



California Commissioning Collaborative

ECAM Update

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Review of Tool History

- ECAM ≡ Energy Charting and Metrics
- Intended to provide easy, semi-automated organization and analysis of interval data.
- Started with organization of personal tools
- Initial formal tool development completed in 2007
- Funding from
 - Northwest Energy Efficiency Alliance
 - California Energy Commission, Public Interest Energy Research (PIER) Buildings Program
 - New Buildings Institute
 - California Commissioning Collaborative

ECAM Menu

The screenshot shows the ECAM menu in a software application. The menu is open, displaying the following options:

- Select Data
- Definition of Points
- Create Schedules
- Input Dates for Comparison of Pre and Post
- Utilities
- Create Per Sq. Foot Metrics
- Create Other Metrics
- Time Series Charts
- Scatter Charts
- Matrix Charts
- PNNL Re-Tuning
- About ECAM

The background shows a data table with the following columns and values:

	E	F	G	H
VST	CHW Flow	OAT	Damper Signal	Supply Static SFS
40.2	200	43.6	0	2.2
40.4	200	43.6	0	2.21
40.2	200	43.9	0	2.21
40.2	200	43.7	0	2.2
40.4	200	43.4	0	2.22
40.4	200	42.9	0	2.3
40.5	200	42.7	0	2.25
40.4	200	42.2	0	2.26

ECAM Metrics Creation Capabilities

In ECAM, metrics are typically data averaged over a particular time period

- Can be normalized:
 - Building area (e.g. W/sqft)
 - Cooling tons (e.g. kW/ton)
 - CFM (e.g. Watts/CFM)
 - gpm (e.g. gpm/ton)
- Can be filtered by:
 - Year
 - Month
 - Pre/Post time periods
 - Daytype
 - Time of day
 - Occupancy
 - Weather conditions
 - Status of Equipment
 - Combinations

All filters and many normalizations are automatically set up by ECAM.

Data Visualization

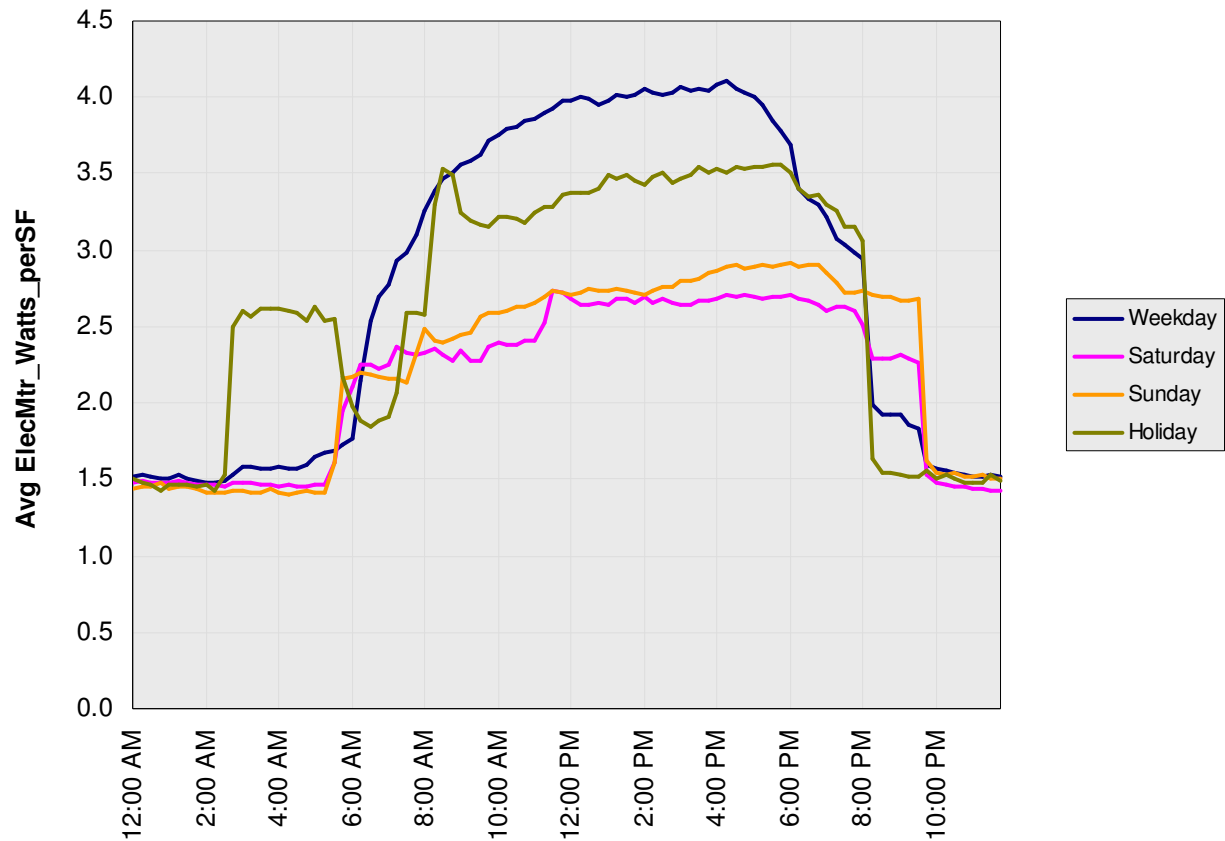
- Load profiles
 - Raw data
 - Averages
 - Pre/post
 - By daytype
 - Calendars
- Scatter charts
 - Raw data
 - Averages
 - Pre/post
 - By daytype
 - By occupancy
 - By time of day
 - Choice of independent variable
 - Multiple points

**Filtering capabilities are provided
for all types of charts**

Sample Chart and Filters:

Load Profile by Daytype

Year	(All)
Month	(All)
MonthYr	Sep 2006
Weekday	(All)
Day	(All)
Holiday	(All)
5degBin	(All)
1degBin	(All)
TempRng	(All)



ECAM Features Brainstormed in 2008

- Additional Metrics
- Time-series history of all timestamps
- Additional load profiles (Weekly, box plots)
- Load-duration chart
- Chart to show input schedules
- Chart matrices
- Zooming capability for charts
- Chart animation
- Startup and shutdown time periods in schedules
- Second schedule type
- Have new data automatically included
- Bins of hourly weather data based on input schedule
- Regression models, change point, multivariate

ECAM Improvements in SOW

- Excel 2007 Capability
- Updated and Improved Instructions
- General Improvements and Automation
- Additional Scheduling—startup and shutdown
- Additional Chart Types
- More Chart Features
- Additional Metrics
- New Data Summaries

Excel 2007 Capability

- Biggest focus of effort.
- Significant challenges addressed.
- Also should work with Excel 2010 and has minimal testing to confirm that.
- New Excel 2010 capabilities considered during development.

**This work is completed.
Remaining development is proceeding in
Excel 2007, with testing in Excel 2003.**

Updated and Improved Instructions

- Update User Guide
- Integrate Help

**User Guide has been updated through current feature development.
Help approach has been determined, but work has not been done yet.**

General Improvements and Automation

- Provide a means to add in new data or points, or instruct users to add new data within original data range.
- Complete automatic creation of additional fields for metrics.
- Extend list of typical Holidays.
- Add additional error checking for inputs, Excel installation variations, and user execution order.
- Check instances where the calculation mode is set to manual, to make sure that it is always set back to the user's calculation setting.

All these improvements have been completed.

Automatic Creation Of Additional Fields For Metrics

- Equipment Status
- Demand (kW)
- Chilled water tons
- Watts per square foot
- CFM per square foot
- kW per ton
- gpm per ton
- From demand (kW) or current (amps)
- from current (amps) approximate calculation
- whenever flows and temperatures are available
- for all electrical demand points (kW)
- for all airflow points
- for all related points
- for all related points

Additional Chart Types

- Time-series history (of all timestamps)
- Weekly load profiles
- Scatter chart of all data, toggled with averages
- Load-Duration Chart
- Load profiles as grouped box plots (LBNL)
- Chart to check schedule

**The first three are completed.
The last three are in-process.**

More Chart Features

- Automatic Scales Adjustment
- Ability to copy worksheet with chart, and keep PivotTable chart references
- Chart Matrices

These features are completed.

Additional Metrics

- Occupancy and Month-Year combination
- Daytype and Month-Year combination
- Ratio of typical low (unoccupied) demand to typical high (occupied) demand

**The first two features are completed.
The third feature needs debugging.**

PNNL Re-tuning

- [Commercial Building Re-tuning Project](#)
 - A Low-Cost Path to Energy Efficiency and Cost Savings
 - Through the U.S. Department of Energy's Building Technologies Program
- PNNL funded addition of common Re-tuning diagnostic charts to ECAM.
- ➔ Work is being disseminated outside of the CCC.