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# Updated compilation of information on mitigation benefits of actions, initiatives and options to enhance mitigation ambition

## Technical paper

## Addendum

## Technical examination process to unlock mitigation potential for raising pre-2020 ambition through renewable energy deployment and energy efficiency improvements

*Summary*

This updated technical paper compiles information on the mitigation and sustainable development benefits of actions, initiatives and options to enhance mitigation ambition, with a focus on the thematic areas of renewable energy and energy efficiency. Information for the update was provided in submissions from Parties and observer organizations and at the technical expert meetings held during the fourth part of the second session of the Ad Hoc Working Group on the Durban Platform for Enhanced Action, held in March 2014 in Bonn, Germany. This technical paper builds on the second version thereof, contained in document FCCC/TP/2013/8 and its two addenda FCCC/TP/2013/8/Add.1 and 2, and consists of the main document and an addendum. The addendum is focused on mitigation action in the thematic areas of renewable energy and energy efficiency and elaborates on mitigation potential, progress, benefits, costs and barriers, as well as on good practice policies, key opportunities and options for catalysing concrete actions in those two thematic areas.

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# I. Introduction

1. This update of the technical paper on mitigation benefits of actions, initiatives and options to enhance mitigation ambition was requested by the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP) at the third part of its second session.[1] The first and second versions of this technical paper were published on 28 May and 30 October 2013, respectively, and are contained in documents FCCC/TP/2013/4 and FCCC/TP/2013/8 and Add.1 and 2.

2. It comprises two parts: the main text, contained in document FCCC/TP/2014/3, and an addendum, contained in document FCCC/TP/2014/3/Add.1. The main text contains a summary of the main findings, which are substantiated by the more detailed information provided in the addendum, which captures the content of the discussions that took place at the technical expert meetings (TEMs) on renewable energy (RE) and energy efficiency (EE) held in March 2014 during the fourth part of the second session of the ADP.[2] The two chapters of this addendum are dedicated to covering the discussions on RE deployment and EE improvements and each consists of two parts, discussing potential, progress, benefits, costs and barriers and then practices, policies and actions to catalyse RE deployment and EE improvements.

# II. Technical summary on renewable energy

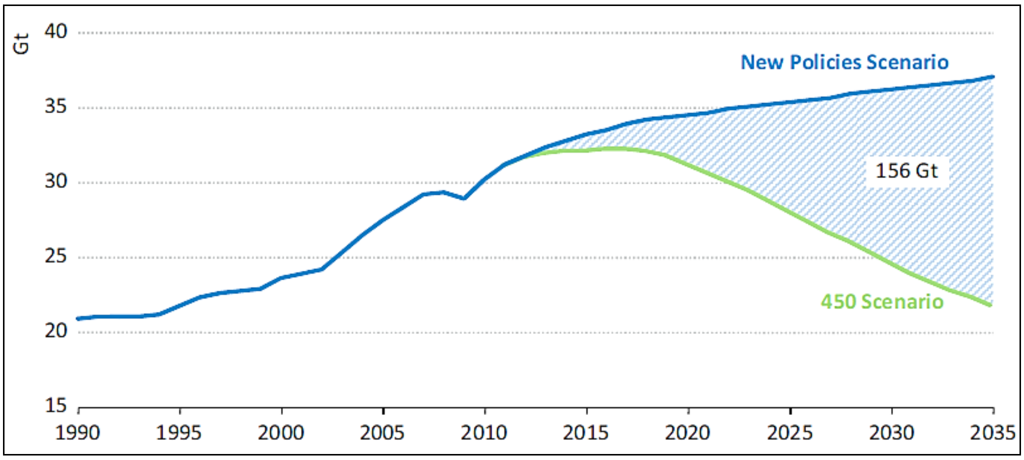
## A. Potential, progress, benefits, costs and barriers

3. The analysis of the International Energy Agency (IEA) (2013a) shows that meeting the 2 °C climate goal set by the international community is still achievable through the vastly expanded adoption and replication of energy policies, technologies and other actions that build on successes around the world. As described in the IEA 450 Scenario,[3] targeted investment and support for actions to expand growth in wind, hydro and solar photovoltaics (PV) could lead to half of global electricity being supplied by RE by 2035. However, IEA also describes the need, in order to realize such a future, for “unprecedented change” and “urgent commitment to strong action, followed by robust, unwavering implementation”, as a pathway focused on current and planned policies will not be sufficient to meet the 2 °C goal.

4. The 450 Scenario requires significant mitigation action in the energy sector before 2020, which could result in 3.1 billion tonnes of carbon dioxide equivalent (Gt $CO_2$ eq) emission reductions by 2020, or approximately 80 per cent of the overall reductions needed to meet the 2 °C goal. Under the scenario, and in combination with a number of other actions in the energy sector, RE would replace significant amounts of traditional fossil fuel power and would account for 48 per cent of global power generation by 2035 (IEA, 2013a). Enhancing current RE policies (aligned with the IEA New Policies Scenario) could lead to 31 per cent of global power generation coming from RE sources by 2035 and 4.1 Gt $CO_2$ eq emission savings; however, that would not be sufficient to meet the 2 °C goal (IEA, 2013b). Figure 1 presents a comparison of the mitigation potential of the two IEA scenarios.

1 FCCC/ADP/2013/3, paragraph 30(c)(ii).
2 Detailed information on the TEMs held in March, including the initial summaries of discussions at the meetings, is available at <http://unfccc.int/bodies/awg/items/8112.php> and <http://unfccc.int/bodies/awg/items/8113.php>.
3 The 450 Scenario projects a stabilization of the concentration of greenhouse gases at 450 ppm.

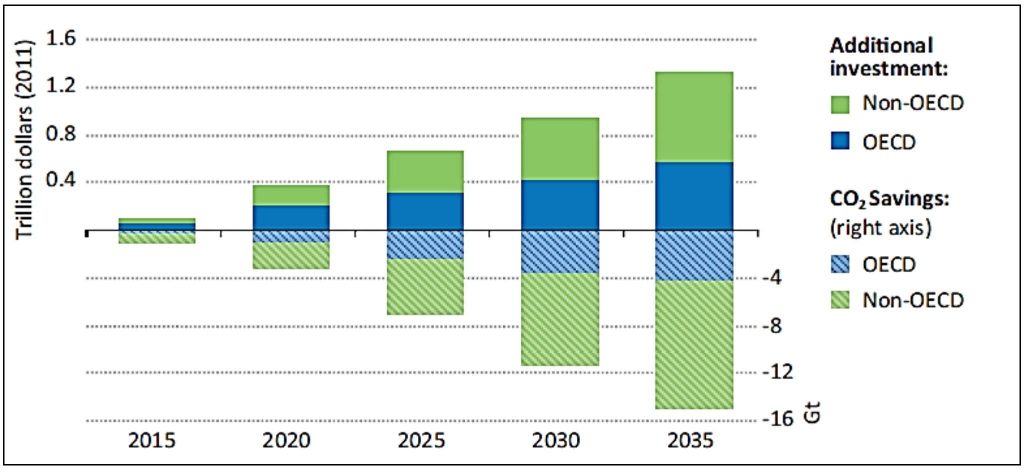
Figure 1
**Global energy-related emissions under the International Energy Agency New Policies Scenario and 450 Scenario**




*Source*: International Energy Agency. 2013. *World Energy Outlook Special Report 2013: Redrawing the Energy-Climate Map*.

5. Meeting the 2 °C climate goal under the 450 Scenario would require an estimated USD 16 trillion global increase in investments in low-emission policy and technology. In addition to the vast climate-related benefits, such investments could also lead to significant national account savings, with fossil fuel import bills reduced by USD 850 billion for the top five fossil fuel importers, as well as various other key benefits described below (see table 1). Figure 2 presents annual additional investments and projected $CO_2$ savings at the global level.

Figure 2
**Global annual additional investments and projected $CO_2$ savings under the International Energy Agency 450 Scenario**




*Source*: International Energy Agency. 2013. *World Energy Outlook Special Report 2013. Redrawing the Energy-Climate Map*.
*Abbreviation*: OECD = Organisation for Economic Co-operation and Development.

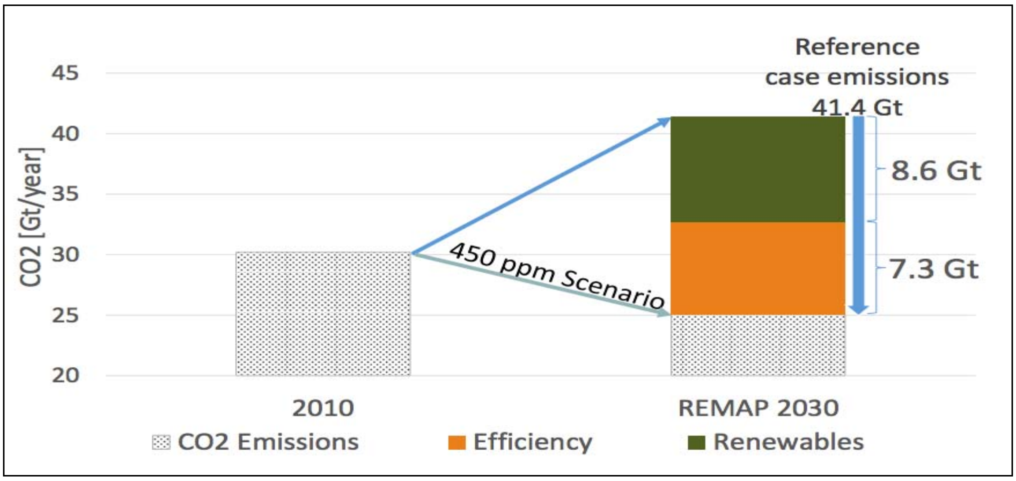
6. The United Nations Environment Programme (UNEP) *Emissions Gap Report 2013* describes RE as a key sector for mitigation action, which could lead to 1–3 Gt $CO_2$ eq emission reductions by 2020 through international collaboration to support reductions in three targeted areas: solar PV (possible 1.4 Gt $CO_2$ eq emission reduction), wind energy (1.2 Gt $CO_2$ eq) and low-emission energy access options (0.4 Gt $CO_2$ eq) (Blok et al., 2013). The report notes 17 key

international initiatives that could be expanded and enhanced to achieve significant emission reductions in those areas (UNEP, 2013). The Intergovernmental Panel on Climate Change (IPCC) also describes a key role for RE in the future, noting that, with the necessary enabling conditions and policies, RE could supply approximately 80 per cent of global energy by 2050 (IPCC, 2011).

7. Aligned with the projections detailed in paragraph 4 above, according to the global renewable energy road map of the International Renewable Energy Agency (IRENA), namely REmap 2030,[4] doubling RE capacity between now and 2030 could lead to approximately 9 Gt $CO_2$ eq emission savings annually.[5] Coupled with EE-related actions, and accounting for associated reductions in methane emissions, this could lead to savings of approximately 16 Gt $CO_2$ eq emissions. Figure 3 presents a mix of actions that could support such an outcome in 2030.

Figure 3

**Opportunities for reducing emissions by 2030 based on the International Renewable Energy Agency REmap 2030 study**




*Source*: International Renewable Energy Agency. 2014. *Renewable Energy Innovation Policy: Success Criteria and Strategies.*

*Abbreviation*: REmap = renewable energy roadmap.

8. When evaluating the potential of RE, one must go beyond power technologies to also consider end-use applications (transport, industry and buildings). As a whole, the role of end-use technologies, such as solar thermal, biofuels, electrical vehicles, etc., could be substantial in meeting global energy demand by 2030[6] and they could provide a 32 per cent contribution to doubling the share of RE in total final energy consumption by 2030 (IRENA, 2014).

9. Global RE capacity continues to expand rapidly on an annual basis, with the annual average growth rates of solar PV, concentrating solar power and wind power from 2007 to 2012 being 60 per cent, 43 per cent and 25 per cent, respectively (Renewable Energy Policy Network for the 21st Century (REN21), 2013). Over half of new electricity generation capacity came from renewables in 2012 (REN21, 2013) and RE capacity has doubled in recent years.[7] The success of RE in relation to projections that were made over the last decade, which estimated significantly fewer additions to RE capacity, demonstrates that many perceived barriers were overcome earlier and more effectively than expected (REN21, 2013).

[4] REmap is an exploratory study considering technology options (costs and potential) rather than scenarios and targets. The study analyses 26 countries, making up 75 per cent of global energy use. The analysis should be considered as a starting point for evolution over time.

[5] Compared with the 2030 reference case.

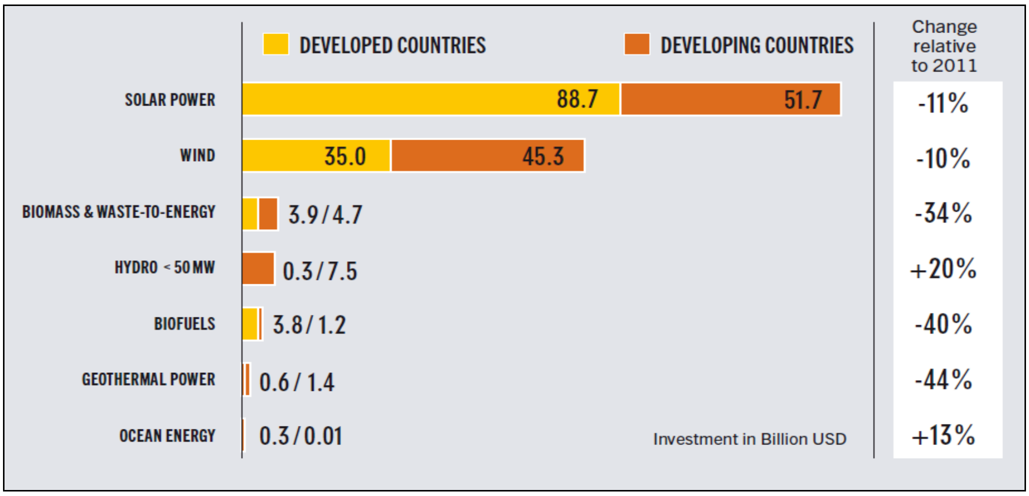
[6] ADP TEM on RE, presentation by IRENA, 2014.

[7] As footnote 6 above.

10. Although biofuel production recently stagnated, with a negative annual growth rate in 2012,[8] there is still great promise for advanced biofuels, with production expected to increase by 250 billion l/year between 2014 and 2030 (REN21, 2013). However, food security issues must also be taken into account when considering biofuel activities. Brazil offers a valuable example of successful support for bioelectricity, bioethanol and biodiesel. Notably, as a result of bioethanol blending mandates, flex-fuel vehicles currently make up 52 per cent of the light-vehicle fleet in Brazil and ethanol use has led to the avoidance of 44 Mt $CO_2$ eq emissions annually.[9] Commercially viable biogas activities are also expanding rapidly around the world.

11. According to REN21 (2013), uncertainty around long-term policy support for RE in developed countries (primarily in Europe and the United States of America) led to a decline in the total investment in new RE capacity in 2012. Global investment in RE in 2012 totalled USD 244 billion (a decrease of 8 per cent from the record high in 2011). Investment activity shifted prominently to developing countries in 2012, making up 46 per cent of total new investment in RE (USD 112 billion, an increase of 34 per cent since 2011). In total, solar power received the greatest share of new investment in 2012 (57 per cent, or USD 140.4 billion), followed by wind (USD 80.3 billion) and hydro (USD 33 billion). The RE-related investment trends in 2012 are presented in figure 4.

Figure 4
**Trends in global investment in renewable energy in 2012**




*Source*: Renewable Energy Policy Network for the 21st Century. 2013. *Renewables 2013: Global Status Report.*

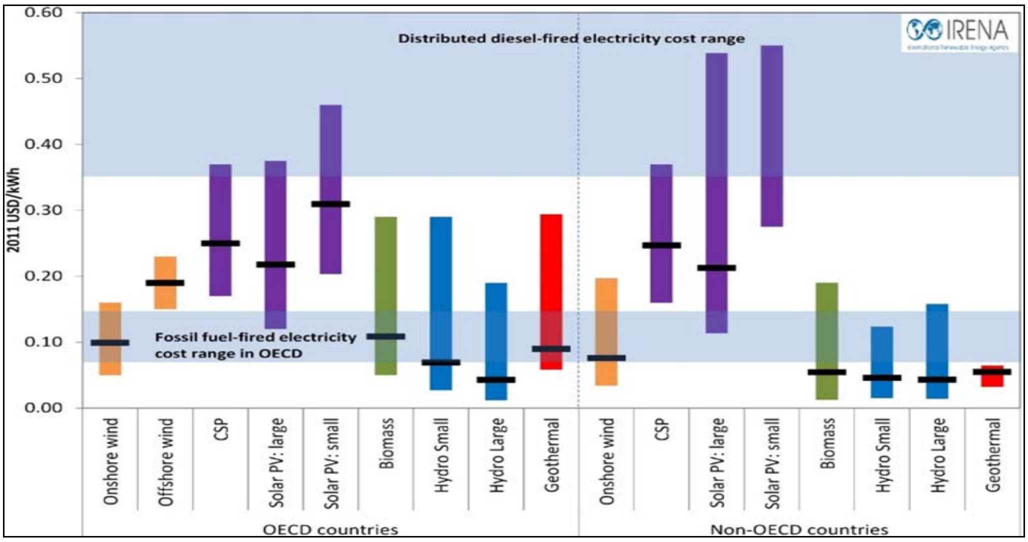
12. Despite the lower investment levels in 2012 and 2013, RE generation continues to be an increasingly competitive investment opportunity. While traditional investors, such as development banks, utilities and climate finance sources, have provided much of the finance for RE development to date, green bonds, insurance and pension funds, and crowd-sourcing are likely to play an increasingly prominent role in future investment.[10]

13. As a result of technological advances, economies of scale and component production surplus, the prices of solar PV and onshore wind power have continued to decline over time (REN21, 2013). In many cases, and as presented in figure 5, RE technologies now offer the most economic solution for new power generation capacity (IRENA, 2013). As a notable example, spotlight box 1 describes the United States SunShot Initiative, which has supported the declining

[8] As footnote 6 above.
[9] ADP TEM on RE, Brazil's presentation, 2014.
[10] As footnote 6 above.

price of solar PV by focusing on all stages of RE diffusion from research and development (R&D) to deployment.

Figure 5
**Comparison of electricity costs across technologies in 2011**




*Source*: International Renewable Energy Agency. 2013. *Renewable Energy Innovation Policy: Success Criteria and Strategies*.

*Abbreviations*: CSP = concentrating solar power, OECD = Organisation for Economic Co-operation and Development, PV = photovoltaics.

Spotlight box 1
**Supporting the reduction in cost of renewable energy technologies**

**United States of America:** Renewable energy (RE) capacity in the United States has doubled since 2008, bringing the total to 86 GW (not including hydro). Building on that progress, the United States is seeking to expand clean energy electricity to 80 per cent of energy generated and to increase the cost-competitiveness of RE technologies. Solar power in the United States has experienced notable success, with an approximately 60 per cent annual growth rate and an 80 per cent reduction in price over the last four years, providing broad benefits to the global community. Supporting solar power from a systemic and integrated perspective, the United States Department of Energy's SunShot Initiative is a major contributor to such success, focusing on all stages of RE diffusion from research and development (R&D) to deployment. Specifically, the programme supports R&D in relation to solar photovoltaics and concentrating solar polar, systems and grid integration analysis, technology development and advancing innovation in domestic manufacturing. The programme seeks to address key challenges associated with RE technologies by engaging stakeholders in innovative ways of supporting the reduction of 'soft' (finance and other non-hardware) costs, minimizing grid integration costs through the development of new technologies, and supporting manufacturer competitiveness by developing partnerships with state and local governments and industry. Since 2011 the price of solar power has dropped from 21 cents to 11 cents/kWh and SunShot Initiative has a goal of continuing to reduce the price of solar electricity to 6 cents/kWh by 2020.

*Source*: The United States' presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

14. The alignment of mitigation actions with development goals is of critical importance to countries around the world and crucial in building motivation and political support for action on

RE. Parties described a number of development benefits, drivers and broader macro-objectives closely linked with action in the RE sector, which are presented in table 1. Spotlight box 2 describes efforts undertaken in two countries to align RE-related activities with critical development and climate goals in the context of their unique national circumstances.

Table 1
**Renewable energy sustainable development benefits**

| *Benefits* | *Details drawn from the technical expert meeting and relevant submissions*[a] |
|---|---|
| **Economic**<br>• Jobs and income generation<br>• Energy security and trade balance<br>• Sustainable economic growth<br>• Cost savings<br>• Technological competitiveness and innovation | The renewable energy (RE) sector created 5.7 million jobs globally (direct and indirect) in 2012 and, according to the global renewable energy road map (REmap) study of the International Renewable Energy Agency (IRENA), doubling RE by 2030 could lead to the creation of 3.5 million associated jobs annually, on average.[b] RE can be especially important for jobs and income generation in rural areas, can lead to various local sourcing and operation and maintenance opportunities and can spur entrepreneurship in various sectors<br><br>RE can also support energy independence; specifically, a number of Parties noted benefits associated with lessened vulnerability to oil price shocks, enhanced supply security and improved trade balance/foreign exchange savings |
| **Social**<br>• Poverty reduction<br>• Energy access<br>• Health improvements | According to IRENA, doubling RE by 2030, and thus significantly reducing local and indoor air pollution, could result in an avoided impact on health worth USD 80–185 billion[b] |
| **Environmental**<br>• Climate change mitigation<br>• Climate resilience<br>• Local environmental protection | In addition to climate change mitigation benefits, diversifying the energy sector to include a broader RE portfolio could help to address other national environmental concerns, such as dependence on hydro (and associated environmental impacts) and addressing water scarcity issues to support climate resilience |

[a] The benefits presented align with those identified in various presentations and comments made at the technical expert meeting and in the relevant submissions.
[b] *Source*: Presentation made by International Renewable Energy Agency at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

Spotlight box 2
**Aligning action with national circumstances and development goals**

**Ethiopia**: Action on renewable energy (RE) in Ethiopia is closely connected with the country's Climate Resilient Green Economy Strategy, which emphasizes economic growth, poverty reduction and adapting to climate change as key development priorities. Importantly, Ethiopia seeks to move from being an agriculturally focused least developed country to a middle-income country with a flourishing industrial sector and zero net carbon emissions. To meet those sustainable development goals, Ethiopia is pursuing a number of RE policies and actions focused on hydro, wind and geothermal development. Hydro currently makes up a large portion of grid-connected RE in Ethiopia; however, to address the adaptation goals noted above, Ethiopia is diversifying its electricity sector to also include wind and geothermal through public and private investments, while also continuing investment in select hydro projects. Another key development goal for the country is to expand energy access, as only 20 per cent of the population is currently connected to the grid. Ethiopia seeks to expand the grid to reach all rural households within approximately 20 years, while currently supporting small-scale off-grid renewables and efficient cook-stove programmes. Ethiopia is also investing in biofuel development and implemented fossil fuel subsidy reform in 2008 to support the expansion of renewables and broader sustainable development goals.[a]

**Saudi Arabia**: Saudi Arabia's national circumstances are integral to determining the appropriate mix of RE related actions. Namely, the country's demographic, geographical and economic context plays a significant role in its energy-related decisions. In addition to those broader drivers, Saudi Arabia sets its RE-related priorities to align closely with the country's national development goals, related to sustainable economic growth, job creation, economic diversification, adaptation and water security, among others. The Saudi Arabian Government finds that RE-related choices can complement the hydrocarbon sector in working towards development goals. Saudi Arabia considers mitigation to be a co-benefit of sustainable development and adaptation. The country collaborates with national and international institutions to assess and determine appropriate policy and technology choices that align key economic drivers, RE and national development priorities.[b]

[a] *Source*: Ethiopia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.
[b] *Source*: Saudi Arabia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

15. According to REN21 (2013), in most countries renewable policy is driven by specific targets and 138 countries had established RE policy targets in 2012, a 27 per cent increase since 2010 (see para. 23 below). More specifically, FiTs, renewable portfolio standards or quota policies, and biofuel mandates have expanded in recent years, with 99 countries, states or provinces implementing FiTs, 76 with quota policies and 76 with biofuel mandates in place in 2012. Such policy actions have contributed greatly to the significant expansion of RE described in chapter II.B.2 of the paper.

16. Despite the significant potential for RE technologies to reduce greenhouse gas (GHG) emissions, and other advancements noted in paragraphs 9 and 10 above, there remain significant gaps in, and formidable barriers to the expansion of, the adoption of policies and actions required to meet the 2 °C goal.[11] While individual barriers must be considered in relation to specific national circumstances, a number of common challenges were identified during the TEM and in Parties' submissions, which are outlined in table 2. Policies and actions to support moving past such barriers are described in chapter II.B below.

Table 2
**Barriers to renewable energy diffusion**

| *Barriers* | *Details drawn from the technical expert meeting and relevant submissions*[a] |
|---|---|
| **Technical** | **Geographical circumstances**<br>• Distances between load/demand centres and resource/supply locations<br>• Need for tailored or country-specific technologies and research and development to address local conditions (e.g. temperature, dust and sand storms, humidity and other circumstances)<br>• Difficult to access certain renewable energy (RE) sites<br>**Grid reliability and integration of RE**<br>• Need to address imbalances related to supply and demand and resource variability<br>• Need to ensure grid stability and resilience with significant RE integration<br>• Need for the strengthened capacity of distribution and load centres<br>• Need for access to the grid and priority in dispatching RE from wind and |

[11] As footnote 6 above.

| *Barriers* | *Details drawn from the technical expert meeting and relevant submissions*[a] |
|---|---|
| | solar power |
| **Economic and policy** | **Cost/price**<br>• In competition with low-cost fossil fuels (especially in relation to subsidies)<br>o The International Renewable Energy Agency noted that in 2012 fossil fuel subsidies totalled USD 544 billion, while RE subsidies were approximately USD 101 billion<br>• Cost of RE technologies (including operation and maintenance) relating to:<br>o High upfront project development costs (especially for geothermal drilling and exploration with high risk)<br>o High transaction costs for small-scale RE technologies<br>o Difficulty reducing soft costs of RE<br>o High cost of technology transfer<br>• Need for price certainty of RE over the long term and to address the risk associated with policy change<br>**Finance/investment**<br>• Need for affordable upfront finance/lower cost of capital<br>• Need for support to prove RE project bankability to investors/funders<br>• Need for risk mitigation instruments (especially for geothermal)<br>• Long lead time for geothermal power development and contract negotiation<br>• Difficulty matching national and donor priorities<br>• Need for support of project proposal development<br>**Manufacturing**<br>• Need for support of domestic manufacturing and competitiveness |
| **Skills** | **Technical**<br>• Need for skilled RE engineers and technicians to support analysis of technology options, planning, installation, maintenance and operation<br>• General lack of access to information<br>**Policymaking**<br>• Need for capacity development to design and implement policy options<br>**Financial**<br>• Need for capacity development to facilitate private investment and negotiate power purchase agreements |

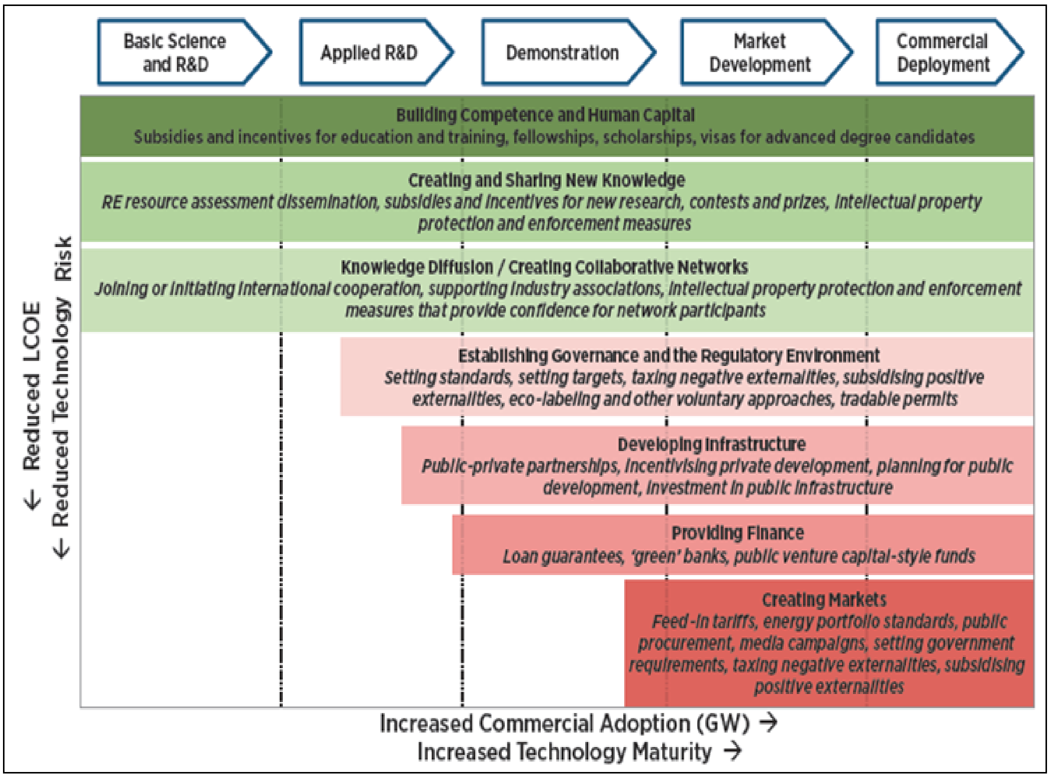
[a] The barriers presented align with those identified in various presentations and comments made at the technical expert meeting and in the relevant submissions.

## B. Practices, policies and actions to catalyse renewable energy deployment

17. As can be surmized from the barriers described by Parties during the TEM and in various submissions (outlined in table 2), tailored and country-specific policy portfolios congruent with national circumstances, and designed to address key barriers, are needed to realize the potential of RE. Country-level planning in relation to RE varies greatly depending on a number of technical, geographical, economic and other capacity-related factors.[12] Therefore, there is no one-size-fits-all approach to supporting RE deployment. IRENA put forward the overarching structure to consider RE-related action on the basis of maturity level or stage of technology deployment presented in figure 6: R&D, applied R&D, demonstration, market development and commercial deployment.

[12] As footnote 6 above.

Figure 6
**Framework for action on renewable energy based on technology and maturity level**




*Source*: International Renewable Energy Agency. 2013. *Renewable Energy Innovation Policy: Success Criteria and Strategies*.

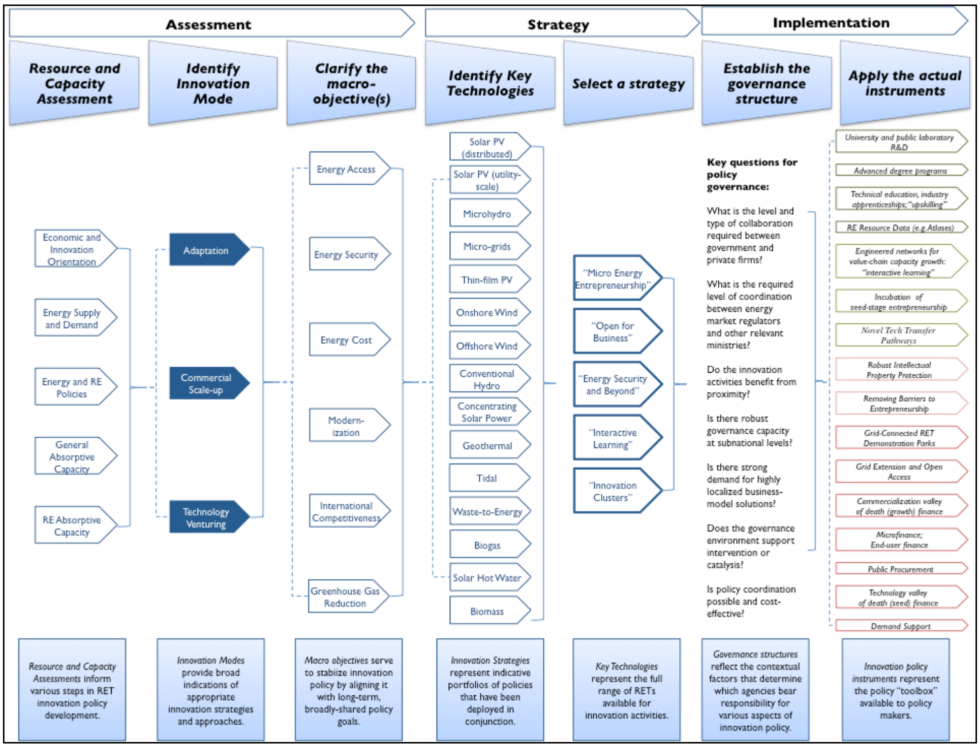
*Abbreviations*: LCOE = levelized cost of energy, R&D = research and development, RE = renewable energy.

18. A number of countries are pursuing innovative work to support RE diffusion and to overcome the barriers presented in table 2. Successes, challenges and lessons drawn from their activities can be used to inform and inspire similar actions in other countries, customized to national contexts. Policies, initiatives and other actions at the country level, described during the TEM and in various submissions, are highlighted in paragraphs 19–27 below in relation to common policy themes, namely strengthening institutional, legal and regulatory frameworks and designing and implementing effective and multifaceted policy portfolios.

### 1. Policy theme: strengthening institutional, legal and regulatory frameworks

19. Parties emphasized the need to reinforce institutional, legal and regulatory frameworks that can promote RE through comprehensive and integrated planning. Frameworks that clearly streamline the key planning and implementation stages, with a focus on transparency, accountability and broad stakeholder engagement, as well as the regular and iterative refinement of policies and actions, are crucial. More broadly, the alignment of RE, EE and grid integration measures within an integrated energy transformation framework can help to ensure coordination, efficiency and sustainable outcomes. The policy development process for RE innovation and the key elements of an illustrative planning and implementation framework for RE diffusion as developed by IRENA are presented in figures 7 and 8.

Figure 7
**Policy development process for renewable energy innovation**




*Source*: International Renewable Energy Agency. *Guide to Develop Renewable Energy Innovation Policy* (in press).

*Abbreviations*: PV = photovoltaics, R&D = research and development, RE = renewable energy, RET = renewable energy technology.

Figure 8
**Key planning and implementation stages to support renewable energy diffusion**


*Source*: Adapted from World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.

20. Building on the integrated framework presented in figure 8, ministerial coordination is also critical in streamlining cross-governmental processes and decisions related to action on RE and in reducing policy overlap and duplication. In some cases, an entity dedicated to RE with a specific directive to support the deployment of RE can help to facilitate broader coordination, oversee actions, increase legitimacy, etc. (World Resources Institute (WRI) and World Wildlife Fund (WWF), 2013). Examples of integrated RE frameworks are presented in spotlight box 3. Streamlining RE-related action with broader low-emission development planning processes can also support coordinated action at the national level, as in the case of Colombia's integration of its Energy Sector (RE and EE) Action Plan with the country's Low Carbon Development Strategy (see spotlight box 7).[13]

Spotlight box 3
**Integrated and robust renewable energy frameworks**

**Germany**: Germany's comprehensive energy policy framework "Energiewende" encompasses actions on renewable energy (RE) (through the Renewable Energy Sources Act), energy efficiency (through the Energy Efficiency Directive) and grid transformation (through the Power Line Development Act and Federal Requirement Plan). RE and energy efficiency (EE) related action is also integrated with and supported by the National Climate Initiative and the Market Incentive Programme. Through that three-tiered approach, Germany seeks to expand cost-efficient renewables, significantly reduce energy consumption (by one half) and support grid flexibility and RE integration. Germany is currently on the pathway to achieving the ambitious targets that were set for mitigation, RE and EE by 2020 and 2050. "Energiewende" also incorporates policies, targets and other actions across electricity, heating, transport and research and development. This comprehensive policy approach has led to major successes for the economy and climate. In 2013 RE accounted for approximately 25 per cent of the electricity supply in Germany and led to the mitigation of 147.9 million tonnes of carbon dioxide equivalent. RE is expected to create approximately 600,000 jobs by 2020 and support new entrepreneurship opportunities.[a]

**Kenya**: Kenya, a country with significant technical RE potential, recognizes the importance of RE diffusion to support energy security, employment and income generation (especially in rural areas), improved trade balance and climate change mitigation. Kenya supports RE through a number of policies and plans, including: the Constitution of Kenya, the Vision 2030 development plan, the National Climate Change Action Plan, the 2006 Energy Act, the Geothermal Resources Act, various feed-in tariffs to support investment in RE, and regulations related to solar water heating, energy management, cook stoves, etc. A number of government institutions support action on those policies and plans, highlighting the need for effective intergovernmental coordination to support RE as well as the need for engagement and coordination with the private sector. Taken as a whole, the policies provide a strong institutional and political framework for RE deployment in the country. The mix of policies and plans also highlights the need for a portfolio of actions, rather than reliance on a single 'silver bullet' to support robust RE deployment.[b]

**Philippines**: The Philippines adopted a long-term Energy Plan that integrates RE-related actions with broader resource planning and supports key national priorities focused on energy security and sustainable development. In alignment with the Energy Plan, the Renewable Energy Act and National Renewable Energy Programme seek to triple RE capacity to 15,304 MW by 2030. The Philippines' Renewable Energy Act is also closely aligned with the country's broader Climate Change Act and National Climate Change Action Plan for 2011–2028, supporting integrated and coordinated action across the

[13] ADP TEM on RE, Colombia's presentation, 2014.

Government.[c]

[a] *Source*: Germany's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.
[b] *Source*: Kenya's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.
[c] *Source*: World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.

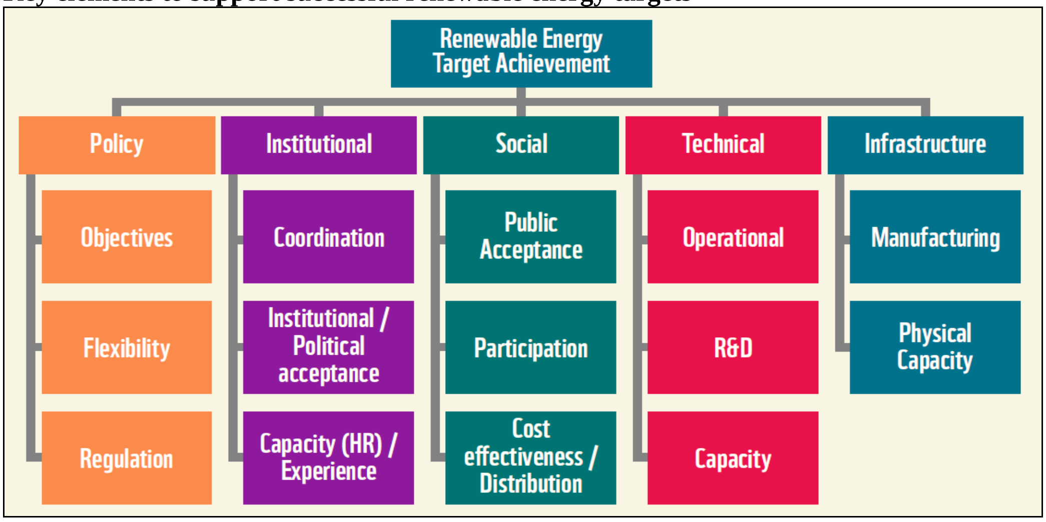
## 2. Policy theme: designing and implementing effective and multifaceted policy portfolios

21. Participants in the TEM described various policies to support RE deployment, including: (a) RE targets and quotas; (b) pricing policies, such as feed-in tariffs (FiTs), carbon pricing and establishing price stabilization funds; (c) fiscal incentives, such as direct RE subsidies and tax credits; and (d) grid integration measures. Although not considered in great detail during the TEM, other key RE policies to support RE diffusion include support for tradable RE certificates and net metering.

22. Across policy options, Parties emphasized the need for flexible design to ensure that market and technology changes inform refinements and adjustments, also requiring nimble and flexible institutions to respond to changes and ensure efficiency. Also, to ensure broad public acceptance and support, the benefits of policies to support the scaling up of RE should be clearly and compellingly presented to stakeholders and the public to ensure sustained support and successful outcomes (WRI and WWF, 2013). In addition, Parties highlighted the need for timely, integrated, tailored and affordable financial support, both to design and implement effective policies.

23. **Renewable energy targets**: As a key element of broader RE planning frameworks, Parties emphasized the need to establish effective RE targets that send stable policy signals and support long-term deployment goals. WRI and WWF analysed seven case studies of countries implementing RE targets and proposed key policy, institutional, social, technical and infrastructure factors to ensure targets are achieved. Those factors are presented in figure 9. Successful actions supporting RE targets at the country level are presented in spotlight box 4.

Figure 9
**Key elements to support successful renewable energy targets**




*Source*: World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.
*Abbreviations*: HR = human resources, R&D = research and development.

Spotlight box 4
**Renewable energy targets and policies implemented to meet them**

**China**: China currently has the greatest installed renewable energy (RE) capacity in the world, with 556 GW in 2012 (increasing by 13 per cent between 2000 and 2012), and expects to build on that success with a target of 15 per cent non-fossil primary energy by 2020. To that end, China established a portfolio of laws and regulations under its Renewable Energy Law, which includes national RE targets, mandatory RE grid access, electricity pricing policies and special RE funds. The law is complemented by a number of actions, including annual RE plans and goals, distributed and off-grid RE for rural areas, and pilot projects. RE policies in China couple both incentives and standards to support RE deployment, such as feed-in tariffs, technical codes for solar water heaters and biodiesel blend standards. China's policy portfolio resulted in a doubling of emission reductions associated with RE between 2005 and 2012.[a]

**European Union**: The European Union's 2020 Climate and Energy Package sets out the 20-20-20 targets to reduce greenhouse gas emissions by 20 per cent (from the 1990 level), increase RE consumption by 20 per cent and improve energy efficiency (EE) by 20 per cent by 2020. To support key development goals, the RE and EE targets are projected to produce approximately 817,000 jobs by 2020. To achieve these targets, the European Union is supporting four key legislative actions: the reform of the European Union Emissions Trading System (EU ETS); national targets to reduce emissions not covered by the EU ETS (such as those from agriculture, housing, waste and transport); national RE targets; and carbon capture and storage. In addition, the European Union has offered to reduce emissions even more significantly (up to 30 per cent) given similar commitments by the international community.[b]

**Marshall Islands**: In 2009 the Marshall Islands was 90 per cent dependent on imported fossil fuel, representing 20 per cent of the national budget expenditure and leading to an energy crisis that year. To address that key national challenge, the National Energy Policy was adopted, leading to incremental, yet significant, progress over the next five years. Specifically, the outer island solar project set a target of 100 per cent RE electrification and resulted in 95 per cent solar electrification of all outer island public facilities and households. Building on that success, the country adopted a target for the rest of the island of 20 per cent RE electrification by 2020 from solar photovoltaics, biofuels and wind energy, with a major focus on grid-connected solar. The country is making significant progress towards meeting that target.[c]

[a] *Source*: China's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.
[b] *Source*: See <http://ec.europa.eu/clima/policies/package/index_en.htm>.
[c] *Source*: The Marshall Islands' presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

24. **Feed-in tariffs**: Many countries have adopted FiTs to support RE deployment, often in combination with other RE policies, such as tax incentives and RE quotas, which are generation-based, quantity-driven policy instruments. To be successful, FiTs must complement existing policies and take into account various national drivers and support high-level policy goals. Tariff differentiation and setting are key elements in designing an effective FiT and should be aligned with overall policy goals and considerations relating to cost, energy access, economic development, price stability and diversification of power supply, among others (UNEP, 2012). Funding of FiTs is also an area of critical importance, especially in developing countries. The Third World Network has proposed a globally funded programme, under the What Next Forum, to support the design and implementation of FiTs.[14] The proposal highlights the need for both grid-connected as well as innovative decentralized energy provision models and presents a structure to

[14] ADP TEM on RE, presentation by the What Next Forum, March 2014.

finance the programme under the Green Climate Fund (GCF) in partnership with a number of implementing agencies.

Spotlight box 5

**Innovative renewable energy policies**

**The United Kingdom of Great Britain and Northern Ireland** has a legally binding commitment to reduce its greenhouse gas emissions by 80 per cent by 2050. Renewable electricity production is expanding rapidly to help meet that commitment, with 350 per cent growth from 2003 to 2012. However, even in the light of such rapid expansion, there is still a need for massive investment in the renewable energy (RE) sector to meet mitigation and energy security goals under the Electricity Market Reform Programme. The United Kingdom established an innovative pricing mechanism called Contracts for Difference (CfD) to reduce investment risk associated with RE projects by providing greater stability and certainty in relation to revenue. The mechanism allows RE generators to receive a fixed or 'strike' price for RE electricity production. Under that approach, revenues are stabilized within a predetermined range for the period of the contract and when the electricity market price is higher or lower than the strike price the generator either receives the difference in payment or pays back the difference. The CfD structure increases efficiency by addressing market issues associated with bidding electricity when market prices are negative and supports revenue certainty for the generator, thus addressing key economic barriers to RE deployment.

*Sources*: The United Kingdom's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014; and Department of Energy & Climate Change. 2012. *Annex: Feed-in Tariff with Contracts for Difference: Operational Framework.*

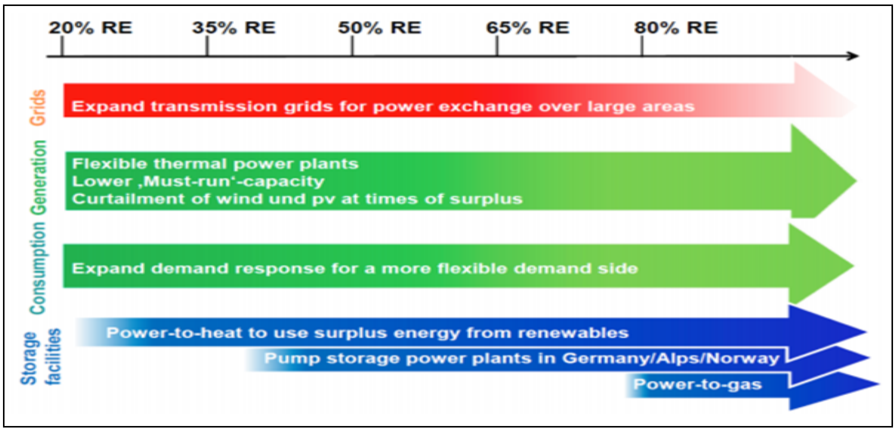
25. **Tax incentives**: Tax incentives, including industry, production, personal, property and sales tax credits and deductions, accelerated depreciation and income tax holidays for the first few years can help to reduce the burden of high upfront capital costs of RE projects and should be aligned with higher-level RE goals and available financial resources. In addition, tax incentives can reduce overall investment risk and support the uptake of new RE technologies. In many cases, new jobs created by RE projects can help to offset revenue losses related to tax rebates. They can also make RE sources competitive compared with other sources of energy, which have been subsidized. As technologies become more commercially viable, incentives can be reduced and ultimately phased out over time (Renewable Energy and Energy Efficiency, 2010).

26. **Grid integration measures**: Parties highlighted the need for action and policies to ensure grid stability, flexibility and resilience with the increasing integration of RE. As noted in paragraph 19 above, grid integration and access measures should be integrated within broader RE frameworks, as early planning for grid integration infrastructure and technical requirements, such as transmission and distribution needs, forecasting and storage technologies, etc., can help to ensure-long term sustainable outcomes. On the basis of countries' experiences, Cochran et al. (2012), IEA (2013) and other studies have identified best practices for RE grid integration, including the case described in spotlight boxes 5 and 6.

Spotlight box 6

**Grid integration action to support high-penetration renewables**

**Germany**: Under Germany's Renewable Energy (RE) Sources Act, RE is guaranteed grid access and given priority for transmission and distribution. Grid access is supported by technology-specific 20-year feed-in tariffs, with grid operators equalizing additional costs associated with RE electricity across all electricity consumers (excluding energy-intensive industries). Monitoring and evaluation play a key role in assessing the performance of the Renewable Energy Sources Act. Given the success thereof, Germany highlighted electricity system volatility as a major challenge for the future, as RE is expected to meet nearly 100 per cent of electricity demand by 2022. To address that challenge, Germany is investing in innovative measures to increase flexibility in electricity system supply and demand. Such measures are highlighted in the graphic below.




*Source*: Germany's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on renewable energy in March 2014.

27. Several policy options to address barriers, as well as key actions to support successful policy replication and implementation, are highlighted in table 3, which also includes information on some country-specific examples. A few noted policies described during the TEM are highlighted in spotlight boxes 3–6.

Table 3
**Renewable energy policy menu** (for select policy options and examples highlighted during the technical expert meeting and in relevant submissions)

| *Select policy options and key elements of the enabling environment to support successful policy replication and implementation* | *Select country-specific examples* |
|---|---|
| **Policy option: High-level policy frameworks and integrated action plans** | |
| • **Establish integrated, transparent and stakeholder-driven approaches**, including: setting a vision and objectives; assessing resources and potential; identifying barriers; establishing targets; evaluating, designing and implementing policies and actions; and reviewing and refining the overall process, policies and actions<br>• **Iterate and refine** policies and actions to ensure learning and good practices are captured and weaknesses are addressed<br>• **Support coordination** to streamline cross-governmental processes and decisions related to action on renewable energy (RE) and reduce policy overlap and duplication<br>• **Consider an agency dedicated to RE** to support RE deployment by facilitating broader coordination, overseeing actions and increasing legitimacy<br>• **Monitor and evaluate** RE-related actions within broader frameworks to support improvements over time and attract international finance | • China – Comprehensive Workplan for Energy Conservation and Emission Reduction during its Twelfth Five-Year Plan period<br>• Colombia – Low Carbon Development Strategy<br>• European Union – European Union Climate and Energy Package<br>• Indonesia – National Action Plan for Reducing Green House Gas Emissions<br>• Kenya – National Climate Change Action Plan for 2013–2017<br>• Philippines – Climate Change Act and National Climate Change Action Plan for 2011–2028<br>• United Kingdom – Low Carbon |

| *Select policy options and key elements of the enabling environment to support successful policy replication and implementation* | *Select country-specific examples* |
|---|---|
| | Transition Plan: National strategy for climate and energy<br>• United States – The President's Climate Action Plan |
| **Policy option: RE targets (quotas and renewable portfolio standards)**[a, b] | |
| • **Engage stakeholders** to support initial target design and plan for regular consultation and feedback<br>• **Determine policy goals and analyse and model policy impacts** to ensure goals are met on the basis of resource availability, transmission and distribution, siting considerations and complementary policies (at the national and subnational levels)<br>• **Identify technologies to be included in the policy** by assessing social impacts, determining which technologies are proven, but not yet widely deployed, and defining geographical territories for inclusion and treatment of central and distributed generation<br>• **Set effective and achievable targets** by including eligible technologies, developing tiers for higher-cost technologies, establishing a time frame that supports long-term finance and contracting, rather than relying primarily on short-term RE certificate markets, and monitoring compliance by providing clear guidance on accounting systems and payments, as well as a system to redistribute non-compliance payments (e.g. RE Fund)<br>• **Establish a tradable Renewable Energy Credits (REC) system** to support flexibility and market-based approaches for compliance. REC systems can also reduce compliance and administrative costs and simplify verification processes<br>• **Other enabling actions** include: verifying available resources through detailed geospatial and resource assessments; ensuring transmission access for RE; and establishing complementary mechanisms to support finance, such as power purchase agreements and other contractual arrangements for project finance | • China – 20 per cent share of RE in electricity production by 2015<br>• European Union – 20-20-20 targets<br>• Germany – at least a 35 per cent share of RE in electricity production by 2020<br>• India – 17 per cent share of RE in electricity production by 2017<br>• Marshall Islands – 100 per cent RE electrification for outer island and 20 per cent RE electrification for whole island<br>• Morocco – 42 per cent share of RE in electricity production by 2020<br>• Philippines – 40 per cent share of RE in electricity production by 2020<br>• South Africa – 30 per cent share of RE in electricity production by 2020<br>• Spain – 38 per cent share of RE in electricity production by 2020 |
| **Policy option: FiTs**[c] | |
| • **Conduct robust analyses** to ensure policy aligns with and meets overall goals (e.g. rapid RE deployment to meet targets, emission reduction, job creation, minimizing policy cost, etc.), especially given complexity associated with design of FiTs<br>• **Design effective policies** by: basing payments on cost of RE generation and setting tariff prices in relation to technology, location, resource availability and size of the project; guaranteeing RE access to the grid; including eligibility for project developers and end-users; ensuring electricity generated has a 'must-take' provision; and supporting the long term stability of the policy<br>• **Determine approach to financing FiT**; some options include: integrating costs directly with the electricity rate; use of tax revenues; a combination of the two aforementioned options; and leveraging carbon auction revenues. Cost sharing is another important consideration and spreading costs across utilities and regions can support efficient outcomes<br>• **Ensure policy flexibility, as well as predictable and gradual adjustments** in relation to advancements in technology, evolving markets, and other considerations that often require adjustments to the short-term FiT payment level and assessment of the long-term | • Germany – Renewable Energy Sources Act – technology-specific 20-year FiTs<br>• Kenya –FiT regime for geothermal, wind, small hydro, biomass, biogas and solar-generated electricity<br>• United Kingdom – Contracts for Difference<br>• Various state FiTs in the United States (Hawaii, Vermont, California, etc.) |

| *Select policy options and key elements of the enabling environment to support successful policy replication and implementation* | *Select country-specific examples* |
|---|---|
| programme design. Leadership by policymakers is often integral to ensuring the flexibility and overall efficiency of the policy. However, policy adjustments should be incremental and predictable and avoid volatility or quick reactions. | |
| **Policy option: Tax incentives (industry/production, personal, property and sales)**[a, d] | |
| • **Strong political leadership** is required to communicate to the public the broader economic development benefits associated with tax incentives (e.g. jobs, new enterprises, etc.), given tax revenue implications<br>• **Design of tax incentives** should: ensure that the size of the incentive is adequate to attract private-sector interest, but not overly burdensome on the tax revenue base; have a long enough time-horizon to provide a significant market signal, but also be flexible in supporting reductions over time; include consumer education and marketing approaches related to return on investment; and include the development of a plan to review the effectiveness of the tax incentive programme | • Cameroon – removal of value-added tax for RE technologies<br>• India – removal of import taxes for concentrating solar power technologies<br>• Ireland – corporate tax deductions for investment in RE<br>• Nicaragua – tax exemption for carbon bond sales and for RE operations (five-year maximum)<br>• United States – Production Tax Credit |
| **Policy option: RE grid integration measures**[e, f] | |
| • **Facilitate and ensure public engagement** to inform grid integration actions, with an emphasis on engagement for planning new transmission taking into account overall grid expansion objectives and distribution of costs and benefits; siting locations (stakeholders can provide valuable information that could affect RE siting but may not be included in public records); transmission routing options; regulatory approach associated with projects; and expansion, among many other possible areas of interest<br>• **Integrate processes to ensure planning efficiency across the grid network** to streamline transmission, generation and system actions. At the geographical level, subnational institutions (local and regional) often have grid planning processes that can be built upon to ensure coordination and integration across actors and locations<br>• **Consider increasing RE resource area through** grid extension to access remote and diverse RE resources, and expanding energy trade opportunities can help address resource variability constraints<br>• **Enhance power system operations** through actions such as adapting dispatch rules for the market and power plant to accommodate increasing RE integration and adopting advanced forecasting methods<br>• **Support system flexibility** through actions such as: reforming scheduling and dispatch intervals to occur subhourly; designing capacity markets where there are issues related to decreases in wholesale electricity prices; and implementing zonal or nodal pricing schemes that can address congestion issues and support new resource development, among many others. In addition, storage, demand response and smart grid options can further support flexibility through shifting load, balancing and frequency measures | • Germany – grid integration actions under the Renewable Energy Sources Act<br>• Mexico – engagement in 21st Century Power Partnership under the Clean Energy Ministerial<br>• South Africa – engagement in 21st Century Power Partnership under the Clean Energy Ministerial<br>• United States – systems and grid integration analysis under the SunShot Initiative |

*Note*: This policy menu should be complemented by the information on cooperative initiatives presented in box 2 in the main text of this updated technical paper and information on additional initiatives presented on the portal on cooperative initiatives, which is available at <http://unfccc.int/focus/mitigation/items/7785.php>.

[a] *Source*: Renewable Energy and Energy Efficiency Partnership, Alliance to Save Energy and American Council On Renewable Energy. 2010. *Compendium of Best Practices: Sharing local and state successes in energy efficiency and renewable energy from the United States.*

[b] *Source*: Various examples drawn from World Resources Institute and World Wildlife Fund. 2013. *Meeting Renewable Energy Targets: Global lessons from the road to implementation*.

[c] *Sources*: Cochran J, Bird L, Heeter J and Arent D. 2012. *Integrating Variable Renewable Energy in Electric Power Markets: Best Practices from International Experience*. National Renewable Energy Laboratory, Joint Institute for Strategic Energy Analysis, Clean Energy Solutions Center and Clean Energy Ministerial; and Couture T, Cory K, Kreycik C and Williams E. 2010. *A Policymaker's Guide to Feed-in-Tariff Policy Design*. National Renewable Energy Laboratory.

[d] *Source*: Renewable Energy Policy Network for the 21st Century. 2013. *Renewables 2013: Global Status Report*.

[e] *Source*: Key actions adapted from Cochran J, Bird L, Heeter J and Arent D. 2012. *Integrating Variable Renewable Energy in Electric Power Markets: Best Practices from International Experience*. National Renewable Energy Laboratory, Joint Institute for Strategic Energy Analysis, Clean Energy Solutions Center and Clean Energy Ministerial.

[f] *Source*: International Energy Agency. 2013. *World Energy Outlook 2013*.

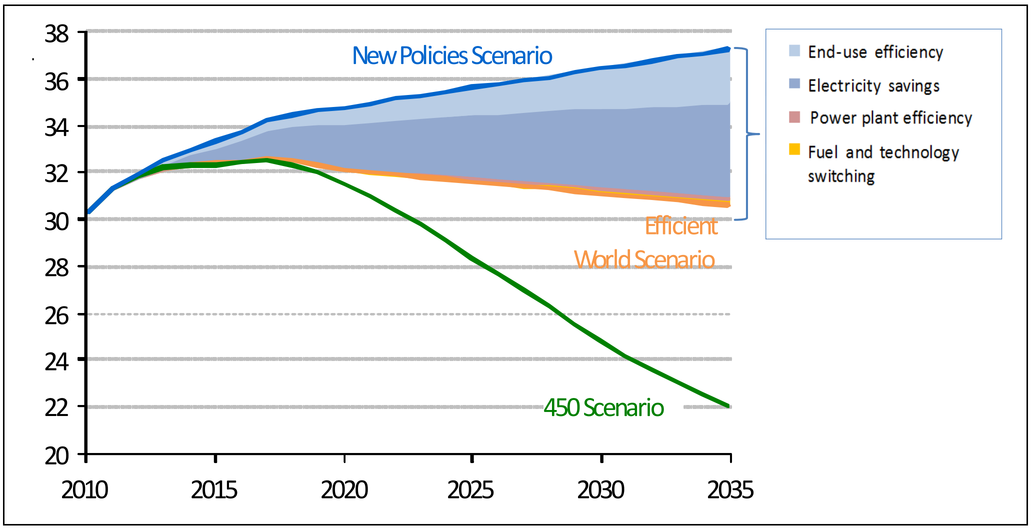
# III. Technical summary on energy efficiency

## A. Potential, progress, benefits, costs and barriers

28. As described in its 450 Scenario, IEA (2013a) estimates that by 2020 action on EE could lead to approximately 1.5 Gt $CO_2$ eq emission reductions (approximately half of the emission reductions under the 450 Scenario). Specific EE-related actions included in the scenario are presented in figure 10.

Figure 10

**Action on energy efficiency and emission reductions under International Energy Agency scenarios**




*Source*: International Energy Agency. 2013. *World Energy Outlook Special Report 2013: Redrawing the Energy-Climate Map*.

29. The UNEP *Emissions Gap Report 2013* found that significant EE-related actions could result in emission savings of approximately 2 Gt $CO_2$ eq per year by 2020, with action focused on buildings (accounting for 0.6 Gt $CO_2$ eq per year), removal of incandescent light bulbs (accounting for 0.5 Gt $CO_2$ eq), energy-efficient electrical appliances (0.6 Gt $CO_2$ eq) and vehicle efficiency improvements (0.7 Gt $CO_2$ eq) (Blok et al., 2013). UNEP (2013) also found that there are currently 25 key initiatives that could support expanded action in this sector.

30. Large investments[15] in EE are significantly contributing to reducing energy demand, as demonstrated in 11 countries where EE-related actions led to 570 Mtoe avoided energy

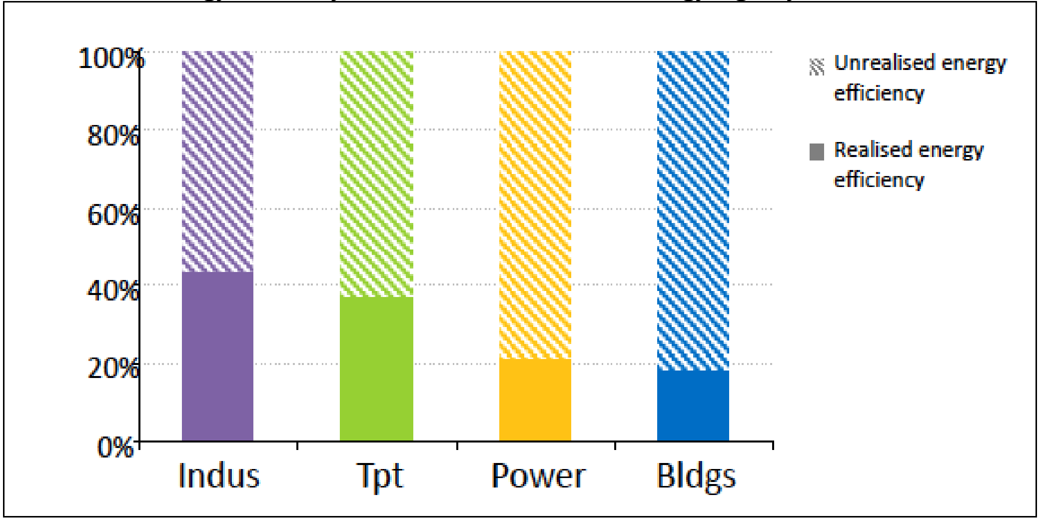
[15] In 2011 IEA estimated USD 300 billion in total investments in EE globally.

consumption, or approximately USD 420 billion in savings,[16] from 2005 to 2010 (IEA, 2013c). However, despite such promising trends, global investments in EE are still approximately one third lower than fossil fuel subsidies, and investments are unevenly distributed across countries and economic sectors.

31. Given the often low or negative net costs and short payback periods, EE-related actions are widely seen as low-hanging fruit when compared with other mitigation options (IEA, 2013a). Generally, technologies with a three- to four-year payback period can achieve around 30 per cent energy savings (International Institute for Applied Systems Analysis, 2012; and UN-Energy, 2009). There are significant opportunities to expand EE-related action and capture those cost benefits, as two thirds of the economic potential of EE (up to 2035) remains unrealized (IEA, 2013b) (see figure 11). Scaled-up investment in EE-related action could also greatly benefit the global economy, supporting a possible increase of USD 18 trillion in cumulative global economic output by 2035 (IEA, 2012).

Figure 11

**Potential for energy efficiency under the International Energy Agency New Policies Scenario**



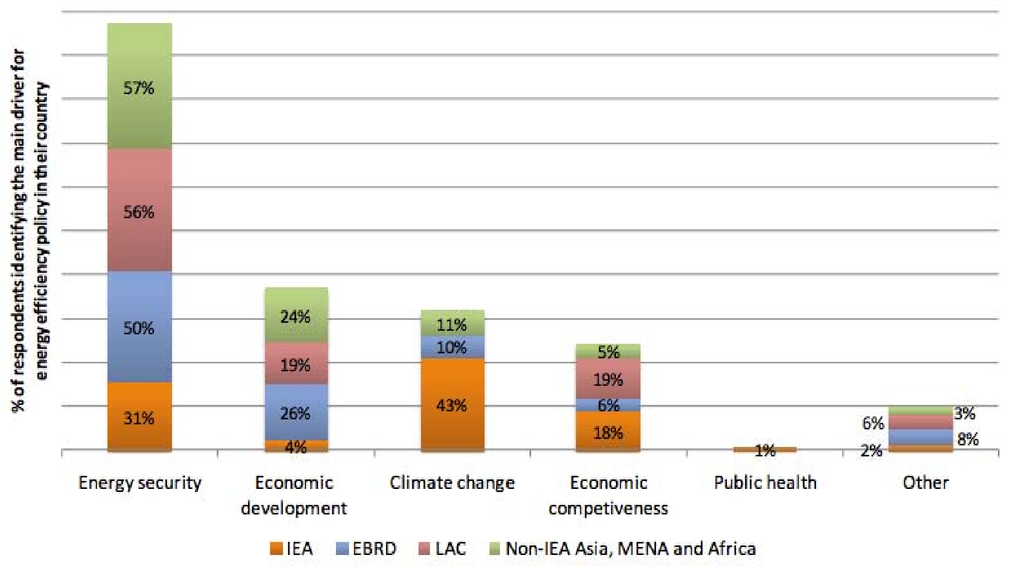

*Source*: International Energy Agency. 2013. *World Energy Outlook 2013*.
*Abbreviations*: Bldgs = buildings, Indus = industry, Tpt = transport.

32. As noted by various Parties, alignment with national development goals is a critical component of planning EE-related action. EE can induce various benefits beyond energy savings. Key benefits highlighted during the TEM and in submissions include: cost savings associated with electricity and fuel expenditure; energy security; trade benefits associated with decreased energy imports or expanded energy exports; economic development and job creation; diversion of investment to other sectors as a result of energy savings; improved energy system stability and resilience; improvements in health and well-being; and reductions in GHG emissions and other pollutants, among others.[17] Figure 12 presents key development drivers associated with EE-related activities for a sample of countries surveyed by IEA.

[16] Assuming USD 100/barrel.

[17] The benefits noted align with those identified in various presentations and comments made at the TEM and in relevant submissions.

Figure 12
**Development drivers for action on energy efficiency**




*Source*: International Energy Agency. 2010. *Roundtable Panel Discussion: Coordinating Energy Efficiency Policy Delivery*.

*Abbreviations*: EBRD = European Bank for Reconstruction and Development, IEA = International Energy Agency, LAC = Latin America and the Caribbean, MENA = Middle East and North Africa.

33. Parties described a number of barriers and challenges to realizing the potential for EE during the TEM. Innovative national-level action supported by international partnerships and collaboration will be crucial in addressing technical, economic, policy and other capacity-related challenges specific to each country. However, while identifying and tailoring solutions to address barriers is largely country-specific, a number of Parties identified common barriers to EE, which are presented in table 4.

Table 4
**Barriers to energy efficiency**

| *Barriers* | *Details drawn from the technical expert meeting and relevant submissions*[a] |
|---|---|
| **Technical** | • Costs and benefits associated with energy efficiency (EE) policies differ across segments of the population (especially in relation to buildings)<br>• The research and development of EE technologies needs to be aligned with national circumstances |
| **Economic and policy** | **Policy and pricing**<br>• Need for greater emphasis on EE as a key priority at the national policy level<br>• Need for cost-reflective energy pricing (especially in countries with fossil fuel subsidies), energy tariffs to support EE-related action and market organization reform<br>• Difficulty integrating EE policies and actions with sectoral planning processes<br>• Supply-side investment is often favored by policymakers<br>**Consumer behaviour and awareness**<br>• Consumer behaviour often leads to short-sighted purchasing and investment patterns and further financial incentives are needed to promote choosing EE<br>• Information on and awareness of the benefits of EE is lacking and there is a perceived risk associated with EE technologies |
| **Financial** | • High upfront capital costs for project development and a perceived risk associated with EE technologies |

| *Barriers* | *Details drawn from the technical expert meeting and relevant submissions*[a] |
|---|---|
| | • Need for expanded awareness of the financial benefits of EE for financial institutions<br>• Large-scale financing is difficult to access, especially for expensive technologies that could lead to the replication of large-scale and impactful successes |
| **Institutional** | • Lack of effective coordination among the many government ministries that may be engaged in EE-related activities |
| **Skills** | • Constraints on the capacity to support EE-related action, for example for initial data collection, analysis of the costs and benefits of opportunities for EE, planning (economy-wide and sectoral), designing and implementing effective policies and supporting finance<br>• Need for country-specific benchmarking of energy-use patterns and technology performance<br>• Need for the development of energy servicing companies to support the diffusion of EE technologies |

[a] The barriers presented align with those identified in various presentations and comments made at the technical expert meetings and in the relevant submissions.

## B. Practices, policies and actions to catalyse energy efficiency improvements

34. Successful and innovative actions to support the diffusion of EE technologies are occurring around the world and a number of high-quality examples were highlighted during the TEM and in Parties' submissions. The replication of successes offers much promise and Parties emphasized the need to share successes, challenges and lessons learned from their experiences to support such replication.

35. As presented in table 5, IEA highlighted 25 policy recommendations to vastly scale up EE by addressing the barriers noted in chapter III.A above. Taken as a whole, and if implemented globally, the policies could lead to 7.6 Gt $CO_2$ eq emission reductions per year by 2030 (IEA, 2011b). Country-specific examples highlighting experiences in and lessons learned from implementing such policies are presented in spotlight boxes 7 and 8.

Table 5
**International Energy Agency policy recommendations**

| *Category* | *Policies* |
|---|---|
| **Cross-sectoral** | • Collection of data on energy efficiency (EE) and indicators<br>• Strategies and action plans<br>• Competitive energy markets with appropriate regulation<br>• Private investment in EE<br>• Monitoring, enforcement and evaluation of policies and measures |
| **Buildings** | • Mandatory building energy codes and minimum energy performance requirements<br>• Aiming for net zero energy consumption in buildings<br>• Improving EE of existing buildings<br>• Building energy labels or certificates<br>• Improved energy performance of building components/systems |
| **Appliances and equipment** | • Mandatory minimum energy performance standards and labels for appliances and equipment<br>• Test standards and measurement protocols for appliances/equipment<br>• Market transformation policies for appliances and equipment |
| **Lighting** | • Phase out of inefficient lighting products and systems<br>• Energy-efficient lighting systems |

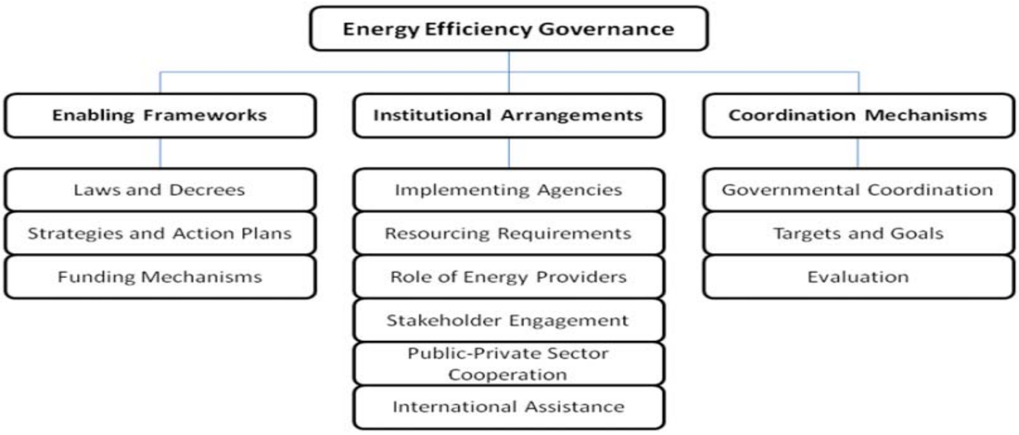
| *Category* | *Policies* |
|---|---|
| **Transport** | • Mandatory vehicle fuel efficiency standards<br>• Measures to improve vehicle fuel efficiency<br>• Fuel-efficient non-engine components<br>• Improved vehicle operational efficiency<br>• Eco-driving and other measures<br>• Transport system efficiency |
| **Industry** | • Energy management in industry<br>• High-efficiency industrial equipment and systems<br>• EE services for small and medium enterprises<br>• Complementary policies to support industrial EE |
| **Utilities/end-use** | • Energy utilities and end-use EE |

*Source*: Adapted from the presentation made by the International Energy Agency at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

36. Aligned with the policies noted in table 5, Parties described various EE-related actions that they are currently undertaking. Parties highlighted the need for a suite of actions, as there is no single 'one-size-fits-all' approach or 'silver bullet' that can address all barriers to EE. Policy portfolios or combinations of actions are required, including high-level policy frameworks, regulations, economic incentives, knowledge and information dissemination, and support for changes in consumer behaviour.

37. To move from discussing the potential for EE to realizing action, Parties emphasized the importance of a number of broader policy themes. Firstly, significantly scaling up EE-related action must be a key high-level policy priority, with government leadership playing an integral role in promoting EE at all levels. Also, effective coordination between ministries engaged in EE-related action, as well as partnership and collaboration between national and subnational governments and the public and private sectors, are critical components for success. Finally, multifaceted policy portfolios are necessary to ensure economy-wide and robust action. Those higher-level policy themes are highlighted in chapters III.B.1 and III.B.2 below. Figure 13 captures the themes, along with additional key areas of support for effective governance of EE.

Figure 13
**Key elements of energy efficiency governance structures**




*Source*: International Energy Agency. 2010. *Roundtable Panel Discussion: Coordinating Energy Efficiency Policy Delivery*.

### 1. Policy theme: strengthening institutional, legal and regulatory frameworks

38. While the private sector has a key role to play in implementing EE-related activities, the public sector plays an equally important role in promoting EE by designing policies and developing incentives for private-sector uptake. Building on public and private leadership, broader EE frameworks that combine policy, regulatory and financial actions from the long-term perspective are necessary to create an enabling environment for the significant diffusion of EE technologies and measures. Diverse stakeholder engagement and input for the development of such policy frameworks is crucial to ensure broad support and sustainable outcomes.

39. Public-sector stakeholders, crucial for EE-related action, are often dispersed throughout the government within different ministries and entities, creating a need for consistent and transparent coordination. Effective coordination can support the replication of successful EE-related actions across government agencies, as well as the integration and capture of synergies across related initiatives, for example across EE, climate change and low-emission development programmes. For example, South Africa emphasized the need for ministerial coordination to support the country's National Energy Efficiency Strategy (NEES), which set a target of a 12 per cent improvement in EE by 2015. South Africa described a number of government agencies engaged with EE-related actions, including: the Ministry of Energy (leading NEES); the Department of Trade and Industry (Industrial Action Policy Plan); the Economic Development Department (New Growth Path Framework); the Department of Environmental Affairs (Climate Change Response Policy White Paper); the Department of Public Enterprise; the national power utility Eskom; and local and subnational governments that have significant responsibility for the provision of energy services under the constitution, among others. Given the number of government actors engaged, South Africa's experience highlights the need for effective and robust ministerial coordination.[18] France and Portugal provide two other examples of cross-government coordination effort between the central and local governments in the case of France, and between several sectoral ministries, as in the case of Portugal, to address EE-related considerations across the entire economy.[19] Additional examples are described in spotlight box 7.

40. As part of a broader institutional framework for EE, Parties emphasized the need for the regular monitoring and evaluation (M&E) of EE-related actions and initiatives under way in order to inform the prioritization of EE programmes, policy iteration and improvements over time. As a prerequisite for effective M&E, the collection of data on energy use is required at the national and sectoral levels to support benchmarking and other M&E processes. As noted by India, the benchmarking of energy-use patterns and technology performance must occur at the country level and in relation to local circumstances.[20] M&E is also crucial to ensure compliance with EE policies and regulations. However, M&E of EE policies can be very challenging and may require international support to ensure investors do not feel overwhelmed in relation to M&E requirements and processes.[21]

41. Finally, Parties also noted that, despite the market success of a number of EE technologies, there is still a need for further innovative R&D of new and improved products, especially products that are tailored to national circumstances. As presented in spotlight box 7, Japan is currently implementing R&D of high-performance heat pumps, among other technologies, within its broader EE policy framework.[22]

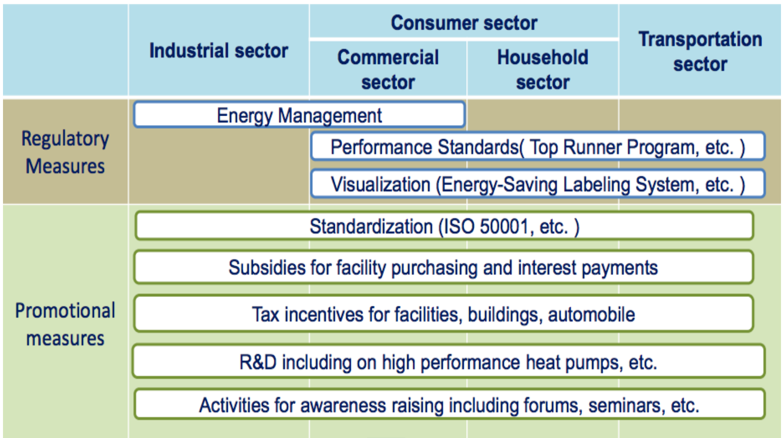
[18] ADP TEM on EE, South Africa's presentation, 2014.
[19] Submission made by the European Union in 2014 under ADP workstream 2.
[20] ADP TEM on EE, India's presentation, 2014.
[21] ADP TEM on EE, presentation by UNEP, 2014.
[22] ADP TEM on EE, Japan's presentation, 2014.

Spotlight box 7

**Comprehensive national energy efficiency policy framework**

**Colombia**: The Colombian National Development Plan highlights the need for reliable, high-quality and environmentally sustainable energy provision to support economic development. Aligned with that overarching priority, Colombia's comprehensive energy efficiency (EE) policy Programme on Rational and Efficient Use of Energy and Other Forms of Non-Conventional Energy supports a number of EE-related actions in the residential, industrial, transport, commercial and public sectors. EE-related activities in Colombia are also closely aligned with the country's Low Carbon Development Strategy (ECDBC) and, specifically, the Sectoral Mitigation Action Plan (SMAP) for the electricity sector. In relation to EE, the action plan focuses on both demand-side EE and the efficiency of the national energy system. Integration of EE-related actions with ECDBC and SMAP helps to facilitate cross-ministerial and collaborative support for EE-relation action and to ensure alignment with the country's broader development and climate goals.[a]

**Japan:** Oil crises in the 1970s led Japan to take significant action on EE, resulting in a 40 per cent improvement in EE (based on primary energy use per unit of gross domestic product) and making Japan a global leader in EE. Japan's Energy Conservation Policy (presented in the graphic below) provides a strong example of a comprehensive set of actions to support EE, combining regulatory and incentive-based measures. The private sector is central to the framework, as policies are designed to ensure business action through minimum energy performance standards, namely the Top Runner Program, requirements to designate energy managers, and regular reporting, among other actions. Peer pressure among private entities has also played a major role in supporting successful outcomes.[b]




[a] *Source*: Colombia's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

[b] *Source*: Japan's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

*Abbreviations*: ISO = International Organization for Standardization, R&D = research and development

### 2. Policy theme: design and implementation of effective and multifaceted policy portfolios

42. Rather than depending on one 'silver bullet', Parties emphasized the need for EE policy portfolios that integrate various policies, such as standards and labeling (S&L), incentives, pricing policies, R&D and M&E. Key policies are described in paragraphs 43–50 below, while successful policies, which combine various policies, are highlighted in spotlight boxes 7 and 8.

43. **Standards and labelling**: More than 75 countries currently have S&L policies in place (Collaborative Labeling and Appliance Standards Program (CLASP), 2011). Parties emphasized the need to scale up such programmes to support the rapid deployment of EE technologies. UNEP found that support for efficient appliances and equipment through S&L programmes and other actions could potentially result in 1.25 Gt $CO_2$ eq annual emission savings globally.[23] As presented in spotlight box 8, India introduced a voluntary labelling initiative for refrigerators and air conditioners and has since made labelling mandatory for four products. India emphasized the importance of robust marketing and outreach to raise public awareness of the benefits and 'superiority' of energy-efficient appliances, which contributed to the success of the programme.[24] Building on that point, to complement S&L programmes, a number of TEM participants emphasized support for forums, seminars and other learning initiatives and marketing campaigns to raise consumer awareness of the benefits of EE. Drawing on research conducted by CLASP and, specifically, successful activities in Ghana, best practices associated with designing S&L programmes are highlighted in table 6.

44. **Minimum energy performance standards**: In addition to S&L programmes, Parties specifically highlighted minimum energy performance standards for buildings, appliances and vehicles as key policy actions to support EE. Notable examples include Japan's Top Runner Program, presented in spotlight box 7, support for various programmes for the phasing out of incandescent light bulbs through the UNEP en.lighten initiative, and various measures to support fuel efficiency standards.

45. **Fuel efficiency standards:** The Global Fuel Economy Initiative (GFEI) set a target to reduce fuel consumption by half in 2050. Meeting that target could lead to the stabilization of global $CO_2$ emissions from light vehicles, even with the projected number of vehicles expected to double during that time period.[25] UNEP also noted that reducing vehicle fuel consumption by 50 per cent could lead to more than USD 300 billion in annual oil import bill savings by 2025 and USD 600 billion by 2050.[26] TEM participants and various submissions described the best practices to support fuel efficiency (see table 6).

46. **Efficient lighting:** According to UNEP, potential global emission benefits related to lighting standards and phase-out programmes could lead to 490 Mt $CO_2$ eq emission reductions annually (assuming all inefficient light bulbs are replaced globally).[27] Lighting programmes are also very cost-effective. For instance, and as described by UNEP, a country similar to India could save approximately USD 2.6 billion through electricity savings (with a nine-month payback period) if EE lighting programmes were fully implemented in all sectors.[28]

47. **Incentives and subsidies**: Despite the economic feasibility of many investments in EE, further financial incentives are required to ensure the widespread diffusion of technologies. For instance, India noted that payback periods of two to five years for EE technologies are the most effective at voluntarily attracting consumer uptake, while payback periods beyond five years often require further incentives. Examples of financial incentives include rebates and discounts for the purchase of appliances, vehicles and buildings, while non-financial incentives may include technical assistance, training and information dissemination (United States Environmental Protection Agency, 2010).

48. **Pricing policies:** Price signals also play a key role in encouraging the uptake of EE technologies and practices by consumers. Emissions trading and carbon tax policies that integrate a price for $CO_2$ emissions, as well as unsubsidized energy prices, can greatly encourage EE-related

[23] As footnote 21 above.
[24] As footnote 20 above.
[25] ADP TEM on RE, presentation by the What Next Forum, 2014.
[26] As footnote 21 above.
[27] As footnote 21 above.
[28] Submission made by UNEP under ADP workstream 2 in 2014.

action. China has implemented a number of subnational actions to support carbon markets that are also expected to benefit the expansion of EE.[29] The trading of EE white certificates associated with energy saving obligations is another innovative measure to send price signals associated with EE through market-based transactions. Spotlight box 8 highlights an energy obligation trading system in Denmark and factors for success and good practices that have been observed.

49. **Research and development**: Parties noted that, despite the market success of a number of energy-efficient technologies, there is still a need for further innovative research and development on new and improved products, especially products that are tailored to national circumstances. Japan is currently supporting the research and development of high-performance heat pumps, among other technologies.[30]

Spotlight box 8
**Successful energy efficiency policies in various sectors**

**Denmark**: Denmark is among the world leaders in action on energy efficiency (EE), investing heavily in the sector since the global oil price shocks in the 1970s. Denmark expanded its conservation target in 2012 to reduce energy use by 12 per cent by 2020. To support that target, Denmark has implemented a number of successful and cost-effective policies and actions.

The Danish Ministry of Climate, Energy and Building collaborated with trade associations that encompass over 450 energy distribution companies (including oil, natural gas, heating and electricity) to negotiate a pact that establishes a national annual energy savings goal of approximately 3,000 GWt/hour for 2014 and 3,400 GWt/hour for 2015 (an increase of 75 per cent on a previous agreement). Under the pact, each sector is allocated a share of the reduction obligations, which are then distributed to trade association member companies on the basis of market share. When companies reduce energy use (through financial or technical support), they receive credit for the energy savings, which can then be sold to other companies. The national energy saving goals associated with the programme have been exceeded every year since 2007. The programme has also spurred the development of a number of energy servicing companies to support energy savings. Key factors contributing to the success of the programme include:

- **Cost-neutrality** for the utilities involved, as spending on energy savings is passed along to the customer through tariffs, sending a price signal associated with energy efficiency;
- **Flexibility for sectors** to meet targets at the aggregate level in the most efficient way, meaning that there are no requirements for energy savings at the company, just at the sector level.

To further support EE, Denmark also implemented new building codes, with a target of reducing energy use by 70 per cent by 2020. The codes incorporate a number of dynamic elements that are regularly updated to reflect changes in the market, technology, etc. Announcements of updates are made very early to allow industry to prepare and adapt. Denmark highlighted enforcement as a key aspect to ensure the success of building code policies. It also supports voluntary agreements with industry that include energy management actions and implementing cost-effective projects that are incentivized by $CO_2$ tax rebates.[a]

**India**: EE-related action is seen as a critical element to support economic growth and related energy needs in India over the coming decades. Energy prices in India are among the highest in the world, and, while there has been significant improvement in EE over

[29] FCCC/TP/2013/8.
[30] ADP TEM on EE, Japan’s presentation, 2014.

the last decade, further action is required to realize cost reductions as well as trade and environmental benefits. India's Energy Conservation Act, established in 2001, and the National Action Plan for Climate Change (2008) both encompass EE-related actions, including: the establishment of a Bureau of Energy Efficiency; standards and labelling for appliances; energy-use reporting and norms for energy-intensive industries; EE building codes and the certification of energy managers; and a mandate to support market-based mechanisms for EE. India's standards and labelling programme was successful in creating a 'brand' for energy-efficient appliances that were seen as 'superior'. Key factors that contributed to the success of the programme included:

- Assertive marketing that was ultimately adopted by the manufacturers;
- Combining mandatory and voluntary labelling approaches;
- Regular adjustmentor tightening of standards associated with labels to ensure progress;
- Testing of labelled products;
- Choosing appropriate products to label in relation to the payback period, given that appliances with payback periods of greater than five years are often not successfully marketed through labelling programmes.

India has also adopted EE building codes in the commercial sector, which offers the greatest potential for savings. However, progress is still needed to incorporate the codes at the subnational level and to strengthen overall enforcement. Finally, India adopted Specific Energy Consumption Targets for energy-intensive sectors of the economy, under which Energy Savings Certificates can be traded and penalties will be enforced for non-compliance.[b]

**Singapore**: With a focus on long-term action on EE Singapore developed a Green Building Master Plan, with the goal of 80 per cent 'Green Mark' certification of buildings by 2030. The initiative certifies buildings in relation to energy and water efficiency, indoor environmental quality, green space integration and the use of eco-friendly materials for construction, and emphasizes high standards for measurement and verification. The programme has already exceeded the target for 2014, with more than 25 per cent of buildings expected to be certified by the end of 2014, making Singapore a global leader in green building certification. With all existing large public-sector buildings on target to reach the 'Green Mark Gold' rating by 2020 and all new public construction mandated to have a 'Green Mark Platinum' rating, Singapore's public sector represents a strong model for replication in other sectors. Incentives implemented to encourage the private sector to follow the model have been very successful in attracting private investment. In addition to building certification, Singapore has regulations in place for energy consumption in buildings and mandates regular energy audits. It also engages in a number of international initiatives to support the transformation of EE.[c]

[a] *Sources*: Denmark's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014; and Danish Energy Agency. 2010. *Why obligation schemes are the solution for European member states during the financial crisis*.

[b] *Source*: India's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

[c] *Source*: Singapore's presentation at the Ad Hoc Working Group on the Durban Platform for Enhanced Action technical expert meeting on energy efficiency in March 2014.

50. The submission from the Environmental Investigation Agency (EIA) emphasized the substantial opportunities for EE associated with phasing out hydrofluorocarbons (HFCs), especially in developing countries, where energy demand associated with air conditioning is expected to increase significantly. Significant efficiency gains (between 5 and 35 per cent) have

been achieved by a number of retailers by replacing refrigerators utilizing HFCs, which has also led to emission reductions. A number of public- and private-sector entities are taking significant action in that regard, including the European Union, Japan, the United States, the Consumer Goods Forum, the Arctic Council and the Climate and Clean Air Coalition. The Montreal Protocol currently provides financial support for the phasing down of HFCs; however, further finance, capacity-building and technology transfer are needed to extend efforts and realize further benefits. In addition to expanding the Montreal Protocol's phase out of HFCs, EIA recommends supporting communication and learning between decision makers in relation to the climate and ozone and participation in related workshops and forums in order to move the relevant work forward.[31]

Table 6
**Energy efficiency policy menu** (for select policy options and examples highlighted during the technical expert meetings and in relevant submissions)

| *Select policy options and key elements of the enabling environment to support successful policy replication and implementation* | *Select country-specific examples* |
|---|---|
| **Policy option: Standards and labelling (S&L) programmes**[a] | |
| • **Identify available resources**: Designated entities must explore the availability of resources for programme design, including: legal resources (such as mandates and an authorized agency to implement an S&L programme); financial resources (budget and good practices from other countries that can be leveraged to reduce programme development costs); human resources (staff and training needs for technical and market analysis, development of standards, designing and implementing communication strategies, etc.); facilities (central office, test labs and field offices for monitoring and enforcement); and a managing institution to implement and oversee the programme<br>• **Regional harmonization**: Implementers may also want to consider harmonizing S&L programmes at the regional level at this point in the planning process<br>• **Collect market data**: Implementers should begin to collect key market data at this stage, including projected market trends, new technologies, performance data, etc.<br>• **Determine policy approach**: Various options related to the policy approach should be considered, including: mandatory vs. voluntary programmes; standards vs. labels; endorsement vs. comparative labels<br>• **Product selection**: Products should also be selected at this stage on the basis of criteria such as energy use, cost, mitigation potential, etc.<br>• **Ensure testing capabilities**: Test procedures can be developed on the basis of international good practices and should occur at accredited institutions. They should also be inexpensive, repeatable and accurate<br>• **Assess and establish standards**: When establishing standards, it is important to ensure the affordability of efficient products, to determine the best approach to incentivize businesses to produce and support the products, and to understand how standards might have an impact on different income groups<br>• **Raise awareness through a communications campaign**: Communication campaigns complement and support the success of S&L programmes by raising consumer awareness of the benefits of energy efficiency (EE) associated with products included in the S&L programme<br>• **Monitor, report and evaluate**: to ensure compliance, to provide a | • China – Energy Label scheme<br>• European Union – Ecodesign Directive<br>• Ghana – energy efficiency S&L programme<br>• India – S&L programme<br>• Japan – Energy Saving Labelling System<br>• United States – ENERGY STAR programme |

[31] Submission by Environmental Investigation Agency under the ADP workstream 2 made in 2014.

| *Select policy options and key elements of the enabling environment to support successful policy replication and implementation* | *Select country-specific examples* |
|---|---|
| mechanism to assess programme outcomes and to redesign the programme over time as needed | |
| **Policy option: Energy performance standards (EPS) and obligations (including trading schemes)**[b, c] | |
| • **Engage multiple stakeholders in developing performance standards (particularly the private sector)**: Processes to design standards should involve the active engagement of the private sector and other stakeholders to ensure industry and other needs and interests are considered and addressed. In many cases, the private sector can also support governments in better understanding customer needs in relation to standards. Technical expert groups can also be formed to consider policy, regulation and finance, quality and environmental issues in greater detail and to inform the design of standards<br>• **Support long-term action and flexibility**: EPS design should take a long-term and flexible perspective that allows for the increasing rigour of standards over time. This allows the private sector sufficient time to make adjustments to meet standards and reduces risk associated with policy uncertainty<br>• **Communicate the benefits**: EPS programmes should be coupled with effective communication campaigns to raise awareness of the economic, environmental and social benefits of related EE improvements<br>• **Ensure technology and product neutrality**: Policymakers should avoid picking winners in relation to standards, instead allowing for private-sector competition in meeting the standard in efficient manner | • Denmark – Energy Reduction Obligation and trading mechanism<br>• India – Perform, Achieve and Trade scheme<br>• Japan – Top Runner Program |
| **Policy option: Building standards and codes** [d, e] | |
| • **Establish an effective governance and institutional structure**<br>• **Establish local leadership** and dedicated staff to support the implementation of codes<br>• **Design and implement a long-term training strategy** for building designers and architects, contractors and construction workers to meet building codes<br>• **Establish achievable codes** in relation to locally available materials<br>• **Adopt tools and services** to streamline inspection/permit processes<br>• **Design and implement awareness campaigns**<br>• **Evaluate the programme regularly** to support improvements and adopt emerging good practices | • Denmark – building codes<br>• France – 2012 Building Energy Code for New Buildings<br>• India – EE building codes<br>• Netherlands – investor payback schemes for refurbishment of rented buildings by landlords<br>• Singapore – Building Control Act and Green Mark Scheme<br>• Tunisia – Building Energy Code and Labelling Scheme |
| **Policy option: Fuel efficiency standards**[f, g] | |
| • **Improve and share information**: It is crucial to support information provision and experience sharing on the design and implementation of fuel efficiency actions and policies with policymakers. Information on fuel consumption and associated $CO_2$ emissions provided to consumers should be improved to support informed decision-making<br>• **Set standards and design fiscal policy**: Regulatory standards for fuel consumption or $CO_2$ emissions send a clear signal and provide certainty to the private sector and consumers on the viability of investments. Vehicle taxes can be designed in relation to fuel economy or $CO_2$ emissions to support consumer uptake of EE vehicles<br>• **Engage the private sector**: Working closely with the private sector in designing fuel efficiency programmes can support successful outcomes | • Brazil – fuel economy standard<br>• Canada – greenhouse gas (GHG) standard<br>• European Union – CO2 standard<br>• Japan – Top Runner Program<br>• Mexico – fuel economy/GHG standard<br>• South Korea – fuel economy/GHG standard |

| *Select policy options and key elements of the enabling environment to support successful policy replication and implementation* | *Select country-specific examples* |
|---|---|
| **Policy option: Lighting measures**[g ,h] | |
| • **Establish national regional governance and leadership**: It is important to develop strategies for efficient lighting at both the national and regional levels to ensure high-level political support and coordination across relevant entities. Strategies can include standards, labels and quality control approaches, which can be harmonized at the regional level. Successful programmes are also supported by robust education and public-awareness initiatives. Integrating lighting technology road maps at the national and regional levels can help to support technology transfer<br>• **Strengthen technical capacities**: The training of government staff to support programme implementation may be necessary, as well as measures to enhance monitoring and enforcement processes and capacities. Training and investment to support the establishment of collection and recycling programmes may be necessary<br>• **Design financial incentives**: Financial incentives and other fiscal mechanisms may be necessary to support the uptake of efficient lighting technologies | • Colombia – replacement of incandescent light bulbs under the Programme on Rational and Efficient Use of Energy and Other Forms of Non-Conventional Energy<br>• Ghana – incandescent light bulb phase-out programme |
| **Policy option: Incentives and subsidies** [d, h] | |
| • **Strong political leadership** is required to communicate to the public the broader economic development benefits associated with tax incentives (e.g. jobs, new enterprises), given the tax revenue implications<br>•<br>**he design of tax incentives** should: ensure that the size of the incentive is adequate to attract private-sector interest, but not overly burdensome on the tax revenue base; have a long enough time-horizon to provide a significant market signal, but also be flexible in supporting reductions over time; include consumer education and marketing approaches related to return on investment; and include the development of a plan to review the effectiveness of the tax incentives programme | • Japan – tax incentives for facilities, buildings and automobiles and subsidies for facility purchasing and interest payments<br>• Netherlands – Accelerated Depreciation of Environmental Investments Measure<br>• South Africa – Section 121 Tax Allowance for manufacturing projects<br>• United States – home, vehicle and appliance efficiency tax credits |

*Note:* The policy menu should be complemented by the information on cooperative initiatives presented in box 2 of the main text of this updated technical paper and additional initiatives presented on the portal on cooperative initiatives, which is available at <http://unfccc.int/focus/mitigation/items/7785.php>.

[a] *Source*: Information adapted fromCollaborative Labelling and Appliance Standards Programme. 2011. *Standards and Labels: Transforming the Market for Energy Efficient Appliances*.

[b] *Source*: Regulatory Assistance Project. 2012. *Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes.*

[c] *Source*: Consumer Federation of America. 2013. *Energy efficiency performance standards.*

[d] *Source*: Renewable Energy and Energy Efficiency Partnership, Alliance to Save Energy and American Council On Renewable Energy. 2010. *Compendium of Best Practices: Sharing local and state successes in energy efficiency and renewable energy from the United States.*

[e] *Source*: International Energy Agency.2008. *Energy Efficiency Requirements in Building Codes, Energy Efficiency - Policies for New Buildings*.

[f] *Source*: Global Fuel Economy Initiative. 2010. *Fuel Economy State of the World 2014: The World is Shifting into Gear on Fuel Economy.*

[g] *Source*: Adapted from the submission by the United Nations Environment Programme under workstream 2 of the Ad Hoc Working Group on the Durban Platform for Enhanced Action in 2014.

[h] *Source*: See <http://www.kpmg.com/global/en/issuesandinsights/articlespublications/green-tax/pages/energy-efficiency.aspx>.