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A post-2020 EU energy technology policy: Revisiting the strategic energy technology plan

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HIGHLIGHTS

- We discuss options for a post-2020 EU energy technology policy.
- The policy context is defined by market pull regimes, and here foremost by the ETS.
- A multi-criteria evaluation shows that no single policy is clearly superior.
- We propose a revised, post-2020 SET Plan that supports all possible futures.
- Priority identification requires a comprehensive approach across sectors.

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ABSTRACT

With the European Strategic Energy Technology Plan (SET Plan) expiring in 2020, the EU needs to revisit its energy technology policy for the post-2020 horizon and to establish a policy framework that fosters the achievement of ambitious EU commitments for decarbonization by 2050. We discuss options for a post-2020 EU energy technology policy, taking account of uncertain technology developments, uncertain carbon prices and the highly competitive global market for energy technologies. We propose a revised SET Plan that enables policy makers to be pro-active in pushing innovation in promising technologies, no matter what policy context will be realized in the future. In particular, a revised SET Plan should include a more technology-specific focus, provide the basis for planning and prioritization among decarbonization technologies, and should be based on a comprehensive approach across sectors. Selected technology targets and EU funding of innovation should be in line with the SET Plan prioritization.

1. Motivation

The long-term EU climate policy goal is to reduce greenhouse gas (GHG) emissions within the EU by at least 80% below 1990 levels by 2050. European policy makers are facing substantial challenges in achieving this goal. Current policy initiatives, such as the Strategic Energy Technology Plan (SET Plan), are running out in 2020. Global competitive pressure on European industries, along with the sovereign-debt crises, heavily constrain existing budgets and public acceptance for climate and clean energy policies. These constraints are well illustrated by the rejection of the proposal to back-load emission rights by the European Parliament in early 2013. Nonetheless, clear-cut policies for 2050 are needed, a fact also stressed in the recent EU Communication on Energy Technologies and Innovation, see EC (2013).

Much effort has already been spent on the evaluation and impact analyses of different policies promoting different (to a high degree decarbonized) technology mixes, see e.g. EC (2011a); Eurelectric (2011), or IEA (2012). These analyses suggest that much of the success of European climate policy depends upon low-carbon energy technologies and their viable deployment in European electricity markets. However, most studies propose and analyze different technology mixes and do not put much emphasis on the evaluation of different policies—which policy and to what extent can steer electricity markets to one or the other future technology mix remains an open question. Little work also has been done so far on the role of public support on inventions and the adoption of breakthrough technologies, see OECD (2012) and Chiavari and Tam (2011).

For this reason, our article develops and discusses different policy paths for a post-2020 EU energy technology policy. We evaluate these different paths and show which technology mixes are more likely to realize, given one or the other path. We also propose a design for a renewed post-2020 SET Plan that can – under any future

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policy path – be an effective tool for policy makers in steering innovation and pushing low-carbon energy technologies.

The paper is structured as follows. Section 2 demonstrates the need for a European energy technology policy and critically assesses the effectiveness of currently implemented policy measures. Section 3 proposes possible paths for a post-2020 policy, which are then evaluated along several criteria in Section 4. In Section 5, we finally discuss policy implications for a revised SET Plan that should not exclude the possibility to act within any future context. Section 6 concludes.

2. Need to revisit existing policies

In what follows, we demonstrate the need for a European energy technology policy and critically assess the effectiveness of currently implemented policy measures.

2.1. Why an energy technology policy is needed

An energy technology policy comprises all measures that aim at promoting a selected set of energy technologies from early research to market deployment. Such a promotion typically leads to many overlaps with other policy areas. As different technologies show different environmental impacts, energy technology policy also relates to environmental policy. When selected technologies and projects are then supported at the basic research stage, intersections with science and innovation policy arise. When certain technology sectors are promoted on the world market, technology policy influences industrial or even trade policy. In this article, we focus on energy technology policy in a narrow sense, in which policy makers can choose which technologies to promote, by what means, to which extent, and for which period of time.

That from an economic point of view policy intervention and the existence of energy technology policy as such is justified, is commonly accepted in the economic literature. Technology policy can be motivated by market externalities and market imperfections on the one hand, or by strategic industry and trade policy concerns on the other:

2.1.1. Environmental externalities

The emission of GHGs involves negative externalities. Emitters cause climate change and, thus, impose costs on the whole population and future generations. The reduction of emissions consequently is a global public good and unless such reduction is adequately rewarded, or emissions properly charged, the incentive to develop and deploy low-carbon technologies will be too low. From a global perspective, a common, comprehensive, global carbon price would be the economically efficient instrument, inducing emission reductions wherever they are cheapest and minimizing abatement costs across all sectors, see also Stern (2006). A technology policy may implement incentives in favor of deploying low-carbon technologies.

2.1.2. Innovation externalities

Most low-carbon technologies are not yet competitive or even not technologically proven. All fundamental and a part of applied knowledge gained from research activities is a public good, because without a very restrictive access regime, innovating firms cannot fully appropriate the returns to their RD&D activities due to existing spillover effects. Jaffe (1996) gives an excellent account of various market and technological spillovers arising from private innovation activities. Martin and Scott (2000) and Foxon (2003) discuss the resulting market failures of low-carbon innovation. In this context, a technology policy may implement incentives to innovate despite spillover effects.

2.1.3. Capital market imperfections

Capital markets suffer from information asymmetries among innovators, investors and policy makers. Moreover, innovations in clean energy technologies often pair high capital requirements with substantial economic, technical and regulatory uncertainties. As a result, many investors are constrained in equity as well as debt capital. Moreover, Hyytinen and Toivanen (2005) present evidence that especially small and new firms suffer from higher cost of capital than their larger, incumbent competitors. In this vein, a technology policy can include tools, such as low interest loans, that ease funding whenever the net benefits of respective projects are positive but financial agents reject finance.

2.1.4. Increasing global competition

A major challenge Europe is facing today is “to remain at the forefront of the booming international market for energy technology” (EC, 2010, p. 15). If decarbonization has no alternative, but real potential gains from decreasing electricity generation and supply costs only occur in the longer-run, growth effects stemming from the competitive production and profitable trade of low-carbon technologies on the world market are key to enhance growth in the shorter-term. Hence, technology policy can be motivated by strategically pushing certain low-carbon technologies on the world market.

2.2. Effectiveness of currently implemented policy measures

The effectiveness of existing policy measures can be assessed in the context of the four above initial reasons for policy intervention. Especially regarding environmental and innovation externalities and also financial measures to account for capital market imperfections, we find that current policy measures are limited in their effectiveness and call for improvements for the post-2020 horizon.

The major policy tool to account for the environmental externality is the EU-wide emission trading scheme (EU ETS), introduced in 2003. The 2009 climate and energy policy package strengthened legislation and extends the coverage of the EU ETS substantially.[1] However, the EU ETS does not yet deliver an adequate price signal, see Ellerman et al. (2010); Schmidt et al. (2012), or Martin et al. (2012). Prices are neither at a sufficiently high level nor reliable, but instead are argued to be too low and far from being predictable in the long-term. As a consequence, the UK Government, for instance, unilaterally introduced a price floor of GBP 16/ton in 2011 (which follows a linear path up to GBP 30/ton in 2020). The European Parliament's recent rejection of the backloading proposal further decreases the chances that sufficiently tight caps will be introduced soon, and it is open whether different European Member States might follow the British example as a result of this decision.

Regarding innovation externalities, EU policies mainly aim at directly or indirectly promoting low-carbon technologies. Indirect promotion mostly comes in the form of national support schemes for low-carbon technologies. Directive 2009/28/EC sets binding national targets for the share of renewable energy sources (RES) in gross final energy consumption by 2020. Member States have full autonomy in the choice of policy measures and have already implemented a wide set of instruments, see also Ecofys (2011), Jacobsson et al. (2009), or Ragwitz et al. (2011) and references therein). Kitzing et al. (2012) find indications for a bottom-up convergence of policy choice. Indeed, the Commission expressed lately that “a greater convergence of national support schemes to facilitate trade and move towards a more

[1] Directive 2009/29/EC considers a single EU-wide cap on emission allowances from 2013 on, the stepwise replacement of a free allocation by auctioning, and an enlarged list of activities and GHGs covered. Decision 2010/634/EU sets the total EU-wide amount of allowances at 2039 mn for 2013. The cap will decrease by 1.74% per year, with this factor to be reviewed by 2020.