Section 5: REQUEST SUMMARY (page b)

(Use one sheet for a single building. If more than one building, please use a separate sheet for each building.

Measure	Existing Equipment (T12 with magnetic ballast, etc.)	Wattage	New Equipment (manf. & model/part #)	Wattage	Location (bldg, floor & area)	Hrs. of Operation (per day)	Incentive Amount (A)	Qty of Proposed tubes retro-fitted (B)	Total Proposed Incentive Amount (A x B)
4' T8 *number of 32w lamps with electronic ballast and reflector*							$9.00		
8' T8 *number of 59w lamps with electronic ballast and reflector*							$12.00		

Measure	Existing Equipment (switch or no controls present)	Wattage	New Equipment (manf. & model/part #)	Wattage	Location (bldg, floor & area)	Hrs. of Operation (per day)	Incentive Amount (A)	Qty of Proposed sensors (B)	Total Proposed Incentive Amount (A x B)
Occupancy Sensor *list number of watts controlled*							$25.00		

Measure	Existing Equipment (Incandescent, fluorescent exit fixture, etc.)	Wattage	New Equipment (manf. & model/part #)	Wattage	Location (bldg, floor & area)	Hrs. of Operation (per day)	Incentive Amount (A)	Qty of Proposed Fixtures (B)	Total Proposed Incentive Amount (A x B)
LED Exit Sign *new fixture or LED retro fit*							$22.00		

		Total PROPOSED incentive :
REMEMBER: Cutsheets and Invoices are required to be provided at the completion of the project. No Incentives can be paid without proper documentation	Estimated installation date:	*** Incentive amounts will be verified for accuracy ***

MULTIFAMILY COMMON AREA LIGHTING INCENTIVE FUNDS APPLICATION

ActOnEnergy

Office Use Only:(circle one) S.I. or A.I.

Reservation #:

Final Verification:

Section 1: CUSTOMER & SITE INFORMATION

Customer Name & Title:	Contact Name:		Contact Telephone:
Mailing Address:	City / Town:	State:	Zip:
Telephone:	Fax:	Email Address:	
Property address:	City / Town:	State:	Zip:
Property Name:	No. of Total Bldgs:	No. of Total Units:	Bldg type (Apt, Condo, etc):	Ameren Electric Account #:

Section 2: CONTRACTOR INFORMATION (if applicable / contractor not required for CFLs)

Contractor Name & Title:	Contact Name:		
Mailing Address:	City / Town:	State:	Zip:
Telephone:	Fax:	Email Address:	

Section 3: PAYMENT INFORMATION (if Payee is same as above, write "see above" & include Tax ID)

Payee:	Tax ID # / SSN:		
Mailing Address:	City / Town:	State:	Zip:

Section 4: CUSTOMER SIGNATURE

By signing below, I acknowledge that I have read and approve of this Application, and I agree to be bound by all program Terms and Conditions. I state that the information contained within this application is true and accurate to the best of my knowledge. Additionally, I certify that I have not and will not apply for an incentive for the measures on this Application with any other Ameren Illinois Utilities program.

Customer Name (signature):	Customer Name (print):	Date:

Please direct all correspondence to:

Ameren Illinois Utilities Act On Energy Multifamily Common Area Lighting Program

300 Liberty Street, 4th Floor, Peoria, IL 61602

Fax: 309-673-3370 • Toll-free: 866-838-6918 • ActOnEnergy.com

Ameren Illinois Utilities

AIU-MF-CAL-INCENTAPP-11.21.08

Summary of "PROJECT AS COMPLETED" (sheet: a)

Print multiple sheets if needed.

Measure	Existing Equipment (Incandescent, T12 with magnetic ballast, etc.)	Wattage	New Equipment (manf. & model/part #)	Wattage	Location (building, floor & area)	Hrs. of Operation (per day)	Incentive Amount (A)	Qty of Proposed Fixtures (B)	Total Proposed Incentive Amount (AxB)	SHADED AREA OFFICE USE ONLY: Installed	Total Approved Incintive Amount
Integral CFL *≥13 watts screw-in*							$1.50				
Modular CFL *≤18 watts pin based electronic ballast fixture*							$23.00				
Modular CFL *>18 watts pin based electronic ballast fixture*							$26.00				

Measure	Existing Equipment (T12 with magnetic ballast, etc.)	Wattage	New Equipment (manf. & model/part #)	Wattage	Location (bldg, floor & area)	Hrs. of Operation (per day)	Incentive Amount (A)	Qty of tubes retro-fitted (B)	Total Proposed Incentive Amount (A x B)		
4' T8 *number of 32w lamps with electronic ballast*							$7.00				
8' T8 *number of 59w lamps with electronic ballast*							$10.00				

Summary of "PROJECT AS COMPLETED" (sheet: b)

Print multiple sheets if needed.

Measure	Existing Equipment (T12 with magnetic ballast, etc.)	Wattage	New Equipment (manf. & model/part #)	Wattage	Location (bldg, floor & area)	Hrs. of Operation (per day)	Incentive Amount (A)	Qty of tubes retro-fitted (B)	Total Incentive Amount (A x B)	SHADED AREA OFFICE USE ONLY: Installed	Total Approved Incintive Amount
4' T8 *number of 32w lamps with electronic ballast and reflector*							$9.00				
8' T8 *number of 59w lamps with electronic ballast and reflector*							$12.00				

Measure	Existing Equipment (switch or no controls present)	Wattage	New Equipment (manf. & model/part #)	Wattage	Location (bldg, floor & area)	Hrs. of Operation (per day)	Incentive Amount (A)	Qty of sensors (B)	Total Incentive Amount (A x B)		
Occupancy Sensor *list number of watts controlled*							$25.00				

Measure	Existing Equipment (Incandescent, fluorescent exit fixture, etc.)	Wattage	New Equipment (manf. & model/part #)	Wattage	Location (bldg, floor & area)	Hrs. of Operation (per day)	Incentive Amount (A)	Qty of Proposed Fixtures (B)	Total Incentive Amount (A x B)		
LED Exit Sign *new fixture or LED retro fit*							$22.00				

	Total incentive amounts Proposed and Approved:			

REQUIRED Cut Sheets Attached: YES / NO	**REQUIRED Invoices Attached: YES / NO**	*** Incentive amounts will be verified for accuracy ***

Multifamily Common Area Lighting Program Ally List

Updated 9-28-2009

Ameren Illinois Utilities

ActOnEnergy

					Areas Served												
Company	**Address**	**Phone**	**Contact**	**Email and Web site**	**Bloomington**	**Carbondale**	**Champaign**	**Decatur**	**East St. Louis**	**Effingham**	**Galesburg**	**Lincoln**	**Macomb**	**Mount Vernon**	**Peoria**	**Quincy**	**Other Areas**
Action Electric	W1906 Cty. Tk. JJ Kaukauna, WI 54130	866-636-4020	Rick VanDynHoven	lisaactionelectric@tds.net www.actionelectricwi.com	●	●	●	●	●	●	●	●	●	●	●	●	
Aschinger Electric	877 Horan Dr. Fenton, MO 63025	636-343-1211	Jeff Wilkinson	jwilkinson@aschinger.com www.aschingerelectric.com					●								
BLI Lighting Inc.	1305 S. Fell Ave. Normal, IL 61761	309-830-2909	John Griffard	john.griffard@budgetlighting.com www.budgetlighting.com	●	●	●	●	●	●	●	●	●	●	●	●	
Emmett-Scharf Electric Co.	1005 E. Lafayette St. Bloomington, IL 61701	309-664-1111	Richard Johnston	ESCOElectric@msn.com www.emmett-scharfelectric.com	●		●	●				●			●		●
Foster Jacob, Inc.	826 W. Main St. Peoria, IL 61606	309-674-8129	Gary Jacob	Garyj@fosterjacob.com www.fosterjacob.com	●						●				●		
Koener Electric Inc.	6301 SW Washington St. Bartonville, IL 61607	309-647-5550	Ty Slonneger	tslonneger@koener.com www.koener.com	●										●		
L & F Electric, Inc.	120 W. Madison Morton, IL 61550	309-263-1471	Mark Stephens	mark@lfelectric.com www.lfelectric.com	●							●			●		
Schaeffer Electric	4667 Green Park Rd. St. Louis, MO 63123	314-815-3231	Vickie Turner	www.schaefferelectric.com					●								
Witte Electric Company	4110 Colleen Dr. Champaign, IL 61822	217-352-0144	Merlyn Witte	mwitte@witteelectric.com			●										

THE CADMUS GROUP, INC.

Date: **February 9, 2011**

To: **Karen Kansfield, Ameren Illinois**

From: **Robert Huang, The Cadmus Group Inc.**

Re: **Domestic Hot Water Savings Analysis Addendum to PY2 Multifamily and Home Energy Performance Reports**

In January 2010, Cadmus developed an engineering estimate of unit savings for domestic hot water (DHW) measures in follow up to the PY1 Home Energy Performance and Multifamily program evaluations. **The purpose of this memo is to describe how these results, shown in Table 1, were calculated.**

Table 1. Domestic Hot Water Unit Savings Summary

DHW Default Savings Estimates										
Type of Water Heater	Faucet Aerator				Low Flow Showerheads				Pipe Insulation	
	Single Family		Multifamily		Single Family		Multifamily		Single and Multifamily	
	Savings	Per	Savings	Per	Savings	Per	Savings	Per	Savings	Per
Electric (in kWh)	30	aerator	37	aerator	240	shower-head	264	shower-head	51	insulation job
Gas (in therms)	1.2	aerator	1.6	aerator	10.6	shower-head	11.7	shower-head	2.3	insulation job

Aerators

We calculated energy savings by assuming a decrease in flow rate through the aerators in both kitchen and bathroom faucets. This decrease in flow led to energy savings calculated for electric and gas water heaters, shown in Equations 1 and 2 below, respectively:

Equation 1:

Annual Electric DHW Savings (in kWh) per Person for bathroom and kitchen aerators = $(8.33*1*TFR_b*TIME*((TFR_b-TFR_e)/TFR_b)*(T_{in}-T_{out})*DAY_h/3{,}413)/EFF_{elec}$

Equation 2:

Annual Gas DHW Savings (in therms) per Person for bathroom and kitchen aerators = $(8.33*1*TFR_b*TIME*((TFR_b-TFR_e)/TFR_b)*(T_{in}-T_{out})*DAY_h/100{,}000)/EFF_{gas}$

Where the constants in the equation are:

- *8.33 lbs per gallon*
- *3,413 BTUs per kWh*

- *100,000 BTUs per therm*
- *1 BTU/lb-degree F = amount of energy to raise 1 lb of water 1 degree F*

The inputs into Equations 1 and 2, as well as the results of the savings calculation, are shown in the Table 2. We then weighted the annual DHW savings per person by the ratio of kitchen to bathroom aerator PY1 installs. We multiplied the annual weighted DHW savings per person by the number of people living in the home and divided by the number of sinks per home to derive an annual per aerator savings for either single or multifamily homes in the Ameren Illinois service territory.

Table 2. Assumptions Used in Aerator Calculation

Estimate of Default Saving for Aerators				
Type of Water Heater	Electric		Gas	
Measure Name	Kitchen Aerator	Bathroom Aerator	Kitchen Aerator	Bathroom Aerator
Number Installed at AIU	5	38	59	680
Efficient Aerator Throttled Flow Rate (TFRe)	1.84	1.48	1.84	1.48
Baseline Aerator Throttled Flow Rate (TFRb)	2.13	1.87	2.14	1.85
Water Heater Recovery Efficiency (EFF)	100%	100%	77%	77%
Tin (in °F)	53.9	53.9	53.9	53.9
Tout (in °F)	80	80	80	80
Length of Use (in min) per day per person (TIME)	5	5	5	5
Days per Year at Home (DAYh)	352.25	352.25	352.25	352.25
Annual DHW Savings per Person	**32 kWh**	**44 kWh**	**1.5 therms**	**1.8 therms**
Annual DHW Savings per Person Weighted	**42.40**	**kWH**	**1.79**	**therms**
People per SF Home	2.67	people	2.67	people
Sinks per SF Home	3.83	sinks	3.83	sinks
Annual Savings per Aerator in SF Home	***30***	***kWH***	***1.2***	**therms**
People per MF Home	2.14	people	2.14	people
Sinks per MF Home	2.46	sinks	2.46	sinks
Annual Savings per Aerator in MF Home	***37***	***kWH***	***1.6***	**therms**

Showerheads

We calculated energy savings by assuming a decrease in flow rate through low-flow showerheads. This decrease in flow led to energy savings calculated for electric and gas water heaters, shown in Equations 3 and 4 below, respectively:

Equation 3:

Annual Electric DHW Savings (in kWh) per Person for showerheads =
$(8.33*1*TFR_b*TIME*((TFR_b-TFR_e)/TFR_b)*(T_{in}-T_{out})*DAY_h/3{,}413)/EFF_{elec}$

Equation 4:

Annual Gas DHW Savings (in therms) per Person for showerheads =
$(8.33*1*TFR_b*TIME*((TFR_b-TFR_e)/TFR_b)*(T_{in}-T_{out})*DAY_h/100{,}000)/EFF_{gas}$

Where the constants in the equation are:

- *8.33 lbs per gallon*
- *3,413 BTUs per kWh*
- *100,000 BTUs per therm*
- *1 BTU/lb-degree F = amount of energy to raise 1 lb of water 1 degree F.*

The inputs into Equations 3 and 4, as well as the results of the savings calculation, are shown in Table 3. We then multiplied annual savings per person by the number of people living in the home and divided by the number of sinks per home to derive an annual per aerator savings for either single or multifamily homes.

Table 3. Assumptions Used in Low-Flow Showerhead Calculation

Estimate of Default Saving for Low-Flow Showerheads		
Type of Water Heater	Electric	Gas
Efficient Aerator Throttled Flow Rate (TFRe)	1.82	1.82
Baseline Aerator Throttled Flow Rate (TFRb)	2.26	2.26
Water Heater Recovery Efficiency (EFF)	100%	77%
Tin (in °F)	53.9	53.9
Tout (in °F)	105	105
Length of Shower (in min) per day per person (TIME)	8.2	8.2
Days per Year at Home (DAYh)	352.25	352.25
Annual Savings per Person	**161 kWh**	**7.1 therms**
People per SF Home	2.67	2.67
Showers per SF Home	1.79	1.79
Annual Savings per Showerhead in SF Home	***240 kWh***	***10.6 therms***
People per MF Home	2.14	2.14
Showers per MF Home	1.30	1.30
Annual Savings per Showerhead in MF Home	***264 kWh***	***11.7 therms***

Hot Water Pipe Insulation

We calculated heat loss per area of pipe for insulated and non-insulated water pipe via Equations 5 and 6 below:

Equation 5:

$Q/A_{ins} = (T_{pipe} - T_{amb})/R_{ins}$

Equation 6:

$Q/A_{unins} = (T_{pipe} - T_{amb})/R_{unins}$

Where:

- *Q/A = heat loss per area of pipe (BTU/hr-ft^2) for non-insulated and insulated pipe*
- *R = R-value of insulated and non-insulated pipe (hr- ft^2-degreeF/Btu)*
- *T_{pipe} = temperature of copper pipe*
- *T_{amb} = temperature of ambient air*

The inputs into Equation 5 and 6, as well as the results of the heat loss per area calculation, are shown in Table 4 below.

Table 4. Assumptions Used in Low-Flow Showerhead Calculation

Pipe Heat Loss Assumptions		
Temperature of copper pipe (T_{pipe})	122	°F
Temperature of ambient air (T_{amb})	67.5	°F
R-value of un-insulated pipe (R_{unins})	0.86	hr-ft^2-°F/Btu
R-value of insulated pipe (R_{ins})	2.79	hr-ft^2-°F/Btu
Efficiency of electric hot water heater ($EFF_{electric}$)	100%	
Efficiency of gas hot water heater (EFF_{gas})	77%	
$AREA_{pipe}$	0.46	ft^2
Calculation		
Q/A_{ins}	19.47	Btu/hr-ft^2
Q/A_{unins}	63.18	Btu/hr-ft^2
Conversion to Gas and Electric Water Heater Savings		
Pipe Insulation Annual Electric and Gas Water Heater Savings	**51**	**kWh**
	2	**therms**

We calculated annual savings with Equations 7 and 8 below:

Equation 7:
Pipe Insulation Annual Electric Water Heater Savings = $(Q/A_{unins} - Q/A_{ins}) * AREA_{pipe} * 8{,}760)/EFF_{electric}/3{,}413$

Equation 8:
Pipe Insulation Annual Gas Water Heater Savings = $(Q/A_{unins} - Q/A_{ins}) * AREA_{pipe} * 8{,}760)/EFF_{gas}/100{,}000$

Where the constants in the equation are:

- *3,413 BTUs per kWh*
- *100,000 BTUs per therm*
- *8,760 hours per year*

The inputs into Equation 7 and 8, as well as the results of the annual savings calculations, are shown in Table 4 above.