NREL Advances in Resource Assessment at the National Renewable Energy Laboratory

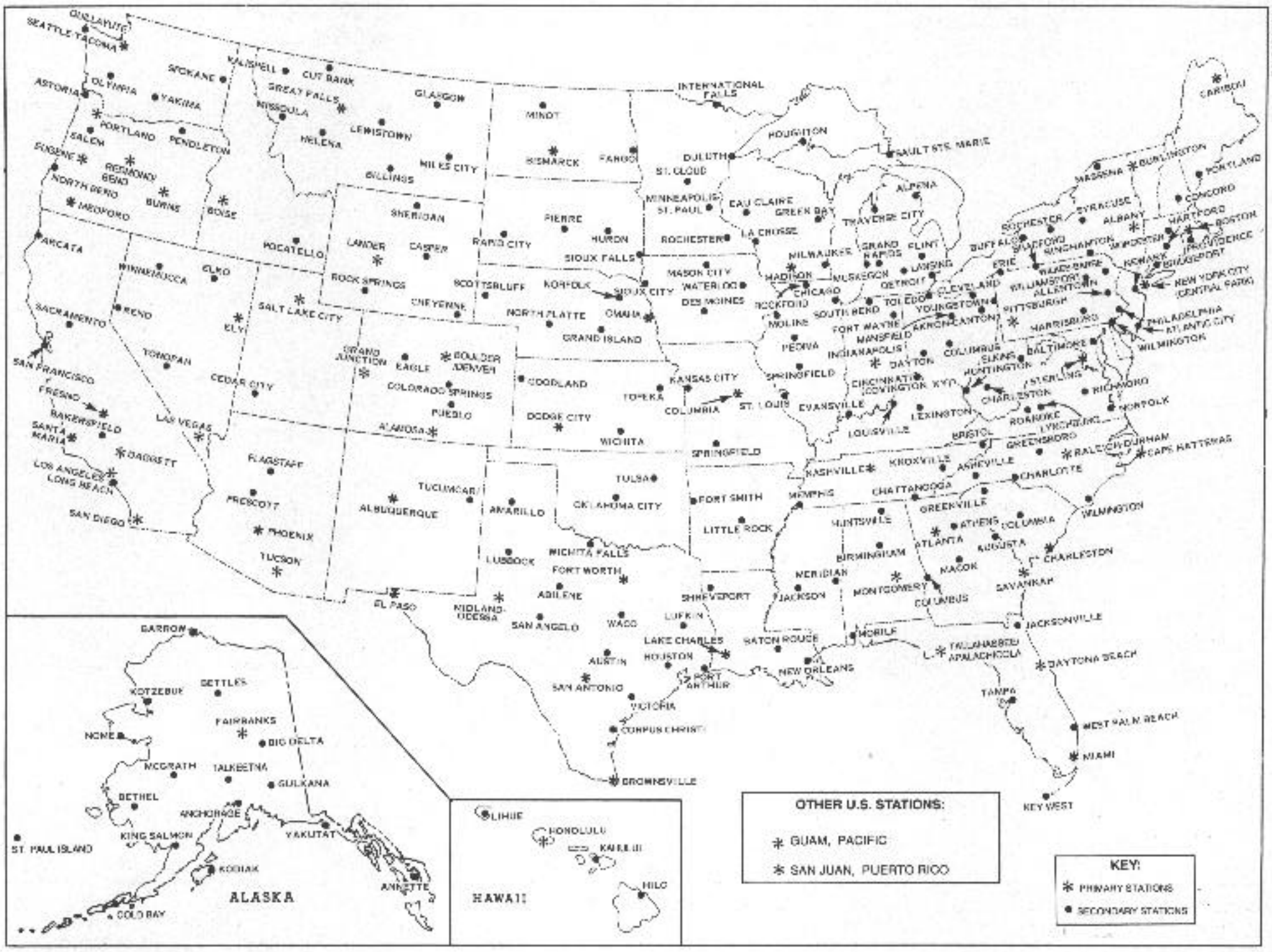
Resource Assessment Brief

NREL Completes the National Solar Radiation Data Base

Recently completed by the National Renewable Energy Laboratory (NREL), Version 1.0 of the National Solar Radiation Data Base (NSRDB) provides hourly values of measured or modeled solar radiation and meteorological data for 239 stations for the 30-year period from 1961 to 1990. Later versions of the NSRDB will include data collected after 1990 and changes resulting from customer feedback.

Timely and More Accurate Data

Before the completion of the NSRDB, designers and planners of solar energy systems relied primarily on information from the 1952-1975 SOLMET/ERSATZ data base. The NSRDB succeeds this older data base. In addition to accounting for recent climate changes, the NSRDB provides more accurate values of solar radiation. These values are more accurate for several reasons: more measured data were available;



This map shows the locations of the 239 stations in the National Solar Radiation Data Base.

NSRDB Solar Radiation and Meteorological Elements

Extraterrestrial Horizontal Radiation (Wh/m²)	Atmospheric Pressure (mb)
Extraterrestrial Direct Normal Radiation (Wh/m²)	Wind Direction (°)
Global Horizontal Radiation (Wh/m²)	Wind Speed (m/s)
Direct Normal Radiation (Wh/m²)	Horizontal Visibility (km)
Diffuse Horizontal Radiation (Wh/m²)	Ceiling Height (m)
Total Sky Cover (tenths)	Present Weather (10-digit code)
Opaque Sky Cover (tenths)	Precipitable Water (mm)
Dry Bulb Temperature (°C)	Broadband Aerosol Optical Depth
Dew Point Temperature (°C)	Snow Depth (cm)
Relative Humidity (%)	Days Since Last Snowfall

a better model estimated solar radiation for sites and times where no measurements were available (more than 90% of the solar radiation data in both data bases are modeled); calibration methods were improved; and procedures and software were devised for performing postmeasurement quality assessment of the data.

Although the two data bases compare within ±5% for about half the stations, the NSRDB data for other stations show greater differences. For example, changes in annual global horizontal radiation range from -10% to +18%, and changes in annual direct normal radiation range from -24% to +33%. When compared month by month, the differences between the SOLMET/ERSATZ and the NSRDB data are even larger.

NSRDB Products

Products available from the NSRDB include (1) serial hourly data in either a synoptic or TD-3282 format, (2) hourly, daily, and quality statistics for solar radiation elements, (3) daily statistics for meteorological elements, and (4) persistence statistics for daily total solar radiation. Typical meteorological years (TMYs) for the NSRDB are being developed by NREL and will be available in the fall of 1993.

The synoptic format is similar to the SOLMET format. Each line of data contains all solar radiation and meteorological elements for 1 hour. The next line of data contains data for the next hour. The synoptic format includes quality flags for global horizontal, direct normal, and diffuse horizontal radiation that indicate the percentage of uncertainty and whether the data were measured or modeled.

For the TD-3282 format, each line of data contains a day (24 hourly values) of data for one element. The next line of data contains a day of data for the next element. This format offers flexibility because only the requested solar radiation and meteorological elements need to be included in the data file. The TD-3282 format includes quality flags for all elements.

Statistical summaries computed from the hourly data include hourly, monthly, annual, and 30-year averages and their standard deviations. The persistence statistics show the number of times the daily solar energy persisted above or below set thresholds for periods from 1 to 15 days during the 30-year period. The statistical products, as well as the synoptic and TD-3282 formats, are completely described in the user's manual available from the National Climatic Data Center.

The NSRDB data and statistical products are available on magnetic media: 3.5-inch or 5.25-inch high-density diskettes, high-density magnetic tapes, and CD-ROM.

To order and to obtain prices:

User Services
National Climatic Data Center
Federal Building
Asheville, NC 28801-2696
(704) 259-0682
Fax: (704)259-0876

To obtain information on the development of the NSRDB and its products:

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