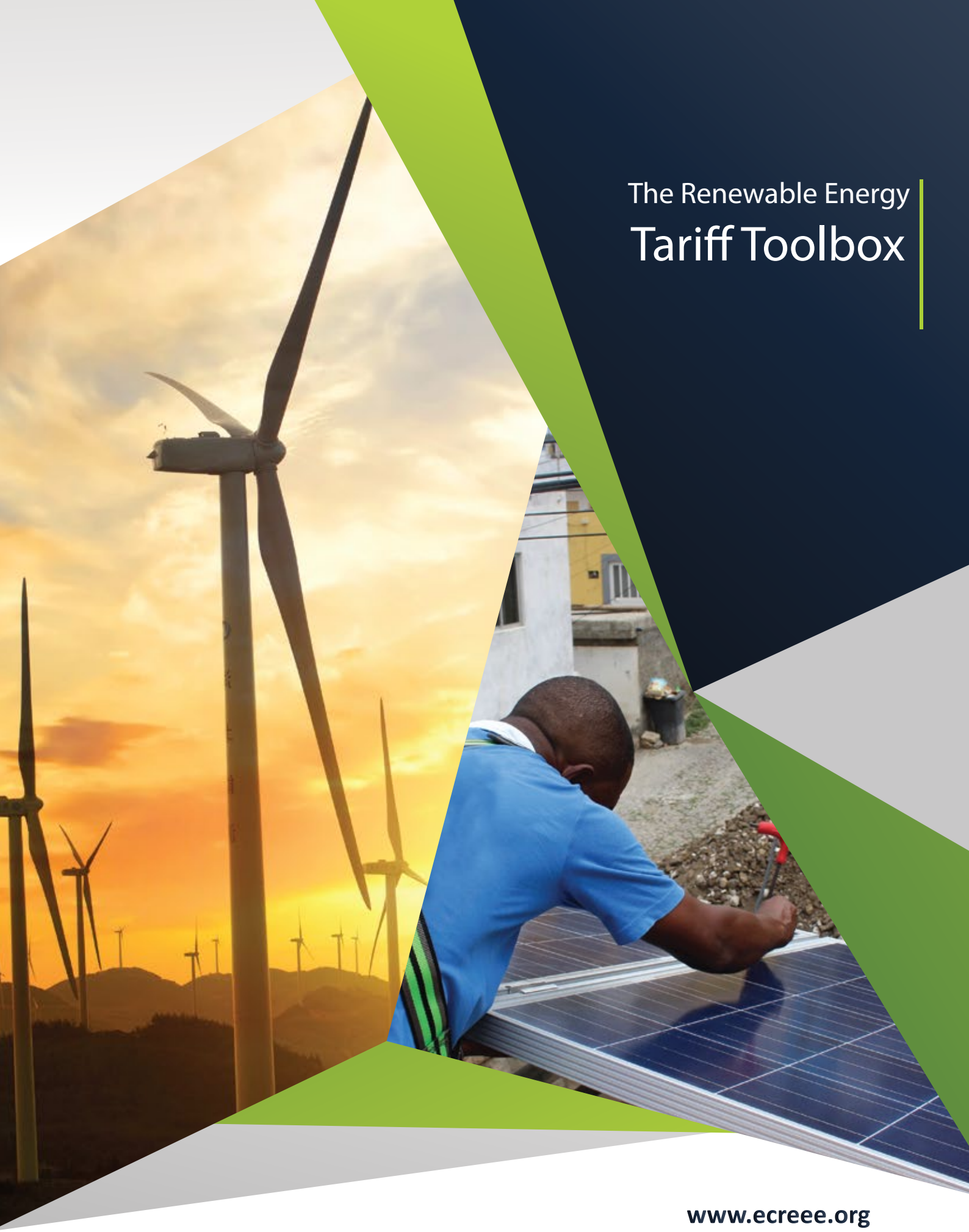

The Renewable Energy Tariff Toolbox

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ECREEE
Towards Sustainable Energy

The Renewable Energy Tariff Toolbox

Economic Community of West African States (ECOWAS) state governments see renewable energy deployment as a way to improve the power sector and expand electricity access; however, the lack of clear renewable energy (RE) policy instruments is, still today, a main barrier for increase of RE generation and specifically the participation of private entrepreneurs.

Traditionally, many project developers have had to negotiate with authorities the conditions applicable to each individual project such as, for example, individual feed-in tariffs. In recent years, tenders to select independent power producers have become increasingly prevalent in the region, tenders for which ceiling tariffs are needed but seldom used. In sum, many ministries, regulators and utilities still lack appropriate instruments and methodologies to design fair and transparent RE tariffs hindering the development of cost-competitive projects and the RE sector in the region.

In 2017, the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE), requested EU Energy Initiative Partnership Dialogue Facility (EUEI PDF) support for the development of a set of tools (toolbox) to define tariffs for renewable energy.

To this end, EMRC (a member of the MRC Group of Companies) was commissioned by EUEI PDF to develop a toolbox consisting of several standard tariff models to calculate tariffs for renewable technologies and an associated user manual. Additional contributions to the development of the toolbox were provided by GIZ.

Content of the Toolbox

The Toolbox takes the shape of an Excel table. It contains four separate models:
1. Renewable Independent Power Producer (IPP),
2. Prosumers[1],
3. Green Mini-grids (GMG) and
4. Supply curve.

Additionally, two workbooks have been developed to help convert input data into the format required for the four models:
5. Fuel cost tool and
6. Wind power curve.

The toolbox was developed to support RE tariffs in the ECOWAS region. However, the models are flexible and can be adapted and used in any country enabling policy makers to balance the needs of RE investors, power utilities and consumers.

[1] The neologism ''prosumer'' refers to a small-scale end-users who, in addition to using electricity from the grid, generates power for own consumption and/or to be fed back into the grid. The word is a combination of terms "producer" and "consumer".

MODEL	MAIN FEATURES
1. Independent Power Producer (IPP) Model	• The model calculates Feed-in tariffs (FiTs) for grid-connected systems (national grid and mini-grids) and Ceiling tariffs (the maximum prices) or reference prices that could be used for competitive tenders and bilateral negotiations including the ability to quantify potential PPA duration and indexation options; • It also calculates cost reflective and technology specific tariffs (e.g.: calculation of the levelised cost of electricity (LCOE) of different renewable technologies); • It calculates the costs avoided as a result of having renewable electricity generation, for example the avoided cost of generating from conventional technologies, with the option of expanding the calculation to allow the addition of wider social avoided costs (i.g., avoided emissions, or the additional cost of balancing variable generation); • It finally allows to consider different avoided costs in different major grid systems (for example, different avoided costs for separate islands).
2. Prosumer model	• This model calculates Tariffs at which excess generation by prosumers in net metering/billing systems can be credited; • It also calculates the net cost for the utility through the system impact assessment: distributed generation being installed at the end-user consumption point, it directly reduces all flows (energy and economic) upstream in the power system.
3. Green Mini-grids (GMG) model	• This model calculates appropriate tariffs for off-grid mini-grid systems as well as the associated network cost and losses of generation (relevant to the consideration of mini-grids, cross border trade and geographically remote generation); • It also calculates the “system impact” using the projection of the avoided cost applied to the projected green mini grids development.
4. Supply Curve Model	• This model identifies a required incentive level to reach a certain renewable energy penetration target in a year given various renewable energy technologies which are available (wind, solar PV, concentrating solar power (CSP), geothermal and biomass).
5. Fuel Cost Tool	• This tool helps the user to convert fuel specific costs (which may be in a wide variety of units) into the units of currency/MWh that are required for the above models. For example, the user may wish to convert procurement of heavy fuel oil in US$/barrel or coal in US$/ton into US$/MWh so it can be used in their renewable IPP model.
6. Wind Power Curve	• This tool is useful if the user has wind speed data and wishes to calculate an estimated capacity factor for wind energy, i.e. the ratio of the actual electrical energy output of a wind turbine over a given period of time to its potential output if it were possible for it to operate at full nameplate capacity

Data requirements

All models are very sensitive to the data used, and any model requires good data to give robust outputs. It should be noted that the models in the toolbox can work with a fairly minimal set of data, although it allows the user to enter very detailed data if this is available. In case data available are insufficient, reference values or ranges of values have been supplied for each model to help populate all model inputs. If users wish to update this in the future, a full set of sources is provided.

User Manual

A user manual has been developed to help using the toolbox. The Manual is split into sections in accordance with the individual excel models which are supplied as part of the Toolbox. Each section is split into the following subsections:

- Inputs: Discusses key inputs and their impact on the results
- Running the model: How the user should proceed to run the model
- Calculations underpinning the calculations: and methodologies behind the tool
- Outputs: Key outputs which can be viewed
- Key questions: Includes a list of questions, which the user can use the model to answer and how to interpret them.

The toolbox and the manual can be downloaded from the following links

- **ECREEE:** http://www.ecowrex.org/page/toolbox-renewable-energy-tariff-calculation-west-africa
- **EUEI PDF:** http://www.euei-pdf.org/en/seads/capacity-building/renewable-energy-tariff-calculation-toolbox-for-ecowas

For more information, please contact:

European Union Energy Initiative
Partnership Dialogue Facility (EUEI PDF)
c/o Deutsche Gesellschaft für Internationale
Zusammenarbeit (GIZ) GmbH
P.O. Box 5180, 65726 Eschborn, Germany
T : +49 (0) 61 96 79-7024
E: info@euei-pdf.org
I: www.euei-pdf.org

ECOWAS Centre for Renewable Energy
and Energy Efficiency
Achada Sto. António, ECREEE Bld, 2nd Fl.
C.P 288, Praia, Cabo Verde
Nicola BUGATTI (Mr)
T: (+238) 2604641
E: nbugatti@ecreee.org
I: www.ecreee.org

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