Energy Charting and Metrics Tool (ECAM)
Part II: ECAM Basics: A Step by Step Walkthrough

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Part II: Webinar Outline

- Interval meter data walkthrough
  - Data input (INPUT)
    - Select data (user interaction)
    - Definition of points (user interaction)
    - Create schedules (user interaction)
    - Input dates for comparison of pre and post (user interaction)
  - Time series charts (OUTPUT)
    - Utilizing excel Pivot Tables
  - Load profile as box plots (OUTPUT)
  - Scatter charts (OUTPUT)
- Converting meter data received from utilities in ECAM
- Review and look ahead to webinar #3

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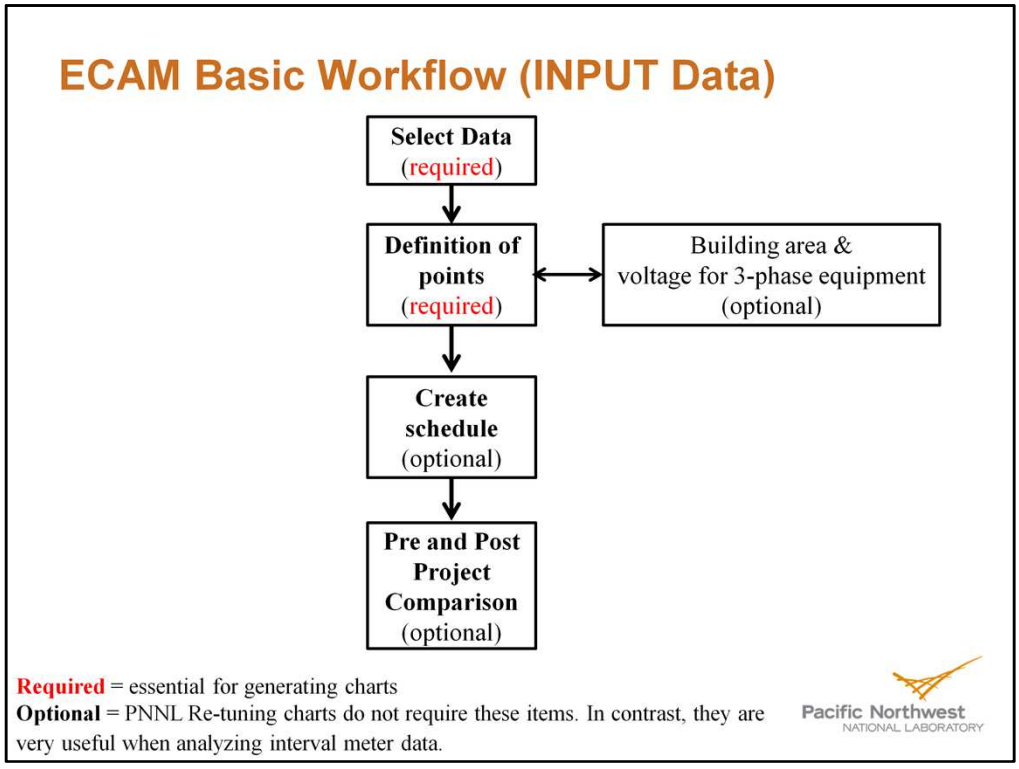

To create any charts (whether using interval meter data or system data), the first two items of ECAM must be completed.

User Interactive Walkthrough

- Please open file MeterData.csv
  - Questions before we continue?
- Menu Item Number 1: Select data (required)
  - Purpose: To import the data into ECAM

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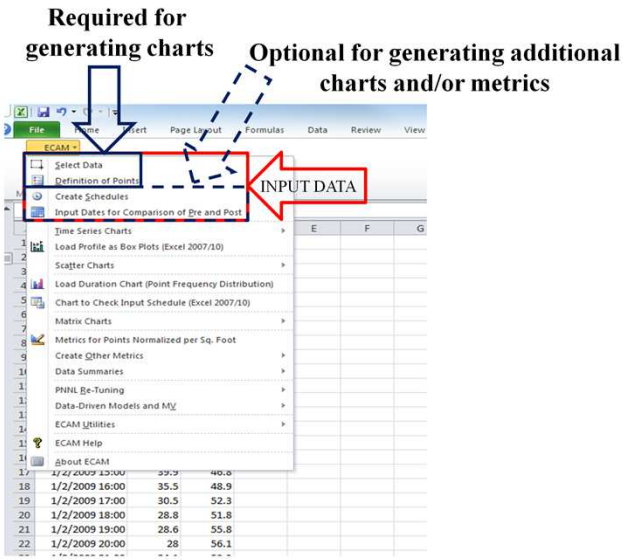
ECAM Basic Workflow (INPUT Data)



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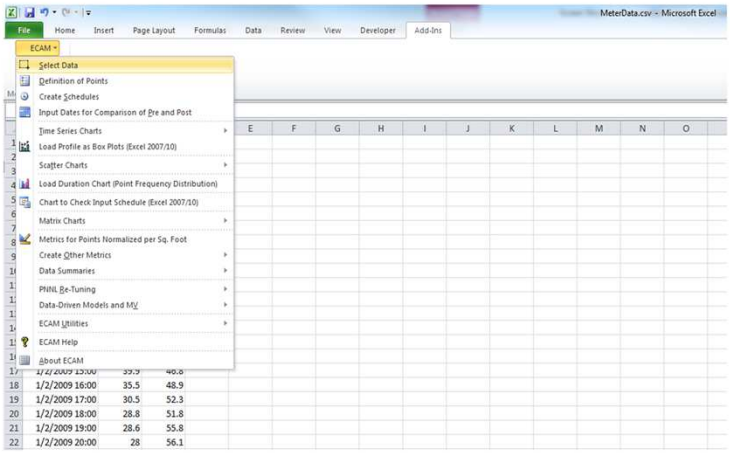
Data Input: Select Data

- **Step 1: Choose "Select Data" from the ECAM dropdown menu**



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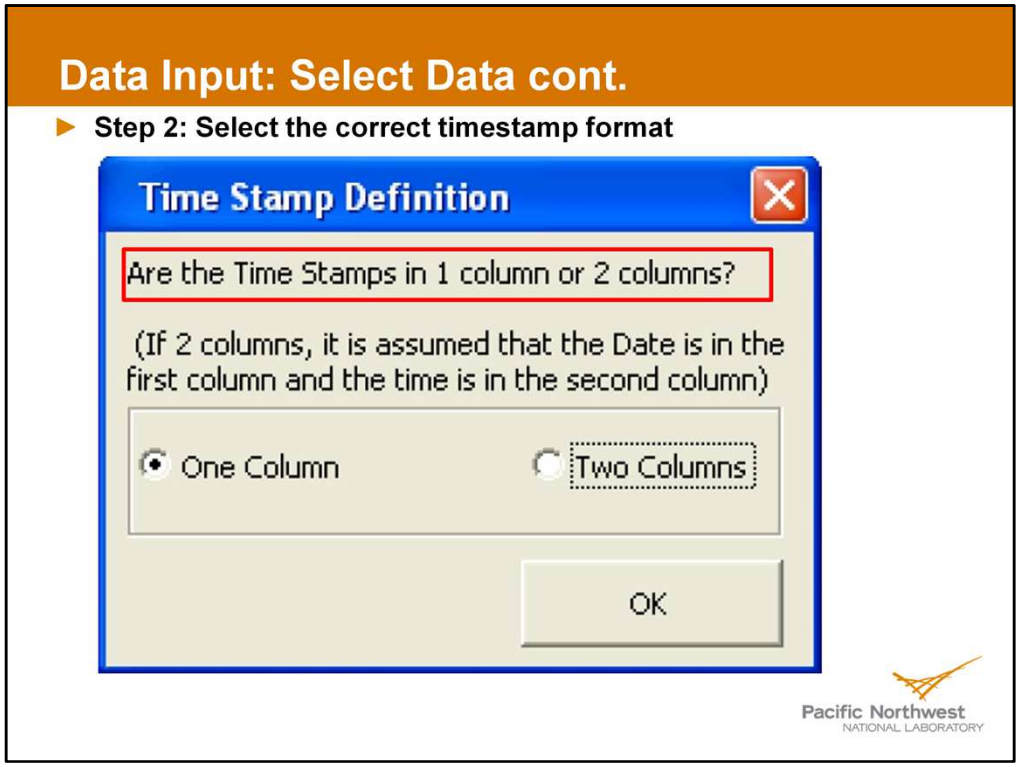
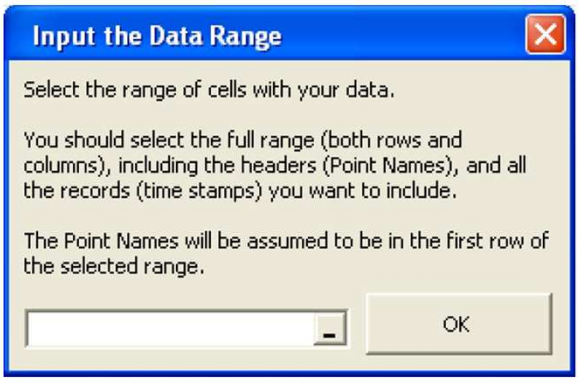


Note: Make sure if the time stamps are in two columns, that the first column is the date and the second column is the time. If this is not done by the user, ECAM will not be able to process the data.

Data Input: Select Data cont.

- **Step 3: Select the range of cells that contain the data**



Tip: Click the 1st cell on the upper left, hold Ctrl+Shift and press the right & down arrows on the keyboard to select all of the data.

Note: If the data contain empty cells the above tip will not work. Thus, if you use the tip be sure that all data is selecting by scrolling to the end of the excel sheet.

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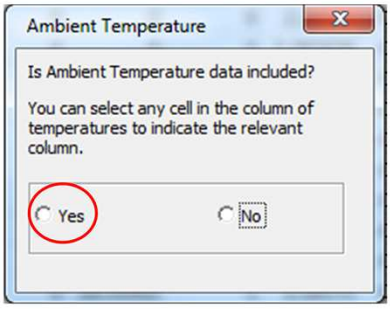
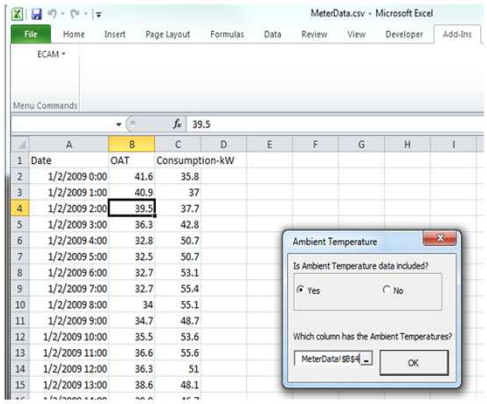
Note: The user should remove any empty cells or rows or columns before importing it into ECAM. This was handled in webinar #1 during our pre-processing steps.

Data Input: Select Data cont.

- **Step 4: Select whether ambient temperature data is included**





Tip: Click on any cell within the Ambient Temperature column to select it. The ambient temperature is the same as the outdoor-air temperature.

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Note: Having the outdoor-air temperature located at the first column after the timestamp makes it easy to remember for this step in ECAM.

Data Input: Select Data Result

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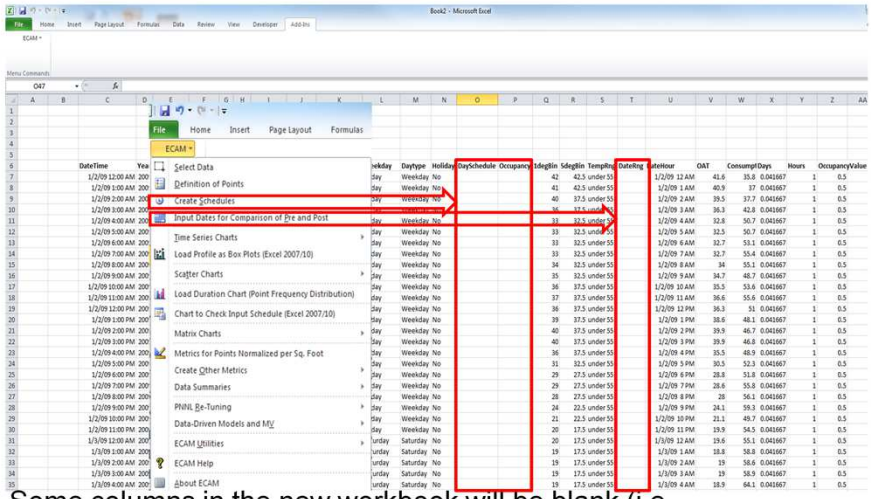
Result: ECAM generates a new workbook with both raw and processed data.



Note: Some columns in the new workbook will be blank (i.e., DaySchedule, Occupancy, and DateRng). These can be filled by alternate ECAM menu items, but are not required.

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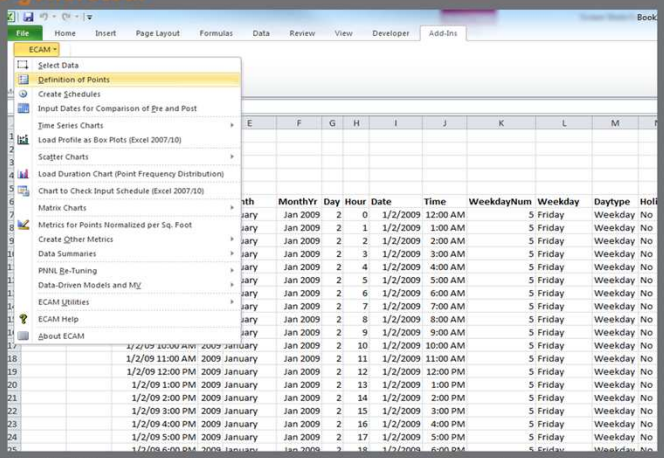
Note: It is a good idea for the user to save the new workbook before continuing so that the process does not have to be repeated if a mistake is made. Save the file as an extension xlsm (macro-enabled workbook). ECAM now recognizes the timestamp, and creates multiple columns for Year, Month, Day, Hour, Date, Time, WeekdayNum (i.e., 1-7, with Monday being 1 and Sunday being 7), Daytype (i.e., Weekend, Weekday, Holiday), and several outdoor-air temperature categories (if outdoor-air temperature exists in the data) such as temperature bins and temperature range.

Menu Item Number 2: Definition of Points (Required)

Purpose: To "map" the BAS trended points (columns of data) into ECAM so charts can be generated.



Step 1: Choose "Definition of Points" from the ECAM menu

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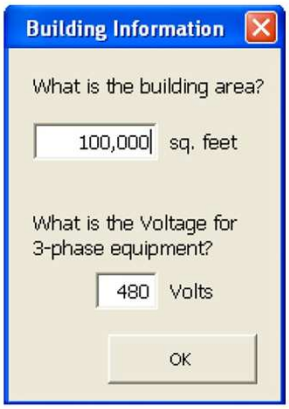
Note: The number of points trended and exported from the BAS can be very large (i.e., 2,000 points). However, only certain points are necessary for ECAM to generate useful charts to analyze. Thus, mapping the points of interest in ECAM allows the user to keep all data in the workbook, but only utilize that which is useful for generating charts to analyze.

Data Input: Definition of Points

- **Step 2: Input the building area and voltage for three-phase equipment (if known)**



Tip: ECAM needs this input to create metrics. However, it is not required to generate charts, and thus the default values (e.g, building area = 100,000 sq.feet and 3-phase voltage = 480 V are acceptable).

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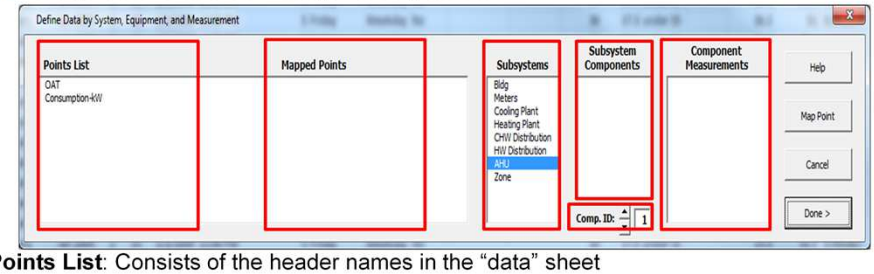
Tip: ECAM needs this input to create metrics. However, it is not required to generate charts, and thus the default values (e.g, building area = 100,000 sq.feet and 3-phase voltage = 480 V are acceptable).

Data Input: Definition of Points Cont.

- **Step 3: Define or "map" the points**



Points List: Consists of the header names in the "data" sheet

Subsystems: A list for different systems inside of the building for the user to cycle between when defining specific points.

Subsystem Components: The individual components for the subsystem chosen.

Component Measurements: Specific measurement (with units) for the subsystem and component chosen

Component ID: ECAM designation allowing for multiple components to be mapped, and generate charts for different components (i.e., air-handling unit 1 and air-handling unit 2). The user should map all components for a specific system with the proper Comp. ID.

Mapped Points: New name given by ECAM once the point has been mapped.

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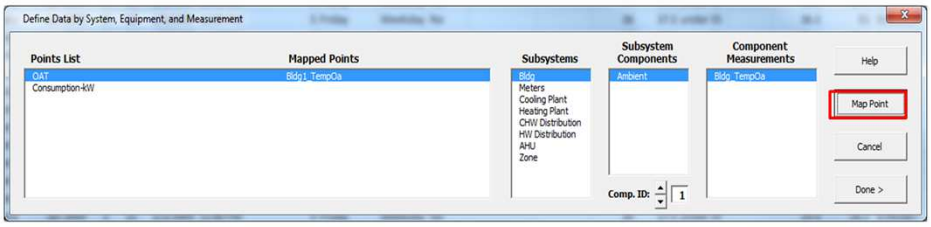
Note: The Definition of Points window needs to be refreshed before mapping any points. To do so simply click on any subsystem and everything else will refresh.

Data Input: Definition of Points Cont.

- Step 3 Detailed Example: Walkthrough



Click on “OAT” under the “Points List”
Click on “Bldg” under “Subsystems”
Click on “Ambient” under “Subsystem Components”
Click on Bldg_TempOa under “Component Measurements”

Click on “Map Point”

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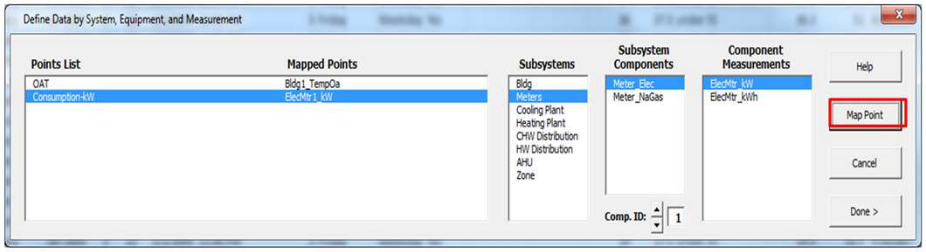
Note: Identifying what each point name from the BAS is can be confusing unless you are the one who set up the trends. Generally, the end of the point name will give a good indication of what the point that is trended corresponds to. In this file, I modified the point names to say OAT and Consumption-kW.

Data Input: Definition of Points Cont.

- Step 3 Detailed Example: Walkthrough



Click on "Consumption-kW" under the "Points List"
Click on "Meters" under "Subsystems"
Click on "Meter_Elec" under "Subsystem Components"
Click on "ElecMtr_kW" under "Component Measurements"

Click on "Map Point"

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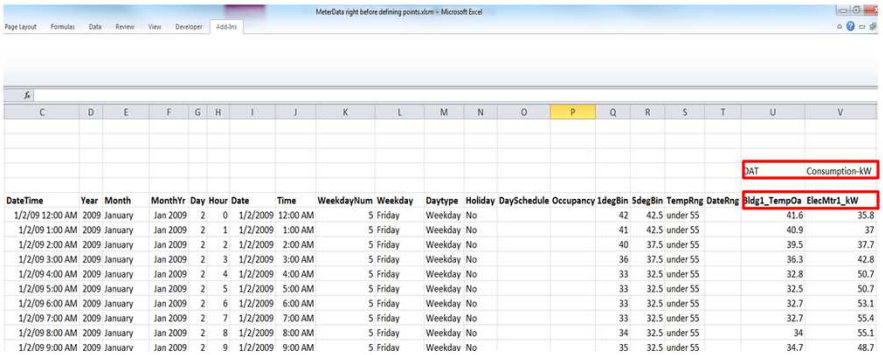
Note: Identifying what each point name from the BAS is can be confusing unless you are the one who set up the trends. Generally, the end of the point name will give a good indication of what the point that is trended corresponds to. In this file, I modified the point names to say OAT and Consumption-kW. Also, it is highly possible that there are multiple meters that are being analyzed. If that is the case, the "Comp. ID:" option allows the user to change from 1 to 100 and map accordingly.

Definition of Points: Result

- ECAM defined point names show up in row 6, and BAS point names are moved up to row 4 as a reference for the user:



																	OAT	Consumption-kW
DateTime	Year	Month	MonthYr	Day	Hour	Date	Time	WeekdayNum	Weekday	Daytype	Holiday	DaySchedule	Occupancy	1degBin	5degBin	TempRng	Bldg1_TempOa	ElecMtr1_kW
1/2/09 12:00 AM	2009	January	Jan 2009	2	0	1/2/2009	12:00 AM	5	Friday	Weekday	No			42	42.5 under 55		41.6	35.8
1/2/09 1:00 AM	2009	January	Jan 2009	2	1	1/2/2009	1:00 AM	5	Friday	Weekday	No			41	42.5 under 55		40.9	37
1/2/09 2:00 AM	2009	January	Jan 2009	2	2	1/2/2009	2:00 AM	5	Friday	Weekday	No			40	37.5 under 55		39.5	37.7
1/2/09 3:00 AM	2009	January	Jan 2009	2	3	1/2/2009	3:00 AM	5	Friday	Weekday	No			36	37.5 under 55		36.3	42.8
1/2/09 4:00 AM	2009	January	Jan 2009	2	4	1/2/2009	4:00 AM	5	Friday	Weekday	No			33	32.5 under 55		32.8	50.7
1/2/09 5:00 AM	2009	January	Jan 2009	2	5	1/2/2009	5:00 AM	5	Friday	Weekday	No			33	32.5 under 55		32.5	50.7
1/2/09 6:00 AM	2009	January	Jan 2009	2	6	1/2/2009	6:00 AM	5	Friday	Weekday	No			33	32.5 under 55		32.7	53.1
1/2/09 7:00 AM	2009	January	Jan 2009	2	7	1/2/2009	7:00 AM	5	Friday	Weekday	No			33	32.5 under 55		32.7	55.4
1/2/09 8:00 AM	2009	January	Jan 2009	2	8	1/2/2009	8:00 AM	5	Friday	Weekday	No			34	32.5 under 55		34	55.1
1/2/09 9:00 AM	2009	January	Jan 2009	2	9	1/2/2009	9:00 AM	5	Friday	Weekday	No			35	32.5 under 55		34.7	48.7

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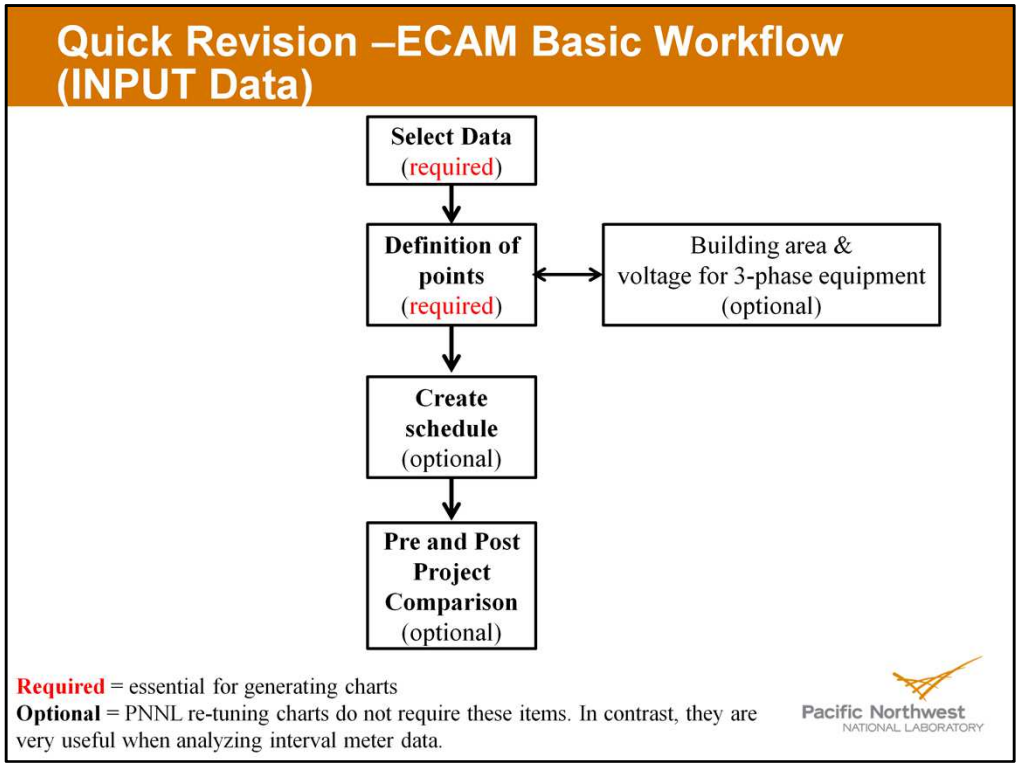
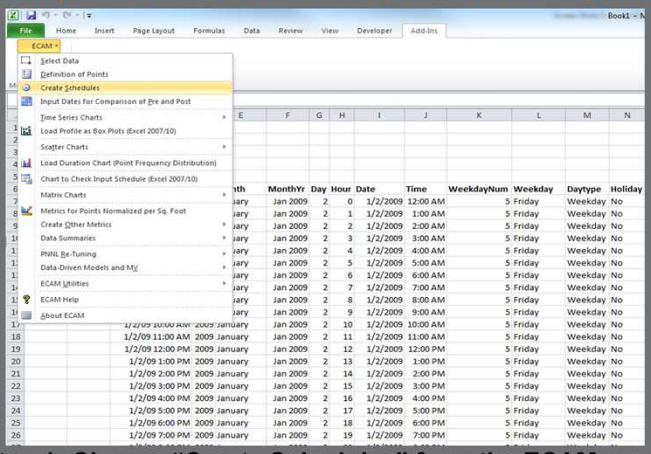


Required = essential for generating charts
Optional = PNNL re-tuning charts don't use these items. In contrast, these are used for creating metrics (e.g., W/sq.ft, etc.) for interval meter data.

Menu Item Number 3: Create Schedule (Optional)

Purpose: To input the building occupancy schedule to maximize analysis and monitor performance between occupied and unoccupied hours.



Step 1: Choose "Create Schedules" from the ECAM menu

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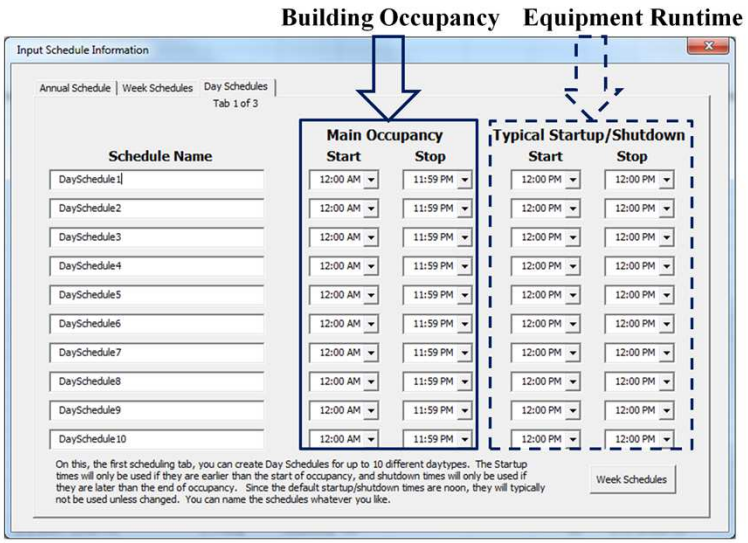
Note: This menu item is not required, but if known, should be input to maximize ECAM charting functions and analysis capability.

Create Schedules: Day Schedules



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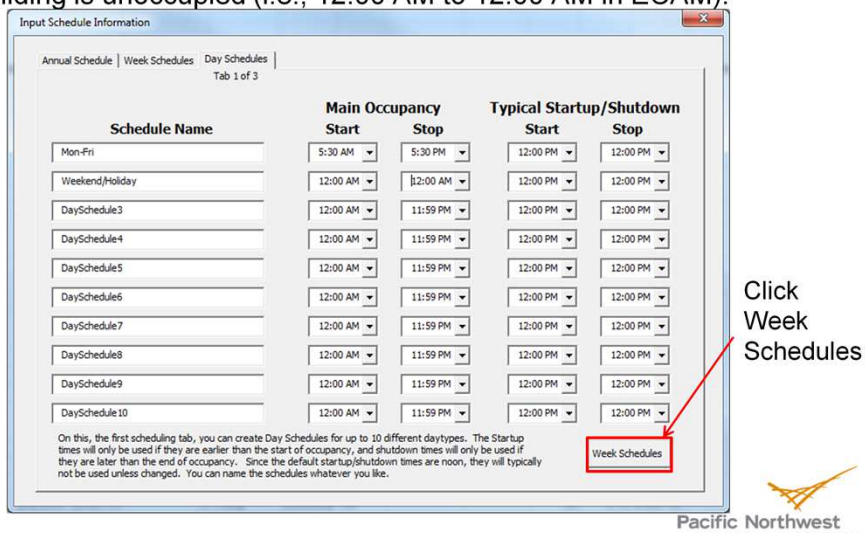
Default is 24/7 Occupied. To schedule a day for no occupancy, set the start time to 12:00 AM and the stop time to 12:00 AM

Whatever time is chosen for the start time, the next available time will be considered occupied in the data. Whatever time is chosen as the stop time, the next available time will be considered unoccupied in the data. For example, if the data is hourly, then a scheduled occupied time of 5:00 AM would actually translate to 6:00 AM in the data.

Create Schedules: Day Schedules Cont.

- Under "Schedule Name," create a Mon-Fri schedule of 5:30 AM to 5:30 PM. Create another for the Weekend/Holidays where the building is unoccupied (i.e., 12:00 AM to 12:00 AM in ECAM).



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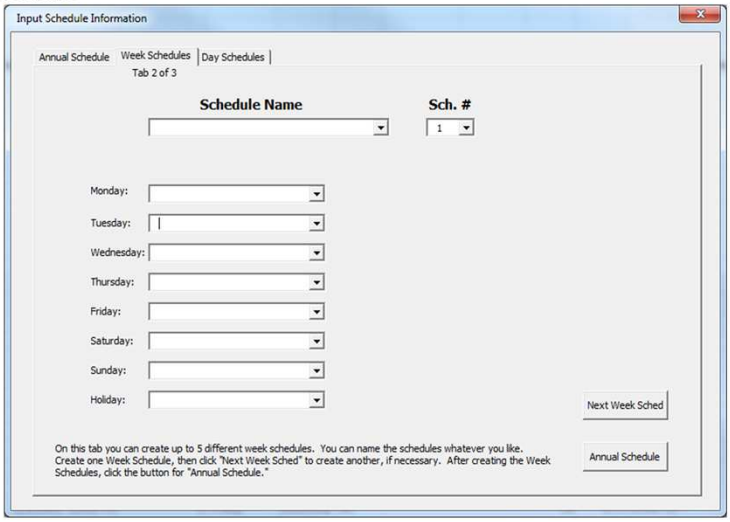
Note: This is an example case. The user would input the schedule that is unique to their building by the process demonstrated here.

Create Schedules: Week Schedules

- Name the schedule and designate each day with the appropriate day schedule



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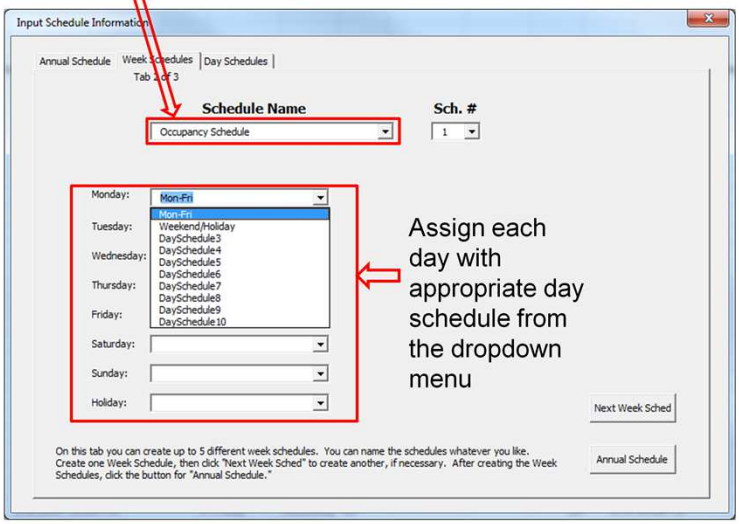
Create Schedules: Week Schedules Cont.

Name the schedule



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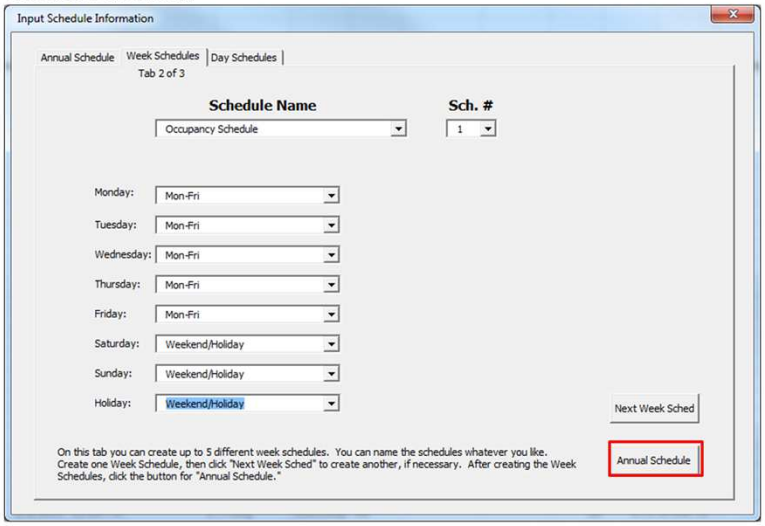
Create Schedules: Week Schedules Cont.

- Once the Week Schedules looks like this, click on the Annual Schedule button.



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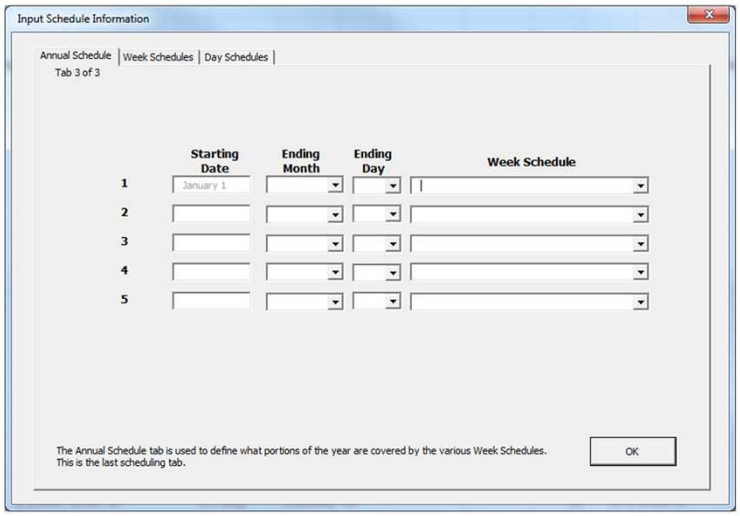
Create Schedules: Annual Schedule

- User can input up to 5 different week schedules



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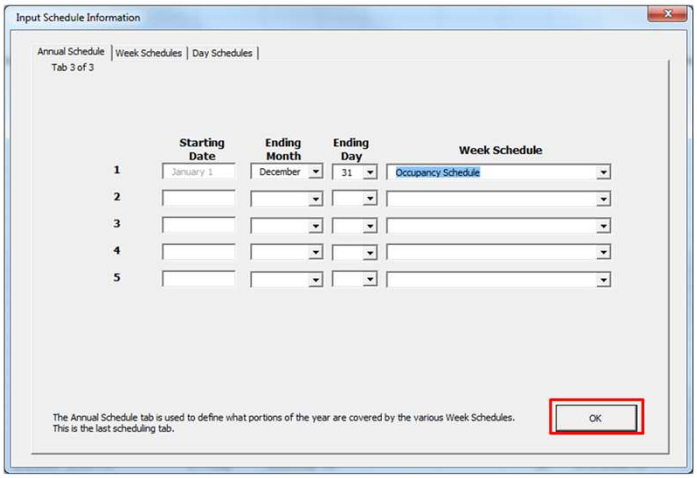
Create Schedules: Annual Schedule Cont.

- Toggle the Ending Month to December, Ending Day to 31, and choose the Occupancy Schedule from the Week Schedule dropdown menu, then select OK.



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Data Input: Create Schedules Result

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Create Schedules Result

																OAT	Consumption-kW			
DateTime	Year	Month	MonthYr	Day	Hour	Date	Time	WeekdayNum	Weekday	Daytype	Holida	DaySchedule	Occupancy	1degBin	5degBin	TempRng	DateRng	Bldg1_Te	ElecMtr1_	Days	Hours	ElecMtr1\
1/2/09 12:00 AM	2009	January	Jan 2009	2	0	1/2/2009	12:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	42	42.5	under 55		41.6	35.8	0.04167	1	0.358
1/2/09 1:00 AM	2009	January	Jan 2009	2	1	1/2/2009	1:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	41	42.5	under 55		40.9	37	0.04167	1	0.37
1/2/09 2:00 AM	2009	January	Jan 2009	2	2	1/2/2009	2:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	40	37.5	under 55		39.5	37.7	0.04167	1	0.377
1/2/09 3:00 AM	2009	January	Jan 2009	2	3	1/2/2009	3:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	36	37.5	under 55		36.3	42.8	0.04167	1	0.428
1/2/09 4:00 AM	2009	January	Jan 2009	2	4	1/2/2009	4:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	33	32.5	under 55		32.8	50.7	0.04167	1	0.507
1/2/09 5:00 AM	2009	January	Jan 2009	2	5	1/2/2009	5:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	33	32.5	under 55		32.5	50.7	0.04167	1	0.507
1/2/09 6:00 AM	2009	January	Jan 2009	2	6	1/2/2009	6:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	33	32.5	under 55		32.7	53.1	0.04167	1	0.531
1/2/09 7:00 AM	2009	January	Jan 2009	2	7	1/2/2009	7:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	33	32.5	under 55		32.7	55.4	0.04167	1	0.554
1/2/09 8:00 AM	2009	January	Jan 2009	2	8	1/2/2009	8:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	34	32.5	under 55		34	55.1	0.04167	1	0.551
1/2/09 9:00 AM	2009	January	Jan 2009	2	9	1/2/2009	9:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	35	32.5	under 55		34.7	48.7	0.04167	1	0.487
1/2/09 10:00 AM	2009	January	Jan 2009	2	10	1/2/2009	10:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	36	37.5	under 55		35.5	53.6	0.04167	1	0.536
1/2/09 11:00 AM	2009	January	Jan 2009	2	11	1/2/2009	11:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	37	37.5	under 55		36.6	55.6	0.04167	1	0.556
1/2/09 12:00 PM	2009	January	Jan 2009	2	12	1/2/2009	12:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	36	37.5	under 55		36.3	51	0.04167	1	0.51
1/2/09 1:00 PM	2009	January	Jan 2009	2	13	1/2/2009	1:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	39	37.5	under 55		38.6	48.1	0.04167	1	0.481
1/2/09 2:00 PM	2009	January	Jan 2009	2	14	1/2/2009	2:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	40	37.5	under 55		39.9	46.7	0.04167	1	0.467
1/2/09 3:00 PM	2009	January	Jan 2009	2	15	1/2/2009	3:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	40	37.5	under 55		39.9	46.8	0.04167	1	0.468
1/2/09 4:00 PM	2009	January	Jan 2009	2	16	1/2/2009	4:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	36	37.5	under 55		35.5	48.9	0.04167	1	0.489
1/2/09 5:00 PM	2009	January	Jan 2009	2	17	1/2/2009	5:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	31	32.5	under 55		30.5	52.3	0.04167	1	0.523
1/2/09 6:00 PM	2009	January	Jan 2009	2	18	1/2/2009	6:00 PM	5	Friday	Weekday	No	Mon-Fri	Unocc	29	27.5	under 55		28.8	51.8	0.04167	1	0.518
1/2/09 7:00 PM	2009	January	Jan 2009	2	19	1/2/2009	7:00 PM	5	Friday	Weekday	No	Mon-Fri	Unocc	29	27.5	under 55		28.6	55.8	0.04167	1	0.558
1/2/09 8:00 PM	2009	January	Jan 2009	2	20	1/2/2009	8:00 PM	5	Friday	Weekday	No	Mon-Fri	Unocc	28	27.5	under 55		28	56.1	0.04167	1	0.561
1/2/09 9:00 PM	2009	January	Jan 2009	2	21	1/2/2009	9:00 PM	5	Friday	Weekday	No	Mon-Fri	Unocc	24	22.5	under 55		24.1	59.3	0.04167	1	0.593
1/2/09 10:00 PM	2009	January	Jan 2009	2	22	1/2/2009	10:00 PM	5	Friday	Weekday	No	Mon-Fri	Unocc	21	22.5	under 55		21.1	49.7	0.04167	1	0.497
1/2/09 11:00 PM	2009	January	Jan 2009	2	23	1/2/2009	11:00 PM	5	Friday	Weekday	No	Mon-Fri	Unocc	20	17.5	under 55		19.9	54.5	0.04167	1	0.545
1/3/09 12:00 AM	2009	January	Jan 2009	3	0	1/3/2009	12:00 AM	6	Saturday	Saturday	No	Weekend/Hol	Unocc	20	17.5	under 55		19.6	55.1	0.04167	1	0.551
1/3/09 1:00 AM	2009	January	Jan 2009	3	1	1/3/2009	1:00 AM	6	Saturday	Saturday	No	Weekend/Hol	Unocc	19	17.5	under 55		18.8	58.8	0.04167	1	0.588

DaySchedule and Occupancy columns now filled in

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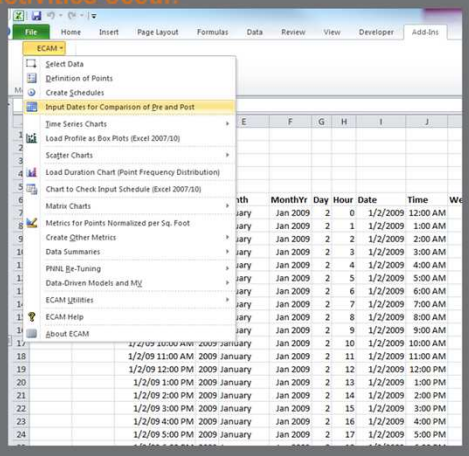
Note: Schedule for Mon-Fri was 5:30 AM to 5:30 PM. For this hourly data, ECAM designates the next timestamp (6:00AM) as the scheduled occupied start time, and 6:00 PM as the schedule start of unoccupied time.

Menu Item Number 4: Input Dates for Comparison of Pre and Post (Optional)

Purpose: To monitor energy consumption changes when upgrades or commissioning activities occur.



Step 1: Click Input Dates for Comparison of Pre and Post in the menu

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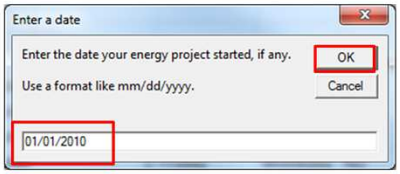
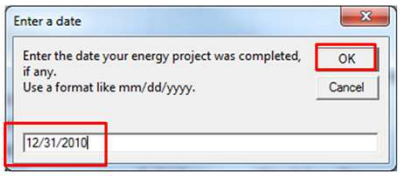
Input Dates for Comparison of Pre and Post

- Sample data provided is for 3-year period (2009-2011), and during 2010, energy savings measured were applied to the building.



Input first day of 2010 as the start date, select "OK"



Input last day of 2010 as the end date, select "OK"

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Input Dates for Comparison of Pre and Post Result

																OAT	Consumption-kW			
DateTime	Year	Month	MonthYr	Day	Hour	Date	Time	WeekdayNum	Weekday	Daytype	Holiday	DaySchedule	Occupancy	1degBin	5degBin	TempRng	DateRng	Bldg1_Tei	ElecMtr1_	Days	Hours	ElecMtr1\
1/2/09 12:00 AM	2009	January	Jan 2009	2	0	1/2/2009	12:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	42	42.5	under 55	Before 1-1-10	41.6	35.8	0.04167	1	0.358
1/2/09 1:00 AM	2009	January	Jan 2009	2	1	1/2/2009	1:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	41	42.5	under 55	Before 1-1-10	40.9	37	0.04167	1	0.37
1/2/09 2:00 AM	2009	January	Jan 2009	2	2	1/2/2009	2:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	40	37.5	under 55	Before 1-1-10	39.5	37.7	0.04167	1	0.377
1/2/09 3:00 AM	2009	January	Jan 2009	2	3	1/2/2009	3:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	36	37.5	under 55	Before 1-1-10	36.3	42.8	0.04167	1	0.428
1/2/09 4:00 AM	2009	January	Jan 2009	2	4	1/2/2009	4:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	33	32.5	under 55	Before 1-1-10	32.8	50.7	0.04167	1	0.507
1/2/09 5:00 AM	2009	January	Jan 2009	2	5	1/2/2009	5:00 AM	5	Friday	Weekday	No	Mon-Fri	Unocc	33	32.5	under 55	Before 1-1-10	32.5	50.7	0.04167	1	0.507
1/2/09 6:00 AM	2009	January	Jan 2009	2	6	1/2/2009	6:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	33	32.5	under 55	Before 1-1-10	32.7	53.1	0.04167	1	0.531
1/2/09 7:00 AM	2009	January	Jan 2009	2	7	1/2/2009	7:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	33	32.5	under 55	Before 1-1-10	32.7	55.4	0.04167	1	0.554
1/2/09 8:00 AM	2009	January	Jan 2009	2	8	1/2/2009	8:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	34	32.5	under 55	Before 1-1-10	34	55.1	0.04167	1	0.551
1/2/09 9:00 AM	2009	January	Jan 2009	2	9	1/2/2009	9:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	35	32.5	under 55	Before 1-1-10	34.7	48.7	0.04167	1	0.487
1/2/09 10:00 AM	2009	January	Jan 2009	2	10	1/2/2009	10:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	36	37.5	under 55	Before 1-1-10	35.5	53.6	0.04167	1	0.536
1/2/09 11:00 AM	2009	January	Jan 2009	2	11	1/2/2009	11:00 AM	5	Friday	Weekday	No	Mon-Fri	Occ	37	37.5	under 55	Before 1-1-10	36.6	55.6	0.04167	1	0.556
1/2/09 12:00 PM	2009	January	Jan 2009	2	12	1/2/2009	12:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	36	37.5	under 55	Before 1-1-10	36.3	51	0.04167	1	0.51
1/2/09 1:00 PM	2009	January	Jan 2009	2	13	1/2/2009	1:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	39	37.5	under 55	Before 1-1-10	38.6	48.1	0.04167	1	0.481
1/2/09 2:00 PM	2009	January	Jan 2009	2	14	1/2/2009	2:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	40	37.5	under 55	Before 1-1-10	39.9	46.7	0.04167	1	0.467
1/2/09 3:00 PM	2009	January	Jan 2009	2	15	1/2/2009	3:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	40	37.5	under 55	Before 1-1-10	39.9	46.8	0.04167	1	0.468
1/2/09 4:00 PM	2009	January	Jan 2009	2	16	1/2/2009	4:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	36	37.5	under 55	Before 1-1-10	35.5	48.9	0.04167	1	0.489
1/2/09 5:00 PM	2009	January	Jan 2009	2	17	1/2/2009	5:00 PM	5	Friday	Weekday	No	Mon-Fri	Occ	31	32.5	under 55	Before 1-1-10	30.5	52.3	0.04167	1	0.523
1/2/09 6:00 PM	2009	January	Jan 2009	2	18	1/2/2009	6:00 PM	5	Friday	Weekday	No	Mon-Fri	Unocc	29	27.5	under 55	Before 1-1-10	28.8	51.8	0.04167	1	0.518

"DateRng" now filled in

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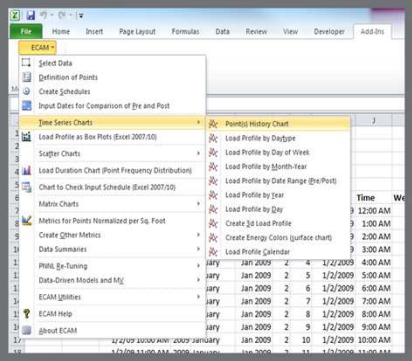
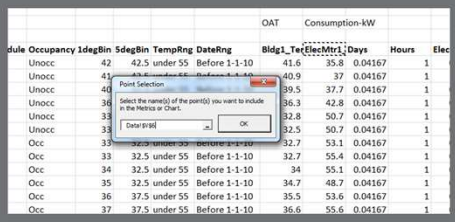
Generating Time-Series Charts: Point History Chart

- Purpose: The point history chart shows the user the usage history for the data collection period (raw data plot)



Step 1: Click on Point(s) History Chart



Step 2: Select the header name ElecMtr1 as the point to include in the Chart and click OK.

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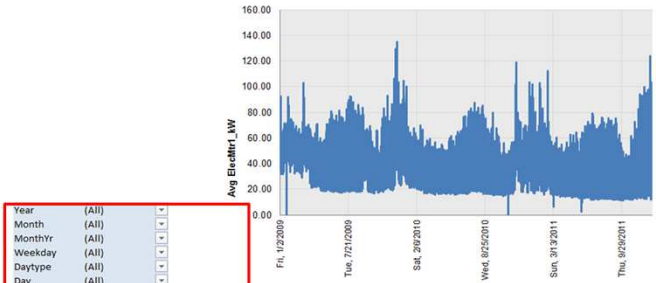
Generating Time-Series Charts: Point History Chart Result

- A new sheet is created called “chtHistory,” and should look like this:



Year	(All)
Month	(All)
MonthYr	(All)
Weekday	(All)
Daytype	(All)
Day	(All)
Occupancy	(All)
Holiday	(All)
5degBin	(All)
1degBin	(All)
TempRng	(All)

Date	DateTime	Avg ElecMtr1_kW
12/31/2011	12/31/11 11:00 PM	26.75
	12/31/11 10:00 PM	25.73
	12/31/11 9:00 PM	25.31
	12/31/11 8:00 PM	21.73

Excel Pivot Table

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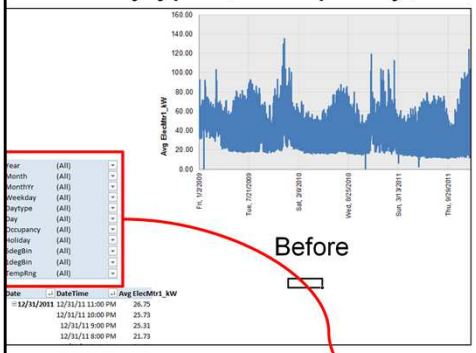
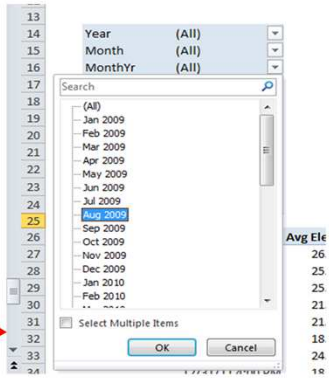
Very difficult to gain knowledge from the raw data, but the pivot table can be used to look at a specific time period.

Leveraging the Excel Pivot Table

- Purpose: To filter the data to specific years, months, days, daytypes, occupancy, or temperature ranges



Choose Aug 2009 from the MonthYr dropdown list, select OK



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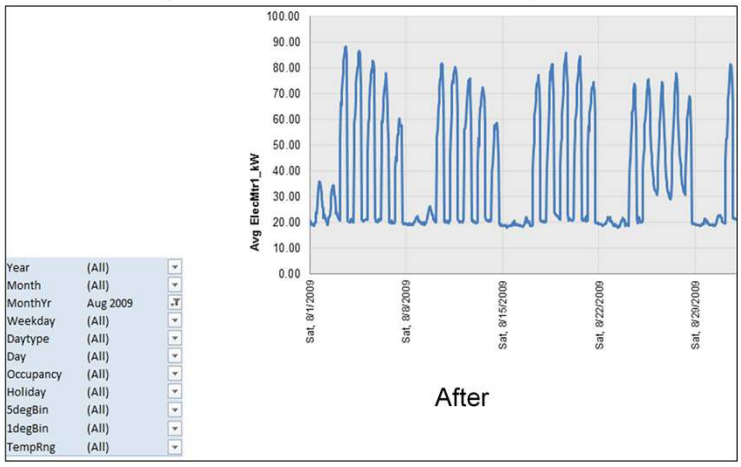
Leveraging the Excel Pivot Table

- The user can see the raw consumption for each week across the month of interest. Can dial down further to individual days or combinations of days as well



After

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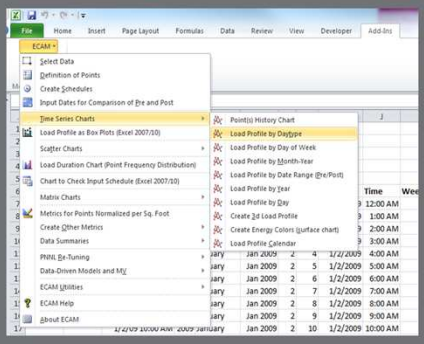
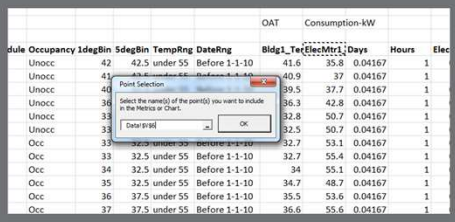
Note: Show more pivot table demonstration with excel workbook. Note that user can create errors with the pivot table that may make the charts look strange (i.e., selecting January, skipping February and March, and then selecting April). This will cause a "hole" in the chart where February and March should be. This can also occur with days.

Generating Time-Series Charts: Load Profile by Daytype

- Purpose: The load profile by daytype groups the data into average profiles for each daytype: weekday, weekend, and holidays



Step 1: Click on Load Profile by Daytype



Step 2: Select the header name ElecMtr1 as the point to include in the Chart and click OK.

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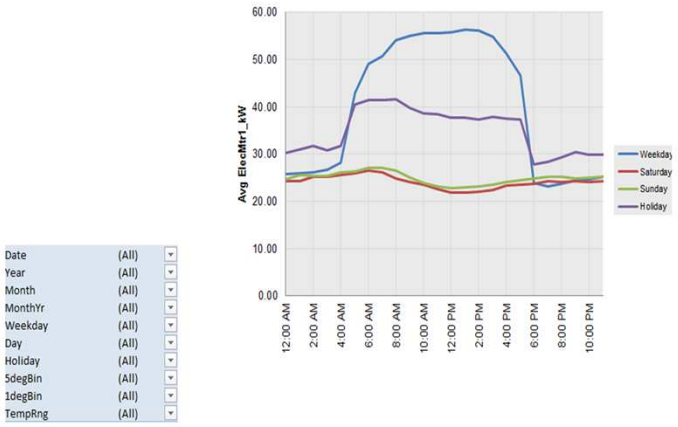
Generating Time-Series Charts: Load Profile by Daytype Result

- A new sheet called “ptLPchartDaytype” and should look like this:



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

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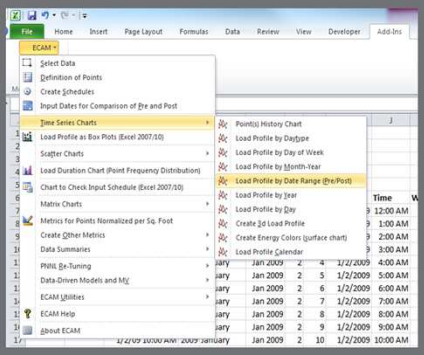
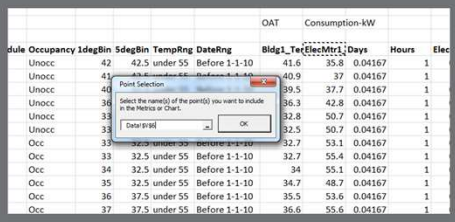
Note: When generating any charts, ECAM will default the original chart to show the data for the entire data set. Thus, the user must take advantage of the pivot table to “dial down” to look at specific time periods of interest.

Generating Time-Series Charts: Load Profile by Date Range (Pre/Post)

- Purpose: If the optional menu item “Input Dates for Comparison of Pre and Post” then this chart will show the average profile for 3 periods: before, during, and after changes.



Step 1: Click on Load Profile by Daytype



Step 2: Select the header name ElecMtr1 as the point to include in the Chart and click OK.

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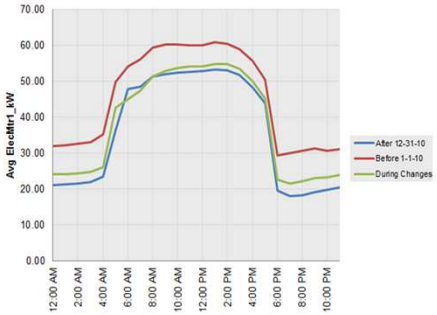
Generating Time-Series Charts: Load Profile by Date Range (Pre/Post)

- Note that the default Daytype in the Pivot Table is Weekday. This can be changed to Weekend or Holiday.

Date	(All)
Year	(All)
Month	(All)
MonthYr	(All)
Weekday	(All)
Day	(All)
Daytype	**Weekday**
Holiday	(All)
5degBin	(All)
1degBin	(All)
TempRng	(All)



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You can see that the energy project that was implemented in 2010 reduced the weekday energy profile for this particular building.

Other Useful Time-Series Charts

- The remainder of time-series charts will not be generated in detail, but the results from the charts will be highlighted and the user can see the usefulness of the charts

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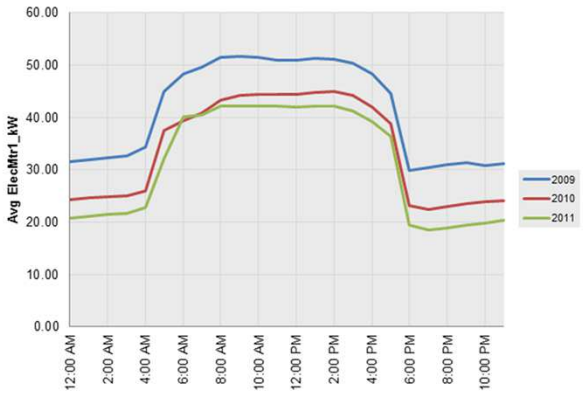
Load Profile by Year

- Purpose: To monitor average consumption from year to year



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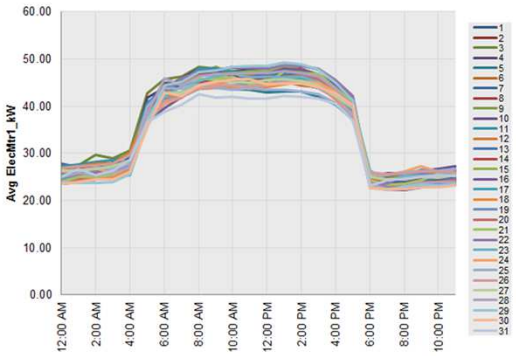
Note: This chart is only useful if there are multiple years of data collection.

Load Profile by Day

- Purpose: This chart is only useful because it is **required** to generate the last three time-series charts: 3d load profile, energy colors, and load profile calendar. Refer to the user's guide for further instruction.



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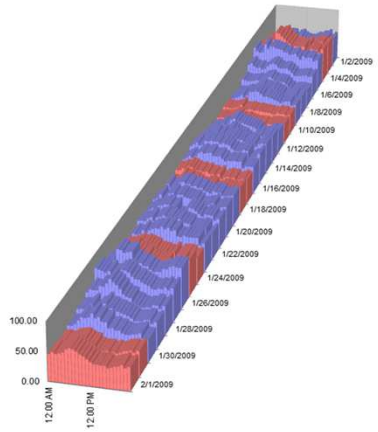
Note: This chart (as it appears) is NOT useful, because it takes an average of ALL days in the data set and makes an average profile for each day. So, for day 10, it is the average over each 10th day of the month in the data set. Therefore, to generate the following 3 charts, the user should highlight one month from the "MonthYr" in the pivot table.

Create 3d Load Profile

- Purpose: To show a 3-dimensional view of the consumption for a given month in the data set. Must be generated from the load profile by day chart.

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

Avg ElecMtr1_kW	Date	
Time	1/2/2009	1/3/2009
12:00 AM	35.80	55.10
1:00 AM	37.00	58.80
2:00 AM	37.70	58.60
3:00 AM	42.80	58.90
4:00 AM	50.70	64.10



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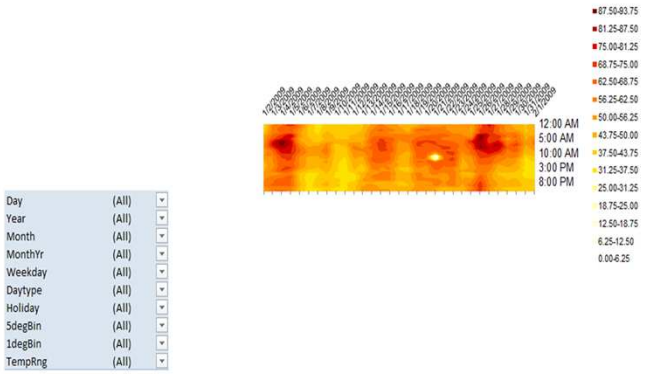
Note: The pivot table defaults to all data, because the load profile by day chart was showing the average profile by day for the entire data set. When generating the 3d load profile chart, if the user does not specify a month prior to creating, ECAM defaults to the first month in the data set, i.e., January 2009 in this instance. The user can then use the pivot table to toggle between different months within the data set.

Create Energy Colors

- Purpose: To show a surface chart for consumption within a specified month. Must be generated from the load profile by day chart



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

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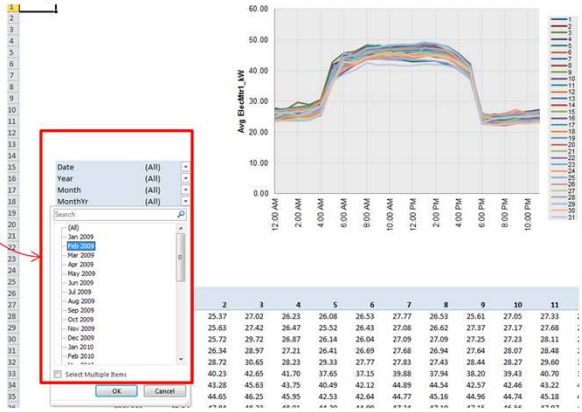
Note: The pivot table defaults to all data, because the load profile by day chart was showing the average profile by day for the entire data set. When generating the energy colors chart, if the user does not specify a month prior to creating, ECAM defaults to the first month in the data set, i.e., January 2009 in this instance. The user can then use the pivot table to toggle between different months within the data set.

Load Profile Calendar

- Purpose: To get a calendar view of the consumption for each day within a chosen month. Must be generated from the load profile by day chart, and the pivot table must be used to choose a specific "MonthYr" prior to generating the calendar.



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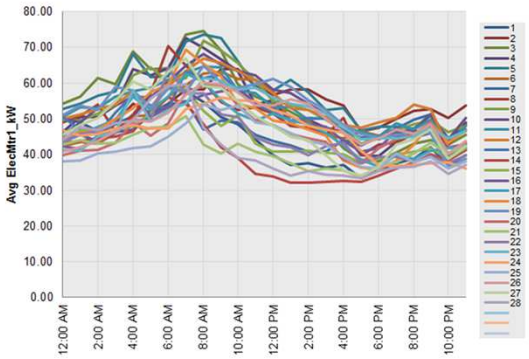
Load Profile Calendar: Continued

- Intermediate load profile by day chart:

Date	(All)
Year	(All)
Month	(All)
MonthYr	Feb 2009
Weekday	(All)
Daytype	(All)
Holiday	(All)
5degBin	(All)
1degBin	(All)
TempRng	(All)



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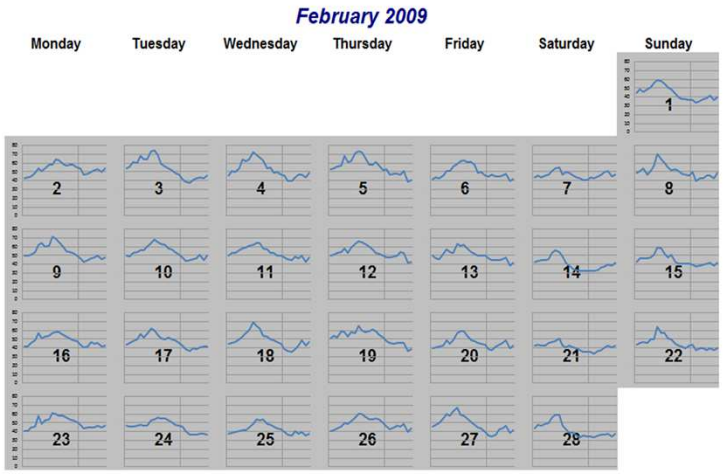
Load Profile Calendar Result:



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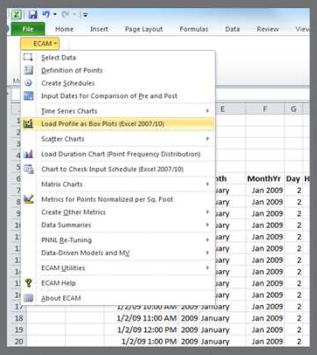
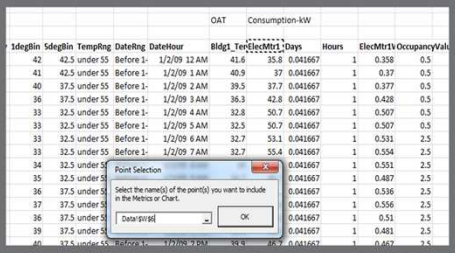
Load Profile as Box Plots

- Purpose: This menu item generates an average load profile for the data collection period and shows statistical measures of where the data lies about that average



Step 1: Click on Load Profile as Box Plots



Step 2: Select the header name ElecMtr1 as the point to include in the Chart and click OK.

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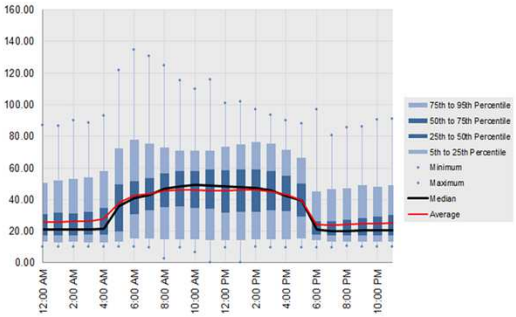
Note: This item will only work with Excel 2007/2010.

Load Profile as Box Plots Result



Year	(All)
Month	(All)
MonthYr	(All)
Weekday	(All)
Daytype	(All)
Holiday	(All)
5degBin	(All)
1degBin	(All)
TempRng	(All)

The user can see how "tight" the building energy use is throughout the period, and can use the pivot table to choose different time periods

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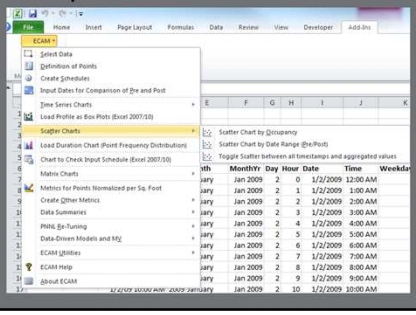
Note: This is the average load profile for the entire year, and the statistics are based on the entire year. The user can use the pivot table to look at specific months or days, and see how "tight" the building is operated for different times of the year.

Scatter Charts

- Purpose: To generate charts of consumption versus outdoor-air temperature
  - By Occupancy
  - By Date Range (Pre/Post)
- ECAM menu items #3 (Create Schedules), and #4 (Input Dates for Comparison of Pre and Post) are very critical for scatter charts
  - If these items are skipped, the user can still create a scatter chart by occupancy, but every point will be considered occupied if no schedule was input.



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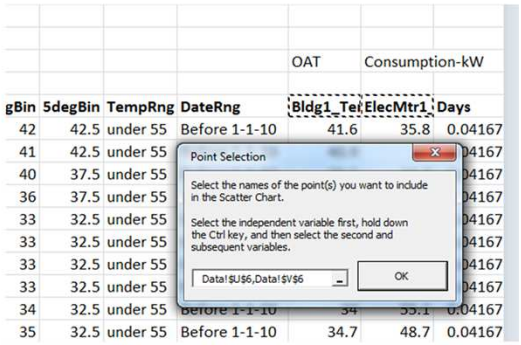
Note: The third item in the scatter charts, “Toggle Scatter between all timestamps and aggregated values” will aggregate data into groups, to help identify building consumption trends easier.

Scatter Chart by Occupancy

- Step 1: Click on the first scatter chart option: “Scatter Chart by Occupancy.”
- Step 2: Choose the independent variable first “OAT”, then hold down the “Ctrl” key and select “Consumption-kW.”



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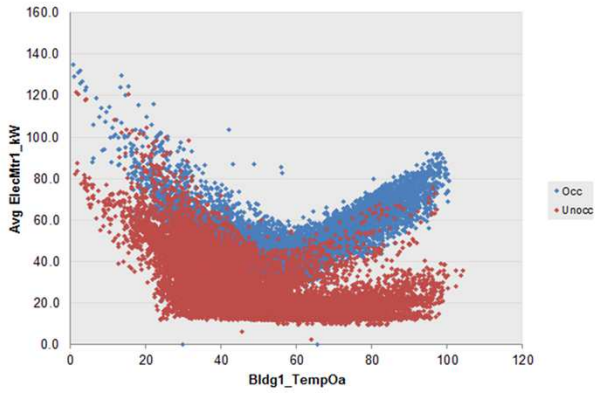
Scatter Chart by Occupancy Result

- ECAM creates a new sheet called “ptScatterChartOcc.”



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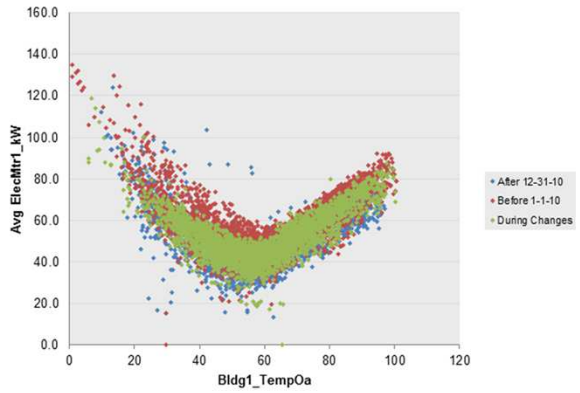
Note: If no schedule was input (menu item #3), the user can still create a scatter chart by occupancy, but every point will be considered occupied. Therefore, no red points would exist in this chart.

Scatter Chart by Date Range (Pre/Post)

- Repeat steps used to create scatter chart by occupancy to get this:



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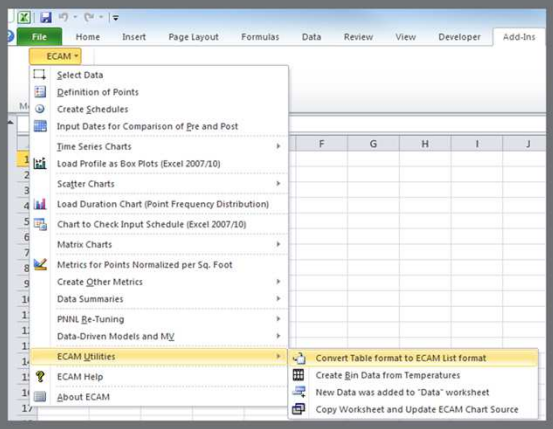
Note: If no dates for comparison of pre and post were input (menu item #4), the user will not get a useful scatter chart.

Convert Table format to ECAM List format (utility company meter data)

- If meter data comes from the utility company, ECAM can process it



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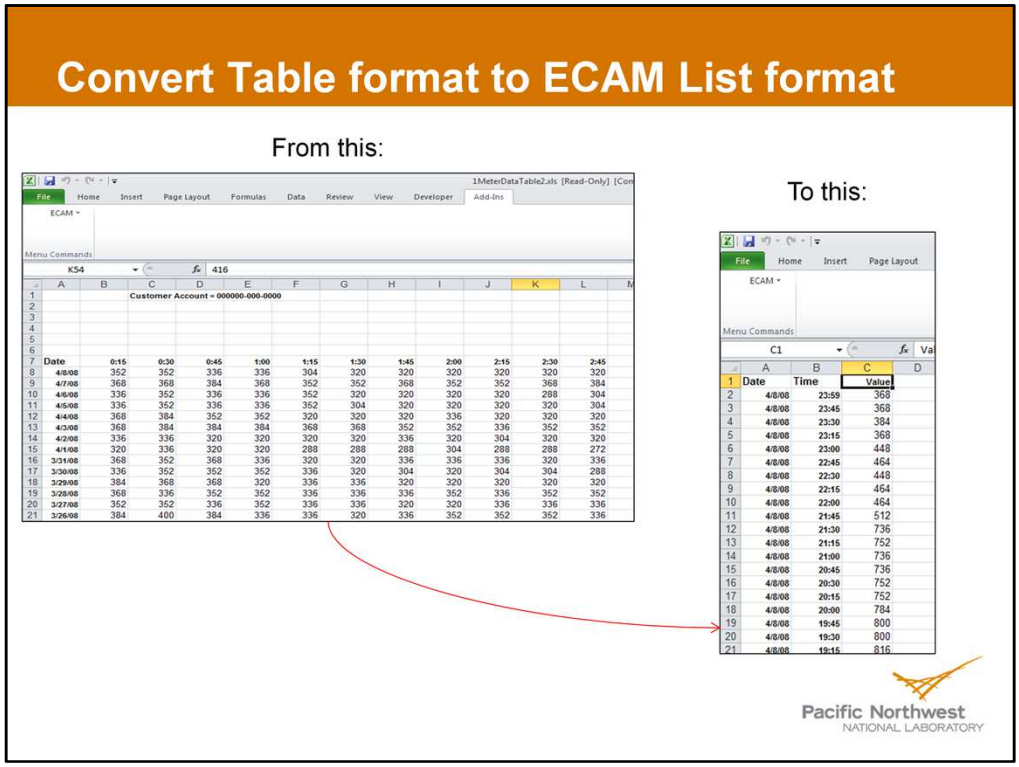

Note: Once the data is converted, the user can start with ECAM menu item number 1 (Select Data), and continue processing.

Review

- Detailed walkthrough of first 4 menu items
  - Select data and definition of points (required)
  - Create schedules and input dates for comparison of pre and post (optional)
- Generated time-series charts, load profile as box plots, and scatter charts
- Showed ECAM's ability to convert utility data to ECAM acceptable format
- Next webinar:
  - Discuss PNNL re-tuning, i.e., taking end-use data and charting it to identify improvements to system operations and controls
  - Look at some examples of good and bad operation
  - Discuss future additions and improvements to ECAM

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All Resources Available at:
www.pnnl.gov/buildingretuning/resources.stm

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Thank You

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