Enhancing the NASA Prediction of Worldwide Energy Resource Web Data Delivery System with Geographic Information System (GIS) Capabilities

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The Description of the Prediction of Worldwide Energy Resource (POWER) Project

Renewable energy technologies are changing the face of the world’s energy market. Currently, these technologies are being incorporated within existing structures to increase energy efficiency. Crucial to the success of the emerging renewable market is the availability of accurate solar, wind, and meteorological data. The poster presents an overview of the history of the development of an effort to distribute data parameters from NASA’s research for use in the energy sector applications spanning from renewable energy to energy efficiency. The poster also highlights the improved validation and data set improvements.

The POWER/SSE are currently undergoing major updates that include the prediction and validation of data products to the new spatial resolution of 1 x 1 degree and the expansion of the data set to the 30 years. As part of this function, data parameters from the Modern-Era Retrospective Analysis for Research and Applications, version 2 (MERRA-2) are now being used to improve the marketing data set for surface meteorological parameters. This shows validation results for these efforts together with more focused applications.

A recent focus has been to process, formulate and geospatially enable current data to formats that are consistent with Earth and openGIS tools and services useful for decision support systems. Functions are in development to improve upon the current site capabilities to produce data products that can be extended from the single location to regional and global scales. A major expected significance of the inclusion of GIS with POWER will be the development of Open Geospatial Consortium (OGC) compliant web services (WMS, WCS, WFS, and WPS) and Earth ArcGIS Image Services. This will provide additional data access by means of generating tools and image generation tools for the renewable energy and agricultural applications. This will allow graphical functionality to the POWER web applications, allowing users to view and process images of their desired parameters in relation to large geographical areas, while providing extensive data access to users. The poster promotes the POWER products which provides an open computing platform for maps and geographic information, making it easy to create and share POWER data as useful and geospatially intelligent maps.

New GIS Applications on the POWER web site

• High quality viewing (Desktop/Mobile) and printing
• Data Extraction/Subsetting
• Simultaneous Dataset Visualization (Zooming)
• Temporal Visualization
• Custom Color Ramps
• Pixel Attribute Values

The poster summarizes POWER project efforts to distribute data parameters via the POWER web site to the renewable energy, agricultural industry, and other energy applications spanning from renewable energy to energy efficiency. The POSTER describes the desire to support the emerging renewable energy sector which accurate environmental information is vital. Leveraging the suite of Open Geospatial Consortium (OGC) compliant web services (WMS, WCS, WFS, and WPS) and Earth ArcGIS Image Services will provide additional data access by means of generating tools and image generation tools for the renewable energy and agricultural applications. This will allow graphical functionality to the POWER web applications, allowing users to view and process images of their desired parameters in relation to large geographical areas, while providing extensive data access to users. The poster promotes the POWER products which provides an open computing platform for maps and geographic information, making it easy to create and share POWER data as useful and geospatially intelligent maps.

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POWER Overview

• Objectives: Improve the Nation’s and Global capability to provide the public with high quality renewable energy data
• Mission: Provide renewable energy related scientific data in a user-friendly manner
• Services:
  - Indicators and metrics
  - Data access/Download
  - Time series data
  - Satellite/remote sensing
  - High resolution data
  - GIS tools

POWER/SSE partnerships and collaboration have resulted in ongoing improvements to the web site and forum. The most important boost to the site was the addition of the POWER/SSE Partnership of the National Renewable Energy Laboratory (NREL) which has incorporated the POWER/SSE project.

POWER was expanded to include many regional and national partnerships to support the application of NASA provided renewable energy related science. This project includes renewable energy for many sectors and applications.

As part of these capabilities, the Surface Meteorology and Solar Energy (SSE) website was established to include user access to coupled parameters and provide more comprehensive data access for use in the energy sector. SSE has been incorporated into the POWER/SSE project.

Under POWER, SSE was expanded to include more parameters, one (2013) spanning 20 years. The parameters span a wide range of GIS (x, y, t, z) and temporal (daily and monthly) formats. POWER increased the variety of methods for access to the data. These methods include direct use of the data products, downloading of data products, and use of the POWER/SSE web site. The SSE is a comprehensive web site that contains thousands of parameters including surface meteorological parameters required for renewable energy data products.

As part of the transition, the Surface Meteorology and Solar Energy (SSE) website was incorporated to the POWER/SSE website to support users in the energy sector. The most important transition was the inclusion of the Modern-Era Retrospective Analysis for Research and Applications, version 2 (MERRA-2) parameters from NASA’s research for use in the energy sector applications spanning from renewable energy to energy efficiency. The POWER/SSE Partnership of the National Renewable Energy Laboratory (NREL) has incorporated the POWER/SSE project. As part of this project, POWER/SSE parameters from the Modern-Era Retrospective Analysis for Research and Applications, version 2 (MERRA-2) are now being used to improve the marketing data set for surface meteorological parameters. This shows validation results for these efforts together with more focused applications.

SSE-GIS Internet and Mobile GIS Tools

The SSE-GIS interface and mobile GIS tools have been incorporated on the POWER web site. These tools are designed to allow users to view and analyze the data in a geographic context. The SSE-GIS interface provides a mapping tool that allows users to visualize the data as a map. Users can also download the data in a GIS-compatible format. The mobile GIS tools are designed for use on smartphones and tablets, allowing users to access the data on the go.

Summary and Conclusions

The POWER/SSE Partnership of the National Renewable Energy Laboratory (NREL) has incorporated the POWER/SSE project. As part of this project, POWER/SSE parameters from the Modern-Era Retrospective Analysis for Research and Applications, version 2 (MERRA-2) are now being used to improve the marketing data set for surface meteorological parameters. This shows validation results for these efforts together with more focused applications.

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Acknowledgments

The SSE and subsequent POWER web portal would not have been possible without the contributions of staff members and partners whose efforts provided the critical support that enabled the project. In particular, we acknowledge the support of the Applied Science program and the Office of the Chief Information Officer (CIO) for providing data products on the fly, extending them beyond the single location to regional and global scales. A major expected significance of the inclusion of GIS with POWER will be the development of Open Geospatial Consortium (OGC) compliant web services (WMS, WCS, WFS, and WPS) and Earth ArcGIS Image Services. This will provide additional data access by means of generating tools and image generation tools for the renewable energy and agricultural applications. This will allow graphical functionality to the POWER web applications, allowing users to view and process images of their desired parameters in relation to large geographical areas, while providing extensive data access to users.