

### Section 3

## TERMS OF REFERENCE

# Enhancement of REmap tool and preparation for the Energy Transition Model

## 1. Introduction

IRENA is an inter-governmental organization, mandated by Governments worldwide to promote the widespread and increased adoption and sustainable use of all forms of renewable energy. In order to do so, IRENA will facilitate access to all relevant renewable energy. It facilitates and analyses the sharing of best practices and lessons learned regarding policy frameworks, capacity-building activities, available financial mechanisms and relevant technologies on renewable energy.

IRENA's Innovation and Technology Centre (IITC) located in Bonn, Germany, is responsible for the provision of the means for an accelerated renewable energy technology uptake, considering national conditions of resource endowment, social and economic frameworks. In accordance with the IRENA Statute, activities in this field include analysis of renewable energy technology policies; dissemination of information and increased awareness; technologies and equipment overview and assessment of success-failure factors; improved pertinent knowledge and technology transfer, and joint RD&D and provision of information about the development and deployment of national and international technical standards in relation to renewable energy.

## 2. Background

REmap is IRENA's global renewable energy roadmap that has the objective of developing pathways for accelerating renewable energy deployment, and characterizing cost and benefits of renewable energy technology options. The REmap programme is coordinated through IRENA's Bonn office at the IITC. REmap is a country by country analysis built on an internally developed REmap tool that assesses renewable technology options (REmap Options) on sector level for each country. IRENA cooperates closely with its member countries in the REmap programme to identify the REmap Options. Currently 70 countries are included representing 90% of global energy demand.

IRENA has developed the Excel® based REmap tool that allows IRENA's analysts and national experts to evaluate and create a country-level REmap analysis. The tool provides a simplified but dynamic accounting framework to create and evaluate energy system developments and costs at sector (power, transport, industry, buildings) and technology level. The tool is applied to each country resulting in 70 separate analyses.

In addition to country analysis, the other main objective of the tool is to ensure that data and results can be aggregated and compared in a consistent way across countries. The choice of Excel® is also meant to allow as broad as possible the user base of the tool considering other software often require licenses and advanced understanding of a modeling environment.

Based on the results generated from the application of this tool for the REmap countries, many other complementary analyses are prepared that support IRENA's REmap programme and other IRENA activities. These include aggregation of results at regional, sectoral and global levels, externality valuation assessment, carbon dioxide (CO<sub>2</sub>) emission calculation, investment analyses, and other technology or issue specific analysis and reports.

The REmap tools for participating countries have resulted in the publications of 12 country studies, three global reports, five sectoral studies, and numerous issue or technology specific reports and papers. Please see [www.irena.org/remap](http://www.irena.org/remap) for more information.

### 3. Scope and objectives of the work

IRENA is looking to improve and expand the REmap tool. The redesigned REmap tool needs to build on the structure and strengths of the existing tool, while improving its capabilities. IRENA will provide the existing tool, handbook and other supporting documentation, detail the improvement tasks in greater depth during an inception meeting, and will provide input to the consultant entity as necessary to improve the REmap tool in line with the desired improvements listed below.

3.1 The overall objectives of this tool improvement effort is to:

- (i) simplify the tool for users through the use of more Excel® based automation that enables them to easily change input variables and key parameters, and have results presented in a manner that is easier to follow;
- (ii) internalize some of the post-analyses that are done in subsequent steps outside the tool environment into the tool itself;
- (iii) improve the flexibility of the use of the tool (e.g. adding/changing years of analysis, adding energy carriers to the energy balances), an in particular allowing different base years 2015 or newer, and future scenarios beyond 2030 to include 2040 and 2050;
- (iv) expand the capability of the tool including incorporating energy efficiency options analysis capability and other low carbon technology options analysis capability (this function is to enable the tool to better assess energy system decarbonization) as well as a basic power system flexibility quick scan capability;
- (v) adding the capability of having energy demand and supply forecasts function for the Reference Case; this could be included in the tool itself or be enabling a link to an outside tool;
- (vi) Enable a reporting function of the tool that allows the analysis findings to quickly and simply be outputted and displayed outside of the tool
- (vii) Develop a versatile and capable aggregation framework outside the tool that allows aggregation of country tool data at country, sector or technology level
- (viii) Preparation and design the tool to be at the center of a new IRENA suite of analysis tools that will collectively be known as the Energy Transition Model (ETM).

3.2 The items listed above are general objectives. The wish-list of improvement needs are listed below. These items are explained in general terms, and IRENA will clarify the individual tasks in greater detail upon selection of the consultant entity during the initial

inception meeting. IRENA understands that a discussion with the consultant entity will need to take place during this meeting about if all these capabilities are possible in an Excel environment and prioritize the improvements with the consultant entity given their allotted time availability:

- Overall simplification of key parameter and variable input methods for base year and Reference Case energy balances, technology potentials, technology cost and technical performance.
- Adding more recent base year energy balance input table, and/or a statistics function for importing historic data
- Expand energy carriers in the energy balances (e.g. adding offshore wind, heat pumps, bioenergy types).
- Better display of REmap results in a summary sheet
- Incorporation of an sheet allowing non-experts a method to interact with the tool
- Improving externality analysis integration for Reference Case and REmap case
- Improving greenhouse-gas (GHG) and other atmospheric emissions analysis for Reference Case and REmap case
- Improving analysis for Reference Case and REmap case, i.e. system cost (able to incorporate structural or ancillary costs), investment needs (including structural), and REmap case subsidy needs
- Expanding analysis year capability to 2040 and 2050, however the tool should be able to function for either 2030, 2040 or 2050 without having later or earlier inputs being necessary, i.e. just a 2050 analysis could be undertaken (2015-2050) without having to input 2030 or 2040, or just a 2030 analysis could be undertaken (2015-2030) without having to enter other years. For ease and simplicity of use, years that are not used should also be able to be hidden
- Allow changing future years, from 2030 to 2036 for instance, and then have subsequent calculations that involve year time-steps to considered the changed year
- Expand commodity, including biofuels, fuel input options
- Expand discount rate assumptions to allow differentiation on sector level
- Creating a more presentable cost-supply curve graph functionality
- Develop a power system flexibility quickscan capability to flag potential issues and identify solutions to enabling higher shares of variable renewable power technologies
- Incorporate energy efficiency options and other low carbon technology options
- Incorporate input side capabilities (e.g. use of IEA energy balance for base year, IRENA capacity/statistics databases for power sector, capital stock inputs from sources such as Platts)
- Preparation of an aggregation framework that can incorporate all country results in a consistent and comparable manner, which can also be expanded to more countries and that allows simple data analysis and aggregation
- Enable a tool environment that allows the REmap country tools to be the center of the Energy Transition Model suite of analysis tools

- Enable a reporting functionality, i.e. automation function that outputs a standardized analysis briefing note that includes text with the tool inputting key findings and variables, several key figures and tables

3.3 Additionally, the consultant entity should remain available for up to 7 days per month for 3 months after final delivery of the tool refinement support and other ad-hoc requests that arise once testing of tool begins. Some of the ad-hoc request could, but are not limited, include:

- Error checking
- Tool interaction improvements
- Ability to analyze multiple scenarios within the tool
- More in-depth reporting functionality
- Incorporate deeper system analysis functionality (e.g. grid-integration, commodity trading, transport mode shifts, etc)
- Add support for different languages
- Deepening of the database or aggregation tool showing results from individual country tools on regional, sectoral or global levels

## Deliverables and expected outcomes

- A. One-day kick-off meeting and consultation at IRENA Bonn office is conducted to introduce the team, and existing REmap tool, and define exact tool enhancement needs, structure of the tool, capabilities of revised tool and aggregation framework.
- B. Submission of the tool for review by the IRENA Secretariat, multiple rounds of review until tool meets needs set forth in deliverable (a). These reviews could include meetings in Bonn for in person feedback and consultation or troubleshooting.

**Deliverable 1:** REmap excel tool and aggregation framework that meets the requirements outlined in section 3.1 and further defined in deliverable A. (3-4 months after kick-off meeting)

*Expected work requirement for deliverable 1 is approximately 60 man-days*

- C. Once improved tool is submitted and approved by IRENA, consultant entity should be available for up to 21 days over a three month period for periodic requests and tasks relating to continued refinement of the tool and aggregation framework, as well as eventual interoperable of the Energy Transition Model system.

**Deliverable 2:** Support services related to tasks identified in section 3.3 over a three month period beginning after completion of deliverable 1.

*Expected work requirement for deliverable 2 is approximately 21 man-days*

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