



*CR23X integral in the study  
of proposed power plant sites*

# Tall tower platforms help record baseline data

## APPLICATION AT A GLANCE

**Application type:**

Meteorological and Air Quality Monitoring

**Project area:**

Utah, USA

**Author:**

William J. Hauze

**Contracting agencies:**

Various energy concerns in Utah

**Datalogger(s):**

Campbell Scientific CR23X

**Communication links:**

Landline phone, cellular phone

**Measured/calculated parameters:**

Horizontal wind speed/direction, vertical wind speed, sigma theta of the wind direction, air temperature, delta temperature, solar radiation, net radiation, relative humidity, barometric pressure, precipitation, sulfur dioxide, PM10, PM2.5



*Going up? Preassembled instrumentation platforms await deployment on electrically powered lift carriages.*

The past few years have seen a scramble within the power industry to use more of Utah's natural resources for electric power production. To secure the required permits to construct proposed facilities, power companies must model emissions from the proposed plant site using current meteorological and air quality data that are representative of on-site conditions. Meteorological Solutions, Inc. (MSI) installed and operated meteorological and air quality monitoring systems to characterize baseline conditions at proposed or existing power plant locations in Utah. A minimum of one year of valid data is required, and strict quality control measures



*View of two deployed instrument platforms from below; the wind speed, wind direction, and aspirated temperature sensors can be distinguished.*

**Continued on back**

## Continued from front

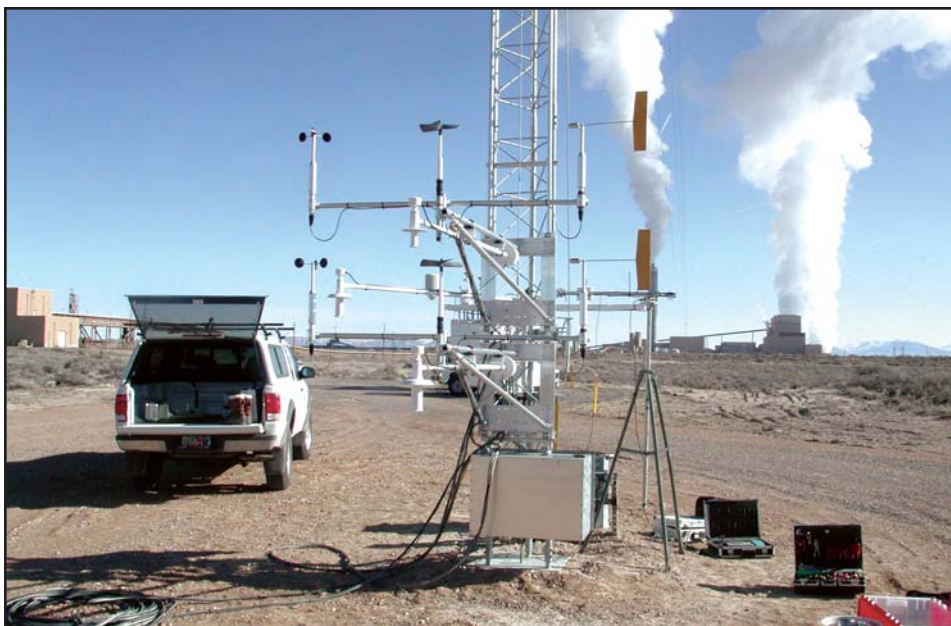
are implemented to assure high data recovery. Data are collected and stored as 15-minute averages computed from 1-second values using a Campbell Scientific CR23X datalogger. A reliable landline or cellular telephone connection allows frequent interrogation of the installed dataloggers to retrieve data and confirm data validity. Campbell Scientific's Datalogger Software was used for data retrieval, real-time display of numeric values, and datalogger program modifications.

For all of these applications, meteorological sensors were either mounted on 50 or 100 meter towers. Wind and temperature sensors were boom-mounted on electrically powered instrument lift carriages at 100 or 50 meters and at 10 meters. This feature facilitated sensor access for periodic maintenance and semi-annual performance audits and eliminated the need to climb the towers. The tower sensor configuration included Met One 010C/020C sensors to measure wind speed and direction at 10 and 50 or 100 meters and R.M. Young RTD temperature probes with motor-aspirated shields at 2, 10, and 50 or 100 meter levels. This arrangement allowed for a variety of delta temperature calculations to satisfy different dispersion model input requirements. A Li-Cor LI200X measured solar radiation and a Vaisala CS105 measured barometric pressure.

All towers were instrumented with sensors to collect data for input into the EPA-approved ISCST dispersion model. Two towers were equipped with additional sensors to satisfy the data input



*The ENC 16/18 enclosure functions as an "on-site headquarters;" the CR23X enables quality control, performs data calculation, and provides communications through a COM200.*



*View of the base of a 50 meter tower; power plant is in the background.*

requirements of the EPA-approved AERMOD and CALPUFF dispersion models. These included the Vaisala HMP45C sensor for relative humidity, the REBS Q-7.1 Net Radiometer, and the R.M. Young tipping bucket rain gauge.

Atmospheric stability was calculated using three different methods. Sigma theta ( $\sigma_\theta$ ) was calculated by the CR23X from 1-second data and stored every 15 minutes for later calculation of atmospheric stability using the sigma theta method. The solar radiation-delta temperature (SRDT) approach to calculating atmospheric stability required processing the 15-minute average data by MSI as did the sigma-W approach which uses vertical wind speed measurements.

In order to maintain current information about site measurement systems and assure high rates of data recovery (usually greater than 98%), dataloggers were interrogated daily whenever possible using either the COM210 telephone modems or a COM100 cellular phone package. After interrogating the on-site datalogger and retrieving all data stored since the last call, MSI computers in Salt Lake City stored the data. The data validation process was initiated when these data were automatically subjected to a series of parameter-specific quality tests using a program developed by MSI based on USEPA guideline criteria. The program generated a report identifying each value in the data file that failed one or more of the listed tests. In addition, a series of stacked time parameter plots were created so that an air

quality meteorologist could visually inspect or look for irregularities in the data, assess parameter interrelationships, and decide if corrective action was needed. If appropriate, the site technician was dispatched to the site as soon as possible to rectify the problem.

As an added quality control measure to confirm proper operation of motor-aspirated temperature shields, the shields were equipped with flow switches that were interfaced with control ports on the CR23X. Whenever the flow through the aspirated shields was obstructed (e.g., by icing or spider webs), a switch connected to the control port prompted the datalogger program to increment a counter. The quality control program registered the counts as a parameter that failed the data editing criteria, and the site technician initiated corrective action.

Quality control for atmospheric gas sampling equipment may include periodic zero, span and precision checks. The checks can be activated by the CR23X control ports connected to an A21REL-12 relay driver and interfaced with the gas analyzer calibration system. Gas analyzers and calibrators with RS-232 connections to their microprocessors allow remote access via modem to their systems. At one air quality monitoring station, MSI used a code-activated switch for selectable telephone access of not only the CR23X but the gas monitoring equipment as well. This feature allowed real-time communication with the analyzer to view diagnostics and troubleshoot problems remotely.



**CAMPBELL SCIENTIFIC, INC.**

815 W. 1800 N. • Logan, Utah 84321-1784 • (435) 753-2342 • FAX (435) 750-9540  
Offices also located in: Australia • Brazil • Canada • England • France • South Africa • Spain

AP No. 027

Copyright © 2003  
Campbell Scientific, Inc.  
Printed August 2003