-)practices in order to draw conclusions about prevailing (situated) governmentalities (see McKee, 2009). Such an approach not only recognizes that technologies of power are specific to space and time, but also acknowledges the sometimes paradoxical coexistence of different governmental strategies and techniques. In doing so, it follows Foucault's later notion of governmentality as "a much more generic term to describe various strategies for directing the 'conduct of conduct', of which sovereignty and discipline [are] now included as two such modalities" (Fletcher, 2017:312). A situated governmentality approach thus aims to examine the unfolding of power relations at the micro- and meso-levels of energy transition projects as enacted through specific, overlapping and sometimes competing technologies of power, leading to "multiple governmentalities" (Fletcher, 2017) in energy transformations.

Second, a situated governmentality analysis takes up the call to look more closely at the influences of materialities on power relations and power dynamics. It thus goes beyond the question of how people govern themselves and each other to consider how people are governed in relation to their material (in our case technological) environment. This pursuit, we argue, does not contradict Foucault's theory. Although Foucault focuses on how people govern themselves and each other, Lemke (2015, 2021) argues that the idea of the "government of things" is already present in Foucault's work. While Foucault attributes a crucial role to the discursive in the constitution of power and thus the production of "reality", he does not turn away from materiality in his works. Rather, Foucault writes that "[i]n fact, nothing is more material, physical, corporeal than the exercise of power" (Foucault, 1980:57). In particular, his theory of power, which understands power as productive and relational, may be appropriate for considering non-human entities and thus the exercise of power by means of new technologies. This conception of power allows for openness to the agency of things that emerges within relationality in a Foucauldian understanding (Lemke, 2015:10). A situated governmentality analysis thus not only understands technologies of power as manifestations of discourses, but also accepts their existence beyond discourse. In doing so, such an analysis seeks to reveal the material effects of policy interventions as well as their unintended consequences, thus contributing to a better understanding of the observed discrepancy between planned and unexpected socio-technical change.

4 Methods and materials

In this section, we present our framework for the analysis of situated governmentalities and develop a model for comparative case studies. To understand situated governmentalities, we argue, comparative case studies offer a fruitful approach provided the focus is not primarily on homogenization but on exploring differences.

Our study draws on a corpus of relevant public and official documents, such as website material, funding calls, regulations, project reports and press releases related to the smart grid programmes, comprising 74 documents for SINTEG and 49 documents for the NSGM (see Appendix A). We argue that this corpus provides a rich empirical basis, as it includes both planning and vision documents on anticipated development as well as reviews and reports pointing to challenges and adaptations throughout the process. Furthermore, we included technical documents (e.g. on standards), which provided deeper insights into the material and practical dimensions of the strategies. Nevertheless, this approach has the limitation of, firstly, providing only hints of deeper fissures, resistance and complexity of practice. Our analysis should therefore be understood as an entry point for in-depth field research, e.g. using ethnographic research methods. Secondly, with regard to the material analysed, the scope of our argument is primarily confined to the strategies in focus. However, read together with the larger discourses, it points to topics of wider relevance, e.g. on the national scale. The analysis presented here can be further substantiated by more case studies, e.g. on specific private sector or local strategies.

For the data analysis, we used the software MAXQDA and interpreted the material following an inductive, grounded theory approach (Glaser and Strauss, 2006) to category building. Based on this methodological orientation, we propose a three-step research framework for the comparative analysis of situated governmentalities (see Fig. 1).

In the first step (1) of the analysis, we sought to understand the discursive context in which governmental programmes such as the national smart grid strategies are formulated and embedded. Looking at the discursive context, i.e. in our cases primarily the energy transition discourses on distribution technologies in Germany and India, helps to understand how and why certain phenomena, such as smart grids, are

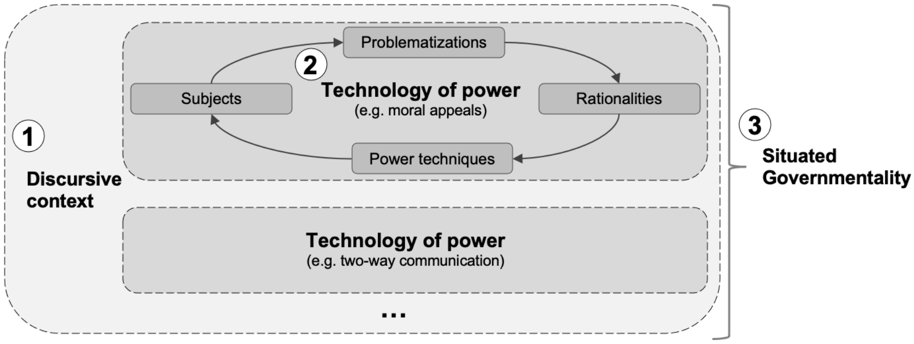

Figure 1. Illustration of our three-step research process and the simplified theoretical framework.

made a governmental matter in the first place in a particular place and time.

In contrast to other governmentality studies, however, we seek to go beyond merely analysing the knowledge orders and systems of thought in which smart grids are embedded. Rather, we suggest examining the technologies of power through which new power relations are stabilized in the energy systems. This will enable us to understand how governmental programmes are realized and how governmentality operates in the specific contexts. In doing so, we do not understand the technologies of power merely as manifestations of discourses but consider more openly their power effects, which may well contradict governmental efforts. In a second step (2), we therefore identify and disentangle the technologies of power present in the strategies. We argue that it is the situated context that makes materials and practices technologies of power and that determines how the behaviour of subjects and society is governed. In this sense, technologies of power are not understood as mediating predetermined power relations but are constructed as technologies of power with regard to the discursive context and the relations among its parts. This approach can be read in parallel with ideas of the assemblage (e.g. Anderson et al., 2012) or the actor network (e.g. Latour, 1987), which also locate the functioning of power (in the sense of governmentality, e.g. of the self or of domination) in heterogeneous and dynamic relations. We approach the functioning of these technologies of power by their recurring modes of argumentation, rationalizations and power techniques as well as the subject they address (see Table 1). These categories are inspired by scholars such as Bäckstrand and Lövbrand (2016) and Nagorny-Koring (2018). Although the order of the analysis may suggest linear causality, we emphasize that the elements are mutually constitutive. We therefore see the order as heuristic and underline the analytical attention to contradictions and ambiguities.

Finally (3), we look at the relations between the different technologies of power that constitute the situated governmentality. This way, we pay attention to the different forms of power realized by smart grid projects. Though this cross-reading makes visible dominant logics of interaction (e.g. addressing similar subjects), it may not be without contradictions and tensions. In this final step, we therefore relate the situated governmentalities back to the discursive context and ask to what extent the governmental programmes can be read as reactions to the discursive context, resistant practices or the rejection of certain mechanisms of power. In this way, the analysis takes account of the complex reality of adaptation and resistance to the larger context, influenced, for example, by social or material disruptions, allowing us to understand the interplay of discursive and material practices in energy transition scenarios.

5 Governing energy through smart grids

In this section, we present the results of our analysis of how power is exercised in the context of two specific energy transition strategies: the Smart Energy Showcases – Digital Agenda for the Energy Transition (SINTEG) in Germany and the National Smart Grid Mission (NSGM) in India. We discuss the individual cases starting with a brief introduction to the strategies. We then follow the three-step research framework outlined above, first examining the discursive contexts in which the strategies are embedded and second analysing the key technologies of power at play. In the discussion that follows, we will then look comparatively at the relations between the different technologies of power that constitute the situated governmentality.

5.1 SINTEG: smart energy for green growth

German energy policymakers have been discussing the digitalization of the energy system and pushing ahead with developing smart energy systems in cooperation with industry, business and research since 2008. During the first national funding programme E-Energy – ICT-based Energy System of the Future (2008–2013), new approaches in the energy system were tested in six model projects. The digitalization of the energy system was pursued further as part of the programme Smart Energy Showcases – Digital Agenda for the

Table 1. Categories and analytical questions for the analysis of the material.

Categories	*Analytical questions*
Problems	How and why is the energy sector problematized and discursively constructed as an object of governing?
Rationalities	How (according to which logic, ideas and principles) and by whom should a given problem be solved? Which way of governing seems appropriate?
Power techniques	What means, techniques, instruments and practices are used to govern (to observe, control and direct) behaviour?
Subjects	What subjects are formed? How are subjects repositioned?

Energy Transition (SINTEG) (2016–2020), funded by the Federal Ministry for Economic Affairs and Energy (BMWi). Model solutions for the future energy supply were developed and tested on an experimental basis in large consortia in five model regions, so-called showcases. The challenges posed by the volatility of generation as a result of the increasing share of renewable energies in the German electricity market were highlighted. Due to the experimental approach, each project differed greatly in its objectives, the actors involved and the technologies used. Moreover, as experiments, they were not designed to be comprehensive and were largely discontinued after the funding period. Nevertheless, tendencies towards governmentality can be observed in connection with the SINTEG programme, which we examine in more detail below.

5.1.1 Utilizing smart grids for the realization of the *Energiewende*

Analysing the documentation of the SINTEG, we find that the discursive context of smart grid development mainly refers to discussions on decarbonization, ensuring supply security and achieving economic efficiency. This observation is in line with previous studies that see smart grids as a "solution to the destabilization and loss of control" (Lösch and Schneider, 2016:263) caused by the *Energiewende* (or "energy transition") while also serving as an opportunity to implement the *Energiewende* cost-effectively (Quitzow and Rohde, 2021). Across the documents analysed, we find that the development of smart grids is justified by the *Energiewende*. Furthermore, the construction of a so-called "flexibility gap" (Munzel et al., 2022:28) is used to support this justification. Such a gap, it is argued, arises from the growing use of renewable, fluctuating and decentralized energy sources, which could lead to an imbalance between energy production and consumption, consequently causing grid instability. Against the background of this argumentation, the SINTEG programme focuses on increasing the flexibility of the energy system by making loads, generation, storage, sector coupling and power-to-X more flexible. Additionally, smart grids are framed to reduce the costs of grid expansion through optimized grid management and grid capacity utilization (BMWi, 2014:4) and to create new business opportunities while positioning Germany as a leader in the energy sector. The digitalization of the energy system is thus portrayed not only as a prerequisite for the *Energiewende* but also as an economic opportunity for Germany. Overall, smart grid projects are in line with the broader rationale of ecological modernization and smart grids are positioned as a climate-friendly, modern, economically viable and consumer-friendly solution to the challenges of the *Energiewende*.

5.1.2 Making the energy system more flexible

In the second step, we identified several technologies of power within the SINTEG programme that are currently shaping the redesign of energy systems in Germany. Three technologies of power are particularly significant in changing the way individuals and society are governed, leading to different forms of flexibility in energy systems. These include (1) moral appeals and performance technologies, (2) economic incentives, and (3) more detailed data granularity. All of these technologies of power take the discursively constructed problem of a "flexibility gap" (Munzel et al., 2022:28) as their starting point. However, as we will see below, the construction of this problem serves to legitimize different, coexisting approaches to the exercise of power.

First, we observe the use of various disciplinary techniques such as moral appeals and performance technologies. Through moral appeals and the discursive framing of flexible consumption as ethically "right", individuals are urged to behave in certain ways – in this case, flexibly – and are thus disciplined. The use of performance technologies, such as monitoring and controlling energy consumption, visualizing, and benchmarking with other customers via in-home displays, also serves to discipline individuals and is intended to contribute to the flexibilization of energy behaviour. These technologies can be understood to induce self-discipline in consumers for fear of deviating from the norm and, in this sense, function as a subtle political technology of control. In this context, SINTEG refers not only to an "*energiewende*-conscious" consumer (Munzel et al., 2022:49), but also to a prosumer or "flexumer" (Schütz et al., 2022:16), i.e. customers with their own generation system who "voluntarily" and "actively" participate in implementing the *Energiewende* by consuming and producing electricity more flexibly.

A second technology of power relates to redesigning people's access to the electricity system and introducing price signals. Here, we identify the rational that a lack of flexibility in the power system can be addressed with economic incentives, including the introduction of dynamic price tariffs. Price signals are meant to stimulate "flexible behaviour that serves the system" (Munzel et al., 2022:49), with consumers being promised the possibility of achieving energy cost savings through flexibility (BMWi, 2014:4). In this context, governing through economic incentives is not about controlling the behaviour of individuals, as previously done through disciplining techniques, but about regulating the system as a whole (see Klauser, 2013:102). A price-conscious consumer is constructed, who behaves rationally according to the economic incentives and makes their consumption more flexible.

A third technology of power relates to redesigning the data granularity. For this, the newly designed systems draw heavily on information and communications technology (ICT)-mediated distribution technologies that collect, process and analyse data in real time to enable automatic responses and thus increase flexibility in the power system. In the event of an unstable phase in the *Energiewende*, grid stability can be automatically safeguarded by enhanced demand-side management, such as remotely activating or deactivating components or entire parts of the grid, including storage (e.g. electric cars) or plants, as needed. This remote and more fine-grained control is also reflected in the idea of increasingly autonomous smart grid technologies. Modern smart grid technologies are intended to compensate for fluctuations in the grid "automatically" (BMWi, 2018:12). In the long term, smart home devices are positioned to enable such demand-side management down to the smallest level and support consumers in making their electricity demand more flexible without "loss of comfort" (Munzel et al., 2022:48).

5.2 NSGM: smart grids and the digital order

The Indian National Smart Grid Mission (NSGM) was launched in 2015 to promote smart grid projects in India, with an initial budget of around EUR 113 million (NSGM, 2018). With the vision of "[t]ransforming the Indian power sector into a secure, adaptive, sustainable and digitally enabled ecosystem that provides reliable and quality energy for all with active participation of stakeholders" (NSGM, 2018:2), a total of 14 projects (2015–2025) were developed in different Indian cities through individual collaborations between stakeholders from the private sector, public institutions, and in some cases development and research institutions. The projects varied in scope, focusing on urban subdistricts with 10 000–20 000 mixed consumers (households, industry, commerce, etc.). The focus was on developing and demonstrating technological components (mainly advanced metering infrastructure, AMI), although business models, standards and regulations were also considered. While the projects have been considered largely completed since 2020, the NSGM continues its work in consulting, developing standards and networking. However, it is important to note that the projects initially planned have not all been fully realized (USAID and NSGM, 2018; NSGM, 2018). Moreover, there is evidence that many of the systems installed were discontinued and disassembled after the funding periods (Kumar, 2022:17).

5.2.1 Smart grids for a sound distribution sector

The NSGM has been developed in the context of one of the largest power sectors in the world in terms of size, consumption and generation. Despite significant progress in recent years, e.g. in terms of comprehensive electrification, India's electricity sector continues to face problems in generation, transmission and distribution and the associated social, technical, economic and ecological issues. Analysing the extensive documentation of the NSGM, we find that the discursive context of smart grid development mainly refers to discussion on technical and economic efficiency of the distribution system, in particular the reduction in losses. Here, the digitalization of the grid is portrayed as a solution to derelict energy infrastructures, inefficient utilities, corruption and energy theft. This is addressed, for example, by the notion of "self-healing" (ISGF and ISGTF, 2013:3) functions of the smart grid, which envision a system that automatically detects or anticipates faults and initiates repair and maintenance. The overall focus of the NSGM is also strongly linked to the motif of economic profitability, especially of the state-led distribution utilities, which are considered economically unviable in many parts of India, despite several attempts at privatization (Pargal and Banerjee, 2014).

5.2.2 Remote control and data granularity

By following references to specific concepts in the NSGM, we identified two technologies of power that play a particularly important role in comprising the situated governmentality here: (1) two-way communication and (2) increased data granularity.

The first technology of power we identified revolves around the enhanced two-way communication capabilities of ICT components, which allow the utilities not only to read consumer data but also to (automatically) deactivate access in case of power theft or other forms of misconduct. This is seen to solve two problems: the first and most important one is the deviant behaviour of consumers; the second relates to interactions between consumers and the distribution system operator (DSO) in general, as well as the workforce required for maintenance, customer care and sanctioning. These problems are addressed in the basic rationale that "[t]he key features that make a meter 'smart' are the addition of a communication module capable of two-way Machine to

Machine (M2M) communications and a remote connect/disconnect switch" (ISGF, 2017:86). The NSGM arguably differs from other smart grid scenarios in that it strongly emphasizes the meter's ability to be remotely controlled. While the ethics of this technology are currently being discussed across India, it has effectively already been implemented: the Indian standard IS 16444, created in 2015, specifies, among other things, internal connect–disconnect switches and automatic tampering detection. The standard seeks to regulate the behaviour of "defaulters" (ISGF, 2016) and "dishonest customers" (ISGF, 2017), as well as the employees of the "army of field operators" (ISGF, 2017) and "hotline gangs" (NSGM, 2018). The former are defined either by non-payment of bills or by tampering with components and are therefore to be technically sanctioned by remote or fully automated disconnection from the grid. This type of technical control also confines consumers' behaviour in the sense that other forms of influencing conduct, e.g. through legal negotiations and incentives, fade in importance. The latter are to be rationalized by technical means (e.g. automatic meter reading and problem support). In this sense, two-way communication features also work to limit the contact between system operators (the DSO) and customers. Accordingly, we understand this technology as particularly relevant in terms of reducing human influence (e.g. in negotiations), which is constructed as messy and a hindrance to the neat functioning of the distribution system.

A second technology of power relates to increasing the data granularity of the system, aimed at enhancing the reliability of the systems and the timely identification of problems and preventing unauthorized changes. The main aim is to achieve a higher data granularity through multiple digital measuring points (e.g. at the level of substations, feeders, transformers and smart meters) which identify the geographical location of malfunctions faster and more precisely. In addition, physical smart grid control centres are set up on a project scale together with data management software to collect and process data and partially automate functions. The installation of ICT components throughout the systems thus addresses the problem of a lack of information on the system's state, where components often fail to perform due to physical deterioration, damage, a lack of maintenance or manipulation by consumers (e.g. energy theft, manipulation of transformers). In the current distribution system, these issues can often only be located by optical identification through field visits. The rationale here is present in the idea that "increased temporal and special granularity of electricity consumption allows DISCOMS to pinpoint areas of inefficient system operation and predict future system upgrade requirement better" (Regy et al., 2021:55). Furthermore, the new ICT components promise to "enable targeted loss reduction interventions in high loss pockets with surgical precision" (ISGF, 2016:46). Following the rationale and means of this technology of power makes visible that in the case of the NSGM, not only the customers are subjects of conduct. The data granularity can also be directed "inwards", for instance at "deviant employees" of the DSO, whose behaviour is to be regulated or reduced altogether. Moreover, focusing on people's behaviour reveals that the NSGM's governing of granularity is not primarily geared towards real-time data generation for economic purposes (e.g. dynamic pricing) or giving consumers subtle nudges to adjust their consumption. Instead, it is more concerned with detecting and regulating deviant human behaviour, such as errors (e.g. in reading meter data) or misconduct (e.g. meter tampering or corruption).

6 Discussion

While the previous section reflected on the first two steps of the analysis of situated governmentality, treating the case studies separately, in the following we examine the relation between the different technologies of power at play that constitute the situated governmentality and compare central differences and similarities.

Revisiting the context of SINTEG, we can see that consumers are portrayed as active, responsible and environmentally conscious citizens – citizens who are able to govern themselves and manage their own risks. These citizens are to be involved via the new digital technologies, e.g. via the visualization of their electricity consumption through in-home display. We observe a mode of governing through moral appeals and "technologies of performance" (Dean, 2010:225) that promotes a disciplinary regime. The idea shares similarities with Foucault's (1977) panopticon. Individuals are encouraged to behave "ideally", that is, to voluntarily engage in flexible electricity consumption, essentially making them co-managers of a low-voltage grid. Similarly, Lösch and Schneider (2016:274) describe German energy customers as "co-experimenters". The notion of "active" users and producers who "voluntarily" contribute due to their environmental awareness is not a unique feature to German strategy documents but can also be observed in other European smart grid strategy documents, e.g. in Sweden (see Rohracher and Envall, 2021). In addition to disciplinary forms of power, we also observe neoliberal forms of power in the context of SINTEG. In this sense, behaviour is controlled rather subtly (mainly through price signals), while a *Homo economicus* is constructed who ought to act rationally and adapt their energy consumption to the price signals, resulting in a "price-conscious energy consumer" (Bues and Gailing, 2016:73). The common feature among the technologies of power in the German case is their classification as "technologies of responsibilisation" (Soneryd and Uggla, 2015). These technologies transfer the responsibility for grid stability and, ultimately, the risks of the *Energiewende* to individuals (see Rohracher and Köhler, 2019). In the event of energy shortages (e.g. due to cloudy or windless days), it is no longer the energy suppliers who bear the brunt of high prices but rather the consumers who must reduce or adapt their consumption accordingly. Smale et al. (2017:139) refer to this as a "commodification of individual behaviour in households" through the concept of "consumer flexibility".

In contrast, the exercise of power in the case of the NSGM displays many elements of a digitally enhanced sovereign power. Rather than being "activated", "involved" and "empowered", subjects are understood as "defaulters" or "dishonest", and compliance tends to be enforced from the top down. The focus within the NSGM is primarily on technical curtailment, which makes deviant behaviour almost impossible. This observation is supported by a recent finding from Kumar (2022:3), who argues that the "question of cunning/deception and power is at the heart of the smart grids deployments in India". In our analysis, we identified improved two-way communication as a key means of bypassing human intervention in the management of energy distribution and of automatically sanctioning "misbehaviour". This way of utilizing the "smart grid as a security device used to protect infrastructures and revenues against losses and fraudulent behaviours" is also observed by Pilo' (2021:3268) for the cities of Kingston (Jamaica) and Rio de Janeiro (Brazil). Interestingly, the NSGM discourse only tangentially addresses some of the central issues raised in other smart grid contexts, such as the figure of the "prosumer". As a result, two-way communication is less relevant to the management of dynamic energy fluctuations or the integration of small renewable energy generators in the context of the NSGM.

Despite these differences in the way smart grids are used to reshape energy behaviour and how these new contexts are realized technically, there are also key similarities between the situated governmentalities. The first, and probably the most striking, is their shared goal of reducing or eliminating human unpredictability in order to address challenges in the existing energy system. In the case of SINTEG, this refers to the increasing complexity of the *Energiewende*, while in the case of the NSGM, the challenge is "human non-compliance" in energy distribution. Another significant parallel can be found in the power effects of ICT-mediated power techniques. Specifically, smart metering plays a role in removing irrational behaviour from the system and establishes an automated, self-healing system. While in the context of SINTEG, consumers are "educated" to become rational consumers, in the case of NSGM, smart grid components, especially on the metering side, prevent collective resistance (e.g. by tampering with an electricity connection) and depoliticize the energy sector.

Overall, both strategies understand the smartness of smart grids to be provided or at least facilitated centrally by material technology. Little mention is made, by contrast, of the social dimension of smartness, which is increasingly being addressed in smart city policies (e.g. in the Smart Climate City Strategy of Vienna) and, at the level of theory, in discussions on smart grids (e.g. Kumar, 2019; Meadowcroft et al., 2018).

Through the comparative perspective on the situated governmentalities in the two national smart grid interventions, we were able to show that smart grids differ in terms of the local (re)production of power relations. First, our findings reveal that national smart grid interventions are embedded in various macropolitical rationalities and that they pursue distinct governmental efforts. Second, our findings uncover dissimilarities in how technologies of power – which differ in their configuration of rationalities, techniques of power and subjects – govern energy behaviour in a Foucauldian sense. The results highlight the diverse approaches through which power is mediated through situated governmentality in the case studies and provide insights into the variety of governmental programmes that can be realized through smart grids.

Ultimately, our analysis highlights the importance for scholars studying energy transitions of avoiding generalizing the rationalities and power approaches linked to smart grids while overlooking the situatedness of governmental programmes. Instead, we encourage scholars to examine the variances of how smart grids are rationalized and instrumentally deployed to govern energy behaviour across different contexts and to explore how power relations are being reordered through emerging socio-technical systems.

7 Conclusion

In this article, we have shown how Foucauldian thinking can help us examine power relations in energy transitions and understand how power is exercised. Drawing on previous critical engagement with the concept of governmentality in energy geography and a more recent re-reading of Foucault that analyses the "government of things" (Lemke, 2015, 2021), we developed a situated governmentality approach to study the particularities of energy transition projects. We applied our approach to the example of two national smart grid strategies, Germany's SINTEG programme and India's NSGM. We analysed how smart grids, which we understand as governmental programmes, are used to establish new forms of consumption and production behaviour and to reconstitute the energy system.

The different contexts of energy systems in India and Germany provided a rich contrast for the situations in which smart grids are set up. Ultimately, we argue that smart grids can realize very different ways of governing society, for example based more on sovereign power (e.g. using the smart grid to restrict access), on neoliberal power (e.g. using variable price tariffs to control the society as a whole) or on disciplinary power (e.g. attempting to morally influence energy consumers). In this way, our study complements existing research on smart grids which focuses primarily on the efforts of Western, typically neoliberal, strategies to generate flexibility and shift responsibility (see e.g. Sadowski and Levenda, 2020), pointing to the messy actualities of smart grid systems that are far more complex and situated than social science research has so far suggested. Moreover, the situated governmentality analysis highlights the importance of a geographical perspective. The specific governmentality of energy transition projects is linked to and determined by the respective local discourses, material configurations and technologies of power at hand, as well as to the specific processes of subjectivation.

Furthermore, as we have focused on the micro- and mesoscale, our findings are limited in their applicability to the larger societal context and in their capability to anticipate future scenarios of governmentalities. Nevertheless, the analysis of situated governmentality provides a starting point for future research in three potential directions. One approach is to enhance the methodology by adding ethnographic methods to document analysis. This could provide a better understanding of how governmentality is enacted in and through concrete places and practices. A second approach is to consider further policy levels and scales, as well as other projects, in order to gain an understanding of the prevalence of a dominant governmentality being enacted through energy transitions in regional, national or local contexts. A third approach would involve exploring the extent to which such patterns of governmentality exist in similar political systems or in other policy areas and the factors that contribute to their emergence in distinct contexts.

Appendix A

Table A1. SINTEG and NSGM programme documents analysed.

Document type	Germany	India
Laws and regulations	2	3
Office memoranda	1	3
Position papers	23	
Policy documents, guidelines and reports	10	26
Presentations	4	6
Press releases	7	
Project materials	17	10
Websites	6	
In total	74	49

Data availability. The research presented here is based on the analysis of documents. The collection of all analysed documents is available on request.

Author contributions. LBü coordinated and supervised the project, developed the main conceptual ideas, and designed the study. LBa co-developed the main conceptual ideas and co-designed the study. Both authors contributed to the design of methodology, the collection and analysis of empirical data, and the original draft preparation.

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References

Anderson, B., Kearnes, M., McFarlane, C., and Swanton, D.: On assemblages and geography, Dialog. Hum. Geogr., 2, 171–189, 2012.

Bäckstrand, K. and Lövbrand, E.: The Road to Paris: Contending Climate Governance Discourses in the Post-Copenhagen Era, J. Environ. Policy Plan., 21, 519–532, 2016.

Badouard, R., Mabi, C., and Sire, G.: Beyond "Points of Control": logics of digital governmentality, Internet Policy Rev., 5, 1–13, https://doi.org/10.14763/2016.3.433, 2016.

Ballo, I. F.: Imagining energy futures: Sociotechnical imaginaries of the future Smart Grid in Norway, Energ. Res. Soc. Sci., 9, 9–20, 2015.

Becker, S., Moss, T., and Naumann, M.: The Importance of Space: Towards a Socio-Material and Political Geography of Energy Transitions, in: Conceptualizing Germany's Energy Transition, edited by: Gailing, L. and Moss, T., Palgrave Macmillan UK, London, 93–102, https://doi.org/10.1057/978-1-137-50593-4_6, 2016.

BMWi: Smart Energy made in Germany, Erkenntnisse zum Aufbau und zur Nutzung intelligenter Energiesysteme im Rahmen der Energiewende, Berlin, https://www.digitale-technologien.de/DT/Redaktion/DE/Downloads/Publikation/abschlussbroscchuere-e-energy.pdf?__blob=publicationFile&v=1 (last access: 18 December 2023), 2014.

BMWi: SINTEG – Schaufenster intelligente Energie, Ein Programm zur Förderung von Schaufensterregionen für die Energieversorgung der Zukunft, Berlin, https://docplayer.org/73074890-Sinteg-schaufenster-intelligente-energie.html (last access: 18 December 2023), 2018.

Bröckling, U., Krasmann, S., and Lemke, T. (Eds.): From Foucault's Lectures at the Collège de France to Studies of Governmentality: An Introduction, in: Governmentality: current issues and future challenges, edited by: Bröckling, U., Krasmann, S., and Lemke, T., Routledge, New York, 1–33, ISBN 9780203846476, https://doi.org/10.4324/9780203846476, 2011.

Bues, A. and Gailing, L.: Energy Transitions and Power: Between Governmentality and Depoliticization, in: Conceptualizing Germany's Energy Transition, edited by: Gailing, L. and Moss, T., Palgrave Macmillan UK, London, 69–92, https://doi.org/10.1057/978-1-137-50593-4, 2016.

Bulkeley, H., Powells, G., and Bell, S.: Smart grids and the constitution of solar electricity conduct, Environ. Plan. A, 48, 7–23, 2016.

Dean, M.: Governmentality: Power and Rule in Modern Society, in: 2nd Edn., Sage, London, ISBN 978-1847873842, 2010.

Envall, F.: Experimenting for change? The politics of accomplishing environmental governance through smart energy pilot projects, PhD thesis, Faculty of Arts and Sciences, Linköping, https://doi.org/10.3384/diss.diva-172293, 2021.

Fletcher, R.: Environmentality unbound: Multiple governmentalities in environmental politics, Geoforum, 85, 311–315, 2017.

Foucault, M.: Überwachen und Strafen – Die Geburt des Gefängnisses, Suhrkamp Verlag, Frankfurt am Main, ISBN 9783518077849, 1977.

Foucault, M.: Power/Knowledge, Pantheon, New York, ISBN 978-0394739540, 1980.

Foucault, M.: The Essential Works of Michel Foucault, 1, Ethics: Subjectivity and Truth, Allen Lane, London, ISBN 978-0713991635, 1997.

Foucault, M.: Security, Territory, Population: Lectures at the Collège de France, 1977–78, Palgrave, New York, ISBN 978-0312203603, 2007.

Gailing, L.: Transforming energy systems by transforming power relations. Insights from dispositive thinking and governmentality studies, Innovation, 29, 1–19, 2016.

Glaser, B. G. and Strauss, A. L.: The discovery of grounded theory: strategies for qualitative research, 5. paperback print, Aldine Transaction, New Brunswick, ISBN 978-0-202-30260-7, 2006.

Hajer, M. and Versteeg, W.: A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives, J. Environ. Policy Plan., 7, 175–184, 2005.

Hargreaves, T.: Governing Energy Use at Home: Smart Meters, Governmentality and Resistance, 3S Working Paper 2012-01, Science, Society and Sustainability Research Group, Norwich, https://3sresearch.org/2014/12/04/hargreaves-2012-01-smart-meters/ (last access: 19 December 2023), 2012.

Hobson, K.: Beyond the control society: realist governmentality and the analysis of "good governance", Adm. Theory Prax, 32, 252–261, 2010.

ISGF – India Smart Grid Forum: Recommendations of Updating India Smart Grid Roadmap: 2016, https://www.indiasmartgrid.org/reports-detail/26 (last access: 19 December 2023), 2016.

ISGF – India Smart Grid Forum: Smart grid Handbook for Regulators and Policy Makers, https://www.indiasmartgrid.org/reports-detail/23 (last access: 19 December 2023), 2017.

ISGF (India Smart Grid Forum) and ISGTF (India Smart Grid Task Force): Smart Grid Vision and Roadmap for India, https://www.nsgm.gov.in/sites/default/files/India-Smart-Grid-Vision-and-Roadmap-August-2013.pdf (last access: 19 December 2023), 2013.

Klauser, F.: Through Foucault to a political geography of mediation in the information age, Geogr. Helv., 68, 95–104, https://doi.org/10.5194/gh-68-95-2013, 2013.

Korf, B., Verne, J., Oßenbrügge, J., Hannah, M., Glasze, G., and Mattissek, A.: Book review: Handbuch Diskurs und Raum, Geogr. Helv., 77, 433–442, https://doi.org/10.5194/gh-77-433-2022, 2022.

Kumar, A.: Beyond technical smartness: Rethinking the development and implementation of sociotechnical smart grids in India, Energ. Res. Soc. Sci., 49, 158–168, 2019.

Kumar, A.: Promises of a truth machine: deception and power in smart grids in India, Soc. Cult. Geogr., 24, 1616–1535, https://doi.org/10.1080/14649365.2022.2073607, 2022.

Latour, B.: Science in action: how to follow scientists and engineers through society, Harvard University Press, Cambridge, Massachusetts, ISBN 9780674792913, 1987.

Leipold, S., Feindt, P. H., Winkel, G., and Keller, R.: Discourse analysis of environmental policy revisited: traditions, trends, perspectives, J. Environ. Policy Plan., 21, 445–463, 2019.

Lemke, T.: Neoliberalismus, Staat und Selbsttechnologien. Ein kritischer Überblick über die governmentality studies, Politische Vierteljahresschrift, 41, 31–47, 2000.

Lemke, T.: New Materialism: Foucault and the 'Government of Things', Theory Cult. Soc., 32, 3–25, https://doi.org/10.1177/0263276413519340, 2015.

Lemke, T.: The Government of Things. Foucault and the New Materialism, New York University Press, ISBN 9781479829934, 2021.

Levenda, A. M.: Configuring the Urban Smart Grid: Transitions, Experimentation, and Governance, PhD thesis, Urban Studies and Planning, Portland State University, https://doi.org/10.15760/etd.3281, 2016.

Levenda, A. M.: Urban Living Labs for the Smart Grid, in: Urban Living Labs, edited by: Marvin, S., Bulkeley, H., Mai, L., McCormick, K., and Palgan, Y. V., Routledge, 52–73, https://doi.org/10.4324/9781315230641, 2018.

Lösch, A. and Schneider, C.: Transforming power/knowledge apparatuses: the smart grid in the German energy transition, Innovation, 29, 262–284, 2016.

Lovell, H.: The promise of smart grids, Local Environ., 24, 580–594, 2018.

Mattissek, A. and Sturm, C.: How to make them walk the talk: governing the implementation of energy and climate policies into local practices, Geogr. Helv., 72, 123–135, https://doi.org/10.5194/gh-72-123-2017, 2017.

McDonald, C. and Marston, G.: Workfare as welfare: Governing unemployment in the advanced liberal state, Crit. Soc. Policy, 25, 374–401, 2005.

McKee, K.: Post-Foucauldian governmentality: What does it offer critical social policy analysis, Crit. Soc. Policy, 29, 465– 486, 2009.

Meadowcroft, J., Stephens, J. C., Wilson, E. J., and Rowlands, I. H.: Social dimensions of smart grid: Regional analysis in Canada and the United States. Introduction to special issue of Renewable and

Sustainable Energy Reviews, Renew. Sustain. Energ., 82, 1909–1912, 2018.

Munzel, B., Reiser, M., and Steinbacher, K.: Flexibilitätspotenziale und Sektorkopplung, Synthesebericht 1 des SINTEG Förderprogramms, BMWK, Berlin, https://www.bmwk.de/Redaktion/DE/Publikationen/Sinteg/synthesebericht-1-flexibilitatspotenziale-und-sektorkopplung.pdf?__blob=publicationFile&v=1 (last access: 19 December 2023), 2022.

Nagorny-Koring, N.: Kommunen im Klimawandel: Best Practices als Chance zur grünen Transformation?, transcript, Bielefeld, ISBN 978-3-8376-4627-6, 2018.

NSGM – National Smart Grid Mission: National Smart Grid Mission Implementation Framework, https://www.nsgm.gov.in/en/nsgm-framework (last access: 19 December 2023), 2018.

O'Malley, P., Weir, L. and Shearing, C.: Governmentality, Criticism, Politics, Econ. Soc., 26, 501–517, 1997.

Pargal, S. and Banerjee, S. G.: More power to India: the challenge of electricity distribution, The World Bank, Washington, DC, https://doi.org/10.1596/978-1-4648-0233-1, 2014.

Pilo', F.: The smart grid as a security device: electricity infrastructure and urban governance in Kingston and Rio de Janeiro, Urban Stud., 58, 3265–3281, 2021.

Quitzow, L.: Smart grids, smart households, smart neighborhoods – contested narratives of prosumage and decentralization in Berlin's urban Energiewende, Innovation, 2022, 107–122, https://doi.org/10.1080/13511610.2022.2057934, 2022.

Quitzow, L. and Rohde, F.: Imagining the smart city through smart grids? Urban energy futures between technological experimentation and the imagined low-carbon city, Urban Stud., 59, 1–19, 2021.

Radtke, J.: Smart energy systems beyond the age of COVID-19: Towards a new order of monitoring, disciplining and sanctioning energy behavior?, Energ. Res. Soc. Sci., 84, 102355, https://doi.org/10.1016/j.erss.2021.102355, 2022.

Regy, P., Sarwal, R., Stranger, C., Fitzgerald, G., Ningthoujam, J., Gupta, A., and Singh, N.: Turning around the power distribution sector: Learnings and best practices from reforms, NITI Aayog, RMI, and RMI India, https://doi.org/10.31219/osf.io/xd2he, 2021.

Rodin, L.: Studies on Governmentality: Six Epistemological Pitfalls, Russian Sociolog. Rev., 16, 9–28, 2017.

Rohracher, H. and Envall, F.: Zur Wissenspolitik von Smart-Grid-Experimenten, in: In digitaler Gesellschaft, edited by: Braun, K. and Kropp, C., transcript, Bielefeld, 37–52, https://doi.org/10.1515/9783839454534-002, 2021.

Rohracher, H. and Köhler, H.: Household as infrastructure junctions in urban sustainability transitions: The case of hot water metering, Urban Stud., 56, 2372–2386, 2019.

Rose, N. and Miller, P.: Political power beyond the state: problematics of government, Br. J. Sociol., 43, 173–205, 1992.

Sadowski, J. and Levenda, A. M.: The anti-politics of smart energy regimes, Polit. Geogr., 81, 102202, https://doi.org/10.1016/j.polgeo.2020.102202, 2020.

Schütz, J., Uslar, M., and Clausen, M.: Digitalisierung, Synthesebericht 3 des SINTEG Förderprogramms, BMWK, Berlin, https://www.bmwk.de/Redaktion/DE/Publikationen/Sinteg/synthesebericht-3-digitalisierung.pdf?__blob=publicationFile&v=1 (last access: 19 December 2023), 2022.

Skjølsvold, T. M., Ryghaug, M., and Berker, T.: A traveler's guide to smart grids and the social sciences, Energ. Res. Soc. Sci., 9, 1–8, https://doi.org/10.1016/j.erss.2015.08.017, 2015.

Smale, R., van Vliet, B., and Spaargaren, G.: When social practices meet smart grids: Flexibility, grid management, and domestic consumption in The Netherlands, Energ. Res. Soc. Sci., 34, 132–140, 2017.

Soneryd, L. and Uggla, Y.: Green governmentality and responsibization: new forms of governance and responses to 'consumer responsibility', Environ. Polit., 24, 913–931, 2015.

USAID and NSGM – National Smart Grid Mission: Insight from pilot projects for scaling up smart grid in India – Partnership to Advance Clean Energy – Deployment (PACE-D) Technical Assistance Program, https://www.nsgm.gov.in/sites/default/files/Insights-from-SGPP-for-Scaling-Up-Smart-Grids-in-India (last access: 19 December 2023), 2018.

Vesnic-Alujevic, L., Breitegger, M., and Pereira, Â. G.: What smart grids tell about innovation narratives in the European Union: Hopes, imaginaries and policy, Energ. Res. Soc. Sci., 12, 16–26, 2016.