The Impact of a Home Laundry on Energy Consumption

By Sean Armstrong and Michael Winkler of Redwood Energy, 12/2012

Overview: One of the largest energy impacts of the average household is the home laundry. For a developer using the California Utility Allowance Calculator, including a home laundry vs. a central laundry facility increases the CUAC-projected utility bills by 30-50%, or the required photovoltaic array for a "net zero" project. We recommend that affordable housing developers using the CUAC carefully examine marketing benefits of home laundry hook-ups vs. the cost-effectiveness of convenient, central laundry facilities with high-spin laundry machines.

Why Does A Home Laundry Room Dramatically Increases the CUAC-Projected Utility Bills?

The most important issue is the habits of the tenants. The average apartment tenant will use their laundry machine 2-4 times as much as if they used a central facility. For a net zero community a home laundry requires 1-1.5kW more photovoltaic panels per apartment, which is a 30-50% larger photovoltaic system than if the Owner located the machines down the hall or in a central building. That one design decision—home laundry vs. central laundry—is the single largest utility bill impact within the control of the Owner, the design team and the asset management team.

The secondary, but significant, issue is that home laundries generally use inefficient laundry equipment, particularly top-loading machines that have low-speed spin cycles (400rpm) that leave 2 gallons or more of water in the wet laundry. Boiling 2 gallons into exhaust vapor is extremely energy intensive, just if you were to boil away a huge stock pot of water on the stove, running a giant gas stove burner, an exhaust fan and a Kitchen Aid full of bread dough for hours (the laundry). Commercial Energy Star coin-op front loading machines spin between 500-1000rpm, leaving as little as 1 gallon. Even more efficient "spin dryers" extract 90% of the water at 3200 rpm, leaving just a cup of water left in a load of barely damp laundry.

Redwood Energy's Recommendations:

1. **In new construction locate the laundry facilities in a convenient location, like down the hall. In existing construction that requires a significant reduction in the utility allowance, consider replacing laundry hook-ups in the apartments with a number of smaller laundry rooms around the complex.**
2. **Whenever choosing equipment, choose laundry machines with at least a 1000rpm spin cycle. Faster spin cycle speeds are directly proportionate to reductions in the utility cost. Post signs encouraging tenants to use the fastest spin cycles to save energy and money.**
3. **Install commercial grade "spin dryers" in the laundomat to extract water at higher rpms. These can be used prior to a final "fluff and dry" cycle in the standard dryer.**
4. **Consider providing units with residential scale spin dryers, such as those found at: http://www.laundry-alternative.com/products/Spin_Dryer.html.**

The Supporting Science Behind the CUAC's Laundry Reports:

Below is a key table from "A National Study of Water & Energy Consumption in Multifamily Housing" that was use to create the formula in the California Utility Allowance Calculator. If you review the totals, you can see that in each major U.S. city Laundromat did much less laundry, and with more efficient equipment.

FIGURE 16: Estimates of Laundry Use Energy Consumption

		Type of Laundry Facilities							
		Common Area				In-Unit			
		Cycle/Loads	Estimated Energy Use			Cycle/Loads	Estimated Energy Use		
		per Unit per Week	per Cycle	per Week	per Year	per Unit per Week	per Cycle	per Week	per Year
California	Electricity (in kWh)	2.26	1.048	2.368	123.16	7.74	2.139	16.559	861.05
	Gas (in therms)	2.26	0.049	0.111	5.79	7.74	0.107	0.824	42.87
Georgia	Electricity (in kWh)	3.50	1.048	3.668	190.74	4.93	2.139	10.547	548.45
	Gas (in therms)	3.50	0.049	0.173	8.97	4.93	0.107	0.525	27.31
Oregon	Electricity (in kWh)	2.65	1.048	2.777	144.41	3.39	2.139	7.252	377.13
	Gas (in therms)	2.65	0.049	0.131	6.79	3.39	0.107	0.361	18.78
Texas	Electricity (in kWh)	1.57	1.048	1.645	85.56	4.70	2.139	10.055	522.86
	Gas (in therms)	1.57	0.049	0.077	4.02	4.70	0.107	0.501	26.03
Total	Electricity (in kWh)	2.16	1.048	2.264	117.71	5.22	2.139	11.167	580.71
	Gas (in therms)	2.16	0.049	0.106	5.54	5.22	0.107	0.556	28.91

The California Utility Allowance Calculator also predicts laundry energy use by calculating the relative impacts of the washer and dryer. The study referenced below was performed last year in California's Bay Area Laundromats, asking the question of how to reduce the energy impacts of laundry use.

Do the Savings Come Out in the Wash?
A Large Scale Study of In-Situ Residential Laundry Systems

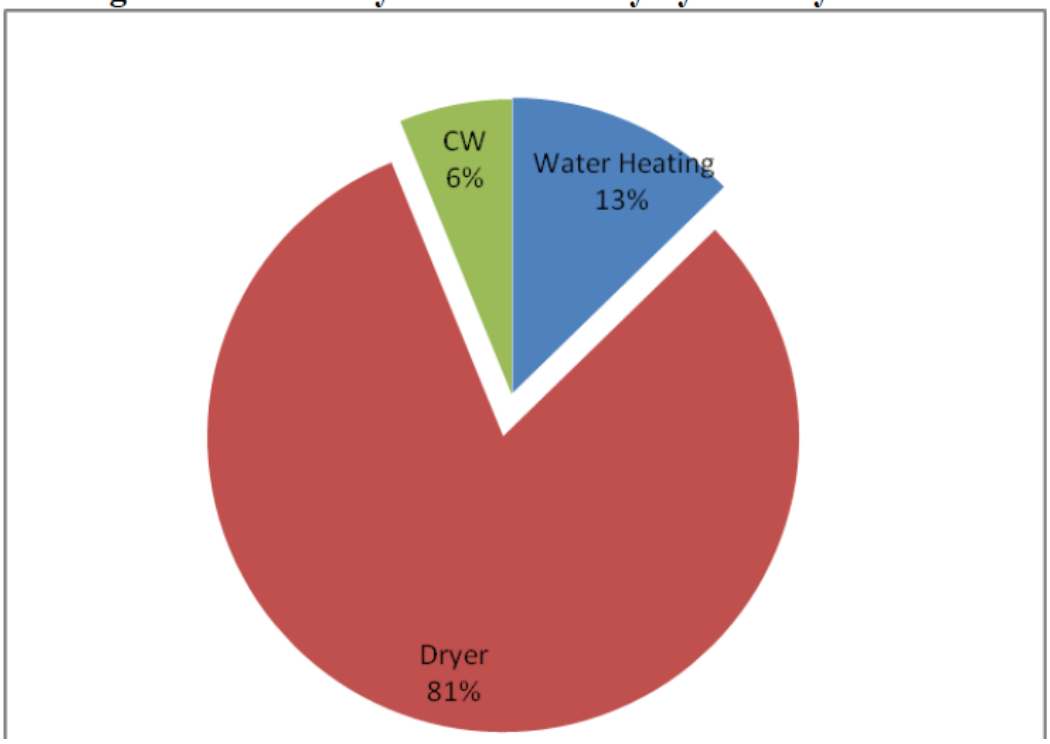
David Korn and Scott Dimetrosky, The Cadmus Group, Inc.[1]

ABSTRACT

This report explores the energy use of laundry systems at residences across southern California and the Bay area. Efficient laundry systems, and in particular clothes washers, are an unusual retail efficiency product in that the energy savings potential occurs primarily outside of the clothes washer, namely in the hot water heater and the clothes dryer. The study metered the actual energy use of 115 laundry systems – clothes washer, hot water heater, and clothes dryer – comprised of 24 non-ENERGY STAR qualified clothes washers, and 91 clothes washers that qualified under current or previous ENERGY STAR specifications, and under Tier 1, 2, or 3 criteria published by the Consortium for Energy Efficiency (CEE). Contrary to previous assumptions, the analysis determined that only 13 percent of the water used in the laundry system was heated, and that the majority of the energy consumed and potential savings arise in reduced operation of the clothes dryer.

Below you see the pie chart I find most compelling in the study—it shows how little of the energy impact is heating the hot water and mechanical energy of washing (13% and 6%), and how much is the consequence of evaporating 1-2 gallons of remaining water seen over the diverse array of 115 Energy Star and non-Energy Star machines they studied.

Figure 4: Electricity Use in Laundry Systems by End Use



Their central finding was that **drying wet laundry creates 81% of the energy impact of washing and drying laundry**. The practical impact of that knowledge is that we now know that almost all of energy savings possible comes from reducing the required drying energy.

What Does This Mean for CUAC Reports?

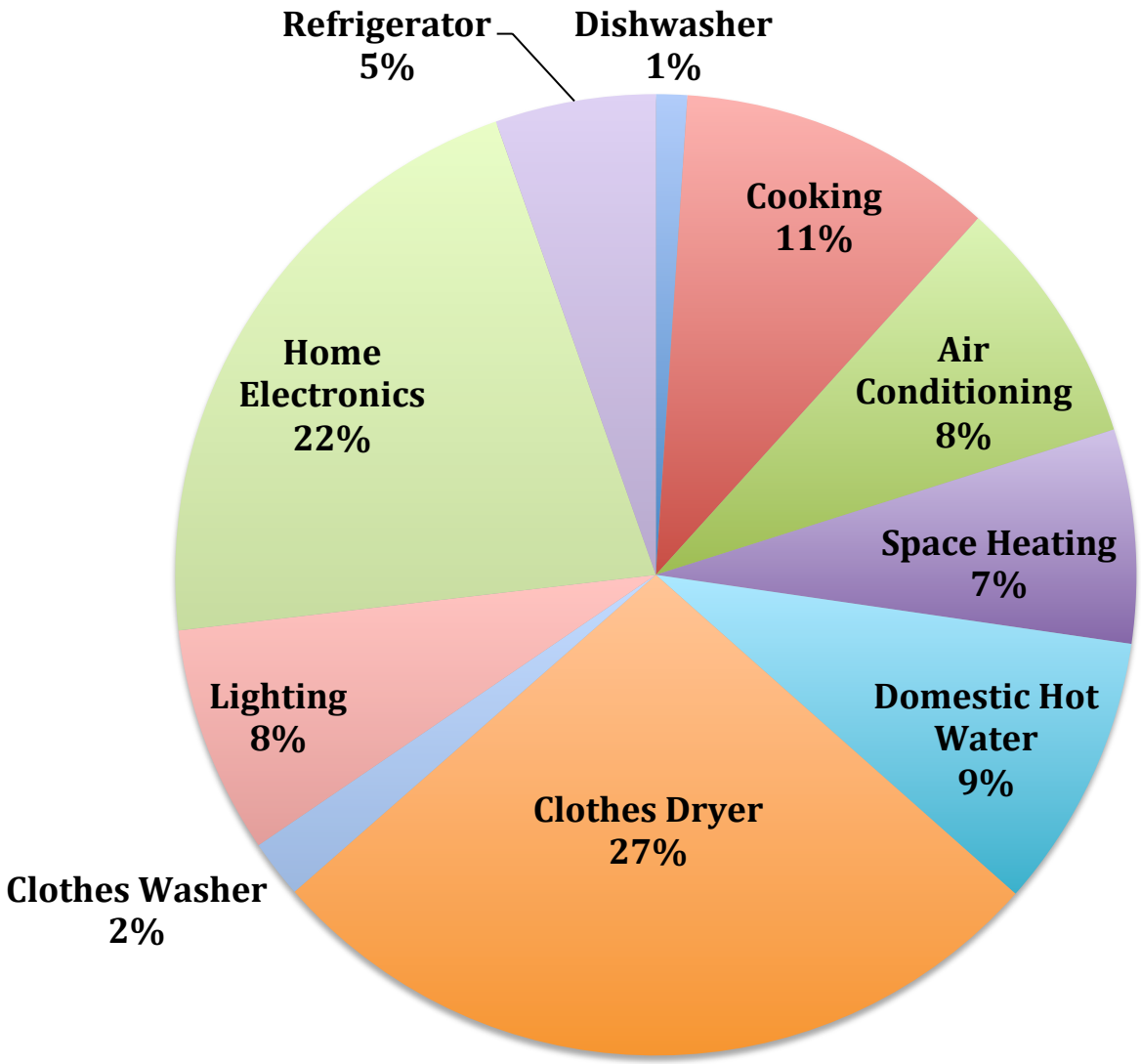
If one reviews the CUAC detailed report when a unit is provided with laundry hook-ups, an efficient new construction three bedroom unit in Sacramento has the following energy profile. On the following two pages are comparisons of relative and total demands for a 3 bed townhouse in Sacramento, with and without an Energy Star home laundry included in the CUAC analysis see directly below:

Electric kWh Usage by End Use Summary

Apartment Type	End Use	Daily Avg	Annual Total	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	No	Dec
Three Bedroom	Cooking	2.3	852.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0	71.0
Three Bedroom	Cooling	1.8	673.0	0.0	0.0	0.0	7.0	36.0	124.0	208.0	184.0	96.0	17.0	1.0	0.0
Three Bedroom	DHW	2.0	740.0	0.0	0.0	0.0	0.0	0.0	0.0	125.0	124.0	120.0	124.0	121.0	126.0
Three Bedroom	Dishwasher	0.2	84.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Three Bedroom	Dryer	5.9	2,160.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.0
Three Bedroom	Heating	1.6	575.0	99.0	61.0	41.0	26.0	18.0	38.0	57.0	51.0	32.0	16.0	41.0	95.0
Three Bedroom	Lighting	1.7	612.9	52.1	47.0	52.1	50.4	52.1	50.4	52.1	52.1	50.4	52.1	50.4	52.1
Three Bedroom	Plug Loads	4.7	1,716.0	143.0	143.0	143.0	143.0	143.0	143.0	143.0	143.0	143.0	143.0	143.0	143.0
Three Bedroom	Refrigerator	1.2	432.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
Three Bedroom	Washer	0.4	156.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0

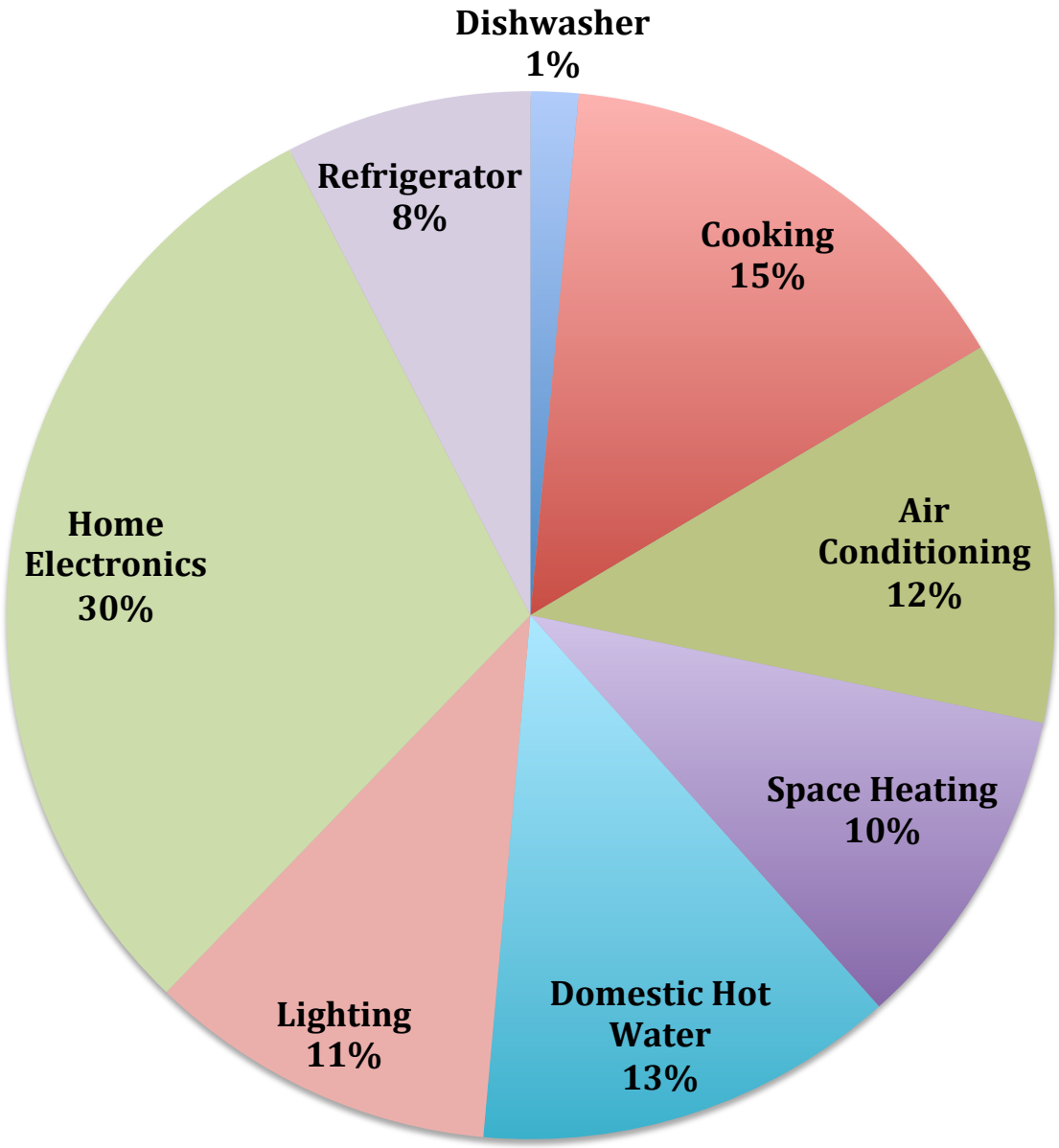
CUAC Energy Profile for an Energy Star New Affordable Townhouse in Sacramento with a Laundry Room

8001 kWh Annually



CUAC Energy Profile for an Energy Star New Affordable Townhouse in Sacramento with NO Laundry Room

5685 kWh Annually



Project Summary (if available)

Apartment Type	Total Annual Cost	Total Average Monthly Cost
One Bedroom	727.69	60.64
Three Bedroom	1,602.44	133.54

Apartment Type	Electric Annual Cost	Electric Monthly Cost	Gas Annual Cost	Gas Monthly Cost	Water Annual Cost	Water Monthly Cost	Trash Annual Cost	Trash Monthly Cost
One Bedroom	503.11	41.93	115.94	9.66	108.64	9.05	0.00	0.00
Three Bedroom	978.29	81.52	437.21	36.43	186.94	15.58	0.00	0.00

This Sacramento-area apartment complex used home laundry rooms in just the 12 three bedroom units, not in the 78 one bedroom units. Using the CUAC, this choice will cost the three bedroom tenant $283 more annually in utility bills, which equals $283 annually in lost rent for each three bedroom unit. That choice costs the project $3,400 annually in rental revenue. Had the Owner provided the 78 one bedroom units with laundry hook-ups, this Owner would have lost $215 in revenue per one bed apartment, while costing the one bedroom tenants $215 more annually in utility bills, for project total of $16,815 for the one bedroom units. **For this 90 unit project, choosing laundry rooms meant choosing to generate or lose $20,215 in revenue each year.**

We hope you found this informative as you make significant design decisions.

Regards,
Sean Armstrong and Michael Winkler
Partners in Redwood Energy