European Commission

Joint Research Centre

The European Commission's in-house science service

RE^2_nAF renewable energies rural electrification africa

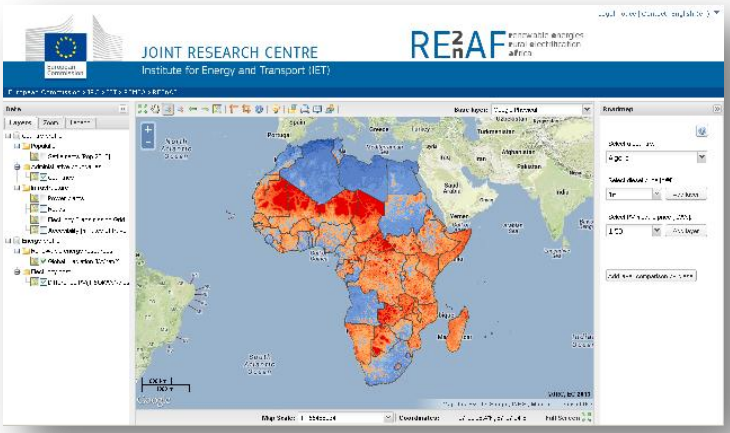
RE^2_nAF

The tool for off-grid electricity production options in Africa

✓Decision makers, academia, investors and other **stakeholders** benefit from its use.
✓Designed to meet the needs of **all users**: from non-experts to advanced.
✓ No plug-ins or specialized software required; RE2nAF is **completely Web based**.
✓ Developed using **Open Source** software and libraries.

What is the global irradiation in Windhoek?

How far is Garissa (Kenya) to the nearest transmission line?



How much does it cost 1kWh produced by PV in Goundam, Mali?

After setting a diesel and PV module price, which off-grid technology is cheaper in Sokode, Togo?

RE^2_nAF enables geographically based exploratory analysis for off-grid electricity production options in Africa. It overlays population features (settlements), infrastructure (transmission electricity grids, roads), national boundaries together with renewable energy resources. RE^2_nAF is completely Web based and requires no specialized software or plug-ins.

RE^2_nAF includes information on:

- Settlements: more than 6700, with estimated population data for 2010
- Electricity grid: more than 230,000 km in 46 countries
- Power plants: more than 900 in 54 countries, almost 200GW
- Global irradiation data
- Diesel based electricity cost: for 2008, 2010 and 2012
- PV based electricity cost: estimated for 8 module prices (from 0.75 to 2.5€/W_p)

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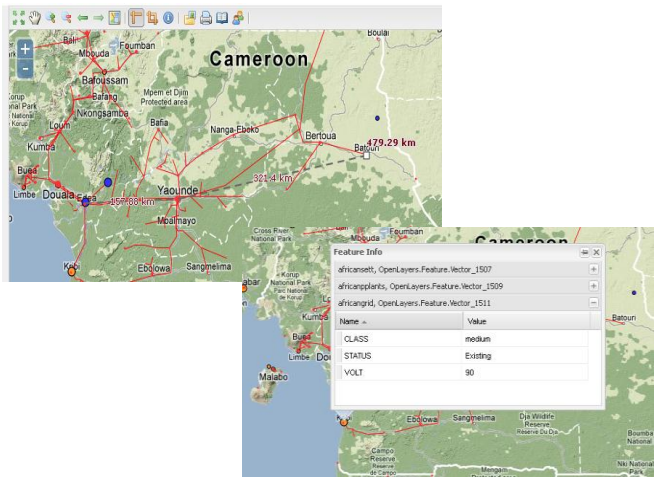
https://ec.europa.eu/jrc/

Why RE2nAF?

DG JRC has been developing mapping applications to support national governments and agencies to decide which energy technology options would better deliver their goals of rural electrification. The JRC method takes into account the diversity of energy resources, coupled with the existing grid, transport infrastructure, hydropower resources, the current diesel and photovoltaic costs, to map the current least-cost electricity option for rural electrification.



RE2nAF allows overlaying population, power plants, electricity grid layers and accessing information on each feature.

The interface

The interface has been designed to meet the needs of all different types of users. For non-experts, the interface provides easy navigation through the default datasets, enables to manipulate its visualization according to their needs, and to perform basic queries. For more advanced users, the interface allows access to advanced analysis tools.

Off grid options: exploring scenarios

$RE^2{}_n$AFallows the comparison of several scenarios (different diesel and PV module prices), modeling the least cost electricity option for each case.

1-. Country selection

In order to model the cost of the electricity provided by diesel and PV mini-grids, a country must be selected among the list included in the first combo box. Once a country is selected, the map will be centered in the country and the other combo boxes activated.
If at any point during the analysis, the selected country is changed, the values in the other combos will be cleared and the buttons disabled.

2-. Set the diesel price

Three values are included in the diesel price combo box. These values corresponded with the values reported by GIZ for 2008, 2010 and 2012.
Modeling diesel generator electricity cost
For diesel generators, fuel consumption is the major portion of the cost of producing 1kWh. That is the main reason why in our methodology, transport costs were taken into account, added to production costs, costs of labour, maintenance and amortization.

3-. Set the PV module price

Eight values ranging from 0.75 to 2.50 €/Wp are included in the PV module price combo box .
Modeling PV electricity cost
In the series of maps, the module price and the maintenance costs (2.5% per year of the combined cost of modules plus BOS) vary. Just the BOS is constant and fixed to 1€/kWp.

Compare and understand the results

When both values, diesel and PV module price, have been set, the button *"Add layer comparing PV and diesel"* is enabled
The value included in this layer is the computed difference between the PV and the diesel electricity cost (in c€/kWh) for a given location. The symbology has been defined to help the user interpreting the results: yellow-red color scheme is applied to areas where PV is the least cost option while blue is applied to the areas where diesel is the cheapest.

The image below shows the comparison of diesel and PV based electricity cost for 2012 as shown in RE2nAF. The PV module price is set to 1.75€/Wp while diesel prices are those officially reported for Angola (33c€/l) and Zambia (115c€/l).