

# Activity: Identifying Study Areas in the Renewable Energy Zone (REZ) Transmission Planning Process with Renewable Energy Data Explorer

In this activity you will identify initial study areas with high-quality renewable energy resources that may be feasible for development as part of the REZ process. The goal is to understand the steps of identifying study areas and to become familiar with the Renewable Energy Data Explorer (RE Data Explorer).<sup>1</sup>

This activity focuses on Step 2 of the REZ Process shown in Figure 1 below. The activity is aimed at the [Technical Advisory Committee and the Zone Identification and Analysis Working Group of a REZ process](#).<sup>2</sup>

To complete this activity, you will need a computer with an internet connection.

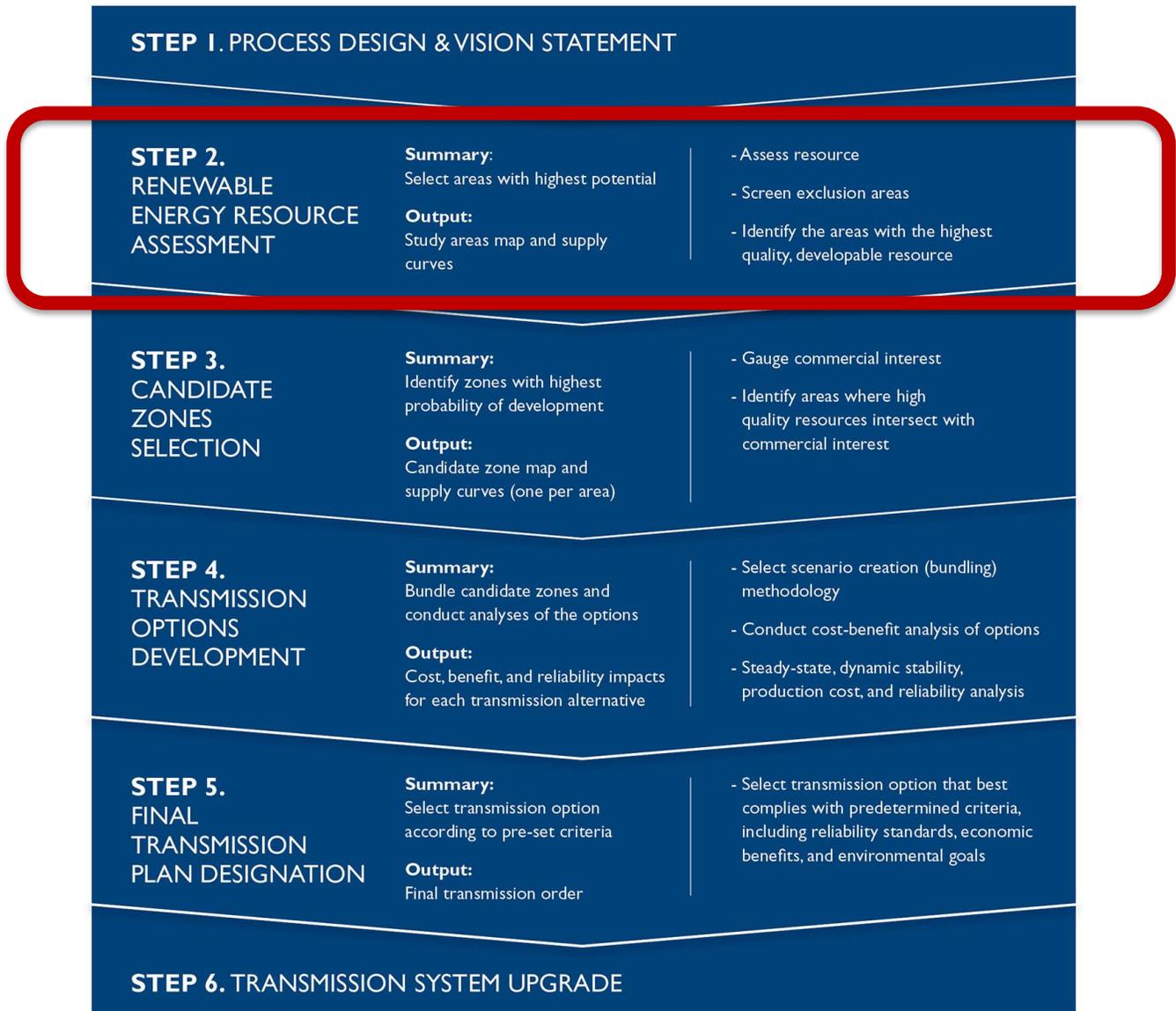


Figure 1. Renewable energy zones transmission planning process outline

<sup>1</sup> RE Data Explorer, the flagship tool of the RE Explorer, facilitates renewable energy decision making, investment, and deployment through a dynamic, online and no-cost analytical tool. RE Data Explorer, developed by the U.S. Department of Energy’s National Renewable Energy Laboratory, and supported by the U.S. Agency for International Development, provides renewable energy data, analytical tools, and technical assistance to developers, policymakers, and decision makers in developing countries.

<sup>2</sup> See <https://greeningthegrid.org/Renewable-Energy-Zones-Toolkit/guidebook/the-rez-process-organizational-structure> for more information.

## Step 2. Renewable Energy Resource Assessment



**Summary:** Identify areas with the highest potential for low-cost development; allow governments to identify priority or avoidance areas



**Final output:** Study areas map and supply curves (one per area)



**Estimated time:** 8 months



**Central decision makers and stakeholders:** TAC and Zone WG

### Exercise 1: Access the RE Data Explorer

- Using your web browser, navigate to <https://www.re-explorer.org>
- Click on the link to [Renewable Energy \(RE\) Data Explorer](#)
- Click on an available country or region on the map to launch the RE Data Explorer

### Exercise 2: Follow the built-in tutorials to learn about the GIS functionality of RE Data Explorer

- Select the *Take Tutorial* button in the *Welcome!* prompt that appears on the screen
- Follow the step-by-step instructions and selecting *Back* or *Next* to navigate through the tutorial

### Exercise 3: Use the *Technical Potential Tool* to estimate utility-scale PV technical potential

#### Exercise 3.1: Explore data through visualization

- Turn off all active layers in the *Layer Tree* under the *Data Layers* tab by unchecking all checked boxes
- Open the *Find Location* tool in the map navigation bar (top-right)
- Type a city or a country and click *Find*
- On the *Data Layers* tab, under the selected country, turn on the following layers:
  - Global Solar* (under *Solar*)
  - Protected Areas* (under *Environmental*)
  - Land Use* (under *Environmental*)
- On the *Legend* tab, **turn off** the *Agricultural*, *Arid*, *Forest*, and *Open Wildlands* layers (if these specific layers are not available select similar layers such as *Cropland*, *Barren*, *Mixed Forest*, *Savannas*, or others)

#### Exercise 3.2: Assess technical potential

- Click the *Analysis & Downloads* tab in the upper left-hand corner
- Select *Technical Potential* tool by clicking on the button
- In the *Run Analysis* tab, make the following selections to explore utility-scale solar PV potential:
  - Country:** if necessary, select the country of interest in the region
  - Region:** select all provinces to analyze national potential
  - Resource Type:** choose *Solar*
  - Technology Type:** choose *Fixed Tilt PV System*
  - Limit by Solar Resource (kWh/m<sup>2</sup>/day):** minimum 2, maximum 12

- **Power density (MW/km<sup>2</sup>):** use the default given in the tool (36 MW/km<sup>2</sup>), or incorporate local assumptions if known
- **Limit by Distance to Roads:** select None
- **Limit by Distance to Transmission:** select None
- **Exclude Protected Areas:** check the box
- **Exclude Land Use Types:** select () any *Urban, Built-Up, Water Bodies, Rivers, and Wetland* categories in the scroll box
- **Limit by Slope (%):** limit to slopes under 5% maximum (Min = 0% and Max = 5%)
- **Save Layer As:** "Technical\_Potential\_SolarPV\_ YOUR COUNTRY NAME"

D. Select *Run Analysis* (Please be patient as this may take a few minutes)

E. Select *OK* in the *Analysis Complete! Dialog Box*

F. Examine results in the *Results* tab of the *Technical Potential Tool*

- Under *Cumulative Results* what is the *Total AC Generation?* \_\_\_\_\_ MWh/year
- What is the *Total Land Area?* \_\_\_\_\_ km<sup>2</sup>
- What is the *Nameplate Capacity?* \_\_\_\_\_ MW
- How do these values differ under the different *Regional/State Results?*

### **Exercise 3.3: Examine the spatial technical potential analysis results**

- Close the *Technical Potential Tool*
- Navigate to the *Data Layers* tab and **turn off** all active layers under your country
- Turn on** your results layer ("Technical\_Potential\_SolarPV\_ YOUR COUNTRY NAME") under *Analysis Results* at the top of the *Data Layers* tab
- Visually examine your technical potential analysis results (zoom-in to see details, select different points by clicking on the map)

### **Exercise 3.4: Download analysis results**

- Navigate to the *Data Layers* tab
- Turn off** all active layers under *your country*
- Turn on** your results layer ("Technical\_Potential\_SolarPV\_ YOUR COUNTRY NAME") under *Analysis Results* at the top of the *Data Layers* tab
- Select the download button ("↓") next to your results layer ("Technical\_Potential\_SolarPV\_ YOUR COUNTRY NAME")
- Select CSV (or one of the other geospatial data formats that you may be familiar with) and then select to save file if prompted and select *OK*.

### **Exercise 3.5: Download query results**

- Navigate to the *Query* tab
- Select the *Region Query*
- By clicking and dragging your mouse, select a specific region of interest in your country.
- Review *Analysis Results* at the bottom of the screen (*Region Query* will display analysis results for the data layers currently selected in the *Layer Tree*)
- In the top right of the *Analysis Results* pane select *Download Query Results* and download the csv file.
- Close the *Analysis Results* with the *Close* button in the top right of the *Analysis Results* pane

#### **Exercise 4: Add economic considerations to the Technical Potential analysis**

##### **Exercise 4.1: Quantitatively assess technical potential**

- A. Open the *Technical Potential Tool*
- B. On the inputs tab, make the following changes (from exercise 3 above):
  - **Limit by Distance to Roads:** 10 kilometers
  - **Exclude Land Use Types:** Select *Agricultural* and *Forest* (or similar land use types)
  - **Save Layer As:** “Economic\_Potential\_SolarPV\_ YOUR COUNTRY NAME”
- C. Select *Run Analysis*
- D. Select *OK* in the *Analysis Complete! Dialog Box*
- E. Examine results in the *Results* tab of the *Technical Potential Tool*
  - Under *Cumulative Results* what is the *Total AC Generation?* \_\_\_\_\_ MWh/year
  - What is the *Total Land Area?* \_\_\_\_\_ km<sup>2</sup>
  - What is the *Nameplate Capacity?* \_\_\_\_\_ MW
  - How do these values differ under the different from the technical potential results above?

##### **Exercise 4.2: Visually explore results**

- A. Close the *Technical Potential Tool*
- B. Navigate to the *Data Layers* tab and **turn off** all active layers under your country
- C. **Turn on** your results layer (“**Economic\_Potential\_SolarPV\_ YOUR COUNTRY NAME**”) under *Analysis Results* at the top of the *Data Layers* tab
- D. Visually examine your technical potential analysis results (zoom-in to see details, select different points by clicking on the map)

##### **Exercise 4.3: Download analysis results**

- A. Navigate to the *Data Layers* tab
- B. **Turn off** all active layers under *your country*
- C. **Turn on** your results layer (“**Economic\_Potential\_SolarPV\_ YOUR COUNTRY NAME**”) under *Analysis Results* at the top of the *Data Layers* tab
- D. Select the download button (“↓”) next to your results layer (“**Economic\_Potential\_SolarPV\_ YOUR COUNTRY NAME**”)
- E. Select CSV (or one of the other geospatial data formats that you may be familiar with) and then select to save file if prompted and select *OK*

#### **Exercise 5: Discussion Questions**

- A. Were there significant differences between the “Technical Potential” and “Economic Potential results?”
  - If so, why do you believe these results were different? If not, do you think that other exclusion layers (such as urban areas) would make a significant difference in the results?
- B. Are there specific regions with high-quality solar resources that could be considered as REZ study areas in the results?
- C. How many potential REZ study areas could you identify in the final results layer?
- D. Where are these study areas located in relation to existing urban areas (loads) and transmission?
- E. Do you know of existing renewable energy development in or around these potential REZ study areas?
- F. What other potential exclusions (such as protected areas, water bodies, or others) should be added to refine these results for your country?

**Congratulations!**