Ninth meeting of the Technology Executive Committee

Langer Eugen, Bonn, Germany
18–21 August 2014

Background paper of the task force on mitigation to the Technology Executive Committee on topics or areas of work on mitigation technologies

I. Introduction

A. Background

1. The Technology Executive Committee (TEC) established at its 8th meeting (TEC 8) several task forces to undertake intersessional work in support of the implementation of the "Rolling workplan of the Technology Executive Committee for 2014-2015" (rolling workplan). One of these is the task force on mitigation.

B. Scope of the paper

2. As per the terms of reference (ToR) of the task force on mitigation, the task force is to report at the 9th meeting of the TEC (TEC 9) on what it has agreed to do, in terms of:

(a) Areas prioritized;

(b) Preparation work for the thematic dialogue;

(c) Proposals for how it could contribute to the Ad Hoc Working Group on the Durban Platform for Enhanced Action (ADP), including the technical expert meetings (TEMs).

3. This background paper serves as the report of the task force to TEC 9, provides an overview of the work undertaken since TEC 8, and presents suggestions to the TEC on how to move forward in the area of mitigation technologies.

C. Possible action by the Technology Executive Committee

4. The TEC will be invited to consider at TEC 9 the suggestions of the task force on mitigation, and:

a) Agree on topics or areas of work to be taken forward;

b) Provide any other guidance to the task force, as needed.

II. Work undertaken

A. Organisation of work

5. The task force initiated its work after TEC 8, and prepared its ToR, consistent with the rolling workplan of the TEC.

6. As per the ToR, the mandate of the task force is to conduct work on mitigation technologies, including:

a) Preparation and organization of a thematic dialogue in 2015;

b) Preparation of TEC Brief(s) in 2015.

7. In addition, the task force may consider contributing to the work of ADP, including the TEMs, with a timeline to be determined.

8. Invitations to designated observer organisations to participate in the task force were sent by the TEC Chair. All representatives of observer organisations were nominated as of 11 July 2014. The composition of the task force as of 4 August 2014 is given in the annex 1 to this background paper.

9. The task force held two conference calls between TEC 8 and TEC 9, in addition to numerous electronic exchanges.

B. Issues considered

10. The task force has considered a wide range of possible themes, topics or areas of work on technologies for mitigation, classified in four sectors: energy efficiency; renewable energy; land use; and urban environment.

11. The compilation of all suggestions made by task force members is contained in annex 2 to this background paper.

12. Those possible themes, topics or areas of work were suggested and considered with a view to serving as a basis for the thematic dialogue and subsequent TEC Brief(s) in 2015.

13. Furthermore, the task force considered whether any work could contribute to the ADP process. Such consideration was given due to the current context by which the TEC is invited to contribute to the ADP, including in the TEMs, by engaging intersessionally this year, in line with its respective mandate, to assist countries in scaling up the deployment policies, initiatives and actions in all four areas of the TEMs, i.e. energy efficiency; renewable energy; land use; urban environment.

III. Suggestions

A. Topics or areas of work

14. The task force suggests the following topics or areas of work[1] to be taken forward, in the two following sectors:

(a) **Energy efficiency**:

(i) Raise awareness and develop and enhance knowledge and capacity of key decision-makers, policy-makers and related stakeholders, at national and local levels, on the benefits of energy efficiency, with specific end-user applications, such as building, cooling and lighting, and considering what policies would be needed to mobilise finance and achieve the full potential of energy efficiency;

(ii) Promote and facilitate dialogue and collaboration with international and national financial institutions and community to explain the importance of energy efficiency and find solutions to lower the investment risk in energy efficiency;

(iii) Technology transfer and development of specific technologies as contained in the table in annex 2, covering all or some of these technology topics, with a view to removing the barriers to, and enhancing technology transfer to developing countries.

(b) **Renewable energy**, through conducting specific programs on technology transfer and development as well as the removal of barriers:

(i) Decentralized/mini-grids, smart grids, integration of renewable energy in grids, and distributed generation; and look at how innovation in grid connection policies and technologies could benefit both developing and developed countries;

[1] The order in which topics or areas of work are suggested is not an indication of priority.

(ii) Transport technologies, to replace fossil fuel with various sources of renewable energies, including in urban environments and, as possible sub-sectors, urban transport, electric vehicles, battery or other storage, efficient public transport, etc.

15. Annexes 3 and 4 to this background paper contain a brief descriptive of some of these topics or areas or work, prepared as an informal contribution by the representative of the observer organisations participating in the task force: International Partnership for Energy Efficiency Cooperation (IPEEC) and International Renewable Energy Agency (IRENA).

B. Follow-up actions after the 9th meeting of the Technology Executive Committee

16. In order to continue the work in the selected topics or areas of work, the task force suggests the following actions after TEC 9:

(a) Continue the discussion within task force members and seek further inputs from IPEEC and IRENA to begin fleshing out the selected topics or areas of work and consider doing preparatory work with the support of the secretariat;

(b) Start developing an agenda for the thematic dialogue, including possible topics and speakers.

17. With regards to possibly contributing to the ADP this year, the task force suggests to have a discussion on this matter at TEC 9 with all TEC members, based on a clear view of the ADP work under workstream 2, including the TEMs, as well as of what the TEC is invited to do.

Annex 1

Composition of the task force on mitigation as of 4 August 2014

TEC members

Mr. Albert Binger
Mr. Matthew Kennedy
Mr. Eduardo Noboa
Mr. Antonio Pflüger
Mr. Seyed Mohammad Sadeghzadeh
Mr. Griffin Thompson (facilitator of the task force)
Ms. Amel Zouaoui

Observer organizations

Mr. Arthur Lee, Business and industry non-governmental organizations (BINGO)
Ms. Janice Meier, Environmental non-governmental organizations (ENGO)
Ms. Heleen de Coninck, Research and independent non-governmental organizations (RINGO)
Mr. Ruud Kempener, Intergovernmental organizations (IGO) – International Renewable Energy Agency (IRENA)
Mr. Benoit Lebot, Intergovernmental organizations (IGO) – International Partnership for Energy Efficiency Cooperation (IPEEC)

Annex 2

Compilation of suggestions by task force members on topics or areas or work on technologies for mitigation

Topics or areas of work			
Energy efficiency	**Renewable energy**	**Land use**	**Urban environment**
GHG and efficiency standards across a selection of Technologies Capacity-building development of key stakeholders on the benefits of EE Dialogue and collaboration with International and National Finance Communities to explain importance of EE and find solutions to lower investment risk in EE Smart grid Electrification of the transport sector Transport planning in cities Energy efficiency in the industrial sector Commercial and manufacturing plants energy efficiencies How to incentivize a race to the top among countries on building efficiency improvements (for both new and existing buildings) How to enhance the rate of improvements in appliance energy efficiency worldwide Fuel substitution as a means to improve energy efficiency Lighting Cooling Domestic use of heat pumps for air conditioning in buildings Energy storage technologies PV applications in buildings	Skilled work force to build needed infrastructure, install new technologies and operate new generating plants Research, development and educational capacity Dynamic policies for RE cost competitiveness Distributed Generation How to enhance RE technology penetration through facilitated convergence between technology-sharing, finance provision and implementation projects, and how UNFCCC institutions can assist/encourage countries to adopt ambitious policy frameworks and targets for the rollout of RE Technologies Globally Funded Renewable Energy Feed-in Tariffs (REFITs) for Distributed Community-controlled Power and Sustainable Energy Access in Developing Countries Grid Stability Grid/systems integration, including smart/mini grid and integration of variable non synchronized renewables New utility model (Smart Grid) Policy and business applications for PV as a major electricity source Gas compression and expansion cycles powered by RE Water pumping in dams Solar photo-voltaic technologies Wind turbine technologies Sustainable biomass use in end-use sectors	Regulating land use issues for advanced biofuels Reforestation Efficient charcoal production Ensuring Land Rights, Food Security and Environmental Integrity in Land Use Approaches Further work under the UNFCCC regarding land use aiming to answer specific questions	Financing streams for local governments Local power grids for small, rapidly expanding cities Synergies of Urban Power Resilience and Rural Energy Access through Policy Support for “Microgrid” Interconnection with “Macrogrids” Valorization of landfills waste (especially CH_4)

Annex 3

Brief descriptive of the suggested topics or areas of work on energy efficiency

Informal submission of IPEEC to the TEC task force on mitigation

1. Capacity-building development of key stakeholders on the benefits of EE

Energy efficiency consists in choosing orientations and actions in various and complementary sectors (economical, industrial, energy) so as to provide a more efficient energy consumption system which will then allow an optimal service to the user for limited energy expenses, and minimum economical and environmental incidences. Energy efficiency is a combination of very different ingredients, from technology improvements to change in consumer's behavior. While some energy efficiency improvements can and do occur purely due to market forces, the full potential of energy efficiency is contingent upon governments creating appropriate policy frameworks at a domestic level. Ingredients of an optimal energy efficiency policy comprise a sound energy price signal, a conducive policy framework, the availability of energy efficient technologies, specific know how for the installation and management of technical solutions. The chain of decisions for achieving energy efficiency is broad, from the product designers to city planners, from end-use consumers to energy utility companies, from fiscal policy makers to custom officers. It is widely understood that cost-effective improvements in energy efficiency reduce energy costs for consumers, enhance social welfare, improve business competitiveness and reduce the need for investment in energy generation and transmission/distribution networks. They have also been found to boost productivity, reduce greenhouse gas emissions, improve energy security and enhance economic growth.

The barriers to energy efficiency are well known. One of the biggest hurdles is ignorance, precisely the lack of understanding of the nature of energy efficiency.

To address climate change, both in terms of GHG mitigation or to improve the resilience of human societies, countries have to adjust numerous sectoral policies. An EE initiative could consist in building capacity of key decision makers and stakeholders from key economic sector on the role, significance and benefit of energy efficiency. The capacity building efforts will target in particular government ministries, agencies or departments in charge of, and lead stakeholders operating in:

- Urban and City planning,
- Construction and building sector,
- Infrastructure,
- Large industries,
- Small & Medium Enterprises,
- Equipment manufacturers,
- Transport,
- Energy,
- Finance & Fiscal policies, and
- Education.

The intention is to create the optimal conditions for the design and implementation of energy efficiency policy, to support technology development and transfer in energy efficiency, and enhance national and local response to climate change mitigation.

The capacity-building initiative will be based on the reality of climate change, the necessity to mitigate GHG emissions and the unique role of energy efficiency. The initiative will provide concrete elements of successful energy efficiency policies and measures, based on world's best practice in energy efficiency. For the next steps, the initiative will be tailored to national circumstances, for instance, through the support to design of national EE

policies, support the implementation of national energy efficiency institutions… all the way to propose off-the-shell legislation whenever appropriate, etc…

2. Dialogue and collaboration with International and National Finance Communities to explain importance of EE and find solutions to mitigate the risk for investment in EE

The need to scale-up access to private finance in order to realise the full potential of energy efficiency and its multiple benefits is well recognized. At the same time, new public funds might not be available. Therefore the need and opportunity is to facilitate access to private capital on attractive commercial terms.

Energy efficiency is an atypical investment class, with unique challenges posed by the smaller scale of individual investments, and the need to replicate such investments in large numbers and facilitate technology development and transfer in energy efficiency. Improved shared understandings' about energy efficiency financing is needed.

This initiative could gather success stories and provide capacity building to both the demand side (national financial institutions, borrowers, local policy makers) and the supply side (international financial institutions). It could provide guidance to produce or facilitate access to best practice toolkits, information packs, YouTube tutorials, and direct engagement processes such as forums. This initiative could also promote and draw attention to the specific model of energy efficiency financing, where projects seeking funding are required to have an independent energy efficiency expert integrated into the project assessment team, to prepare a detailed efficiency audit, and to ensure that all viable efficiency opportunities are built in at the start. By leveraging additional investment, the potential of economic benefits and technology development and transfer of such collaboration could be very large.

Annex 4

Brief descriptive of the suggested topics or areas of work on renewable energy

Informal submission of IRENA to the TEC task force on mitigation

Introduction

With this submission, IRENA provides some background information regarding the renewable energy (RE) topics, suggested by the TEC task force on mitigation:

1. Decentralised renewable power generation and mini-grids
2. Renewable energy deployment in the transport sector

The submission highlights the potential of these RE topics to facilitate technology development and transfer for reducing greenhouse gas emissions, and provides a short overview of existing activities. Except for indicated otherwise, the data provided in this submission is based on IRENA's renewable energy roadmap – REmap 2030 - published in June 2014.

Topic 1: Decentralised renewable power generation and mini-grids

In the power sector, roughly half of additional capacity is from renewable energy. The largest growth in renewable energy sources has been in variable renewables (VRE), wind and solar PV, which account for almost 40 GW addition each in 2013 (EPIA, 2014; GWEC, 2014). Despite tremendous growth, solar PV and wind power only accounted for 2.5% of power generation in 2012. Based on national RE plans, this percentage would grow to around 15% globally in 2030. For most grids, VRE up to 20% can be handled with conventional technologies to handle variability.

However, there is considerable additional growth potential and current market trends already outpace the 400 GW of solar PV and the 680 GW of wind envisioned in national RE plans by 2030. For solar PV, the capacity could grow to around 1000 GW, and for wind to around 1700 GW. A substantial amount of this capacity growth would be decentralised. Almost 40% of solar PV capacity in 2030 would be on rooftops and wind turbines will be providing electricity to many remote areas and islands currently relying on diesel generators.

These decentralised RE sources could be locally used through mini-grids. Many islands countries already effectively operate mini-grids and hundreds of thousands of mini-grids, mainly based on diesel or small hydro, are already deployed to provide electricity to rural communities. However, the growth in solar PV and wind power is catalysing new developments in grid infrastructure developments, including smart grid technologies, advanced mini-grid design and control systems, and electricity storage. Industry estimates suggests that up to 15 GW_e of mini-grids could be installed by 2020 (Navigant, 2013). Existing markets are islands, remote communities, telecommunication towers, mining projects, and the defence sector. Especially in those areas where renewables can replace diesel generators, significant opportunities exist for technology development and transfer for greenhouse gas emission reductions. The provision of renewables-based power to the 1.3 billion people without electricity access could also reduce greenhouse gas emissions by 3-4% (IEA, 2011). Furthermore, the use of decentralised renewable power generation in mini-grids could reduce transmission losses that could be up to 20%.

What initiatives exist on decentralised renewable power generation and mini-grids?

There are a number of activities and studies that have been focused on the integration of variable renewables into the grid (e.g. the GIVAR project by the IEA and the RE grid integration roadmap of IRENA), and IRENA is providing grid stability studies for renewables integration in island networks. Furthermore, the World Bank and UN Foundation and have recently published reports on the role of mini-grids in providing universal access. RMI

has published a report on the role of mini-grids and decentralised renewable power generation in developed economies.

The Clean Energy Ministerial (CEM) has organised roundtables on mini-grid development, and also has a working group on smart grids (operated as the IEA-ISGAN implementing agreement).

What are potential areas where work of the TEC can add value?

Technologies used to control and manage mini-grids in islands and for rural electrification are similar to those used for localised use of decentralised renewable power generation in developed countries. Synergies could be created between experiences in islands, rural areas, localised power networks in cities, and RE-based distribution networks in developed countries. Best practices on models to develop, finance, and operate localised renewable-based distribution networks could be exchanged. Also, several technological challenges, such as long-term storage and control systems, still exist and need to be addressed to make mini-grids based on renewable energy a cost-effective option for electricity users. Although IRENA has initiated statistical data collection on renewables used in off-grid and mini-grid applications, data is still very limited.

Topic 2: Renewable energy deployment in the transport sector

Transport sector consumes about one third of global energy consumption, but has the lowest share of RE of all sectors (3% of TFEC, respectively). In 2010, the transport sector accounted for 23% of CO2 emissions (IPCC, 2014). Energy consumption can be subdivided into personal vehicles (roughly 50%), trucks (25%), aviation (11%) and sea transport (10%). Transport has grown with 50% between 1990 and 2010, and is expected to grow with an additional 33% by 2030. Emissions are expected to grow with 40% in the 2007-2030 timeframe (OECD, 2010).

Under current policies, RE share is not expected to increase beyond 5% at global level. However, there is the potential to increase RE share through renewables-based fuels to 15% of global transport fuel. Biofuel consumption has grown 6- and 47-fold from 2000 to 2014, but still account for only 2% of energy consumption in the sector. A bottom-up analysis by countries shows the potential to grow 8-fold over the period between 2010 and 2030. Advanced biofuels account for only 0.2% of biofuel production, but doubled in capacity in 2012. Through technology development and transfer, they could account for 37% of biofuel consumption by 2030. An important criteria is the management of land use issues and limiting CO2 emissions in the supply chain.

The production of biogas and bio-syngas is another option to reduce emissions in the transport sector. After upgrading to biomethane, to bio-dimethyl ether (DME) or through conversion into bio-ammonia, these fuels can be used with slight modifications into existing engines, or as fuel for fuel cells. As of mid-2013, more than 260 biogas upgrading units are in operation worldwide[2].

The third option is to use renewable-based power generation to fuel the transport sector. The electricity can be used directly in plug-in hybrid-electric (PHEVs) or electric vehicles (EVs), converted into hydrogen to be used in fuel cells, or the hydrogen can be converted into ammonia. PHEV and EV sales account for 0.3% of total car sales in 2013 (200000 vehicles), but could account for 10% of the total passenger car fleet in 2030.

Besides fuel switching, there is opportunity for modal shifts among different subsectors to increase RE share. Examples are road transport to rail or navigation, or aviation to high-speed trains. High urbanisation rates in Africa and Asia means that cities could be an important location for introducing renewables-based fuels, modal shifts. For example, small electric 2- and 3-wheelers are gaining significant ground in the market, particularly in China where by 2018 there could be over 350 million. Biokerosene (e.g. from crops irrigated with salt water), solar PV, and wind power (kites and Flettner rotors) could contribute to renewables deployment in the aviation and navigation sectors.

[2] http://www.iea-biogas.net/plant-list.html

What initiatives exist on renewables in the transport sector?

Business is engaged in global initiative on Sustainable Mobility under the World Business Council for Sustainable Development (WBCSD), and the OECD has developed the International Transport Forum which also focuses on environmental issues. Furthermore, the Clean Energy Ministerial (CEM) has set up an electric vehicle initiative. Regarding research activities, the International Energy Agency (IEA) has implementing agreement on fuel cells, advanced motor fuels, and hybrid/electric vehicles. On biofuels, GEF, UNIDO, FAO and UNEP have developed a biofuels greenhouse gas calculator.

What are potential areas where work of the TEC can add value?

Although 63 countries have targets for biofuels (REN21, 2014), the target setting and support policies for achieving these targets can be improved. Another important topic that needs to be considered is the sustainability of global biomass logistics. Transitions in the transport sector towards alternative infrastructures (electricity, hydrogen, ammonia) will require long-term planning and sustained efforts. Finally, an important role could be to bring together different stakeholder groups (business (both car manufactures and fuel producers), academia, policy makers, and civil society).

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