APPLICATION


DATA DELIVERY METHOD

http://eosweb.larc.nasa.gov/sse/ (DATA TABLES & MAPS)

Surface meteorology and Solar Energy (SSE) Applications Project

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CERES Science Team Meeting
January 23-26, 2001

WHY?

LETTERS FROM DR. CREEDON AND MR. GOLDIN EMPHASIZING COMMERCIAL APPLICATIONS.

(LETTERS TO "ALL HANDS" ABOUT 1996)
Surface meteorology and Solar Energy Data Set

A renewable energy resource web site
sponsored by NASA's Earth Science Enterprise Program

- over 100 satellite-derived meteorology and solar energy parameters
- monthly averaged from 10 years of data
- data tables for a particular location
- color plots on both global and regional scales
- global solar energy data for 1100 ground sites
- data for the RETScreen® Renewable Energy Project Analysis Software

Data Retrieval:
- Meteorology and Solar Energy
- Ground Site
- RETScreen Users

Supporting Documentation:
- Geometry
- Accuracy
- Methodology
- Parameters (Units & Definition)
- Related Web Sites
- Join SSE mailing list / Submit Questions
- Release Notes

Pictures courtesy of the DOE/NREL Photographic Information Exchange

Responsible NASA Official: Richard McGinnes
Site Administration: NASA Langley ASDC User Services
Site URL: http://eosweb.larc.nasa.gov/sse/
Last Updated: January 8, 2001
SSE SUCCESS TO DATE

DATA CUSTOMERS

- U.S.: 551 FROM 46 STATES.
- INTERNATIONAL: 1388 FROM 94 COUNTRIES.
- REPEAT TO NEW RATIO = 25% TO 45% OVER PAST 6 MONTHS.

LARGER-SIZE CUSTOMERS

Duke Solar Power, DuPont, BP Amoco, Shell, Siemens Solar Industries, International Finance Corporation, the World Bank, UNESCO, UNEP, Winrock International, the Jet Propulsion Laboratory, the U.S. Department of Energy, the USDA Forest Service, and 79 educational institutions in the U.S.

WHY?

1. RENEWABLE'S TO PROVIDE 5 TO 10% OF WORLD ENERGY BY 2025 AND 50% BY 2050\(^1\).
2. PHOTOVOLTAIC MARKET GROWING AT 25% PER YR.
3. WIND TURBINE SALES GROWING AT 40% PER YR.
4. SOLAR-THERMAL AND BIOMASS PLANTS TO BE ECONOMICAL BY 2010.
5. HYBRID-SYSTEM DESIGN PROCEDURES\(^2\) BECOMING MORE ACCURATE.

NOTE:

\(^1\) Oil industry estimates.
\(^2\) Three international design programs are already using NASA SSE data for input.
SSE METRICS

- RELEASE 1 = ENERGY INDUSTRY RESEARCH PARTNERS.
- RELEASE 2 = ENERGY INDUSTRY SMALL BUSINESS PARTNERS.
- RELEASE 3 = ENERGY INDUSTRY DESIGN/ECONOMICS PARTNERS.

WEB SITE PERFORMANCE

<table>
<thead>
<tr>
<th>MONTHLY AVERAGES</th>
<th>RELEASE 1</th>
<th>RELEASE 2</th>
<th>RELEASE 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEB SITE HITS</td>
<td>1,278</td>
<td>12,533</td>
<td>29,000</td>
</tr>
<tr>
<td>DATA DOCUMENTS DOWNLOADED</td>
<td>59</td>
<td>873</td>
<td>2267</td>
</tr>
</tbody>
</table>

RELEASE (2 + 3) SUMMARY: (20 MONTHS)

- HITS = 279,000
- DATA DOCUMENTS DOWNLOADED ~ 20,000
## SCIENCE AND COMMERCIAL PARAMETERS

### SCIENCE - SYNTHESIZED TO -> COMMERCIAL

(5+ Yr Time Histories) (Mult-Yr Avg, Max, Min, Mid-Day, Accum-Day, Etc.)

<table>
<thead>
<tr>
<th>RADIATION &amp; CLOUDS:</th>
<th>RAD &amp; CLD:</th>
<th>TEMPERATURE:</th>
<th>OTHER:</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOA &amp; Surf SW Down</td>
<td>Tot/Diff/DirN</td>
<td>10-m Air T</td>
<td>10-m Rel H</td>
</tr>
<tr>
<td>Cloud Fraction</td>
<td>SW</td>
<td>Earth T Avg, Max,</td>
<td>Air Press</td>
</tr>
<tr>
<td>Surf Albedo</td>
<td>Daily Accum</td>
<td>Min, Amp</td>
<td>10-m Sp H</td>
</tr>
<tr>
<td>Surf Vegetation</td>
<td>SW Deficits &amp; Surplus</td>
<td>Number Frost Days</td>
<td>Surf &amp; Col Prec H2O</td>
</tr>
<tr>
<td>Surf Altitude</td>
<td>Equivalent SW</td>
<td>Heating Deg Days</td>
<td>10-m Wind Vel</td>
</tr>
<tr>
<td></td>
<td>Black Days</td>
<td>Cooling Deg Days</td>
<td>10-m Wind Dir</td>
</tr>
<tr>
<td></td>
<td>Solar Geo. &amp; SW</td>
<td>Dew Pt</td>
<td>10-m Wind Freq</td>
</tr>
<tr>
<td></td>
<td>@ 8 Times/Day</td>
<td></td>
<td>(6 Vel Ranges)</td>
</tr>
<tr>
<td>METEOROLOGY:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surf Press</td>
<td>Clr-Sky SW</td>
<td></td>
<td>10-m Wind Dir</td>
</tr>
<tr>
<td>Skin and 10-m Temp</td>
<td>All- &amp; Clr-Sky Clearness Index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-m Wind U &amp; V &amp; Sp H</td>
<td>Cld Fraction &amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surf Roughness/vegetation</td>
<td>Number Clr Days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model Assumptions &amp; Map</td>
<td>Mid-Day SW</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## RELEASE 3 SSE ACCURACY ESTIMATES

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Global sites WRDC</th>
<th>Global sites RETScreen</th>
<th>Renewable sites RETScreen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar Insolation (kWh/m²/day)</td>
<td>14.2%</td>
<td>13.0%</td>
<td></td>
</tr>
<tr>
<td>Near-Surface Air Temperature (K) (10-meter altitude)</td>
<td></td>
<td>&lt; 243 K = 3.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 263 K = 1.1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>linear variation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>between 243 K and 263 K</td>
<td></td>
</tr>
<tr>
<td>Heating Design Temperature (K)</td>
<td></td>
<td>1.2%</td>
<td></td>
</tr>
<tr>
<td>Cooling Design Temperature (K)</td>
<td></td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>Summer mean daily design range (K)</td>
<td></td>
<td>1.4%</td>
<td></td>
</tr>
<tr>
<td>Heating degree-days below 18°C (degree-days)</td>
<td></td>
<td>0.9%</td>
<td></td>
</tr>
<tr>
<td>Relative Humidity (%)</td>
<td>15.3%</td>
<td>9.7%</td>
<td></td>
</tr>
<tr>
<td>Surface Air Pressure (kPa)</td>
<td>3.6%</td>
<td>2.4%</td>
<td></td>
</tr>
<tr>
<td>10-meter altitude Wind Speed (m/s)</td>
<td>1.9 m/s</td>
<td>1.4 m/s</td>
<td></td>
</tr>
</tbody>
</table>

**SOLAR INSOLATION BIAS**  
-2.0% ≤ +3.3% DEPENDING ON YEAR.
ON-THE-FLY SSE WEB SITE STRATEGY
(AFTER FORTRAN SYNTHESIS OF SCIENCE DATA)

SERVER INPUTS:

- 1,550 Meg for 114 SSE Parameters. (66,062 FILES)
- 33 Meg of NREL/WRDC Ground Site Data.

SERVER OPERATION:

- PERL Software Calculation of 56 Additional SSE Parameters.
- ION Software Calculation of USER-DEFINED Data Plots and Regional Maps.  
  (SAVES CONSTRUCTION OF MILLIONS OF GRAPHICS IMAGES ON DATA UPGRADES)
- PERL Software Calculation of USER-DEFINED HTML File Windows.  
  (SAVES CONSTRUCTION OF MILLIONS OF HTML FILES ON DATA UPGRADES)

WEB SITE OUTPUT: (Each 1-deg cell)

- Digital Values for 149 SSE Parameters.
- Monthly Plots of Daily Data for 1195 WRDC Sites Over 30+ Years.
- Monthly Regional Maps for 61 SSE Parameters.
- 108 SSE Parameters for RETScreen™ Design/Financial Analysis Software.
SSE LESSONS LEARNED

1. CONSTRUCT A COMMERCIAL PROTOTYPE PRODUCT.

2. GET OUTSIDE YOUR BOX.

3. WORK WITH END CUSTOMERS.

4. MAKE EASY-TO-USE DATA DELIVERY SYSTEM.

5. CONTINUALLY UPGRADE TO INCREASE DEMAND.