REexplorer
MAPPING OUR ENERGY FUTURE

RE Data Explorer:

Informing Variable Renewable Energy Grid Integration for Low Emission Development

The RE Data Explorer, developed by the National Renewable Energy Laboratory, is an innovative web-based analysis tool that utilizes geospatial and spatiotemporal renewable energy data to visualize, execute, and support analysis of renewable energy potential under various user-defined scenarios. This analysis can inform high-level prospecting, integrated planning, and policymaking to enable low emission development.

In 2016, the RE Data Explorer was significantly expanded and scaled up to support renewable energy planning in several partner countries of the U.S. Agency for International Development's Enhancing Capacity for Low Emission Development Strategies (EC-LEDS) program. The RE Data Explorer is currently available and being applied to support LEDS and related efforts in the Lower Mekong region of Asia (Figure 1) and the Philippines. The RE Data Explorer is currently under development for Afghanistan, Bangladesh, Indonesia, Kazakhstan, Kenya, Mexico, and Nepal. The RE Data Explorer builds on a desktop-based version of the tool (available for the countries listed above along with several others) to provide further functionality and a userfriendly online interface.

What is Geospatial Data Science?

Geospatial data science examines the surface of Earth—from topography and the atmosphere to groundwater and geology and on scales from local to global.

With geospatial data science, we can examine, for instance, the spatial relationship of wind speed—or wind resource—to other pertinent information, such as locations of environmentally sensitive areas and transmission lines.

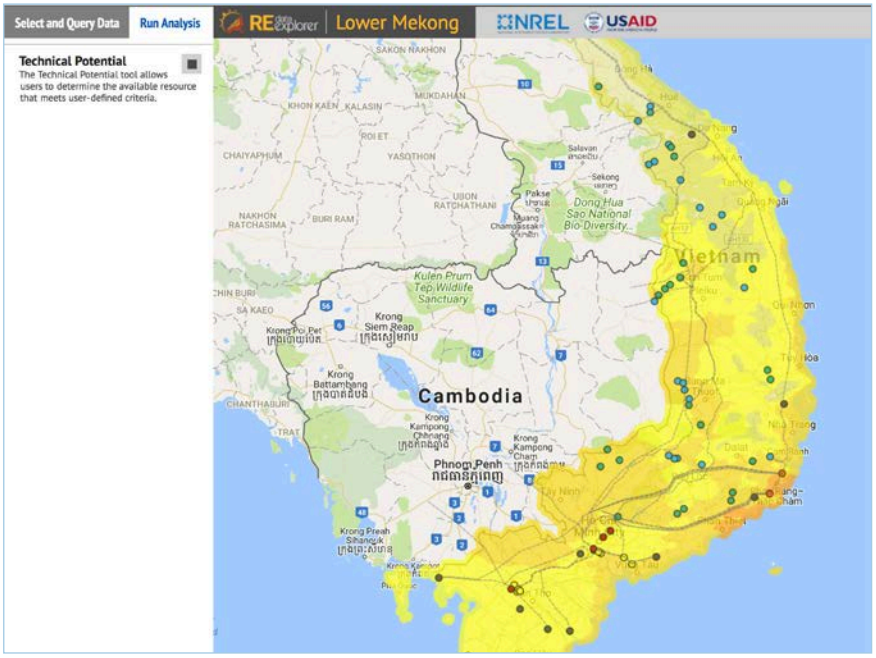

Figure 1. The RE Data Explorer is available for the Lower Mekong region of Asia as well as other geographic locations.

By recognizing these spatial relationships, we can gain a fundamental understanding of renewable energy potential: how much energy we can get out of the technology. That understanding can guide decision making, attract investment, and ultimately reduce greenhouse gas emissions.

Geospatial data science can support a number of key policy areas to enable low emission development.

RE Data Explorer for Grid Integration

Integrating variable renewable energy to the grid requires data-driven analysis to evaluate efficient ways to deliver wind and solar energy to meet demand and inform detailed generation, transmission, and system operations planning. Geospatial analysis using the RE Data Explorer can provide a fundamental starting point for grid integration studies.

A grid integration study simulates the operation of an electricity system under one or more high renewable energy scenarios. These simulations identify economic and reliability constraints associated with significant penetrations of solar and wind generation and inform actions to address constraints. Scenarios used in the analysis rely heavily on detailed information about the location, supply, and timeframe for renewable generation.[1] High quality renewable energy resource data are crucial to accurately estimating solar and wind generation potential and characterizing the variability and uncertainty of renewable energy

1 See *http://www.nrel.gov/docs/fy16osti/66504.pdf* and *http://www.nrel.gov/docs/fy15osti/63043.pdf*.

generation, which allows power system planners and operators to understand how high renewable energy scenarios will impact the utilization (i.e., dispatch) of conventional generators. Additionally, data that accurately capture the spatial and temporal diversity of wind and solar resources enable power system analysts and planners to identify tradeoffs among different siting strategies for new, grid-connected renewable energy generators. For example, deploying solar and/or wind energy projects across a large or diverse spatial area can play an important role in reducing the aggregate variability and uncertainty associated with these resources. To explore grid integration further, Greening the Grid (greeningthegrid.org), a USAID initiative, provides detailed information on grid integration components and related analysis, including geospatial analysis and data needs.

The RE Data Explorer provides a valuable tool to inform grid integration studies. In addition to providing a repository of best-available public RE resource data sets, the RE Data Explorer's dynamic technical potential analysis enables users to determine RE supply and power profiles. The first step is filtering modeled RE resource data against other geospatial data such as proximity to transmission, land use type, and restrictions and slope. The new, filtered data sets developed in the RE Data Explorer can then be exported and used as inputs into other system analysis tools to develop RE power production profiles and supply curves for particular sites or substations. Supply curves and class-based time-series power profiles can then feed into capacity expansion and production cost models, two analytical tools frequently used to assess RE grid integration scenarios. Figure 2 presents RE Data Explorer analysis outputs that can feed into detailed grid integration studies. The RE Data Explorer enables policymakers, system operators, and project developers in planning for effective implementation and scale-up of variable renewable power.[2]

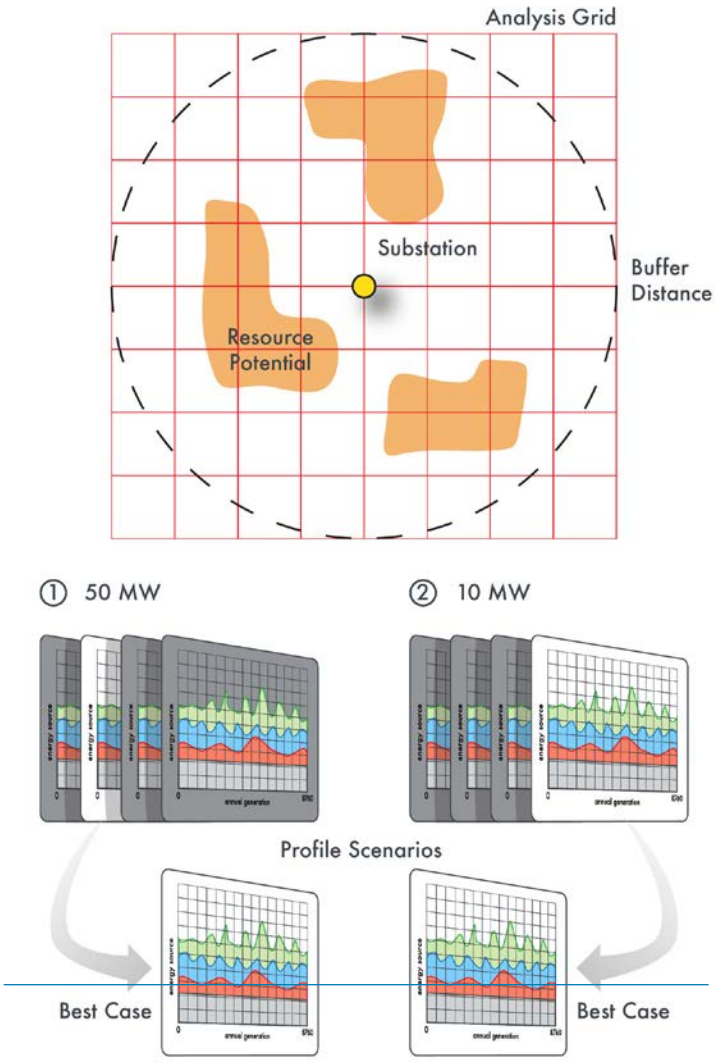

Figure 2. The RE Data Explorer supports development of production cost model data to inform grid integration studies.

RE Data Explorer Support Resources

The EC-LEDS Geospatial Analysis Tool web page ( ) provides training materials, including a web-based tutorial for the RE Data Explorer. Up to 40 hours of no-cost expert assistance to support geospatial analysis for low emission development is also available through the LEDS GP Remote Expert Assistance on LEDS (REAL) service (*www.ledsgp.org/assistance*).

2 See *http://www.nrel.gov/docs/fy16osti/66504.pdf* and *http://www.nrel.gov/docs/fy15osti/63043.pdf*.

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NREL/FS-6A20-67280 • November 2017