Article

Politics of Green Energy Policy

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Abstract

The transformation toward sustainability calls for profound renovation of economic structures, technologies, and institutions. The concept of green energy policy, which we define as encompassing any policy measure aimed at aligning the structure of a country's energy sector with the needs of sustainable development within established planetary boundaries, is critical to this end. We elaborate on why the state needs to play an eminent role in driving the green transformation in general and that of the energy sector in particular, why this brings about coordination challenges with nonstate actors, and how these can be met. We illustrate these aspects with energy policy examples from countries of the global South and, where illustrative, North. In particular, we argue that green energy policy success is subject to three conditions: effectiveness, efficiency, and legitimacy. These conditions can be achieved by facilitating societal agreement on the direction of change, forging change alliances, systematic policy learning, and using market mechanisms to manage policy rents and political capture.

Keywords

renewable energies, energy policy, global south, developing countries, energy politics, green transformation

Planetary Boundaries and the Next "Great Transformation"

The looming danger of catastrophic global warming and negative effects of environmental mismanagement have given rise to concerns about economic development exceeding the earth's carrying capacity (Rockström et al., 2009).

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In response, an increasing body of literature calls for a societal transformation to bring the economy back into a safe operating space. Correspondingly, in one of its recent flagship reports, the German Advisory Council on Global Change (WBGU, 2011) argued that the transformation toward a low-carbon, sustainable global economic system should be radical—on par indeed with the two great transformations mankind has encountered so far: the prehistoric Neolithic settlement and the transformation of agrarian into industrial societies (see also Leggewie & Messner, 2012). The report also points to an important distinction in that the first two great transformations were natural, evolutionary processes while the shift toward a new sustainability paradigm needs to be predominantly a planned, policy-induced process. Furthermore, based on a broad consensus in climate science, given the consequences of inaction, this is the first transformation with a deadline (Schmitz, Johnson, & Altenburg, 2013).

At the core of this transformation toward sustainable practices is a profound renovation of economic structures, technologies, and institutions. Economic systems need to be deeply rethought and redesigned to support decarbonizing. The energy sector takes center stage, having been responsible for more than 70% of global emissions in 2012[1] (World Resources Institute, 2016). As the market alone is failing to bring about these changes—and what is worse, its incentive structures have caused the current situation—governments must intervene as drivers of the low-carbon (or green) transformation (Lederer, Wallbott, & Bauer, 2018). This is a particularly challenging task because market failures that lock in polluting technologies and preclude sustainable ones are particularly numerous and critical (Altenburg & Pegels, 2012; Lütkenhorst, Altenburg, Pegels, & Vidican, 2014).

We call the set of instruments available to governments to initiate this structural change "green energy policy". As we understand it, green energy policy encompasses any policy measure aimed at aligning the structure of a country's energy sector with the needs of sustainable development within established planetary boundaries—both in terms of the absorption capacity of ecosystems and the availability of natural resources. Such a policy is critical for achieving the goals of a green economy, an economy that is "low carbon, resource efficient, and socially inclusive" (United Nations Environment Programme [UNEP], 2011, p. 16). The available instruments of the green energy policy can be grouped into mandating, incentivizing, and nudging instruments, which are to be applied to a wide range of subsectors. The systemic nature of the green transformation furthermore requires the coordination and harmonization of green energy policies with other policies, such as trade and public investment. By their very nature, "green" policies need to be

1. designed under conditions of technological uncertainty, that is, aimed at nurturing new technologies toward commercial viability (Altenburg & Lütkenhorst, 2015);

2. more selective than suggested by the neoclassical view of public choice theory (e.g., Falck, Gollier, & Woessmann, 2011) thereby providing directionality (Mazzucato, 2013) and narrowing the technological development corridors (Altenburg & Lütkenhorst, 2015) to substantively accelerate innovation and diffusion; and
3. designed over long periods to cover a long-term transformation process.

Although governments need to play a proactive role, they cannot bring about change at the required scale and speed single-handedly. They need to coordinate with nonstate actors, not only to ensure that benefits and costs are optimized and distributed fairly but also to nurture a process of transformation where political capture is minimized. This invariably entails managing conflicting interests and dealing with more or less powerful actors who seek to take influence, in short, managing issues of political economy.

This article examines green energy policy against this backdrop, aiming to carve out how governments can reshape current incentive systems to support the green transformation. In so doing, we aim to capture the complexity of the politics of green energy policy and point to factors for policy success, rather than providing an in-depth literature review on the manifold facets of the subject or developing an encompassing theoretical framework.

In the next section, we substantiate the eminent role of the state in driving the green transformation. The Desirable Conditions for Green Energy Policy section addresses the conditions for effective, efficient, and legitimate state intervention toward the green transformation. We argue that these qualities can be achieved by facilitating societal agreement on the direction of change, forging change alliances, systematic policy learning, and using market mechanisms to manage policy rents and political capture. Concluding remarks are presented in final section.

Throughout this article, we include policy examples taken from the global South and, where instructive, North. These examples aim to illustrate the potential scope of our conceptual arguments of how green energy policy challenges play out in reality and how policy makers are coping with them. Although this article touches upon the need to align the green and the inclusive development dimensions—and indeed argues that disregarding the latter will put the former at risk—its main focus clearly remains on providing an overview of key political challenges associated with the pursuit of policies to promote green transformation.

Green Energy Policy: Governments in the Driver's Seat

Most policy instruments used today to lead economic activity toward environmental sustainability, such as regulation, subsidies, and tax incentives, are familiar from industrial policy. This is not unreasonable, industrial policy having

been employed for decades to initiate and facilitate structural change. In fact, linking environmental protection to competitiveness, a core aim of industrial policy, may contribute to winning supporters. Studies have shown that alignments of interests other than environmental protection can indeed be central to achieving green transformation (Chaudhary, Narain, Krishnan, & Sagar, 2014; Dai, 2015; Dai & Xue, 2015; Morris & Martin, 2015; Schmitz, 2017; Shen, 2016).

Many lessons have been learned from the past few decades of industrial policy implementation. Facilitating private sector–led experimentation in the pursuit of new technologies, focusing on the competitive allocation of funds, monitoring and evaluation, systematic policy-learning and codesigning instruments, and cofunding with the private sector are established principles of industrial policy (Altenburg, 2011; Altenburg & Lütkenhorst, 2015; Rodrik, 2007). The objective now is to make use of what has been learned for achieving structural change toward the green transformation.

To be truly transformative, however, government intervention must exceed the conventional limits that "traditional" industrial policy imposes (Altenburg & Lütkenhorst, 2015). The WBGU (2011) called for a "proactive state" seized with the "ethical imperative" to bring about the required transformation through determining long-term priorities and underpinning them with clear policy signals (pp. 1–2). Industrial policy as we know it, in contrast, has fostered competitiveness along established technological trajectories. While innovation has been supported, technology diffusion has been left to the market. Supply and demand have largely been taken as given, and market dynamics have led to the selection of certain technologies. In contrast, environmental pressures are now making it necessary to deliberately disrupt established pathways and replace them with new, sustainable ones. This will require support not only for low-carbon technology innovation but also for diffusion—through, say, the creation of markets. Governments must also seek to influence and change (unsustainable) consumption patterns. The issue of unsustainable consumption patterns is becoming even more pertinent as growing middle classes in emerging economies tend to adopt lifestyles similar to those in industrialized countries.

There is, therefore, a role for governments not only to play a more active role in guiding markets but also to introduce additional and fundamentally new policy instruments. Going beyond the energy sector, the term *green industrial policy* is rapidly gaining currency in this context. In recent years, it has found its way into globally negotiated commitments (United Nations Conference on Sustainable Development, 2012) and is being increasingly used by economic development and policy researchers (Altenburg & Lütkenhorst, 2015; Johnson, Altenburg, & Schmitz, 2014; Pegels, 2014; Rodrik, 2013; Schmitz et al., 2013) as well as by international organizations (for the World Bank: Hallegatte, Fay, & Vogt-Schilb, 2013; for the United Nations: Altenburg & Assmann, 2017; Pegels & Lütkenhorst, in press; United Nations Industrial

Development Organization, 2011, 2016). Our notion of green energy policy can be seen as an application of green industrial policy to the energy sector.

Expecting governments to single-handedly enable the green transformation would be unrealistic, given the complexity of this undertaking, its effects on the economy and society at large, and the political dynamics that such a process unleashes (as we discuss later). Governments therefore need to coordinate their actions with nonstate actors. Following Smith, Sterling, and Berkhout (2005) and Lovio, Mickwitz, and Heiskanen (2011), Schmitz (2017) suggested that in addition to government actors with powers to regulate, tax, subsidize, or invest, nonstate change agents are to be found in industry (incumbents deciding to change or diversify, new market entrants, spin-offs, or venture capital) or in society (civic actors such as environmental and consumer associations). These groups of actors can support or oppose change (Hess, 2014).

Economic nonstate actors are of particular relevance to the green transformation (Newell & Paterson, 2010). The World Economic Forum (2013) estimated that investment needs for a 2°C scenario would amount to US$5.7 trillion per year. To attract such investment, significant changes in the decision-making framework of economic actors are needed. Government actors can catalyze this change by transforming incentives, which would redistribute profit opportunities from polluting to clean investments. However, where redistribution of profit opportunities occurs, there will always be groups who try to influence such shifting in their favor. Similarly, there will always be losers—transformation is rarely a process in which all parties gain. The inevitable result is resistance to change. If governments are in the driver's seat, they will thus be lobbied by various interest groups. This entails a risk of political capture and rent seeking (Krueger, 1974; Tullock, 1967). For the green transformation to succeed, these interests must be managed in a way that precludes inefficiencies and excessive windfall profits. These dynamics are the focus of the following sections.

Desirable Conditions for Green Energy Policy

For green energy policy to be successful, three main conditions need to be ensured: efficiency, effectiveness, and legitimacy. The requirements for effectiveness and efficiency, and the resulting roles of the state and the market, have been discussed in industrial policy literature. Rodrik (2007) argued that effective policy first and foremost needs an institutional setting that balances embeddedness and autonomy of governments vis-à-vis the private sector. Policy efficiency, here understood as achieving given policy aims at minimal cost, can be improved, according to Altenburg and Lütkenhorst (2015), by integrating market mechanisms in policy design.

However, we argue that an undertaking as complex, long term, and overarching as the green energy transformation should also be legitimate. The nature of legitimacy is manifold, calling for a societal consensus on a long-term vision

for achieving the agreed goals, an acceptance of the costs of policy incentives (both in terms of subsidizing sunrise sectors and compensating sunset sectors), and a fair distribution of these costs but also of the benefits (through, e.g., compensation as an instrument of burden sharing).

Effectiveness, efficiency, and legitimacy are interlocked and cannot be implemented in isolation. They all require interaction of the state with nonstate actors, mainly, but not exclusively, in the economic sphere. Furthermore, they share four underlying factors, which are discussed in the following subsections: broad societal agreement on the direction of change, change alliances, systematic policy learning, and the use of market mechanisms to manage policy rents and political capture.

These factors contribute to legitimacy, effectiveness, and efficiency in multiple ways. Societal agreement on directionality lends legitimacy to transformative policy and increases its effectiveness. Change alliances can strengthen these chances, since less powerful actors can join forces to support the transformation. Openness to policy learning enhances effectiveness and also efficiency. Including market elements (such as competition between beneficiaries) improves efficiency by eliciting information on optimal prices and optimizing the allocation of resources. At the same time, it can help to avoid political capture, which would inherently be inefficient—resources spent on lobbying or outright corruption could be spent more productively elsewhere. Reducing the likelihood of capture, in turn, increases effectiveness and legitimacy of green energy policies.

Broad Agreement on the Direction of Change

Green energy policy is implemented in a context of both high uncertainty and long-time horizons. What is more, economic and social reality is inevitably characterized by winners and losers and hence by conflict and controversy based on often irreconcilable objectives of different societal groups. For these reasons, action toward the green transformation needs to have a high degree of legitimacy.

A broad agreement across stakeholders is needed with respect to the long-term vision of the transformation, as for example, on closing down certain options and supporting new industries (as, for instance, Germany's decision to exit from nuclear energy and invest heavily in renewable energy technologies). Such an agreement should establish a sufficient degree of policy "directionality" (Mazzucato, 2013, p. 15) and manifest in long-term policy frameworks. When policies in favor of renewable energy change entire markets, bring down prices, and create profit opportunities for future investments, they increase pressure on future governments to continue along the same path. The long-term certainty of institutional frameworks, in turn, is crucial for investment. As Evans (1995) put it, "without a predictable environment of political rules and decisions, long-term investment is foolish" (p. 247). Forging an agreement on the most promising

transformative technologies, institutions, and policies cannot be reasonably addressed without negotiations between the full spectrum of stakeholders ranging from government agencies to business, trade unions, consumer organizations, civil society, and the research community—representing a quintessential example of ''embedded autonomy'' (Evans, 1995, p. 227).

When it comes to carrying the additional cost of the green transformation, social inclusion and fairness are also key to ensuring legitimacy. Only when the necessary burden sharing is perceived as equitable by various population segments, it will be possible to sustain support in the long run. Equally important for ensuring legitimacy is also the fair distribution of benefits.

An illustrative example is the case of Morocco, a country highly dependent on energy imports, currently engaged in greening not only the energy mix but also the economy (Vidican-Auktor, 2017). The government legitimized its actions by developing a long-term vision for green growth in Morocco, building coalitions across national state and nonstate actors, harnessing synergies from green investments in different sectors (i.e., energy, agriculture, manufacturing, and housing), gradually reforming fossil-fuel subsidies, and seeking ways to compensate vulnerable population groups (Vidican-Auktor, 2017).

Change Alliances

The green transformation is an undertaking involving exceedingly high levels of ambition, uncertainty, and complexity. As such ''no single actor has the resources to bring about the green transformation''; public–private–civic alliances are essential for fostering the transformation (Schmitz, 2015, p. 177). Such alliances can be seen as vehicles for bundling diverse interests for a particular purpose such as influencing legislation, policies, or technological projects. Heterogeneous change alliances are certainly difficult to organize and often operate in loosely connected networks. Yet, as Scharpf (1997) argued, in ''highly conflictual negotiation situations the discovery of previously unknown 'win-win solutions' may make all the difference between a policy impasse and effective action'' (p. 63). Thus, the anticipation of cobenefits from the green transformation would actually facilitate cooperation (Schmitz, 2016).

For instance, the German energy transformation has been driven by civil society advocacy groups with a genuine green agenda, enlightened business circles anticipating the growth of green markets, employers *and* trade unions alike in sectors benefiting from new jobs (such as wind and solar energy) or in electronic and chemical industries exporting specialized components to green industries worldwide, and regional governments and municipalities seeking to strengthen decentralized power structures.

Strong emphasis on cobenefits of greening is often key to mobilizing positive forces that can push for transformative change. Cobenefits are not limited to the economic sphere. The Intergovernmental Panel on Climate Change (IPCC)

groups them into economic (e.g., energy security, local employment), social (e.g., energy access, health impacts), and environmental benefits (e.g., decrease in air pollution and water use). Employment effects in particular have been crucial arguments for the green transformation (International Labour Organization [ILO], 2013; ILO & UNEP, 2012). Although most ''green jobs'' are being created in the Organisation for Economic Co-operation and Development (OECD) countries and in emerging economies like China and Brazil (UNEP, 2008), there is also evidence of positive employment effects in low-income developing countries (Asian Development Bank, 2013). Access to modern energy services can be an additional argument. The success of energy access programs has to be, however, measured against affordability and reliability for the poor (IPCC, 2014).

While some of these effects are difficult to quantify, their long-term effects and economic spillover impacts can open new corridors for development. The size of cobenefits depends on a variety of factors, such as the level of low-carbon technology deployment, existing technological capabilities, and state capacity to develop and implement coherent long-term strategies. Measuring and capturing cobenefits from greening can impact investment decisions, individual behavior, and the priority setting of policy makers (IPCC, 2014). An effective green energy policy must, thus, consider these cobenefits from its inception. They form the foundation for broad alliances that are critical for political advocacy campaigns.

Systematic Policy Learning

The third key element for thoroughly implementing green energy policy is systematic policy learning. Arguably, green energy policy is highly contextualized and requires the skillful combination of instruments adapted to the prevailing socioeconomic conditions and institutional features of a particular country. Furthermore, the complex nature of the green transformation requires systematic and continuous learning. Last, the necessary speed of the transformation needs an accelerated evolution of policies and, in some cases, policy innovations (Schön, 1973).

Systematic policy learning, we argue, must have two main dimensions: learning from others and, over time, and policy experimentation (Pegels, 2014). These dimensions can be supported by a cyclical approach, including regular reviews and revisions of goals and achievements. The implications for policy actors are not trivial, as such an approach toward policy making requires a shift from linear thinking to one that is based on complex adaptive systems (Hallsworth, 2012).

Several studies have recently explored how to achieve an effective policy process when dealing with complex problems (Jones, 2011). One of the most compelling approaches to integrate learning in policy making is the ''learning spiral'' developed by the World Bank (Blindenbacher, 2010). At its core is an iterative process based on feedback loops that, in its ideal form, allows for the integration

of new knowledge in the decision-making process and adds flexibility to revise earlier goals and objectives to ensure adaptability to a continually changing reality. In this process, agents as "learning broker" or facilitator are in charge of framing the knowledge, facilitating the ongoing revision, moderating the interactive learning procedures, and facilitating dissemination of new knowledge. Furthermore, several policy-making tools need to be used to enhance learning, such as scenario planning, technology foresight exercises, value-chain analyses, systems mapping, and growth diagnostics.

An example for how to integrate learning in policy making is the National Platform for Electromobility, a joint council of the German government established in 2010 (Vidican et al., 2013), which includes representatives of industry, academia, government, trade unions, and civil society and pursues "a systematic, market-focused and technology neutral approach with the aim of developing Germany into a lead provider of and a lead market for electromobility by 2020" (Nationale Plattform Elektromobilität, 2010, p. 5).

Policy experimentation is increasingly recognized as critical for tackling complex development problems (Mukand & Rodrik, 2005; OECD & World Bank, 2014). To a great extent, this is due to the rise of emerging economies, which inter alia has been the result of applying unconventional policy approaches that combine market forces with state leadership. The openness toward experimentation is particularly pronounced in attempts to shape future sustainable development patterns. For instance, model cities experimenting with new low-carbon infrastructures are spreading in emerging economies and explore new forms of energy-efficient buildings, public transport, infrastructure for scaling up the use of electric vehicles, or waste recycling. In the absence of homogeneous and binding global environmental policy frameworks, international networking and knowledge-sharing among pioneers of change—for example, "clubs" of cities with a green transformation agenda—can make important contributions in terms of developing and testing sustainable alternatives and increasing their appreciation in society (WBGU, 2014).

Despite the policy experimentation successes in the global South, learning from "Southern" approaches is only gradually taking place in industrialized countries. One specific field that lends itself to such South–North policy learning is the use of renewable electricity feed-in tariffs (FiT). Although conceptualized in the context of rich economies, the tool has come to be applied widely and improved in emerging economies. Considerable experience has been gained with various auctioning schemes. Auctioning allows for tariff levels to be determined in a competitive manner, that is, testing the market before granting subsidies. Apart from the United Kingdom, auctioning has been applied primarily in emerging economies such as China, India, Brazil, and South Africa. Many of these cases were highly effective in achieving growth in renewable energy capacity and efficient in terms of securing low cost of electricity supply.

The cases of India and South Africa provide interesting examples of systematic policy learning over time. In 2014, over 270 million people were not connected to electricity grids in India. Here, power outages are frequent (World Bank, 2017), and the willingness and ability of many consumers to pay for electricity are limited, even if tariffs are highly subsidized. Yet, India has an enormous solar energy potential. Thus, in 2012, the government enacted the National Solar Mission with the aim of increasing capacity of grid-connected solar power generation from 0.1 GW to 20 GW, plus 2 GW off-grid, by 2022, and lowering costs to retail grid parity. Despite the manifold structural problems of its energy market, India succeeded in leveraging substantive investments in solar power plants. Within just 5 years, installed solar capacity increased to about 13 GW (Ministry of New and Renewable Energy, 2017). At the same time, the cost of solar energy fell below the cost of new-built coal capacity.

This was achieved through highly effective competitive reverse auctions for 25-year FiT. As it was impossible to know at which price per kilowatt hour firms would invest in solar power plants, the government first tested the market with tenders for small projects. Project developers were invited to submit bids specifying at which tariff rates they would be willing to invest. The government selected the proposals with the lowest bid. Then it organized the next tender for larger projects, asking bidders to bid below the level of the first tender, and so on. After the first year of repeated auctions, the price had come down from 0.27 to 0.11 euro per kWh (Altenburg & Engelmeier, 2013). By 2017, bids had come down to 0.04 euro (Clover, 2017). In parallel, bid specifications and contract design changed over time to incorporate insights from the previous tenders. The government also learned from failed auctions in Europe where investors had made low bids but failed to fulfill their contracts. To avoid such so-called adventurous bidding, bidders had to make bank deposits, which they would lose when failing to fulfill their contracts. Ultimately, the National Solar Mission, with its clearly defined targets, sequenced approach, and in-built safeguards, was successful in terms of mobilizing investment *and* decreasing tariffs (Altenburg & Engelmeier, 2013).

South Africa has experienced a similar success story, albeit on a smaller scale. Also through the employment of an auctioning scheme similar, South Africa has been able to increase its renewable energy capacity significantly, from virtually no installed capacity in 2011 to over 3.2 GW in 2017 (Creamer, 2017). The most recent bid window achieved a tariff of 0.62 ZAR per kWh (about US$0.05) for solar photovoltaic and wind energy. Estimations for new-built coal capacity in South Africa range from 1.03 to 1.16 ZAR per kWh (Bischof-Niemz & Fourie, 2016), which means that new renewable capacity is currently over 40% cheaper than new coal capacity. Political support was, among other factors, ensured by including local economic development criteria for project developers (see Baker & Sovacool, 2017, for the political economy aspects of these criteria, and Ettmayr & Lloyd, 2017, for the economic effects).

With the diversified experience gained and lessons learnt in these emerging markets, designing an effective auctioning scheme is a promising option for reforming FiT systems that in some European countries (notably in Germany) have not been as efficient as initially expected. Germany decided to gradually shift its support of renewable energies from predetermined FiT to tendering, hoping to curb excessive profits that arose from the interplay of rapidly decreasing technology cost and relatively inflexible FiT rates, in particular in solar photovoltaics (Pegels, 2017). This constitutes an intriguing case of exporting a policy scheme and, in time, reimporting its improved version (Pegels & Lütkenhorst, 2014).

Integrating Market Mechanisms in Green Energy Policies

The last underlying factor contributing to successful green energy policy relates to the use of market mechanisms. The more competitive market-based mechanisms and private-sector initiatives are built into green energy policy design and implementation, the smaller will be the likelihood of capture and the proliferation of private gains. This may involve building competitive bidding into green subsidy approaches, testing new technologies in public–private collaborations, using the most efficient product developed by the private sector as performance standard for similar products, and phasing-in standards by encouraging the private sector to adopt voluntary standards, which are made mandatory once producers and consumers had time to adapt. The choice of the respective policy instrument depends on the policy issue that is targeted as well as on the country context. What works in Norway can, but need not, work in China, India, or Mozambique. In the design and implementation of these policies, the management of rents and the risk of political capture are essential, as we discuss later.

Managing policy rents. The green energy transformation requires enormous upfront investments which, given the manifold market failures, need to be induced by policy. Put differently, policy rents need to be created to make these investments artificially attractive, while profits related to unsustainable business practices need to be reduced. Following Schmitz et al. (2013), we define policy rents as ''risk-adjusted above-average profits made possible by government intervention'' (p. 7).

The management of policy-induced rents thus involves the creation (respectively dismantling) of incentives that cause economic actors to temporarily generate profits above (respectively below) those the market itself would allow. These incentives need to be calibrated to establish conditions of optimal encouragement without overshooting. The obvious risk is that an overly generous provision of incentives leads to a wasteful allocation of scarce resources and triggers behavioral patterns that turn rent seeking into the very objective of investment, thus stifling the entrepreneurial drive for innovation.

When conceptualized and implemented in an optimal manner, policy rents can indeed be a powerful tool and have the potential to become a strategic resource for driving structural change (Altenburg & Engelmeier, 2013). Energy systems in particular have always been shaped by policy rents, with many countries favoring coal-based regimes during the postwar decades, some investing in nuclear energy in the 1970s and 1980s, and increasing numbers supporting renewable energy since the 1990s. The range of specific instruments is broad. Rents can be created by raising prices (such as in the case of FiT for renewable energy sources), providing long-term loans at preferential rates, subsidizing research-and-development investments into specific new technologies, or creating a dedicated physical or institutional infrastructure for collaborative technological exploration activities (for instance, in the form of a public–private research consortium). However, as Schroeder (2010) rightly stated that ''public officials also act on their own convictions, including their convictions about the public good'' (p. 450), the risk of political capture cannot be neglected.

Managing the risk of political capture. Literature on industrial policy offers particularly valuable lessons for analyzing the risk and management of political capture in state–industry interactions. In essence, it asserts that powerful interest groups can influence the outcome of regulatory action by government agencies (often through lobbying) and counteract the intended purpose of incentive schemes (Laffont & Tirole, 1991).

The ability to resist lobbying pressure is generally low in contexts of poorly developed government capabilities, weak monitoring systems, and insufficient transparency, conditions prevailing in many developing countries. However, experience with the European Emissions Trading Scheme, for example, shows that political capture also happens in context of highly developed government capacities. Various authors claim that the European Emissions Trading Scheme has fallen prey to a mix of vested interests of various lobby groups advocating the free allocation of permits (''grandfathering''), exemptions, and loopholes, and the excessive issue of permits, contributing to what Helm (2009) called the ''climate change 'pork barrel''' (p. 26).

What is more, in many countries, environmentally adverse incentives go beyond mere exemptions to outright subsidization of polluting activities. Although the debate on fossil-fuel reserves and stranded fossil-fuel assets is gaining traction (Carbon Tracker Initiative, 2013; Financial Times, 2014a, 2014b; McGlade & Ekins, 2014), countries worldwide are continuing to heavily subsidize fossil fuels.

Even though a global consensus has been reached that fossil-fuel subsidies pose substantial constraints to the green transformation process (Beaton et al., 2013), reducing subsidies is notoriously difficult. Although fossil-fuel subsidies are justified by policy makers on equity and competitiveness grounds, there is mounting evidence showing that continuing to pay such subsidies has adverse

social, fiscal, and environmental effects. In particular, fossil-fuel subsidies have been benefiting middle- and high-income population groups and other powerful stakeholders—such as energy-intensive industries and fuel distributors.

For these reasons, reforming subsidies requires close cooperation between the society at large, the state, the business sector, and energy producers, as well as international donors. Strong vested interests among these stakeholders, and even within the government, trigger multifaceted political economy dynamics. Where reforms were successfully implemented in the past, alliances were formed between various stakeholders, compensation schemes implemented, and extensive information campaigns carried out (e.g., South Africa, Turkey, Philippines). In these countries, independent agencies for energy policy were set up, which contributed to ensuring stability and consistency of reforms. At the same time, improved macroeconomic conditions and transparency in decision making reduced opposition and supported coalition building (Clements et al., 2013).

Reforms, however, often fail due to a lack of state capabilities to manage strong opposition from interest groups, a lack of public awareness on the size, and the impact of subsidies and inability to form consensus among diverging interests (e.g., Mexico, Egypt; Clements et al., 2013; Vidican, 2014). Indeed, Lockwood (2015) argued that countries with the strongest need for subsidy reform are also likely to have the least political capacity for carrying out reform (mainly due to subsidies being used as tools of political legitimization and weak channels for compensating vulnerable income groups). Where political credibility is low, Lockwood suggested second-best solutions to subsidy reform, such as a shift from fossil-fuel to food subsidies—the latter being easier to monitor and less environmentally harmful, as well as contributing to reducing poverty.

In view of the high incidence of political capture, and given high uncertainties and risks involved in green energy policy, there must be commensurate demands on transparent implementation as well as tight monitoring. This can be achieved by, for example, developing road maps based on inclusive technology foresight exercises as well as regular performance evaluation of organizations responsible with policy implementation. This is particularly important in contexts of weak institutional capabilities (Altenburg, 2013), where checks and balances need to be strengthened to disentangle and evaluate different policy functions.

Conclusion and Future Research

In this article, we reflected on the importance of green energy policy in guiding a green transformation. Such transformation requires creativity and an accelerated rate of innovation, in terms of technologies as well as institutions. Economic history has shown the importance of the private sector in developing commercially viable solutions for a wide range of problems—in some cases, without major government support but often, as Mazzucato (2013) has recently shown, with quite substantial public investment at precompetitive stages. The

conventional debate, which tends to juxtapose the state with the market, is as stale as the stereotype of picking winners. As Rodrik (2007) put it after having analyzed and compared state-centered and market-centered industrial policies of the past, ''reality has not been kind to either set of expectations'' (p. 99).

The art of any policy aiming at structural change, and green energy policy in particular, is thus to find agreement on the broad direction of desirable societal change. Regulations and rent management processes should also offer incentives for the private sector to identify the most effective and efficient solutions.

There is no doubt that uncertainties and risks are exceedingly high, and thus, less optimal choices are likely to be made. This is why a rational and transparent policy process, continuous and systematic policy learning, and options for corrective action are of greatest importance. At the same time, the green transformation offers new opportunities and numerous cobenefits, ranging from job creation and competitiveness in new green sectors to health benefits, energy access, and security, to name just a few. Furthermore, as change dynamics are often mutually reinforcing, effort should be made in supporting positive feedback loops; for instance, new information and communication technologies may expand global knowledge networks and consumers' environmental awareness; new technological options may drive more ambitious regulations, and vice versa; scientific insights and pioneering applications may inform new, more sustainable development narratives, and so on.

We see three particular areas for future research. First, better understanding how the aforementioned coevolutionary change dynamics unfold, who and what drives or obstructs them, is necessary as such dynamics are the basis for accelerating the green transformation. Second, context- and country-specific solutions for a green transformation require further analyses. This applies to country-specific institutional contexts, for example, in situations when markets fail and governments are weak (Altenburg & Lütkenhorst, 2015). It also relates to the energy market context, which can significantly influence the political economy of green energy policy implementation. Third, the implementation of green energy policies will require a basic degree of societal acceptance. The essential need for societal acceptance of green energy policies is related to their distributional impact, in particular, in terms of affecting the balance between green sunrise and brown sunset industries. The same applies to the impact on different interest groups, which is one of the reasons for the continued prevalence of fossil-fuel subsidies. Yet, as Lederer et al. point out in this volume, while debates on growth and inequality as well as growth and environmental damage have taken place for many decades, a systematic analysis of the synergies and, in particular, the trade-offs between green and inclusive growth have been largely missing so far.

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Note

1. The World Resources Institute uses a broad definition of the energy sector, including the subsectors electricity or heat, manufacturing or construction, transportation, other fuel combustion, and fugitive emissions. Given the strong interdependencies between these subsectors and thus the implications on policy, we adopt this definition here.

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