Executive Summary

Background

This publication reviews the success of policy implementation and development based on a analysis of market trends in the three renewable energy (RE) sectors - electricity, heat and transport. It also provides an in-depth analysis of the deployment impact and cost-effectiveness of current policies based on quantitative indicators.[1]

This analysis updates and expands *Deploying Renewables: Principles for Effective Policies* (IEA, 2008), published by the IEA in 2008 in light of events and trends in the last five years. It also extends the analysis to a wider range of countries beyond the OECD and BRICS countries, focussing on 56 countries representative of each world region.

Market developments

Key finding

RE deployment has been expanding rapidly. Growth rates are broadly in line with those required to meet the levels required in IEA projections of a sustainable energy future.

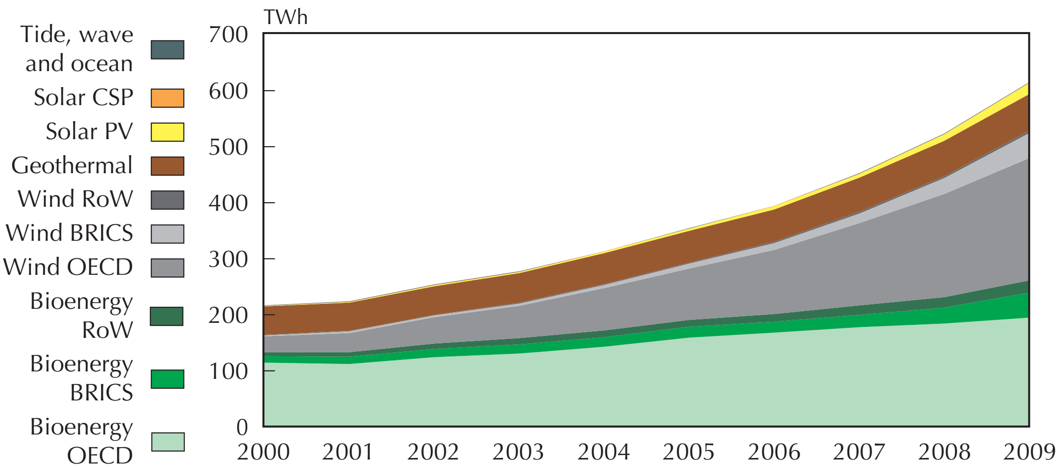
RE deployment has been expanding rapidly, which is evidence that this group of low–carbon energy technologies can deliver the intended policy benefits of improved energy security, greenhouse gas reductions and other environmental benefits, as well as economic development opportunities. Each of the RE sectors has been growing strongly, at rates broadly in line with those required to meet the levels required in IEA projections of a sustainable energy future, such as the *WEO* 2010 450 Scenario (IEA, 2010*a*). These scenarios also depend on increases in energy efficiency and the deployment of other low–carbon energy options.

- The RE electricity sector, for example, has grown by 17.8% over the last five years (2005-09) and currently provides 19.3% of total power generation in the world.
- Hydro power is still the major source of renewable electricity (83.8% of RE generation, corresponding to about 16% of total generation in 2009), and the absolute growth in hydro generation over the last five years has been equivalent to that of all the other RE electricity technologies, mainly because of developments in China. Hydro will continue to be an important technology for years to come and must not be excluded from policy considerations.

1. This publication provides a summary of the main points of the work. More details are available in three associated IEA Information Papers, which are available via the IEA website, www.iea.org.
- *Renewable Energy: Markets and Prospects by Technology (Brown, Müller and Dobrotková, 2011).*
- *Renewable Energy: Markets and Prospects by Region (Müller, Marmion and Beerepoot, 2011).*
- *Renewable Energy: Policy Considerations for Deploying Renewables (Müller, Brown and Ölz, 2011).*

- The other newer RE electricity technologies have also grown rapidly, by an impressive 73.6% between 2005 and 2009, a compound average growth rate (CAGR) of 14.8%. Wind has grown most rapidly in absolute terms and has overtaken bioenergy. Solar PV has grown at a growth rate of 50.2% (CAGR), and installed capacity reached about 40 GW by the end of 2010 (Figure E.1).
- Progress in RE electricity penetration was focused in the OECD and in Brazil, India and China. The OECD was the only region where the deployment of less mature technologies (such as solar PV, offshore wind) reached a significant scale, with capacities in the order of GWs.
- Renewable heat grew by 5.9% between 2005 and 2009. Although the use of biomass is still the dominant technology (and includes the use of "traditional" biomass with low efficiency for heating and cooking), growth in solar heating, and to a lesser extent geothermal heating technologies, has been strong, with an overall growth rate of nearly 12% between 2005 and 2009. Growth was particularly driven by rapid increases in solar heating in China.
- The production and use of biofuels have been growing rapidly, and in 2009 they provided 53.7 Mtoe, equivalent to some 3% of road transport fuels (or 2% of all transport fuels). The biofuels sector has been growing very rapidly (26% CAGR in 2005-09). Biofuels production and consumption are still concentrated in Brazil, the United States and in the European Union. The main centres for ethanol production and consumption are the United States and Brazil, while Europe produces and consumes mainly biodiesel. The remaining markets in other regions and the rest of the world account for only 6% of total production and for 3.3% of consumption. Trade in biofuels plays a limited, yet increasingly important role.

Figure E.1 **Regional trends in non-hydro power generation, 2000-09**



Key point

Growth in non-hydro renewable electricity was driven by wind and to a lower extent biomass, in the OECD, China and India from 2000 to 2009.

RE competitiveness and economic support

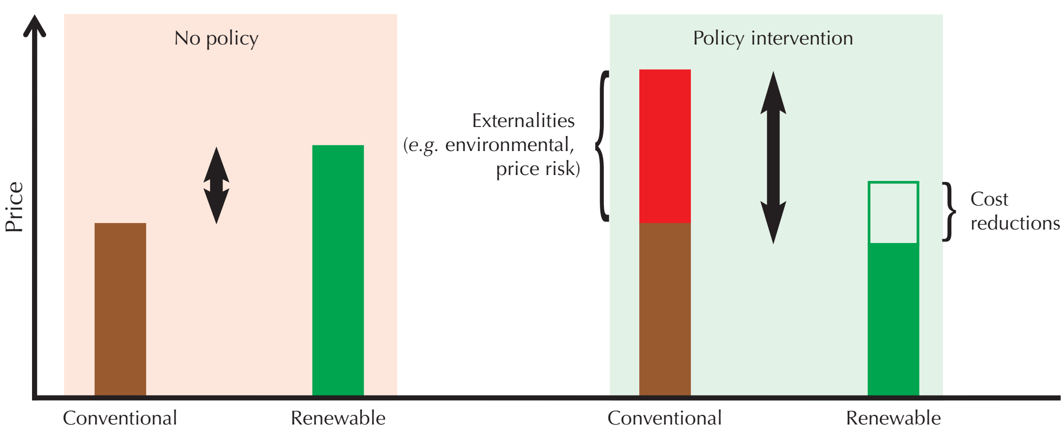
Key finding

A portfolio of RE technologies is becoming cost-competitive in an increasingly broad range of circumstances, in some cases providing investment opportunities without the need for specific economic support, but economic barriers are still important in many cases. A range of significant non-economic barriers is also delaying progress.

RE technologies may not generally be cost-competitive under current pricing mechanisms, and so may be inhibited by an economic barrier. The market expansion of RE technologies, however, has been accompanied by cost reductions in critical technologies, such as wind and solar PV, and such trends are set to continue. The portfolio of RE technologies, which includes established hydro power, geothermal and bioenergy technologies is now, therefore, cost-competitive in an increasingly broad range of circumstances, providing investment opportunities without the need for specific economic support. For example, wind projects have successfully competed with other generation projects (including gas) for long-term power purchase contracts in Brazil without special support measures, and solar water heating has expanded rapidly in China due to its favourable economics. Taking the portfolio as a whole, RE technologies should no longer be considered only as high–cost, immature options, but potentially as a valuable component of any secure and sustainable energy economy, providing energy at a low cost with high price stability.

Where technologies are not yet competitive, economic support for a limited amount of time may be justified by the need to attach a price signal to the environmental and energy security benefits of RE deployment, when these are not reflected by current pricing mechanisms. Support is also justified to allow the newer RE technologies to progress down the learning curve and so provide benefits at lower cost and in larger scale in the near future (Figure E.2).

Figure E.2 **Factors influencing RE competitiveness and the role of policies**



Key point

Policies should aim at internalising externalities and unlocking RE technology learning.

But even where RE technologies could be competitive, deployment can be delayed or prevented by barriers related to, for example, regulatory and policy uncertainty, institutional and administrative arrangements or infrastructure designed with fossil fuels in mind that may be unsuited to more distributed energy supply or the high up-front capital demand of RE technologies. Sustainability and social acceptance can also be critical issues for some technologies. In particular, regulatory and policy uncertainty may play a very significant role, even when economic barriers are removed, as shown by the analysis of the performance of financial support mechanisms in the next section.

Policy indicators

Key finding

The differences in impact and cost-effectiveness among the various economic support systems tend to be smaller than the differences among countries that have the same system. This underlines the importance of the overall policy package.

As an aid to identifying policy best practice, quantitative policy indicators have been developed that aim to answer the following questions:

- Are a country's policies stimulating growth in RE electricity generation on a track that leads to a sustainable energy future, such as the IEA *World Energy Outlook* 450 Scenario?
- Is a country paying a reasonable remuneration per unit of deployed RE technology?
- Is a country getting a volume of RE electricity generation in line with the remuneration that it allows for generators?
- Are the overall costs of support premiums in line with the contribution of the technology to the country's electricity system?

Three quantitative indicators were developed and applied to the onshore wind and solar PV policies for countries in the OECD and BRICS regions, where comprehensive data are available.

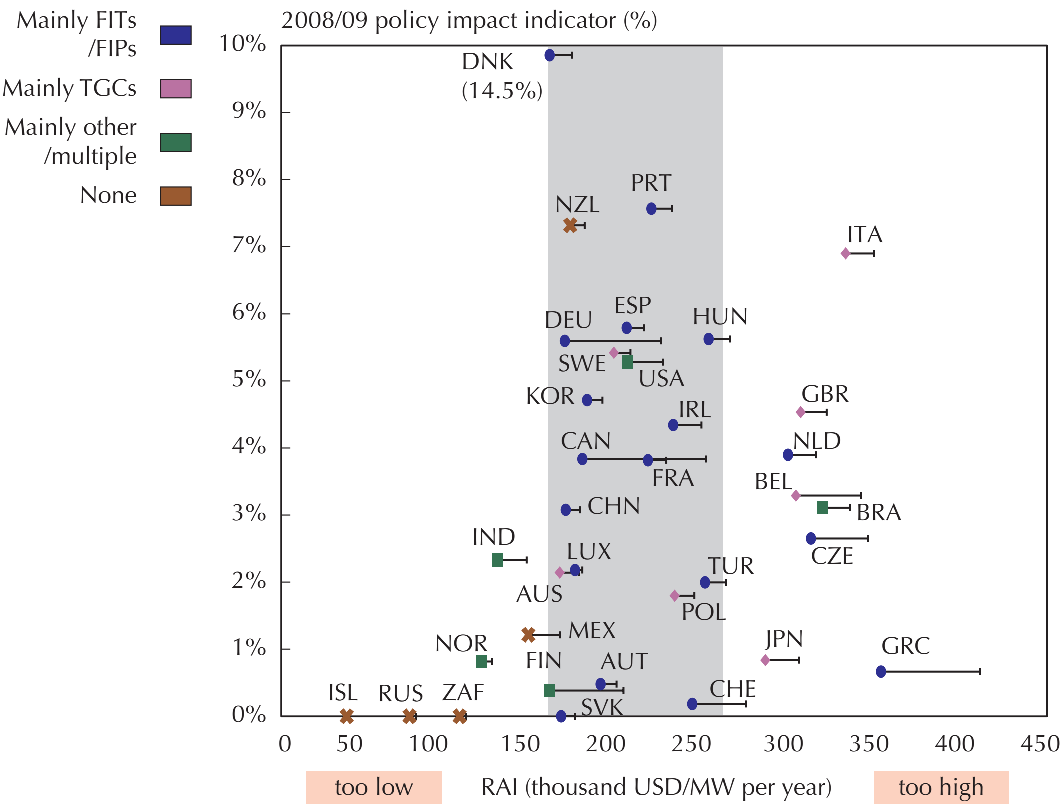
- The policy impact indicator (PII) assesses a country's success in adding generation from a RE technology using *WEO* 450 projections for deployment in the country in 2030 as a benchmark.
- The remuneration adequacy indicator (RAI) assesses whether the total remuneration provided to generators is adequate. Remuneration levels are compared, correcting for the country's different resource endowments.
- The total cost indicator (TCI) benchmarks the level of premiums that have to be paid annually for the additional generation that was achieved in a given year. The total wholesale value of a country's power generation is used as a benchmark for comparison. Note that the TCI may overestimate total policy costs, because it does not take into account the merit-order effect.

The analysis for recent years shows that both feed-in tariffs (FITs) and tradable green certificates (TGC) schemes can have a significant impact on deployment levels, and be cost effective, or not (Figure E.3). This analysis highlights the importance of other factors, *e.g.* the overall level of investor confidence engendered by the whole policy portfolio and the extent of non-economic barriers. For FITs the impact of these barriers is to deter deployment altogether. For TGCs the impact is to push up the support costs.

For wind, the indicators show that for the period 2001-09, FITs were significantly more effective in stimulating deployment than TGCs and other schemes. For 2008–09, however, this difference has largely disappeared. This change may be due to policy-learning effects as well as increasing technical and market maturity. The remuneration adequacy indicator shows that countries with TGC schemes tend to pay more than those using FITs.

The analysis also shows the increase in the number of countries who are now making serious efforts to deploy wind, compared to earlier years and to the number of countries engaging in PV deployment.

Figure E.3 **Remuneration adequacy and policy impact indicators for onshore wind support policies, 2008/09**

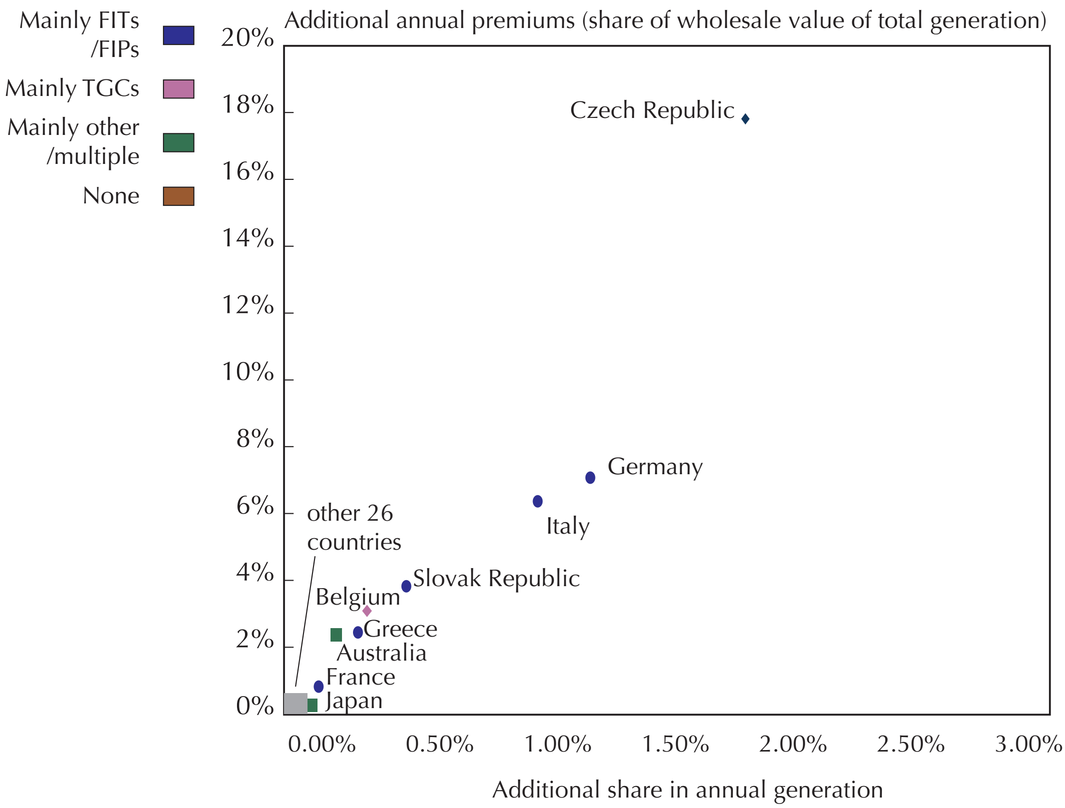


Note: See Annex A for ISO country codes feed-in premiums (FIPs).

Key point

On average, feed-in systems have a better trade-off between impact and remuneration level than certificate systems.

Figure E.4 **Total cost of policy support in major PV markets, 2010**



Key point

Rapid growth of Solar PV has been confined to a few countries. In some countries support has involved the payment of premiums which have amounted to a high proportion of the total wholesale value of generation.

A similar analysis for solar PV shows that nearly all countries with growing markets have used FITs. The impact of policies in countries actively promoting solar PV has been higher than for wind, with several countries experiencing very rapid growth, which in some cases (particularly the Czech Republic and Spain) has led to very high overall policy costs (Box E.1 and Box 4.1). The deployment was stimulated by the attractive and secure rates of return available to investors, with tariffs remaining high at a time when system prices were falling rapidly. PV expansion grew dramatically in 2010 in the Czech Republic, the year for which the total cost indicator was calculated, leading to a very large volume of annual premiums, corresponding to almost 18% of the total wholesale value of the entire Czech system (Figure E.4). High total costs are also an issue in other markets, such as Spain, where a boom took place in 2008 (which is not reflected in the 2010 additional premiums). In Germany and Italy, high rates of deployment are also causing comparably high total support costs.

Policy principles and priorities

Key finding

The critical barriers which can deter or slow down deployment change as the market for a technology develops. Policy makers need to adjust their priorities as deployment grows, taking a dynamic approach. The impact of support policies depends on the adherence to key policy principles.

Table E.1 **Best practice policy principles**

Overarching principles		
• Provide a **predictable and transparent RE policy framework**, integrating RE policy into an overall energy strategy, taking **a portfolio approach** by focusing on technologies that will best meet policy needs in the short and long term, and backing the policy package with ambitious and credible **targets**. • Take a **dynamic approach** to policy implementation, differentiating according to the current maturity of each individual RE technology (rather than using a technology-neutral approach), while closely **monitoring national and global market trends and adjusting policies accordingly.** • Tackle **non-economic barriers** comprehensively, streamlining processes and procedures as far as possible. • At an early stage, identify and address overall **system integration** issues (such as infrastructure and market design) that may become constraints as deployment levels rise.		
Inception	**Take-off**	**Consolidation**
Develop a clear roadmap, including targets that generate confidence. Provide a suitable mixture of support, which may include both capital and revenue support. Ensure that the necessary regulatory framework is in place and streamlined. Provide support for the continuing industry-led R&D work.	Ensure a predictable support environment, backed by credible and ambitious targets. Ensure that adaptability to market and technology developments is built in as a key characteristic of the policy package. Provide appropriate incentives to ensure continued growth in deployment, managing them dynamically to control total policy costs, and to encourage improved cost competitiveness. Focus on non-economic barriers and implementation details.	Deal with integration issues (such as the biofuels blending wall or system integration of variable renewable power), and focus on enabling technologies. Ensure that energy market design is commensurate with high levels of RE penetration and economic support can be progressively phased out. Maintain public acceptance as deployment levels grow and projects have higher visibility and impact.

The main challenges to deployment change as progress is made along the deployment curve. The three phases of deployment are:

- an **inception phase**, when the first examples of technology are deployed under commercial terms;
- a **take-off phase**, when the market starts to grow rapidly; and
- a **market consolidation phase**, where deployment grows toward the maximum practicable level.

The impact of support policies depends on the adherence to key policy principles. This publication has reviewed the best practice policy principles described in the *Deploying Renewables* 2008 publication. Best practice can now be summarised in terms of a number of overarching principles that apply throughout the deployment journey, as well as some that are specific to particular deployment phases (Figure E.5, Table E.1).

The differences in deployment success on the national level reflect the extent to which these principles have been applied. Onshore wind developments, for example, demonstrate that those countries that have managed to induce a dynamic and stable market (Denmark, Germany, Spain, and, more recently, China and India) have adhered to the best practice policy principles (Müller, Marmion, Beerepoot). Countries that lack a comprehensive and stable policy framework for RE deployment, on the other hand, have seen boom-and-bust cycles in deployment and, accordingly, a less well-developed market, particularly in terms of the domestic supply chain.

Another important policy principle is the need for close monitoring of market developments and adequate policy reaction, as exemplified by developments in the solar PV market. In Germany, legislation provided for a regular policy review every two years. In mid-2010, unscheduled tariff reductions were enacted following consultation with industry when markets were overheating. This approach avoided the problems experienced in Spain, where regulation was not flexible enough to respond to an overheating PV market in 2008. Experience shows that retroactive changes to policies and support mechanisms have long lasting impacts on market confidence and need to be avoided.

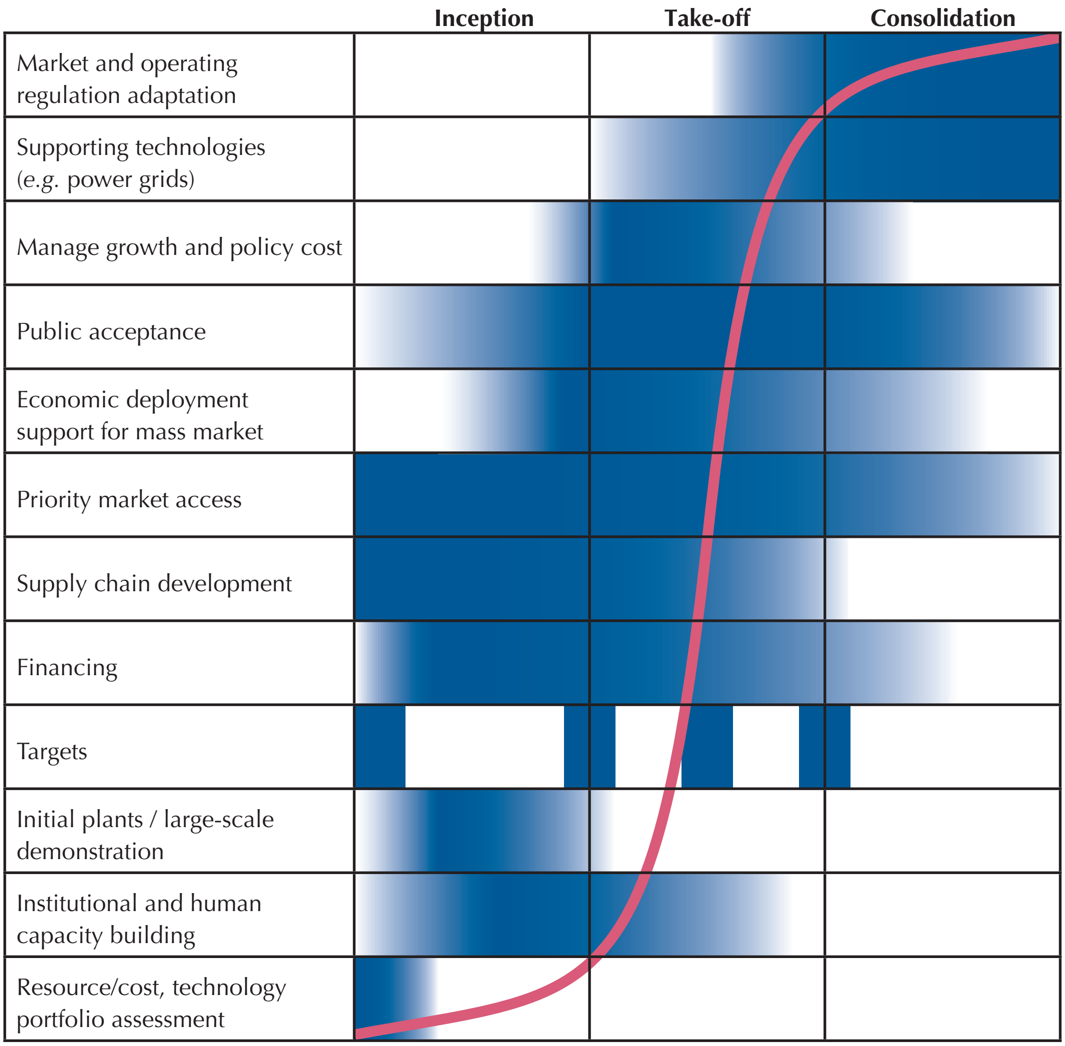
Inception

At this early stage, the market is still immature, the technologies are not well established, and the local supply chain is not in place. The financing institutions may perceive investment as risky. The priority for policy making is to create a secure investment environment that catalyses an initial round of investment, and to put in place the necessary legislative framework.

The main challenge in this phase is to develop a clear roadmap, including targets that generate confidence that the respective market is bound to grow sustainably and at a considerable volume. This requires providing a suitable mixture of financial policy support, which may include both capital and revenue costs. In addition, a streamlined regulatory framework must be in place. This will also stimulate industry-led R&D work in countries with the capacity and appetite to give priority to R&D.

Regarding the choice of incentive scheme, FITs provide the highest amount of certainty, and these systems have been very successful at this stage of deployment. Initial price finding may be difficult, even with a good knowledge of international trends. This challenge could be

Figure E.5 **Deployment journey**



Note: Intensity of shading corresponds to relative importance.

Key point

Policy priorities vary by phase of deployment.

overcome through tendering of a pilot phase (for example, a large-scale demonstration). TGCs may not work that well during inception unless the targets, penalties and implementation details are well designed. In the absence of banding, novel technologies will not be deployed. The financial rewards are seen as less certain, and this may lead to investors demanding a risk premium, so pushing up overall policy costs.

For large-scale technologies with high technological risks (*e.g.* advanced biofuels, large scale enhanced geothermal), tenders may be a useful solution, because they include a price-finding mechanism, and the high transaction costs are less significant compared to overall project costs. Loan guarantees can be an additional risk mitigation instrument in these circumstances.

Tax incentives are subject to frequent review, because they are directly linked to public budget. This characteristic could lead to problems for developers if projects experience delays, a common phenomenon at this stage. Therefore, the instrument is not best suited for the introduction of novel technologies.

Direct investment subsidies can provide an additional market boost by reducing up-front cost exposure. They are also applicable, where FITs are difficult to apply, for example, in the heat sector.

Take-off

By this stage, the deployment of the particular technology is underway within the national market, the supply chain is in place even if not fully developed, and financing institutions have increased knowledge of the technology. The priority for policy makers is to maintain or accelerate market growth, while managing overall policy costs.

Growth is ensured by establishing a predictable support environment, backed by credible and ambitious targets. At the same time, adaptability to market and technology developments must be built in as a key characteristic of the policy package. This adaptability includes providing appropriate incentives to ensure continued growth in deployment, while managing incentives to control total policy costs and encourage improved cost competitiveness of RE technologies. Mitigating and removing non-economic barriers has to be a priority.

In the electricity sector, past experience has shown that FIT schemes can lead to high deployment volumes at comparably low costs. In this phase, however, policy making needs to reap the benefits of learning and increased market maturity by scheduling and implementing ambitious tariff degression schedules aimed, first, at convergence with international benchmarks, and then further cost reductions as global costs decrease. These reductions materialise only when policy makers put sufficient pressure on industry to deliver.

For very modular technologies with rapid cost reduction potential (particularly solar PV), FITs can be challenging from a policy-making perspective, because overheating in the take-off phase can lead to very high total policy costs. Policy makers must, therefore, monitor market developments closely and incorporate a mechanism of deployment volume control into FIT systems (see Box E.1).

At this stage, setting a quota may be applicable in the electricity, heat and transport sectors. For the electricity sector, analysis has shown that TGC systems can lead to high deployment volumes in the take-off phase. These systems, however, are often associated with higher overall costs as compared to (well-designed) FITs. The data used in the current analysis may be too limited to draw a final conclusion, but the analysis suggests that TGCs may be the option of choice only where the government has a strong policy preference for market-based mechanisms.

Tenders can also be used in this phase to meet a certain quota. They are increasingly becoming the option of choice for the take-off phase of mature technologies, especially in emerging economies. Given that a sufficiently mature supply chain is present that supports the up-front risk of tendering schemes, tenders provide volume control while determining prices under competitive conditions. Experience in South American countries illustrates that tenders can be a very effective instrument at this stage of market development.

Box E.1 **Controlling the cost of solar PV**

With policy driven deployment of solar PV reaching scale in leading markets (*e.g.* Germany, Italy, Spain and the Czech Republic), the total cost of policy support has been drawing increasing attention (see Chapter 4).

While currently total policy costs can be a constraint for deployment, the very high cost of support is a transitory problem. Out of all the RE technologies, solar PV holds the promise of the most drastic cost reductions. The technology is semiconductor based or based on other innovative compounds, with learning occurring at a speed more similar to computer equipment than other energy technologies. In addition, the problem of total policy costs is currently exacerbated by the fact that most of the deployment is occurring in just a few markets.

To manage the policy costs associated with the rapid development of the solar PV market and avoid "PV bubbles", governments need to take the following actions:

- **Ensure that PV development and deployment are an integral part of the overall strategy** aimed at deploying an appropriate portfolio of RE technologies, as part of the comprehensive overall energy strategy.

- **Take an ambitious approach to tariff reductions.** As noted above, solar PV has demonstrated a very steep learning curve. Governments need to sustain pressure on the PV industry to deliver such learning, and they need to programme ambitious tariff degression schedules to accompany cost reductions. Tariff degressions should be linked to international benchmarks (global PV module prices or globally best-in class system prices) as this avoids artificially keeping system prices above costs.

- **Spread the burden of financing the technology's learning curve.** The current concentration of PV deployment in a handful of countries needs to be overcome. Once more countries engage in financing the technology's learning curve, each country will face less of a burden.

- **Avoid retroactive policy measures.** Changing the economics of operating projects should be avoided, because this will increase the policy risk perception of investors and may drive up costs in the long term.

In the heat sector, successful take-off policies have also used a type of mandate. For example, in 2000, Barcelona introduced a solar obligation, and its success resulted in the Spanish government developing a national solar obligation policy in 2006. Other regulatory approaches consist of requiring a share of a building's heating demand to be generated by renewable energy, such as in the London "Merton rule" and the 2009 German building regulations.

In the transport sector, market take-off has been successfully stimulated using blending mandates. The success of a mandate depends on the prior establishment of a supply chain that will be able to meet the mandate (see inception phase). Mandates can be combined with tax breaks to limit the financial impact on consumers.

Consolidation

By this stage, the technologies are well established, the market has grown substantially, supply chains are robust, and finance and public institutions have streamlined their procedures. The technologies are close to or fully cost-competitive.

The challenges in this phase relate to the integration of larger volumes of RE into the system. This involves some technical integration issues, such as the system integration of variable renewables. It also involves market impacts, particularly the impact of increasing levels of renewables deployment on existing market players, and non-economic factors, such as maintaining public acceptance as the scale and impact of deployment grows.

The recent IEA *Harnessing Variable Renewables* (2011*b*) study shows that the limits to integrating variable RE supplies depend on the characteristics of particular systems. From a technical perspective, the limits can be much less restrictive than is often thought, if a whole system approach is adopted, taking into account the flexibility of other generation technologies, the potential for load management, and grid interconnectivity as well as storage capacity. Such an approach will, however, require reforms of operating systems and regulatory reform, as well as significant investment in the necessary infrastructure (IEA 2011*b*).

In the consolidation phase, some continued economic support for RE technologies may be required, but policies may also need to introduce elements of competition between the RE technologies and conventional generation to incentivise further cost reductions and to optimise the overall generation costs. In practice, this policy shift can be achieved by modifying a number of the economic support mechanisms or creating hybrid systems, for example, by providing a uniform FIT for a number of technologies and moving to a premium rather than a fixed price, as Spain has done at a comparably early phase for wind. Consolidation can also be addressed by moving away from technology specific rewards within a TGC, such as providing different numbers of certificates for different technologies, and moving to a technology-neutral system once the costs of particular technologies converge, or by arranging multi-technology tenders (as in Brazil).

For the power sector, the fundamental market design problem is not addressed, however, by just choosing a more market-based instrument for RE support in the consolidation phase. Because most RE power technologies have very low marginal costs (with the exception of bioenergy), RE generators will almost always be able to sell their electricity on marginally priced wholesale energy markets. This trend pushes more costly generation out of the market, reducing the capacity factor of these plants. This reduction can lead to a situation where investment is inhibited and, in the long term, an insufficient amount of flexible dispatchable capacity is available to balance RE generation.

Such problems are likely to make a fundamental redesign of power markets necessary. The design must provide stable and long-term signals that appropriately reward low-carbon generation. It must offer economic incentives for the flexible operation that is required for example, to gas generators, hydro plant operators or electricity storage. New policies must reward the energy security benefits that renewables offer by decoupling costs from rising and erratic fossil fuel prices, and so insulate consumers from varying costs that generators usually pass on to them. Market design also needs to provide a higher degree of market harmonisation across systems allowing for competition.

Such market redesign will be an essential step if renewable sources are to meet their potential. This is now the major challenge faced by policy makers in markets where RE technologies are playing or will play a major role, and needs to be the subject of much further thinking and analysis. This will be an important topic in the next stages of IEA research.

In the transport sector, consolidation challenges have emerged involving the "blending wall". The United States has found it difficult to move to fuel blends containing higher levels of ethanol, and in Germany consumers have been rejecting the move to higher blends due to potential compatibility problems with conventional vehicles and a lack of comprehensive consumer information. These issues are being tackled successfully elsewhere, particularly via the introduction of fuel-flexible vehicles, for example in Brazil and Sweden.

Key challenges

Key finding

Current growth has been concentrated on certain technologies and in certain countries. Staying on track to deliver ambitious levels of RE will require that:

- the current momentum is sustained;
- the heat sector is tackled with priority;
- the full range of technologies is exploited; and
- the geographic base is broadened.

Although deployment has been growing rapidly, and good progress has been made in reducing costs, the challenges of keeping growth rates on track should not be underestimated. Current growth has been concentrated on certain technologies, particularly hydro power, wind and biofuels. The potential of the other technologies is not being exploited as rapidly, even though they are often technically proven. The range of countries where RE technologies are growing rapidly is also still limited. Keeping on track to deliver ambitious levels of RE will require that the full range of technologies is exploited, and that the geographic base is broadened (Figure E.7).

Specific challenges in each sector will need to be tackled if growth is to continue to accelerate. These challenges include:

Electricity

- maintaining investor confidence in market stability while managing the overall costs of policies;
- tackling the technical and policy challenges of integrating larger amounts of renewable electricity into the market;
- providing the necessary push to bring less mature technologies such as offshore wind and concentrating solar power into the market as long as these technologies demonstrate sufficient learning effects;

- bringing emerging technologies, such as ocean energy up to the deployment inception phase.

Heat

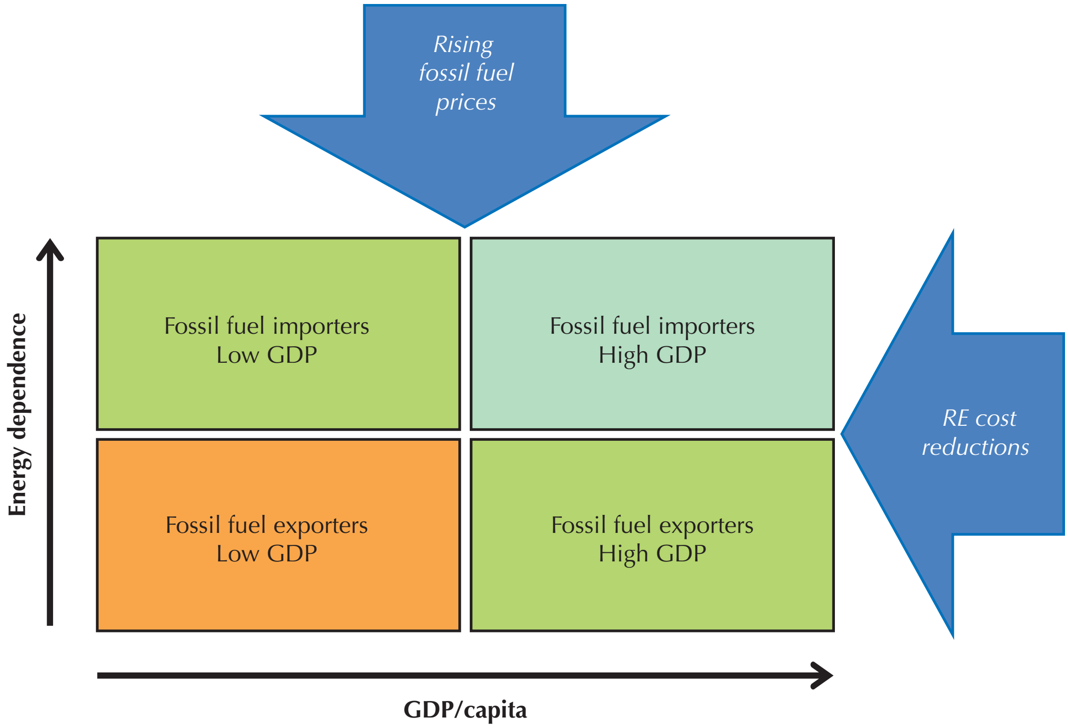
- dealing with the specific non-economic organisational barriers to renewable heat deployment, such as split-incentive barriers and the fragmented nature of the market;
- developing innovative policy measures that reconcile a large impact with cost-effectiveness.

Transport

- addressing concerns about the sustainability of current biofuels technologies;
- tackling the barriers to the introduction of the advanced biofuels technologies.

An additional challenge across all RE sectors is broadening the base of countries that are deploying RE technologies in an ambitious way. Up to now deployment of the newer RE technologies has been focused in countries which have been fossil fuel importers, and who have felt the need to diversify their energy resources, but which have also been able to afford to develop and deploy the technologies while the costs have been high.

Figure E.6 **Expanding RE deployment**



Key point

Fossil fuel exporting countries, as well as emerging and developing economies are becoming more likely to deploy renewables.

Now that the RE technology portfolio is more mature and costs have declined, a growing number of countries with good renewable resources can profit from these technologies to meet their energy policy objectives. They should be able to use the body of policy experience to do this as quickly and cost-effectively as possible (figure E.6).

Progress in this direction is already underway. Compared to 2005, many more countries are taking policy measures aimed at stimulating renewables' deployment, and the regional diversity is growing. No fewer than 45 of the 56 countries which have been considered in detail in the report, for example, now have renewable electricity targets in place, including 20 non-OECD members, whereas in 2005, such targets were largely confined to OECD and BRICS regions. In 2011, 53 of the 56 focus countries have electricity support policies in place, compared to 35 in 2005. These new countries are only just starting on their deployment journeys, however, and will be able to make much better progress if they, too, take advantage of the technology and policy lessons now available.

Recommendations

The IEA makes the following recommendations on priority actions for the key stakeholder groups, based on the challenges to maintaining momentum and drawing on the policy analysis and priorities identified above.

Governments already taking steps to deploy renewables should:

- Recognise renewables as an increasingly competitive key component of a secure, low-carbon and sustainable energy system, along with other low-carbon energy sources and improvements to energy efficiency.
- Sustain and accelerate the momentum of deployment in all three sectors, maintaining progress in the power sector, prioritising the development of markets for renewable heat by addressing sector-specific barriers, and developing consistent sustainability frameworks for bioenergy, in particular biofuels.
- Review policy portfolios against the best-practice principles and adjust policies where necessary.
- Closely monitor deployment trends and adjust policy measures dynamically in response to national and international developments, and give particular attention to removing non-economic barriers as a main priority.
- Address the system integration of renewables at an early stage and incentivise the deployment of enabling technologies such as grid expansion, storage and adaptation of the vehicle fleet.
- Tackle the overall market design issues needed to ensure investment in the technology portfolio required to deliver secure and low carbon energy.
- Continue the support for targeted R&D, particularly demonstration projects necessary to enable the next generation of RE technologies to reach the deployment stage.

Governments not yet committed to large-scale RE deployment should:

- Re-evaluate, in light of dramatic recent cost reductions, the opportunity of RE technologies to provide affordable, safe and clean energy, particularly the potential of RE technologies to help meet rising energy demand.
- Increase the penetration of renewables by stimulating deployment as part of a strategy to develop a sustainable low-carbon energy system, taking advantage of the technology progress and policy experience now available.

More broadly governments and international organisations should:

- Use existing international mechanisms, such as those provided by the Clean Energy Ministerial and G20 for concerted efforts to develop a broad range of renewable energy technologies and to cooperate to bring the next-generation technologies into and through the market inception phases.
- Cooperate to allow tracking and monitoring of rates of deployment and share policy experience to allow refinement and dissemination of best practice in policy development.
- Reap the benefits of cooperating internationally between countries that are very rich in resources and those that can provide funds to develop resources (making sure that sustainable growth is stimulated in host countries, rather than perpetuating dependency).
- Provide support for capacity building and transfer of best practice in policy development to countries starting to develop their RE resources.
- Assist in the mobilisation of the finance necessary for deploying the RE technologies, particularly in emerging and developing countries by giving priority to the sector in the plans of multilateral and development banks.

The IEA work on monitoring trends within the RE market is evolving, given the fast moving and dynamic nature of the sector, the growing regional and technological diversity, and the continuing evolution of policy hot-spots as more and more countries progress along the policy journey. In particular, in 2012 a *Medium-Term Renewables Market Report* will be launched for the first time. This will track recent market and policy trends and look at shorter term market prospects. In addition a study of the needs for market reform and design will get underway.