

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO**

**IN THE MATTER OF THE APPLICATION OF
PUBLIC SERVICE COMPANY OF COLORADO
FOR AUTHORITY TO IMPLEMENT AN
ENHANCED DEMAND SIDE MANAGEMENT
PROGRAM AND TO REVISE ITS DEMAND SIDE
MANAGEMENT COST ADJUSTMENT
MECHANISM TO INCLUDE CURRENT COST
RECOVERY AND INCENTIVES**

DOCKET NO. 07A-420E

**DIRECT TESTIMONY AND EXHIBITS OF
PAUL KRIESCHER**

1 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

2 A. My name is Paul Kriescher. My business address is 4303 Brighton Blvd., Denver, CO
3 80216.

4 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

5 A. I am employed by Lightly Treading, Inc. My title is Principal.

6 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS DOCKET?**

7 A. I am testifying on behalf of the Energy Efficiency Business Coalition.

8 **Q. PLEASE BRIEFLY DESCRIBE YOUR EXPERIENCE AND QUALIFICATIONS
9 RELEVANT TO YOUR TESTIMONY.**

10 A. I have more than 11 years of experience as residential home Energy Rater inspecting and
11 testing new and existing homes. I hold a Master's Degree from the University of
12 Wisconsin-Madison in Energy Analysis & Policy. I also serve as an Adjunct Professor to

1 Colorado State University's Institute for the Built Environment teaching a course in
2 Residential Green Building.

3 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?**

4 **A.** EEBC witness Tom Konrad presented the argument for a new DSM assessment to begin
5 immediately after the order in this docket. My testimony highlights two points to bolster
6 EEBC's central position in this case. First, my testimony demonstrates the extent of DSM
7 potential available in the residential sector in Colorado under the house-as-a-system
8 approach to analyzing DSM potential in residential and small commercial buildings.
9 Second, my testimony demonstrates how that same approach identifies customer driven
10 non-energy benefits to increase the cost-effectiveness of DSM measures because of the
11 role they play in attracting customers to their specific DSM technology purchases and to
12 the related energy savings and cost-effective potential of DSM implementation.

13 Because the residential market accounts for 1/3rd of all building related energy
14 consumption (based on data from the U.S. Energy Information Administration; 21,054
15 trillion BTU of 71,481 trillion BTU consumed by buildings in 2006), my testimony
16 presents justification for Demand Side Management dollars and potential energy savings
17 and demand reduction targets to be influenced by the residential sector as opposed to the
18 testimony presented by Public Service Company of Colorado ("PSCo") and the related
19 KEMA Market Assessment.

20 **Q. DESCRIBE THE NATURE OF YOUR BUSINESS WITH REGARD TO DEMAND**
21 **SIDE MANAGEMENT.**

22 **A.** Lightly Treading, Inc., a Colorado corporation incorporated in 1997, is a Home
23 Performance firm (certified through Energy-Star, Built Green & LEED) that conducts

1 energy audits and ratings which include energy-efficiency testing such as blower door
2 testing, infra-red camera scanning and duct-leakage testing as well as computer modeling
3 (HERS Energy-Ratings) to guide homeowners, owners of residential rental properties,
4 builders and architects to optimize the energy-efficiency and performance of their
5 existing or yet to be built residential properties. We have 11 employees and independent
6 contractors working across Colorado with the majority of our services being delivered
7 along the Front-Range and in the Roaring Fork Valley. We have worked on more than
8 20,000 new and existing homes and buildings since we started.

9 **Q. IN YOUR EXPERIENCE, PLEASE DESCRIBE THE POTENTIAL FOR**
10 **RESIDENTIAL DEMAND SIDE MANAGEMENT GROWTH IN COLORADO.**

11 A. The potential electricity savings in terms of baseload and peakload demand is enormous
12 on the residential side. In our work conducting Thermal Audits with computer modeling
13 and Electric Audits (see the descriptions below) we typically find paths to guiding
14 homeowners to upgrade energy-efficiency technologies (better insulation, air-sealing and
15 windows as well as whole house fans, evaporative cooler, high-efficiency air-
16 conditioning, compact florescent lighting and controls which reduce “ghost-loads” i.e.,
17 electricity still being drawn when the homeowner believes everything is turned off, etc.)
18 and education of the homeowners that result in homes cutting their electricity
19 consumption by 25% or more.

20 This means with average home levels of consumption in PSCo service territory in
21 Colorado being 625 KWH/month; that for every 5,000 average homes/year that receive
22 guidance through energy audits which provide the owners a complete house-as-a-system
23 assessment, results in approximately 781,500 KWH/month of energy savings. These

1 improvements also have the significant benefit of cutting natural gas consumption which
2 can result in average Thermal consumption of 190 in January being cut by nearly 50%. If
3 the rebate to homeowners creates an incentive for homes which consume more energy,
4 which frequently corresponds with larger homes (those over 4,000 sq. ft. of conditioned
5 space) the savings will be even greater because consumption levels in these homes rise
6 into the 900 KWH/month range.

7 **Q. HOW ARE THESE LEVELS OF RESIDENTIAL ENERGY SAVINGS**
8 **CORRELATED WITH THE POTENTIAL FOR DSM PENETRATION IN THE**
9 **ENHANCED DSM PLAN?**

10 A. The Market Assessment used by Public Service for its enhanced DSM plan showed very
11 modest DSM potential in the residential sector. I am confident that far greater savings can
12 be achieved in the residential sector if a comprehensive, "house-as-a-system" approach is
13 considered in the calculation of residential DSM potential. House-as-a-system analysis
14 requires comprehensive audits or computer modeling of homes and small buildings. This
15 approach delivers results because it is the antithesis to one-size-fits-all remedies of DSM
16 programs of the past, for example attic insulation programs, that frequently have resulted
17 in lower than expected outcomes because the windows, appliances, air-leakage or a
18 combination therein is where the home's energy consumption problems reside. For
19 example, I reviewed a small sample of rating computer files of homes Lightly Treading,
20 Inc. has tested in the house-as-a-system approach. The results of a sample 4000 square
21 feet of conditioned space house attached as EXHIBIT PK-1 (10 SEER 2.5 Ton sizing, 13
22 SEER 2.5 Ton sizing, 13 SEER 5-ton sizing) shows where a homeowner or builder is
23 able to install a 2.5 ton air-conditioning (AC) unit because of house-as-a-system analysis

1 and related improvements, instead of a 5 ton AC unit using rules-of-thumb based on the
2 size of the house, electricity consumption can be cut by an average of 148 KWH during
3 the summer months. If proper sizing is done along with an improvement from an old 10
4 SEER AC unit to a 13 SEER unit (which is the minimum SEER currently available by
5 Federal law), then savings buoys to 542 KWH. Additionally, if there has not been a
6 house-as-a-system evaluation of this house and the installer simply installs a 5-ton 13
7 SEER unit the energy savings only goes to 424 KWH. Finally, these savings almost
8 always occur during peak-load times in the afternoon when the Company is at greatest
9 risk of not meeting demand.

10 Another powerful aspect to making the improvements to the thermal envelope of
11 the house with a focus on house-as-a-system performance is these improvements will also
12 deliver greater thermal comfort for the occupants throughout the year. Thus, the house-
13 as-a-system approach, when applied to an assessment of the cost-effective DSM potential
14 in Colorado, will result in a much greater potential for residential DSM energy savings.

15 **Q. HOW DOES YOUR ANALYSIS OF DSM POTENTIAL AFFECT HOW PSCo**
16 **SHOULD EVALUATE RESIDENTIAL DSM IN A NEW MARKET**
17 **ASSESSMENT?**

18 A. When a comprehensive analysis is done, I am confident that it will show all the energy
19 efficiency measures that make sense in the residential market when they are intertwined.
20 Air conditioning is the biggest electric load in homes that have AC. A comprehensive
21 analysis using house-as-a-system analysis will demonstrate that insulation and air sealing
22 opportunities create synergies with AC and heating use. These measures in turn produce
23 non-energy benefits which are very attractive to the homeowner because they will not

1 only reduce electric use in the summer, they will also reduce natural gas use in the winter
2 and they will make the home more comfortable. Once the insulation and air sealing
3 measures are done, the home can be cooled with a smaller AC unit and heated with a
4 smaller furnace. The electric savings from a smaller AC and a smaller furnace blower
5 motor are only achieved when this comprehensive, "house-as-a-system" approach is
6 taken.

7 **Q. PLEASE DISCUSS THE IMPORTANCE OF NON-ENERGY BENEFITS IN**
8 **OVERCOMING THE MARKET BARRIERS HIGHLIGHTED IN PSCo's**
9 **TESTIMONY.**

10 A. The primary reasons clients seek our services are comfort, utility bills and the
11 environmental impact of their homes or building. With our focus being on identifying and
12 understanding how their home works as a system, we have a much greater likelihood of
13 ensuring we can solve the problem not simply throwing them a solution of "more attic
14 insulation" because that is the product we sell. Especially when it comes to comfort, it is
15 rare that the solution to the problems can come from one product. We typically find by
16 looking at a house synergistically that it is a series of items that need to be addressed to
17 resolve the problem.

18 A common complaint that we hear from homeowners has to do with bedrooms
19 above garages. We find that these spaces can be uncomfortable because of air-leakage,
20 poor insulation, window insulation and/or solar heat gain issues as well as ductwork
21 sizing, design or duct-leakage. Without looking at and either systematically ruling out
22 through tests and inspections that each of these elements is not a part of the problem or
23 by developing a plan to make the necessary corrections to these areas, the discomfort will

1 remain. Put bluntly, the non-energy benefits of DSM potential are the very factors that
2 break down the barriers explained by PSCo witness Sundin in her testimony. They are an
3 essential piece of evaluating the cost-effective potential for residential DSM in Colorado.

4 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

5 **A. Yes.**

6

CERTIFICATE OF SERVICE

I hereby certify that on this, the 14th day of March, 2008, a copy of **DIRECT**

TESTIMONY AND EXHIBITS OF PAUL KRIESCHER was emailed to the following:

| | | |
|----------------------------------|---------------------|---------------------------|
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| Fredric C. Stoffel | Michael Hydock | Thorvald Nelson |
| Gina Hardin | Michael Kurtz | Virginia Oen |
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| Holly Rachel Smith | Morey Wolfson | William W. Wright |
| | Nancy LaPlaca | <i>Brenda K. Hartsorn</i> |

10 SEER 2.5 ton sizing

FUEL SUMMARY

EXHIBIT PK-1

| | | | |
|-----------------|--|---------------|-----------------------|
| Date: | March 10, 2008 | Rating No.: | |
| Building Name: | Lot 4 | Rating Org.: | Lightly Treading Inc. |
| Owner's Name: | Coast to Coast Development | Phone No.: | 303.733.3078 |
| Property: | 3102 Palo Parkway | Rater's Name: | Sue Bryant |
| Address: | Boulder, CO | Rater's No.: | 074 |
| Builder's Name: | Coast to Coast Development | Rating Type: | Projected Rating |
| Weather Site: | Boulder, CO | Rating Date: | 062907 |
| File Name: | Lot 4 3102 Palo Single Family Custom -5 ton AC.t | | |

| | Lot 4:Base | | Lot 4 | | DIFF | % DIFF |
|------------------------------------|------------|----|-------|----|------|--------|
| Annual Energy Cost (\$/yr) | | | | | | |
| Natural gas | \$ 359 | \$ | 359 | \$ | | |
| Electric | \$ 843 | \$ | 830 | \$ | 13 | 1.5% |
| Annual End-Use Cost (\$/yr) | | | | | | |
| Heating | \$ 326 | \$ | 326 | \$ | | |
| Cooling | \$ 179 | \$ | 166 | \$ | 13 | 7.2% |
| Water Heating | \$ 0 | \$ | 0 | \$ | | |
| Lights & Appliances | \$ 955 | \$ | 955 | \$ | | |
| Photovoltaics | \$ -236 | \$ | -236 | \$ | | |
| Service Charges | \$ 195 | \$ | 195 | \$ | | |
| Total | \$ 1418 | \$ | 1405 | \$ | 13 | 0.9% |

| | | | | | | |
|-----------------------------------|-------|--|-------|--|-----|------|
| Annual End-Use Consumption | | | | | | |
| Heating (Therms) | 429 | | 429 | | | |
| Heating (kWh) | 439 | | 439 | | | |
| Cooling (kWh) | 2065 | | 1917 | | 148 | 7.2% |
| Lights & Appliances (Therms) | 104 | | 104 | | | |
| Lights & Appliances (kWh) | 10402 | | 10402 | | | |
| Photovoltaics (kWh) | -2780 | | -2780 | | | |

Utility Rates:
 Electricity: Xcel - Electric
 Gas: Xcel Energy

13 SEER - 2.5 ton Sizing

FUEL SUMMARY

EXHIBIT PK-1

| | | | |
|-----------------|--|---------------|-----------------------|
| Date: | March 10, 2008 | Rating No.: | |
| Building Name: | Lot 4 | Rating Org.: | Lightly Treading Inc. |
| Owner's Name: | Coast to Coast Development | Phone No.: | 303.733.3078 |
| Property: | 3102 Palo Parkway | Rater's Name: | Sue Bryant |
| Address: | Boulder, CO | Rater's No.: | 074 |
| Builder's Name: | Coast to Coast Development | Rating Type: | Projected Rating |
| Weather Site: | Boulder, CO | Rating Date: | 062907 |
| File Name: | Lot 4 3102 Palo Single Family Custom -2 ton AC.t | | |

| | | Lot 4 | | Lot 4 | | DIFF | % DIFF |
|------------------------------------|----|-------|----|-------|----|------|--------|
| Annual Energy Cost (\$/yr) | | | | | | | |
| Natural gas | \$ | 359 | \$ | 359 | \$ | | |
| Electric | \$ | 843 | \$ | 796 | \$ | 47 | 5.6% |
| Annual End-Use Cost (\$/yr) | | | | | | | |
| Heating | \$ | 326 | \$ | 326 | \$ | | |
| Cooling | \$ | 179 | \$ | 132 | \$ | 47 | 26.2% |
| Water Heating | \$ | 0 | \$ | 0 | \$ | | |
| Lights & Appliances | \$ | 955 | \$ | 955 | \$ | | |
| Photovoltaics | \$ | -236 | \$ | -236 | \$ | | |
| Service Charges | \$ | 195 | \$ | 195 | \$ | | |
| Total | \$ | 1418 | \$ | 1371 | \$ | 47 | 3.3% |
| Annual End-Use Consumption | | | | | | | |
| Heating (Therms) | | 429 | | 429 | | | |
| Heating (kWh) | | 439 | | 439 | | | |
| Cooling (kWh) | | 2065 | | 1524 | | 542 | 26.2% |
| Lights & Appliances (Therms) | | 104 | | 104 | | | |
| Lights & Appliances (kWh) | | 10402 | | 10402 | | | |
| Photovoltaics (kWh) | | -2780 | | -2780 | | | |

Utility Rates:

Electricity: Xcel - Electric
 Gas: Xcel Energy

13 SEER - 5-TON Upgrade

FUEL SUMMARY

EXHIBIT PK-1

| | | | |
|-----------------|--|---------------|-----------------------|
| Date: | March 10, 2008 | Rating No.: | |
| Building Name: | Lot 4 | Rating Org.: | Lightly Treading Inc. |
| Owner's Name: | Coast to Coast Development | Phone No.: | 303.733.3078 |
| Property: | 3102 Palo Parkway | Rater's Name: | Sue Bryant |
| Address: | Boulder, CO | Rater's No.: | 074 |
| Builder's Name: | Coast to Coast Development | Rating Type: | Projected Rating |
| Weather Site: | Boulder, CO | Rating Date: | 062907 |
| File Name: | Lot 4 3102 Palo Single Family Custom -2 ton AC.t | | |

| | | Lot 4 | | Lot 4 | | DIFF | % DIFF |
|------------------------------------|----|-------|----|-------|----|------|--------|
| Annual Energy Cost (\$/yr) | | | | | | | |
| Natural gas | \$ | 359 | \$ | 359 | \$ | | |
| Electric | \$ | 843 | \$ | 806 | \$ | 37 | 4.4% |
| Annual End-Use Cost (\$/yr) | | | | | | | |
| Heating | \$ | 326 | \$ | 326 | \$ | | |
| Cooling | \$ | 179 | \$ | 142 | \$ | 37 | 20.5% |
| Water Heating | \$ | 0 | \$ | 0 | \$ | | |
| Lights & Appliances | \$ | 955 | \$ | 955 | \$ | | |
| Photovoltaics | \$ | -236 | \$ | -236 | \$ | | |
| Service Charges | \$ | 195 | \$ | 195 | \$ | | |
| Total | \$ | 1418 | \$ | 1381 | \$ | 37 | 2.6% |
| Annual End-Use Consumption | | | | | | | |
| Heating (Therms) | | 429 | | 429 | | | |
| Heating (kWh) | | 439 | | 439 | | | |
| Cooling (kWh) | | 2065 | | 1641 | | 424 | 20.5% |
| Lights & Appliances (Therms) | | 104 | | 104 | | | |
| Lights & Appliances (kWh) | | 10402 | | 10402 | | | |
| Photovoltaics (kWh) | | -2780 | | -2780 | | | |

Utility Rates:

Electricity: Xcel - Electric
 Gas: Xcel Energy