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

William S. Chandler, Paul W. Stackhouse, Jr., Audy J. Barnett, James M. Hoell, David J. Westberg, and Amanda I. Ross

A primary objective of NASA's Prediction of Worldwide Energy Resource (POWER) project is to put NASA Earth Science research to practical uses in the energy, agricultural, and architectural industries. NASA's solar and meteorological data have been formulated through analysis and modeling, producing POWER data sets useful for the optimization of renewable energy production and efficient energy technologies to the environment.

Enhancements to the environmental data are incorporated when higher resolution and longer-term data inputs become available. The 3-hourly temporal resolution and 1 x 1 degree latitude/longitude spatial resolution from previously available data sets has been improved. Meteorological parameters now are taken from the NASA Modern Era Retrospective-analysis for Research and Applications (MERRA) data set which provides higher resolution data products (hourly and 1/2 x 1/2 degree) covering the entire globe. The NASA/GEWEX Surface Radiation Budget (SRB) and Clouds and the Earth's Radiant Energy System (CERES)/Fast Longwave and SHortwave radiative Fluxes (FLASHFlux) data set provides solar fluxes, from which POWER solar data sets are developed. More than 30 years of hourly, daily, monthly and annual time slices are included in the data sets.

A recent focus has been to process, formulate and geospatially enable current data to formats consistent with Esri and openGIS tools useful for decision support systems. Functions are in development to improve upon the current site capabilities to produce data products on the fly, extending these beyond the single location to regional and global scales. A major expected significance on the inclusion of GIS with POWER will be the development of Open Geospatial Consortium (OGC) compliant web services (WMS, WCS, WFS, and WPS) and Esri ArcGIS Image Services. This will provide additional data accessibility options and geoprocessing tools for the renewable energy and agricultural application users. This will restore graphical functionality to the POWER web applications, allowing users to view and produce images of their desired parameters in relation to a larger geographical scale as well as in relationship to other GIS displayed parameters. Leveraging the suite of Esri ArcGIS tools and open source products 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.

These data may be useful to several renewable energy sectors: solar and wind power generation, agricultural crop modeling, and sustainable buildings. The POWER team will interact with user communities in government and industry to test GIS formats and usage for optimization and develop a series of metrics to allow for monitoring of performance. Collaboration, through partnerships with public organizations, will provide improvements in their ability to manage and plan natural resources and to make better environmental predictions, decisions, and policymaking.