User Guide

https://power.larc.nasa.gov/data-access-viewer

Web Mapping Application, Geospatial Data Outputs, and Web Processing Service
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Introduction

The POWER Data Access Viewer (DAV) Web Mapping Application contains geospatially enabled solar, meteorology, and cloud related parameters formulated for assessing and designing renewable energy systems.

The POWER DAV is a responsive widget based application which runs on all devices (PC, laptop, tablet, smartphone) and all platforms (Apple, Android, and Windows). This design provides users with access to POWER data in the office or in the field.

POWER datasets and WPS services are extensible and integral beyond the web mapping application. POWER provides various text, tabular, and geospatial datasets and files which users can download and/or integrate into custom software and applications for further processing, analysis, and visualization.

This guide provides an introduction to the POWER Data Access Viewer Web Mapping Application and Web Processing Service to make use of the latest POWER data and enhancements.
POWER Data Access Viewer is a web-based application that currently supports Chrome, Safari, and Firefox. Internet Explorer is not supported. Please ensure the most current version of the browser is installed on your device for full compatibility.

When the application loads, you will notice a Splash screen summarizing application information and available widgets for use. These widgets provide functionality for viewing, downloading, and interacting with global datasets, map features, and tools.

Splash Screen
Once the application loads, you will notice the application has various widgets in the top right and bottom of the map. The POWER Single Point Data Access Widget opens on application startup by default.

1. **Data Access Widgets** are used to download POWER data.
2. **Map Viewer** includes interactive maps and mapping functionality.
3. **Map Widgets** provide interactive map tools and app information.

The **Data Access Widgets** allow users to download POWER data by parameter, location, time, data averages, and user community. Clicking on the individual widget icons will open the widget panel for that particular widget. Each widget provides various functionality and available data.

The **Map Viewer** provides the interface for viewing and interacting with interactive maps and map layers. Users can select various basemaps to view, search and zoom the map by coordinates or address, and locate their position on the map using various **Map Widgets**.

**Map Widgets** provide various tools and functions for analyzing, measuring, and interacting with POWER data and maps. The **Map Widget** panels will
display full screen depending on the size of the device. Users can minimize the panel while interacting with the map viewer, rather than close the widget completely.
POWER leverages the ArcGIS API for JavaScript and is built upon the Web AppBuilder for ArcGIS framework. This integral framework provides the tools and interface for developing custom applications and widgets for geospatial data interaction, subsetting, geoprocessing, and analysis.

The following application widgets provide functionality allowing users the ability to locate, analyze, and interact with geographic data, map features, and POWER datasets.

**Map Widgets:**

- The 'Information' widget contains additional links, resources, and information about the POWER project and datasets.

- The 'My Location' widget allows the application to detect your IP location and zoom the map to it. The accuracy is network and device dependent.

- The 'Default Extent' widget zooms the map to the original extent.
- The 'Basemap Gallery' widget presents a gallery of basemaps to select as the application's underlying basemap.

- The 'Draw' widget allows you to create graphics, text, and measurements that display on the map.

- The 'Measurement' widget allows the user to measure the area of a polygon, length of a line, or find coordinates of a point.

- The 'Geocoder' widget enables end users to find locations or search features on the map by coordinates or address.

**Data Access Widgets:**

- The ‘POWER Single Point Data Access’ widget provides access to near real-time ½ x ½ degree datasets by single point (lat/lon).

Steps and details for using this widget are shown below.

1. Choose a User Community.
   
   - This selection will determine which units per parameter to return to the user for their selection. For example: Insolation on a Horizontal Surface is returned in Millijoules (MJ) for ‘Agroclimatology’ and kilowatt-hour (kWh) for both ‘SSE-Renewable Energy’ and ‘Sustainable Buildings.’

2. Choose a Temporal Average.
   
   - This selection will determine the temporal average of the datasets.
3. Enter Lat/Lon or Add a Point to Map
   - Users can enter global coordinates in decimal degrees or click the small icon and click a point on the map to retrieve coordinates at the map click location. Users can also clear the coordinates and map point.

4. Select Time Extent
   - Users can select a Start and End time between 01/01/1981 – Near Real Time (NRT) to access data for selected parameters. Be sure to view the data availability per model/parameter as some models are available before others.

5. Select Output File Formats
   - Various files are available for download including GeoJSON, CSV, ASCII, ICASA, and NetCDF. By default, if the user selects ICASA, this file will be populated with the necessary ICASA parameters. All other files requested will be populated with ICASA parameters and additional parameters chosen.
   - Users can choose as many parameter as necessary for their download and each will be added to the file.

6. Select Parameters
   - Users can select as many parameters as necessary. Choosing ‘ICASA’ as an Output File Format will add the necessary parameters to the data request. Additional chosen parameters will be added to other file types, although only ‘ICASA’ parameters will be added to the ‘ICASA’ file.

7. Submit and Process
   - Once all data options have been made, the user can submit and retrieve the requested files. A line chart and histogram are also shown per parameter. Users can download the files and interact with the charts as necessary. Various chart tools are available such as export to PNG, Zoom In, Zoom Out, and Edit in the Cloud.

- The ‘POWER Regional Data Access’ widget provides access to near real-time ½ x ½ degree datasets by region (Bottom-left lat/lon, Upper-right lat/lon).

Steps and details for using this widget are shown below.

1. Choose a User Community.
• This selection will determine which units per parameter to return to the user for their selection. For example: Insolation on a Horizontal Surface is returned in Millijoules (MJ) for ‘Agroclimatology’ and kilowatt-hour (kWh) for both ‘SSE-Renewable Energy’ and ‘Sustainable Buildings.’

2. Choose a Temporal Average.
• This selection will determine the temporal average of the datasets.

3. Enter Lat/Lon or Add a Polygon to Map
• Users can enter global coordinates in decimal degrees or click the small icon and Press down on the map to start and let go to finish in order to retrieve coordinates for the region. Users can also clear the coordinates and map point. The maximum area processed is 4.5 x 4.5 degrees (100 points). North and East data will be truncated from any order over 4.5 x 4.5 degrees.

4. Select Time Extent
• Users can select a Start and End time between 01/01/1981 – Near Real Time (NRT) to access data for selected parameters. Be sure to view the data availability per model/parameter as some models are available before others.

5. Select Output File Format
• Various files are available for download including ASCII, CSV, GeoJSON, ICASA, and NetCDF. By default, if the user selects ICASA, this file will be populated with the necessary ICASA parameters. All other files requested will be populated with ICASA parameters and additional parameters chosen.
• Users can choose only one file format per data request for the regional widget.

6. Select Parameters
• Users can select as many parameters as necessary. Choosing ‘ICASA’ as an Output File Format will add the necessary parameters to the data request.

7. Submit and Process
• Once all data options have been made, the user can submit and retrieve the requested file. Line charts and histograms are not available in the regional widget.
The ‘POWER Global Downloads’ widget provides access to Climatology ½ x ½ degree datasets for the entire globe.

Steps and details for using this widget are shown below.

1. Choose a User Community.
   - This selection will determine which units per parameter to return to the user for their selection. For example: Insolation on a Horizontal Surface is returned in Millijoules (MJ) for ‘Agroclimatology’ and kilowatt-hour (kWh) for both ‘SSE-Renewable Energy’ and ‘Sustainable Buildings.’

2. Choose a Temporal Average.
   - This selection will determine the temporal average of the datasets.
   - Climatology is the only available Temporal Average for the Global Downloads widget.

3. Select Output File Format
   - Various files are available for download including ASCII, CSV, GeoJSON, GeoTIFF, and NetCDF.
   - Users can choose only one file format per data request for the global downloads widget.
   - Note: files may take 1 - 2 minutes to download depending on file format.

4. Select Parameters
   - Users are limited to select a maximum of 3 parameters.

5. Submit and Process
   - Once all data options have been made, the user can submit and retrieve the requested file. Line charts and histograms are not available in the global downloads widget.

The ‘POWER Layer List’ widget provides users the ability to visualize global climatological POWER parameters on a gridded map.

- Use the ‘Month’ slider to alternate between parameter monthly averages.
- Use the ‘Opacity’ slider to adjust the parameter layer opacity.
- Turn on and off a 1 x 1 degree Map Grid feature service.
- Swipe a parameter layer across the map.
- Left-Click on map for data set values by location.
Developing with POWER Web Processing Services
Web Processing Services

Access the POWER data holdings through your own custom script or application by using the POWER Web Processing Services. These RESTful services provide a JSON return with links for downloading data in multiple outputs based on required input parameters.

This new capability helps extend the functionality of parameters and provides near real-time data streams for technical users, saving time from data manipulation. Organizations can now spend more time focusing on their research and less time on data management.

These web services can be added to any analytics software and application programming interface that can accept and retrieve WPS data via a URL. This gives users the ability to quickly use scripting tools to complete their research and build useful software with access to POWER data.

To access the data using the Web Processing Service, simply build and browse to the URL with required input parameters. Integrate these interactive web services into custom applications via APIs and SDKs. More technical API documentation for the POWER WPS can be found here.

(https://power.larc.nasa.gov/docs/v1/)
Accessing POWER ArcGIS Image Services
POWER utilizes ArcGIS for Server to host and provide access to GIS web services via REST endpoints. These web services allow users to integrate POWER datasets into custom applications and desktop software for further data visualization, analysis, processing, and development via a single URL.

This new capability helps extend the functionality of POWER data and provides GIS-ready capabilities for technical GIS users, saving time from data consolidation and manipulation. End users can now spend more time focusing on their research and less time on data management.

POWER web services can be added and viewed in ArcGIS Desktop/Pro, ArcGIS Earth, ArcGIS Online, ArcGlobe, as well as other proprietary and open source software for mapping and analysis. This gives users the ability to quickly use geoprocessing, modeling, and script tools to access data and complete their research.

Solar Parameter Image Service URL (22 Year Averages – 0.5 x 0.5 degree):
https://asdc-arcgis.larc.nasa.gov/server/rest/services/power/power_601_22years_lst/ImageServer

Meteorological Parameter Image Service URL (30 Year Averages – 1 x 1 degree):

*Note the ArcGIS Service Directory is disabled.
Application Release Notes

- POWER datasets are large and may have slow loading speeds if internet connection is slow.
- Internet Explorer may not provide full compatibility with the application, please consider another newer supported browser including Firefox, Safari, or Chrome.

If you have any comments or questions, please contact our team at power-project@lists.nasa.gov