
For Businesses


For Homes


Renewable Energy


For Trade Allies


About Us

Energy Trust of Oregon

BSUG

January 19, 2011

Energy Trust of Oregon, Inc.

Building Simulation Users' Group

Sponsors

- **The Energy Trust – Funding***
- **NW Natural – Space & AV***
- **ODOE – Technical Input**
- **ASHRAE - PDHs for P.E.s & CEMs**
- **Members – Substance***

*** No support – No BSUG**

Building Simulation Users' Group

Modeling Baseline/Protocol Survey

- **Disclaimer: ELJ did not participate**
- **Low number of participants**
- **Insightful comments**
- **Survey design was poor - gaming**
- **Results sent to BCD & ETO**
- **Available to BSUG members on request**

Building Simulation Users' Group

Location – Based on IP Address

Location*	No.	%
WA	4	8%
OR	41	80%
KS	1	2%
CO	1	2%
TX	2	4%
NB	1	2%
MI	1	2%
Total:	**51**	**100%**

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Org Type – Includes Multiple Entries

Organization Type	No.	%
Contractor	6	10%
Building operator	0	0%
Engineering firm	25	42%
Architectural firm	5	8%
Energy consultant	16	27%
Conservation prog admin	2	3%
Other (please specify)	6	10%
Total:	**60**	**100%**

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Other Organization Types

- Research Laboratory
- Oregon Department of Energy
- Government
- Energy Services Company
- Multidisciplinary nonprofit
- Integrated Energy Services

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Summary of Results – Mult Types

		Use		Prefer	
Individual Function	**No.**	**90.1**	**L**	**90.1**	**L**
Engineer	27	27	13	19	4
Analyst	20	18	15	12	5
Designer	6	6	5	4	0
Conservation Administrator	0	0	0	0	0
Architect	3	3	3	2	1
Contractor	0	0	0	0	0
Facilities Operation	0	0	0	0	0
Marketing	0	0	0	0	0
Programmer	0	0	0	0	0
Management	2	2	2	0	1
Student	0	0	0	0	0
Other (please specify)	5	4	4	0	4
Total:	**63**	**60**	**42**	**37**	**15**

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Other Functional Types

- Building Scientist
- Review analyst's work
- Outreach
- Researcher
- Program manager - M&V

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Summary of Results – Single Indivduals

		Use		Prefer	
Individual Function	**No.**	**90.1**	**L**	**90.1**	**L**
Engineer	27	27	13	19	4
Analyst	13	11	9	10	2
Designer	4	4	3	3	0
Conservation Administrator	0	0	0	0	0
Architect	2	2	2	1	1
Contractor	0	0	0	0	0
Facilities Operation	0	0	0	0	0
Marketing	0	0	0	0	0
Programmer	0	0	0	0	0
Management	1	1	1	0	0
Student	0	0	0	0	0
Other (please specify)	4	2	1	0	1
Total:	**51**	**47**	**29**	**33**	**8**

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Summary of Results – Individuals

Individual Summary	No.	90.1	L
Use Protocol	51	47	29
Percentages		92%	57%
Preferred Protocol		33	8
Percentages		65%	16%

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Paraphrased Comments

Appendix L Pros

- Oregon specific
- ASHRAE is generic
- More accurate in estimating the actual baseline energy consumption
- ODOE will not accept ASHRAE

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Paraphrased Comments

Appendix L Cons

- SEED has unrealistic and rigid baseline HVAC systems
- Direct project cost increase
- Indirect costs (3rd party reviews)
- Will cause fewer measures to be adopted
- BETC and ODOE may be eliminated

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Paraphrased Comments

ASHRAE Pros

- Industry standard
- Easier

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Paraphrased Comments

ASHRAE 90.1 Cons

- Baseline inaccurate (window distribution, etc.).
- Not Oregon specific

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Other Observations

- Comparisons are relevant, not absolute values
- Simply use the Oregon code as a baseline
- SEED should be approved for LEED projects
- New Buildings should accept both

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Further Discussion

- Panel discussion in March
- Need representative members
- Creators, reviewers, policy folks, etc.
- Will broadcast a call for volunteers

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Intermediate eQUEST Training

Not going to happen before ELJ departs excepting today's presentation

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Today's Discussion

Intermediate Programming in eQUEST

Mark Nieman, PE, CEM

Senior Energy Engineer

McKinstry

EnergyTrust of Oregon, Inc.

Intermediate Programming in eQUEST

Mark Nieman, P.E., CEM
McKinstry Co., Seattle, WA

January 19, 2011 BSUG: Intermediate Programming in eQUEST

This session will look deeper into the capabilities of eQUEST using the Detailed Mode and text editors. A review of eQUEST's deeper help file references will be reviewed, followed by a brief example of a non-standard under-floor air distribution (UFAD) model creation. Examples include using variables within entry fields, creating custom meters, using IF-THEN-ELSE statements, creating parametric runs and using custom hourly reports for troubleshooting.

1. Detailed Mode
2. Text Editors
3. Help File References
4. Non-standard UFAD Model
5. Variables Within Entry Fields
6. Creating Custom Meters
7. IF-THEN-ELSE Statements
8. Parametric Runs
9. Using Custom Hourly Reports for Troubleshooting

1. Detailed Mode
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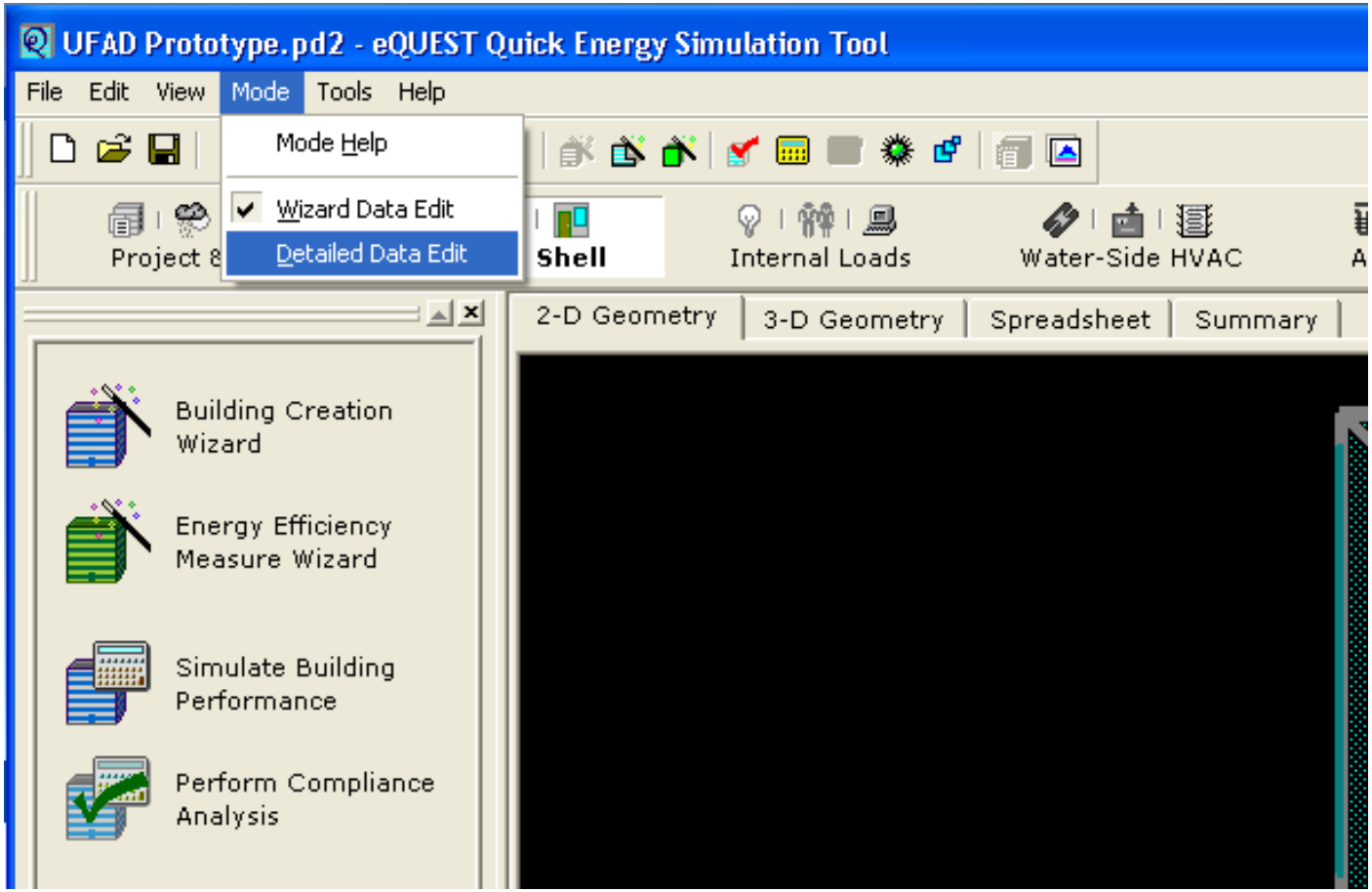
I. Detailed Mode

1. Used after setting up with Wizard
2. Used for building from scratch or file snippets
3. Better schedule control
4. Wider selection of equipment to model
5. Allows for defining sub-meters (useful for LEED, etc.)
6. Allows for non-standard models
7. Can define custom meters (such as steam)
8. Can define custom hourly reports for troubleshooting

I. Detailed Mode



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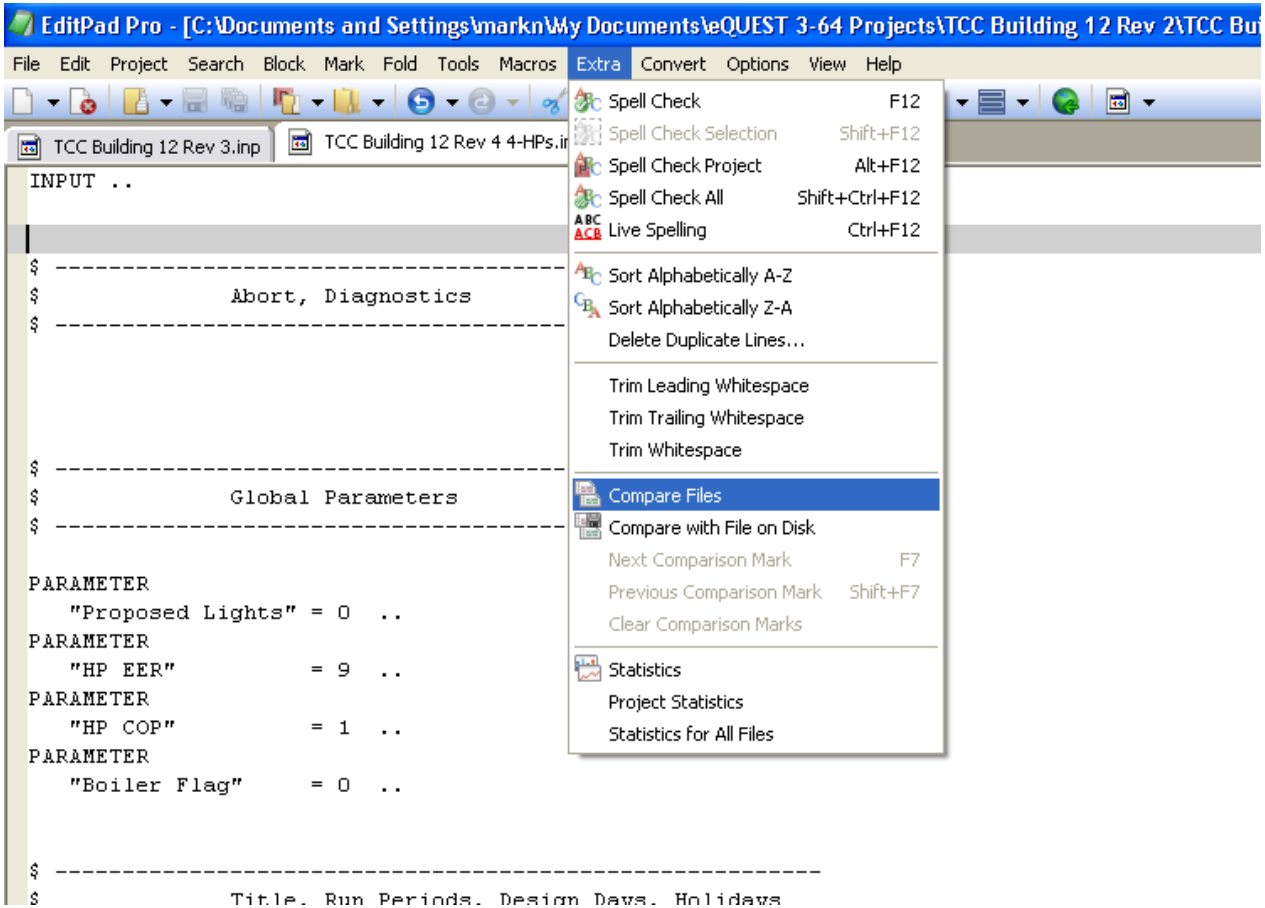
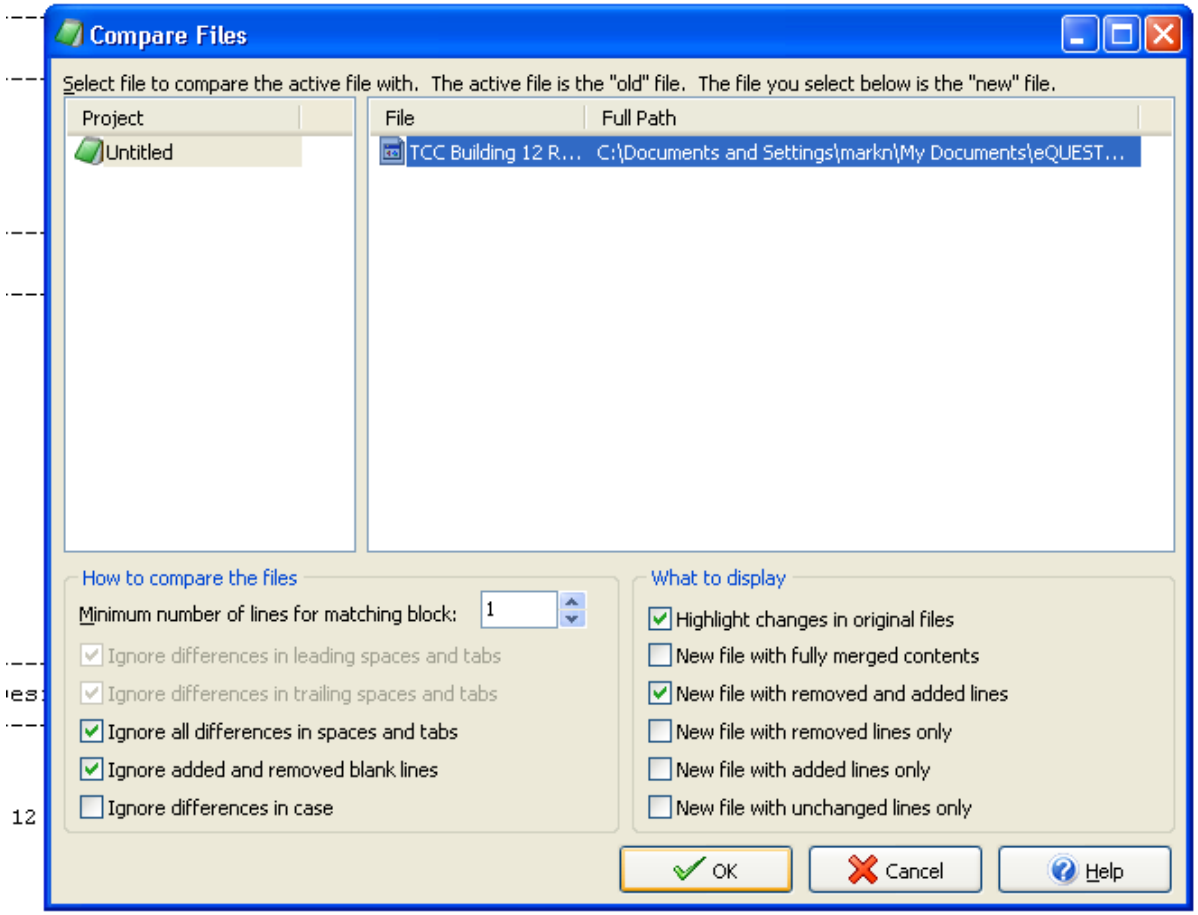
I. **Text Editors**
    1. EditPad Pro
    2. NoteTab
    3. Others
        a. Look for File Compare Functionality
        b. Look for good Search & Replace

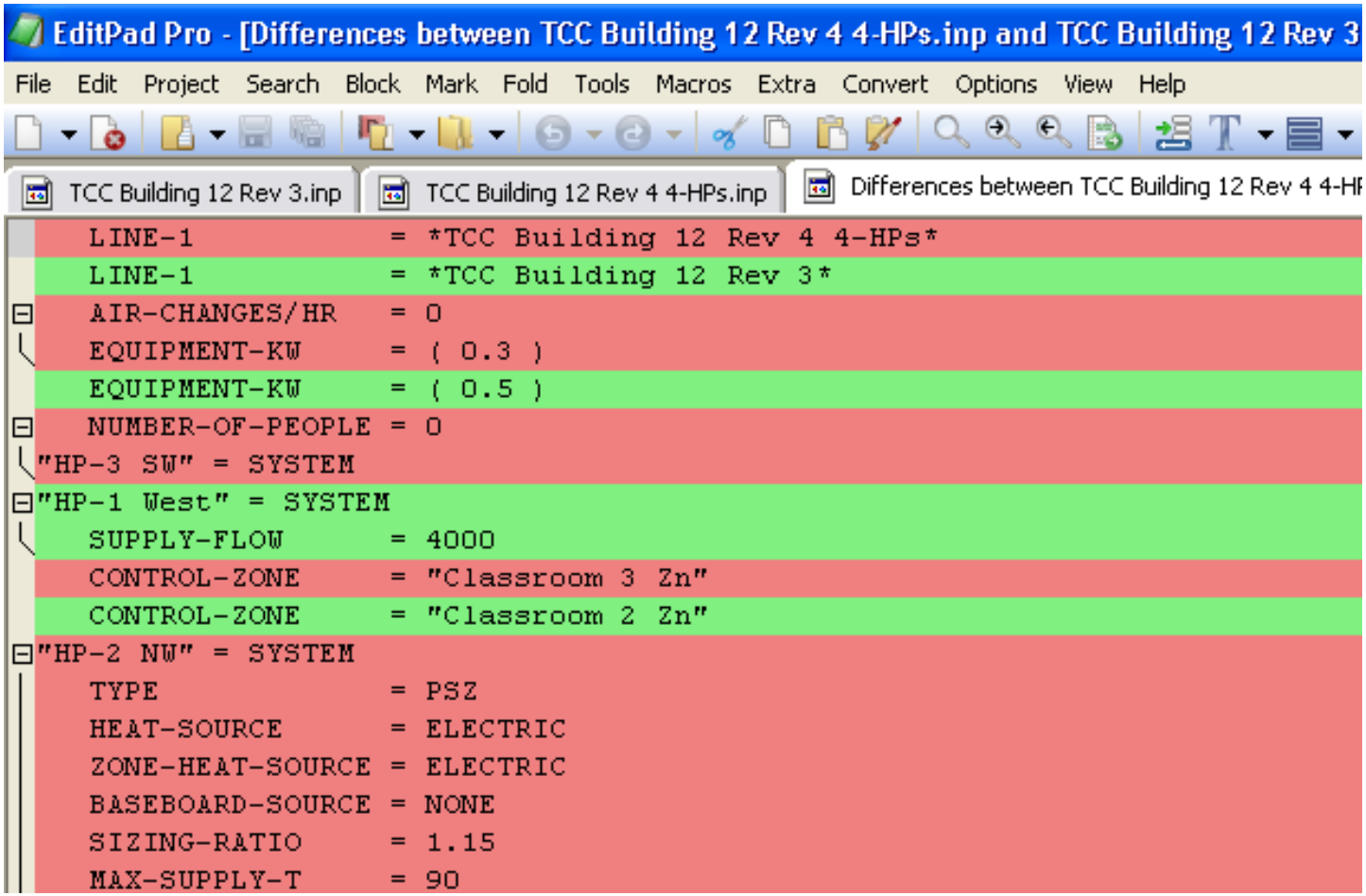
II. **File Compare Functionality**

III. **Edit eQUEST Files in Detailed Mode**
    1. *.pd2: The Wizard and pointer file
        a. Usually not editing this file
    2. *.inp: The actual input file
        a. This is the main file to edit – very easy to do in text editor
    3. *.prd: Parametric Run file
        a. Can edit, but formatting is very difficult and easy to break
        b. Best to edit in eQUEST Detailed Mode

II. File Compare Functionality




Compare Files
Select file to compare the active file with. The active file is the "old" file. The file you select below is the "new" file.
Project
Untitled
File
Full Path
TCC Building 12 R...
C:\Documents and Settings\markn\My Documents\eQUEST...
How to compare the files
Minimum number of lines for matching block:
1
Ignore differences in leading spaces and tabs
Ignore differences in trailing spaces and tabs
Ignore all differences in spaces and tabs
Ignore added and removed blank lines
Ignore differences in case
What to display
Highlight changes in original files
New file with fully merged contents
New file with removed and added lines
New file with removed lines only
New file with added lines only
New file with unchanged lines only
OK
Cancel
Help



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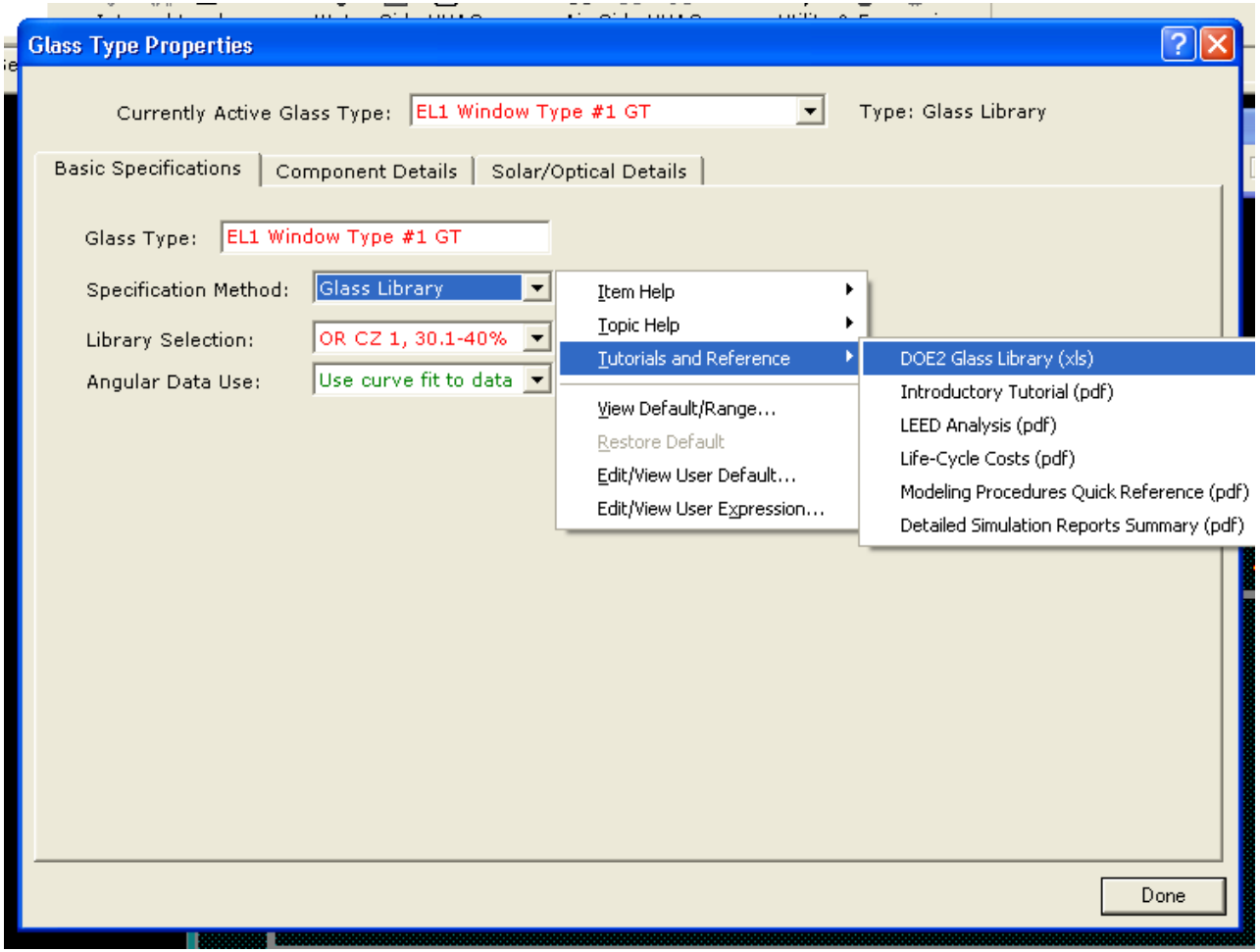
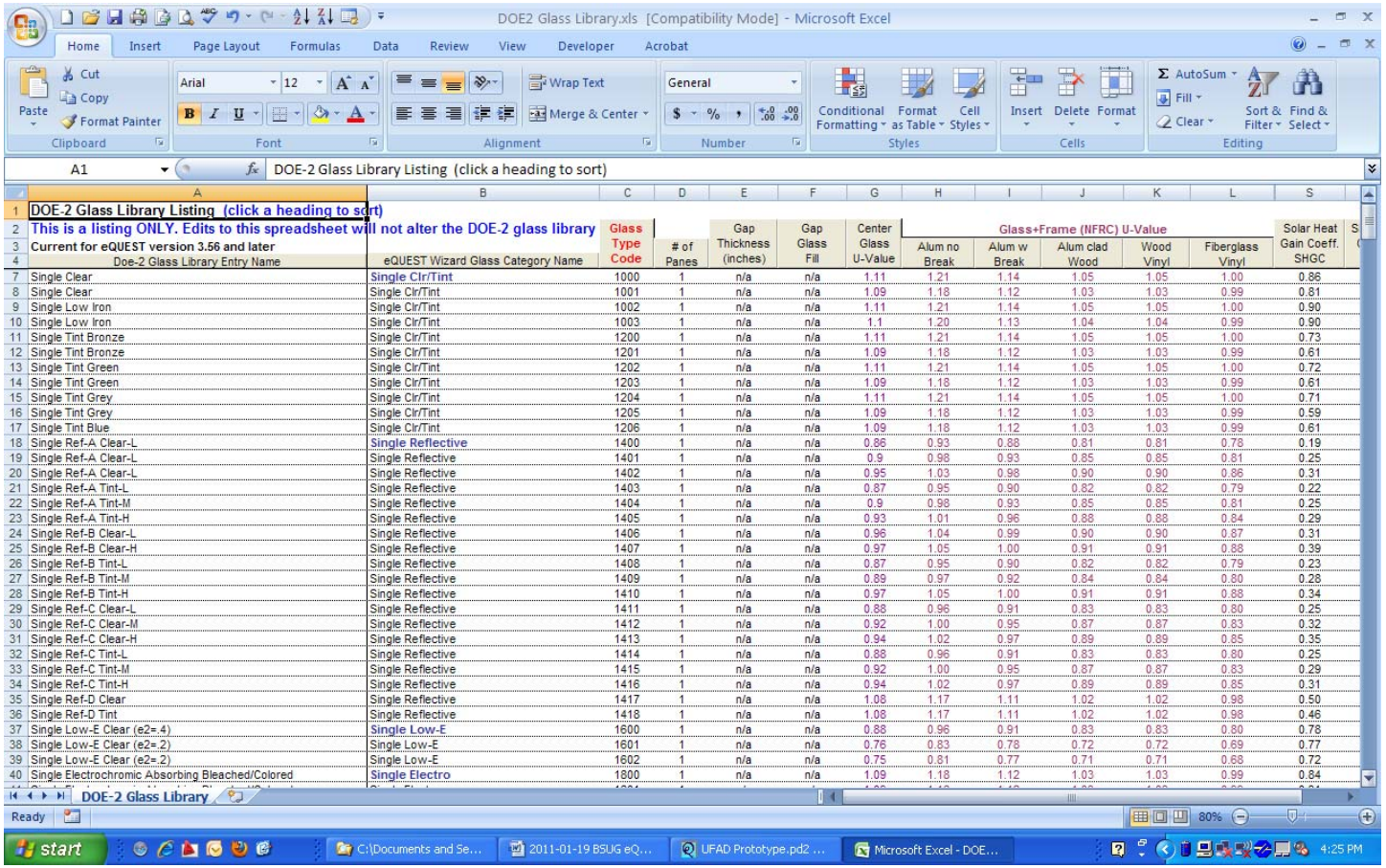
I. Help File References

1. DOE2 Glass Library
2. View Default /Range
3. DOE2 Help File





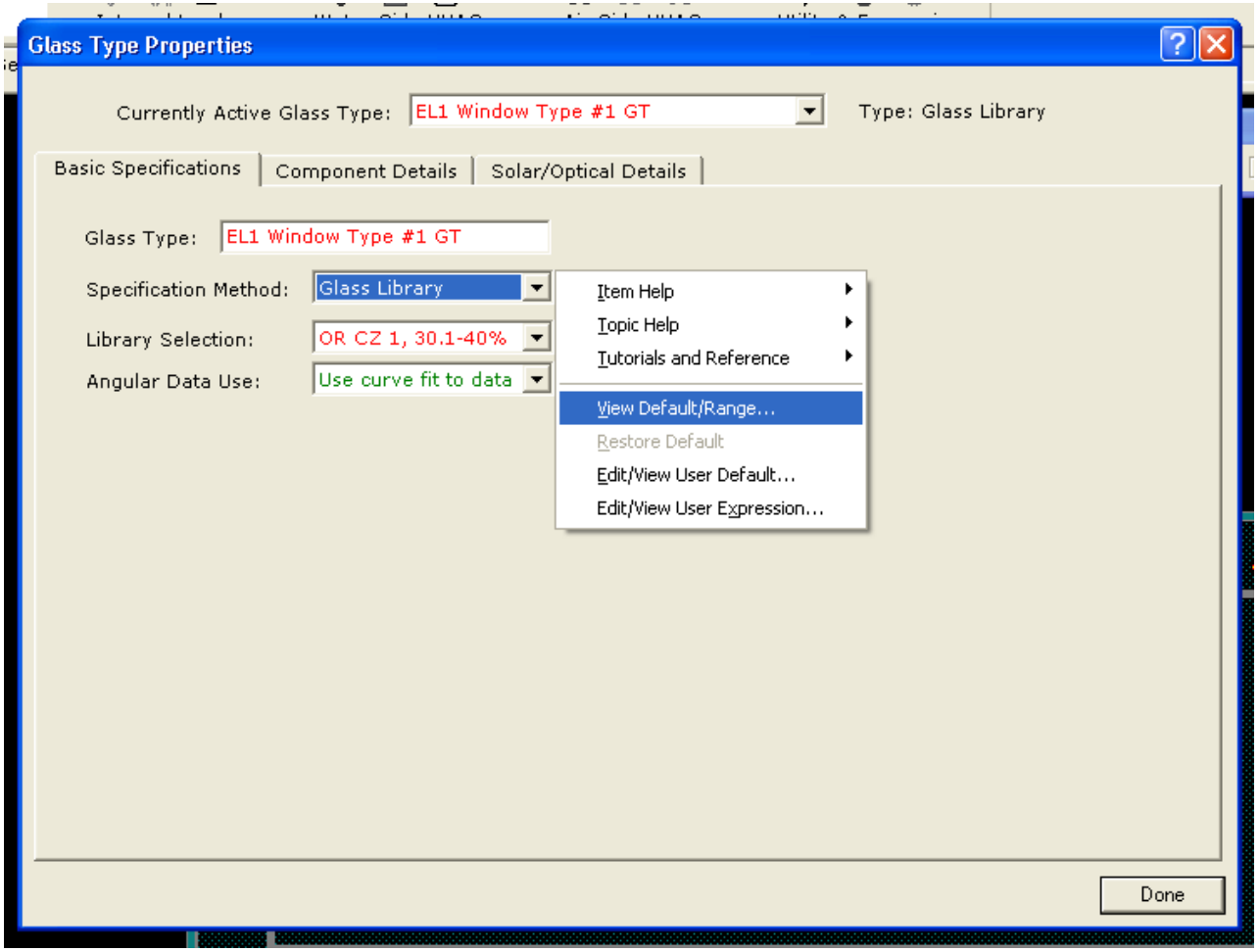
DOE2 Glass Library.xls [Compatibility Mode] - Microsoft Excel

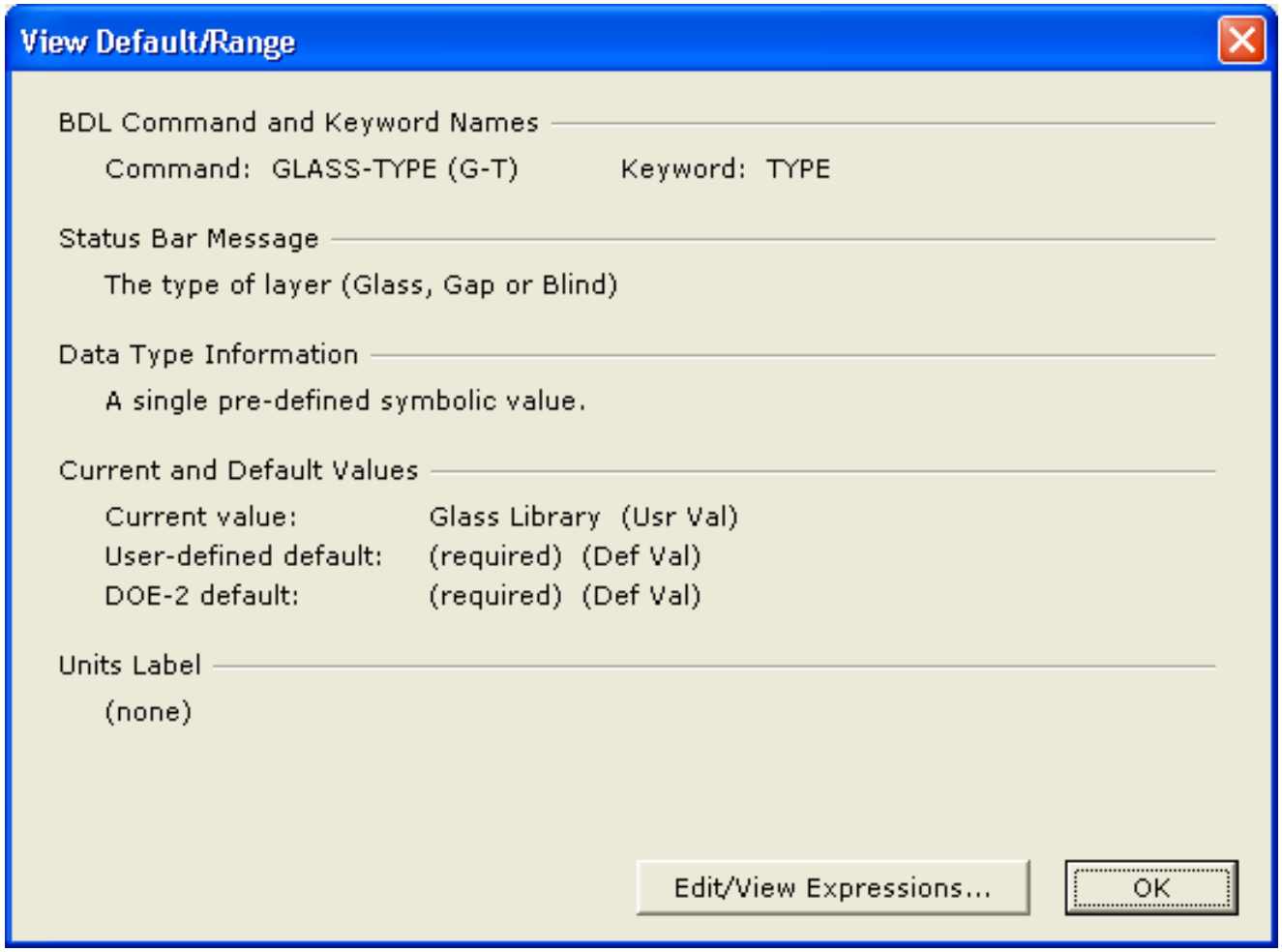
Home | Insert | Page Layout | Formulas | Data | Review | View | Developer | Acrobat

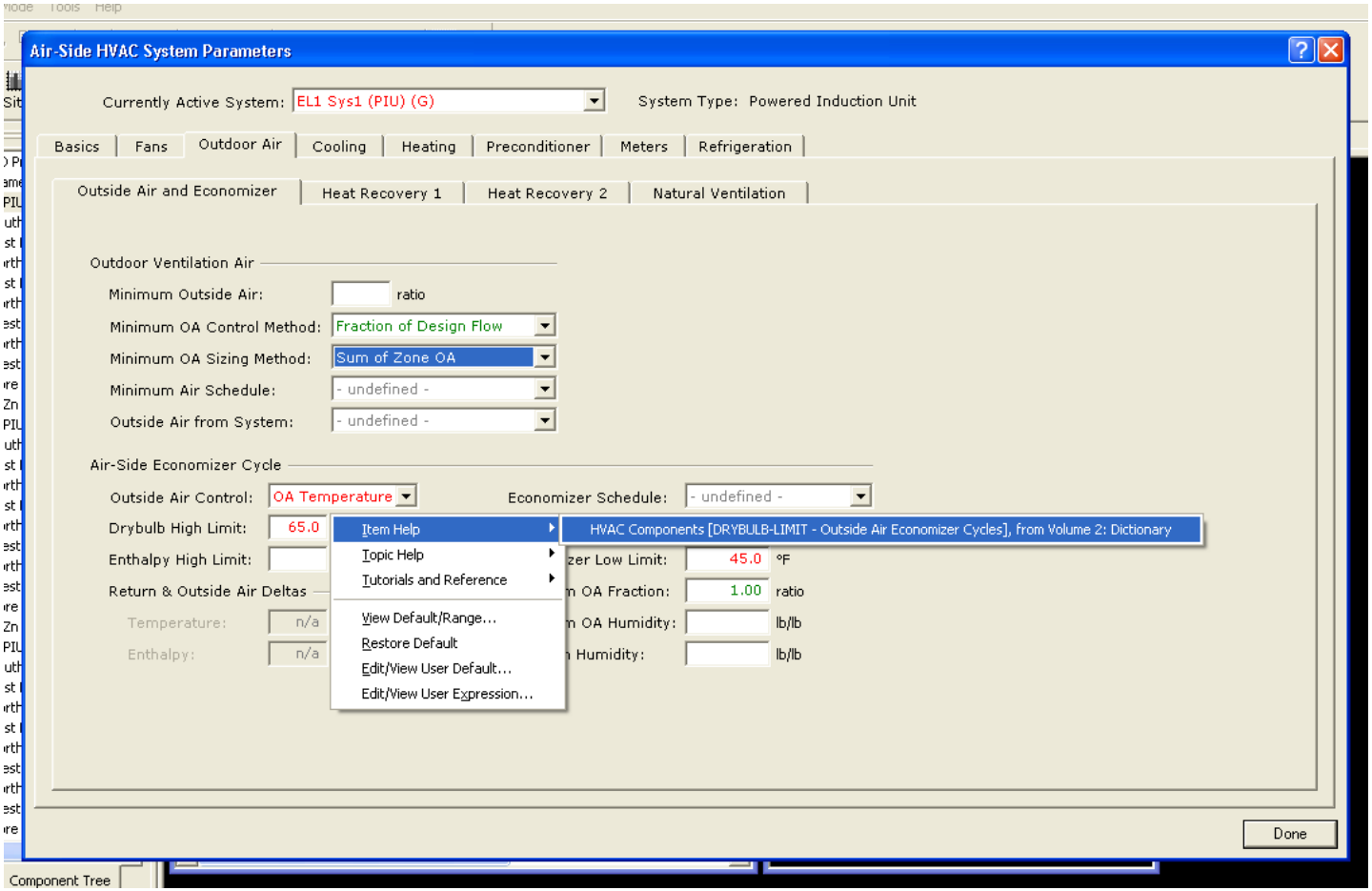
Cell A1: DOE-2 Glass Library Listing (click a heading to sort)

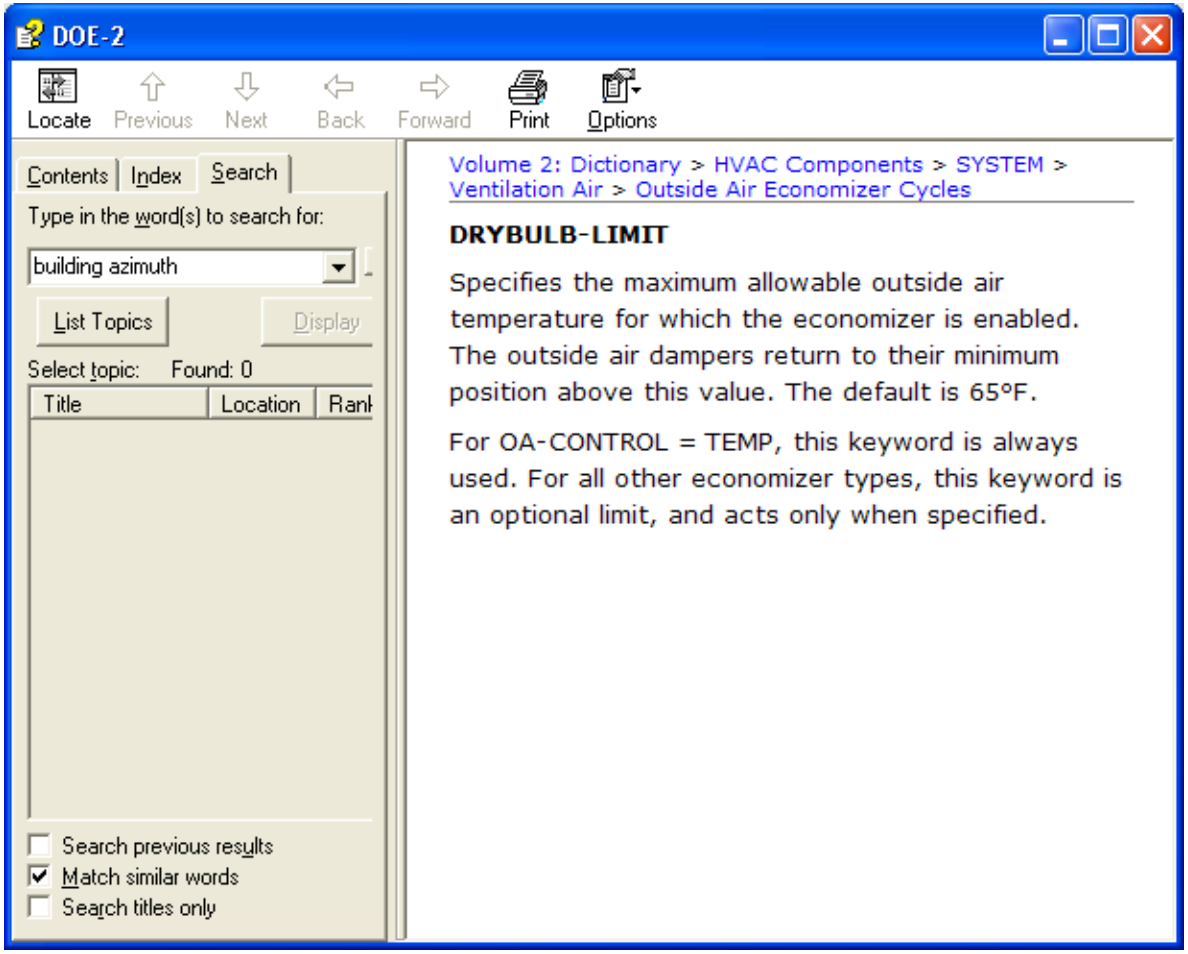
	A	B	C	D	E	F	G	H	I	J	K	L	S
1	DOE-2 Glass Library Listing (click a heading to sort)												
2	This is a listing ONLY. Edits to this spreadsheet will not alter the DOE-2 glass library		Glass Type Code	# of Panes	Gap Thickness (inches)	Gap Glass Fill	Center Glass U-Value	Glass+Frame (NFRC) U-Value					Solar Heat Gain Coeff. SHGC
3	Current for eQUEST version 3.56 and later							Alum no Break	Alum w Break	Alum clad Wood	Wood Vinyl	Fiberglass Vinyl	
4	Doe-2 Glass Library Entry Name	eQUEST Wizard Glass Category Name											
7	Single Clear	Single Clr/Tint	1000	1	n/a	n/a	1.11	1.21	1.14	1.05	1.05	1.00	0.86
8	Single Clear	Single Clr/Tint	1001	1	n/a	n/a	1.09	1.18	1.12	1.03	1.03	0.99	0.81
9	Single Low Iron	Single Clr/Tint	1002	1	n/a	n/a	1.11	1.21	1.14	1.05	1.05	1.00	0.90
10	Single Low Iron	Single Clr/Tint	1003	1	n/a	n/a	1.1	1.20	1.13	1.04	1.04	0.99	0.90
11	Single Tint Bronze	Single Clr/Tint	1200	1	n/a	n/a	1.11	1.21	1.14	1.05	1.05	1.00	0.73
12	Single Tint Bronze	Single Clr/Tint	1201	1	n/a	n/a	1.09	1.18	1.12	1.03	1.03	0.99	0.61
13	Single Tint Green	Single Clr/Tint	1202	1	n/a	n/a	1.11	1.21	1.14	1.05	1.05	1.00	0.72
14	Single Tint Green	Single Clr/Tint	1203	1	n/a	n/a	1.09	1.18	1.12	1.03	1.03	0.99	0.61
15	Single Tint Grey	Single Clr/Tint	1204	1	n/a	n/a	1.11	1.21	1.14	1.05	1.05	1.00	0.71
16	Single Tint Grey	Single Clr/Tint	1205	1	n/a	n/a	1.09	1.18	1.12	1.03	1.03	0.99	0.59
17	Single Tint Blue	Single Clr/Tint	1206	1	n/a	n/a	1.09	1.18	1.12	1.03	1.03	0.99	0.61
18	Single Ref-A Clear-L	Single Reflective	1400	1	n/a	n/a	0.86	0.93	0.88	0.81	0.81	0.78	0.19
19	Single Ref-A Clear-L	Single Reflective	1401	1	n/a	n/a	0.9	0.98	0.93	0.85	0.85	0.81	0.25
20	Single Ref-A Clear-L	Single Reflective	1402	1	n/a	n/a	0.95	1.03	0.98	0.90	0.90	0.86	0.31
21	Single Ref-A Tint-L	Single Reflective	1403	1	n/a	n/a	0.87	0.95	0.90	0.82	0.82	0.79	0.22
22	Single Ref-A Tint-M	Single Reflective	1404	1	n/a	n/a	0.9	0.98	0.93	0.85	0.85	0.81	0.25
23	Single Ref-A Tint-H	Single Reflective	1405	1	n/a	n/a	0.93	1.01	0.96	0.88	0.88	0.84	0.29
24	Single Ref-B Clear-L	Single Reflective	1406	1	n/a	n/a	0.96	1.04	0.99	0.90	0.90	0.87	0.31
25	Single Ref-B Clear-H	Single Reflective	1407	1	n/a	n/a	0.97	1.05	1.00	0.91	0.91	0.88	0.39
26	Single Ref-B Tint-L	Single Reflective	1408	1	n/a	n/a	0.87	0.95	0.90	0.82	0.82	0.79	0.23
27	Single Ref-B Tint-M	Single Reflective	1409	1	n/a	n/a	0.89	0.97	0.92	0.84	0.84	0.80	0.28
28	Single Ref-B Tint-H	Single Reflective	1410	1	n/a	n/a	0.97	1.05	1.00	0.91	0.91	0.88	0.34
29	Single Ref-C Clear-L	Single Reflective	1411	1	n/a	n/a	0.88	0.96	0.91	0.83	0.83	0.80	0.25
30	Single Ref-C Clear-M	Single Reflective	1412	1	n/a	n/a	0.92	1.00	0.95	0.87	0.87	0.83	0.32
31	Single Ref-C Clear-H	Single Reflective	1413	1	n/a	n/a	0.94	1.02	0.97	0.89	0.89	0.85	0.35
32	Single Ref-C Tint-L	Single Reflective	1414	1	n/a	n/a	0.88	0.96	0.91	0.83	0.83	0.80	0.25
33	Single Ref-C Tint-M	Single Reflective	1415	1	n/a	n/a	0.92	1.00	0.95	0.87	0.87	0.83	0.29
34	Single Ref-C Tint-H	Single Reflective	1416	1	n/a	n/a	0.94	1.02	0.97	0.89	0.89	0.85	0.31
35	Single Ref-D Clear	Single Reflective	1417	1	n/a	n/a	1.08	1.17	1.11	1.02	1.02	0.98	0.50
36	Single Ref-D Tint	Single Reflective	1418	1	n/a	n/a	1.08	1.17	1.11	1.02	1.02	0.98	0.46
37	Single Low-E Clear (e2=.4)	Single Low-E	1600	1	n/a	n/a	0.88	0.96	0.91	0.83	0.83	0.80	0.78
38	Single Low-E Clear (e2=.2)	Single Low-E	1601	1	n/a	n/a	0.76	0.83	0.78	0.72	0.72	0.69	0.77
39	Single Low-E Clear (e2=.2)	Single Low-E	1602	1	n/a	n/a	0.75	0.81	0.77	0.71	0.71	0.68	0.72
40	Single Electrochromic Absorbing Bleached/Colored	Single Electro	1800	1	n/a	n/a	1.09	1.18	1.12	1.03	1.03	0.99	0.84

DOE-2 Glass Library | Ready | 80% | start | 4:25 PM


Glass Type Properties
Currently Active Glass Type:
EL1 Window Type #1 GT
Type: Glass Library
Basic Specifications
Component Details
Solar/Optical Details
Glass Type:
EL1 Window Type #1 GT
Specification Method:
Glass Library
Library Selection:
OR CZ 1, 30.1-40%
Angular Data Use:
Use curve fit to data
Item Help
Topic Help
Tutorials and Reference
View Default/Range...
Restore Default
Edit/View User Default...
Edit/View User Expression...
Done


View Default/Range
BDL Command and Keyword Names
Command: GLASS-TYPE (G-T)
Keyword: TYPE
Status Bar Message
The type of layer (Glass, Gap or Blind)
Data Type Information
A single pre-defined symbolic value.
Current and Default Values
Current value: Glass Library (Usr Val)
User-defined default: (required) (Def Val)
DOE-2 default: (required) (Def Val)
Units Label
(none)
Edit/View Expressions...
OK


Air-Side HVAC System Parameters
Currently Active System: EL1 Sys1 (PIU) (G)
System Type: Powered Induction Unit
Basics
Fans
Outdoor Air
Cooling
Heating
Preconditioner
Meters
Refrigeration
Outside Air and Economizer
Heat Recovery 1
Heat Recovery 2
Natural Ventilation
Outdoor Ventilation Air
Minimum Outside Air:
ratio
Minimum OA Control Method:
Fraction of Design Flow
Minimum OA Sizing Method:
Sum of Zone OA
Minimum Air Schedule:
- undefined -
Outside Air from System:
- undefined -
Air-Side Economizer Cycle
Outside Air Control:
OA Temperature
Economizer Schedule:
- undefined -
Drybulb High Limit:
65.0
Enthalpy High Limit:
Return & Outside Air Deltas
Temperature:
n/a
Enthalpy:
n/a
Item Help
Topic Help
Tutorials and Reference
View Default/Range...
Restore Default
Edit/View User Default...
Edit/View User Expression...
HVAC Components [DRYBULB-LIMIT - Outside Air Economizer Cycles], from Volume 2: Dictionary
zer Low Limit:
45.0
°F
n OA Fraction:
1.00
ratio
n OA Humidity:
lb/lb
Humidity:
lb/lb
Done
Component Tree



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4. Non-standard UFAD Model
    a. "Cooling via Underfloor Air Distribution: Current Design Issues and Analysis Options" by Addison & Nall
    b. "EDR Simulation Guidebook Volume 1, PART 1: Underfloor Air Distribution and Thermal Displacement Ventilation"
        i. http://www.energydesignresources.com/media/2654/EDR_DesignGuidelines_%20HVAC_Simulation.pdf
        ii. Loads to plenum

Internal Load Distribution Values for Typical Underfloor Air and Thermal Displacement Ventilation Encourages Systems[5]

	Percent Load to Space		Percent Load to Plenum	
Load Component	Underfloor Air Distribution	Thermal Displacement Ventilation	Underfloor Air Distribution	Thermal Displacement Ventilation
People	75%	67%	25%	33%
Lights	67%	50%	33%	50%
Equipment	67%	50%	33%	50%

Source: CTG Energetics, Inc.

iii. Modeling Issues

1. System Selection (i.e. Powered Induction Unit - PIU)
2. Supply Air Temperature
    a. 64ºF to 67ºF supply air temperature set point (MIN-SUPPLY-T or COOL-SET-T) as opposed to a 55ºF set point for traditional mixing systems
3. Dehumidification
    a. Be aware, you may need to condition down to 55°F, depending on conditions
4. Air Volume
    a. Consider elevated SAT & load to space vs. plenum
    b. Supply air flow rates for UFAD systems range from 25% less to 15% more than traditional overhead systems
5. Static Pressure
    a. May be lower for UFAD--consider your conditions
6. Economizer Controls
    a. Typically increased economizer hours due to higher SAT

7. Building Skin Loads
    a. If return grilles are located directly above the windows in perimeter spaces served by UFAD or TDV systems, a significant portion of the convective cooling load associated with the building skin can be funneled directly into the return air plenum. A precise energy model for UFAD and TDV systems can account for the energy savings associated with this phenomenon by reapportioning some of the glazing and exterior walls in the occupied space to the adjacent plenum. However, this methodology may result in the loss of legitimate automated daylighting control savings in DOE-2-based programs.
8. Perimeter Systems
    a. Select the type of space heating and zone terminal units in DOE-2 that most closely represent the perimeter system design for their project

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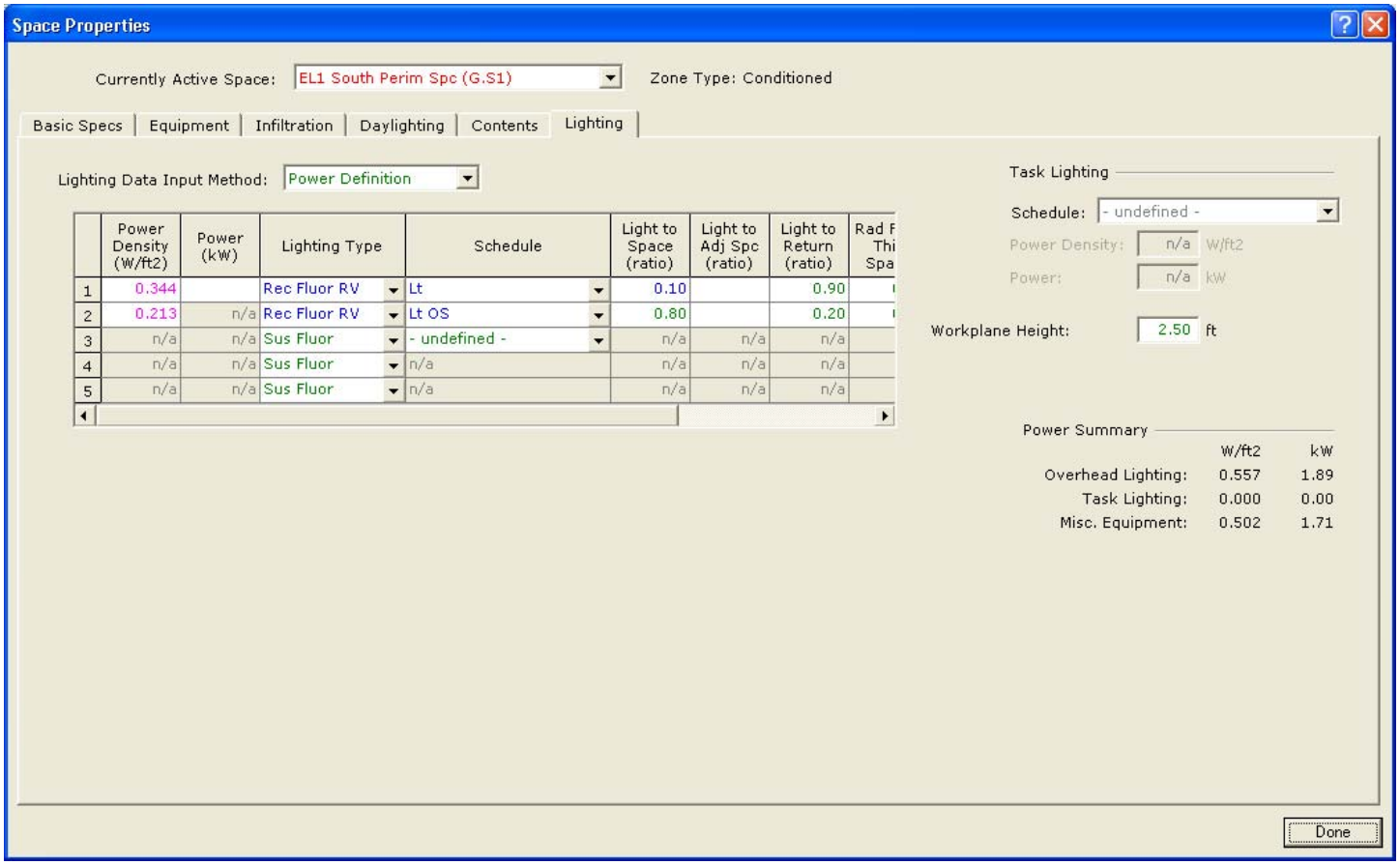
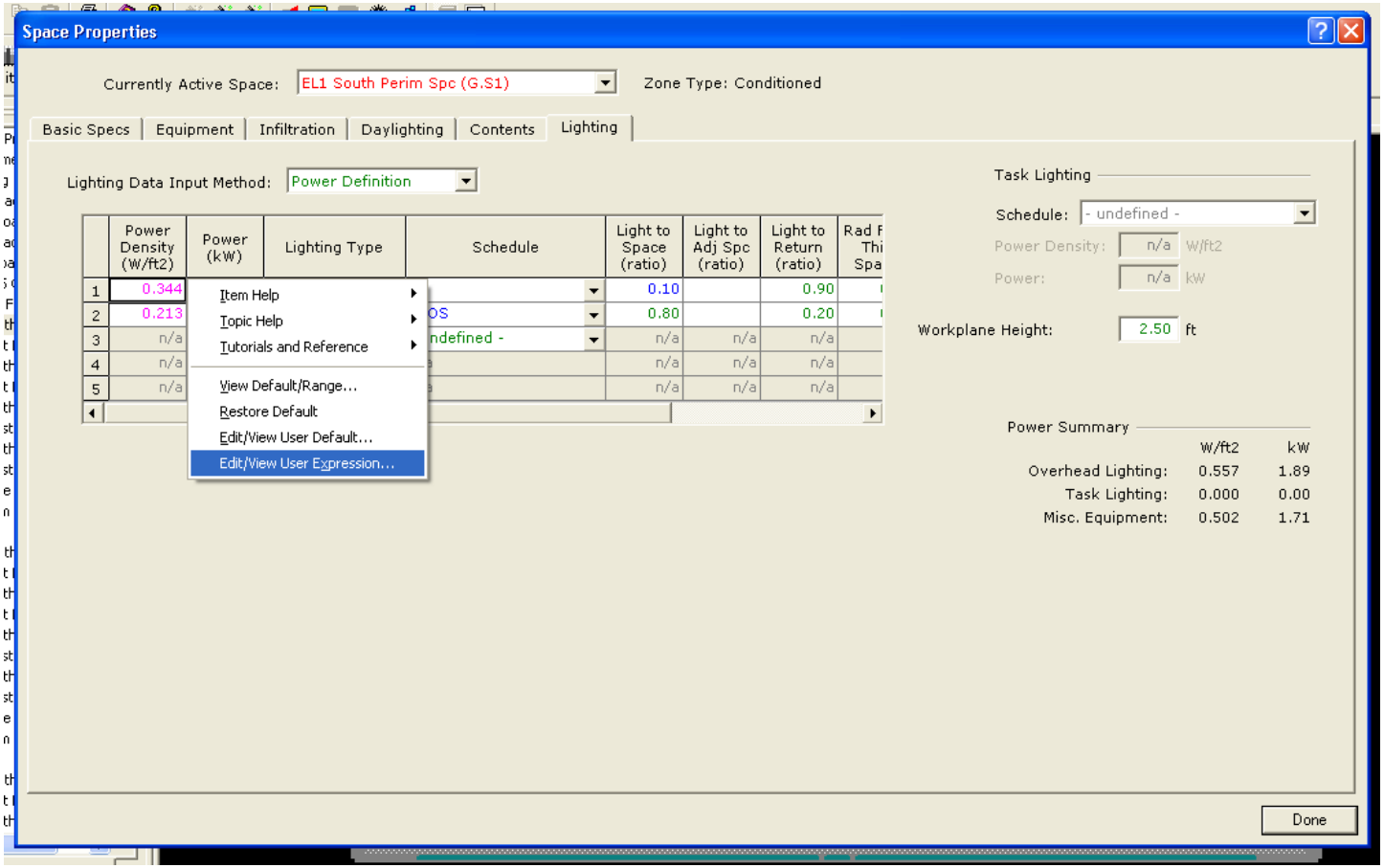
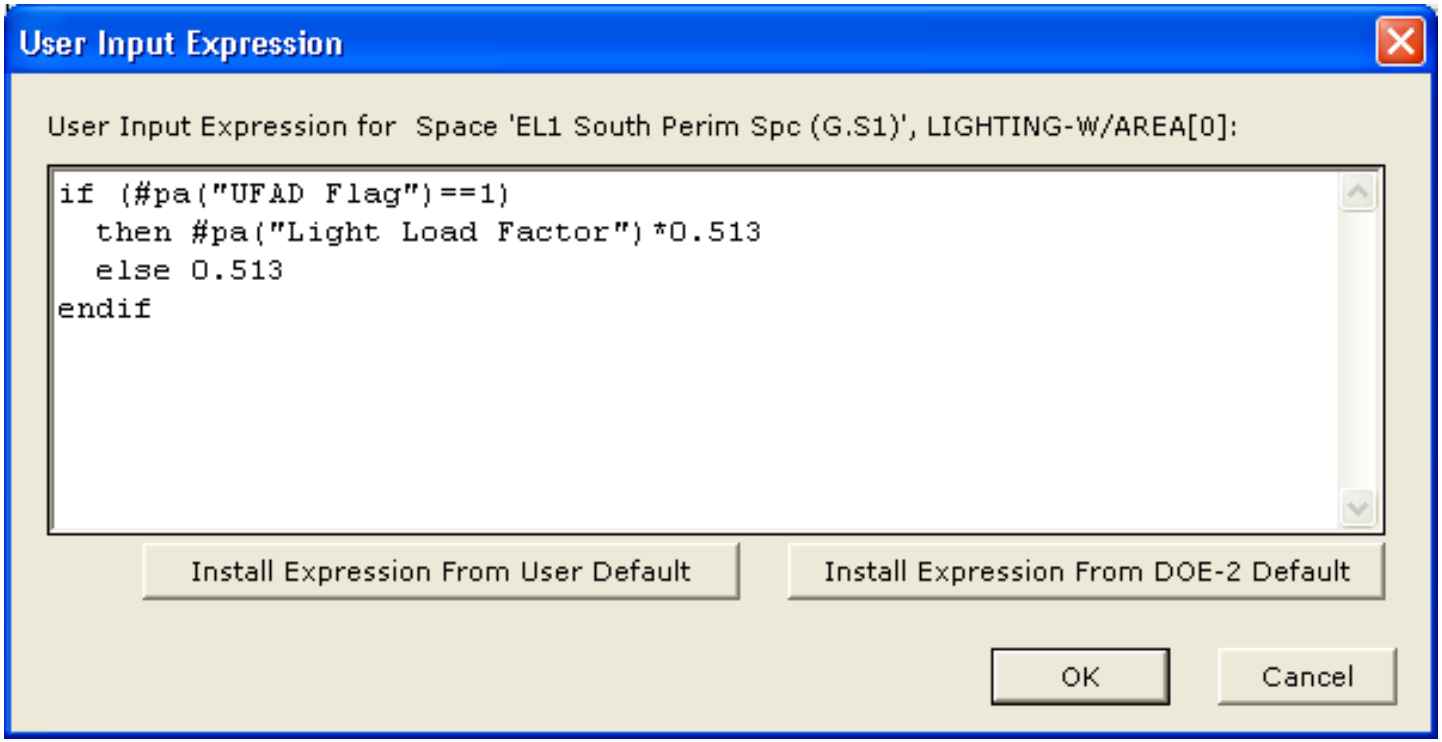
5. Variables Within Entry Fields
    a. Parameter or #PA
        i. User defined numbers
        ii. Returns the value of a BDL-defined PARAMETER u-name.
        iii. Syntax: Parameter(str) or #PA(str)
            1. where str is the u-name of a PARAMETER defined in the BDL file
            2. #PA("Variable Name")
        iv. Example

```
PARAMETER
   "Light Load Factor"   = 0.75  ..
LIGHTING-W/AREA = #pa("Light Load Factor")*0.513 ..
```

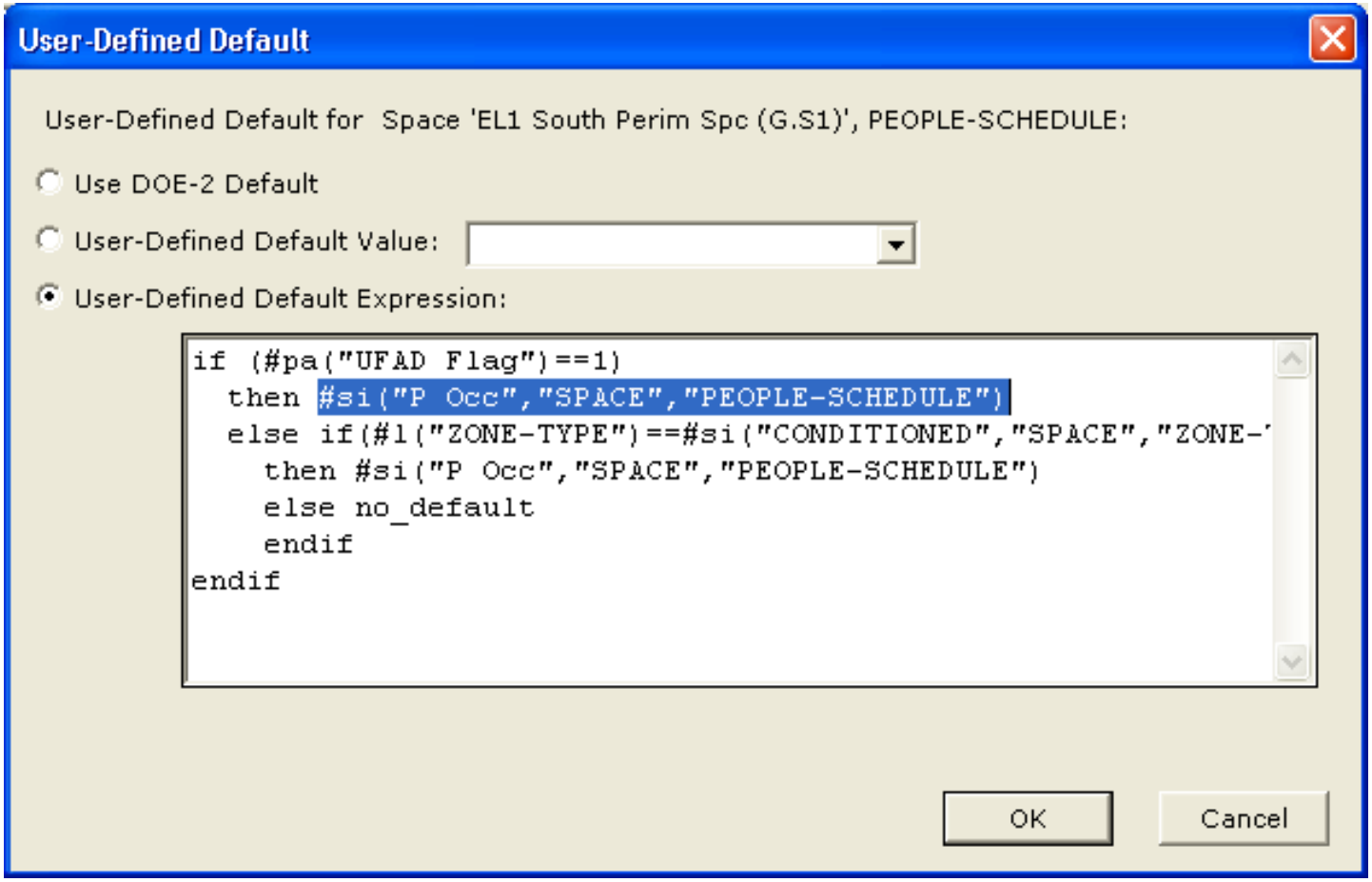

Space Properties
Currently Active Space: EL1 South Perim Spc (G.S1)
Zone Type: Conditioned
Basic Specs | Equipment | Infiltration | Daylighting | Contents | Lighting
Lighting Data Input Method: Power Definition
Power Density (W/ft2) | Power (kW) | Lighting Type | Schedule | Light to Space (ratio) | Light to Adj Spc (ratio) | Light to Return (ratio) | Rad F Thi Spa
1 | 0.344 | | Rec Fluor RV | Lt | 0.10 | | 0.90
2 | 0.213 | n/a | Rec Fluor RV | Lt OS | 0.80 | | 0.20
3 | n/a | n/a | Sus Fluor | - undefined - | n/a | n/a | n/a
4 | n/a | n/a | Sus Fluor | n/a | n/a | n/a | n/a
5 | n/a | n/a | Sus Fluor | n/a | n/a | n/a | n/a
Task Lighting
Schedule: - undefined -
Power Density: n/a W/ft2
Power: n/a kW
Workplane Height: 2.50 ft
Power Summary
W/ft2 kW
Overhead Lighting: 0.557 1.89
Task Lighting: 0.000 0.00
Misc. Equipment: 0.502 1.71
Done


Space Properties
Currently Active Space: EL1 South Perim Spc (G.S1)
Zone Type: Conditioned
Basic Specs
Equipment
Infiltration
Daylighting
Contents
Lighting
Lighting Data Input Method: Power Definition
Power Density (W/ft2)
Power (kW)
Lighting Type
Schedule
Light to Space (ratio)
Light to Adj Spc (ratio)
Light to Return (ratio)
1 0.344 0.10 0.90
2 0.213 0.80 0.20
3 n/a
4 n/a
5 n/a
Item Help
Topic Help
Tutorials and Reference
View Default/Range...
Restore Default
Edit/View User Default...
Edit/View User Expression...
Task Lighting
Schedule: - undefined -
Power Density: n/a W/ft2
Power: n/a kW
Workplane Height: 2.50 ft
Power Summary
W/ft2 kW
Overhead Lighting: 0.557 1.89
Task Lighting: 0.000 0.00
Misc. Equipment: 0.502 1.71
Done


User Input Expression
User Input Expression for Space 'EL1 South Perim Spc (G.S1)', LIGHTING-W/AREA[0]:
if (#pa("UFAD Flag")==1)
then #pa("Light Load Factor")*0.513
else 0.513
endif
Install Expression From User Default
Install Expression From DOE-2 Default
OK
Cancel

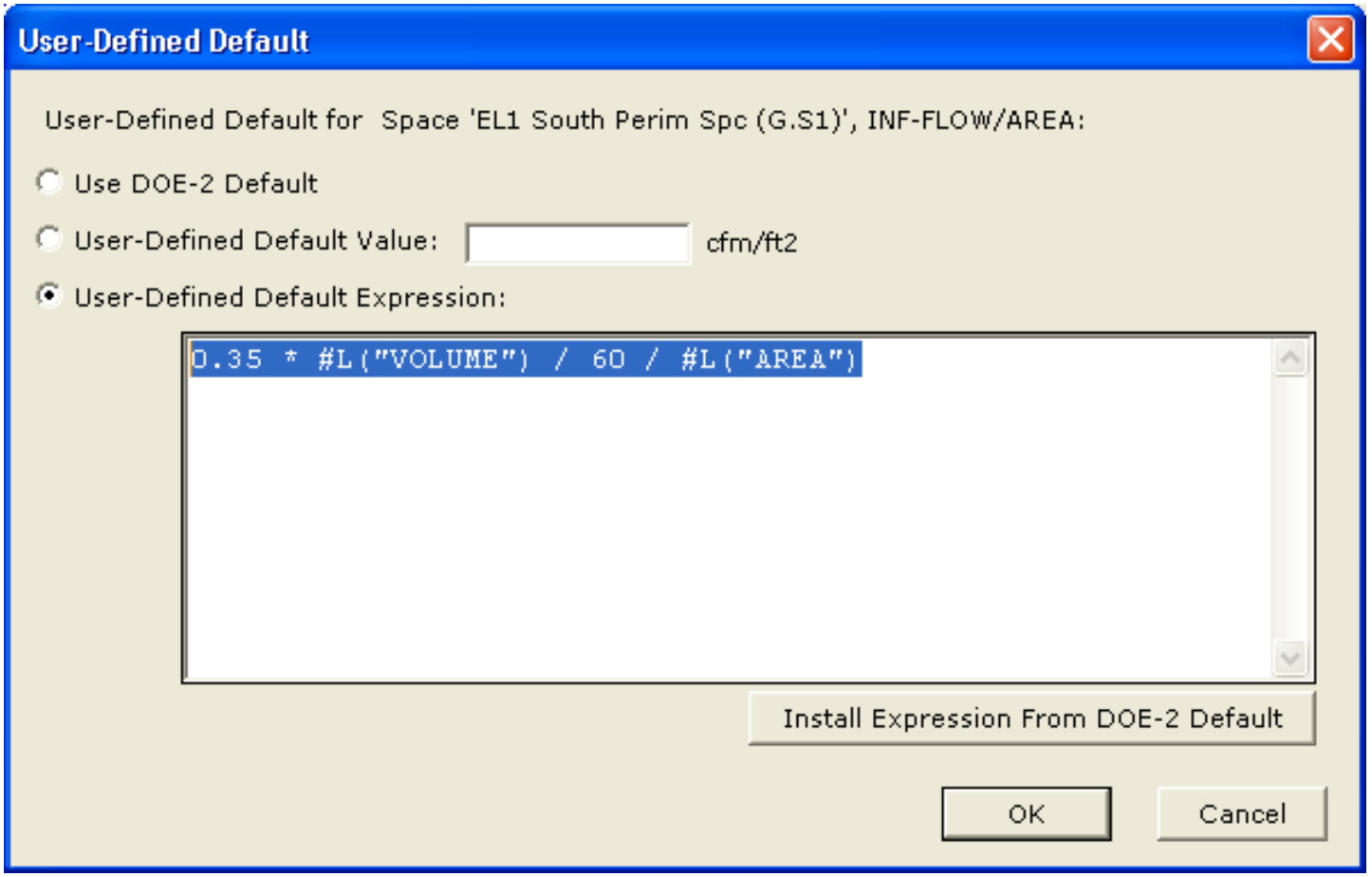
b. SymIndex or #SI
   i. Returns the symbol table index of the symbol named.
   ii. Syntax: SymIndex(str,com,key) or #SI(str,com,key)
      1. where str is the character string of a BDL symbol, com is a command, key is a keyword. The second two arguments are optional, so the user can call this function with just str, with both str and com, or with all three.
      2. SymIndex(str): returns the symbol index of the symbol matching the character string str and of the same symbol type as the keyword being set by the expression.
      3. SymIndex(str, com): returns the symbol index of the symbol matching the character string str and of the same symbol type as the command specified by the com argument.
      4. SymIndex(str, com, key): returns the symbol index of the symbol matching the character string str and of the symbol type compatible with the com : key arguments.
   iii. Example

```
PEOPLE-SCHEDULE  =
#SI("P Occ","SPACE","PEOPLE-SCHEDULE")
```


User-Defined Default
User-Defined Default for Space 'EL1 South Perim Spc (G.S1)', PEOPLE-SCHEDULE:
Use DOE-2 Default
User-Defined Default Value:
User-Defined Default Expression:
if (#pa("UFAD Flag")==1)
then #si("P Occ","SPACE","PEOPLE-SCHEDULE")
else if(#l("ZONE-TYPE")==#si("CONDITIONED","SPACE","ZONE-
then #si("P Occ","SPACE","PEOPLE-SCHEDULE")
else no_default
endif
endif
OK
Cancel

c. Local or #L
   i. Returns the value of a local keyword. See also BDL function notes.
   ii. Syntax: Local(com, key, i) or #L(com, key, i)
      1. where com is a command, key is a keyword, and i is the ith value of the local keyword.
   iii. Example

```
INF-FLOW/AREA = {0.35*#L("VOLUME")/60/#L("AREA")}
```


User-Defined Default
User-Defined Default for Space 'EL1 South Perim Spc (G.S1)', INF-FLOW/AREA:
Use DOE-2 Default
User-Defined Default Value:
cfm/ft2
User-Defined Default Expression:
0.35 * #L("VOLUME") / 60 / #L("AREA")
Install Expression From DOE-2 Default
OK
Cancel

d. ResVal or #RV

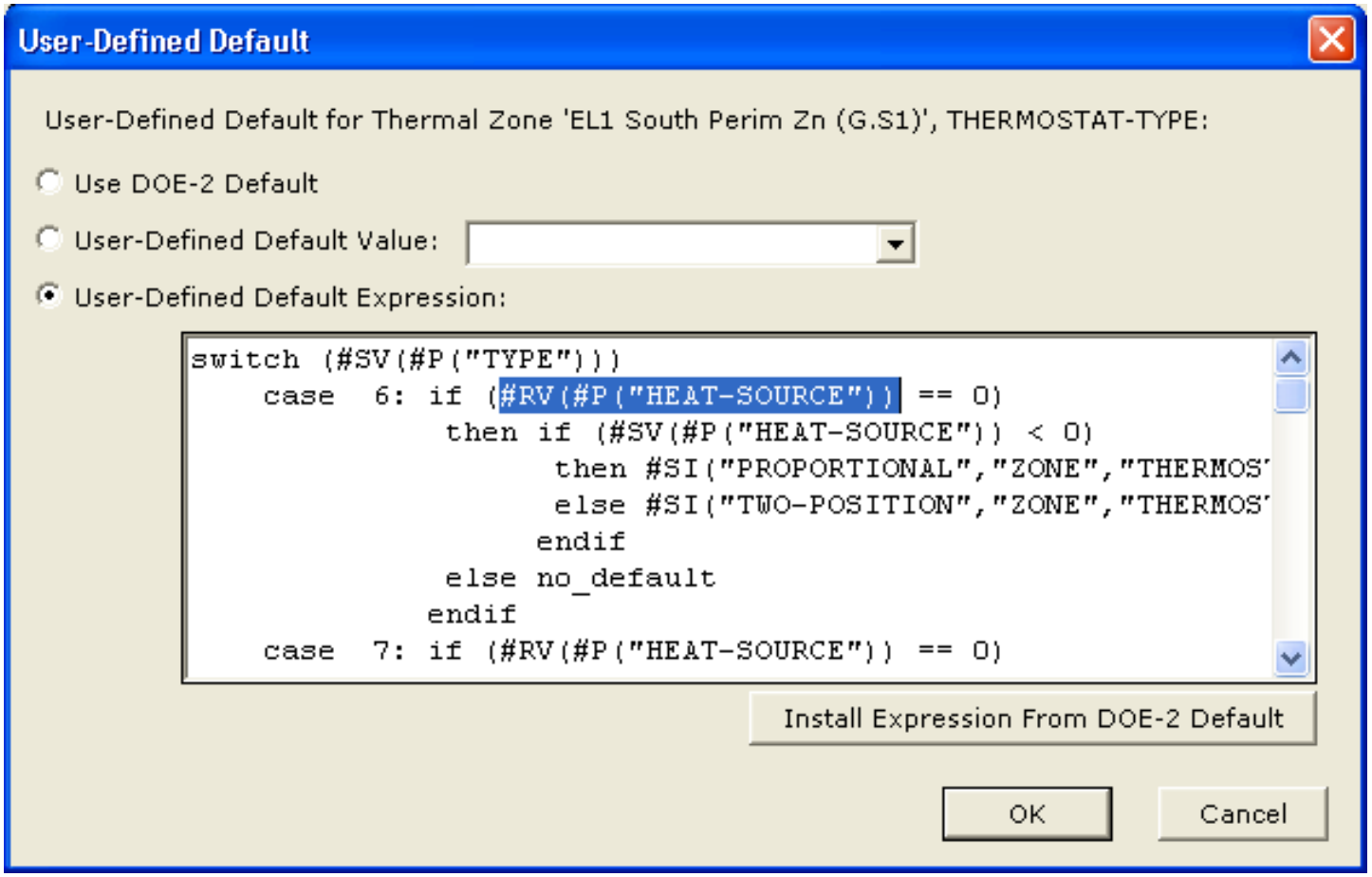
   i. Returns an integer that specifies whether the argument is required, unused, has no default, or is unfilled. The integer that this function returns can be interpreted as follows:

      1. 0 if argument is not a BDL reserved value
         1 if argument = -99999.0 or "required"
         2 if argument = -88888.0 or "unused"
         3 if argument = -77777.0 or "no default"
         4 if argument = -66666.0 or "unfilled"

   ii. Syntax: ResVal(number) or #RV(number)

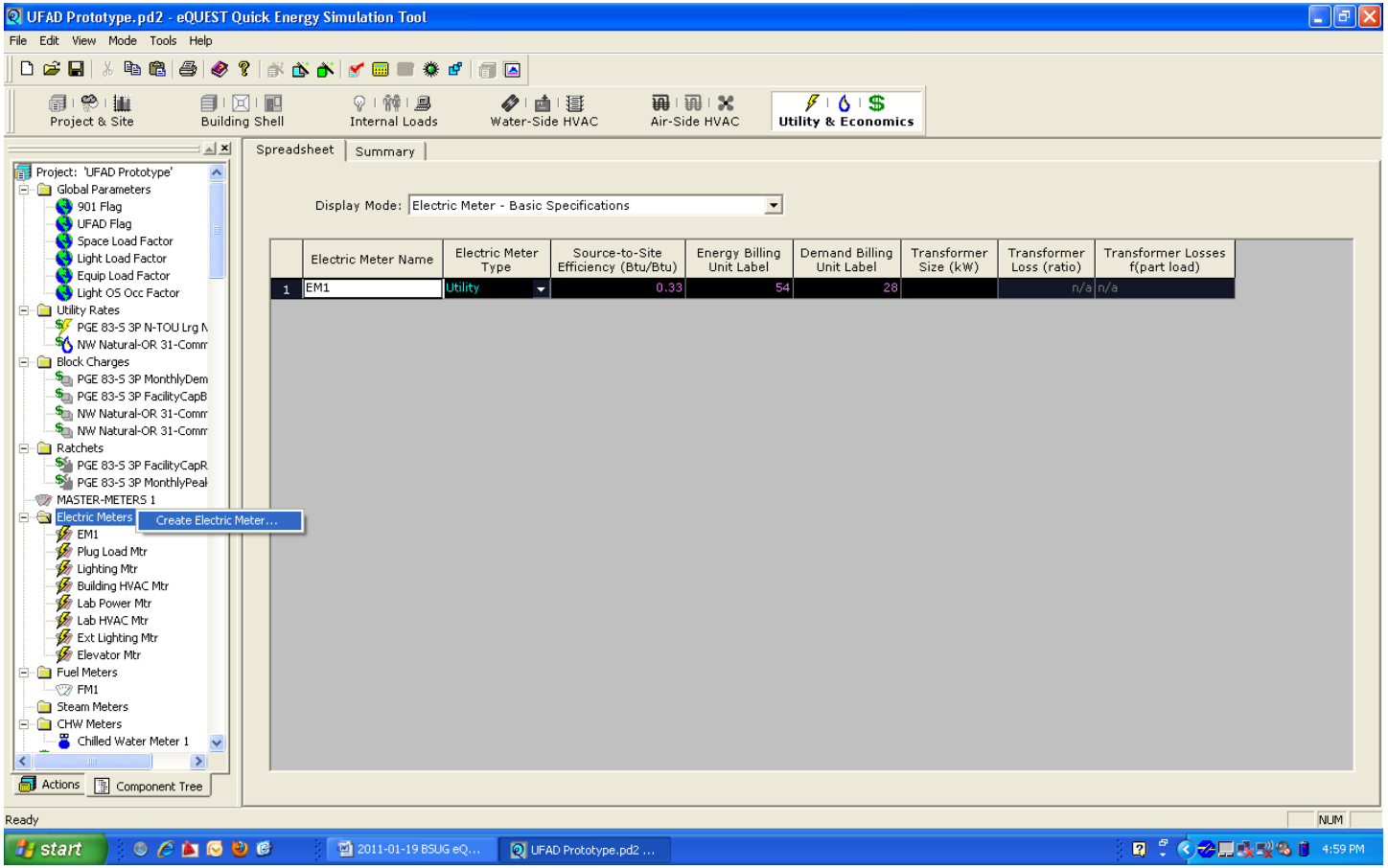
      1. where number is the character string of a BDL symbol.

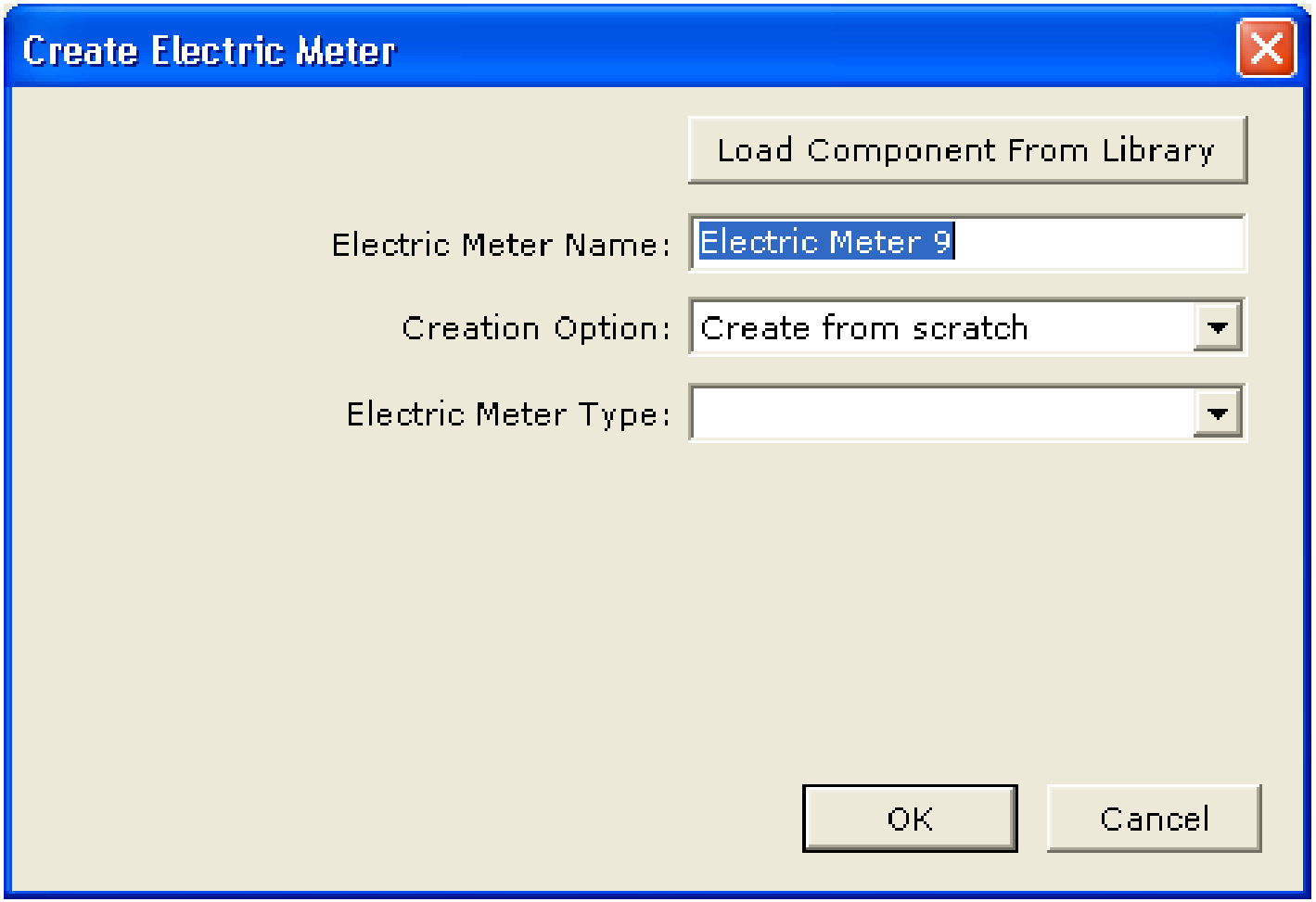
```
THERMOSTAT-TYPE  =
    case  6: if (#RV(#P("HEAT-SOURCE")) == 0)
    then if (#SV(#P("HEAT-SOURCE")) < 0)
    then #SI("PROPORTIONAL","ZONE","THERMOSTAT-TYPE")
    else #SI("TWO-POSITION","ZONE","THERMOSTAT-TYPE")
endif
    else no_default
             endif
```

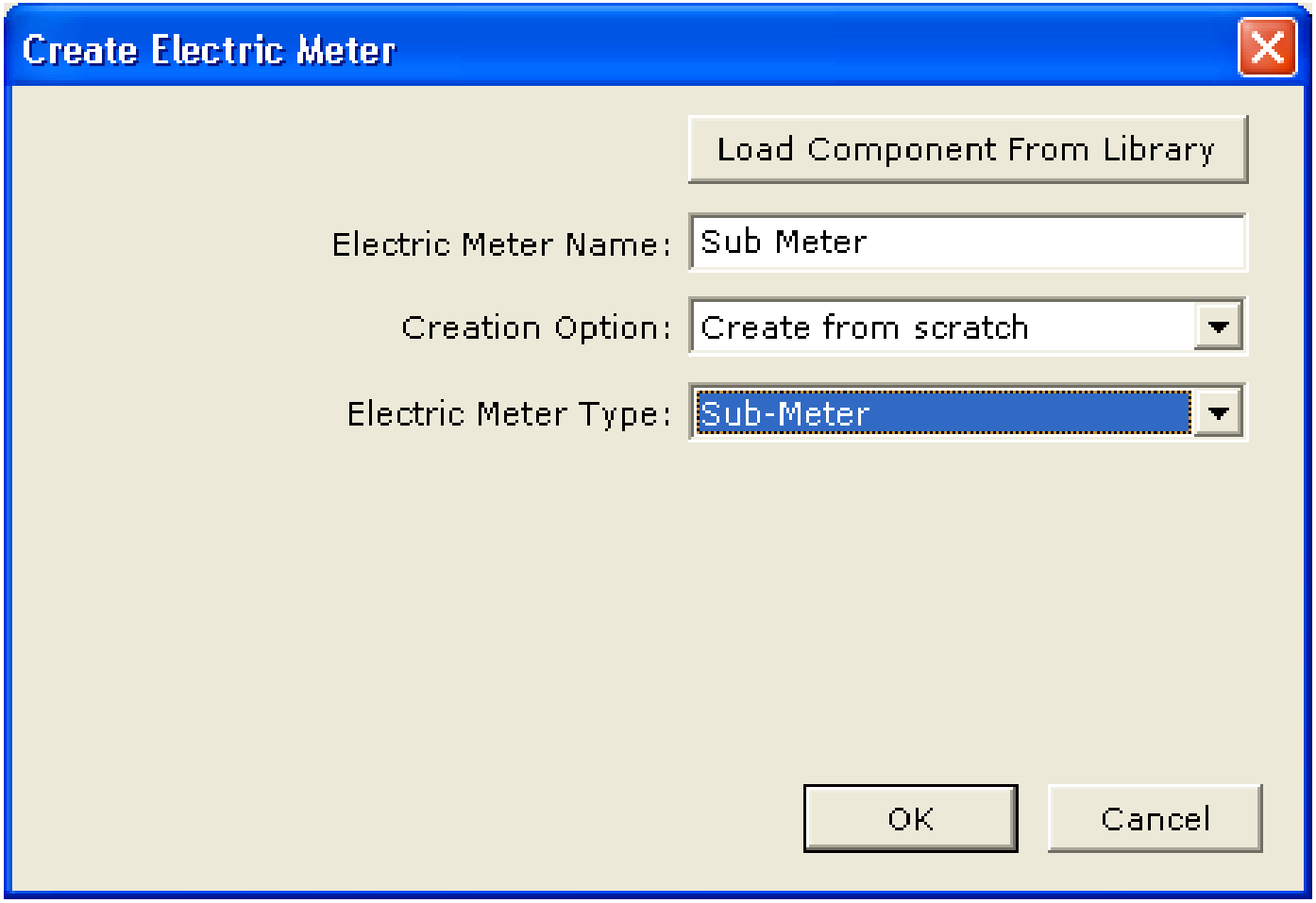

User-Defined Default
User-Defined Default for Thermal Zone 'EL1 South Perim Zn (G.S1)', THERMOSTAT-TYPE:
Use DOE-2 Default
User-Defined Default Value:
User-Defined Default Expression:
switch (#SV(#P("TYPE")))
case 6: if (#RV(#P("HEAT-SOURCE")) == 0)
then if (#SV(#P("HEAT-SOURCE")) < 0)
then #SI("PROPORTIONAL","ZONE","THERMOS
else #SI("TWO-POSITION","ZONE","THERMOS
endif
else no_default
endif
case 7: if (#RV(#P("HEAT-SOURCE")) == 0)
Install Expression From DOE-2 Default
OK
Cancel

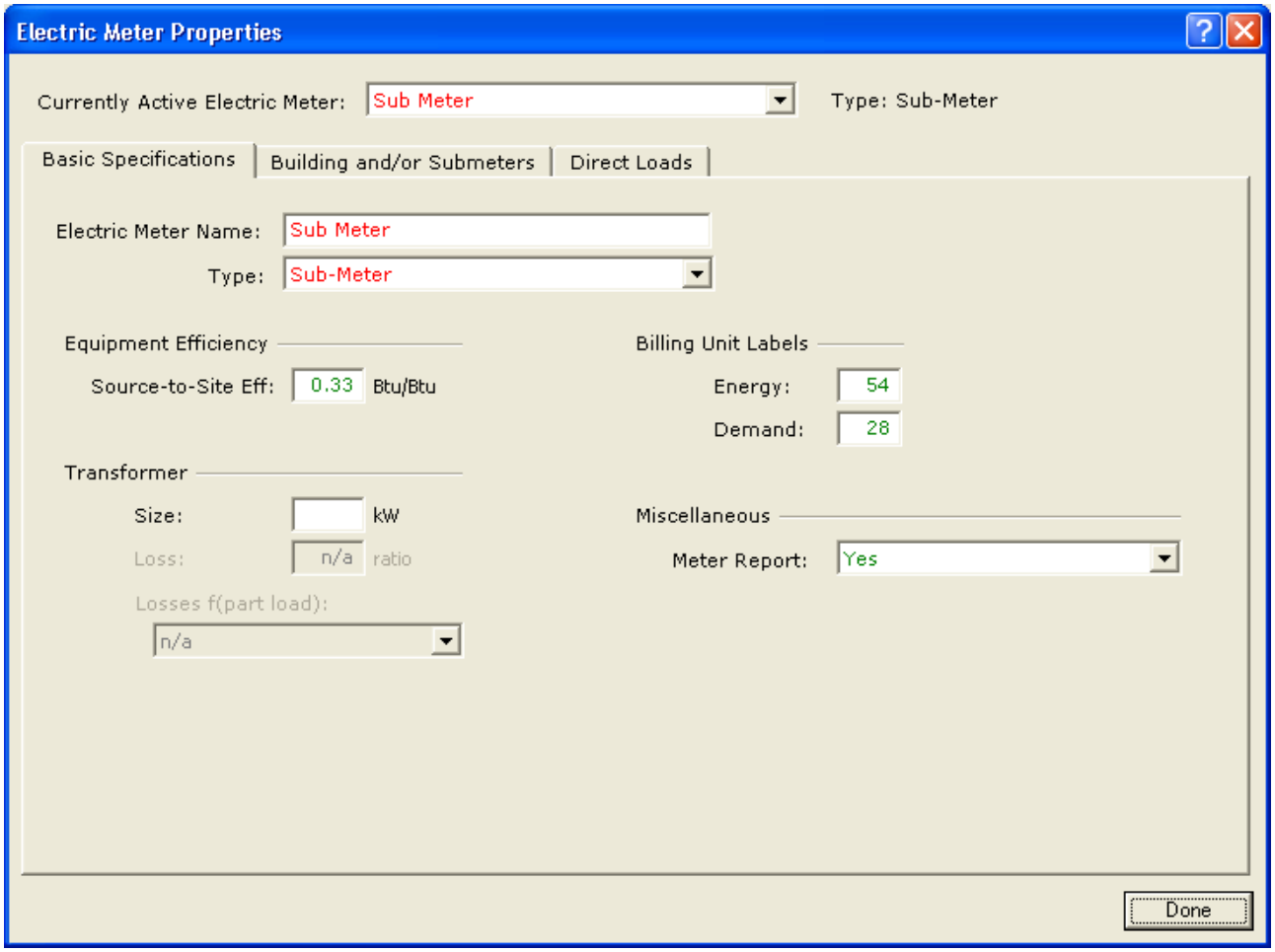
1. Detailed Mode
2. Text Editors
3. Help File References
4. Non-standard UFAD Model
5. Variables Within Entry Fields
6. Creating Custom Meters
7. IF-THEN-ELSE Statements
8. Parametric Runs
9. Using Custom Hourly Reports for Troubleshooting

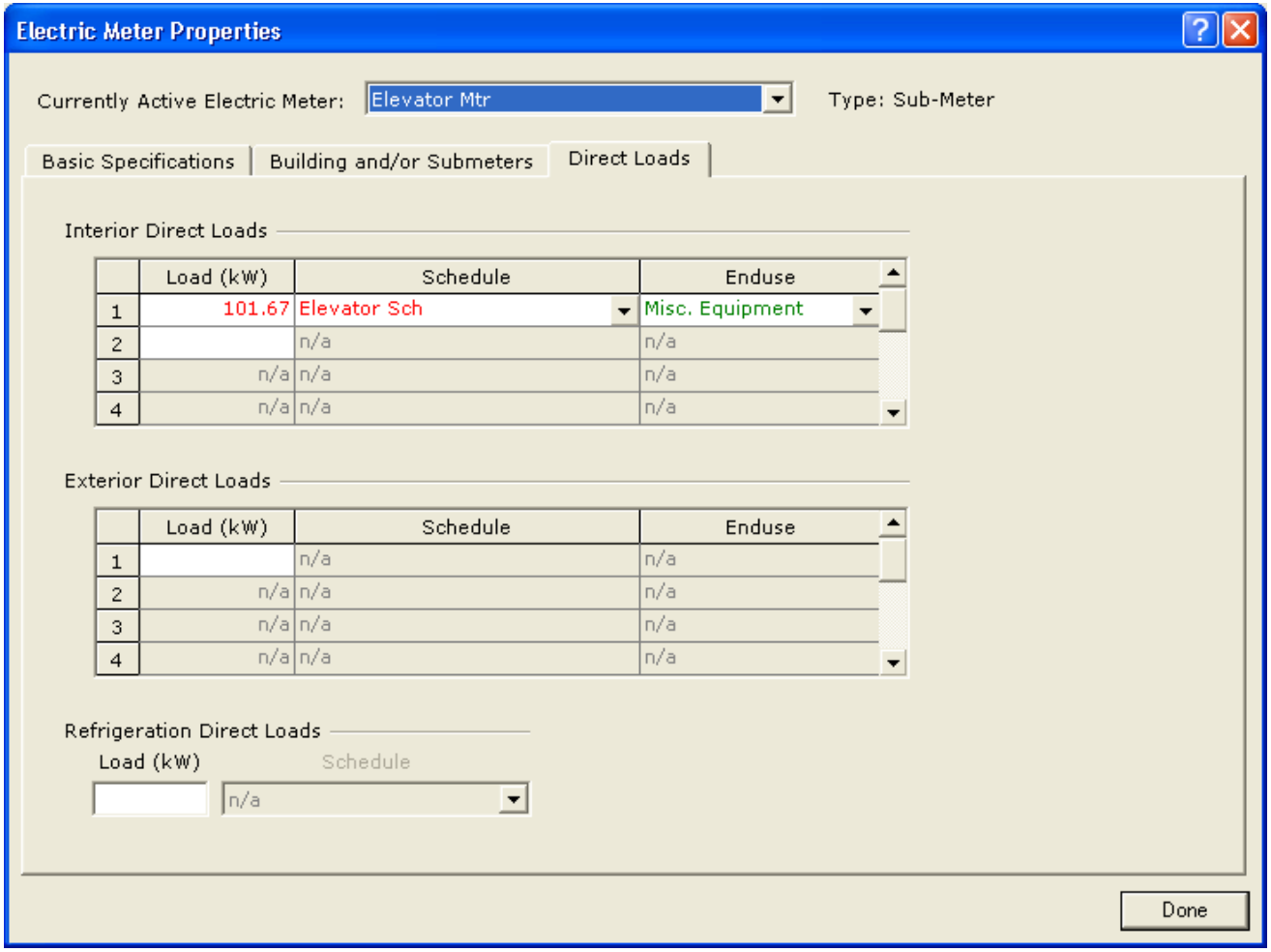
6. Creating Custom Meters

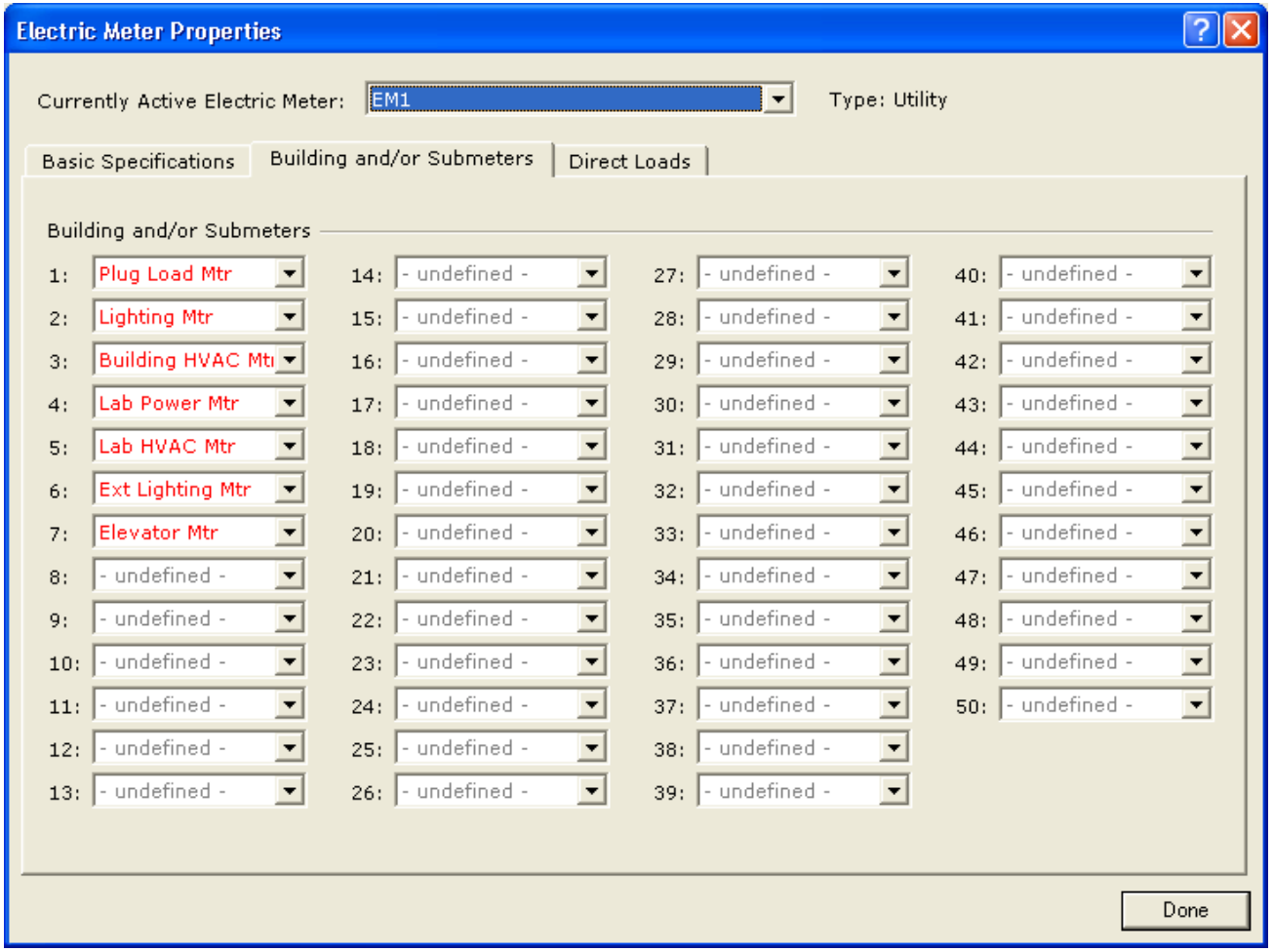


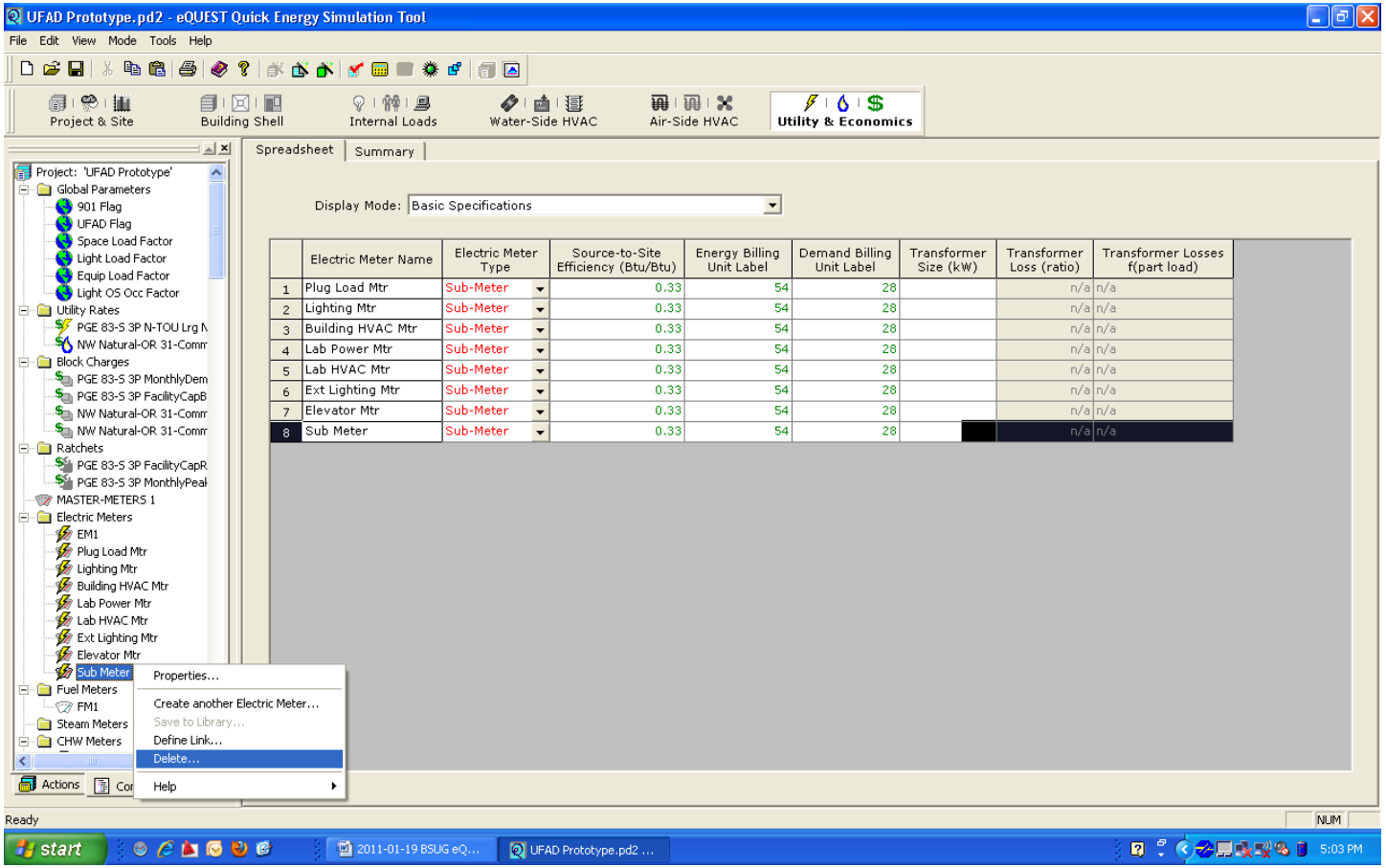

Create Electric Meter
Load Component From Library
Electric Meter Name:
Electric Meter 9
Creation Option:
Create from scratch
Electric Meter Type:
OK
Cancel

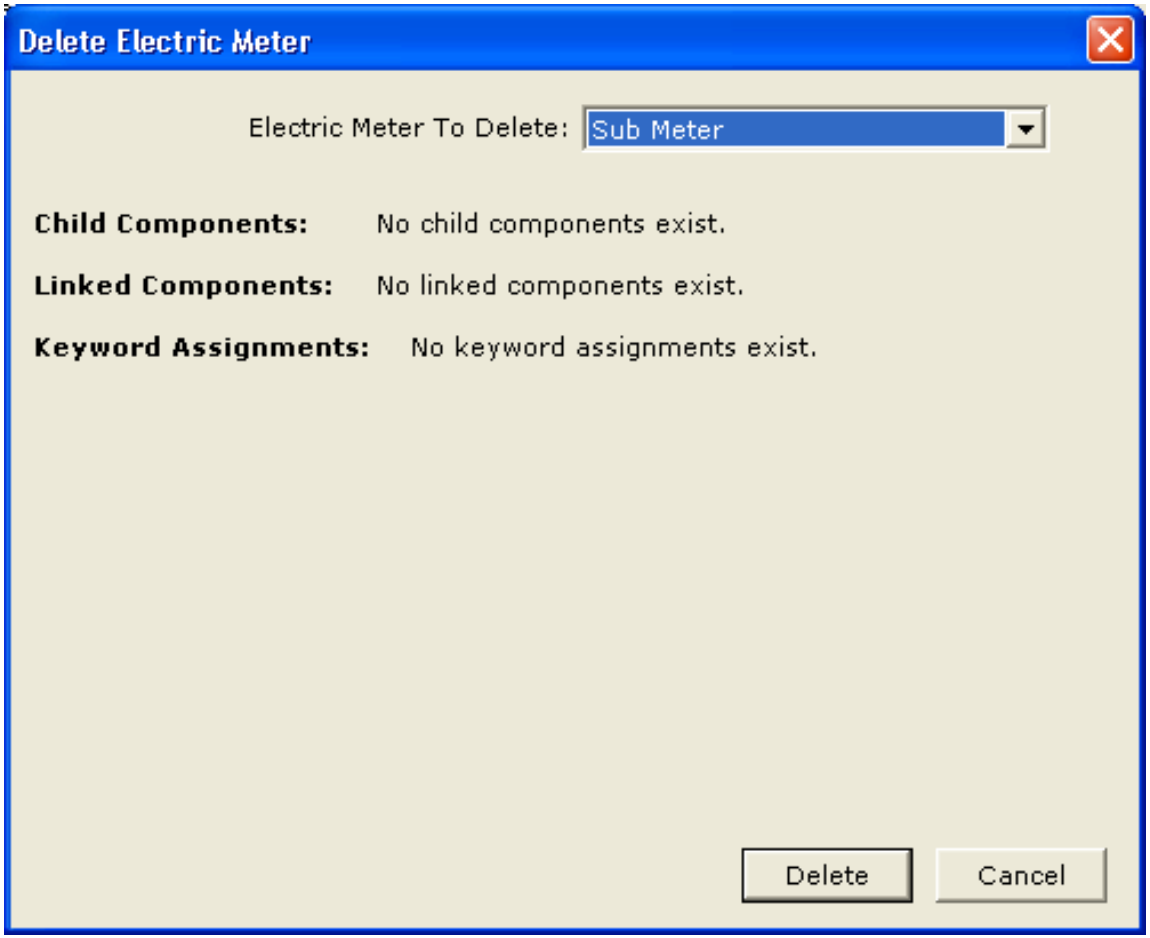

Create Electric Meter
Load Component From Library
Electric Meter Name:
Sub Meter
Creation Option:
Create from scratch
Electric Meter Type:
Sub-Meter
OK
Cancel

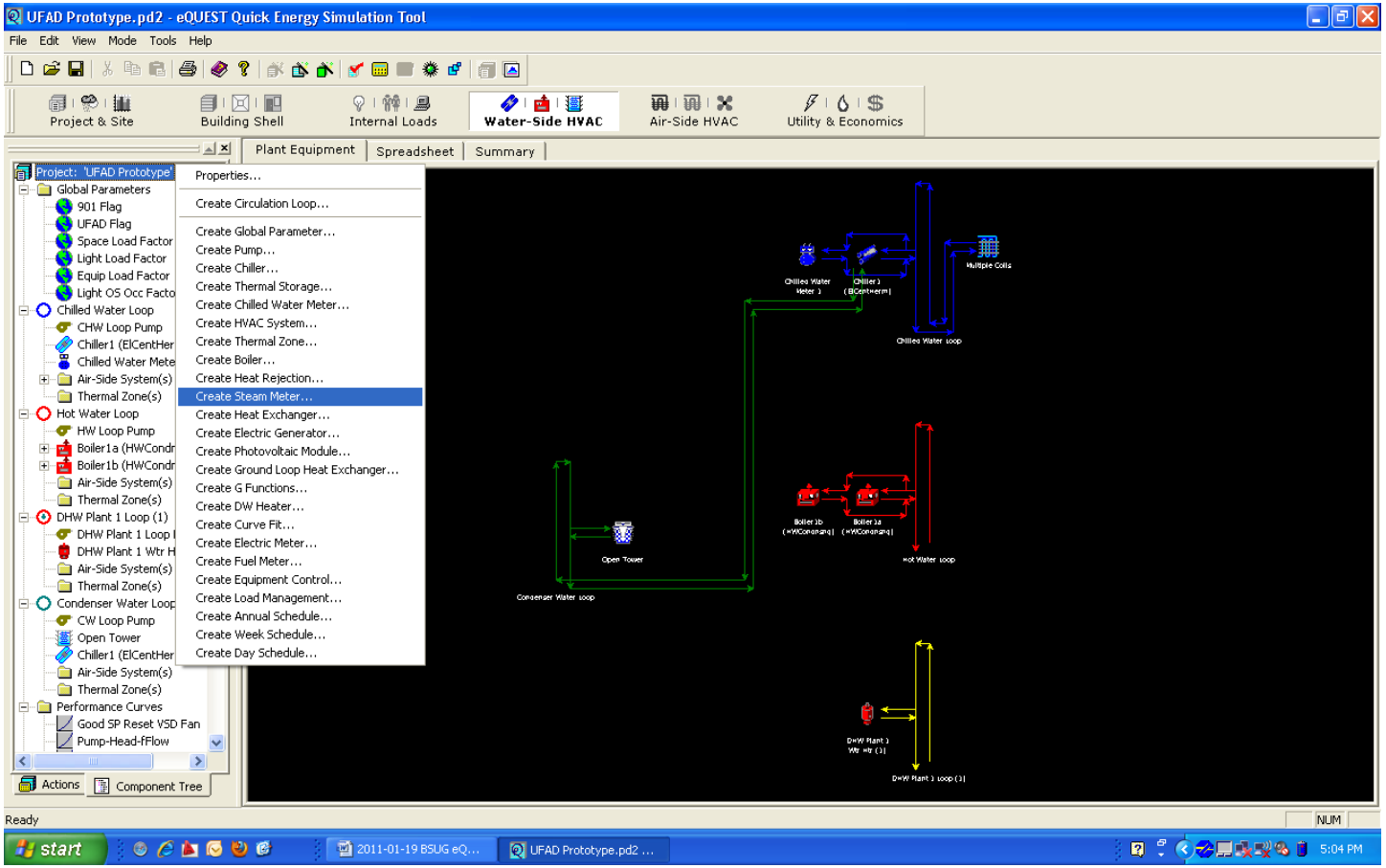

Electric Meter Properties
Currently Active Electric Meter: Sub Meter
Type: Sub-Meter
Basic Specifications
Building and/or Submeters
Direct Loads
Electric Meter Name: Sub Meter
Type: Sub-Meter
Equipment Efficiency
Source-to-Site Eff: 0.33 Btu/Btu
Billing Unit Labels
Energy: 54
Demand: 28
Transformer
Size: kW
Loss: n/a ratio
Losses f(part load):
n/a
Miscellaneous
Meter Report: Yes
Done

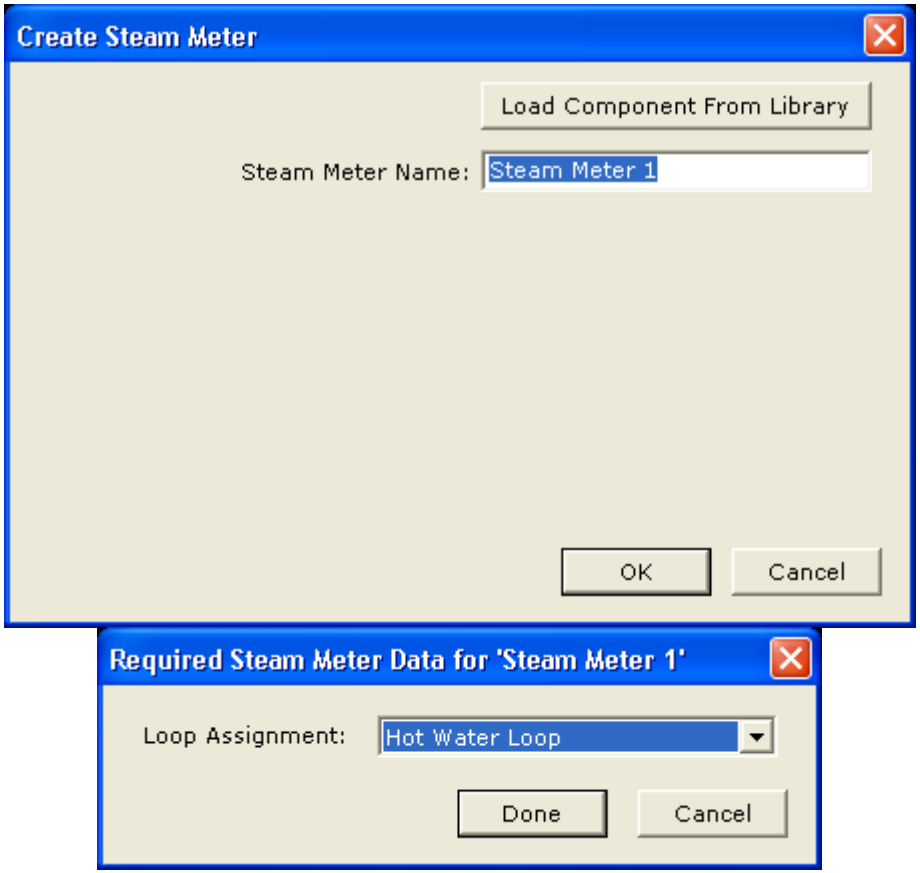

Electric Meter Properties
Currently Active Electric Meter: Elevator Mtr
Type: Sub-Meter
Basic Specifications
Building and/or Submeters
Direct Loads
Interior Direct Loads
Load (kW)
Schedule
Enduse
1 101.67 Elevator Sch Misc. Equipment
2 n/a n/a n/a
3 n/a n/a n/a
4 n/a n/a n/a
Exterior Direct Loads
Load (kW)
Schedule
Enduse
1 n/a n/a n/a
2 n/a n/a n/a
3 n/a n/a n/a
4 n/a n/a n/a
Refrigeration Direct Loads
Load (kW)
Schedule
n/a
Done

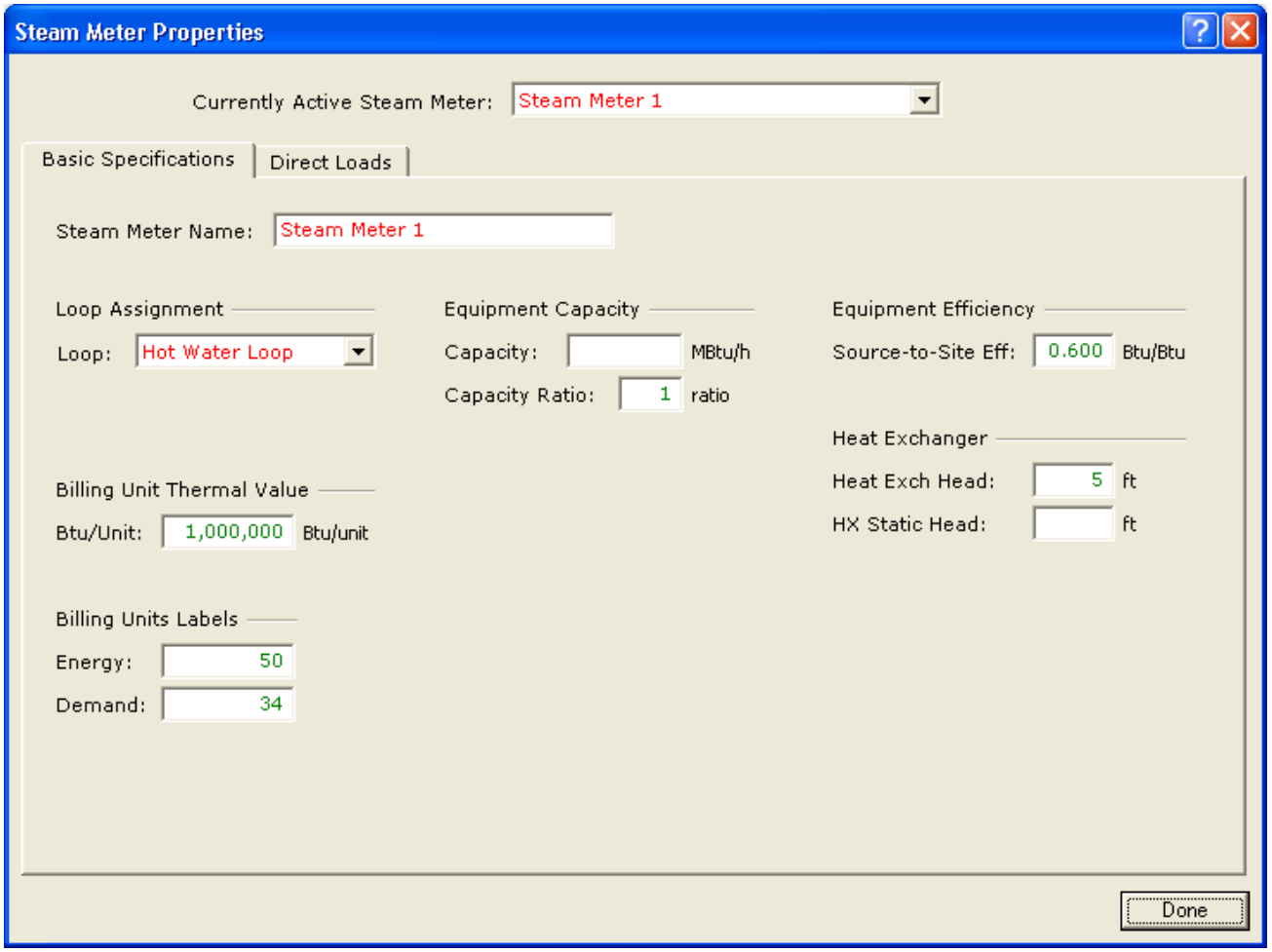



UFAD Prototype.pd2 - eQUEST Quick Energy Simulation Tool
File Edit View Mode Tools Help
Project & Site
Building Shell
Internal Loads
Water-Side HVAC
Air-Side HVAC
Utility & Economics
Spreadsheet
Summary
Display Mode: Basic Specifications
Electric Meter Name
Electric Meter Type
Source-to-Site Efficiency (Btu/Btu)
Energy Billing Unit Label
Demand Billing Unit Label
Transformer Size (kW)
Transformer Loss (ratio)
Transformer Losses f(part load)
1 Plug Load Mtr Sub-Meter 0.33 54 28 n/a n/a
2 Lighting Mtr Sub-Meter 0.33 54 28 n/a n/a
3 Building HVAC Mtr Sub-Meter 0.33 54 28 n/a n/a
4 Lab Power Mtr Sub-Meter 0.33 54 28 n/a n/a
5 Lab HVAC Mtr Sub-Meter 0.33 54 28 n/a n/a
6 Ext Lighting Mtr Sub-Meter 0.33 54 28 n/a n/a
7 Elevator Mtr Sub-Meter 0.33 54 28 n/a n/a
8 Sub Meter Sub-Meter 0.33 54 28 n/a n/a
Project: 'UFAD Prototype'
Global Parameters
901 Flag
UFAD Flag
Space Load Factor
Light Load Factor
Equip Load Factor
Light OS Occ Factor
Utility Rates
Block Charges
Ratchets
MASTER-METERS 1
Electric Meters
EM1
Plug Load Mtr
Lighting Mtr
Building HVAC Mtr
Lab Power Mtr
Lab HVAC Mtr
Ext Lighting Mtr
Elevator Mtr
Sub Meter
Fuel Meters
FM1
Steam Meters
CHW Meters
Properties...
Create another Electric Meter...
Save to Library...
Define Link...
Delete...
Help
Actions
Ready
NUM
start
2011-01-19 BSUG eQ...
UFAD Prototype.pd2 ...
5:03 PM


Delete Electric Meter
Electric Meter To Delete:
Sub Meter
Child Components:
No child components exist.
Linked Components:
No linked components exist.
Keyword Assignments:
No keyword assignments exist.
Delete
Cancel




Create Steam Meter
Load Component From Library
Steam Meter Name:
Steam Meter 1
OK
Cancel
Required Steam Meter Data for 'Steam Meter 1'
Loop Assignment:
Hot Water Loop
Done
Cancel

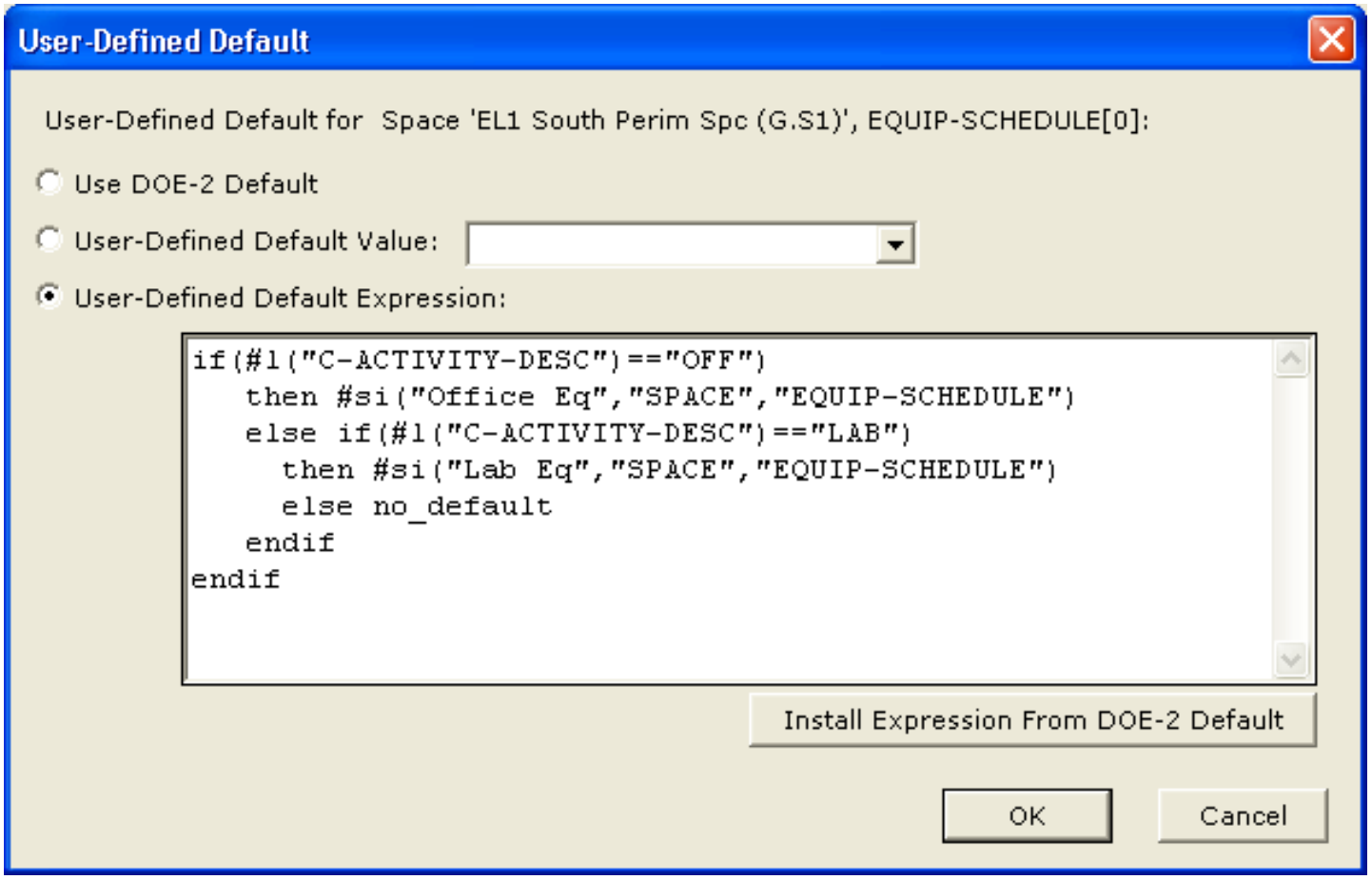

Steam Meter Properties
Currently Active Steam Meter: Steam Meter 1
Basic Specifications
Direct Loads
Steam Meter Name: Steam Meter 1
Loop Assignment
Loop: Hot Water Loop
Equipment Capacity
Capacity: MBtu/h
Capacity Ratio: 1 ratio
Equipment Efficiency
Source-to-Site Eff: 0.600 Btu/Btu
Heat Exchanger
Heat Exch Head: 5 ft
HX Static Head: ft
Billing Unit Thermal Value
Btu/Unit: 1,000,000 Btu/unit
Billing Units Labels
Energy: 50
Demand: 34
Done

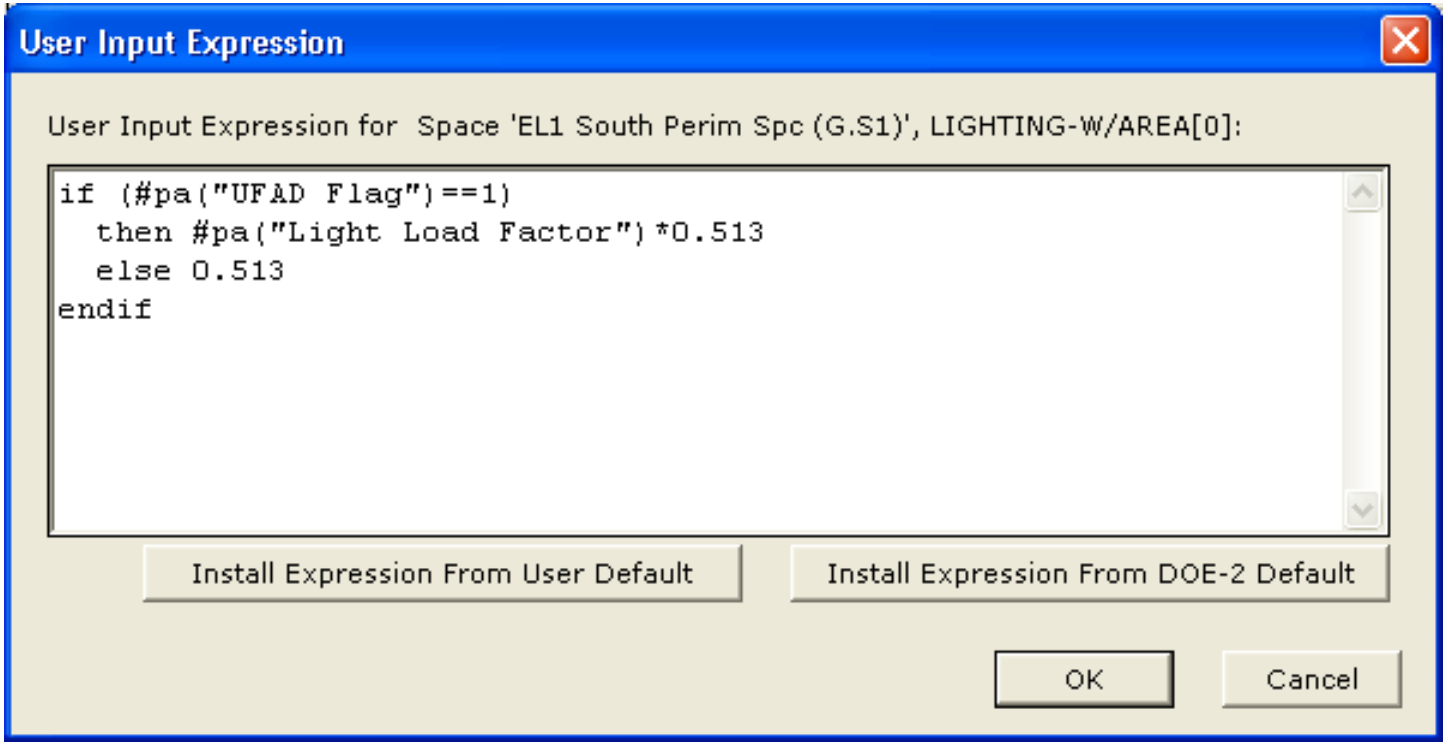
1. Detailed Mode
2. Text Editors
3. Help File References
4. Non-standard UFAD Model
5. Variables Within Entry Fields
6. Creating Custom Meters
7. IF-THEN-ELSE Statements
8. Parametric Runs
9. Using Custom Hourly Reports for Troubleshooting

7. IF-THEN-ELSE Statements
    a. Returns one value if an expression evaluates to TRUE and another value if it evaluates to FALSE. If-then statements can be nested and each loop must be closed with an endif statement.
    b. Structure

```
{if (expression1)
  then statement1
  else if (expression2)
    then statement2
    else statement3
    endif
endif}
```

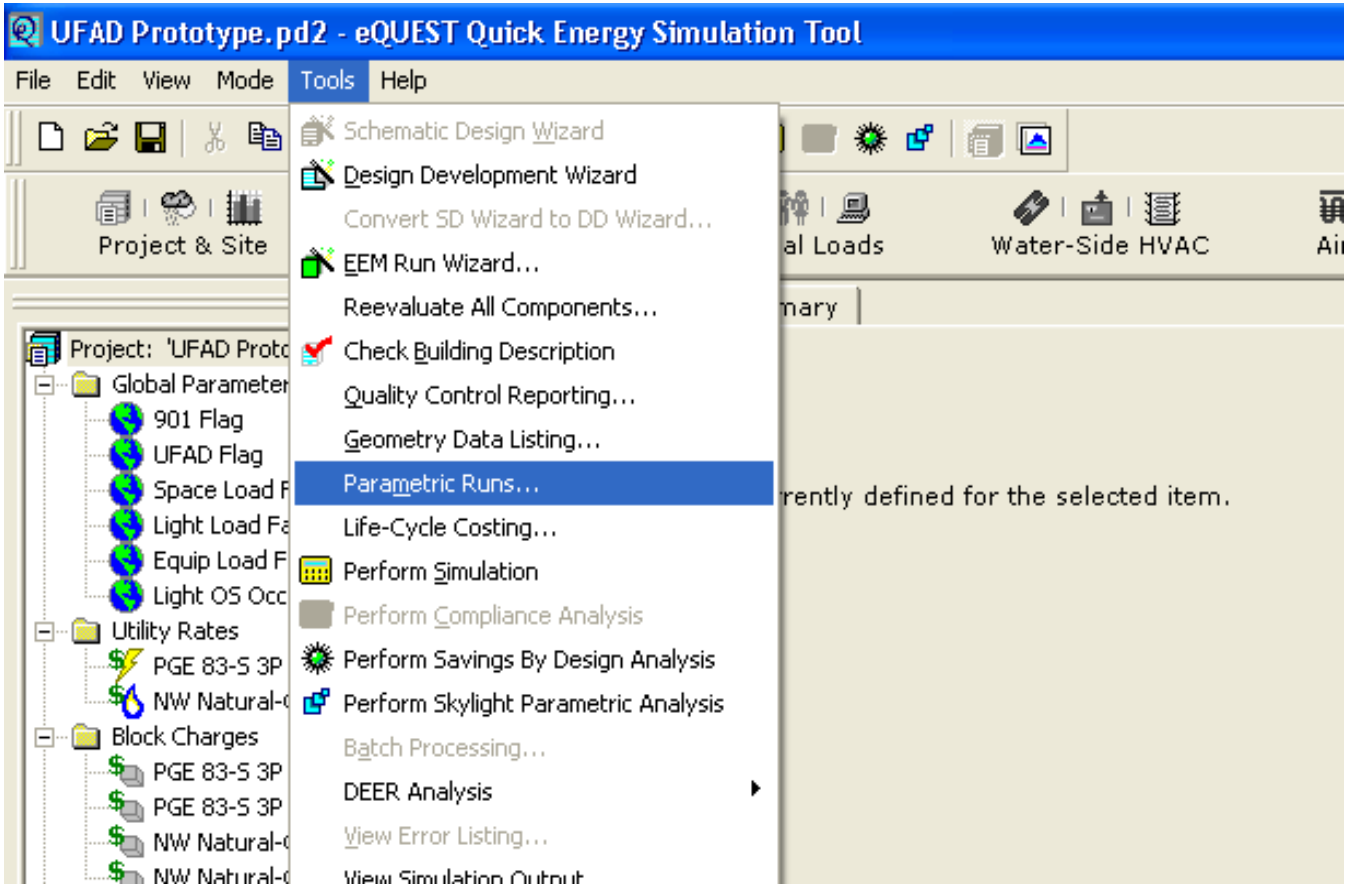
    c. Where (expression#) are expressions get evaluated to TRUE or FALSE (statement#) is the statement that is executed based on the evaluation of expression#

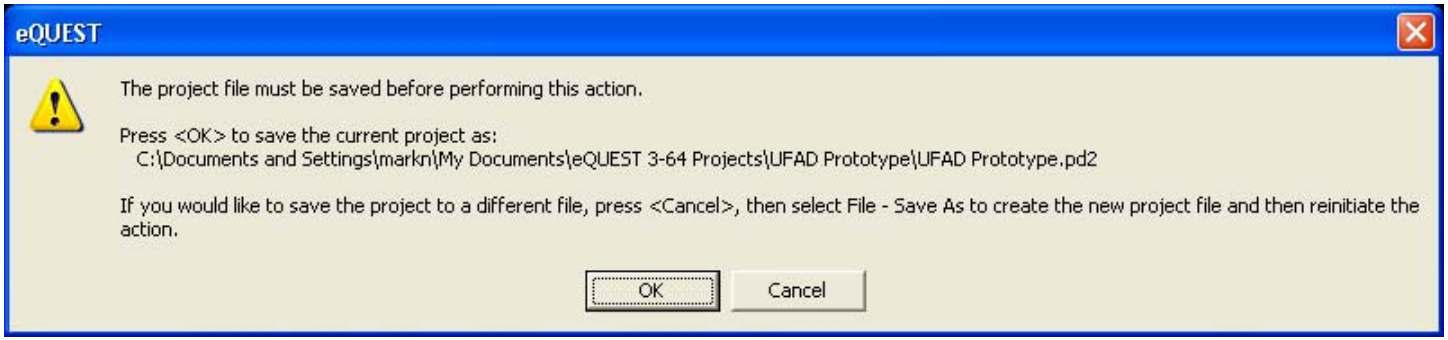

User-Defined Default
User-Defined Default for Space 'EL1 South Perim Spc (G.S1)', EQUIP-SCHEDULE[0]:
Use DOE-2 Default
User-Defined Default Value:
User-Defined Default Expression:
if(#l("C-ACTIVITY-DESC")=="OFF")
then #si("Office Eq","SPACE","EQUIP-SCHEDULE")
else if(#l("C-ACTIVITY-DESC")=="LAB")
then #si("Lab Eq","SPACE","EQUIP-SCHEDULE")
else no_default
endif
endif
Install Expression From DOE-2 Default
OK
Cancel

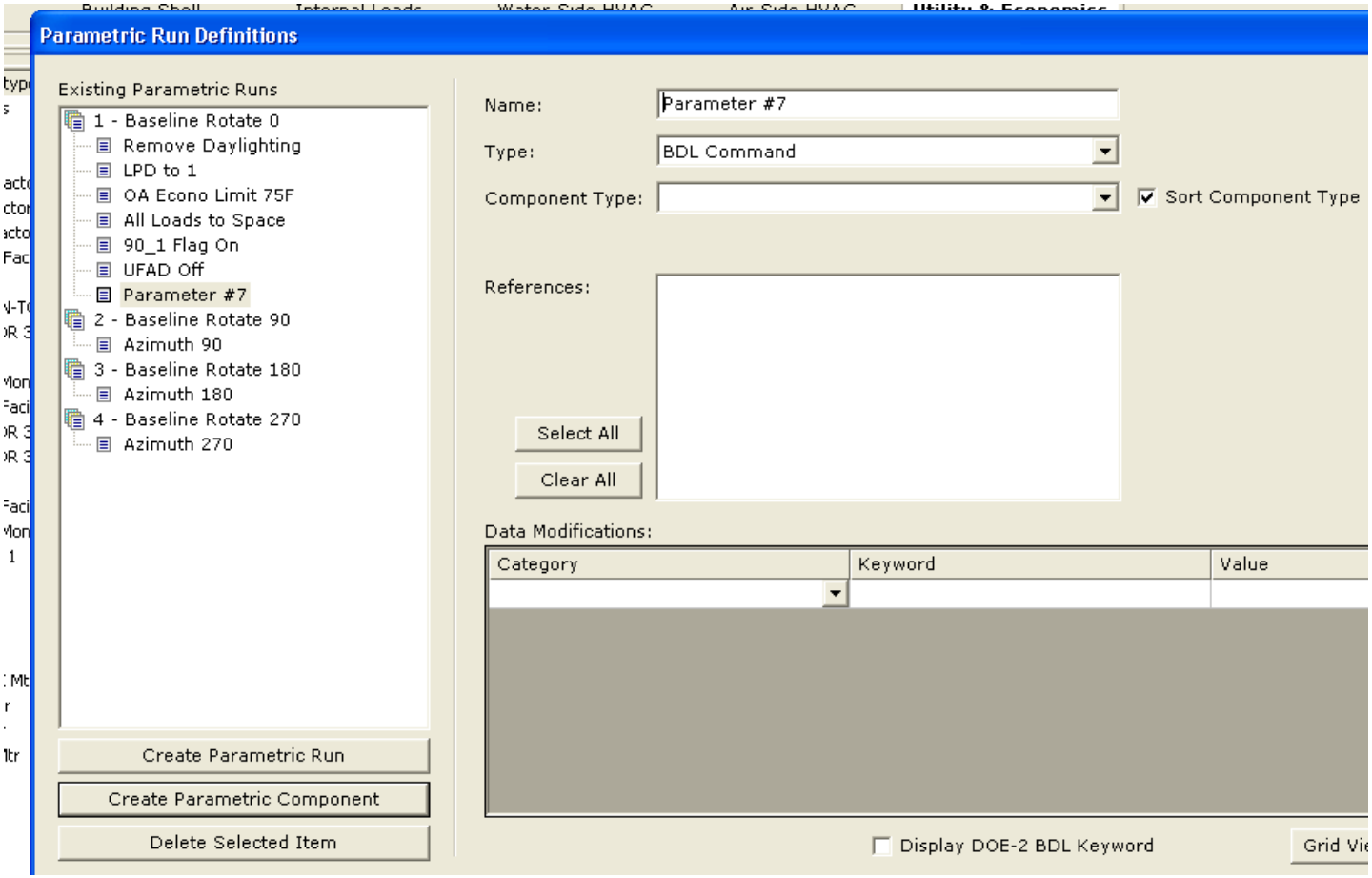

User Input Expression
User Input Expression for Space 'EL1 South Perim Spc (G.S1)', LIGHTING-W/AREA[0]:
if (#pa("UFAD Flag")==1)
then #pa("Light Load Factor")*0.513
else 0.513
endif
Install Expression From User Default
Install Expression From DOE-2 Default
OK
Cancel

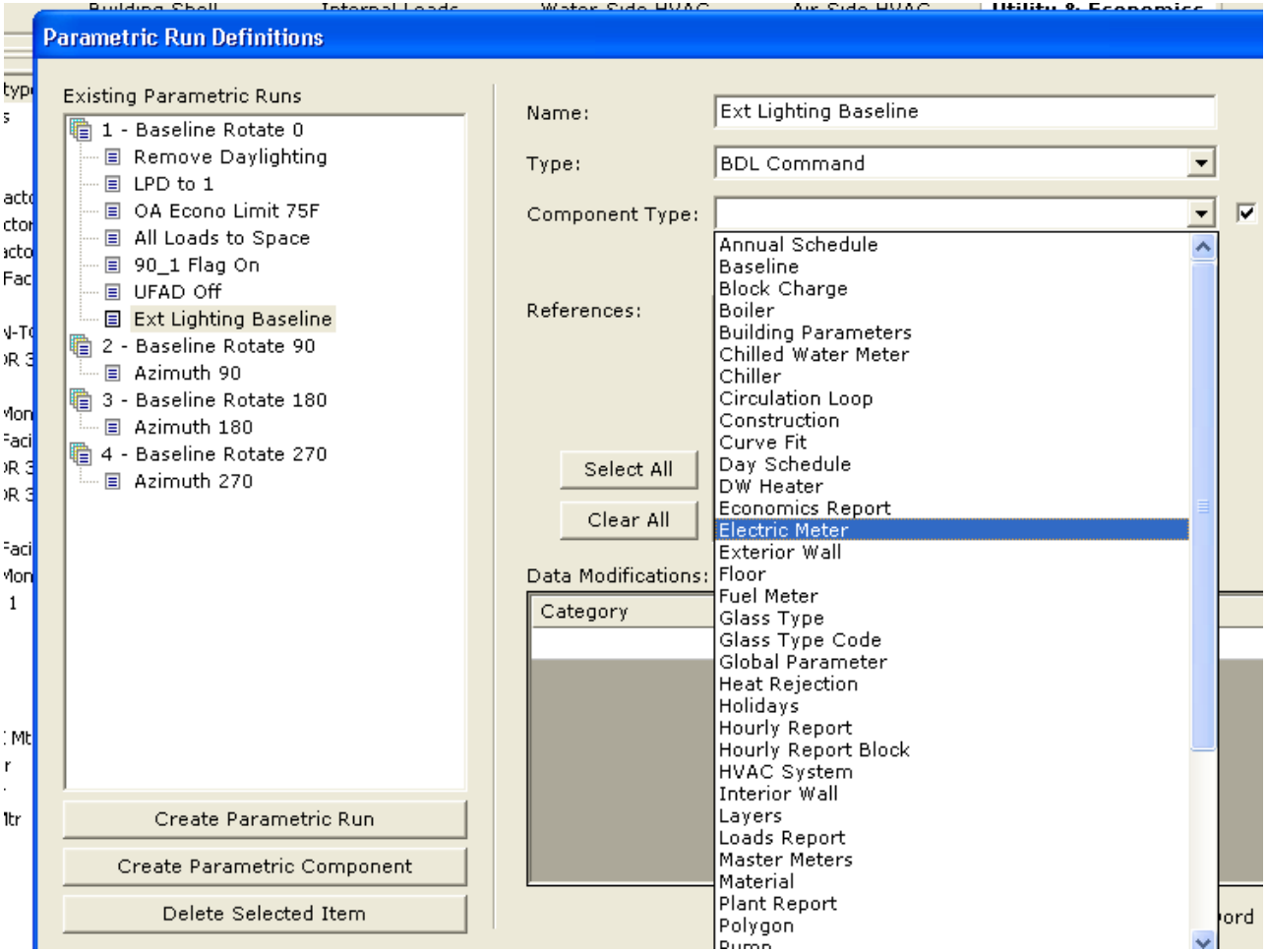
1. Detailed Mode
2. Text Editors
3. Help File References
4. Non-standard UFAD Model
5. Variables Within Entry Fields
6. Creating Custom Meters
7. IF-THEN-ELSE Statements
8. Parametric Runs
9. Using Custom Hourly Reports for Troubleshooting

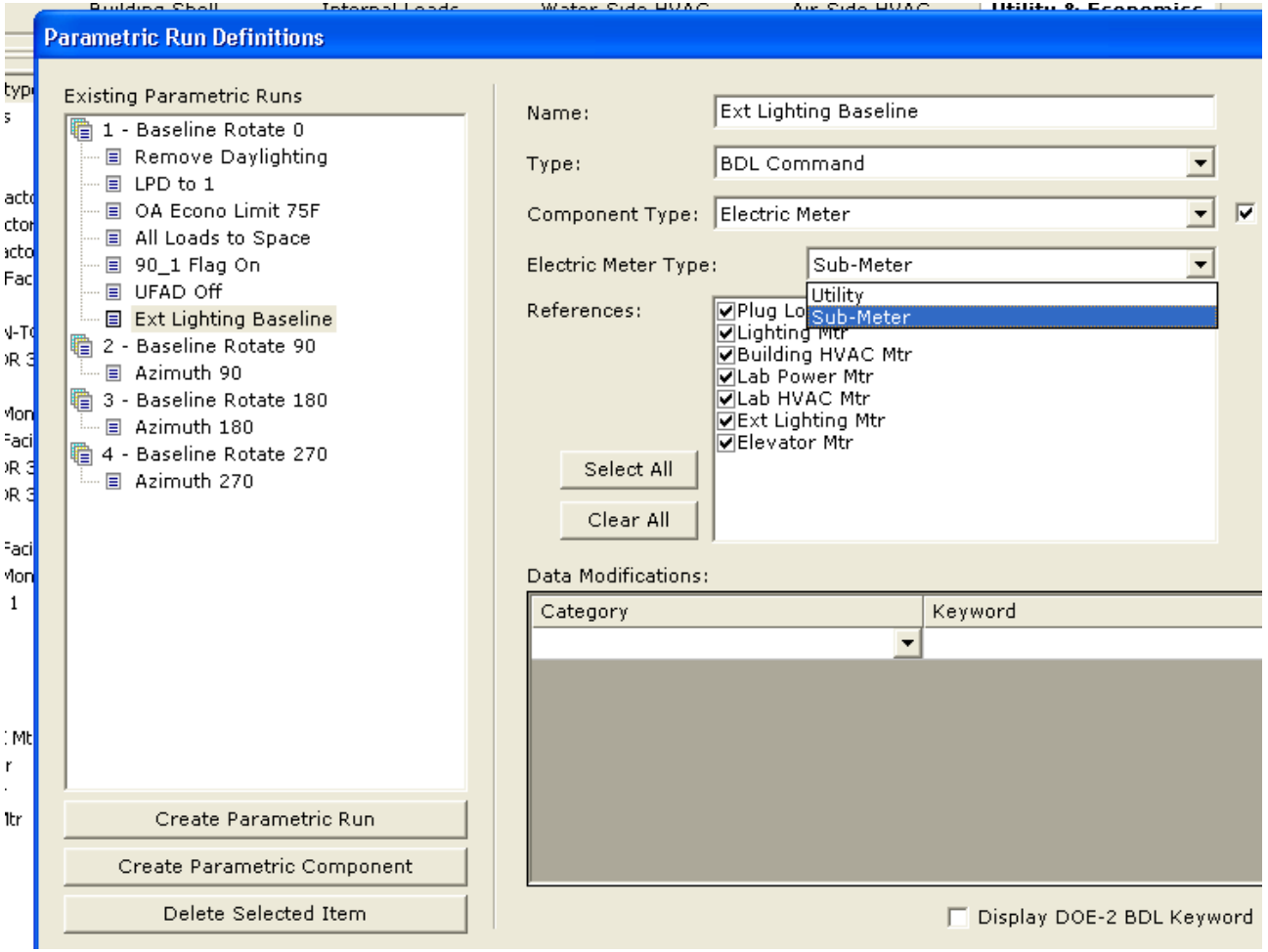
8. Parametric Runs

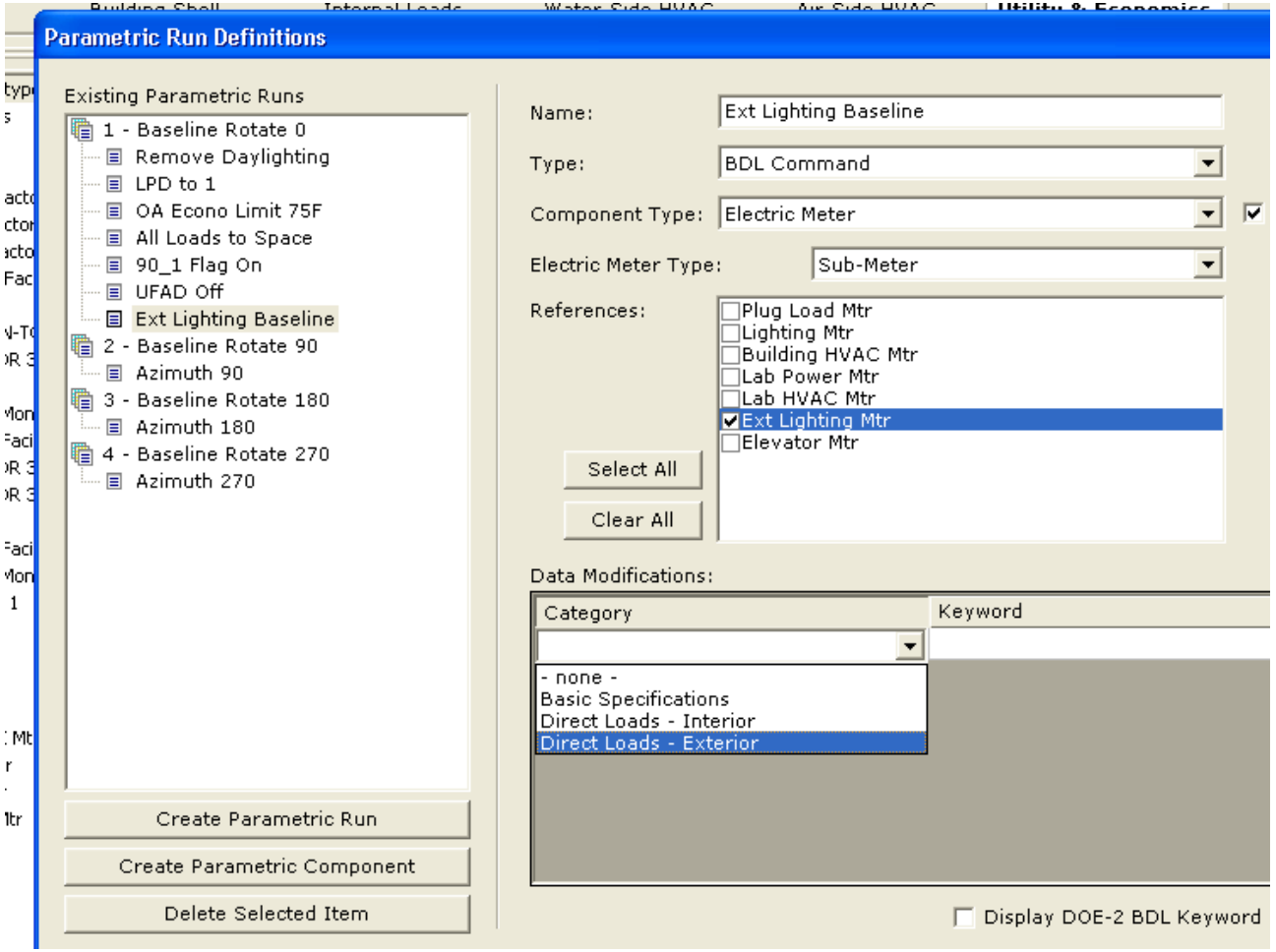


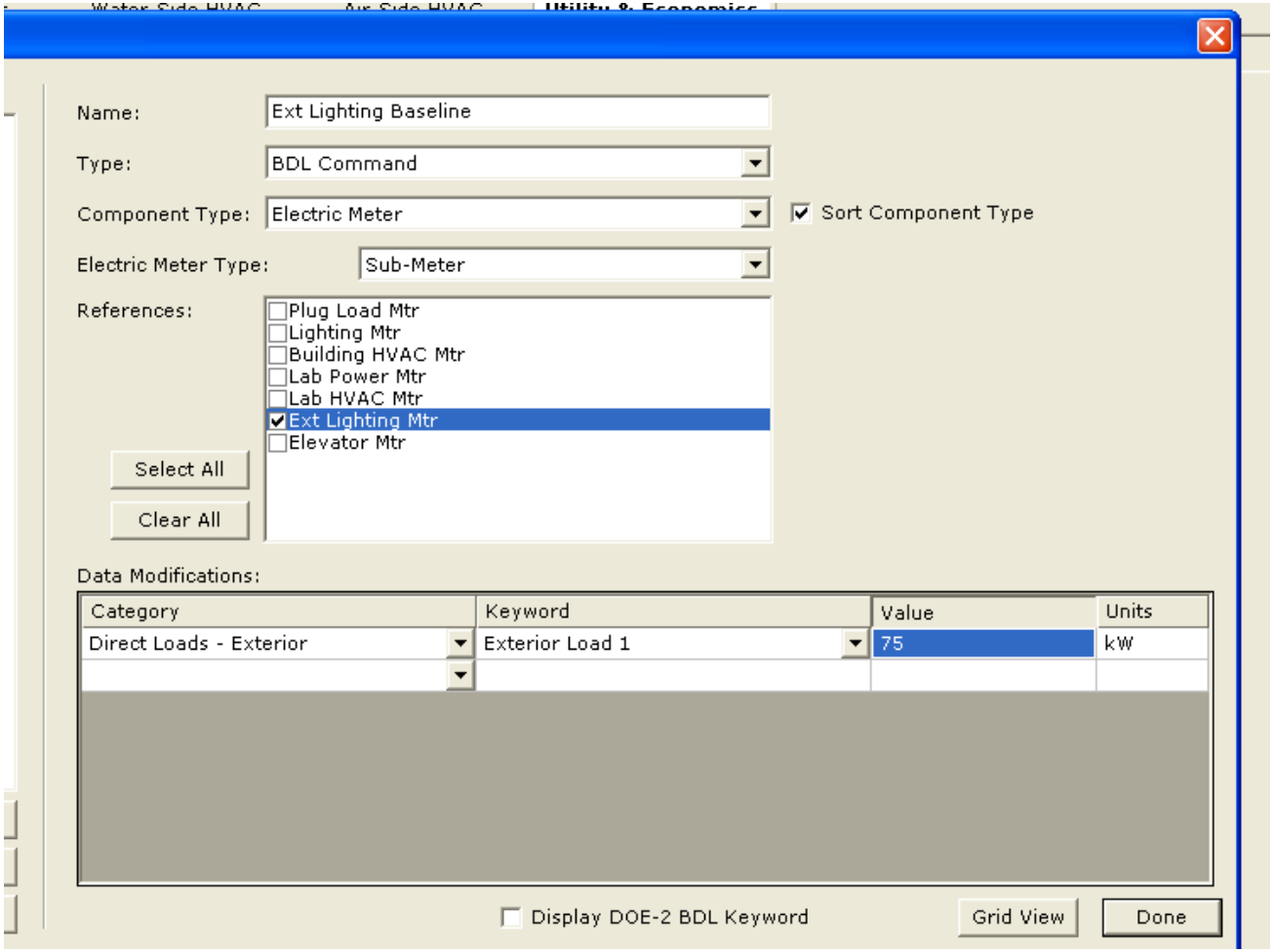


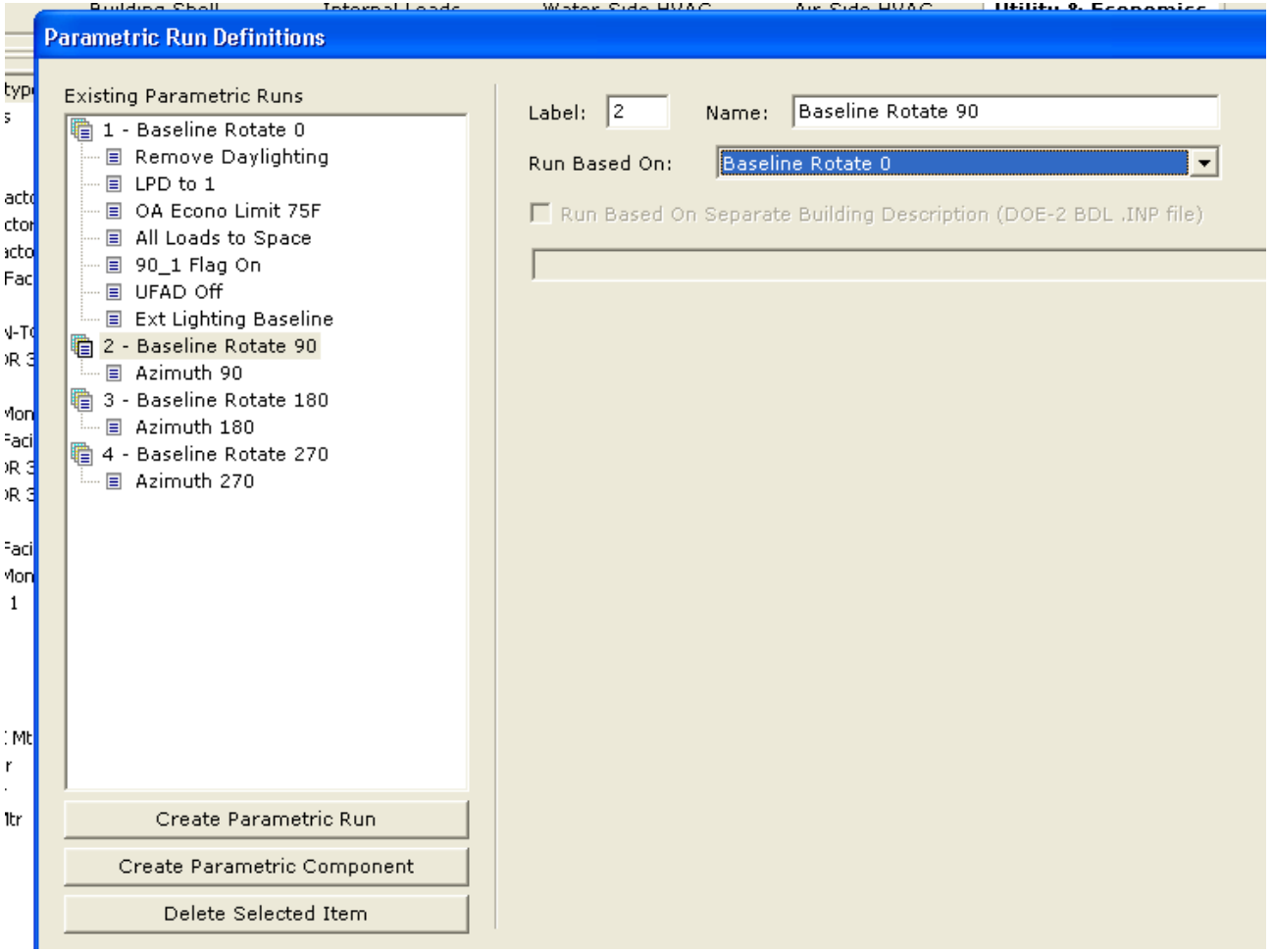

Parametric Run Definitions
Existing Parametric Runs
1 - Baseline Rotate 0
Remove Daylighting
LPD to 1
OA Econo Limit 75F
All Loads to Space
90_1 Flag On
UFAD Off
Parameter #7
2 - Baseline Rotate 90
Azimuth 90
3 - Baseline Rotate 180
Azimuth 180
4 - Baseline Rotate 270
Azimuth 270
Create Parametric Run
Create Parametric Component
Delete Selected Item
Name:
Parameter #7
Type:
BDL Command
Component Type:
Sort Component Type
References:
Select All
Clear All
Data Modifications:
Category
Keyword
Value
Display DOE-2 BDL Keyword

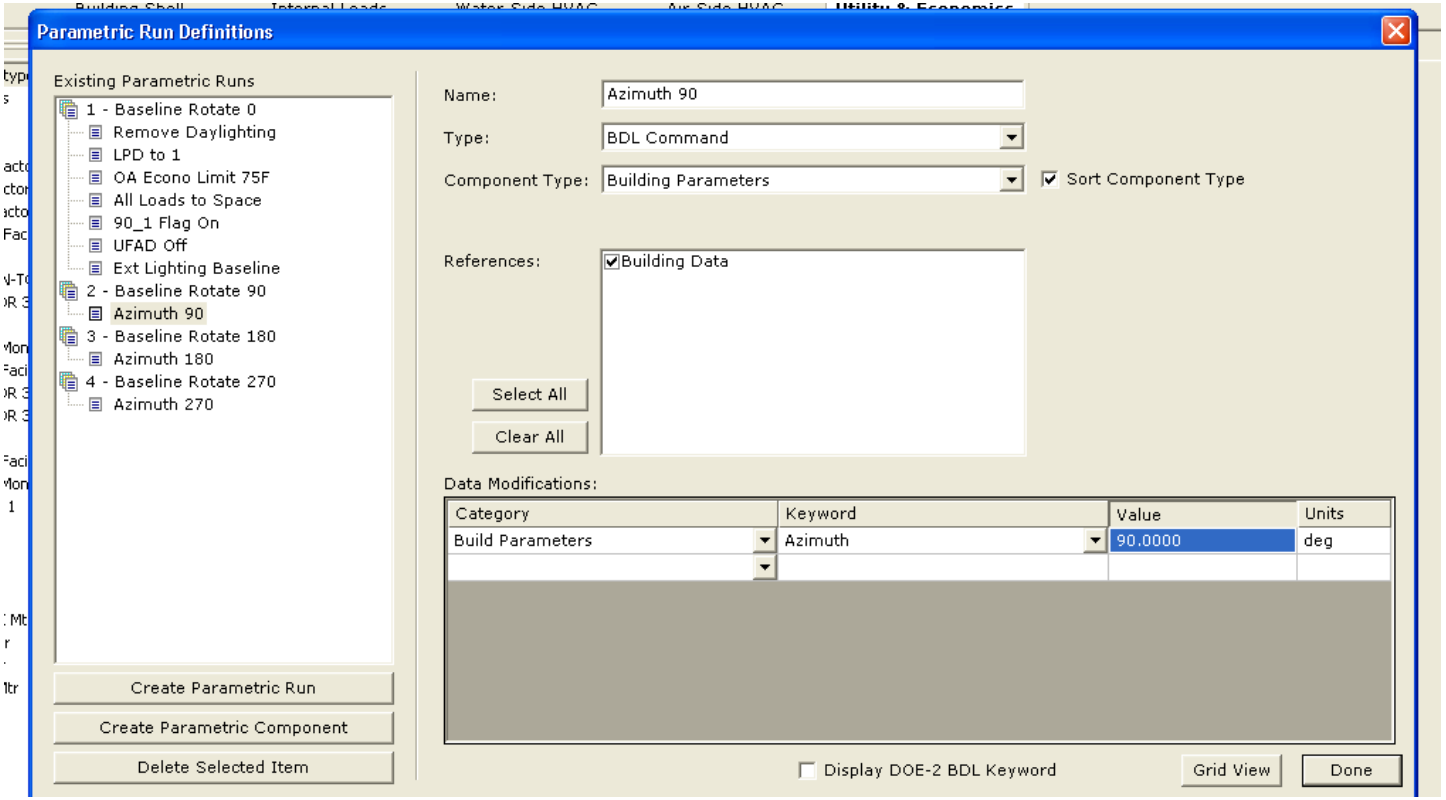

Parametric Run Definitions
Existing Parametric Runs
1 - Baseline Rotate 0
Remove Daylighting
LPD to 1
OA Econo Limit 75F
All Loads to Space
90_1 Flag On
UFAD Off
Ext Lighting Baseline
2 - Baseline Rotate 90
Azimuth 90
3 - Baseline Rotate 180
Azimuth 180
4 - Baseline Rotate 270
Azimuth 270
Create Parametric Run
Create Parametric Component
Delete Selected Item
Name:
Ext Lighting Baseline
Type:
BDL Command
Component Type:
References:
Select All
Clear All
Data Modifications:
Category
Annual Schedule
Baseline
Block Charge
Boiler
Building Parameters
Chilled Water Meter
Chiller
Circulation Loop
Construction
Curve Fit
Day Schedule
DW Heater
Economics Report
Electric Meter
Exterior Wall
Floor
Fuel Meter
Glass Type
Glass Type Code
Global Parameter
Heat Rejection
Holidays
Hourly Report
Hourly Report Block
HVAC System
Interior Wall
Layers
Loads Report
Master Meters
Material
Plant Report
Polygon


Parametric Run Definitions
Existing Parametric Runs
1 - Baseline Rotate 0
Remove Daylighting
LPD to 1
OA Econo Limit 75F
All Loads to Space
90_1 Flag On
UFAD Off
Ext Lighting Baseline
2 - Baseline Rotate 90
Azimuth 90
3 - Baseline Rotate 180
Azimuth 180
4 - Baseline Rotate 270
Azimuth 270
Create Parametric Run
Create Parametric Component
Delete Selected Item
Name:
Ext Lighting Baseline
Type:
BDL Command
Component Type:
Electric Meter
Electric Meter Type:
Sub-Meter
Utility
Sub-Meter
References:
Lighting Mtr
Building HVAC Mtr
Lab Power Mtr
Lab HVAC Mtr
Ext Lighting Mtr
Elevator Mtr
Select All
Clear All
Data Modifications:
Category
Keyword
Display DOE-2 BDL Keyword


Parametric Run Definitions
Existing Parametric Runs
1 - Baseline Rotate 0
Remove Daylighting
LPD to 1
OA Econo Limit 75F
All Loads to Space
90_1 Flag On
UFAD Off
Ext Lighting Baseline
2 - Baseline Rotate 90
Azimuth 90
3 - Baseline Rotate 180
Azimuth 180
4 - Baseline Rotate 270
Azimuth 270
Create Parametric Run
Create Parametric Component
Delete Selected Item
Name:
Ext Lighting Baseline
Type:
BDL Command
Component Type:
Electric Meter
Electric Meter Type:
Sub-Meter
References:
Plug Load Mtr
Lighting Mtr
Building HVAC Mtr
Lab Power Mtr
Lab HVAC Mtr
Ext Lighting Mtr
Elevator Mtr
Select All
Clear All
Data Modifications:
Category
Keyword
- none -
Basic Specifications
Direct Loads - Interior
Direct Loads - Exterior
Display DOE-2 BDL Keyword

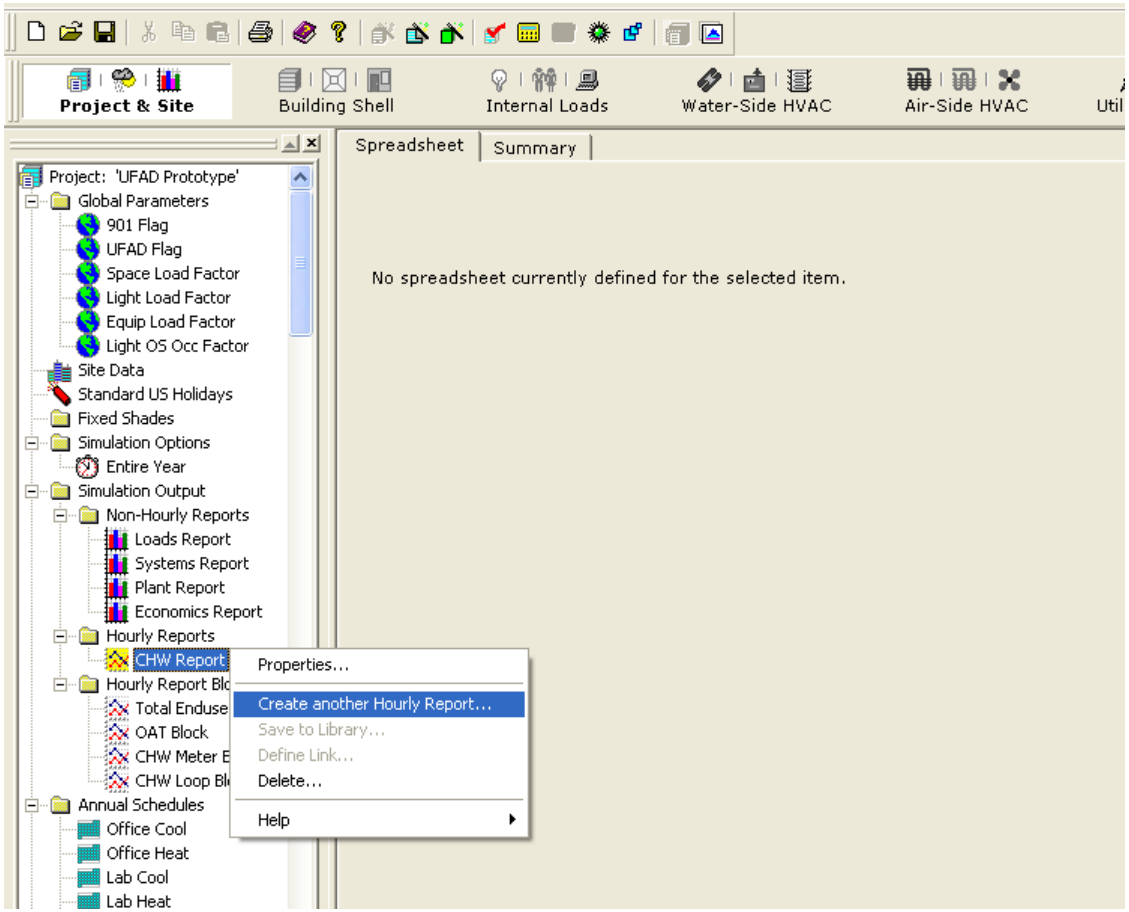

Name:
Ext Lighting Baseline
Type:
BDL Command
Component Type:
Electric Meter
Sort Component Type
Electric Meter Type:
Sub-Meter
References:
Plug Load Mtr
Lighting Mtr
Building HVAC Mtr
Lab Power Mtr
Lab HVAC Mtr
Ext Lighting Mtr
Elevator Mtr
Select All
Clear All
Data Modifications:
Category
Keyword
Value
Units
Direct Loads - Exterior
Exterior Load 1
75
kW
Display DOE-2 BDL Keyword
Grid View
Done

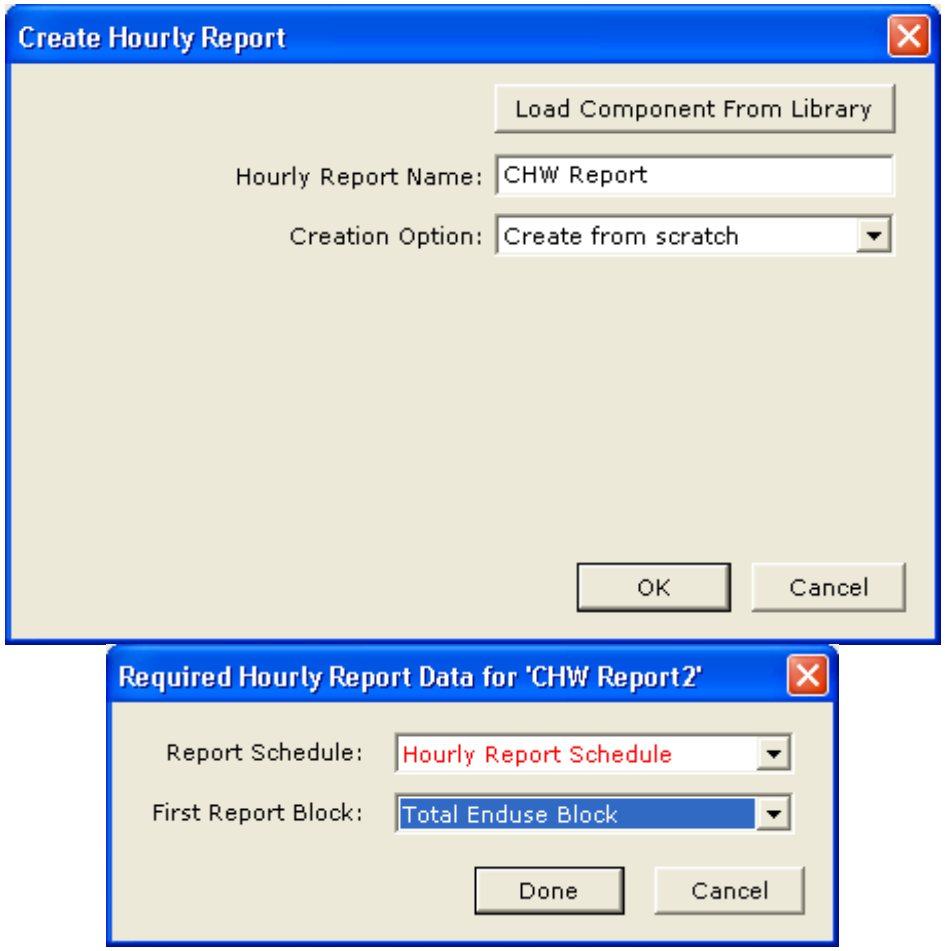

Parametric Run Definitions
Existing Parametric Runs
1 - Baseline Rotate 0
Remove Daylighting
LPD to 1
OA Econo Limit 75F
All Loads to Space
90_1 Flag On
UFAD Off
Ext Lighting Baseline
2 - Baseline Rotate 90
Azimuth 90
3 - Baseline Rotate 180
Azimuth 180
4 - Baseline Rotate 270
Azimuth 270
Label: 2
Name: Baseline Rotate 90
Run Based On: Baseline Rotate 0
Run Based On Separate Building Description (DOE-2 BDL .INP file)
Create Parametric Run
Create Parametric Component
Delete Selected Item

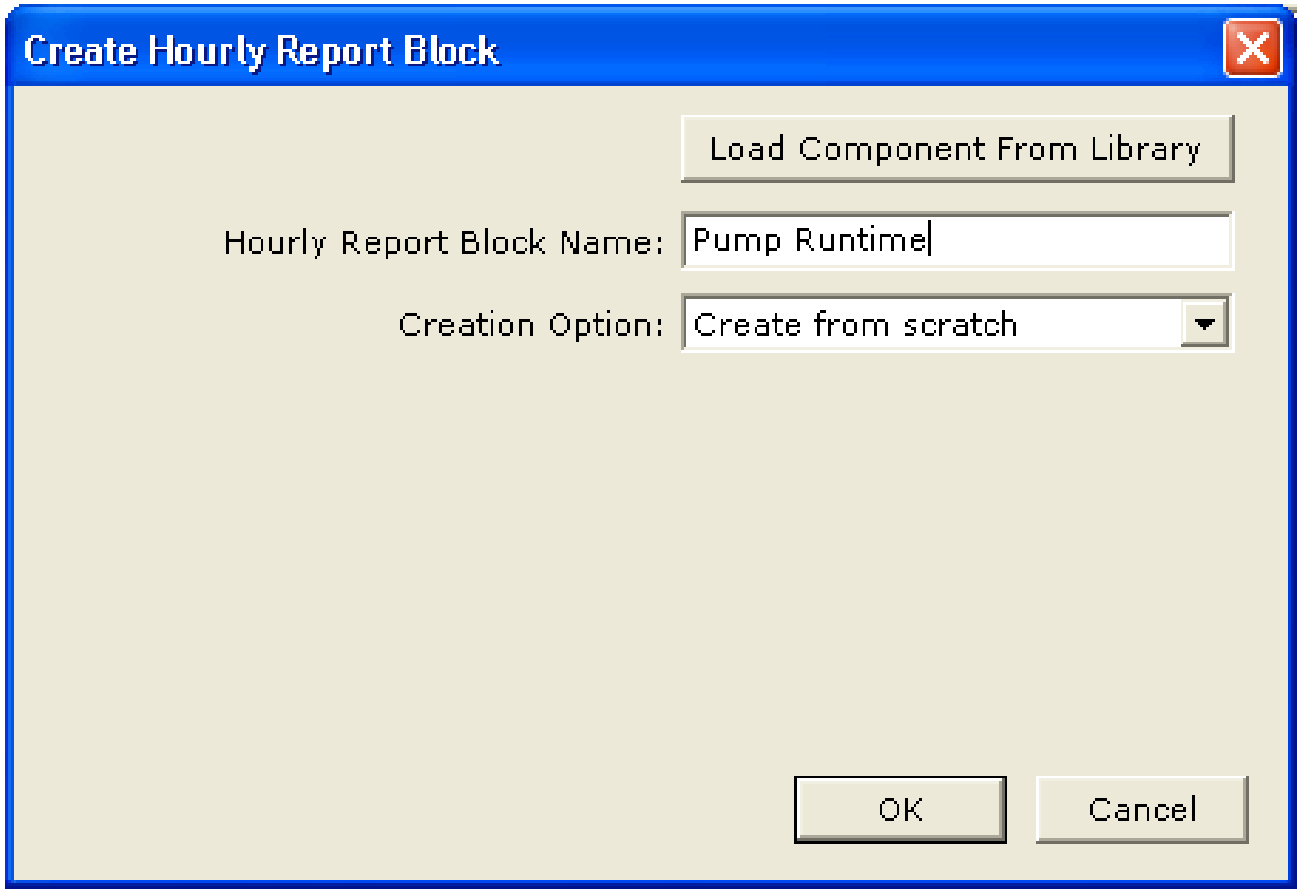

Parametric Run Definitions
Existing Parametric Runs
1 - Baseline Rotate 0
Remove Daylighting
LPD to 1
OA Econo Limit 75F
All Loads to Space
90_1 Flag On
UFAD Off
Ext Lighting Baseline
2 - Baseline Rotate 90
Azimuth 90
3 - Baseline Rotate 180
Azimuth 180
4 - Baseline Rotate 270
Azimuth 270
Create Parametric Run
Create Parametric Component
Delete Selected Item
Name:
Azimuth 90
Type:
BDL Command
Component Type:
Building Parameters
Sort Component Type
References:
Building Data
Select All
Clear All
Data Modifications:
Category
Keyword
Value
Units
Build Parameters
Azimuth
90.0000
deg
Display DOE-2 BDL Keyword
Grid View
Done

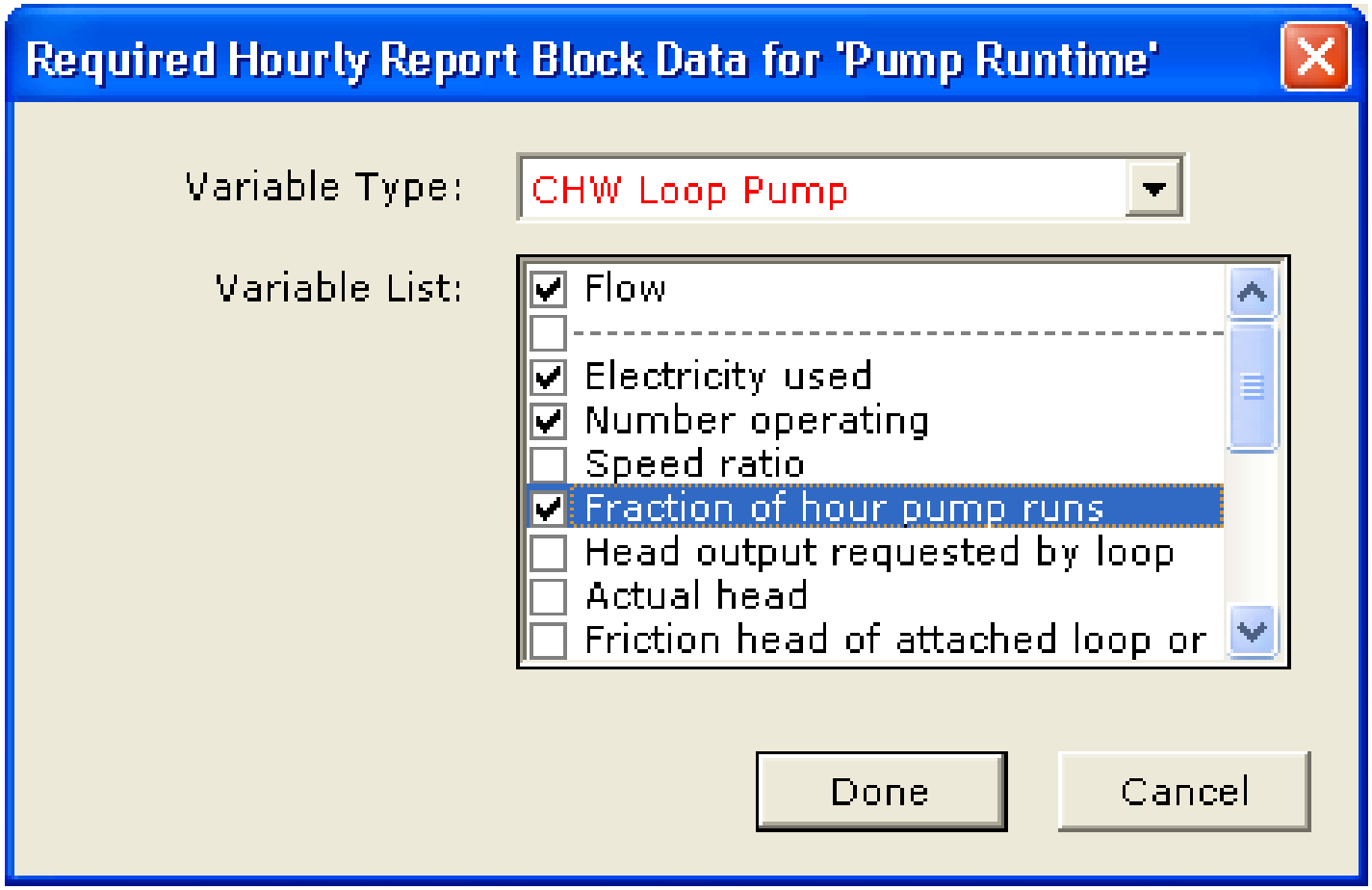
1. Detailed Mode
2. Text Editors
3. Help File References
4. Non-standard UFAD Model
5. Variables Within Entry Fields
6. Creating Custom Meters
7. IF-THEN-ELSE Statements
8. Parametric Runs
9. Using Custom Hourly Reports for Troubleshooting

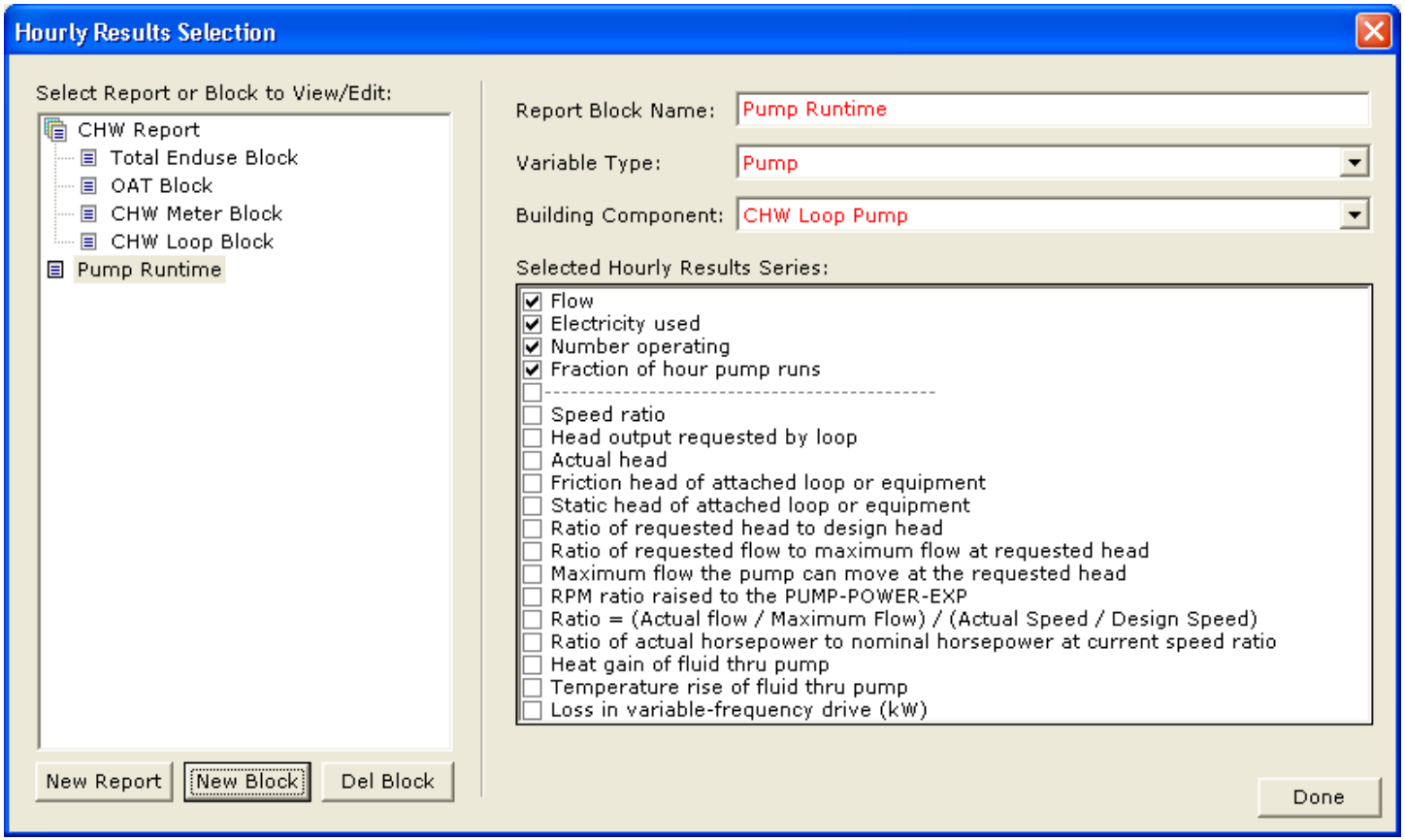
9. Using Custom Hourly Reports for Troubleshooting

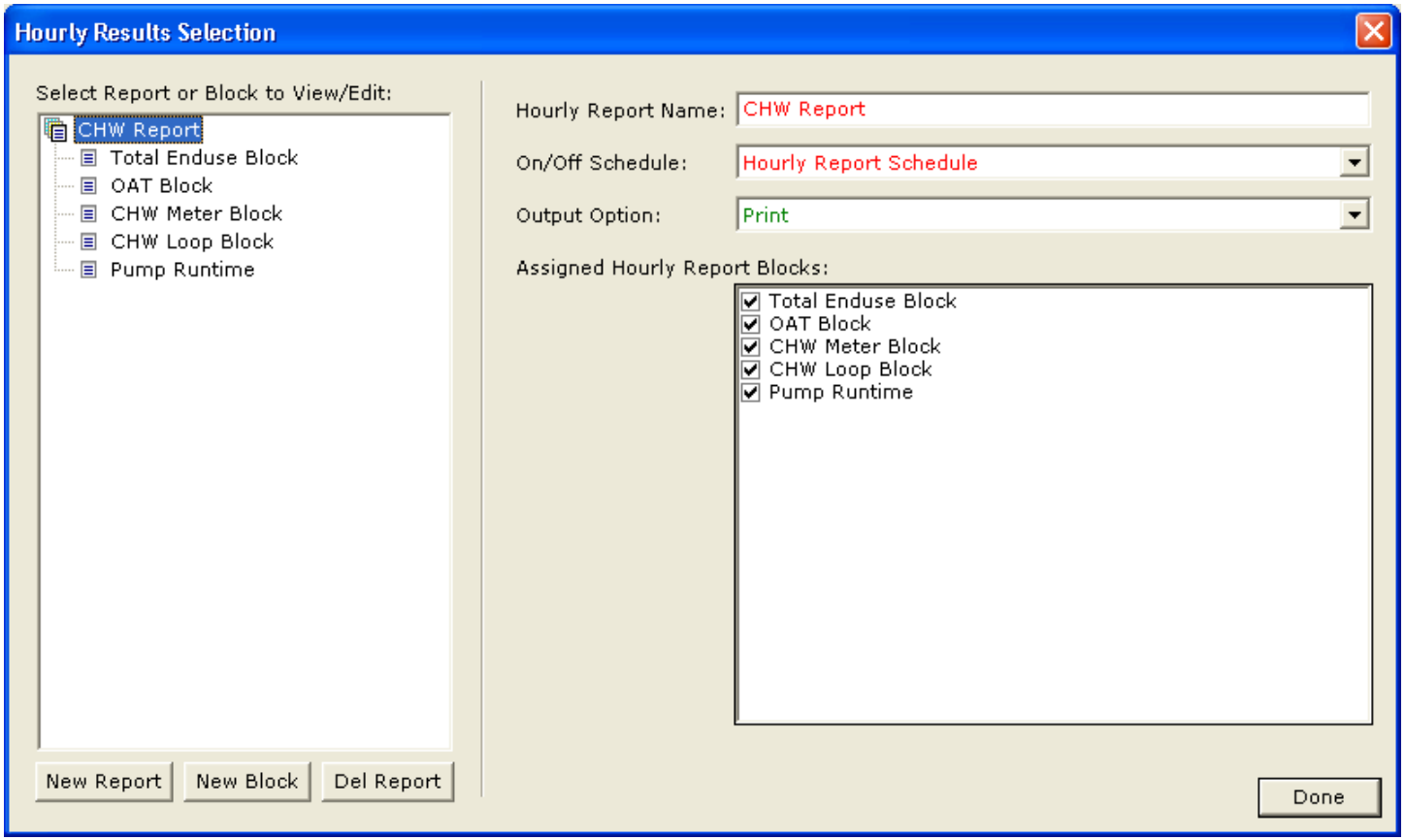


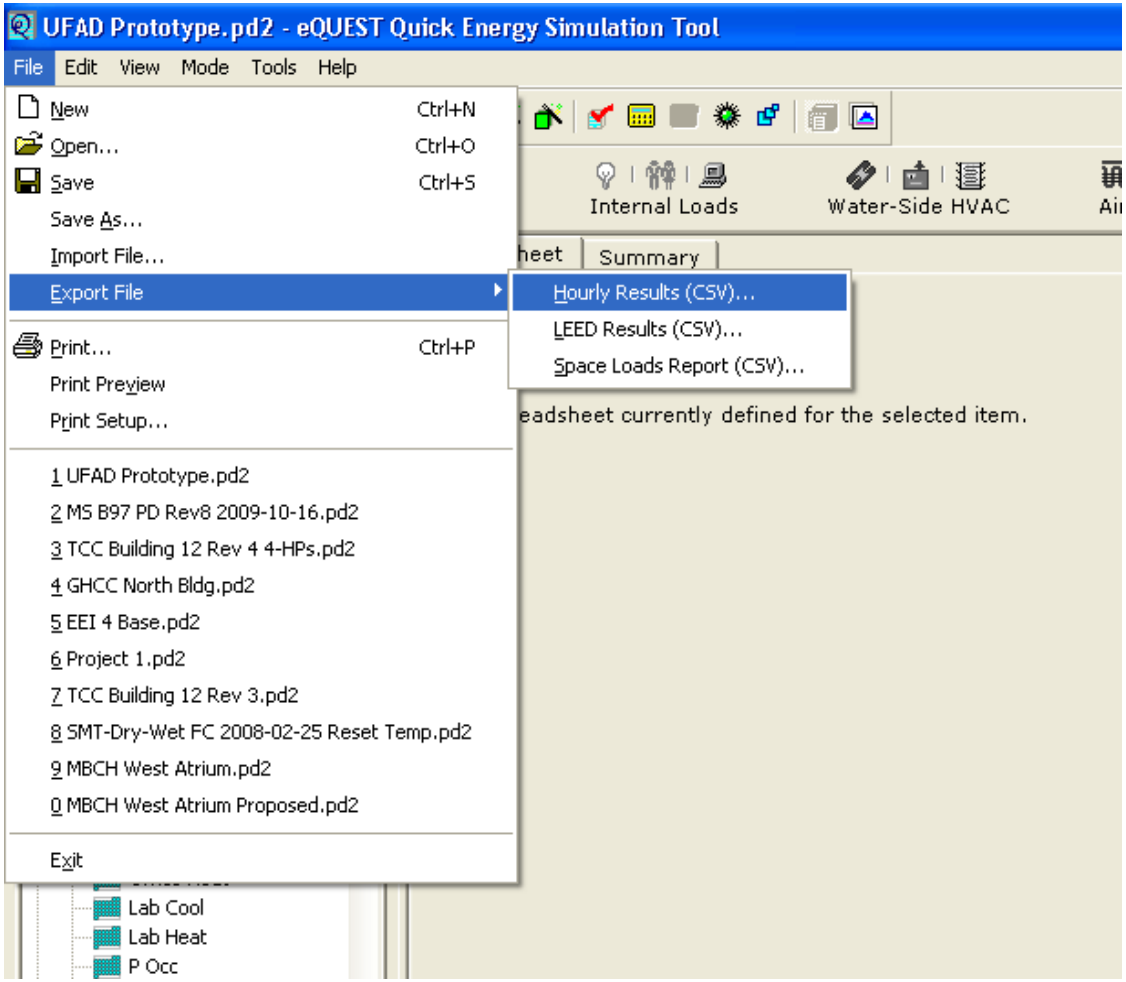

Create Hourly Report
Load Component From Library
Hourly Report Name:
CHW Report
Creation Option:
Create from scratch
OK
Cancel
Required Hourly Report Data for 'CHW Report2'
Report Schedule:
Hourly Report Schedule
First Report Block:
Total Enduse Block
Done
Cancel

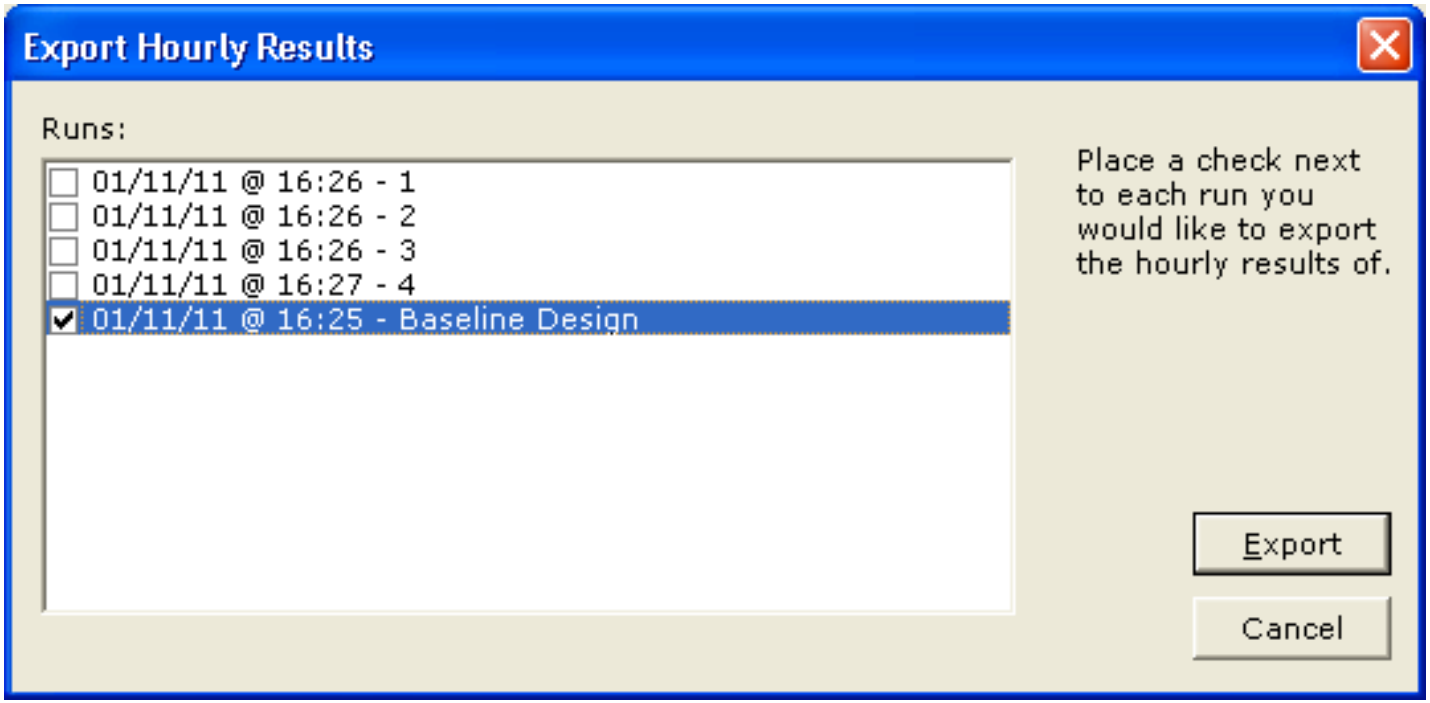

Create Hourly Report Block
Load Component From Library
Hourly Report Block Name:
Pump Runtime
Creation Option:
Create from scratch
OK
Cancel

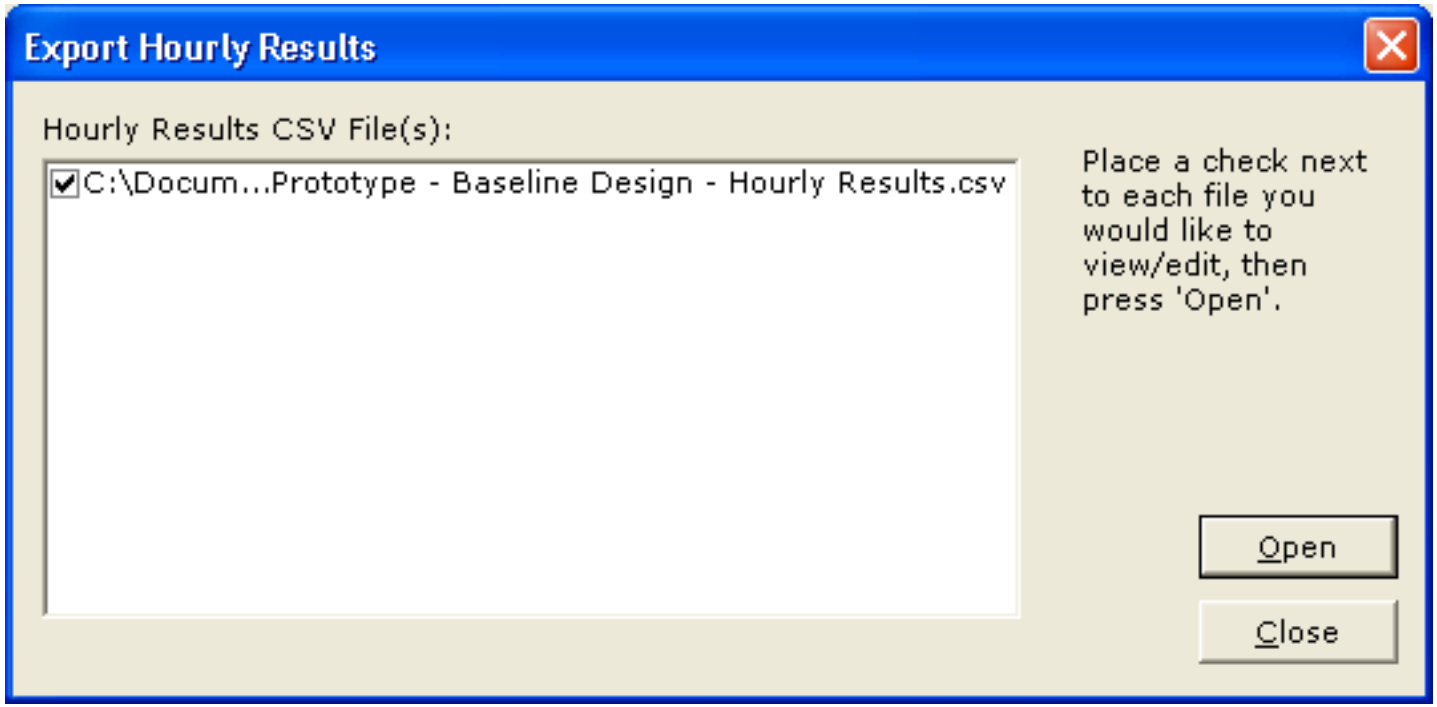

Required Hourly Report Block Data for 'Pump Runtime'
Variable Type:
CHW Loop Pump
Variable List:
Flow
Electricity used
Number operating
Speed ratio
Fraction of hour pump runs
Head output requested by loop
Actual head
Friction head of attached loop or
Done
Cancel

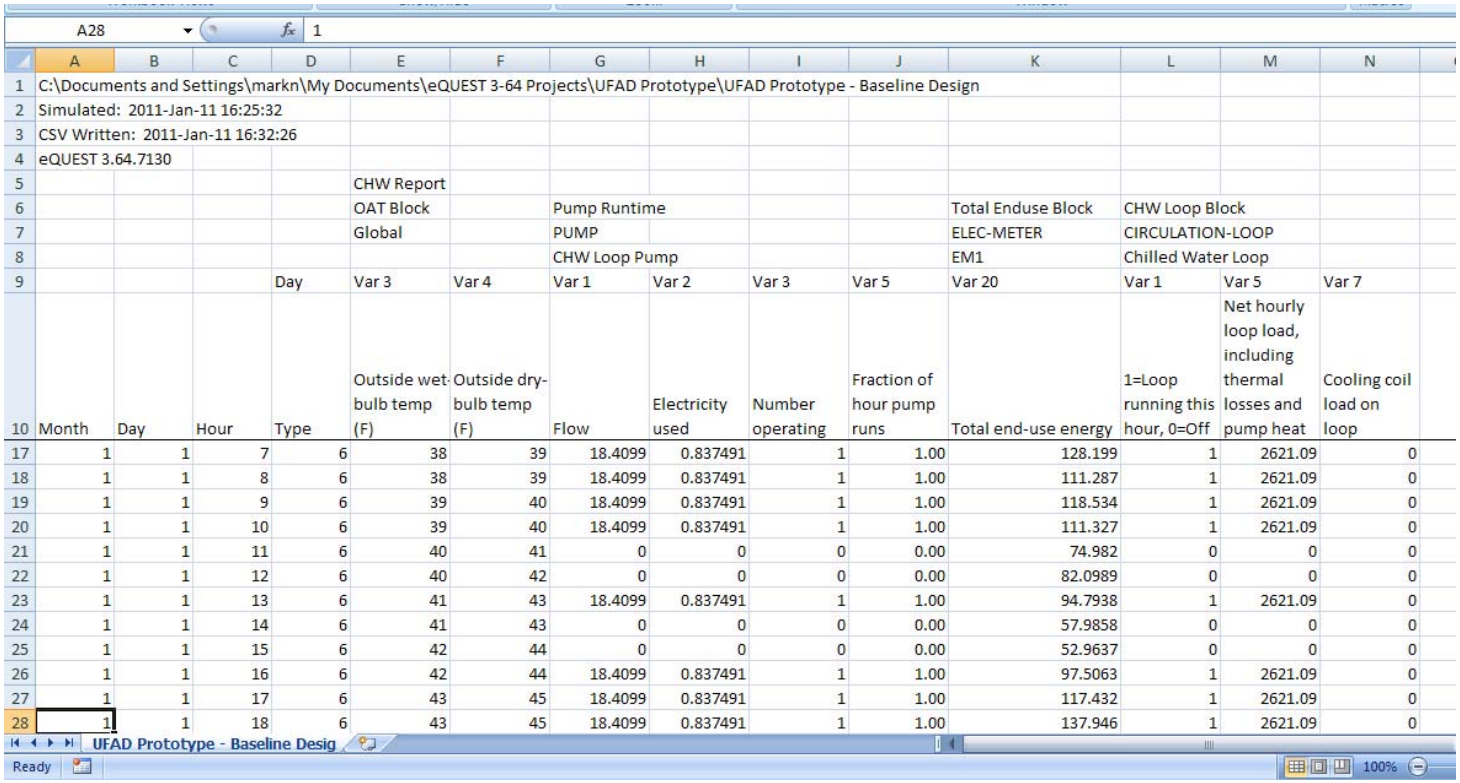

Hourly Results Selection
Select Report or Block to View/Edit:
CHW Report
Total Enduse Block
OAT Block
CHW Meter Block
CHW Loop Block
Pump Runtime
New Report
New Block
Del Block
Report Block Name:
Pump Runtime
Variable Type:
Pump
Building Component:
CHW Loop Pump
Selected Hourly Results Series:
Flow
Electricity used
Number operating
Fraction of hour pump runs
Speed ratio
Head output requested by loop
Actual head
Friction head of attached loop or equipment
Static head of attached loop or equipment
Ratio of requested head to design head
Ratio of requested flow to maximum flow at requested head
Maximum flow the pump can move at the requested head
RPM ratio raised to the PUMP-POWER-EXP
Ratio = (Actual flow / Maximum Flow) / (Actual Speed / Design Speed)
Ratio of actual horsepower to nominal horsepower at current speed ratio
Heat gain of fluid thru pump
Temperature rise of fluid thru pump
Loss in variable-frequency drive (kW)
Done


Hourly Results Selection
Select Report or Block to View/Edit:
CHW Report
Total Enduse Block
OAT Block
CHW Meter Block
CHW Loop Block
Pump Runtime
New Report
New Block
Del Report
Hourly Report Name:
CHW Report
On/Off Schedule:
Hourly Report Schedule
Output Option:
Print
Assigned Hourly Report Blocks:
Total Enduse Block
OAT Block
CHW Meter Block
CHW Loop Block
Pump Runtime
Done


UFAD Prototype.pd2 - eQUEST Quick Energy Simulation Tool
File Edit View Mode Tools Help
New Ctrl+N
Open... Ctrl+O
Save Ctrl+S
Save As...
Import File...
Export File
Print... Ctrl+P
Print Preview
Print Setup...
1 UFAD Prototype.pd2
2 MS B97 PD Rev8 2009-10-16.pd2
3 TCC Building 12 Rev 4 4-HPs.pd2
4 GHCC North Bldg.pd2
5 EEI 4 Base.pd2
6 Project 1.pd2
7 TCC Building 12 Rev 3.pd2
8 SMT-Dry-Wet FC 2008-02-25 Reset Temp.pd2
9 MBCH West Atrium.pd2
0 MBCH West Atrium Proposed.pd2
Exit
Hourly Results (CSV)...
LEED Results (CSV)...
Space Loads Report (CSV)...
Internal Loads
Water-Side HVAC
Summary
eadsheet currently defined for the selected item.
Lab Cool
Lab Heat
P Occ


Export Hourly Results
Runs:
01/11/11 @ 16:26 - 1
01/11/11 @ 16:26 - 2
01/11/11 @ 16:26 - 3
01/11/11 @ 16:27 - 4
01/11/11 @ 16:25 - Baseline Design
Place a check next to each run you would like to export the hourly results of.
Export
Cancel


Export Hourly Results
Hourly Results CSV File(s):
C:\Docum...Prototype - Baseline Design - Hourly Results.csv
Place a check next to each file you would like to view/edit, then press 'Open'.
Open
Close



A28 | 1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	C:\Documents and Settings\markn\My Documents\eQUEST 3-64 Projects\UFAD Prototype\UFAD Prototype - Baseline Design													
2	Simulated: 2011-Jan-11 16:25:32													
3	CSV Written: 2011-Jan-11 16:32:26													
4	eQUEST 3.64.7130													
5					CHW Report									
6					OAT Block		Pump Runtime				Total Enduse Block	CHW Loop Block		
7					Global		PUMP				ELEC-METER	CIRCULATION-LOOP		
8							CHW Loop Pump				EM1	Chilled Water Loop		
9				Day	Var 3	Var 4	Var 1	Var 2	Var 3	Var 5	Var 20	Var 1	Var 5	Var 7
10	Month	Day	Hour	Type	Outside wet-bulb temp (F)	Outside dry-bulb temp (F)	Flow	Electricity used	Number operating	Fraction of hour pump runs	Total end-use energy	1=Loop running this hour, 0=Off	Net hourly loop load, including thermal losses and pump heat	Cooling coil load on loop
17	1	1	7	6	38	39	18.4099	0.837491	1	1.00	128.199	1	2621.09	0
18	1	1	8	6	38	39	18.4099	0.837491	1	1.00	111.287	1	2621.09	0
19	1	1	9	6	39	40	18.4099	0.837491	1	1.00	118.534	1	2621.09	0
20	1	1	10	6	39	40	18.4099	0.837491	1	1.00	111.327	1	2621.09	0
21	1	1	11	6	40	41	0	0	0	0.00	74.982	0	0	0
22	1	1	12	6	40	42	0	0	0	0.00	82.0989	0	0	0
23	1	1	13	6	41	43	18.4099	0.837491	1	1.00	94.7938	1	2621.09	0
24	1	1	14	6	41	43	0	0	0	0.00	57.9858	0	0	0
25	1	1	15	6	42	44	0	0	0	0.00	52.9637	0	0	0
26	1	1	16	6	42	44	18.4099	0.837491	1	1.00	97.5063	1	2621.09	0
27	1	1	17	6	43	45	18.4099	0.837491	1	1.00	117.432	1	2621.09	0
28	1	1	18	6	43	45	18.4099	0.837491	1	1.00	137.946	1	2621.09	0

UFAD Prototype - Baseline Desig

Ready 100%

QUESTIONS?

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