

Summary of the thematic dialogue on the development and transfer of technology in distributed renewable energy generation and integration

United Nations Campus, Bonn, Germany
10 March 2015

Summary

- The Technology Executive Committee (TEC) held a thematic dialogue on the development and transfer of technology in distributed renewable energy distribution and integration on 10 March 2015 in Bonn, Germany.
- This document provides a summary of the thematic dialogue, covering the proceedings of the event, a summary of the presentations and ensuing discussions as well as the work and outcomes of break-out groups.



I. Introduction

A. Background

1. As per its rolling workplan for 2014-2015,¹ the Technology Executive Committee (TEC) agreed to conduct work on mitigation technologies, including the organization of a thematic dialogue and the preparation of TEC Brief(s) in 2015. At its 9th meeting and in the subsequent consideration, the TEC agreed to address the following specific area: Distributed renewable energy (RE) generation and integration (hereinafter referred to as distributed RE).

2. As part of its 10th meeting, the TEC held a thematic dialogue on the development and transfer of technology in distributed RE on 10 March 2015 on the United Nations Campus (Altes Abgeordnetenhaus) in Bonn, Germany.

B. Scope of the document

3. This document provides a summary of the thematic dialogue, covering the proceedings of the event, a summary of the presentations and ensuing discussions as well as the work and outcomes of break-out groups.

4. In supplement to this document, it should be noted that the thematic dialogue was webcast live, and its viewing is available on the TEC webpage of the technology information clearing house (TT:CLEAR),² as are all presentations made during the dialogue.³

II. Proceedings

A. Objective and structure

5. The objective of the thematic dialogue was to support the TEC in identifying and generating policy perspectives, options, mechanisms and measures to enhance the development and transfer of technology in distributed RE. It aimed at helping the TEC prepare a TEC Brief and policy key messages and/or recommendations to Parties on this matter with a view to increasing the share of distributed RE and enhancing pre- and post-2020 mitigation action.

6. The thematic dialogue had three sessions:

- (a) Session I: Presentations and questions and answers;
- (b) Session II: Break-out groups and plenary discussion;
- (c) Session III: Wrap-up and concluding remarks.

B. Participation

7. The thematic dialogue was attended by members of the TEC and representatives of Parties, United Nations organizations, intergovernmental and non-governmental organizations, resource persons, and members of the UNFCCC secretariat.

8. Nine experts made presentations in the thematic dialogue. They were representatives of developed and developing countries, and coming from a wide range of expertise, that is academia, implementing agencies, utility, international organizations, and regional bank.

¹ <http://goo.gl/6pa8Mn>

² <http://unfccc6.meta-fusion.com/tec10/channels/tec10-live#ctf>

³ http://unfccc.int/ttclear/templates/render cms_page?s=TEC_TD5

9. Online stakeholders were able to participate in the discussions via social media by sending questions and comments for the consideration of the participants, by using the Twitter hashtag #climatetech.

III. Summary of the sessions

A. Welcome and opening

10. Mr. Kunihiro Shimada, Chair of the TEC, opened the thematic dialogue by welcoming participants and highlighting the importance and relevancy of addressing distributed RE, as it is in line with what Parties are seeking. Mr. Shimada also thanked the TEC task force on mitigation for its work to organize the thematic dialogue and introduce innovative features such as the use of break-out groups and expert interventions.

11. Mr. Shimada outlined the objective and expected outcomes of the thematic dialogue, encouraging participants to engage in the discussion, including online stakeholders through Twitter.

B. Session I: Presentations and questions and answers

12. The first session was moderated by Mr. Shimada. It comprised a presentation of a background paper on distributed RE that had been commissioned prior to the thematic dialogue, presentations of two case studies as well as five expert interventions. Various question-and-answer sessions took place during this session. Being a new format of presentations, each expert intervention consisted of a very short presentation by an expert on a specific theme surrounding distributed RE and providing initial expert views to set the scene and kick off the discussion. The four themes were: (i) future of distributed RE; (ii) technological challenges and policy options to overcome these; (iii) financial perspective and challenges; (iv) capacity-building.

1. Background paper and first expert intervention

13. The first presentation was on the background paper on distributed RE and was made by the consultant who prepared the paper, Mr. Paul Komor, Lecturer, Environmental Studies, University of Colorado-Boulder. It aimed at providing the current state of play and an accurate and objective assessment of the development and transfer of technology in distributed RE.

14. Mr. Komor first explained what distributed generation is, and outlined some advantages compared to centralised generation, such as its appropriateness for small or remote communities and more opportunities for private involvement and investment. He highlighted the most common technologies, that is solar photovoltaic (PV), micro-hydro and small wind turbine. He mentioned that while the cost of distributed RE is generally well understood, the social and environmental issues are less documented. He provided perspectives of multiple stakeholders involved in distributed RE, as well as discussion of the main barriers to and enabling environments for the deployment of distributed RE technologies.

15. Mr. Komor presented some policy issues and options that countries could consider to enhance distributed RE. One of those could be to rethink the role of private and public sectors, including the role of utilities, in order to provide incentives for private investment and financial innovation while maintaining appropriate regulation. He suggested to rethink fossil fuel subsidies, not as to oppose them to RE technologies, but so that distributed RE also gets support and subsidies. He concluded that certainty in policy frameworks and building in-country capabilities are necessary to achieve widespread and sustainable use of distributed RE.

16. Following the presentation of the background paper, Mr. Yacob Mulugetta, Professor of Energy and Development Policy, University College London, and contributor to the IPCC AR5 WGIII, provided an expert intervention on the future of distributed RE. He underlined that there is good progress happening: a lot of technology and policy innovation, cost decrease and growing involvement of the private sector. However, there are important challenges, such as the establishment and strengthening of needed institutions and policy framework, and the criticality of developing and strengthening national

and local skills and capacity (for example, for system operation and maintenance). He also mentioned that there is considerable political momentum around energy access and the role of distributed RE, and that communities' willingness to take ownership and become RE producers is growing.

17. In the ensuing discussion, it was mentioned that to ensure long-term stability and reliability of off/small-grids, a good infrastructure for operation and maintenance as well as a proper participatory organization/system in communities are needed. In terms of technologies to overcome the intermittence of some RE technologies, storage technologies, such as batteries, are promising and improving, but are still expensive. Participants also highlighted that distributed generation will be the most economic solution globally to provide energy to those who don't have access now, despite its current cost.

2. Case study in a developing country

18. The developing country case study was about the implementation of the initiative Energising Development (EnDev) in Indonesia with micro-hydro power (MHP) and solar PV power (PVP) in mini-grid communities, including highlights of key barriers and innovative solutions. The objective was to identify concrete issues and challenges encountered in mini-grids and solutions that can be applied to successfully deploy and operate such systems.

19. The presentation was made through webex by Ms. Amalia Suryani, advisor for EnDev Indonesia, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). Mr. Andreas Michel also from GIZ was present in person. Ms. Suryani provided some context of the situation in Indonesia where out of the 51 MW installed capacity in the country, 12 MW are from micro-hydro power (from more than 500 mini-grids throughout the country). She underlined that 20% of the population of Indonesia does not yet have access to electricity, which is what EnDev tries to improve, by providing technical support services to communities in the design, commissioning, and operation of mini-grids.

20. She outlined some of the main barriers faced when deploying and implementing MHP and PVP mini-grids, classifying them as: (i) institutional aspects; (ii) management aspects; (iii) post-installation issues. She further explained some of them, for example that the implementation of rural electrification programme is a challenge given multiple actors involved, making the necessary coordination difficult. She noted that the issue relating to the legal ownership and hand-over of mini-grids to the communities is sometimes challenging. Also, and as highlighted by previous speakers, she said that the local capacity and skills (in this case called: village management team (operator, treasurer, chairman)) is very important. To this end, she mentioned that EnDev provides information, documentation and training to communities for the operation of the mini-grids. One of the support tool provided is the Mini-grid Service Package (MSP), covering the technical, participation, documentation aspects. EnDev also provides a SMS-based support "hotline" to assist with mini-grid technical and administrative issues. She mentioned that one focus of EnDev is to address the post-installation issues, for example by trying to ensure adequate after-sales service, local technical infrastructure, and access to maintenance fund.

21. Mr. Michel complemented the presentation saying that the availability of technology is not the issue, but rather the applicability to local conditions. He said that the policy framework and financing are a challenge, as are the roles and responsibilities in the operation and maintenance of the system. One way forward is to raise communities' awareness that distributed RE can work and fulfil their electricity needs. The best approach to making distributed generation a reality is not just to provide a technology or a connection to the grid, but rather to provide energy services (access, proper use, maintenance).

22. After the presentation and in response to questions, Ms. Suryani explained that there is now a strong local manufacturing network of turbines and related components in Indonesia, which is directly helping the development of MHP in the country. In terms of power supply, she mentioned that most of PV systems are equipped with battery storage in order to cope with the energy intermittence, as there is no baseload or diesel generator, and there are also consumption limitations. It was also highlighted that the operational cost is an issue. While the government provides the mini-grid systems to the communities for free, the operational and maintenance costs come back to the communities, which sometimes requires further financial support for major situations. The up-front costs can also be very high, so the government has to cover all costs, as the private sector may not yet want to invest because the systems may not be financially viable. However, there is some potential to develop and replicate models by which local entrepreneurs build and operate such systems, by creating better and safe investment conditions.

3. Case study in a developed country

23. The developed country case study was about Ireland as an island operating distributed RE, bringing the national operator perspective, and highlighting key barriers and innovative solutions. The objective was to identify concrete issues and challenges in particular relating to the integration of RE in the national grid. The presentation was made by Mr. Andrew Keane, Senior Lecturer, School of Electrical, Electronic and Communications Engineering, University College Dublin. Mr. Keane also previously worked with Electricity Supply Board Networks, which is the national utility of Ireland, in the area of renewable generation planning and smart grid solutions.

24. Mr. Keane provided some context of the Ireland situation where the country has strong wind resources, with wind farms ranging from 100 KW to 30 MW. He mentioned that the utility plays an active role as facilitator of RE and also balances its obligations towards primarily demand customers and also now with generation customers. He presented the 2020 RE target for Ireland, which is 40% of electricity to be renewable (~6,000 MW), approximately half of which will be distributed RE. He outlined the two fundamental challenges in distributed RE: (i) the lack of electrical infrastructure in rural areas available to accommodate and integrate wind energy resource, and (ii) the very weak connection with other national grids, making the Irish grid rely on its own for managing electricity supply and demand.

25. Mr. Keane explained that the financing of projects is challenging for private developers due to high upfront capital costs. One way to overcome this is to provide certainty around revenues, for example by establishing feed-in-tariff mechanisms, and by giving priority to the distributed RE to be exported into the grid. He mentioned that for such measures to be effective, there must be coherence between technical realities of the grid and policy requirements, which requires close collaboration between the government and the utility. Mr. Keane presented a model that was used, the Group Processing Approach, which applies in areas of high energy resource density with multiple generators seeking to connect. The approach is to consider network design for cluster as a whole, and guaranteeing that wind power available is able to be utilised. This can also largely eliminate issues related to variability.

26. Mr. Keane presented other new challenges that will need to be tackled, such as a growing public opposition to wind turbines and overhead lines, growing public opposition to renewables incentives, and connections of micro-generation (solar PV). He also introduced some innovative solutions, such as real-time management of resources, and network automation and control. He concluded by saying that what has enabled Ireland to reach such important installed capacity in distributed wind energy is the coherence between technical innovation and appropriate policy and incentives, in addition to effective coordination of operations between the utility, developers and the government.

27. In the ensuing discussion, it was clarified that the feed-in-tariff applicable to all forms of RE is 70 euros per MWh produced. This is guaranteed by the government, and it has been in place for the last 10 years and will be up to 2017-2018. Mr. Keane also mentioned that there are some energy cooperatives emerging in Ireland, and that the utility's approach would be to support those while ensuring technical feasibility.

4. Expert interventions

28. After the case studies, five experts provided their views on specific themes surrounding distributed RE. The first two expert interventions addressed technological challenges and policy options to overcome these. The first expert was Mr. Francisco Boshell, Lead Officer of minigrid system innovation work, International Renewable Energy Agency. Mr. Boshell outlined several technological challenges along with some policy options for centralised and distributed RE. He mentioned that one of them is the variability of distributed RE and a way to address this aspect is by ensuring appropriate policy support, for the access and the use of energy, and by conducting smart planning and design of systems. Another challenge identified was the local value chain, which is a very important link in the sustainable operation of mini-grids. To this end, the community engagement and ensuring proper maintenance of systems are essential.

29. The second expert addressing that theme was Mr. Luis Munuera, Smart Grids Technology Lead, International Energy Agency. Mr. Munuera mentioned that to value and scale-up distributed RE, accurate local resource assessment and data collection will be needed. He also said that standardization of

technologies and business practices and models will improve deployment of distributed RE. At the same time, growth in distributed RE will redefine the role of power distribution. Understanding of loads and customers and communities' needs will be essential, and smart grid technologies can be important enabling technologies.

30. The following expert intervention addressed the financial perspective and challenges, and was provided by Mr. Alberto Levy, Lead Regional Energy Specialist, Energy Division, Inter-American Development Bank. Mr. Levy stated that his intervention applies mainly to urban distributed RE connected to the grid. He also mentioned that a fundamental principle applies in this field: tariff must recover cost. Mr. Levy addressed the topic from two angles: (i) the financing of projects, which is a significant challenge for developing countries, given the high deployment costs and restricted availability of finance; (ii) the pricing of energy exports. In terms of financing, Mr. Levy explained the need to develop mechanisms to allow utilities to finance the generation of distributed RE but also the support system, such as smart grid components and technologies. With regards to energy pricing, he stated that the greater the price is, the faster investment is recovered, and the more likely the technology would be adopted. He said that subsidies from the government/utility to producers could provide incentives to encourage distributed RE. Another way to minimise the financial risks for small producers would be the use of standardized contracts and streamlined processes.

31. The final expert intervention was on capacity-building surrounding distributed RE. It was provided by Mr. Benon Bena, Head of Off-Grid Renewable Energy Development, Rural Electrification Agency of Uganda. Mr. Bena started off by outlining many constraints to deal with when building the capacity needed to develop, absorb and uptake distributed RE technologies, including for the variety of technologies, which each may require different professions, such as in generation, distribution, sales/operations and maintenance. He presented the capacity-building requirements at three levels: (i) national institutions; (ii) private sector; (iii) local communities. He provided concrete examples for each of them, for example: for the Ministry responsible for Energy to design favorable policies and to support demonstration/pilot projects; for the Regulatory Authority to formulate appropriate guidelines and licensing to create good enabling environments for private companies to implement RE mini-grids; for the private sector to reach an understanding of distributed RE technologies, skills for design, installation and maintenance; for local communities to be able to organize themselves, operate and maintain isolated RE systems.

32. A question-and-answer session followed the five expert interventions where it was clarified, *inter alia*, that deployment of distributed RE could not only reduce emissions, but bring very important co-benefits such as reducing poverty and pollution (black-carbon).

C. Session II: Break-out groups and plenary discussion

33. The second session was moderated by Mr. Gabriel Blanco, Vice-Chair of the TEC, and consisted of two parts. The first part was devoted to work in four parallel break-out groups, each addressing one of the four themes on which experts had provided expert interventions in Session I (Future of distributed RE; Technological challenges and policy options to overcome these; Financial perspective and challenges; Capacity-building). The groups were composed of any of the participants in the thematic dialogue, and included the expert who provided the related expert intervention. Each group were facilitated by a member of the TEC task force on mitigation, and was tasked to respond to guiding questions.

34. The second part of the session was for the break-out groups to report to the plenary on the outcomes of their deliberations, followed each by a question-and-answer session.

1. Future of distributed renewable energy generation and integration

35. The break-out group addressing the future of distributed RE first offered possible actions the TEC could take to advance distributed RE, for example by providing an initial set of messages, either key messages or recommendations, and then seek feedback on them. The TEC could also narrow the concept of distributed RE and address specific issues such as energy storage, and explore urban vs rural issues. In terms of the future of distributed RE, the group reported on its consideration with regards to barriers/challenges and opportunities to expanding distributed RE. It explained that barriers may be technical, economic and political, which is similar to other technologies.

36. The group mentioned that there might be some incumbent resistance relating to decentralised generation and it could be worth exploring what that might mean. It was also highlighted the benefits of considering the energy access issue in the context of climate change, and that the benefits of distributed RE should be quantified, that is GHG mitigation, and also social and other benefits.

37. In terms of possible opportunities to maximize distributed RE, the group reported that it might be useful to focus on the co-benefits in rural areas (such as energy security and gender), as economic cases might be more difficult to make in those situations. The importance of considering diversity of perspectives and engaging stakeholders was mentioned, so is the standardization of approaches.

2. Technological challenges and policy options to overcome these

38. The break-out group addressing the technological challenges and related policy options first reported on the technological challenges it had identified, framing the discussion under the premise that pursuing a low-carbon climate-resilient sustainable development pathway is key. The group identified the need to better understand: the context and the specific demand of distributed RE as well as how to ensure affordability and availability of energy to communities and to generate demand and supply for these. The group also reported on the need to identify what technologies and systems are needed, and how they compare with what is currently available. It also highlighted the importance of understanding how things are going forward, and whether technologies and systems will be off-grid permanently or will get eventually connected to the grid. In addition, the group raised the importance of taking into account the local environment to ensure resilient and durable technologies.

39. The group identified possible roles for the TEC and policy options that can overcome the technological challenges, bearing in mind that policy is a process (not an event) that has to be implemented, monitored and fine-tuned, and that time is needed to build effective and durable policies. The group suggested that the TEC could: (i) further identify what the technological challenges are; (ii) give guidance, based on a clear understanding of the challenges, on how technologies could be scaled up; (iii) encourage the development of distributed RE through current processes or mechanisms such as nationally appropriate mitigation actions (NAMA) and technology needs assessment (TNA), and promote customized models and tools at country level; (iv) encourage standardization and national regulations that are catalytic in generating innovation, and identify ideas on how to maintain such technologies; (v) encourage collaboration to build demand through aggregation, for example South-South cooperation; (vi) highlight potential opportunities generated by the retirement of significant diesel-generated energy capacities in developing countries; (vii) identify business models that work, underlining that companies present on the ground may generate greater benefits as they better understand local issues.

3. Financial perspective and challenges

40. The break-out group addressing the financial perspective and challenges reported that high upfront costs and access to financing were important challenges in deploying distributed RE. It highlighted some aspects of investors' perspective, for example: the importance of incentives, such as lending sovereign money to national development agency or banks at low interest rates for final users, globally funded feed-in tariffs, and loan guarantees; the importance of stable policies; and the impact of macro-economic indicators or risks that may affect projects' feasibility.

41. The group identified some ways forward for sustainable and replicable distributed RE projects, such as building the capacity in developing countries to produce/manufacture technology nationally or locally; an insurance system to cover risks as an enabler policy approach; and some innovative financing models (e.g. phased financing model) as current models may not be sufficient.

42. The group also suggested some possible roles for the TEC in enhancing distributed RE, such as: (i) sharing good practices on climate technology financing; (ii) further exploring policy options and possible incentives; (iii) having linkages with the Financial Mechanism, not just procedural or institutional, but rather substantive, such as financing criteria; (iv) looking at making recommendations on standardized contracts between the utility and the investors/producers of distributed RE to streamline the process and lower transaction costs. It was also mentioned that one possible area of work was the provision of technical assistance to better develop and present projects, with financial risks identified and managed, which could be supported by the Climate Technology Centre and Network.

4. Capacity-building

43. The break-out group addressing capacity-building reported that it had identified capacity-building needs for various actors involved in distributed RE. For governments, regulators, planning agencies, including national designated entities (NDEs, linked to the CTCN), some of the needs were to have the capacity to develop and enforce fair and appropriate regulations and standards, and to collect data and conduct economic evaluation. For the private sector, some of the needs were to build local demand and access to communities, to develop financial products as well as to support how technology suppliers can collaborate with the financial sector. The group mentioned that it was very important to build capacity in local communities, including taking the gender perspective into account, by improving energy literacy and awareness. In the longer term, yet still very important, the importance of having education programmes at all levels, including to develop research skills, was emphasized, which ties with the need to enhance the technical capability of researchers and experts.

44. The group suggested some possible actions the TEC could undertake, such as: (i) identify gaps and share success stories to overcome challenges. It was pointed out that the TEC needs to be more effective at conducting outreach activities, in part, to effectively disseminate its TEC Briefs and other publications; (ii) change mindset of technology policy-makers at national level; (iii) specifically focus on outreach to NDEs; (iv) provide guidance on what governments can do to increase distributed RE, including how to build and enhance their needed related capacity; (v) hold an international workshop on distributed RE; (vi) liaise with the Financial Mechanism on this matter.

D. Session III: Wrap-up and concluding remarks

45. The thematic dialogue was concluded by Mr. Shimada. He recognized the richness of discussions, presentations and outcomes of break-out groups, and mentioned that all this information and views will be very useful for the TEC in taking forward its work on distributed RE. He mentioned that a summary of the thematic dialogue will be prepared and made available in due time. Mr. Shimada thanked all speakers and participants, including online viewers, for their active participation and contribution.
