NASA Science Mission Directorate - Applied Sciences Program

Energy Management – Fiscal Year 2005 Annual Report [*]

SUMMARY

The Energy Management program element focuses on extending NASA Earth science research results to improve decisions and assessments for energy production and energy efficiency. In FY05, the program made considerable progress on many elements of the Prediction of Worldwide Energy Resource (POWER) project and other projects.

MAJOR ACCOMPLISHMENTS

Prediction of Worldwide Energy Resource Project (POWER)

The POWER project seeks to improve the Nation's public and private capability for integrating NASA solar energy and global weather products into energy production and energy efficiency systems. POWER consists of five interrelated components (Energy Production Solar Incidence Products, Energy Efficiency Environment Buildings, Energy Production/Efficiency Short-term/Mid-term Prototype Development, Energy Efficiency Energy Load Forecasting, and Energy Production Biomass Products). POWER serves multiple decision support systems (RETScreen, Hybrid Optimization Model for Electric Renewables-HOMER, Solar Sizer, and MiniCAM) and the five interrelated components use a variety of NASA products (Clouds and the Earth's Radiant Energy System-CERES, Earth Radiation Budget Energy-ERBE, International Satellite Cloud Climatology Project-ISCCP, Surface meteorology and Solar Energy-SSE, Surface Radiation Budget-SRB, GEOS, and FLASHFlux) to enhance the capability of decision support systems.

In FY05, the POWER project team completed SSE release 5 and 5.1 with a 1x1° grid. The project team also processed a multi-year dataset for the National Solar Radiation Data Base (NSRDB) maintained by the DOE National Renewable Energy Laboratory (NREL). The project team delivered a preliminary buildings prototype to members of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), and it developed an agricultural/biomass prototype.

The POWER project also incorporated NASA-derived information into RETScreen, which is a decision support tool developed by the Canadian Meteorological Service (CANMET) Energy Diversification Research Laboratory (CEDRL) and used for the feasibility study of renewable energy technologies (RETs) that affect solar energy, wind energy, and geothermal energy systems. NASA and CEDRL have developed a direct link to the SSE website to provide environmental parameters that improve the cost benefit analysis of these projects to international customers using RETScreen. *http://www.retscreen.net/ang/menu.php*

International Energy Agency (IEA) Task

Through a NASA Memorandum of Understanding with NREL, the Energy Management program pursued this activity for NASA Earth science datasets to add value to the standardization and structure (e.g., improved spatial/temporal coverage) of energy products that serve multiple countries and are easily accessible to end users. Responding to the Group on Earth Observation System of Systems (GEOSS) draft implementation plan goals for solar irradiance datasets (Implementation Plan Task Team-IPTT

[*] The FY05-09 Energy Management Program Element Plan is available through: *http://aiwg.gsfc.nasa.gov/dss.html*

Section 4.3), the project used a variety of NASA products (SSE, GEWEX SRB, ISCCP, CERES, and GMAO GEOS) to support the Solar Sizer and RETScreen decision support tools, the solar energy industry, the United Nations Environment Programme's Solar and Wind Energy Resource Assessment (UNEP SWERA), renewable energy system designers/planners, and renewable energy stakeholders in developing countries.

In FY05, the Energy Management's IEA project team helped develop an IEA Annex Plan to establish NASA participation in a multi-national team; this Annex Plan received approval in July 2005. The project team participated in the American Solar Energy Society and International Solar Energy Society industry conferences in August 2005. Also in 2005, the project team began collaborative task planning and activities with the German research institute Deutsches Zentrum für Luft- und Raumfahrt (DLR).

Policy Models

This project evaluates energy policy models and establishes partnerships with model developers to extend NASA measurements and assimilation products to improve assessments that support energy management and policy decisions. The Policy Models project uses NASA products (e.g., CERES, GMAO GEOS, SSE, SRB) and focuses on DOE decision tools, including National Energy Modeling System-NEMS, System for the Analysis of Global Energy Markets-SAGE, MARKet ALlocation-MARKAL, and others.

In FY05, the Policy Models project team completed an evaluation reports and developed tables of NASA satellite measurement datasets. The team formed partnerships with decision support tool owners and developed NASA prototype products. The project team also participated in workshops in December 2004 and May 2005, met with developers of the SAGE energy policy model, and completed a DEVELOP report on MiniCAM/PGCAM.

GEOSS, US GEO, CCSP, CCTP Decision Tools Evaluation

This project identifies scenario assessments and decisions facing organizations responsible for national and international policy relating to the Climate Change Science Program (CCSP), Climate Change Technology Program (CCTP), U.S. Group on Earth Observations, GEOSS, and the World Summit on Sustainable Development (WSSD). The project team is evaluating current and future NASA greenhouse gas satellite measurements, Earth System Modeling Framework, ISCCP, SRB, SSE, and CERES to support the CCSP, CCTP, U.S. GEO, and GEOSS.

In FY05, the Decision Tools Evaluation project team completed an evaluation report identifying potential partners and decision support tools, and it established partnerships with relevant decision tool owners. The project team participated in an IEA Workshop on GEOSS in December 2004. In September 2005, the project team delivered data to the DOE Pacific Northwest National Laboratory (PNNL) for MiniCAM CCTP simulations. The project team also coordinated CCTP measurements and monitoring working group activities in support of the development of the CCTP Strategic Plan.

SOLICITATIONS

Decisions CAN

The Energy Management Program received 5 Step-1 proposals in the Decisions CAN and encouraged 4 to submit full proposals. In Step-2, the Energy Management program received 2 full proposals. Following the panel reviews and internal assessment for programmatic balance, the Applied Sciences Program selected a Water Management proposal that also had applicability in the Energy Management program area:

> Improving Water Resources Management in the Western U.S. through Use of Remote Sensing Data and Seasonal Climate Forecasts
> *PI: Dennis Lettenmaier, University of Washington-Seattle*

ROSES 2005 – Section A.24
For the Applied Sciences portion of the ROSES 2005 NRA, the Energy Management program received 3 Step-1 proposals and encouraged 2 to submit full proposals. The Step-2 proposals were due in November 2005 with selections expected by April 2006.

PUBLICATIONS & CONFERENCE/WORKSHOP PRESENTATIONS (SELECTED)

Chandler, William S., C.H. Whitlock, P.W. Stackhouse, Jr., 2005: "Determining Wind Resources as a Function of Surface Roughness and Height from NASA Global Assimilation Analysis." Proceedings of the *International Solar Energy Society 2005 Solar World Congress*, Orlando, Florida.

Whitlock, Charles H., W.S. Chandler, J.M. Hoell, T. Zhang, P.W. Stackhouse, Jr., 2005: "Parameters for Designing Back-Up Equipment for Solar Energy Systems." Proceedings of the *International Solar Energy Society 2005 Solar World Congress*, Orlando, Florida.

Wilcox, Steve, R. Perez, R. George, W. Marion, D. Meyers, D. Renne, A. DeGaetano, C. Gueymard, F. Vignola, P.W. Stackhouse, Jr., 2005: "Progress on an Updated National Solar Radiation Data Base for the United States." Proceedings of the *International Solar Energy Society 2005 Solar World Congress*, Orlando, Florida.

Hoell, James M., Paul W. Stackhouse, Jr., William S. Chandler, Charles H. Whitlock, and Taiping Zhang, 2004: "Satellite Inferred Meteorology for Agroclimatology: Comparisons of Ground Observations and Satellite Inferred Parameters." *2004 joint ASA-CSSA-SSSA International Annual Meetings*, Oct 31 - Nov 4, 2004, Seattle, Washington.

Stackhouse, P.W., Jr., R. Birk, J. Kaye, C.H. Whitlock and W.S. Chandler, 2004: "Contributions to Solar Energy Resource Information from NASA Satellites and Modeling." Invited presentation at *Renewable Energy Modeling Series - Modeling Solar Energy Use*, December 6, 2004, Washington, DC.

CONTACT INFORMATION

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