BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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RE: THE TARIFF SHEETS FILED BY	**)**	
PUBLIC SERVICE COMPANY OF	**)**	**DOCKET NO. 09S-_____E**
COLORADO WITH ADVICE LETTER	**)**	
NO. 1535 – ELECTRIC.	**)**	

DIRECT TESTIMONY AND EXHIBITS OF AHMAD FARUQUI

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

May 1, 2009

LIST OF EXHIBITS

Exhibit No. AF-1	Distribution Of Monthly Customer Usage
Exhibit No. AF-2	Illustration Of Summer-Only Two-Tier Inclining Block Rate
Exhibit No. AF-3	Comparison Of Summer-Only Tiered Rates Across Rate Designs
Exhibit No. AF-4	Class Impacts Comparison Across Rate Designs
Exhibit No. AF-5	Summer Tier-Level Class Impacts Comparison Across Rate Designs

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RE: THE TARIFF SHEETS FILED BY PUBLIC SERVICE COMPANY OF COLORADO WITH ADVICE LETTER NO. 1535 – ELECTRIC.	**)** **)** **)** **)**	**DOCKET NO. 09S-_____E**

DIRECT TESTIMONY AND EXHIBITS AHMAD FARUQUI

I. INTRODUCTION AND QUALIFICATIONS

Q. WHAT IS YOUR NAME AND AFFILIATION?

A. My name is Ahmad Faruqui. I am a Principal with The Brattle Group, an economics consulting firm with offices in the U.S. and the E.U.

Q. WHAT ARE YOUR QUALIFICATIONS?

A. I have thirty years of consulting and research experience in designing and evaluating innovative customer-side programs, including inclining-block rates, time-of-use rates and dynamic pricing rates. Since the year 2001, I have assisted 14 utilities in 12 states make such assessments. Last year, I published reports that featured innovative rate design for the Edison Electric Institute and the Electric Power Research Institute. I am currently assisting the Federal Energy Regulatory Commission and several independent system operators/regional transmission operators with their assessment of the likely impact of dynamic pricing. I hold a Ph. D. in economics from the University of California at Davis. My resume is appended to the testimony as Attachment A.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to develop, with the Company's assistance, inclining-block rates for the residential class under five scenarios: two versions of a summer-only, two-tier rate design; a summer-only, three-tier rate design; a year-round, two-tier rate design; and a year-round, three-tier rate design. I then estimate the likely impacts of each of the five rate designs on test-year energy consumption, coincident peak demand, revenues and customer bills in the service territory of Public Service Company of Colorado ("Public Service" or "the Company"). Finally, I adjust the base rates under each scenario to generate the residential test-year revenue responsibility after accounting for the impact of each rate design on customer use.

III. DESIGN AND IMPACTS OF INCLINING BLOCK RATE ALTERNATIVES

Q. WHY SHOULD PUBLIC SERVICE CONSIDER INCLINING BLOCK RATES?

A. The main purpose is to comply with the Commission directive in Dockets No. 09M-183E and 08I-420EG. This point is discussed further in the testimony of Company witness Mr. Scott B. Brockett.

Q. IN YOUR WORK, WHAT INCLINING BLOCK RATES DID YOU ANALYZE?

A. I considered five alternative rate designs. The first one is a two-tier rate, which is applied only during the summer months. Mr. Brockett provides the basis for this rate design. It concentrates the price signal during the peaking season and has the considerable advantage of simplicity. Unless customers understand the intent of the rate, they will not be able to take advantage of it. The second rate design is a similar rate with a higher price in the second tier and a lower price in the first tier. The third rate is a year-round variant of the two-tier rate. The fourth and fifth rate designs are three-tier variants of the two-tier rate.

Q. IN GENERAL, HOW DID YOU DEVELOP THE RATES?

A. For each scenario, the rate applied to usage in the last tier was based on an estimate of the long-run marginal cost of providing electricity. This rate was applied to usage in the second tier of the two-tier alternatives and usage in the third tier of the three-tier alternatives. The rates applied to usage in the lower tier (or tiers) were derived to collect the test-year revenue responsibility of the residential class. As explained below, these rates were set after factoring in any changes in customer usage that would be induced by the change in rate design.

Q. IN GENERAL, HOW DID YOU ESTIMATE THE IMPACTS OF THE RATES?

A. The impacts were estimated on a monthly basis for aggregate usage in various size strata, as determined by the tier cutoff of the inclining-block rate. For a customer in a given stratum, changes in usage were estimated

using price elasticities derived from the energy economics literature. If the customer's entire usage fell within the first tier, they would experience a decrease in price and would raise their usage. If the customer's marginal usage fell in the second tier in a two-tier rate design, they would see lower prices for the first tier and higher prices for the second tier. The total change in usage would be the sum of an increase in usage originating in the first tier and a decrease in usage originating in the second tier. This is explained later in the testimony by way of an example. Note that usage data used in this assessment is based on a test year projection for the entire residential class as provided by Public Service

Q. HOW DID YOU DEVELOP THE FIRST VERSION OF THE TWO-TIER, SUMMER ONLY RATE?

A. The rate was designed to be revenue neutral on an annual basis *after* allowing for customer price response. To keep things simple, it was decided that the first tier during the summer months would equal the flat rate in the winter months. As explained by Mr. Brockett, the base energy rate for the second tier was set at 8 cents per kWh, which is below the long run marginal cost of producing and delivering electricity in the summer, but is proposed by the Company to mitigate the impacts on customers from the introduction of this first inclining block rate. After adding the applicable riders, the projected 2010 all-in usage or energy rate is 12.4 cents per kWh. The size of the first tier was set at 500 kWh per month. In a sensitivity analysis, it was lowered to 400 kWh per month and

the results are discussed later in my testimony. The PRISM model used by Brattle in a number of rate design studies for utilities throughout the country was then applied to the billing distribution of Public Service's residential customers (see Exhibit No. AF-1) and solved for the first tier rate. This resulted in a first tier base rate of 5.1 cents per kWh, or 9.5 cents per kWh on an all-in basis.

Q. WHAT IS THE LIKELY IMPACT OF THE TWO-TIER, SUMMER ONLY RATE?

A. In order to estimate the likely impacts, we had to set values for the price elasticity of consumption. We based the second tier price elasticity at -0.26, based on a survey of the literature performed by EPRI and an econometric study by the RAND Corporation. Intuitively, consumption in the first tier is expected to be less price responsive than consumption in the second tier. In the absence of specific guidance on tier-specific econometric studies, we have set the first tier price elasticity at half the value of the second tier price elasticity. The price elasticity of winter energy consumption is generally understood to be less than the price elasticity of summer energy consumption. We have set it equal to the price elasticity of the first tier in the summer, i.e., at -0.13.

Q. CAN YOU PROVIDE AN ILLUSTRATIVE EXAMPLE OF HOW CUSTOMERS MIGHT RESPOND?

A. Yes. Consider the case of two customers, A and B. A uses 300 kWh a month and is towards the low end of the billing distribution. B uses 1,000

kWh a month and is towards the high end of the billing distribution. In the absence of the inclining block rate, they would pay a flat rate of 9.9 cents per kWh on an all-in basis (the sum of the base usage rate and all applicable riders). They are now moved to a two-tier, summer only rate where the first tier is set at 9.5 cents per kWh and the second tier at 12.4 cents per kWh in the summer months.

Customer A sees a drop in price of 4.0 percent and raises his usage by 0.52 percent, as shown in Exhibit No. AF-2. His bill goes down by 3.5 percent. Customer B sees a drop in price for his first-tier usage of 4.0 percent and a rise in price for his second-tier usage of 25.3 percent. The net effect is for his usage to drop by 2.8 percent. He faces a bill increase of 6.8 percent.

The new rate design would lower the all-in usage charge. Both customers would face a flat rate of 9.5 cents per kWh in the winter, as opposed to the otherwise applicable rate of 9.9 cents per kWh. Multiplying the winter price elasticity of -0.13 by this price decrease of 4.0 percent results in an increase in usage of 0.52 percent for both customers during the winter months. These calculations are provided in Exhibit No. AF-2.

It should be noted that the rate designs maintain neutrality in base revenues. However, it is assumed that customers are responding to their entire rate per kWh, so price changes are calculated on an all-in basis when simulating customer response.

Using this same methodology, on an aggregate basis total, class annual energy consumption changes from 8,723 GWh to 8,673 GWh, resulting in a savings of 50 GWh. Class coincident peak demand in July changes from 1,888 MW to 1,842 MW, a reduction of 46 MW. In percentage terms, class annual consumption falls by 0.6 percent and summer peak demand falls by 2.4 percent. I summarize these impacts on my Exhibit AF-4.

The peak demand impact is higher than the usage impact, because customer response is concentrated in the summer months -- when the Company's annual system peak occurs. To estimate the peak demand impacts, I assumed that customer peak demand for a given month would be reduced by 75 percent of the change in consumption (on a percentage basis) in that month. This represents a general assumption that peak demand is less responsive to price changes than off-peak demand.

Q. HOW DID YOU DEVELOP THE ALTERNATIVE VERSION OF THE TWO-TIER RATE WITH A HIGHER SECOND TIER PRICE?

A. The second tier base rate was set at 10 cents/kWh. As with the first scenario, this rate is below the long run marginal cost of producing and delivering electricity in the summer, but is proposed by the Company to mitigate the impacts on customers from the introduction of this first inclining block. The main difference between the scenarios is that the rate of 10 cents is closer to the marginal cost of service, but provides less mitigation than the 8-cent rate. When this base rate of 10 cents/kWh is

added to applicable riders, the result is an all-in usage rate of 14.4 cents/kWh. The corresponding revenue-neutral first tier base rate worked out to 4.8 cents/kWh, or 9.2 cents/kWh on an all-in basis. The winter rate is also set equal to this amount, which maintains revenue neutrality after price response over the entire year.

Q. WHAT WERE THE IMPACTS?

A. Class annual energy consumption changed from 8,723 GWh during the test year to 8,629 GWh, resulting in savings of 94 GWh. Class coincident peak demand in July went from 1,888 MW to 1,826 MW, resulting in a reduction of 62 MW. In percentage terms, this yielded a reduction in annual energy consumption of 1.1 percent and a change in summer peak demand of 3.3 percent.

Q. HOW DID YOU DEVELOP THE YEAR-ROUND VARIANT OF THE TWO-TIER RATE?

A. The second tier base rate was set at the sum of the Company's long-run marginal cost of generating capacity (allocated equally over all 12 months instead of only the summer months, as in the previous example), the test-year embedded transmission and distribution ("T&D") costs per kWh, and test-year variable O&M costs per kWh. The resulting rate is 8.02 cents/kWh which, when added to applicable riders, yields an all-in usage rate of 12.4 cents/kWh. The corresponding revenue-neutral first tier base rate worked out to 4.2 cents/kWh, or 8.6 cents/kWh on an all-in basis.

Q. WHAT WERE THE IMPACTS?

A. Class annual energy consumption changed from 8,723 GWh during the test year to 8,604 GWh, resulting in savings of 119 GWh. Class coincident peak demand in July went from 1,888 MW to 1,863 MW, resulting in a reduction of 25 MW. In percentage terms, this yielded a reduction in annual energy consumption of 1.4 percent and a change in summer peak demand of 1.3 percent.

Q. HOW DID YOU DEVELOP THE SUMMER ONLY, THREE-TIER RATE?

A. The first- and third-tier base rates are set to match the summer-only first- and second-tier base rates, respectively. The second tier base rate is computed to maintain neutrality in base revenues after price response. As with the two-tier rate, revenue neutrality is maintained over the entire test year period, and the winter base rate is set equal to the first-tier base rate for the summer season. The width of the tiers was defined such that about a third of the summer-season test-year class consumption fell into each of the three tiers. This approach yielded a first tier of 0 kWh/month through 250 kWh/month and a second tier of between 251 kWh/month and 650 kWh/month. The resulting base rate for the second tier is 5.9 cents/kWh, the first tier rate is 4.8 cents/kWh and the third tier rate is 10 cents/kWh. On an all-in basis, this resulted in rates of 10.3 cents/kWh for the second tier, 9.2 cents/kWh for the first tier and 14.4 cents/kWh for the third tier.

Q. WHAT WERE THE IMPACTS?

A. Class annual energy consumption changed from 8,723 GWh to 8,639 GWh, resulting in an annual savings of 84 GWh. Class coincident peak demand in July changed from 1,888 MW to 1,835 MW, a reduction of 53 MW. In percentage terms annual energy consumption declined by 1.0 percent and summer peak demand declined by 2.8 percent.

Q. HOW DID YOU DEVELOP THE YEAR-ROUND VARIANT OF THE THREE-TIER RATE?

A. The first- and third-tier base rates were set to match the year-round, two-tier first and second tier base rates, respectively. The second-tier base rate was set to maintain neutrality in base revenues after price response over the entire year. The width of the tiers was defined such that a third of the annual test-year class consumption fell into each of the three tiers. The width of the first tier came in at 0 kWh/month through 225 kWh/month The second tier covers monthly usage between 226 kWh and 550 kWh. This yielded a second tier base rate of 4.4 cents/kWh, a first tier base rate of 4.2 cents/kWh and a third tier base rate of 8.02 cents/kWh. On an all-in basis, this yielded a second-tier all-in rate of 8.8 cents/kWh, a first tier all-in rate of 8.6 cents/kWh and a third tier all-in rate of 12.4 cents/kWh.

Q. WHAT WERE THE IMPACTS?

A. Class annual energy consumption changed from 8,723 GWh to 8,656 GWh, resulting in an annual savings of 67 GWh. Class coincident peak demand in July changed from 1,888 MW to 1,873 MW, a reduction of 15

MW. In percentage terms, annual energy consumption declined by 0.8 percent and summer peak demand declined by 0.8 percent.

Q. DID YOU CONSIDER ANY OTHER RATE DESIGNS?

A. Yes, I considered a variation to the summer-only and year-round two-tier rate designs in which I limited the first tier to 400 kWh/month. In the summer-only variant, the first tier base rate was set at 5.0 cents/kWh and the second tier base rate at 8.0 cents/kWh. This resulted in a first tier all-in rate of 9.4 cents/kWh and the second tier all-in rate of 12.4 cents/kWh. In the year-round variant, the first tier base rate was set at 3.8 cents/kWh and the second tier base rate at 8.0 cents/kWh. This resulted in a first tier all-in rate of 8.2 cents/kWh and the second tier all-in rate of 12.4 cents/kWh.

Q. WHAT WAS THE PROJECTED IMPACT OF THIS RATE?

A. For the summer-only variant, class annual energy consumption changed from 8,723 GWh to 8,663 GWh, resulting in an annual savings of 61 GWh. Class coincident peak demand in July changed from 1,888 MW to 1,845 MW, a reduction of 43 MW. In percentage terms annual energy consumption declined by 0.7 percent and summer peak demand declined by 2.3 percent. For the year-round variant, class annual energy consumption changed from 8,723 GWh to 8,583 GWh, resulting in an annual savings of 140 GWh. Class coincident peak demand in July changed from 1,888 MW to 1,867 MW, a reduction of 21 MW. In

percentage terms, annual energy consumption declined by 1.6 percent and summer peak demand declined by 1.1 percent.

Q. ARE YOU PROVIDING EXHIBITS THAT SUMMARIZE THE FIVE CORE ALTERNATIVE RATE DESIGNS AND THEIR PROJECTED IMPACTS?

A. Yes. The four rate designs are summarized in Exhibit No. AF-3 and the results across the rate designs are summarized on an annual basis in Exhibit No. AF-4. Change in usage is broken out further into season- and tier-specific impacts in Exhibit No. AF-5. The summer-only, two-tier rate does not produce the largest reduction in annual energy use, but I believe this is the simplest rate design for customers to understand.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

Attachment A

Statement of Qualifications

Ahmad Faruqui

I am a Principal with The Brattle Group. I am one of the nation's leading experts on energy efficiency and demand management issues. I have been analyzing the economics of inclining block rates for the past few years and wrote a seminal article on the topic for the Public Utilities Fortnightly in August 2008.

I currently leading a state-by-state assessment of the potential for demand response for the Federal Energy Regulatory Commission. Last year, I performed a national assessment of the potential for energy efficiency for the Electric Power Research Institute and wrote a report on quantifying the benefits of dynamic pricing for the Edison Electric Institute.

I have worked on fostering economic demand response for the Midwest ISO and ISO New England and on load management standards for the California Energy Commission. Since the year 2000, I have been assisting utilities and commissions throughout the US and Canada assess the economics of dynamic pricing, demand response and advanced metering. This has often involved the design and evaluation of innovative pilot programs.

Early in my career, I wrote an evaluation of 14 time-of-use pricing experiments that is cited in the Bonbright canon on public utility rates and the author of several books and more than a hundred papers, I hold a doctoral degree in economics from the University of California at Davis. I am based in

Brattle's San Francisco, California office and can be reached via email at ahmad.faruqui@brattle.com or by phone at (925) 408-0149.