EnergyCAP®

# EnergyCAP Cost Avoidance Formula Validation

This document describes and illustrates the formulas used by the EnergyCAP software to perform cost avoidance calculations

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# F1 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev6 2-10-14**

## Case 1

The building owner received identical baseline and current bills. Usage was 10,000 KWH and cost was $1,000. The only difference is that in the baseline year, the billing period was 32 days and in the current year the billing period was 28 days. Formula #1 adjusted the 32-day baseline to today's equivalency condition of 28 days, a downward adjustment. Even though the "raw" bills were for the same the usage and cost, the billing period adjustment resulted in a calculation of use avoidance of -1,250 KWH and cost avoidance of -$125 (a loss). In Case 1, the start/end dates of the current year bill fall entirely within the start/end dates of the baseline bill. There are two client applications of EnergyCAP that connect to the database—the Web Browser Client and the Installed Windows Client. Both are used in parallel. In general the Windows Client is used by power-users and administrators.

## Formula

Adjust for difference in billing period length (number of days) between baseline and current. Daily usage is the same and current bill monthly start-end dates fall on or between baseline start-end dates.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse | TDuse | Total use/consumption in billing period |
| | BLcost | TDcost | Total cost in billing period |
| | BLdays | TDdays | Total number of days in billing period |

**FORMULAS**

BPA: Billing Period Adjustment = TDdays / BLdays
Adj BLuse = BLuse*BPA

Use Avoidance = AdjBLuse - TDuse

Cost Avoidance = AdjBLuse * TDcost/TDuse - TDcost

**RED TEXT** = Independent Variables

# F1 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev6 2-10-14**

## Example:

BLstartdate=7/1/07
BLenddate=8/1/07
BLuse=10,000 kWh
BLcost=$1,000
BLdays=32

TDstartdate=7/1/09
TDenddate=7/29/09
TDuse=10,000 kWh
TDcost=$1,000
TDdays=28

BPA: Billing Period Adjustment = TDdays / BLdays
Adj BLuse = BLuse * BPA = 10,000 * 0.875 = 8,750

Use Avoidance = Adj BLuse – TDuse
= 8,750 – 10,000 = – 1,250 kWh

Cost Avoidance = Adj BLuse * TDcost/TDuse – TDcost
=8,750 * 1000/10,000 – 1000 = – $125

# F1A | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev2 2-10-14**

## Case 1A

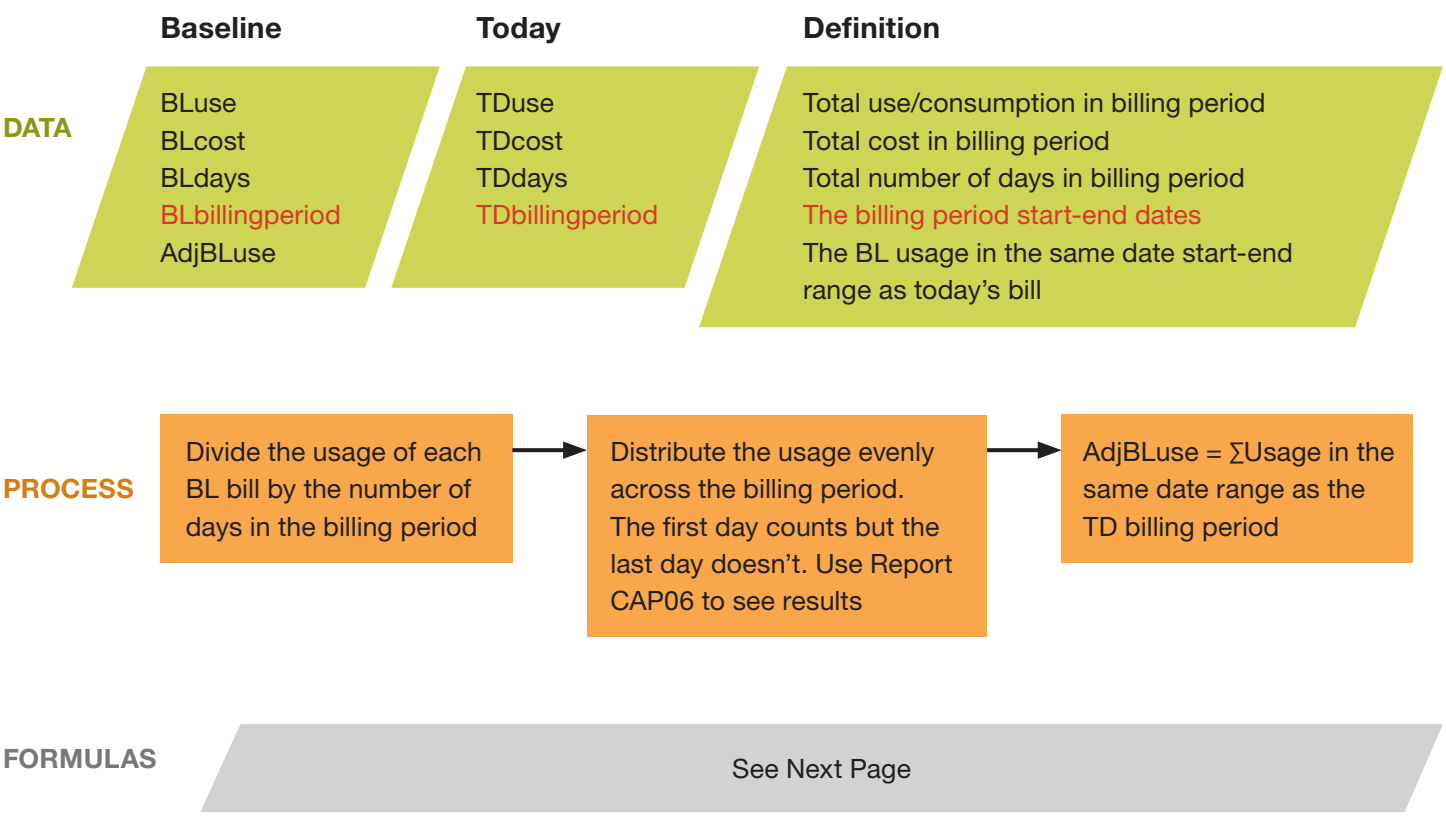
The building owner received these base year bills:

June 6/1/07–7/1/07; 5000 kWh
July 7/1/07–8/1/07; 10,000 kWh
August 8/1/07–9/1/07; 20,000 kWh
The current year bill for July is 6/26/09-8/6/09; 10,000 kWh

Even though this 10,000 kWh bill is equal to the baseline July bill, today's bill includes five days in June and five more in August. EnergyCAP adjusts the July baseline upwards by adding 5 June days @ 166.67 kWh/day and 5 August days @645.16 kWh/day, resulting in avoided usage of 4,060 kWh and Cost Avoidance of $406.

## Formula

Adjust for difference in billing period length (number of days) between baseline and current. Daily usage is different and start and/or end dates fall outside the month defined by the baseline bill.




**RED TEXT** = Independent Variables

# F1A | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev2 2-10-14**

## Example:

BLstartdate=7/1/07
BLenddate=8/1/07
BLuse=10,000 kWh
BLcost=$1,000
BLdays=31

TDstartdate=6/26/09
TDenddate=8/6/09
TDuse=10,000
TDcost=$1,000
TDdays=41

Also:
June bill (6/1/07-7/1/07)=5,000 kWh
August bill (8/1/07-9/1/07)=20,000 kWh

**FORMULAS**

Use Avoidance = (AdjBLuse) – TDuse

Cost Avoidance=(AdjBLuse)(TDcost/TDuse)-TDcost

The View Savings window (see next page) shows the AdjBLuse (the baseline bills that have been distributed by day and then summed across today's start-end date range).

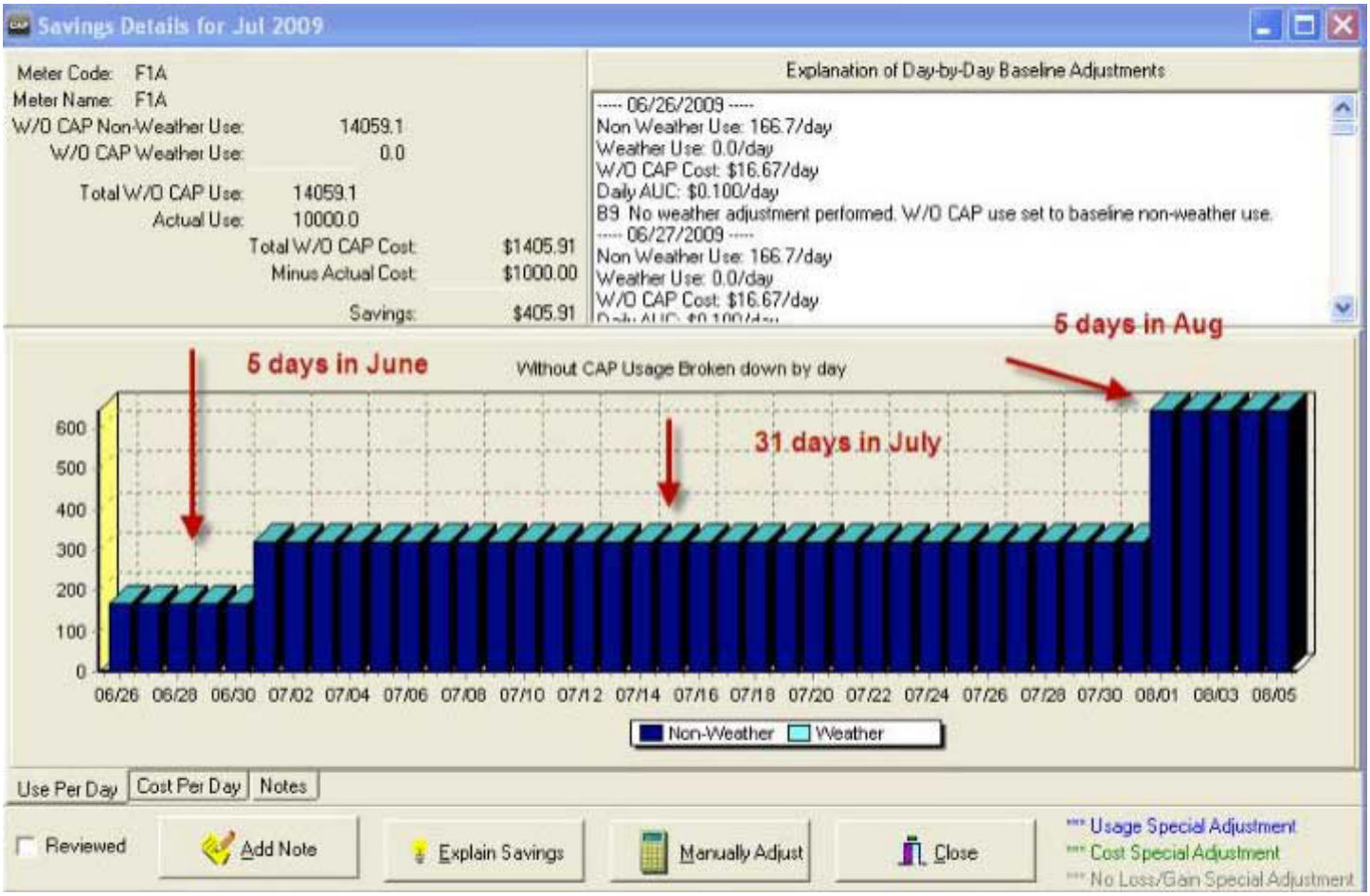
AdjBLuse=14,060
Use Avoidance=AdjBLuse-TDuse=14,060-10,000=4,060 kWh
Cost Avoidance=(AdjBLuse)(TDcost/TDuse)-TDcost
14060(1000/10,000)-1000=$406

**See next page for image**

# F1A | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev2 2-10-14**

## Example:



# F2 EnergyCAP Cost Avoidance Calculation Process and Formula

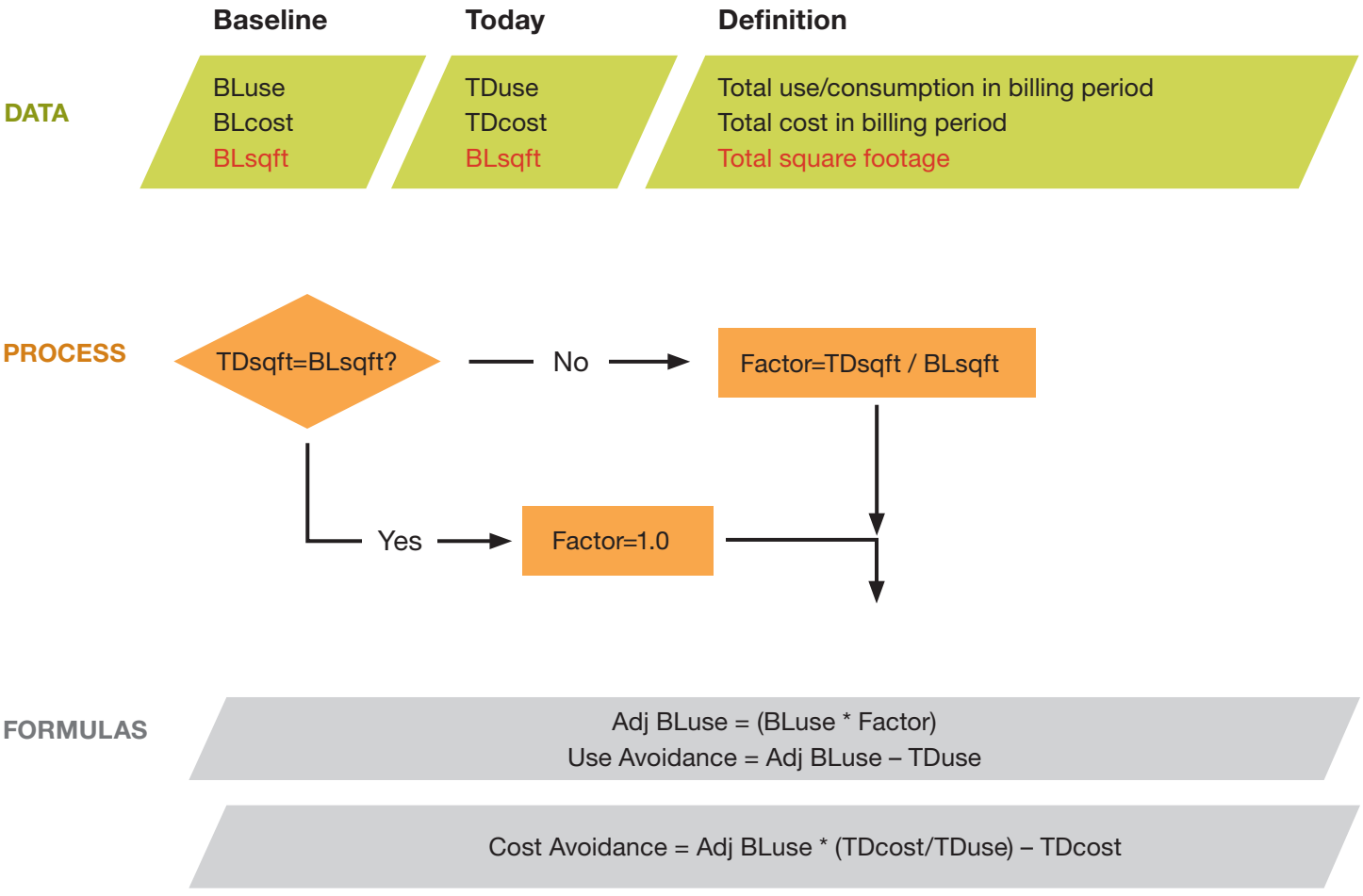
**Rev3 2-10-14**

## Case 2

The building owner received a baseline bill for 10,000 KWH and $1,000. The current year bill for the same month was 12,000 KWH and $1,200. Although it appears that performance was poor due to the usage and cost increase, the building floor area was expanded from 10,000 sq ft in the baseline year to 15,000 sq ft today. Formula #2 adjusted the 10,000 sq ft baseline up to today's condition of 15,000 sq ft. Even though the "raw" bill today exceeded the baseline, the floor area adjustment resulted in a calculation of use avoidance of 3,000 KWH and cost avoidance of $300.

## Formula

Adjust for difference in building floor area between baseline and current.




**RED TEXT** = Independent Variables

# F2 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev3 2-10-14**

**Example:**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=32
BLsqft=10,000 sq ft

TDuse=12,000 kWh
TDcost=$1,200
TDdays=32
TDsqft=15,000 sq ft

Factor=TDsqft / BLsqft = 15000/10000 = 1.5

Use Avoidance = Adj BLuse – TDuse = (10,000*1.5) – 12,000 = 3,000 kWh

Cost Avoidance = Adj BLuse * TDcost/TDuse – TDcost
= 15,000 * 1,200/12,000 – 1200 = $300

# F3 EnergyCAP Cost Avoidance Calculation Process and Formula

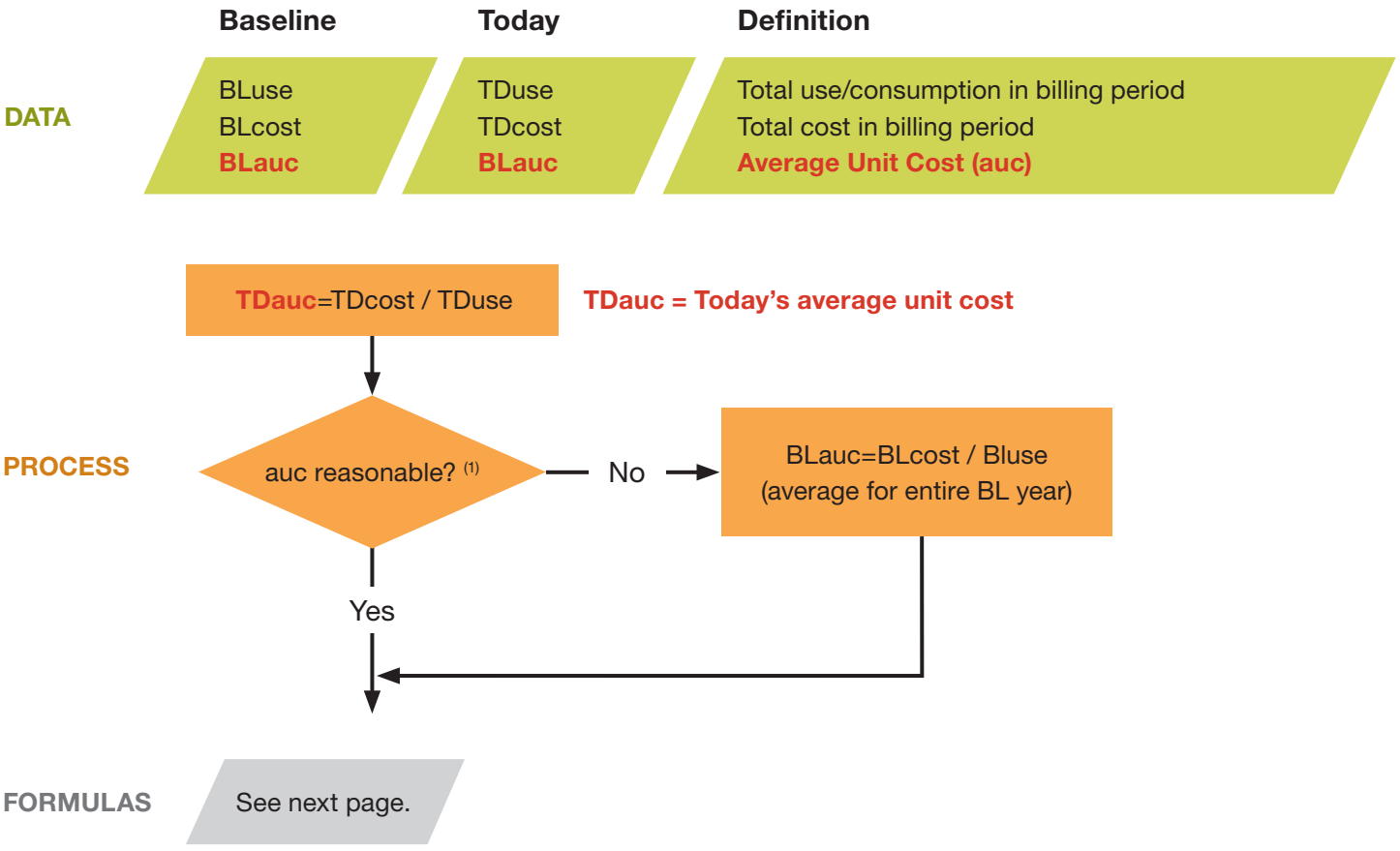
**Rev4 2-10-14**

## Case 3

The building owner received identical $1,000 bills in the baseline and today, indicating an apparent no loss/no gain situation. However, usage in the baseline was 10,000 KWH and 8,333 KWH today, so there was a usage reduction of 1,667 KWH. The costs are identical because the average commodity price increased from $0.10 to $0.12. In Formula #3, the baseline is adjusted to today's condition of $0.12/KWH electricity, resulting in a calculated cost avoidance of $200.

## Formula

Adjust for difference in commodity price between baseline and current.




## NOTES:

1. The auc reasonableness test guards against inflated auc due (for example) to a bill with minimal use and a monthy service charge. Reasonableness 'safety net' limits are set in **Administration > Cost Avoidance Settings**; the default range is between 50 percent LESS and 350 percent GREATER than the BLauc.

**RED TEXT** = Independent Variables

# F3 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-10-14**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=32
BLsqft=10,000 sq ft
BLauc=$0.100

TDuse=8,333
TDcost=$1,000
TDdays=32
TDsqft=10,000 sq ft
TDauc=$0.120

TDauc reasonable? (Up 20% over baseline, which is reasonable)

**FORMULAS**

In this case, there are no adjustments so Adj BLuse = BLuse
Use Avoidance = Adj BLuse – TDuse

Cost Avoidance = (Adj BLuse*auc) – TDcos

Use Avoidance = BLuse – TDuse = 10,000 – 8,333 = 1,667 kWh

Cost Avoidance = (BLuse*auc) – TDcost = (10,000*.120) – 1000 = $200

# F4 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

## Case 4

The building owner received identical July 2007 baseline and July 2009 current bills. Usage was 76,000 KWH and cost was $7,600. It appears that energy performance was no loss/no gain, but upon closer examination, the building owner discovers that the weather was cooler this July than the same month in the baseline year. Cooling degree days were down by 10% (from 697 to 623), resulting in lower A/C loads this year. But it's not correct to say that usage should have been down by a corresponding 10% because not all usage is weather-sensitive (lighting, for example, is not sensitive to outdoor temperature). The regression analysis process determined that in July 2007 the meter consumed 1,706 KWH/day (52,879 KWH) on non-weather sensitive loads and 33.17 KWH/CDD (23,121 KWH) on weather loads. The adjustment process adjusted the weather to today's condition of 623 CDD (vs. 697 CDD in the base year), a downward adjustment of 2,455 KWH for a cost avoidance of -$245.

## Formula

Adjust for difference in weather (degree days) between baseline and current.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse<br>BLcost<br>BLDD | TDuse<br>TDcost<br>TDDD | Total use/consumption in billing period<br>Total cost in billing period<br>Degree days in billing period (1) |

Adj BLuse = ∑Daily Baseloads + ∑Daily TDDD*Regression Slope
Use Avoidance = Adj BLuse - TDuse

Cost Avoidance = (Adj BLuse) * (TDcost / TDuse) – TDcost

FORMULAS

## NOTES:

1. HDD and CDD in billing period are calculated separately from MDT data using a user-defined balance point temperature. System default is 55 degrees F.

2. (see process diagram, second page) When seasonal adjustment is indicated, each baseline bill is disaggregated into daily baseload and weather load components as follows:

   (a) Multiply regression slope * total degree days to drive the total weathersensitive usage.

   (b) Subtract weather usage from total billed usage. The remainder is the nonweather base load.

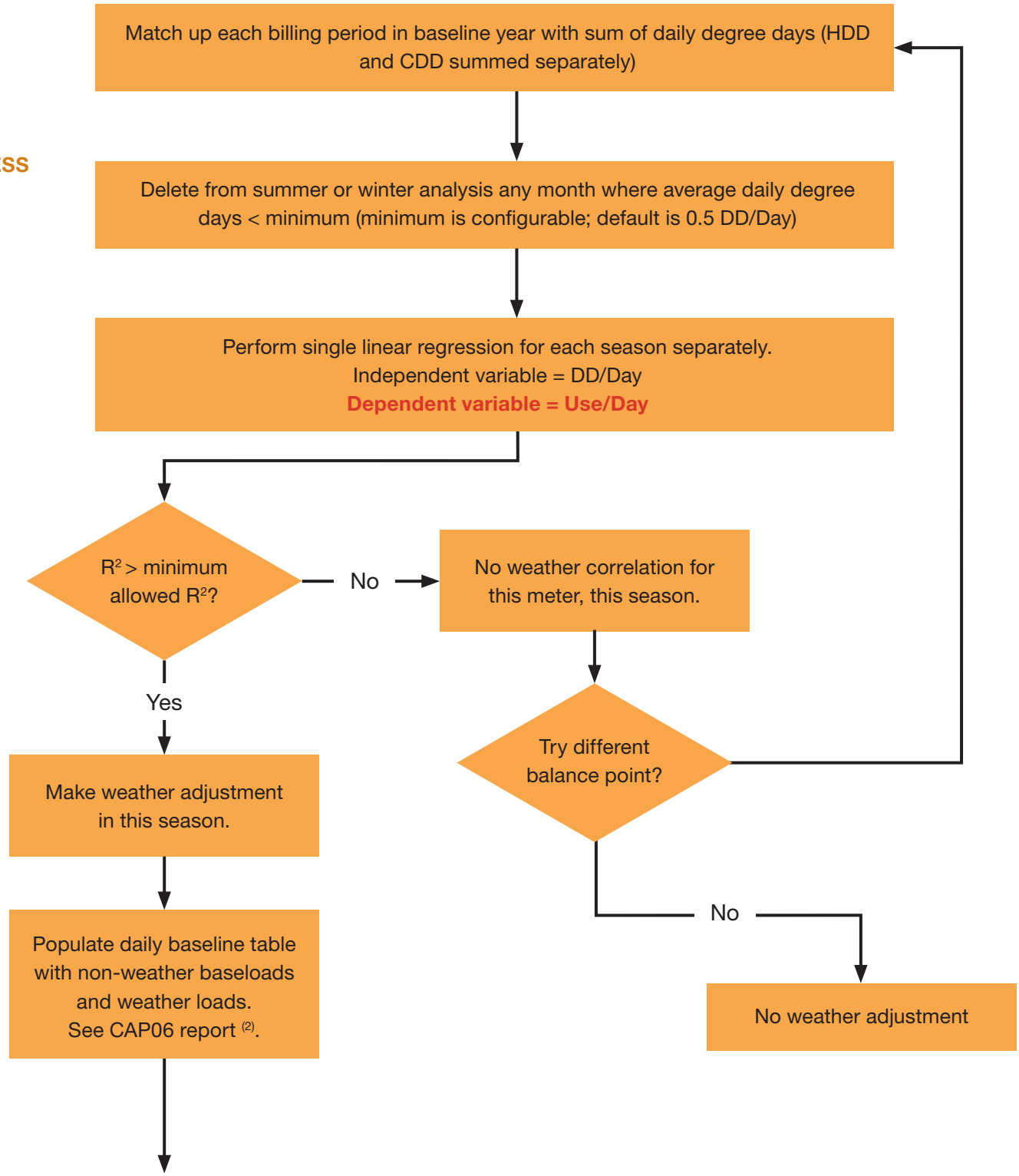
   (c) Evenly distribute the baseload to each day in the billing period

**RED TEXT** = Independent Variables

# F4 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

**PROCESS**




**See next page for data and software interface examples.**

## Baseline Year Data:

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Account Code | Meter Code | Billing Year | Start Date | End Date | days | Use(kwh) | CDD (55BPT- IAD) | CDD/day | use/day |
| 2 | A1 | M1 | 2007 | 20070101 | 20070201 | 31 | 50000 | 27 | 0.871 | 1612.903 |
| 3 | A1 | M1 | 2007 | 20070301 | 20070401 | 31 | 51000 | 55 | 1.774 | 1645.161 |
| 4 | A1 | M1 | 2007 | 20070401 | 20070501 | 30 | 52500 | 101 | 3.367 | 1750.000 |
| 5 | A1 | M1 | 2007 | 20070501 | 20070601 | 31 | 56000 | 351 | 11.323 | 1806.452 |
| 6 | A1 | M1 | 2007 | 20070601 | 20070701 | 30 | 64000 | 589 | 19.633 | 2133.333 |
| 7 | A1 | M1 | 2007 | 20070701 | 20070801 | 31 | 76000 | 697 | 22.484 | 2451.613 |
| 8 | A1 | M1 | 2007 | 20070801 | 20070901 | 31 | 78000 | 744 | 24.000 | 2516.129 |
| 9 | A1 | M1 | 2007 | 20070901 | 20071001 | 30 | 60000 | 492 | 16.400 | 2000.000 |
| 10 | A1 | M1 | 2007 | 20071001 | 20071101 | 31 | 53000 | 305 | 9.839 | 1709.677 |
| 11 | A1 | M1 | 2007 | 20071101 | 20071201 | 30 | 52000 | 18 | 0.600 | 1733.333 |
| 12 | | | | | | | | | | |

| | |
|---|---|
| slope | 33.172874 |
| r-square | 0.855242 |
| linear regr | 33.172874 |

## Current Year Data:

**USE:** 76,000 kWh, 31 days
**COST:** $7,600
**WEATHER DATA:** CDD down 10.6% in 2009 vs. 2007 (see images) 697 CDD vs. 623 CDD

## Regression Results:

**SLOPE:** 33.17
**R-SQUARE:** 0.8552

**CALCULATIONS**

Use Avoidance = ∑Daily Baseloads + ∑Daily TDDD*Regression Slope) – TDuse
= (52879 + (623)*33.17) – 76,000 = –2,455 kWh

Cost Avoidance = Adj BLuse * (TDcost / TDuse) – TDcost
= [52879 + (623)(33.17)](.1) – 7600
= $-245.61

## July 2009

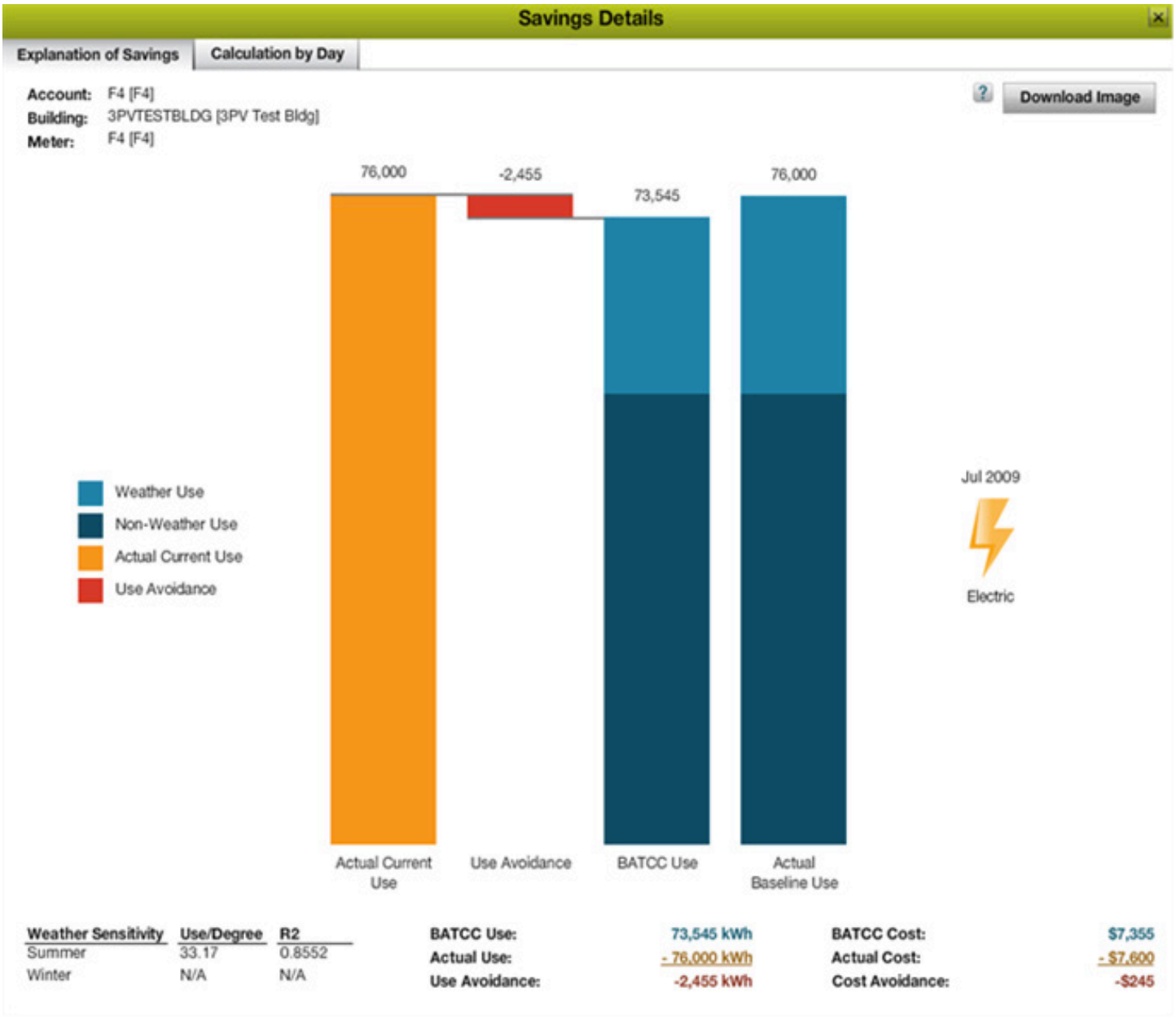
| | Base Year | | | | Comparison Year | | | |
|---|---|---|---|---|---|---|---|---|
| | MDT | HDD | CDD | TDD | MDT | HDD | CDD | TDD |
| 1 | 72 | 0 | 17 | 17 | 75 | 0 | 20 | 20 |
| 2 | 70 | 0 | 15 | 15 | 73 | 0 | 18 | 18 |
| 3 | 67 | 0 | 12 | 12 | 70 | 0 | 15 | 15 |
| 4 | 77 | 0 | 22 | 22 | 72 | 0 | 17 | 17 |
| 5 | 75 | 0 | 20 | 20 | 68 | 0 | 13 | 13 |
| 6 | 77 | 0 | 22 | 22 | 72 | 0 | 17 | 17 |
| 7 | 77 | 0 | 22 | 22 | 76 | 0 | 21 | 21 |
| 8 | 78 | 0 | 23 | 23 | 71 | 0 | 16 | 16 |
| 9 | 82 | 0 | 27 | 27 | 70 | 0 | 15 | 15 |
| 10 | 84 | 0 | 29 | 29 | 73 | 0 | 18 | 18 |
| 11 | 80 | 0 | 25 | 25 | 75 | 0 | 20 | 20 |
| 12 | 75 | 0 | 20 | 20 | 79 | 0 | 24 | 24 |
| 13 | 75 | 0 | 20 | 20 | 76 | 0 | 21 | 21 |
| 14 | 75 | 0 | 20 | 20 | 69 | 0 | 14 | 14 |
| 15 | 82 | 0 | 27 | 27 | 74 | 0 | 19 | 19 |
| 16 | 80 | 0 | 25 | 25 | 83 | 0 | 28 | 28 |
| 17 | 80 | 0 | 25 | 25 | 78 | 0 | 23 | 23 |
| 18 | 83 | 0 | 28 | 28 | 73 | 0 | 18 | 18 |
| 19 | 81 | 0 | 26 | 26 | 70 | 0 | 15 | 15 |
| 20 | 74 | 0 | 19 | 19 | 73 | 0 | 18 | 18 |
| 21 | 74 | 0 | 19 | 19 | 76 | 0 | 21 | 21 |
| 22 | 76 | 0 | 21 | 21 | 77 | 0 | 22 | 22 |
| 23 | 76 | 0 | 21 | 21 | 77 | 0 | 22 | 22 |
| 24 | 74 | 0 | 19 | 19 | 75 | 0 | 20 | 20 |
| 25 | 77 | 0 | 22 | 22 | 77 | 0 | 22 | 22 |
| 26 | 81 | 0 | 26 | 26 | 79 | 0 | 24 | 24 |
| 27 | 82 | 0 | 27 | 27 | 80 | 0 | 25 | 25 |
| 28 | 79 | 0 | 24 | 24 | 81 | 0 | 26 | 26 |
| 29 | 79 | 0 | 24 | 24 | 79 | 0 | 24 | 24 |
| 30 | 80 | 0 | 25 | 25 | 79 | 0 | 24 | 24 |
| 31 | 80 | 0 | 25 | 25 | 78 | 0 | 23 | 23 |

# July 2007

**Baseline Report CAP - 06**

| Date | Mean Temp | Weather Use | Non-Weather Use | Total Use | Heating Need (Degrees) | Cooling Need (Degrees) |
|---|---|---|---|---|---|---|
| **Meter: [F4] F4** | | | | | | |
| Jul 1 | 72 | 564 | 1,706 | 2,270 | 0 | 17 |
| 2 | 70 | 498 | 1,706 | 2,203 | 0 | 15 |
| 3 | 67 | 398 | 1,706 | 2,104 | 0 | 12 |
| 4 | 77 | 730 | 1,706 | 2,436 | 0 | 22 |
| 5 | 75 | 663 | 1,706 | 2,369 | 0 | 20 |
| 6 | 77 | 730 | 1,706 | 2,436 | 0 | 22 |
| 7 | 77 | 730 | 1,706 | 2,436 | 0 | 22 |
| 8 | 78 | 763 | 1,706 | 2,469 | 0 | 23 |
| 9 | 82 | 896 | 1,706 | 2,601 | 0 | 27 |
| 10 | 84 | 962 | 1,706 | 2,668 | 0 | 29 |
| 11 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| 12 | 75 | 663 | 1,706 | 2,369 | 0 | 20 |
| 13 | 75 | 663 | 1,706 | 2,369 | 0 | 20 |
| 14 | 75 | 663 | 1,706 | 2,369 | 0 | 20 |
| 15 | 82 | 896 | 1,706 | 2,601 | 0 | 27 |
| 16 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| 17 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| 18 | 83 | 929 | 1,706 | 2,635 | 0 | 28 |
| 19 | 81 | 862 | 1,706 | 2,568 | 0 | 26 |
| 20 | 74 | 630 | 1,706 | 2,336 | 0 | 19 |
| 21 | 74 | 630 | 1,706 | 2,336 | 0 | 19 |
| 22 | 76 | 697 | 1,706 | 2,402 | 0 | 21 |
| 23 | 76 | 697 | 1,706 | 2,402 | 0 | 21 |
| 24 | 74 | 630 | 1,706 | 2,336 | 0 | 19 |
| 25 | 77 | 730 | 1,706 | 2,436 | 0 | 22 |
| 26 | 81 | 862 | 1,706 | 2,568 | 0 | 26 |
| 27 | 82 | 896 | 1,706 | 2,601 | 0 | 27 |
| 28 | 79 | 796 | 1,706 | 2,502 | 0 | 24 |
| 29 | 79 | 796 | 1,706 | 2,502 | 0 | 24 |
| 30 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| 31 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| **Totals:** | | **23,121** | **52,879** | **76,000** | **0** | **697** |

| | | | |
|---|---|---|---|
| Summer Use/Degree: | 33.17 | Winter Use/Degree: | 0.00 |
| Summer $R^2$: | 0.86 | Winter $R^2$: | 0.00 |
| Cooling Needed Above: | 55 | Heating Needed Below: | 55 |



# F5 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev5 2-10-14**

## Case 5

An electric bill for one building has not yet been received for the month. The Energy Manager needs to run the monthly cost avoidance reports today. It would be incorrect to show this month as a large savings (energy cost went from $1,000 in the baseline to zero today). The adjustment process causes this month for this meter to be skipped. Cost avoidance will be calculated when the bill is processed. There will be no entry on cost avoidance reports.

## Formula

Adjust for difference in weather (degree days) between baseline and current.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse<br>BLcost<br>BLdays | No bill received | Total use/consumption in billing period<br>Total cost in billing period<br>Total number of days in billing period |

| | |
|---|---|
| FORMULAS | Use Avoidance = not calculated [1] |
| | Cost Avoidance = not calculated [1] |

**References:**

1. No value is reported for this month. Savings cannot be calculated when today's bill is missing.

**RED TEXT** = Independent Variables

# F5 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev5 2-10-14**

**Example:**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=28

TDuse=no bill received
TDcost=no bill received
TDdays=no bill received

Use Avoidance =not calculated

Cost Avoidance = not calculated

# F6 | EnergyCAP Cost Avoidance Calculation Process and Formula

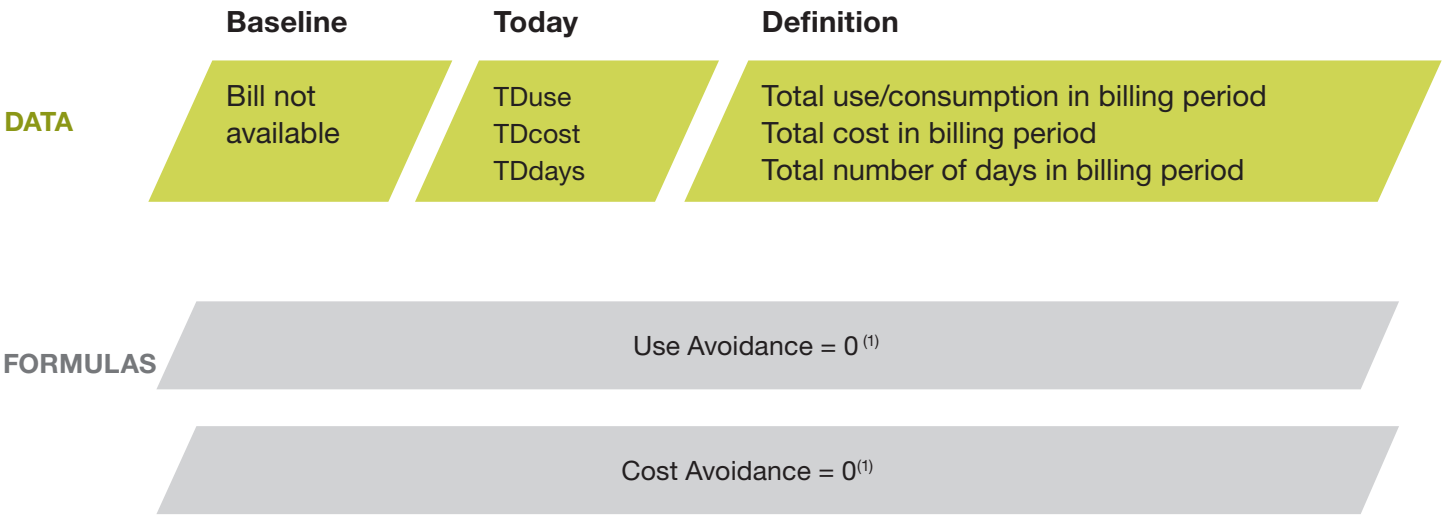
**Rev3 2-10-14**

## Case 6

An electric bill for one building is not available for a baseline month. The Energy Manager has not noticed the data gap. It would be incorrect to show this month as a large loss (energy cost went from zero in the baseline to $1,000 today). The adjustment process causes this month for this meter to be set to no loss/no gain. Cost avoidance will be calculated when the actual bill or a reasonable estimate is processed.

## Formula

Adjust for a missing baseline bill.




**References:**

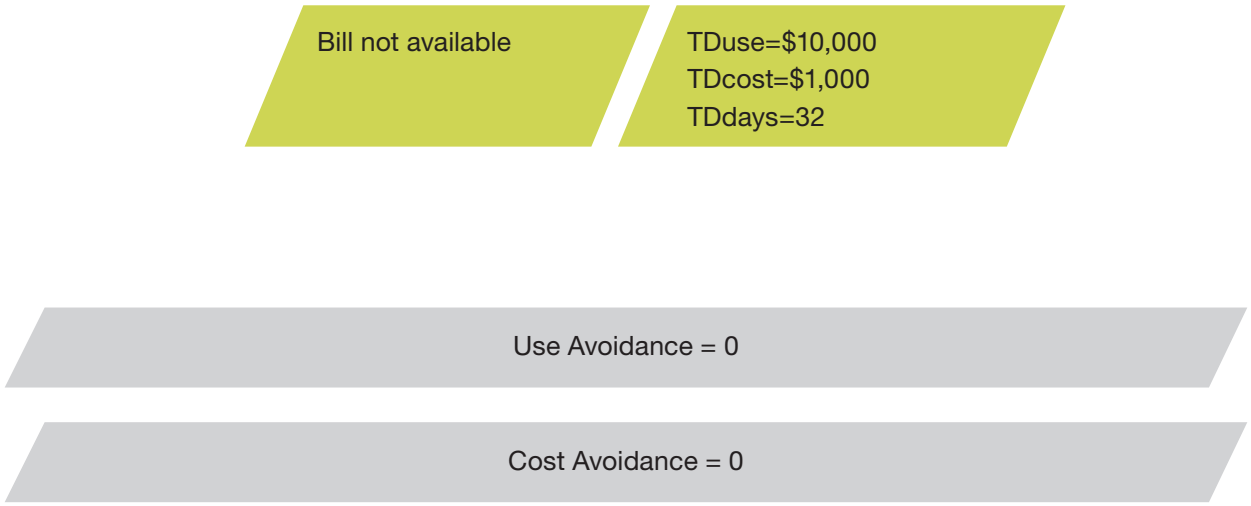
1. Savings cannot be calculated when the baseline bill is missing. It is recommended that an estimated bill be used. EnergyCAP reports no loss/no gain, i.e. Use and Cost Avoidance = 0.

**RED TEXT** = Independent Variables

# F6 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev5 2-10-14**

**Example:**



# F7 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev5 2-10-14**

## Case 7

A building heated with oil in the baseline year (1,000 gallons and $1,500) has been converted to burn natural gas today (800 therm and $1,200). This is considered a "fuel switch." The adjustment formula nets the baseline and current costs for a cost avoidance of $300. The baseline oil usage is shown as savings and today's gas usage is shown as loss.

## Formula

Adjust for a fuel switch between baseline and current.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse<br>BLcost<br>BLdays<br>BLCommodity | TDuse<br>TDcost<br>TDdays<br>TDCommodity | • Total use/consumption in billing period<br>• Total cost in billing period<br>• Total number of days in billing period<br>• Fuel/Commodity (oil/gas/elec/etc.) |
| FORMULAS | Use Avoidance (BLCommodity) = + Bluse<br>Use Avoidance (TDCommodity) = – TDuse(1) | | |
| | Cost Avoidance = BLCost – TDCost(2) | | |

**References:**

1. In a fuel switch, the BLCommodity is shown as positive use avoidance and the TDCommodity is shown as negative use avoidance.

2. A fuel switch scenario uses the net cost difference between costs. Be sure to set the meter CAP Cost Adjustment Setting to "Net Cost Difference."

**NOTE:** For both meters, zero use/cost bills must be entered. Otherwise, F5 & F6 rules will be followed.

**RED TEXT** = Independent Variables

# F7 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev5 2-10-14**

**Example:**

Bill not available

TDuse=800 therm
TDcost=$1,200
TDCommodity=gas

Use Avoidance (oil) = + BLuse = 1000 galUse Avoidance (gas) = –TDuse = –800 therm

Cost Avoidance = BLCost – TDcost = 1,500 – 1,200 = $300

# F8 | EnergyCAP Cost Avoidance Calculation Process and Formula

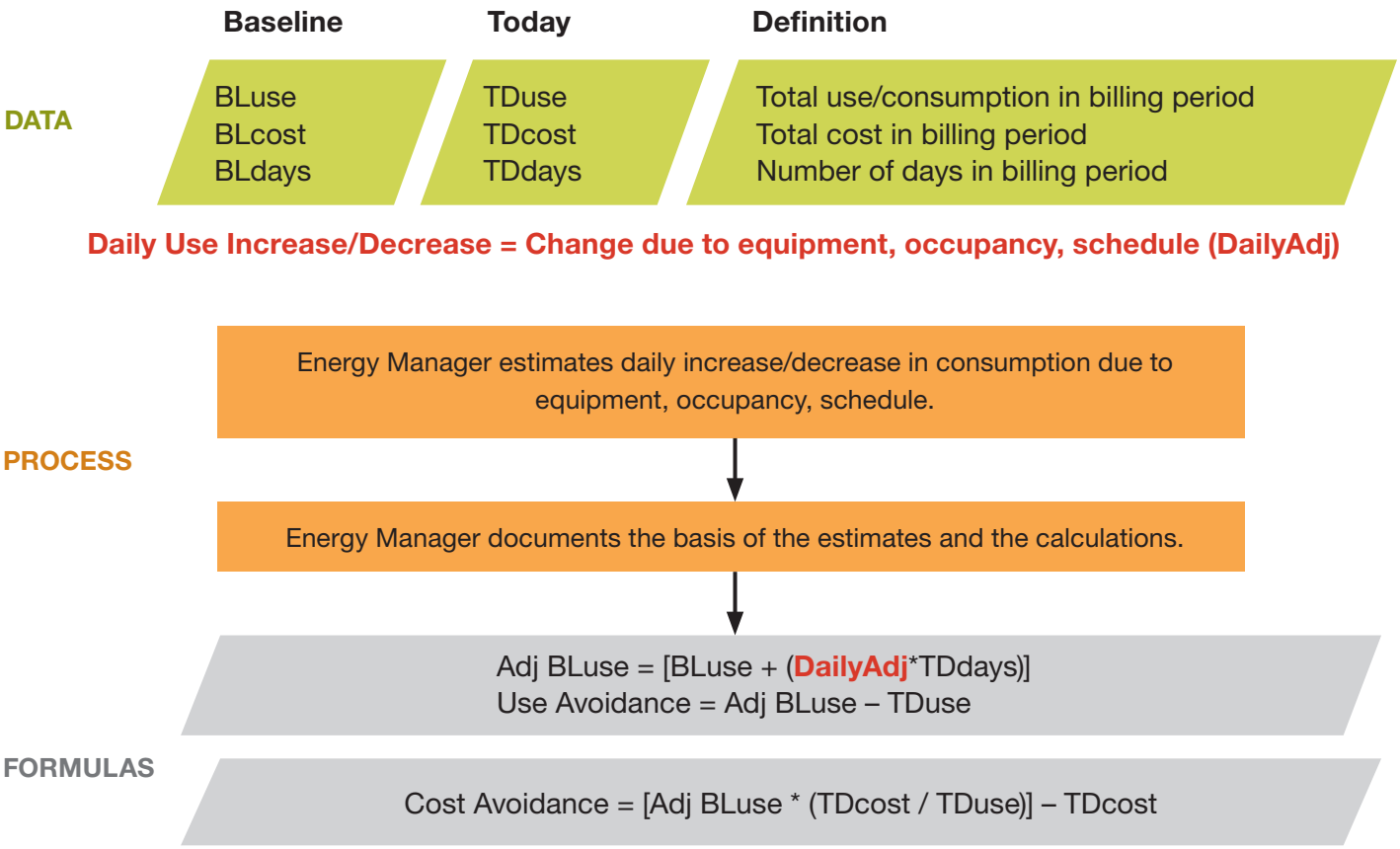
**Rev3 2-10-14**

## Case 8

The building owner received identical baseline and current bills. Usage was 10,000 KWH and cost was $1,000. Even though it appears that energy management efforts were fruitless, the building owner knows that energy management actions resulted in lower usage. The building owner realizes that addition of a new computer lab has eroded apparent energy savings. Metered (or calculated) results show an increase of 30 KWH/day. Formula #8 adjusted the baseline up to today's condition by applying a 30 KWH/day adjustment. The adjustment resulted in a calculation of use avoidance of 960 KWH and cost avoidance of $96.

## Formula

Adjust for a fixed daily non-weather load increase or decrease (x.xx units/day), due to equipment, appliance, occupancy or schedule change between baseline and current.




**RED TEXT** = Independent Variables

# F8 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev5 2-10-14**

## Example:

BLuse=10,000 kWh
BLcost=$1,000
BLdays=32
BLsqft=10,000 sq ft
BLauc=$0.100

TDuse=10,000
TDcost=$1,000
TDdays=32
TDsqft=10,000 sq ft
TDauc=$0.100

Daily Use Increase of 30.00 kWh/day due to new computer lab.
250 watts per workstation * 7 hrs/day * 5/7 days/week * 24 workstations
= 30,000 watts/hrs/day = 30.00 kWh/day

Use Avoidance = [BLuse + (**DailyAdj***TDdays)] – TDuse=
[10,000 + (30*32)] – 10,000 = 960 kWh

Cost Avoidance = [Adj BLuse * (TDcost / TDuse)] –
TDcost= [10,000 + (30*32)]*(0.10) – 1,000 = $96

# F9 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev3 2-10-14**

## Case 9

The building owner received identical baseline and current bills. Usage was 10,000 KWH and cost was $1,000. Even though it appears that energy management efforts were fruitless, the building owner knows that energy management actions resulted in lower usage. The building owner realizes that difficult to quantify "load creep" has eroded apparent energy savings. Load creep is a gradual increase in usage due to ever-increasing proliferation of appliances and equipment that use electricity – smart boards, security equipment, IT equipment, chargers (cell phones, earphones, iPods, PDAs, etc) and so on. Formula #9 adjusted the baseline up to today's condition by applying a 4% load creep adjustment. The load creep adjustment resulted in a calculation of use avoidance of 400 KWH and cost avoidance of $40.

## Formula

Adjust for a percentage-based non-weather load increase or decrease (x.xx %) due to load creep, equipment, appliance, occupancy or schedule change between baseline and current.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse<br>BLcost<br>BLdays | TDuse<br>TDcost<br>TDdays | Total use/consumption in billing period<br>Total cost in billing period<br>Number of days in billing period |

**% Use Increase/Decrease = Change due to load creep, equipment, occupancy, schedule (Adj%)**

**PROCESS**

Energy Manager estimates % increase/decrease in consumption due to equipment, occupancy, schedule.

↓

Energy Manager documents the basis of the estimates and the calculations.

↓

**FORMULAS**

Use Avoidance = Adj BLuse – TDuse

$$\text{Use Avoidance} = \left[ BLuse * \frac{Adj\%+100\%}{100\%} \right] - TDucse$$

Cost Avoidance = [Adj BLuse * (TDcost / TDuse)] – TDcost

**RED TEXT** = Independent Variables

# F9 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev5 2-10-14**

**Example:**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=32
BLsqft=10,000 sq ft
BLauc=$0.100

TDuse=10,000
TDcost=$1,000
TDdays=32
TDsqft=10,000 sq ft
TDauc=$0.100

Load Creep increase of 4.0%

$$\text{Use Avoidance} = \left[ BLuse * \frac{\text{Adj\%}+100\%}{100\%} \right] - TDucse$$

[10,000*(1.040)] – 10,000 = 400 kWh

Cost Avoidance = [Adj Bluse * (TDcost / TDuse)] – TDcost
= 10,400 (0.1) – 1,000 = $40

# F10 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

## Case 10

The case is the same as #4 with one exception. Insulation has been added to the roof of the building resulting in a calculated decrease in A/C load of 8 KWH/CDD (-24.12%). The insulation project is not the result of Energy Manager efforts, so the impact must be "removed" from the use and cost avoidance values by adjusting the baseline downwards to reflect what would have been used in the base year had the insulation been in place then. A downward adjustment of 8 KWH/CDD (-24.12%) is applied to today's CDD of 623, resulting in an adjustment of -4,984 KWH. The use avoidance is -7,441 and cost avoidance is -$744.

## Formula

Adjust for a fixed weather load increase/decrease between summer baseline and current.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse<br>BLcost<br>BLDD | TDuse<br>TDcost<br>TDDD<br>**CDDadj** | Total use/consumption in billing period<br>Total cost in billing period<br>Degree days in billing period<br>**+/- adjustment per CDD** |

**FORMULAS**

Use Avoidance = Adj BLuse – TDuse

Use Avoidance = (∑Daily Baseloads + ∑Daily TDDD*Regression Slope + ∑Daily TDDD*CDDAdj) – TDuse

**NOTES:** TDDD refers to heating or cooling degree days (HDD or CDD).In EnergyCAP, summer (CDD) and winter (HDD) weather correlations are determined independently.

Cost Avoidance = Adj BLuse * (TDcost / TDuse) – TDcost

**RED TEXT** = Independent Variables

# F10 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

**Example:**

| Baseline | Today |
|---|---|
| BLuse = 76,000 kWh | Tduse = 76,000 |
| Blcost = $7,600 | Tdcost = $7,600 |
| BLsqft = 10,000 | TDsqft = 10,000 |
| BLcdd = 697 | TDcdd = 623 |

Regression Slope (weather factor) = 33.17 kWh/cddCDDadj = -8 kWh/cdd (–24.12%)

Use Avoidance = Adj BLuse – TDuse

Use Avoidance = (∑Daily Baseloads + ∑Daily TDDD*Regression Slope + ∑DailyTDDD*CDDAdj) – TDuse

=[52,879 + (623)*33.17 + (-8*623)] – 76,000 = –7,441 kWh

Cost Avoidance = Adj Bluse * (TDcost / TDuse) – TDcost = 68,560(0.10) – 7,600 = $–744

# F11 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-14-14**

## Case 11

Formula 11 is exactly the same as #10, except it's for a winter weather adjustment rather than a summer adjustment. No separate example is necessary because the process is exactly the same (heating degree days are used rather than cooling degree days).

## Formula

Adjust for a fixed weather load increase/decrease between winter baseline and current.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse<br>BLcost<br>BLDD | TDuse<br>TDcost<br>TDDD<br>**HDDadj** | Total use/consumption in billing period<br>Total cost in billing period<br>Degree days in billing period<br>**+/- adjustment per HDD** |

**FORMULAS**

Use Avoidance = Adj BLuse – TDuse

Use Avoidance = (∑Daily Baseloads + ∑Daily TDDD*Regression Slope + ∑Daily TDDD*HDDAdj) – TDuse

Cost Avoidance = Adj BLuse * (TDcost / TDuse) – TDcost

**NOTES:** TDDD refers to heating or cooling degree days (HDD or CDD).In EnergyCAP, summer (CDD) and winter (HDD) weather correlations are determined independently.

**RED TEXT** = Independent Variables

# F11 | EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

**NOTES:** F11 is exactly the same as F10 except:Use heating degree days (HDD) instead of cooling degree days (CDD)

# F12 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev5 2-24-14**

## Case 12

The building owner received identical baseline and current bills. Usage was 10,000 KWH and cost was $1,000. Due to a partial month shutdown due to a construction project, neither bill is relevant. The owner and energy manager have agreed upon an estimated use avoidance value of 100 KWH/day, based upon experience in a prior month. Applying this to the 28-day billing period and average unit cost of $0.10 yields a cost avoidance of $280.

## Formula

Substitute an estimated daily use avoidance value.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse | TDuse | Total use/consumption in billing period |
| | BLcost | TDcost | Total cost in billing period |
| | **BLdays** | **TDdays** | **Total number of days in billing period** |
| | | **TDdua** | **Daily use avoidance value** |

**FORMULAS**

Use Avoidance = TDdua*TDdays

Cost Avoidance = Use Avoidance*(TDcost/TDuse)

**RED TEXT** = Independent Variables

# F12 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

**Example:**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=28

TDuse=10,000 kWh
TDcost=$1,000
TDdays=28
TDdua=100/day*

Use Avoidance = (TDdua*TDdays) = 100*28 = 2,800 kWh

Cost Avoidance = (Use Avoidance)*(TDcost/TDuse)= 2800(1000/10,000) = $280

*The Daily Use Avoidance value (TDdua) is entered into EnergyCAP via a manual adjustment to the adjusted baseline usage, also called “Baseline Adjusted to Current Conditions”. In this case, the daily baseline usage is 10,000/28 = 357.14. In order to “force” an agreed-upon daily use avoidance of 100 KWH/day, the baseline must be adjusted upward by that amount. The new daily adjusted baseline (BATCC) value is 357.14 + 100 = 457.14 KWH/day, and that value is entered into EnergyCAP.

# F13 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-11-14**

## Case 13

The building owner received identical baseline and current bills. Usage was 10,000 KWH and cost was $1,000. Due to a partial month shutdown due to a construction project, neither bill is relevant. The owner and energy manager have agreed upon an estimated cost avoidance value of $25/day, based upon experience in a similar building. Applying this to the 28-day billing period yields a cost avoidance of $700.

## Formula

Substitute an estimated daily cost avoidance value.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse | TDuse | Total use/consumption in billing period |
| | BLcost | TDcost | Total cost in billing period |
| | **BLdays** | **TDdays** | **Total number of days in billing period** |
| | | **TDdca** | **Daily cost avoidance value** |

**FORMULAS**

Use Avoidance = BLuse – TDuse

Cost Avoidance = TDdca*TDdays

**RED TEXT** = Independent Variables

# F13 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-11-14**

**Example:**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=28

TDuse=10,000 kWh
TDcost=$1,000
TDdays=28
TDdca=$25/day*

Use Avoidance = BLuse – TDuse == 10,000-10,000 = 0

Cost Avoidance = TDdca*TDdays= 25*28 = $700

*The Daily Cost Avoidance value is entered into EnergyCAP via a manual adjustment to the adjusted baseline cost, also called ‘Baseline Adjusted to Current Conditions”. In this case, the baseline cost is 1,000/28 = 35.714, so an adjustment of +25/day requires that 60.714 be entered into EnergyCAP.

# F14 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev3 2-11-14**

## Case 14

A building was closed for much of the month due to a renovation project. Even though today's use and cost (2,000 KWH and $200) are less than the baseline year (10,000 KWH and $1,000), it is unreasonable to claim this as cost avoidance attributable to energy management efforts. The "no loss/no gain" adjustment process sets avoidance to zero for this month.

## Formula

Substitute a no-loss/no-gain cost avoidance value.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse<br>BLcost<br>BLdays | TDuse<br>TDcost<br>TDdays | Total use/consumption in billing period<br>Total cost in billing period<br>Total number of days in billing period |

FORMULAS

Use Avoidance = 0

Cost Avoidance = 0

**RED TEXT** = Independent Variables

# F14 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-11-14**

**Example:**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=28

TDuse=2,000* kWh
TDcost=$200
TDdays=28

Use Avoidance = 0

Cost Avoidance = 0

* Building was closed most of the month due to a renovation project.

# F15 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev3 2-11-14**

## Case 15

Today's bill of 25,000 KWH is 2.5 times the baseline of 10,000 KWH. This is due to a 7-day conference and around-the-clock energy usage in the current month. It is not appropriate to show a large loss (negative avoidance) this month because the conference is a one-time event and not the result of poor energy management practices. The Energy Manager estimates a monthly use avoidance of 1,000 KWH and cost avoidance of $100, based on this building's performance in other months.

## Formula

Calculate use and cost avoidance as an estimated monthly value.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse<br>BLcost<br>BLauc | TDuse<br>TDcost<br>TDauc | Total use/consumption in billing period<br>Total cost in billing period<br>Average Unit Cost (auc) |

**FORMULAS**

Use Avoidance = estimated value

Cost Avoidance = estimated value

**RED TEXT** = Independent Variables

# F15 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev3 2-11-14**

**Example:**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=32
BLauc=$0.100

TDuse=25,000 kWh
TDcost=$2,500
TDdays=32
TDauc=$0.100

Estimated use avoidance: 1,000 kWh
Estimated cost avoidance: $100

Use Avoidance = Estimated= 1,000 kWh

Cost Avoidance = Estimated= $100

# F16 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev3 9-16-09**

## Case 16

Today's bill of 8,000 KWH shows a reduction from the baseline of 10,000 KWH. The average unit cost of $0.125 in the current bill does not accurately reflect the value of the avoided KWH, though, because the meter is now on hourly pricing. The Energy Manager recognizes that more electricity has been saved in lower cost non-peak periods than during peak periods, and has calculated $0.08 as a more reasonable marginal unit cost. This unit cost is applied to the use avoidance in the adjustment process, yielding a cost avoidance of $160 for the month.

## Formula

Calculate cost avoidance as avoided units x estimated marginal unit cost.

| | Baseline | Today | Definition |
|---|---|---|---|
| DATA | BLuse | TDuse | Total use/consumption in billing period |
| | BLcost | TDcost | Total cost in billing period |
| | BLauc | TDauc | Average Unit Cost (auc) |
| | | **TDmuc** | **Estimated marginal unit cost (muc)** |

**FORMULAS**

Use Avoidance = BLuse – TDuse

Cost Avoidance = use avoidance*TDmuc

**RED TEXT** = Independent Variables

# F16 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev3 9-16-09**

**Example:**

BLuse=10,000 kWh
BLcost=$1,000
BLdays=32
BLauc=$0.100

TDuse=8,000 kWh
TDcost=$1,000
TDdays=32
TDauc=$0.125

Rate = General Service

TDmuc = $0.08
Rate = Hourly Pricing

Use Avoidance = BLuse – TDuse= 10,000 – 8,000 = 2,000 kWh

Cost Avoidance = Use Avoidance*TDmuc= 2000*0.08 = $160

**RED TEXT** = Independent Variables

# F17 | EnergyCAP Cost Avoidance Calculation Process and Formula

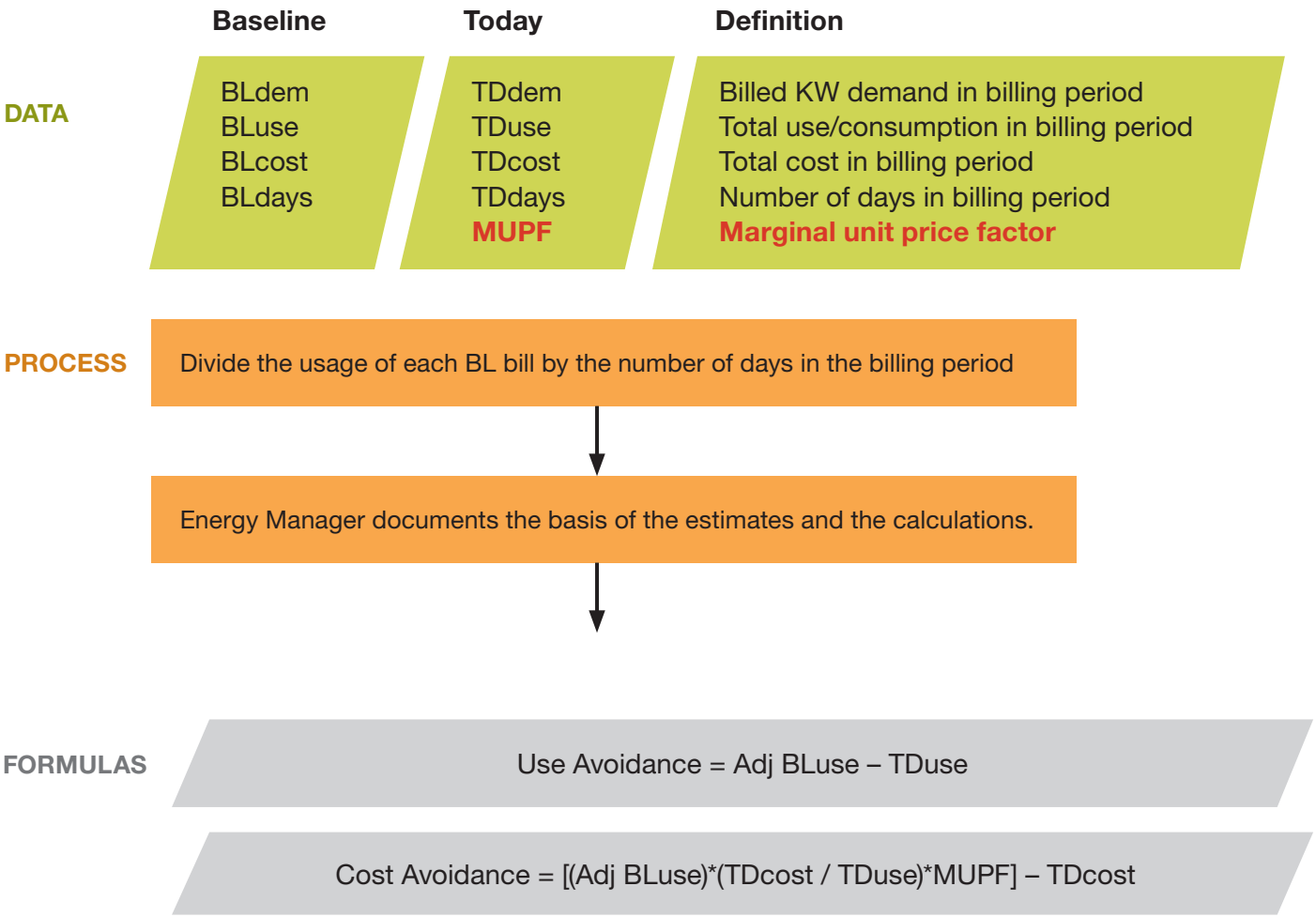
**Rev3 2-11-14**

## Case 17

Today's bill of 8,000 KWH shows a reduction from the baseline of 10,000 KWH. The average unit cost of $0.125 in the current bill does not accurately reflect the value of the avoided KWH, though, because it is a "blended" average that includes the pricing factors of both KWH and KW. The Energy Manager recognizes that the reduction is "unbalanced" -- the KWH has been reduced by 20% but the KW has not been reduced at all. Therefore, use of a blended average rate is not reasonable. The Energy Manager determines that a 0.85 marginal unit price factor should be applied to reduce the average unit cost by 15%. This results in a final cost avoidance calculation of $62.50.

## Formula

Apply a marginal unit price factor




**RED TEXT** = Independent Variables

# F17 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev3 2-11-14**

**Example:**

BLdem = 25
kWBLuse=10,000
kWhBLcost=$1,000
BLdays=31
BLsqft=10,000 sq ft
BLauc=$0.100

TDdem = 25 kW
TDuse=8,000 kWh
TDcost=$1,000
TDdays=31
TDsqft=10,000 sq ft
TDauc=$0.125

MUPF = 0.85

Use Avoidance = Adj BLuse – TDuse= 10,000 – 8,000 = 2,000 kWh

Cost Avoidance = [(Adj BLuse)*(TDcost / TDuse)*MUPF] – TDcost= 10,000*(1000/8000)*.85] – 1000 = $62.50

# F18 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

## Case 18

A real-world situation in which adjustments for weather, floor area, average unit cost, a percentage-based load increase, fixed quantity load increase, and billing period length are in effect at the same time. The process calculates the adjusted baseline use and applies the prevailing Average Unit Cost (AUC) to determine the Baseline Adjusted to Current Conditions (BATCC) cost, and then subtracts today's cost to yield Cost Avoidance.

The bills for the 2007 base year are the same as shown in F4. The current year bill is: START DATE: 7/7/2009; END DATE: 8/7/2009; USE: 76,000 kWh; COST: $9,500

## Formula

Adjust for differences between the base year and current year in:WEATHER: CDD down about 13%, from 755 to 655FLOOR AREA: Increased by 20% from 100,000 to 120,000 sq. ft.UNIT PRICE: Increased by 25%, from 0.10 to 0.125/kWhLOAD INCREASE: Increase of 4% (due to occupancy/schedule changes)NEW COMPUTER LAB: Added a load of 30 kWh/dayBILLING PERIOD START/END DATES: Do not match

## Process

1. Identify the current year bill data (see above)

2. Print the CAP06 Baseline Reports for this time period.

3. Using the CAP06, total the weather use, non-weather use, heating need and cooling need beginning on the start day and ending one day before the end day. The first day is always included, and the last day is always excluded to prevent double-counting of the end day.

   BASELINE WEATHER USE: 25,045 kWh
   BASELINE NON-WEATHER USE: 52,963 kWh
   BASELINE HEATING NEED: 0 HDD
   BASELINE COOLING NEED: 755 CDD
   SUMMER USE/DEGREE: 33.17 kWh/CDD (as shown on bottom of CAP06)

4. Determine the degree days in the current billing period. The weather report WTHR02 is helpful in this calculation. Be sure to use the balance point temperature that applies to this meter.

   CURRENT COOLING DEGREE DAYS: 655 CDD (7/7/09 to 8/6/09)

5. Adjust for weather:

   Current year weather use= Current Year CDD * summer use/degree 33.17 kWh/CDD * 655 CDD=21,726 kWh

**NOTE:** EnergyCAP performs this calculation for each day and then sums the daily weather use values. Some months may have a mix of HDD and CDD, in which case the weather use is the sum of the cooling and heating components.

6. The adjusted baseline usage (BATCC Use) is the sum of the base non-weather use + adjusted weather use (from step 5):

   52,963 + 21,726 = 74,689 kWh

7. Apply the floor area adjustment next.

   The adjustment factor is 120,000/100,000 = 1.20
   74,689*1.20 = 89,627 kWh

8. Apply CAP adjustments in the order shown on the screen:

| Sequence | Start Date | End Date | Occurrence | Cycle Start | Cycle End | Method | Amount | Type | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 1/1/2009 | 12/31/2049 | Continuous | | | Add 4.00% to the total BATCC use | 4.00 | Load Creep | Occupancy increase |
| 3 | 2/10/2008 | 12/31/2049 | Continuous | | | Add 30.00 per day to the BATCC non-... | 30.00 | Computers | New PC Lab |

   Load Increase: 89,627*1.04 = 93,212 kWh
   New PC Lab: 93,212 kWh + 30 kWh/day*31 = 93,212 + 930 = 94,142 kWh

9. Apply today's unit price of $0.125:94,142 kWh*$0.125=$11,768

10. Cost Avoidance = Adj baseline Cost – Actual Cost

    Cost Avoidance = $11,768 - $9,500 = $2,268

11. Verify the calculations via the CAP10 Report and the View Savings window (see images, next pages).

# F18 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

**Baseline Report CAP - 06**

| Date | Mean Temp | Weather Use | Non-Weather Use | Total Use | Heating Need (Degrees) | Cooling Need (Degrees) |
|---|---|---|---|---|---|---|
| **Meter: [F18] F18** | | | | | | |
| Jul 1 | 72 | 564 | 1,706 | 2,270 | 0 | 17 |
| 2 | 70 | 498 | 1,706 | 2,203 | 0 | 15 |
| 3 | 67 | 398 | 1,706 | 2,104 | 0 | 12 |
| 4 | 77 | 730 | 1,706 | 2,436 | 0 | 22 |
| 5 | 75 | 663 | 1,706 | 2,369 | 0 | 20 |
| 6 | 77 | 730 | 1,706 | 2,436 | 0 | 22 |
| 7 | 77 | 730 | 1,706 | 2,436 | 0 | 22 |
| 8 | 78 | 763 | 1,706 | 2,469 | 0 | 23 |
| 9 | 82 | 896 | 1,706 | 2,601 | 0 | 27 |
| 10 | 84 | 962 | 1,706 | 2,668 | 0 | 29 |
| 11 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| 12 | 75 | 663 | 1,706 | 2,369 | 0 | 20 |
| 13 | 75 | 663 | 1,706 | 2,369 | 0 | 20 |
| 14 | 75 | 663 | 1,706 | 2,369 | 0 | 20 |
| 15 | 82 | 896 | 1,706 | 2,601 | 0 | 27 |
| 16 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| 17 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| 18 | 83 | 929 | 1,706 | 2,635 | 0 | 28 |
| 19 | 81 | 862 | 1,706 | 2,568 | 0 | 26 |
| 20 | 74 | 630 | 1,706 | 2,336 | 0 | 19 |
| 21 | 74 | 630 | 1,706 | 2,336 | 0 | 19 |
| 22 | 76 | 697 | 1,706 | 2,402 | 0 | 21 |
| 23 | 76 | 697 | 1,706 | 2,402 | 0 | 21 |
| 24 | 74 | 630 | 1,706 | 2,336 | 0 | 19 |
| 25 | 77 | 730 | 1,706 | 2,436 | 0 | 22 |
| 26 | 81 | 862 | 1,706 | 2,568 | 0 | 26 |
| 27 | 82 | 896 | 1,706 | 2,601 | 0 | 27 |
| 28 | 79 | 796 | 1,706 | 2,502 | 0 | 24 |
| 29 | 79 | 796 | 1,706 | 2,502 | 0 | 24 |
| 30 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| 31 | 80 | 829 | 1,706 | 2,535 | 0 | 25 |
| **Totals:** | | **23,121** | **52,879** | **76,000** | **0** | **697** |

| | | | |
|---|---|---|---|
| Summer Use/Degree: | 33.17 | Winter Use/Degree: | (1.97) |
| Summer $R^2$: | 0.86 | Winter $R^2$: | 0.00 |
| Cooling Needed Above: | 55 | Heating Needed Below: | 55 |

# F18 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**

**Baseline Report CAP - 06**

| Date | Mean Temp | Weather Use | Non-Weather Use | Total Use | Heating Need (Degrees) | Cooling Need (Degrees) |
|---|---|---|---|---|---|---|
| **Meter: [F18] F18** | | | | | | |
| Aug 1 | 80 | 829 | 1,720 | 2,549 | 0 | 25 |
| 2 | 82 | 896 | 1,720 | 2,616 | 0 | 27 |
| 3 | 84 | 962 | 1,720 | 2,682 | 0 | 29 |
| 4 | 84 | 962 | 1,720 | 2,682 | 0 | 29 |
| 5 | 82 | 896 | 1,720 | 2,616 | 0 | 27 |
| 6 | 84 | 962 | 1,720 | 2,682 | 0 | 29 |
| 7 | 85 | 995 | 1,720 | 2,715 | 0 | 30 |
| 8 | 90 | 1,161 | 1,720 | 2,881 | 0 | 35 |
| 9 | 85 | 995 | 1,720 | 2,715 | 0 | 30 |
| 10 | 83 | 929 | 1,720 | 2,649 | 0 | 28 |
| 11 | 79 | 796 | 1,720 | 2,516 | 0 | 24 |
| 12 | 76 | 697 | 1,720 | 2,417 | 0 | 21 |
| 13 | 81 | 862 | 1,720 | 2,582 | 0 | 26 |
| 14 | 75 | 663 | 1,720 | 2,383 | 0 | 20 |
| 15 | 79 | 796 | 1,720 | 2,516 | 0 | 24 |
| 16 | 82 | 896 | 1,720 | 2,616 | 0 | 27 |
| 17 | 83 | 929 | 1,720 | 2,649 | 0 | 28 |
| 18 | 71 | 531 | 1,720 | 2,251 | 0 | 16 |
| 19 | 73 | 597 | 1,720 | 2,317 | 0 | 18 |
| 20 | 67 | 398 | 1,720 | 2,118 | 0 | 12 |
| 21 | 67 | 398 | 1,720 | 2,118 | 0 | 12 |
| 22 | 68 | 431 | 1,720 | 2,151 | 0 | 13 |
| 23 | 72 | 564 | 1,720 | 2,284 | 0 | 17 |
| 24 | 83 | 929 | 1,720 | 2,649 | 0 | 28 |
| 25 | 85 | 995 | 1,720 | 2,715 | 0 | 30 |
| 26 | 80 | 829 | 1,720 | 2,549 | 0 | 25 |
| 27 | 77 | 730 | 1,720 | 2,450 | 0 | 22 |
| 28 | 76 | 697 | 1,720 | 2,417 | 0 | 21 |
| 29 | 78 | 763 | 1,720 | 2,483 | 0 | 23 |
| 30 | 79 | 796 | 1,720 | 2,516 | 0 | 24 |
| 31 | 79 | 796 | 1,720 | 2,516 | 0 | 24 |
| **Totals:** | | **24,681** | **53,319** | **78,000** | **0** | **744** |

| | | | |
|---|---|---|---|
| Summer Use/Degree: | 33.17 | Winter Use/Degree: | (1.97) |
| Summer $R^2$: | 0.86 | Winter $R^2$: | 0.00 |
| Cooling Needed Above: | 55 | Heating Needed Below: | 55 |

# F18 EnergyCAP Cost Avoidance Calculation Process and Formula

**Rev4 2-24-14**