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Renewable energy: from marginal to mainstream

Policy brief

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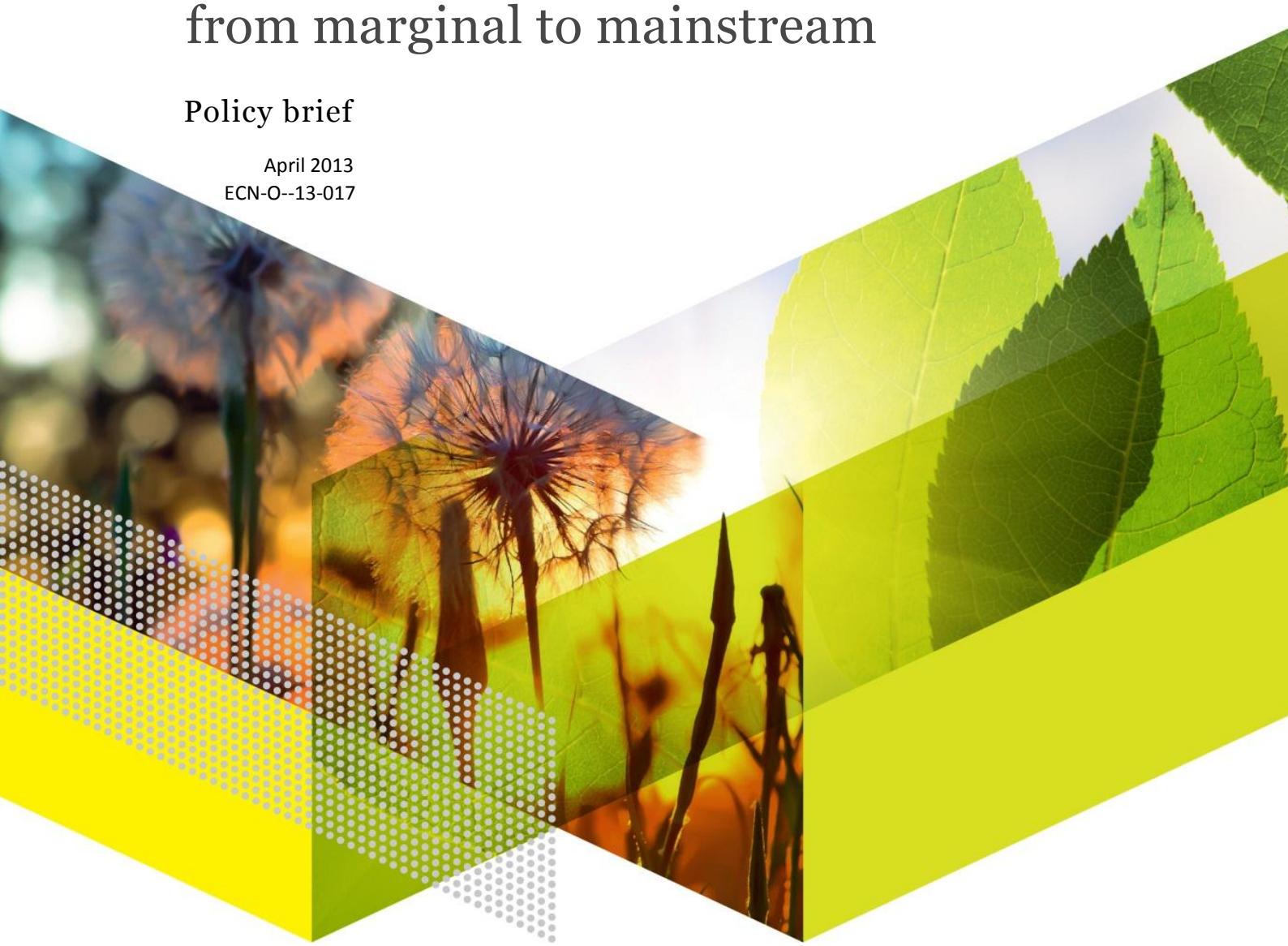

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Introduction

Renewable energy is facing a new era, both globally and in the European context. The EU has agreed to an 80-95% reduction in CO_2 emissions by 2050. In all routes towards decarbonisation of our energy economy, rigorous further growth of renewables is necessary, as illustrated by the Commission's Energy Roadmap 2050.

To date, renewable energy has been given favourable conditions in an attempt to gradually increase its share. The current EU policy framework promoting renewable energy includes an ambitious 20% share of renewable energy in final gross energy consumption in the EU by 2020. For a sustainable energy future, this share will need to increase further to at least 60-80% of total energy supply by 2050. Renewable energy needs to become truly established, and by 2030 the European Union needs to be well under way.

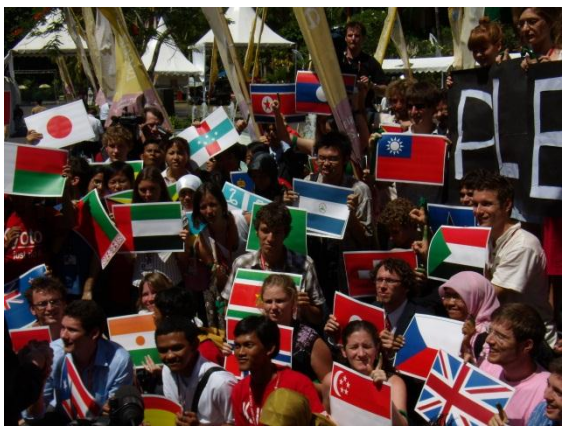
The question of how to bring renewable energy from marginal to mainstream is key. At present, there is no EU renewable energy policy framework beyond 2020, although the Communication on Renewable Energy outlines different options for a 2030 policy framework.

Not only is the question how we get there, we also need to know how the energy system can function with such a high share of renewable energy. Several issues that could be safely ignored as long as renewables were still in their infancy need clear policy maker's attention when they are expected to grow towards becoming our dominant energy source.

This policy brief, by the Policy Studies Unit of the Energy research Centre of the Netherlands (ECN), aims to instigate a debate on the broader enabling conditions required to move renewable energy from marginal shares in the European energy system to a mainstream role. It does so by posing seven key questions related to public movement, the political-industrial complex, resources and sustainability, grids and markets, finance, legal procedures and overall policy. These questions require short to medium term attention to keep a long-term renewable energy system within the realm of possibilities. This policy brief also provides ECN's initial reflections on how these key questions could be addressed, and indicates which relevant expertise it can bring to the table.

1. How can a public movement on the future of renewable energy take shape?

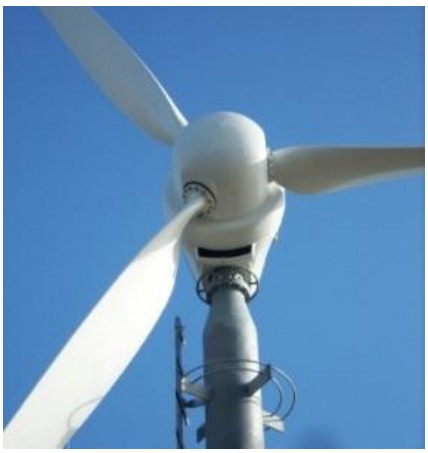
Great transitions in democratic societies require public legitimization, as citizens and consumers make choices that shape society. A transition of the European energy system towards greater shares of renewable energy requires public consensus that this transition is beneficial and necessary. If such a consensus is lacking, politicians will have to make difficult choices without a mandate, which in the long run makes their policies vulnerable. A renewable energy system will only be feasible with general and enduring public willingness.



People affect politics in several ways. As citizens, they elect political parties and politicians decide on policies. But for a renewable energy system, their behaviour as consumers also matters, i.e. their eagerness to install solar heaters and power systems on their houses, their willingness to buy energy-efficient appliances and shares in wind cooperatives, and their constructive participation in processes around siting infrastructure. Additionally, the decentral nature of several renewable options might change the relationship between power utilities and consumers; partly the latter will develop themselves into 'prosumers', on an individual or collective basis. This can lead to a more polarised debate on the fundamentals of our energy economy, while a general bottom-up consensus on the way forward will be required for governmental policies to succeed.

A public consensus cannot be built or forged, it needs to grow. However, it cannot grow without reliable information on our energy system. ECN Policy Studies has a strong track record in providing society with independent information on the energy system, and foreseeable effects of changes in our energy mix. ECN will continue to play a key role in doing so, in collaboration with environmental NGOs, local governments, regulatory agencies, and renewable energy companies. All these parties play essential but different roles in organising collective participation of the general public in shaping a renewable energy system. ECN Policy Studies can also provide support in the process of thinking about innovative governance styles that make use of new bottom-up initiatives related to decentral renewable energy.

2. How can the government-industrial energy system favour renewables?



Since the discovery of fossil fuels, European policies have been shaped to facilitate their extraction and use. These policies have created societies which have grown to depend greatly on fossil fuels. Subsidies have played a key role, and although fossil fuel-based energy is today commercially viable, the sector continues to receive large subsidies and other support from governments. This creates market distortions and continues to lock economies into long term reliance on fossil fuels. In a changing policy environment, companies and businesses will naturally look out for their own interests, especially if policy changes threaten profit margins and/or increase exposure to risks. A key challenge for policy makers is how to get the fossil fuel industry on board and committed to a real transition in the direction of mainstreaming renewable energy, whilst minimising unfavourable impacts on the sector and the economy as a whole.

The production cost of fossil fuels is often low and profit margins are high, generating attractive income for governments. These earnings are crucial for governments, particularly at times with constrained public budgets and economies slowly recovering from the aftermath of a financial crisis. Governments may find it hard to implement policy changes which may have negative impacts on their income, such as tax earnings, and their instincts may be to protect industries and companies that already exist.

Against this background, important questions arise, such as how political and institutional imbalances in the economy and in the political process can be changed, and how we can strengthen a 'renewable energy complex'. In providing a policy framework that facilitates renewable energy, governments must provide a clear vision on the phasing out of unwanted technologies and look for options to reduce the uneven impacts on winners and losers, or allow for bargains between the two. Through various studies on renewable energy and public acceptance issues, and on the dynamics of supporting local energy innovation, ECN Policy Studies has gained

excellent insights and knowledge on some of the underlying challenges and opportunities we face in creating public movements toward a renewable energy complex, and how these can be approached.

3. How can sustainability, resource efficiency and renewable energy be balanced?

All energy technologies make use of natural resources, and renewables are no exception in this respect. A shift towards a more renewable energy economy relaxes the pressure on e.g. fossil fuel and uranium stocks, and reduces e.g. CO_2-related pressures on ecosystem services. However, renewables will cause pressures on other natural resources: Wind and PV technologies require rare earths, and biomass production requires land and water; concrete examples of pressures that relate to other stocks and ecosystem services. Obviously, there is a need for renewable energy technologies to be as resource-efficient as possible, and many R&D efforts aim at that. But more fundamentally, policy frameworks need to include attention for essential scarce natural resources and eco-system services in a credible way. After all, this is an essential element in political decision-making that balances our current needs with those of the generations after us.

Resource efficiency assessment frameworks should enable transparent insights into the impacts of various technologies, and the trade-offs between them. Broad consensus is needed at EU level on methods to value the complex impact of renewable energy policies and measures on resource efficiency. In this respect, the Commission's resource efficiency flagship initiative (COM (2011) 21) comes very timely. Such frameworks should pay attention to e.g.:

- How to value non-monetary stocks and services, such as clean air and water, biodiversity, and soil fertility?
- How to deliver products as resource-efficient as possible, considering full life cycles (in time and spatial terms)?
- How limited resources can be optimally allocated to the sectors in which they have maximum value-added?

A robust policy framework needs to promote renewable energy while considering the interrelations with use and quality of the earth's resources. Sustainable use and management of those resources should be embedded into a wide range of political initiatives that avoid lock–in effects and promote efficient use of resources, in which both the environmental and economic benefits are prioritised. In this field, ECN Policy Studies can support in several ways. Firstly, we have solid insight in renewable energy technologies, and can judge which directions innovation could take in making them more resource-efficient. Secondly, on an energy system level, we can evaluate what (sets of) applications creates highest value added for a limited resource (e.g. biomass). Finally, we are aware of developments regarding resource efficiency policy to advise clients on potential policy directions and the possible implications on e.g. renewable technology prospects.

4. What will large shares of renewable electricity require from grids and electricity markets?

All projections show that there will be a significant increase in the demand for electricity across Europe. As such, large investments in new infrastructure are needed for three reasons: to replace ageing components, to facilitate the mainstreaming of renewable electricity and to accommodate increasing demand for electricity. Key issues are (i) how to provide proper market incentives to new generation and infrastructure investments, (ii) how to align siting of generator capacity and infrastructure development, and (iii) how to further develop demand side management.

As for the first issue, prevailing market distortions in a slowly evolving European electricity market are hindering a cost-efficient integration of renewable energy. A key question is how to actually design the market to allow for integration of electricity based on different (fossil and renewable) energy sources on 'equal footing', and in doing so tackle the distortions. The challenge is not to push renewables into the market at whatever cost but rather to create a market framework that will accommodate renewable energy and its variable characteristics, exposing electricity generated from renewable and other resources to risks that it can tackle. In this context, capacity markets are a hot potato. Providing incentives to generating companies to ensure sufficient reserve capacity through conventional power plants (currently via the TSO-organised markets for regulation and reserve power) may incur significant costs to society. However, these costs need to be compared to the costs of supporting renewables (often affecting government budgets) and costs of increasing transmission network capacity (funded via transmission tariffs). Strengthening transmission networks will reduce the cost of supporting intermittent renewables. All in all, side-effects of capacity markets to development of renewables will need to be reviewed carefully.

The second issue is improved alignment of the siting of new generators in relation to network planning to ensure cost-effective network development. For TSOs, large-scale (offshore) wind is a key concern due to its remote location and variable generation, sometimes resulting in lower than average network utilization. If national TSOs are given the mandate to do so, coordinated siting of new generators and planning of new networks across national borders will allow for better network utilization. Also, allowing generation from offshore wind parks to flow to more than one country would require changes to national support schemes. DSOs face similar challenges for certain forms of distributed generation, especially those based on intermittent sources such as onshore wind and solar PV. In both the TSO and DSO cases, a possible solution could be to integrate support schemes with network planning, by for example including a location-specific component in the support scheme.

Finally, it is clear that a substantial unrealised potential for demand side management (DSM) exists, but its effective size is difficult to determine.

Most likely, providing DSM opportunities to customers will affect to some extent their fuel choice and their investment decisions, thereby changing the effective potential. For households, the existing DSM price incentive - day and night tariffs - only leads to a very limited aggregated reaction of customers. The introduction of smart meters will allow more dynamic tariff structures that can result in a more effective price incentive. For that to materialise however, regulatory stringencies need to be relaxed in order to allow DSOs to have sufficient manoeuvring room or 'regulatory flexibility' to provide these incentives to local consumers and producers.

In moving renewable energy integration forward, emphasis must be put on finding innovative, 'out-of-the box' designs for regulating the markets, incentives for new infrastructure and their siting, and DSM. At the same time, more attention must be given to cooperation and coordination across Europe. On the topic of grid and market integration, ECN Policy Studies provides research and policy advice on the transformation and adaptation of regulatory frameworks, at both transmission and distribution levels. Besides, ECN Policy Studies can provide power and market development scenarios as a basis for this.

5. How can adequate financing be raised for renewable energy and its infrastructure?

Mainstreaming renewable energy in the EU in the coming decades will require a huge scale-up of investments. This creates a challenge as access to traditional sources of capital has become a serious constraint in the aftermath of the 2008 financial crisis. The crisis has led to, among others, more cautious lending behaviour of banks, and to corporations and utility companies having less solid balance sheets, reducing their capacity to bear large-scale investments in capital-intensive renewable energy projects. As in all capital-intensive sectors today, new approaches will be key in attracting required capital to scale up renewable energy.

Whilst the gap between needed and available capital for new renewable energy investments remains large, there are encouraging signs showing that new sources and conduits are emerging and available. However, these new sources of capital, such as pension funds, are raising new issues which need to be addressed, e.g. how risks are managed and by whom. This will play a key role in the success of mainstreaming renewable energy. On the risk aspect, the current and future design of support schemes is crucial.

So far, governments have been active in the promotion of renewable energy through traditional efforts such as setting ambitious renewable energy targets, improving support scheme designs, introducing new efforts to reduce administrative barriers, and addressing public resistance through new measures. However, it is clear that governments will also have to come on board regarding the financing aspects.

To tackle the financing challenges, governments will have to take new and challenging actions facilitating and sourcing finance - i.e. actions to attract more capital as well as actions to reduce unnecessary capital requirements. And in doing so, risks need to be addressed in order to reduce the overall costs of projects, and governments need to consider how risks can be shared.

Spurred by government policy objectives, state-owned banks and multilateral financial institutions are becoming more active players in clean technology. In recent years, both the European Investment Bank and the European Regional Development Fund have invested large sums of money in renewable energy and large infrastructure projects for transmission of electricity in Europe. An often cited initiative is the UK Green Investment Bank, which was created by the UK Government in 2012 to attract private funds for the financing of the private sector's investments related to environmental preservation and improvement.

Finance availability could be enhanced by innovative public-private approaches. In addition, intensified cooperation between Member States could potentially reduce the overall need for capital at European level. The bankability of renewable energy projects and infrastructure for commercial banks will depend on the long-term stability and appropriateness of policy for renewable energy (see question 7). Enhancing the confidence of investors in renewable energy technologies is a key condition.

ECN Policy Studies has good knowledge of energy technologies and can address the various types of risks at hand, including policy risks. With such knowledge, ECN Policy Studies can support the development of innovative financing constructions.

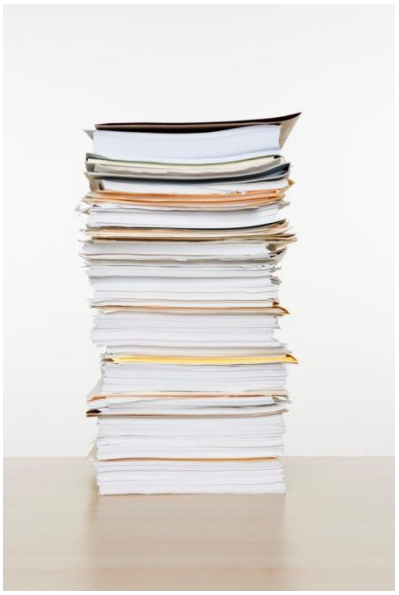
6. How can permitting for renewables be made efficient, practical and fair?

The duration and complexity of planning and permitting processes remains a key obstacle to the development of renewable energy and infrastructure projects. Renewable energy expansion projects often encounter large and costly delays, and in some cases cancellation, as a result of resistance from local stakeholders. The resistance of local stakeholders against energy projects is often explained as NIMBYism (Not In My BackYard): a generally positive attitude towards a technology, but strong objection when it starts affecting the personal environment. However, the origins of resistance can often be attributed to poor process management and a lack of ‘procedural justice’. Top-down, hierarchical, and technocratic approaches to decision making often lead to feelings of injustice and inequity within local communities; this could be prevented by developing more open and flexible procedures.

Instead of being a culprit of the lengthy procedures, people living near infrastructure locations could be powerful advocates of renewable energy. For this, they need to be properly engaged in an early phase and they should be given real opportunity to influence the way renewable energy is developed near where they live, allowing them to optimally link the project to other local values and interests.

Increased public engagement could also include cooperative ownership structures and additional (business) opportunities that will allow people to have a share in or benefit additionally from the renewable energy generation and infrastructure nearby. An essential element of more flexible planning and local ownership, however, is that the project developer should have good insights in the 'local context': culture, spirit and basic attitudes of the citizens. Which parties are trusted, which ones not, who are important informal representatives? Such insights allow developers to interact much more effectively with a local population, and next to 'technical site characterisation', 'social site characterisation'[1] might be equally important for the success of a project.

In some countries, legal procedures and public engagement are more effective than in others. EU Member States could learn from each other's good practices and experiences. On different levels, governments need to think through what legal requirements are absolutely necessary, make internal deadlines more ambitious and stick to them, and align the permitting procedures with both a dynamically robust policy framework (see question 7), and the support that a public movement can provide (see question 2). Project developers might need to overcome their fear of not being able to gain public engagement, shifting from top-down implementation of fully elaborated plans to more open and flexible planning processes.



As already mentioned under question 2 in this policy brief, ECN Policy Studies has gained excellent (quantitative) insights and knowledge on factors that affect citizen's attitudes towards renewable energy projects, and what impacts various communication strategies have. Also, we have developed tools and approaches for 'social site characterisation': the social and contextual mapping of a local environment. With these tools, we can support both policy makers and project developers in applying innovative approaches to renewable energy project development.

7. What policy framework can mainstream renewable energy?

Delivering the EU's 2050 decarbonisation objective necessitates a massive transformation of the entire energy sector; from production, transport and distribution, to use and storage. This transformation is sometimes referred to as the "third industrial revolution", and will only be achieved with the right policy ingredients. Two key ingredients of a policy framework of the future are robustness and flexibility. On the one hand, it should be flexible enough to steer through uncertainties and fluctuations in markets, and the unpredictability of future energy developments. On the other hand, it must provide sufficiently stable and predictable

[1] The term 'social site characterisation' describes the process of collecting and incorporating information about stakeholder views and about socio-economic, political and cultural characteristics of a particular area (source: http://www.sitechar-co2.eu/Sections.aspx?section=558.583.587). Likewise, technical site characterisation describes the designing of a project that is well suited to the site-specific physical (geographical) conditions.

investment conditions for renewable energy, and enable timely investments, innovations, and technological breakthroughs.

Policies must deal with uncertainties, and timely policy decisions are necessary as delays are likely to increase the costs of achieving the overall objective that is sought. However, it is also necessary to avoid 'lock-in' decision making. Decision-making in the face of uncertainty is not new. It is important to ask ourselves what is required of policies in a world that changes in ways that we do not always understand and cannot control. Until now, the EU has developed policy frameworks for promoting renewable energy in 10-year phases. First, voluntary 2010 targets for renewable electricity were introduced, followed by renewable energy in the transport sector. These targets were coupled with soft requirements to improve the uptake of renewables.

In 2009, binding renewable energy targets in the EU for 2020 were adopted, coupled with more stringent requirements to reduce various deployment barriers. The focus is now on a 2030 framework for further promotion of renewable energy, building on the experience gained through the existing framework. This approach allows for policies to develop in stages and to adapt to innovation, technology breakthroughs and evolving markets, on the one hand, and lessons learned and best practices, on the other. Many advocate that a continuation of targets for renewable energy sources in the EU to 2030 is necessary to provide a stable framework for investments. In the longer term, when a level playing field in the energy market is created, targets can be removed.

Policies also need to be coordinated in order to achieve maximum efficiency, and this will become ever more important when renewable energy becomes mainstream. This implies coordination across sectors not only within a country but also across countries. The latter is particularly important in view of Europe heading towards a single European energy market.

Finally, a policy framework that effectively mainstreams renewable energy should take into account barriers, external effects and new challenges that come with further growth of renewable energy; some essential ones which have been discussed briefly in this policy brief. In terms of transition science, the time has come that renewables will grow beyond their niche position and will start co-shaping the landscape, in legal, institutional, social and technical terms.

This transition will require interdependent changes and innovations in all these dimensions, a true challenge to coordinate policy-wise. Perfect and ready-to-go answers for these challenges do not exist, but with its multi-disciplinary team of researchers and advisors, ECN Policy Studies is ready to support policy makers, industries and other relevant actors in all issues they encounter.

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A full overview of data and assumptions is available from the authors.

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