BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF THE MOUNTAIN ENERGY PROJECT AND ASSOCIATED CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR SUPPLEMENTAL SUPPLY	)	**PROCEEDING NO. 25A-0044EG**

REBUTTAL TESTIMONY OF JORDAN MANN

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

July 3, 2025

Colorado PUC E-Filings System

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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REBUTTAL TESTIMONY OF JORDAN MANN

I. INTRODUCTION, QUALIFICATIONS, AND PURPOSE OF TESTIMONY

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Jordan Mann. My business address is 2500 30th Street, Suite 207 Boulder, Colorado 80301.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT POSITION?

A. I am employed by Apex Analytics LLC ("Apex") as a Project Director. Apex was formed in 2011 with the goal of providing the highest-quality research, planning, and strategic support for clean energy programs. Apex has a team of 16 professionals with backgrounds in economics, mathematics, engineering, data science, behavioral science, qualitative research, and market research. PA Consulting partnered with Apex ("the PA team") to support Public Service Company of Colorado ("Public Service" or the "Company") in assessing the

achievable potential of peak hour gas demand reduction in the mountain region.[1] A description of my qualifications, duties, and responsibilities is set forth in my Statement of Qualifications at the conclusion of my testimony.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THE PROCEEDING?

A. I am testifying on behalf of Public Service.

Q. DID YOU PREVIOUSLY PROVIDE DIRECT TESTIMONY IN THIS PROCEEDING?

A. No, I did not.

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. My Rebuttal Testimony provides information about the potential study conducted for the Eastern Mountain Gas System (the "Potential Study") as well as information and estimated adoption rates regarding certain non-pipeline alternative ("NPA") measures.

[1] *See* Hrg. Ex. 102, Attachment GJK-2, section 4.3 at 20 (Jones Direct) for a map of the mountain region.

II. NPA POTENTIAL STUDY

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. This section of my testimony supports the discussion of the Potential Study in section II.A. of Company witness Kerry R. Klemm's Rebuttal Testimony. In particular, I describe the methodology of the Potential Study to estimate potential peak gas demand reduction of the NPA portfolio in the mountain region. Additional information about the Potential Study and results can be found in Hearing Exhibit 102, Attachment GKJ-2, the Mountain Energy Project Non-Pipeline Alternative Report. I also discuss the Potential Study's adoption rates for certain NPA measures addressed in section II.D. of witness Klemm's Rebuttal Testimony.

A. Reasonableness of the Potential Study

Q. DID OTHER PARTIES RAISE CONCERNS WITH ASPECTS OF THE COMPANY'S APPROACH TO THE POTENTIAL STUDY?

A. Yes. For example, as noted in Ms. Klemm's Rebuttal Testimony, Mountain Community Coalition ("MCC") witness Kenji Takahashi asserted that the Company's approach to the NPA Potential Study results in "a substantial underestimation of demand-side potential to meet system needs."[2] Similarly, Southwest Energy Efficiency Project ("SWEEP") witness Justin Brant asserted that the Company "overstated the cost of NPA measures and understated their potential to reduce peak hour gas demand."[3]

[2] Hrg. Ex. 601 at 10:5-11 (Takahashi Answer).
[3] Hrg. Ex. 500 at 18:14-15 (Brant Answer).

Q. DID THE POTENTIAL STUDY REASONABLY ASSESS THE POTENTIAL OF VARIOUS NPA MEASURES TO REDUCE PEAK GAS DEMAND?

A. Yes. The Potential Study followed industry best practices, including in the assessment of the technical and achievable potential of the NPA portfolio.

Q. HOW DID THE POTENTIAL STUDY ASSESS TECHNICAL POTENTIAL?

A. The Potential Study estimated technical potential by first identifying measures that reduce peak hour gas consumption. The PA team created a comprehensive list of measures as part of the Study development process addressed in the Company's Direct Testimony in order to identify all measures that could potentially reduce peak gas demand. Measures then went through a qualitative screen where they were rated on a one to five scale on the size of peak savings, commercial availability of the measure, customer acceptance of solution, availability of contractors to install such measures, ease of implementation, and greenhouse gas emission impacts.

Next the savings potential for each included measure was calculated with reliance on the Company's Demand Side Management ("DSM") Technical Reference Manual assumptions when possible. Measure savings potential was further calibrated by the annual consumption and peak hour gas consumption per customer in the mountain region. The total technical potential of each individual measure is the peak hour reduction achieved if the efficient measure replaced all inefficient measures instantaneously. The total technical potential of all measures is the sum of all individual measures except for the case where multiple efficient measure technologies can replace a single inefficient measure (for example an

inefficient furnace could be replaced with an efficient furnace or an air source heat pump). In the case where multiple efficient measure technologies can replace a single inefficient measure, the measure with the highest technical potential is used and the measure(s) with lower technical potential are ignored. Technical potential is a first step in assessing the overall state of the market; however, it is not useful for setting policy since what is technically achievable is not practically achievable.

Q. HOW DID THE POTENTIAL STUDY ASSESS ECONOMIC POTENTIAL?

A. The study did not assess economic potential.

Q. WHY DID THE POTENTIAL STUDY NOT ASSESS ECONOMIC POTENTIAL?

A. Economic potential is an intermediary step in which an economic screen using a cost test is applied to measures to remove them from consideration in the achievable potential step. Most commonly, a total resource cost ("TRC") test is used and measures with a TRC below 1.0 are excluded from consideration in the achievable potential. For the Potential Study, the study goal was to compare a suite of measures that could alleviate a constraint in the physical infrastructure of the gas system and compare that approach to a gas infrastructure solution. A measure could have a TRC below 1.0, but still be part of a portfolio that is more cost-effective than a gas infrastructure solution. Conversely, a measure could have a TRC above 1.0 but not save any peak hour gas. In addition, at the time of the potential study, the value for a key benefit, the area-specific avoided cost of peak hour gas capacity, was not defined. Instead of a traditional economic potential using a cost-effectiveness screen, an economic screen based on the expanded rate impact measure test or incentives higher than $100,000/mscfh-year

was used. This screen eliminated measures that produce very little savings for the incentive spend required. Ultimately this screen removed measures that make up less than two percent of the total achievable potential.

Q. HOW DID THE POTENTIAL STUDY ASSESS ACHIEVABLE POTENTIAL?

A. The Potential Study assessed achievable potential by forecasting the uptake of each included technology under a scenario where incentives were set equal to the incremental cost of each measure. The forecasting methodology used in the Potential Study was a bass diffusion model. For a characterization of the building stock's equipment, the Potential Study used the Company's most current Colorado DSM potential study to characterize the density (*i.e.*, the prevalence of a technology) and efficient saturation of technologies in the residential and commercial sectors. The estimate of current consumption was calibrated to the actual customers' consumption for each geography in the mountain region. The team collected primary data specific to customers in the mountain region to assess customers' willingness to adopt specific technologies. The bass diffusion forecasting methodology uses the current market share of a technology as a starting point and then creates an s-shaped adoption curve with the end point being equal to the proportion of customers willing to adopt a technology with incentives equal to incremental measure cost, which is informed by the team's primary research. The rate at which the technology is adopted between the start point of current market share and the long-run market share is determined by the bass diffusion coefficients of innovation (p) and innovation (q). A coefficient set which represents a relatively aggressive level of market diffusion was selected.

The overall level of adoption of these technologies represents achievements that are significantly higher than the current adoption levels achieved by existing DSM offerings in the region.

The primary data collection, use of the Public Service prior DSM potential study, actual mountain region customer data, and best-practice bass diffusion forecasting methodologies together resulted in a study that is as accurate as possible. In summary, the Potential Study reasonably assessed the potential of various NPA measures to reduce peak gas demand.

B. <u>Potential Study Adoption Rates</u>

Q. PLEASE OUTLINE INTERVENOR POSITIONS ON THE NPA ADOPTION RATES ASSUMED USED IN THE POTENTIAL STUDY.

A. As noted in Ms. Klemm's Rebuttal Testimony, Staff and Utility Consumer Advocate ("UCA") suggest the Company has overestimated the NPA measure adoption rates,[4] while MCC, SWEEP, and Sierra Club suggest the Company has underestimated NPA measure adoption rates.[5]

Q. HOW DID THE POTENTIAL STUDY CALCULATE ADOPTION RATES FOR NPA MEASURES?

A. The Potential study relied on primary data collection from customers in the mountain region to assess potential participants' willingness to adopt peak gas saving technologies. The percentage of customers willing to adopt a technology with incentives equal to the full incremental cost of the technology is the expected

[4] Hrg. Ex. 900 at 20:4-5 (LaMere Answer); Hrg. Ex. 400 at 17:15-17 (Henry-Sermos Answer).
[5] Hrg. Ex. 601 at 13:5-6 (Takahashi Answer); Hrg. Ex. 500 at 19:1-2 (Brant Answer); Hrg. Ex. 700, Rev. 1, at 21:4-6 (Brown Answer).

long-run market share of a technology. The Potential Study used a bass diffusion model to estimate each technology's adoption, starting with the current market share of the technology and ending at the expected long run market share of the technology. The high level of incentives and intensive outreach activities planned for the Mountain Energy Project led the team to choose relatively aggressive adoption curve coefficients. Based on the novel nature of the Mountain Energy Project, high level of incentives, and current low market share of electric space heating technologies in the mountain region, the Company believes that this forecast does have some level of uncertainty. Implementation of the NPA portfolio will provide the Company evidence of actual customer uptake of the NPA portfolio and assist the Company in determining whether adjustments to the NPA are necessary to increase participation. The Company maintains that the potential study, based upon reasonable adoption rates, accurately assesses the potential savings available in the mountain region through the NPA portfolio.

III. NPA MEASURES

Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

A. This section of my testimony supports the discussion of the Potential Study's consideration of NPA measures in section II.B. of witness Klemm's Rebuttal Testimony. In particular, it addresses the savings that can be achieved through the implementation of various NPA measures identified by MCC witness Takahashi,[6] including heat recovery ventilators and energy recovery ventilators ("HRVs/ERVs"), snowmelt equipment, air-to-water heat pumps, low-flow showerheads, water tank insulation, and pipe insulation.

Q. WHAT WERE THE FINDINGS OF THE POTENTIAL STUDY WITH REGARD TO HEAT OR ENERGY RECOVERY VENTILATORS? WHAT WAS THE BASIS OF THAT ASSESSMENT?

A. The Potential Study did not forecast impacts from HRVs/ERVs because these technologies have minimal impact on peak gas demand. In residential buildings, the primary function of HRVs/ERVs is to provide ventilation and improve indoor air quality by exchanging indoor and outdoor air. When compared to an existing building without powered ventilation, HRVs/ERVs produce only improved ventilation, with an accompanying increase in natural gas consumption to heat that ventilation air during the winter, which would produce negative savings. For this reason, this measure variant was not included in the Potential Study.

[6] Hrg. Ex. 601 at 12:18-13:2 (Takahashi Answer).

When compared to cheaper unbalanced powered ventilation systems, which is an appropriate baseline for comparison, HRVs/ERVs can save energy by recovering heat from the exhaust air to preheat incoming fresh air. While MCC witness Takahashi states that "heat recovery ventilators and energy recovery ventilators are highly cost-effective technologies capable of recovering up to 80–90 percent of heating energy,"[7] this represents the fraction of heating energy required to heat up the ventilation air to indoor air temperature, which is only a small fraction of the total heating energy needed at the premise. This HRV/ERV effectiveness also measures savings against a balanced ventilation system baseline, while savings against a more appropriate unbalanced ventilation system baseline should also consider the interactions of infiltration and ventilation air. During times of high infiltration, which include peak gas events, ERVs and HRVs stop saving gas, because the high infiltration results in smaller incremental flow from the unbalanced ventilation than the implied incremental flow from a balanced ERV/HRV. Therefore, while HRVs and ERVs offer benefits over the course of the winter heating season, they do not provide peak gas savings in residential buildings and should not be included in the estimated peak gas saving potential.

[7] Hrg. Ex. 601 at 52:3-5 (Takahashi Answer).

Q. WHAT WERE THE FINDINGS OF THE POTENTIAL STUDY WITH REGARD TO SNOWMELT EQUIPMENT? WHAT WAS THE BASIS OF THAT ASSESSMENT?

A. The Potential Study determined that snowmelt efficiency and electrification measures faced significant barriers to adoption and would provide little reduction to peak gas demand.

To begin, very few customers have snowmelt systems. Of the 359 residential customers surveyed, only seven (less than two percent of the sample) reported having a snowmelt system.[8] Among the 66 commercial survey respondents, 13 (20 percent of the sample) reported having a snowmelt system.[9] Next, snowmelt consumption during peak times is expected to be very small relative to space heating. Snowmelt systems were expected to make up less than 0.1 percent of residential peak gas demand, and developing new residential measures tailored to less than two percent of the population and such a small percentage of the natural-gas peak was not a focus area for the NPA portfolio. Within commercial buildings, it is estimated that snowmelt made up one to three percent of peak gas consumption, depending on the customer type.[10] Snowmelt efficiency opportunities would generate small savings during peak and snowmelt electrification is understood to be relatively difficult and not widely accepted in the current market. In addition, as indicated in the testimony of Mr. Takahashi, "(s)nowmelt systems are generally not recommended for operation during

[8] Hrg. Ex. 102, Attachment GKJ-2, Figure 4-18 at 36 (Jones Direct).
[9] Hrg. Ex. 102, Attachment GKJ-2, Figure 4-45 at 51 (Jones Direct).
[10] Hrg. Ex. 102, Attachment GKJ-2, Table 4-2 at 19 (Jones Direct).

extremely cold conditions because melting snow becomes more difficult and the resulting water may quickly refreeze, creating safety hazards."[11] For all of these reasons, snowmelt efficiency and electrification were expected to have minimal impact on overall potential and the Company decided to focus its efforts on those measures that provide the greatest potential to achieve the savings needed. Snowmelt demand response was included as part of generalized commercial demand response potential.

Q. WHAT WERE THE FINDINGS OF THE POTENTIAL STUDY WITH REGARD TO AIR-TO-WATER HEAT PUMPS? WHAT WAS THE BASIS OF THAT ASSESSMENT?

A. The Potential Study did not forecast adoption for air-to-water heat pumps due to low market availability for this technology. Air-to-water heat pumps are an emerging technology which heats water. Although this technology has gained traction internationally, it has a very low market share in the United States. An air-to-water heat pump could potentially displace an existing boiler system, but they are not necessarily a one-to-one retrofit since many hydronic systems are designed with higher supply temperatures than what is provided by an air-to-water heat pump, which is an appropriate consideration given the NPA eligible area. Additionally, for residential applications, these technologies are in direct competition with air source heat pumps, including ductless mini split systems, which have a higher market share and are likely a more practical retrofit or new

[11] Hrg. Ex. 601 at 38:4-6 (Takahashi Answer).

construction solution. Displacement of boilers was modeled using air source heat pump systems rather than air-to-water heat pumps and we maintain that the approach taken in the Potential Study was a reasonable assessment. The inclusion of this technology ultimately would not change the total potential estimate of boilers that switch to electric heat.

Q. WHAT WERE THE FINDINGS OF THE POTENTIAL STUDY WITH REGARD TO LOW-FLOW SHOWERHEADS, WATER TANK INSULATION, AND WATER PIPE INSULATION? WAS THAT ASSESSMENT REASONABLE?

A. The Potential Study did not forecast adoption for low-flow showerheads, water tank insulation, and pipe insulation due to the minimal impacts on peak hour gas savings, and the Company maintains that this approach was reasonable. Residential water heating accounts for less than two percent of the peak hour gas usage for the residential sector in the mountain region.[12] Low-flow showerheads, water tank insulation, and water pipe insulation would have the potential to save only a small portion of that two percent of the load. Furthermore, it is my understanding that these low-cost measures are currently offered for free for income qualified ("IQ") customers and market rate customers through Energy Squad visits through the Company's DSM program. It is also my understanding that Energy Squad visits are free for IQ customers and $100 for market rate customers. While the peak hour gas impacts of these measures are *de minimis*, the measures are available to customers should they wish to install them.

[12] Hrg. Ex. 102, Attachment GKJ-2, Table 4-2 at 19 (Jones Direct).

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes, it does.

Statement of Qualifications

Jordan Mann

Jordan Mann is employed by Apex Analytics LLC ("Apex") as a Project Director. In that role, he works with electric utilities, gas utilities, state energy offices, and the DOE to provide decarbonization strategies for the built environment. Mr. Mann is currently working on or has recently completed potential studies, baseline stock analyses, and energy efficiency portfolio development support projects. Prior to joining Apex Analytics, Mr. Mann worked at Guidehouse for over 10 years in their energy efficiency data sciences and engineering group. Prior to Guidehouse, he worked at the Fraunhofer Institute for Solar Energy Research in Freiburg, Germany where he researched hydronic heating systems and efficiency of ground source heat pumps. Mr. Mann has an undergraduate degree in mechanical engineering and a master's degree in building systems engineering with a master's thesis in fault detection, energy use, and operation of gas heated hydronic heating systems.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

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IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF THE MOUNTAIN ENERGY PROJECT AND ASSOCIATED CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR SUPPLEMENTAL SUPPLY	)	**PROCEEDING NO. 25A-0044EG**

AFFIDAVIT OF JORDAN MANN
ON BEHALF OF
PUBLIC SERVICE COMPANY OF COLORADO

I, Jordan Mann, being duly sworn, state that the Rebuttal Testimony was prepared by me or under my supervision, control, and direction; that the Rebuttal Testimony is true and correct to the best of my information, knowledge and belief; and that I would give the same testimony orally if asked under oath.

Dated at Boulder, Colorado, this 30th day of June, 2025.

Jordan Mann
Project Director

Subscribed and sworn to before me this 30rth day of June, 2025.

Notary Public

SARAH BELKIN
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20174013990
MY COMMISSION EXPIRES MARCH 31, 2029

My Commission expires 03/31/2029