BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

IN THE MATTER OF THE APPLICATION OF PUBLIC SERVICE COMPANY OF COLORADO FOR APPROVAL OF A NUMBER OF STRATEGIC ISSUES RELATING TO ITS ELECTRIC AND GAS DEMAND SIDE MANAGEMENT PLAN	)))))	Docket No. 17A-0462EG

Answer Testimony of

Howard Geller

On Behalf Of

Southwest Energy Efficiency Project (SWEEP)

December 5, 2017

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I. Introduction

Q. Please state your name, occupation and business address.

A. My name is Howard Geller. I am the Executive Director of the Southwest Energy Efficiency Project ("SWEEP"). My business address is 2334 Broadway, Suite A. Boulder, Colorado 80304.

Q. For whom are you testifying?

A. I am testifying on behalf of SWEEP.

Q. Please describe SWEEP.

A. SWEEP is a private not-for-profit organization dedicated to advancing energy efficiency in six states in the Southwest including Colorado. SWEEP was founded in 2001 and receives the majority of its funding from charitable foundations and the Federal government.

Q. **What are your professional qualifications?**

A. I have over 36 years of experience working on energy efficiency policy and program design, analysis, evaluation and advocacy. Prior to founding SWEEP in 2001, I served as Executive Director of the American Council for an Energy-Efficient Economy (ACEEE) in Washington, DC. I have authored or co-authored four books on energy efficiency and energy policy, and published dozens of reports and articles on these topics. I have testified before the public utility commissions of Colorado, Illinois, Maryland, Nevada, New Mexico, Utah, Wyoming and the District of Columbia, and I participated in all of the previous DSM Strategic Issues dockets pertaining to Public Service Company. Attachment HG-1 summarizes my professional qualifications.

Q. What is the purpose of your testimony?

A. In my testimony I will comment on and provide recommendations to the Colorado Public Utilities Commission (the "PUC" or the "Commission") regarding the electric savings and peak demand reduction goals for Public Service Company of Colorado's ("PSCo" or the "Company") electric demand-side management ("DSM") programs, policies regarding removing disincentives and providing a performance incentive for the Company's DSM programs during 2019-2023, the DSM market potential study, the non-energy benefits ("NEBs) adders, PSCo's DSM geo-targeting proposal, energy savings goals and related policies for natural gas energy efficiency programs, treatment of energy savings from operational improvements made by commercial and industrial ("C&I") customers, and a few other issues.

Q. Please summarize your testimony.

A. PSCo has exceeded the electric energy savings goals established by the Commission at a cost that in most years was below the Company's approved DSM budget every year during 2009-2016, and PSCo's electric DSM programs have been cost-effective by a wide margin. I show that PSCo was able to exceed the electricity savings goals at a utility cost per unit of energy savings far below what it claimed would be the case in previous Strategic Issues dockets.

I also point out that in previous Strategic Issues dockets the Company claimed that meeting the goals proposed by SWEEP would dramatically increase program costs, when in reality the Company was able to exceed the goals approved by the Commission (which were equal or close to the goals proposed by SWEEP) at a far lower cost than PSCo claimed would be the case. PSCo has consistently underestimated the electric energy savings that it

has been able to achieve and overestimated the cost for achieving energy savings in previous DSM Strategic Issues dockets.

I point out that the DSM shareholder incentive structure gives the Company an incentive to urge the Commission to set relatively low energy savings goals; i.e., it is easier for the Company to meet and surpass the goals and thus receive a larger incentive if the goals are set at relatively low levels. In other words, PSCo has a financial incentive to underestimate electric energy savings goals, and it has done so in the past. As in the past, the Company is recommending that the Commission set relatively low energy savings goals in this docket.

I point out that the DSM Market Potential Study prepared for this docket suffers from many of the same weaknesses of previous Market Potential studies such as excluding a number of available energy efficiency options and being overly conservative about the savings potential from other measures. For example, the DSM Market Potential study greatly underestimates the achievable energy savings potential from LED lighting and other energy-efficient lighting options in the commercial and industrial sectors. I conclude that the DSM Market Potential Study prepared by PSCo should not be used as the basis for establishing future energy savings goals without adjustments.

I also review the policy context for utility energy efficiency programs in Colorado at this time, including recent legislative action and a recent Executive Order issued by Governor Hickenlooper, as well as policies adopted by Denver and other cities and counties served by PSCo. In addition, I review a relevant docket and decision by the Colorado PUC.

Based on my review of the past history of DSM Strategic Issues dockets, PSCo's past performance in implementing DSM programs, my critique of the DSM Market Potential study and the policy context, I recommend that the Commission establish an energy savings

goal of 500 GWh per year for PSCo's energy efficiency programs during 2019-23. I show how this level of savings can be achieved through adjustments to the DSM Market Potential Study and PSCo's assumptions about savings potential from emerging technologies. I point out that as a percentage of retail electricity sales, the goal I propose is less than goals or energy savings requirements adopted by leading states with respect to utility energy efficiency efforts.

Consistent with my recommending a higher energy savings goal than the goals proposed by PSCo, I recommend that the Commission approve a higher energy efficiency peak demand reduction goal and a higher level of funding for PSCo's energy efficiency programs compared to the levels proposed by the Company. The higher demand reduction goals would help PSCo to reduce its projected resource shortfall in 2022 and 2023.

I support the disincentive offset policy proposed by PSCo with the important caveat that the disincentive offset should only be collected from the larger C&I customer classes since the disincentive offset is meant to compensate the Company for lost fixed cost recovery from these customer classes (and not the residential and small commercial classes). I also recommend that the disincentive offset be trued up to actual lost fixed cost recovery from DSM program participation by large C&I customers, rather than set based on an estimated value.

Regarding the energy efficiency shareholder incentive, I do not support the scorecard approach proposed by PSCo as it is overly complicated, unnecessary given the strong performance of PSCo in some of the areas that PSCo proposes including in the scorecard, and susceptible to manipulation by PSCo to its financial advantage. I recommend returning to a performance incentive approach which was successfully used in the past, namely to provide

a sliding scale incentive based on energy savings achievement and net economic benefits, with the incentive amount increasing as energy savings increases relative to the energy savings goal. This approach provides PSCo with an incentive to maximize both the energy savings and the net economic benefits of its energy efficiency programs.

I take no position at this time on the Demand Response (DR) goals proposed by the Company for 2019-23, but I do support PSCo's request to allow the Company to collect a modest shareholder incentive based on the performance of its DR programs. However, I propose basing this incentive on a different parameter than what the Company has proposed, namely basing it on a fraction of the net economic benefits provided by DR programs rather than basing it as a fraction of avoided capacity benefits.

I recommend that the Commission approve PSCo's proposal to implement geo-targeting of DSM programs on distribution feeders that are at or near peak capacity, but on a pilot basis at this time. I also recommend that the Commission approve PSCo's proposed methodology for determining and claiming energy savings from behavior change programs for commercial and industrial customers. With respect to natural gas DSM policy, I recommend that the Commission direct PSCo to increase program participation and maximize cost-effective energy savings, and also increase funding for low-income natural gas DSM programs as long as this can be done cost effectively.

I recommend revising the NEBs adders previously adopted by the Commission based primarily on the evolving cost effectiveness of the Company's energy efficiency programs. I also recommend that the Commission reaffirm the policy that cost effectiveness thresholds apply at the program level, not at the measure or product level when DSM plans are developed and approved. In addition, I recommend that the Commission direct PSCo to

support state and local energy efficiency initiatives to increase energy efficiency such as any building retrofit requirements that local governments might adopt.

II. Electric Energy Savings Goals – Historical Context

Q. Please comment on the history of PSCo's electric energy savings goals and program performance since the passage of House Bill 07-1037 in 2007.

A. This is the fourth DSM Strategic Issues docket in which energy savings goals are being addressed by PSCo and interveners, and established by the Commission in response to the requirements in HB 07-1037. Docket No. 07A-420E completed in 2008 set energy savings goals for the period 2009-2020. Docket No. 10A-554EG completed in 2011 revised the original energy savings goals for the period 2012-2020, significantly increasing the original goals for this time period. Docket No. 13A-0686EG completed in 2014 again revised the energy savings goals for 2015-2020.

Q. How has the Company performed with respect to the electric energy savings goals established by the Commission in these dockets?

A. As shown in Table HG-A-1 below, the Company has done an excellent job of ramping up its DSM programs and has exceeded the electric energy savings goals established by the Commission every year during 2009-16, doing so at a cost that in all but one year was below the Company's approved DSM budget. During 2009-11 as well as 2013-16, the Company exceeded the energy savings goals and underspent its approved budget each year. In 2012, the Company exceeded the savings goal by nearly 22% while overspending the approved budget by just 2.7%.

In addition, the Company has indicated that it expects to meet or exceed the Commission's 2017 energy savings goal of 400 GWh while once again under spending its approved budget by about $4 million.[1] Through the first three quarters of 2017, PSCo had achieved 81% of its annual electricity savings goal while spending only 70% of its annual budget for electric efficiency programs.[2]

Q. How much total electric energy savings has PSCo achieved from the energy efficiency programs it has implemented since 2009?

A. Totaling up the energy savings achieved by the programs each year, as shown in Table HG-A-1, PSCo's programs achieved total electricity savings of 2,777 GWh in 2016 as a result of programs implemented during 2009-16. This savings is at the generator level. Converting the savings to savings at the customer level, PSCo's total savings was equal to about 2,580 GWh or 9.2% of retail electric sales. Including the savings goals for 2017 and 2018 in the Company's approved 2017/18 DSM plan, total savings by 2018 from programs implemented during 2009-18 are likely to be about 3,370 GWh at the customer level. This is equivalent to about 11.7% of PSCo's projected electricity sales in 2018. Thus, PSCo's DSM programs implemented during 2009-18 will save far more than the statutory minimum of 5% savings included in House Bill 07-1037, to the benefit of PSCo's customers and Colorado's environment.

[1] Attachment HG-2a, PSCo response to Discovery Requests CEC 3-1, and Attachment HG-2b, PSCo response to Discovery Request SWEEP 1-4.
[2] Presentation by PSCo at Q3-2017 Colorado DSM Roundtable. Nov. 13, 2017. https://www.xcelenergy.com/company/rates_and_regulations/filings/colorado_demand-side_management

Table HG-A-1: PSCo Electric DSM Program Performance, 2009-2016

	2009	2010	2011	2012	2013
PUC energy savings goal (GWh/yr)	150	220	235	330	356
PSCo DSM plan energy savings goal (GWh/yr)	175.8	237.5	255.9	329.3	345.2
Energy savings achieved (GWh/yr)	219.6	252.0	311.6	400.7	384.2
Peak demand reduction achieved – all DSM (MW)	59.8	67.4	75.6	90.6	81.0
Peak demand reduction achieved – EE only (MW)	37.1	46.6	57.2	76.4	68.9
Approved electric DSM budget (million $)	50.5	63.6	68.5	77.3	83.0
Actual electric DSM budget (million $)	43.9	54.7	63.8	79.4	75.3
Achieved modified TRC ratio	4.07	3.33	2.85	2.38	2.30
Achieved UCT ratio	6.24	5.49	3.93	3.81	3.82
Average measure lifetime (years)	14.0	14.0	14.0	11.8	12.0
Portfolio net-to-gross ratio (energy savings basis - %)	89.8	87.8	85.9	85.7	86.2
Utility cost per lifetime kWh saved ($/kWh)	0.0145	0.0159	0.0150	0.0168	0.0165
Net economic benefits for customers (million $)	205.7	209.8	178.3	169.6	160.5
	2014	**2015**	**2016**	**2017 (DSM plan)**	**2018 (DSM plan)**
PUC energy savings goal (GWh/yr)	384	400	400	400	400
PSCo DSM plan energy savings goal (GWh/yr)	386.1	406.9	407.3	421.7	429.5
Energy savings achieved (GWh/yr)	391.6	405.7	410.5	--	--
Peak demand reduction achieved – all DSM (MW)	86.6	82.9	88.5	--	--
Peak demand reduction achieved – EE only (MW)	69.8	72.4	75.6		
Approved electric DSM budget (million $)	87.8	95.3	92.4	99.6	98.4
Actual electric DSM budget (million $)	77.1	87.1	84.9	--	--
Achieved modified TRC ratio	1.90	1.73	1.80	--	--
Achieved UCT ratio	3.22	2.91	3.09		
Average measure lifetime (years)	14.0	14.3	14.7		
Portfolio net-to-gross ratio (energy savings basis - %)	86.1	86.5	89.5	--	--
Utility cost per lifetime kWh saved ($/kWh)	0.0142	0.0150	0.0141	--	--
Net economic benefits for customers (million $)	123.4	99.8	116.1	--	--

Notes: Energy savings and peak reduction goals and achievements are at the generator level. Peak reduction excludes the ISOC and third party demand response programs since they are not funded under DSM. Net economic benefits take into account the shareholder incentive that PSCo received based on the performance of its programs.
Sources: Demand-Side Management Annual Status Reports prepared by PSCo for years 2009-16; 2017-18 PSCo Demand-Side Management Plan.

Q. How has the Company performed with respect to peak demand reduction?

A. As shown in Table HG-A-1, PSCo achieved a total peak demand reduction of about 632 MW from the electric DSM programs (both energy efficiency and DR programs) implemented during 2009-2016. This is a significant reduction considering that the summer peak demand on the PSCo system was 6,579 MW in 2016. The Company has maintained annual peak reductions in the range of 80-90 MW per year for the past five years, with the 88.5 MW of peak reduction achieved in 2016 being the second highest annual peak reduction during the eight-year period.

Q. How cost effective have the Company's electric DSM programs been?

A. As shown in Table HG-A-1, PSCo's electric DSM programs have been cost-effective by a wide margin in all years under the modified TRC test used in Colorado. The overall benefit-cost ratio has declined somewhat in recent years but was still in the range of 1.7-1.9 during 2014-16. The benefit-cost ratio has come down mainly because avoided costs have declined, not because of a drop in energy savings achieved per program dollar. In fact, Table HG-A-1 shows that the utility cost per lifetime kWh of energy savings has fallen over time, and was at the lowest level in 2016 ($0.0141 per kWh saved) of any year since 2009. Even though some cost-effective technologies such as compact fluorescent lamps (CFLs) are no longer a significant source of energy savings, other newer technologies such as LED lamps are providing cost-effective energy savings opportunities that were not available 5-10 years ago.

PSCo's customers have greatly benefited from electric DSM programs implemented during 2009-2016, with a total estimated net economic benefit for customers of about **$1.26 billion** from a Total Resource Cost perspective, according to the values provided in PSCo's Annual DSM Status reports. This value takes into account the shareholder incentives and disincentive offsets that PSCo has earned during this period. From a utility cost perspective, improving energy efficiency has been (and continues to be) PSCo's most cost-effective energy resource.

Q. How does the energy savings achieved by the Company compare to energy savings goals the Company advocated before the Commission?

A. In docket 07A-420E, PSCo proposed energy savings goals of 200 GWh/yr during 2010-2020.[3] Also, the Company indicated it would need a total electric DSM budget of about $64 million per year to meet the proposed energy savings goals along with proposed peak demand reduction goals.[4] In 2011, the Company achieved over 311 GWh/yr of electric savings with total DSM expenditures of about $64 million, and in 2012 the Company achieved 400 GWh/yr of electricity savings with DSM expenditures of about $79 million. Clearly, the Company was able to achieve much greater energy savings than the goals it proposed in 2007, in response to the Commission setting goals higher than those proposed by the Company. Furthermore, PSCo was able to do so at a utility cost per unit of energy savings far below what it claimed would be the case when it first proposed the DSM goals in Docket 07A-420E.

[3] The goals discussed here and adopted by the Commission are expressed in terms of first year energy savings from efficiency measures implemented each program year.
[4] Direct Testimony of Ms. Debra Sundin, Pubic Service Company of Colorado, Docket 07A-420EG, p. 5.

In Docket 10A-554EG, PSCo proposed increasing the near term energy savings goals that were established by the Commission in Docket 07A-420E. In particular, the Company proposed savings goals of 240 GWh/yr in 2011, 290 GWh/yr in 2012, and 318 GWh/yr in 2013.[5] In 2011, the Company achieved over 311 GWh/yr of electric savings and in 2012 the Company achieved 400 GWh/yr of electricity savings. Once again, the Company was able to far exceed the savings goals it proposed, when it moved from program planning into program implementation. And once again, the Company was able to achieve energy savings at a cost far below what it indicated to the Commission when it proposed the energy goals in 2010. In particular, the Company estimated that achieving 290 GWh/yr of savings in 2012 would require an electric DSM budget of $86.4 million.[6] In reality, the Company achieved 400 GWh/yr of savings in 2012 at a program cost of just $79.4 million. The actual utility cost was about $198,000 per GWh/yr of energy savings compared to an estimated cost of $298,000 per GWh/yr of savings in PSCo's 2010 DSM Strategic Issues docket filing.

In Docket 13A-0686EG, PSCo proposed reducing the energy savings goals previously adopted by the Commission for 2015-2020. In particular, the Company proposed savings goals of 349 GWh/yr in 2015, 321 GWh/yr in 2016, and further reductions after 2016 leading to a proposed goal of only 276 GWh/yr in 2020.[7] The Commission wisely denied PSCo's request and adopted a flat energy savings goal of 400 GWh/yr during 2015-2020. Once again, the Company was able to far exceed the savings goals it proposed, when it moved into program implementation in 2015 and 2016, in response to goals set by the Commission that were considerably higher than those proposed by the Company. And once again, the

[5] Direct Testimony of Ms. Debra Sundin, Public Service Company of Colorado, Docket 10A-554EG, p. 26.
[6] *Id*., p. 26. The budget estimate provided by PSCo was for both energy efficiency and the Savers Switch DR program.
[77] Direct Testimony of Ms. Debra Sundin, Public Service Company of Colorado, Docket 13A-0686EG, p. 34.

Company was able to achieve energy savings at a cost far below what it indicated to the Commission when it proposed its energy goals in the 2013 DSM Strategic Issues docket.

In its 2013 filing, the Company estimated that achieving 349 GWh/yr of savings in 2015 would require an electric energy efficiency budget of $121 million.[8] In reality, the Company achieved nearly 406 GWh/yr of savings in 2015 at an energy efficiency program cost of just $74.7 million. The actual cost was about $184,000 per GWh/yr of energy savings compared to an estimated cost of $347,000 per GWh/yr of savings in PSCo's 2013 Strategic Issues docket filing. The actual energy efficiency program cost per unit of energy savings declined to $175,000 per GWh/yr of energy savings in 2016.

Q. What was the Company's response to the higher energy savings goals proposed by SWEEP and others to the Commission in previous Strategic Issues dockets?

A. In docket 07A-420E, SWEEP, EEBC and OCC witnesses proposed higher savings goals than those advocated by the Company. SWEEP proposed goals in the range of 200-300 GWh/yr starting in 2010; OCC proposed that the Company achieve 1 percent energy savings per year (first year savings as a fraction of retail electricity sales). The Company responded that it did not believe that 1 percent energy savings, estimated to be 290-305 GWh/yr during 2011-13, was achievable, and that if it was achievable it would require a total electric DSM budget of $155-210 million per year in the 2011-13 time period.[9] From the table above, this was clearly not the case. The Company achieved 1% savings starting in 2011 at a cost of only about $64 million, and in 2012 achieved 1.3% savings (net savings per year as a fraction of retail electricity sales) at a cost of only about $79 million.

[8] *Id*., p. 36.
[9] Rebuttal Testimony of Ms. Debra Sundin, Public Service Company of Colorado, Docket 07A-420E, p. 10 and Exhibit No. DLS-3.

In docket 10A-554EG, the Commission adopted energy savings goals that were very close to the goals proposed by SWEEP, which were about 21% higher than the energy savings goals proposed by PSCo. Again the Company claimed that meeting the goals proposed by SWEEP would dramatically increase program costs, with a cost estimate of $118 million per year to achieve 342 GWh/yr on average and a cost of $150-200 million to achieve 418 GWh/yr on average, based on the DSM Market Potential study prepared by PSCo in this docket.[10] Once again, the Company failed to accurately project costs given that it achieved 401 GWh/yr of savings from programs implemented in 2012 at a cost of about $79 million and 384 GWh/yr in 2013 at a cost of about $74 million.

In docket 13A-0686EG, SWEEP proposed energy savings goals starting at 445 GWh/yr in 2015 ramping up to 495 GWh/yr by 2020. The Company claimed that meeting the energy savings goals proposed by SWEEP would cost $146 million in 2015 and ramp up after that.[11] Once again, the Company failed to accurately project costs given that it achieved 406 GWh/yr of savings from programs implemented in 2015 at a cost of about $75 million for energy efficiency programs only and 410 GWh/yr in 2016 at a cost of $72 million for energy efficiency programs only.

Q. What role did DSM Market Potential studies play in the Company's estimates of achievable energy savings potential and program costs in previous Strategic Issues dockets?

[10] Rebuttal Testimony of Ms. Debra Sundin, Public Service Company of Colorado, Docket 10A-554EG, p. 18.
[11] Rebuttal Testimony of Ms. Debra Sundin, Public Service Company of Colorado, Docket 13A-0686EG, p. 20.

A. The DSM Market Potential studies were the primary basis for the energy savings goals proposed by the Company as well as the estimates of the costs to the utility for achieving various levels of energy savings in previous Strategic Issues dockets.

Q. What conclusions do you draw from this experience?

A. There is a clear pattern here. PSCo has consistently underestimated the electric energy savings that it has been able to achieve and overestimated the cost for achieving energy savings. The Commission was justified in establishing electric energy savings goals that were much higher than those proposed by PSCo in the previous three DSM Strategic Issues dockets. To its credit, PSCo has done a very good job of energy efficiency program implementation, even if it did a poor job of projecting achievable energy savings potential or the cost of achieving energy savings in previous DSM Strategic Issues dockets.

PSCo's customers greatly benefited from the energy savings goals set by the Commission as indicated by the very substantial economic benefits along with significant non-energy benefits including the pollutant emissions reductions. Furthermore, the achievable potential scenarios in previous Market Potential studies have proven to be way off the mark for either establishing energy savings goals or for projecting the cost to the Company for achieving various levels of energy savings.

Q. Is there any reason why PSCo would want to underestimate energy savings goals?

A. Yes there is. The shareholder incentive mechanism established by the Commission in previous DSM Strategic Issues dockets allows the Company to retain a small percentage of the net economic benefits generated by its electric DSM programs. Most recently, the shareholder incentive starts when the Company achieves 100% of the energy savings goal established by the Commission. Previously, the Company began earning a small incentive

when it reached 80% of the energy savings goal established by the Commission, with the level of the incentive rising as energy savings increased relative to the goal. Either structure gives the Company an incentive to urge the Commission to set relatively low energy savings goals; i.e., it is easier for the Company to meet and surpass the goals and thus receive a larger shareholder incentive if there is a "low bar" with respect to the energy savings goals.

Q. Are you suggesting that the Commission should maintain the shareholder incentive mechanism previously adopted in Proceeding No. 13A-0686EG?

A. No. Below I proposed some modifications to the incentive mechanism. I am simply pointing out that under the current shareholder incentive structure as well as previous incentive structures, PSCo has a financial incentive to "lowball" the electric energy savings goals. As I will discuss in more detail below, I believe that PSCo has "lowballed" the energy savings goals for energy efficiency programs once again in this proceeding.

III. Policy Considerations

Q. Did PSCo provide a policy background discussion for its proposals in this proceeding?

A. Yes, Mr. Brockett reviews the related proceedings that have a bearing on this DSM Strategic Issues docket as well as the history of DSM program goals and achievements.[12] He also refers to the Colorado statute on utility DSM policy, C.R.S. Section 40-3.2-104(5), on p. 45 of his Direct Testimony.

[12] Direct Testimony and Attachments of Scott B. Brockett, Hearing Exhibit 101, July 3, 2017 ("Brockett Direct"), pp. 32-41.

Q. Are there are some other policy considerations that you recommend the Commission take into account when establishing future energy savings goals and other DSM policies?

A. Yes there are. Below I describe and comment on policies adopted by the Colorado legislature, by Colorado Governor Hickenlooper, by cities such as Denver, and by the Commission in related dockets.

Q. What policies adopted by the Colorado legislature do you urge the Commission to take into account?

A. The original legislation that underpins utility DSM policy is House Bill 07-1037, adopted by the Colorado legislature and signed into law by former Governor Ritter in 2007. This legislation directed the Commission to set electric energy savings and peak demand reduction goals that shall be met by electric utilities by 2018. The goals must be at least five percent of 2006 electricity sales and peak demand, and in meeting the goals a utility shall count savings from DSM measures installed starting in 2006. As I pointed out above, the Commission set energy savings goals for 2009-18, and PSCo was able to surpass the goals. As a fraction of 2006 energy sales, the energy savings in 2018 (accounting for programs implemented during 2006-18) will be close to 13%. Clearly, the Commission viewed the energy savings requirement in HB 07-1037 as a floor rather than a ceiling, and directed PSCo to achieve much greater energy savings than indicated by this floor.

Given that HB 07-1037 only required energy savings and peak demand reduction goals through 2018, new legislation was proposed in 2017 directing the Commission to establish energy savings for another decade, 2019-28. The new legislation, House Bill 17-1227, directed the Commission to set electric energy savings and peak demand reduction goals that

shall be met in 2028. The goals must be at least five percent of 2018 electricity sales and peak demand, and in meeting the goals a utility shall count savings in 2028 from DSM measures installed during 2019-28. The new legislation was adopted by the legislature and signed into law by Governor Hickenlooper.

Passage of HB 17-1227 demonstrated continued support by the Colorado legislature for utility energy efficiency and peak reduction programs. And once again, the updated legislation calls for at least 5% energy savings over the next decade, giving the Commission the discretion to set higher goals if it so chooses.

Q. Has Governor Hickenlooper approved any other policies that you urge the Commission to take into account?

A. Yes he has. On July 11, 2017, Governor Hickenlooper issued an **Executive Order Supporting Colorado's Clean Energy Transition.**[13] The Executive Order establishes goals for reducing carbon dioxide (CO_2) emissions from the electricity sector, in particular goals of a 25% reduction in electric sector CO_2 emissions from 2012 levels by 2025 and a 35% reduction from 2012 levels by 2030. The Executive Order also includes a goal of achieving electricity savings of 2% of total electricity sales per year by 2020 through cost-effective energy efficiency. Through this Executive Order, Governor Hickenlooper is committing Colorado to strong action on CO_2 emissions reduction and as well as on energy efficiency, in the context of backsliding at the federal level as evidenced by the Trump Administration's withdrawal of the U.S. from the Paris Climate Accord and its intent to scrap the Clean Power Plan.

[13] Office of the Governor, State of Colorado. *D 2017-015. Executive Order Supporting Colorado's Clean Energy Transition.* July 11, 2017.

In addition, Colorado has joined the U.S. Climate Alliance, a group of 14 states committed to strong climate action. Continuing a policy of maximizing cost-effective energy savings through its PSCo's DSM programs will help Colorado meet its energy efficiency and greenhouse gas emissions reduction goals.

Q. Do PSCO's energy efficiency and other DSM programs help to reduce Colorado's greenhouse gas emissions?

A. Absolutely. PSCo reports the CO_2 and sulphur oxides (SOx) emissions reductions of its energy efficiency and other DSM programs each year in its DSM Annual reports. Table HG-A-2 below shows the emissions reductions reported by PSCo each year during 2009-16. Table HG-A-2 includes the annual emissions reductions as well as

Table HG-A-2: CO_2 and SOx Emissions Reductions of PSCo's DSM Programs

Year	Avoided CO_2 emissions (1000 tons)		Avoided SOx emissions (1000 lbs)	
	Annual	Lifetime	Annual	Lifetime
2009	156	1,949	246	1,336
2010	177	2,186	278	1,504
2011	236	2,848	159	1,484
2012	292	3,465	238	1,709
2013	280	3,347	228	1,649
2014	286	3,951	233	1,988
2015	296	4,234	241	2,114
2016	300	4,427	244	2,170

Source: PSCo DSM Annual Status Reports.

the projected emissions reductions over the lifetime of efficiency measures installed each year, which is how PSCo reports this data.

As shown in Table HG-A-2, PSCo's DSM programs result in very substantial emissions reductions by reducing the operation of coal- and natural gas-fired power plants. Programs

implemented during 2009-2016 are now reducing PSCo's CO_2 emissions by over two million tons per year, considering all energy efficiency measures adopted during this eight-year period. Furthermore, the Company's DSM efforts are projected to cut CO_2 emissions by over 26 million tons over the lifetime of efficiency measures implemented through the programs during 2009-16. In addition, the CO_2 emissions reductions are increasing over time, not declining, in spite of the fact that clean renewable energy sources are a growing share of PSCo's generation mix. As shown in the table, the projected annual and lifetime CO_2 emissions reductions from 2016 programs are higher than for any other year, and the projected reductions from 2015 programs are the second highest of any year.

Q. Do PSCO's energy efficiency and other DSM programs help to reduce other pollutant emissions?

A. Yes they do. Energy efficiency and other DSM programs reduce emissions of other pollutants besides the ones shown in Table HG-A-2 including NOx, particulates and mercury. And by reducing pollutant emissions, energy efficiency and DSM programs improve public health, lower health care costs and reduce premature deaths associated with air pollution, in addition to reducing greenhouse gas emissions.

A recent study by Lawrence Berkeley National Laboratory valued the public health and greenhouse gas benefits from reducing the operation of coal-fired and natural gas-fired power plants due to the adoption of wind and solar power.[14] The study found that for the Rocky Mountain region, the public health benefits from reducing electricity generation were worth

[1414] D. Millstein et al., "The climate and air-quality benefits of wind and solar power in the United States." *Nature Energy 2*, 17134 (2017). http://www.nature.com/articles/nenergy2017134. Also, see https://emp.lbl.gov/sites/default/files/health_and_environmental_data_compilation_jan2017.xlsx

$0.013 per kWh of avoided generation. Avoided greenhouse gas emissions were valued at an additional $0.028 per kWh in the central case in the study, again for the Rocky Mountain region.

Applying the public health benefits value by itself to the 410.5 GWh/yr of generation saved by PSCo's energy efficiency programs in 2016 indicates public health benefits of $5.3 million per year. These benefits will occur over the lifetime of the energy efficiency measures installed from 2016 programs, which is estimated by PSCo to be 14.7 years on average (see Table HG-A-1). This implies total public health benefits on the order of $75 million from 2016 energy efficiency programs alone. The avoided greenhouse gas emissions are worth an additional $11.5 million per year, based on the value for the Rocky Mountain region in the LBNL study.

Clearly PSCo's energy efficiency and DSM programs are providing significant public health and greenhouse gas benefits in addition to the large avoided utility costs and customer utility bill benefits. Furthermore, the public health and greenhouse gas emissions reduction benefits increase as electricity savings rise, and diminish as electricity savings fall.

Q. Have cities and counties in Colorado approved any policies that you urge the Commission to take into account?

A. Yes they have. Numerous cities and counties in Colorado including Denver have adopted goals and plans to dramatically reduce greenhouse gas emissions. In 2015, Denver adopted a goal of an 80% reduction in greenhouse gas emissions by 2050, relative to 2005 emissions, and a high level plan for achieving the goal.[15] Increasing energy efficiency in buildings is a

[15] *City and County of Denver Climate Action Plan 2015*. https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/Climate/CAP%20-%20FINAL%20WEB.pdf.

key component in Denver's strategy to reduce its greenhouse gas emissions. The Energize Denver initiative developed and the Denver City Council approved an ordinance requiring commercial and multifamily buildings greater than 25,000 square feet in floor area to benchmark and disclose their energy performance annually.[16]

More recently, Denver issued the *80 x 50 Climate Goal Stakeholder Report*.[17] The report recommends specific strategies and actions that Denver should adopt to meet its longer-term greenhouse gas emissions goals. The strategies include expanded energy efficiency retrofits of existing buildings and a transition to Net Zero Energy new buildings.

Other cities and counties besides Denver have adopted strong greenhouse gas emissions reduction and/or energy efficiency goals. These include Boulder, Boulder County, Golden, Lafayette, Eagle County, Vail and other mountain towns.[18] Continuing strong energy savings goals for PSCo, and strong energy efficiency programs in response to these goals, will help Denver and other cities and counties served by PSCo meet their climate action and energy efficiency goals.

Q. Are there any recent proceedings that relate to the DSM Strategic Issues docket that you wish to comment on?

A. Yes. The electric decoupling docket, Proceeding 16A-0546E, is one related docket that merits mentioning. In that proceeding, PSCo requested approval of a revenue decoupling mechanism for residential and small commercial customers. PSCo provided a number of

[16] Commercial and Multifamily Building Benchmarking Ordinance, City and County of Denver. 2017. https://www.denvergov.org/content/denvergov/en/environmental-health/environmental-quality/Energize-Denver/CommercialMultifamilyBuildingBenchmarking.html.
[17] *80 x 50 Climate Goal: Stakeholder Report*. City and County of Denver. 2017. https://www.denvergov.org/content/dam/denvergov/Portals/771/documents/EQ/80x50/80x50%20Stakeholder%20Report.pdf.
[18] For example, see the climate action plan developed and adopted by Eagle County, Vail and other mountain towns. http://www.walkingmountains.org/sustainability-2/climate-action-plan/

reasons why decoupling should be adopted in its testimony in the proceeding. One of the fundamental reasons was the reduction in electricity sales per customer caused by both past and future energy efficiency policies and programs. PSCo witness Jackson argued that the Company supports energy efficiency programs for its customers and that revenue decoupling was needed so that the Company would be able to collect its approved fixed costs rather than be harmed financially when it supports energy efficiency improvements by its customers.[19] The Company indicated that it would continue to implement new initiatives to help its customers save energy such as the IVVO initiative if decoupling was approved, but would be unwilling to implement IVVO if decoupling was not approved.[20]

Q. What assumptions did the Company make about future Company-sponsored energy efficiency programs in the decoupling proceeding?

A. The Company projected that electricity consumption per residential customer would decline from 619 kWh per month in 2016 to 586 kWh per month in 2021.[21] This represented an accelerated decline average monthly electricity consumption compared to rate of reduction over the past five years.[22] This projected decline in forecasted electricity use per customer was an important argument made by PSCo in support of its decoupling proposal. Moreover, Company-sponsored DSM programs are a primary factor driving the projected decline in consumption per customer.

PSCo indicated that DSM programs implemented during 2012-16 reduced average electricity use per residential customer by 53 kWh per month and average electricity use per

[19] Direct Testimony of Alice K. Jackson on behalf of PSCo, Hearing Exhibit 101, Proceeding No. 16A-0546E, ("Jackson Direct") p. 18, ln. 17 - p. 19, ln. 19.
[20] Ibid, p. 17, lines 2-4.
[21] Direct Testimony of Jannell E. Marks on behalf of PSCo, Hearing Exhibit 103, Proceeding No. 16A-0546E, p. 22, Table JEM-2.
[22] Jackson Direct, p. 33, Figure AKJ-3.

average business customer by 571 kWh per month as of 2016.[23] PSCo also indicated that the savings from Company-sponsored DSM programs would increase to 102 kWh per month per average residential customer and to 1,144 kWh per month per average business customer by 2021, meaning that the Company assumed continuation of strong utility DSM programs meeting the energy savings goals previously adopted by the Commission during 2017-21 in the energy use projections included in the Company's decoupling application.[24]

Q. What was the outcome of the decoupling proceeding and what importance was given to this information in the Commission's decision?

A. The Commission approved a revenue decoupling mechanism for residential and small commercial customers. In the Recommended Decision, the Administrative Law Judge stated "The evidence is unrefuted that the average use per residential customer has declined and there is little evidence to suggest that this trend will reverse itself."[25] The projected decline average use per residential customer, driven in large part by the assumption that strong utility energy efficiency programs will continue, was an important factor in the ALJ's recommended decision as well as the Commission's final order in the proceeding.

In short, the Company argued that decoupling was needed because average electricity use per residential customer was declining and that this decline was expected to accelerate based in part on assuming continuation of strong utility energy efficiency programs. The Judge accepted this argument, stating in his decision "Energy efficiency and a viable electric utility are in the interest of the ratepayers."[26]

[23] Answer Testimony of Howard Geller on behalf of SWEEP, Proceeding No. 16A-0546E, Attachment HG-2.
[24] Id. The Company assumed that energy savings per customer would approximately double from 2016 to 2021, meaning the same level of energy savings from programs implemented during 2017-2021 as programs implemented during 2012-16. This level of savings is approximately 400 GWh/yr for all energy efficiency programs.
[25] Decision No. R17-0337, Proceeding No. 16A-0546E, May 2, 2017. p. 13, para. 33.
[26] Ibid. p. 15, para. 40.

Decoupling was adopted to protect PSCo from financial harm due to declining sales per customer as a result of Company-sponsored energy efficiency programs and other factors, and to support continuation of energy efficiency efforts such as utility-sponsored DSM programs and IVVO. A pullback in PSCo's energy efficiency programs at this time would be inconsistent with the Company's position in the decoupling proceeding as well as the Commission's rationale for approving decoupling.

IV. The Evolving DSM Landscape

Q. Does PSCo provide a discussion of the evolving DSM landscape in its filing in this proceeding?

A. Yes. Mr. White discusses this topic in his Direct Testimony.[27]

Q. Do you take issue with any of the arguments or positions that Mr. White presents in this section of his testimony?

A. Yes. I have concerns with a number of Mr. White's arguments and positions, which as I explain below are either exaggerated or not consistent with factual information. The issues I have concerns with are: 1) the degree to which wind curtailment is an issue constraining energy efficiency; 2) the contention that previous energy savings goals have led to less cost-effective energy efficiency programs; 3) the contention that by increasing rates, energy efficiency programs do not save consumers and the utility money; 4) the need to refocus energy efficiency programs on peak demand reduction; and 5) characterization of energy efficiency goals as binding.

[27] Direct Testimony and Attachments of Shawn M. White, Hearing Exhibit 102, July 3, 2017 ("White Direct"), pp. 35-57.

Q. Please address the wind curtailment issue.

A. Regarding wind curtailment, Mr. White argues that the amount of wind curtailment is growing due to increasing penetration of wind resources in the Company's generation mix.[28] He indicates that there are minimal benefits from promoting energy efficiency during these periods. However, it should be noted that the Company is projecting very few hours where wind is being curtailed and where the marginal cost of energy is zero, and less hours rather than more hours over time: specifically 129 hours in 2019, 124 hours in 2020, 74 hours in 2021, 70 hours in 2022, and 25 hours in 2023.[29] Furthermore, the Company admits that it has not conducted an analysis of the number of hours its DSM programs will result in wind curtailment.[30]

Q. Please address the DSM program cost effectiveness issue.

A. Mr. White contends that less cost-effective energy efficiency programs are being maintained to meet "ambitious" energy savings targets (quotations added)[31]. He later states that some non-cost-effective energy efficiency programs have been needed to meet the energy savings goals.[32] These statements deserve some examination.

First, the net economic benefits under the modified TRC test are dropping because of declining avoided costs, not because it is getting more costly for PSCo to achieve energy savings. Table HG-A-1 shows that the average utility cost of lifetime energy savings is remaining low, and in 2016 was at the lowest level of any year since 2009. The "ambitious" energy savings targets adopted by the Commission have not led to an increase in the utility

[28] See White Direct, p. 38, lines 1-5.
[29] Attachment HG-2c, PSCo Response to Discovery Request SWEEP 1-27.
[30] Ibid.
[31] White Direct, p. 40, ln. 14.
[32] White Direct, p. 45, ln 18-21.

cost per unit of energy savings, even as the energy savings goals and amount of achieved energy savings has risen. This is due to factors such as the emergence of new cost-effective energy savings technologies (e.g., LED lighting) and advances in program design (e.g., the shift to midstream and upstream incentives for certain products).

Second, PSCo's portfolio of energy efficiency programs remains very cost effective from a utility system perspective, even with the declining avoided costs and the so-called ambitious energy savings targets approved by the Commission. As shown in Table HG-A-1, the benefit-cost ratio under the Utility Cost test was in the range of 2.9-3.2 during 2014-16. This means that the reduction in utility revenue requirement is nearly three times the utility cost to implement DSM programs, thereby providing significant utility bill savings for all customers. In 2016, PSCo determined that the net utility system benefits resulting from its actual DSM programs were $178 million.[33]

Regarding the degree of non-cost-effective programs in PSCo's DSM portfolio, this was a minor issue as of 2016. Only two business products, LED street lights and retrocommissioning, had a modified TRC benefit-cost ratio less than 1.0 in 2016, and both had ratios of 0.95 or greater. The total cost of these two products was only $494,000. Business programs as a whole had a benefit-cost ratio of 1.53 under the modified TRC test and a benefit-cost ratio of 3.53 under the Utility Cost test in 2016.[34] The LED street lighting product is a special case where there is no cost within the DSM portfolio for achieving energy savings; LED street lights are offered to municipalities through a special tariff approved in the last PSCo general rate case.

[33] See *Demand-Side Management Annual Status Report 2016*. PSCo. p. 105.
[34] Attachment HG-2d. PSCo response to Discovery Request OCC 1-8.

Three residential products were not cost effective under the modified TRC test in 2016, and all had a benefit-cost ratio of 0.85 or greater. The only product with a significant budget (over 1% of the portfolio total) was the high efficiency air conditioning product, a product that emphasizes peak demand reduction. The residential program as a whole had a benefit-cost ratio of 2.71 under the modified TRC test and a benefit-cost ratio of 4.33 under the Utility Cost test in 2016.[35] All low-income products were cost-effective in 2016.

As explained in the Public Direct Testimony of Donna A. Beaman,[36] there are some good reasons to include non-cost-effective products or measures in the Company's DSM portfolio. These include: 1) the fact that some products or measures are newer and take time to gain traction in the marketplace and/or come down in cost to the point where they are cost effective, and it is in the public interest to have PSCo support these products or measures in their early years; 2) some products or measures are included to offer a meaningful participation opportunity to all customers (e.g., LED street lights are an energy efficiency option of great interest to municipal customers); and 3) some measure are desired and expected by consumers, even if not strictly cost-effective from the TRC test perspective.

The Commission has had a policy of requiring energy efficiency programs to pass cost effectiveness screening at the program (i.e., sector) level, not at the individual product or measure level. This policy has led to achievement of the Commission's energy savings goals while producing large economic and environmental benefits for consumers and society as a whole. Furthermore, PSCo has included some non-cost-effective products and measures in its portfolio dating back to 2009, for the reasons explained by Ms. Beaman. In 2010, for

[35] Ibid.
[36] Public Direct Testimony and Attachments of Donna A. Beaman, Hearing Exhibit 105, July 3, 2017 ("Beaman Direct"), p. 15, ln. 12 – p. 16, ln. 6.

example, four of 30 energy efficiency products (13%) implemented by PSCo were not cost-effective under the modified TRC test; in 2013 five of 33 energy efficiency products (16%) were not cost-effective; and in 2016 five of 32 products (15%) were not cost-effective.[37] Thus, the extent of non-cost-effective products within the Company's energy efficiency portfolio is not rising.

The Company has an incentive to minimize the amount of non-cost-effective energy efficiency in its portfolio, namely the fact that its performance incentive is a percentage of the net economic benefits under the modified TRC test. The more cost-effective energy efficiency programs are, the bigger the Company's performance incentive. And as noted above, the amount of non-cost-effective energy efficiency is very limited and does not appear to be increasing over time. SWEEP recommends that the Commission reaffirm its policy requiring cost effectiveness screening at the program level, rather than at the product or measure level, going forward.

Q. Please address the rate impact issue.

A. Mr. White notes that energy efficiency programs can result in an increase in volumetric rates in the context of a reduction in the value of energy savings (i.e., declining avoided costs).[38] This is true, but it does not mean as he suggests that DSM programs are failing to save money for customers.[39] Customers that participate in DSM programs reduce their electricity use and this generally more than offsets any rate increase, leading to a reduction in the energy bills paid by participants and by customers as a whole. And with robust DSM programs such as PSCo's programs in recent years, most residential customers have

[37] This summary does not include pilot products or programs.

[38] White Direct, p. 43, ln. 10-16.
[39] White Direct, p. 43, ln. 17 – p. 44, ln. 3.

participated in the programs. In fact, PSCo estimates that close to 93% of residential customers participated in DSM programs offered during 2009-16, with more than 70% of residential customers reducing their electricity consumption by at least 6%.[40] And as explained above, the Utility Cost test results demonstrate that PSCo's energy efficiency and other DSM programs are reducing utility bills by a substantial amount for customers as a whole, given the energy savings goals established by the Commission.

Q. Please address the peak demand reduction issue.

A. Mr. White contends that the energy savings goals previously adopted by the Commission have limited the ability of PSCo to achieve peak demand reduction and that more focus on peak reduction (and less focus on energy savings) is appropriate going forward.[41] I do not believe the facts support this contention. Table HG-A-1 includes the peak reduction achieved by PSCo's energy efficiency programs each year during 2009-16. The table shows that the peak reduction has increased every year except in 2013, which was due to the significant spike in peak reduction achieved in 2012. The peak reduction from energy efficiency programs was 75.6 MW in 2016, nearly equal to the value in 2012 (76.4 MW). It is simply not true that achieving the Commission's energy savings goals is compromising PSCo's ability to reduce peak demand.

Nor is it the case that achieving the Commission's energy savings goals is compromising low-income program spending or causing the Company to exceed its approved budget cap, two other issues raised by Mr. White.[42] Low-income program spending (electric and gas combined) ranged from $4.5-7.3 million per year during 2009-16. The level of spending on

[40] See *Demand-Side Management Annual Status Report 2016*. PSCo. p. 36.

[41] White Direct, p. 44, ln. 16 – p.45, ln. 21.
[42] White Direct, p. 45, ln. 11-15.

low-income programs in 2016, $6.86 million, was the second highest annual total during this eight-year period. Regarding electric energy efficiency spending, PSCo spent $6.9 million less than its approved budget in 2016; likewise PSCo spent $6.9 million less than its approved budget in 2015.[43] And as noted above, PSCo estimates it will spend about $4 million less than its approved budget for electric energy efficiency programs in 2017.[44]

Q. Please address the issue of binding energy efficiency goals.

A. Mr. White raises the issue of what he terms binding energy efficiency goals.[45] He indicates that the most recent energy savings goals adopted by the Commission in Proceeding 13A-0686EG, 400 GWh/yr during 2015-2020, were binding goals unlike previous goals that were not binding goals. I do not agree with this characterization. The most recent energy savings goals are not binding and there is no penalty if the Company fails to meet the goals. The Company would not receive a performance incentive if it fails to meet the energy savings goal in any particular year, but this does not make the goal binding. Since 2009, there was always an energy savings threshold that the Company needed to reach in order to receive a performance incentive. But the Commission has established energy savings goals not requirements, and the policy has never included a penalty if PSCo failed to meet its energy savings goal.

Q. Are there any other aspects of the evolving DSM landscape that you wish to comment on?

[43] See Demand-Side Management Annual Status Reports 2015 and 2016. PSCo.
[44] Attachment HG-2a, PSCo response to Discovery Request CEC 3-1.
[45] White Direct, p. 49, ln. 1-20.

A. Yes. I would first like to comment on the evolution of energy efficiency and DSM technologies and strategies. Second, I would like to comment on the topic of market transformation.

Q. What comments do you have regarding the evolution of energy efficiency and DSM technologies and strategies?

A. I would like to point out that just as utility systems and their generation resources are evolving over time, so are energy efficiency technologies and implementation strategies. New energy savings technologies that were not commercially available five or ten years ago are now readily available in the marketplace, and other new energy savings technologies are emerging. Some examples include LED lighting products for all lighting markets - residential, commercial, industrial and municipal street lighting; WiFi-enabled smart thermostats and other home and business automation systems; high efficiency heat pump water heaters and clothes dryers; and advanced controls for lighting, HVAC systems and other devices. These technologies are commercially available today and are also steadily improving in terms of cost and performance. I address these new and emerging energy efficiency technologies further in the discussion of proposed energy savings goals.

I also want to point out that DSM strategies and program designs are evolving and improving over time as well. Newer approaches including upstream and midstream incentives to change the stocking practices of lighting distributors, HVAC distributors, and retailers; increased customer engagement through the internet and smart phone applications; promoting Strategic Energy Management within businesses; integrated energy efficiency and demand response programs; targeted energy efficiency programs for specific market segments; utilization of an online store that facilitates consumer purchase of and offers

instant rebates for energy-efficient products; and utilization of smart meter data to improve energy efficiency program design and marketing. PSCo has begun to adopt some of these strategies within its DSM programs which in turn has helped the Company reach its energy savings goals while holding down total program expenditures. But PSCo could do more in the future to make use of these newer DSM strategies and program approaches. For example PSCo has not begun to utilize smart meter data to enhance energy efficiency marketing, customer engagement, and customer education.

Q. What comments do you have on the topic of energy efficiency market transformation?

A. Market transformation is one of the objectives of the DSM programs of PSCo and other utilities, as discussed by Mr. Brockett.[46] With respect to market transformation, he notes that one of the lessons of the last decade of DSM implementation is the importance of working upstream in the supply chain in some cases to change the stocking and promotion practices of equipment distributors and vendors. I agree with this comment.

Mr. Brockett also states that the Company is proposing to step back from energy efficiency promotion in areas such as the lighting market where according to Mr. Brockett costs have come down to competitive levels and awareness is high.[47] I have some comments on this issue. In January 2016, PSCo published a study of the types of lighting products that are used in its service territory in both the residential and commercial lighting markets. This study is provided as Attachment DAB-2 to Ms. Beaman's Direct testimony in this Proceeding. The study shows that while the penetration of energy-efficient light bulbs (CFL and LED lamps) has been growing in the residential market, inefficient incandescent and

[46] Brockett Direct, pp. 47-49.
[47] Brockett Direct, p. 47, ln. 9-15.

halogen lamps still represented 60% of the lamps in high-use areas when the study was performed which was in 2015.[48]

After many years of CFL and LED lamp promotion and incentives, the residential lighting market has not yet been transformed to the point where a large majority of the lamps used in homes are energy efficient. This is consistent with national data from the National Electrical Manufacturers Association (NEMA), which shows that in 2017, more than half of general service light bulb shipments are still inefficient incandescent or halogen lamps (see Figure HG-A-1).[49] The production and sales of LED lamps has greatly increased in recent years, but LED sales have mostly replaced CFL sales rather than significantly reducing the market share of inefficient lamps. For example, the NEMA data show that the market share of inefficient lamps in the second quarter of 2017 was about the same as in the second quarter of 2014, approximately 58%. Clearly, many consumers are still purchasing less efficient lamps because they are the lowest first cost option, because of concerns about the performance or light quality of efficient lamps, force of habit, or for other reasons.

Utility promotion and in-store incentives for energy-efficient light bulbs, now targeting LED bulbs, remains a very cost-effective and impactful energy efficiency program for PSCo and other utilities. PSCo's Home Lighting and Recycling program had an estimated 354,597 participants in 2016, providing 140.9 GWh/yr of electricity savings with a benefit-cost ratio of 2.97 using the modified TRC test.[50] In 2017, PSCo is projecting 280,554 participants,

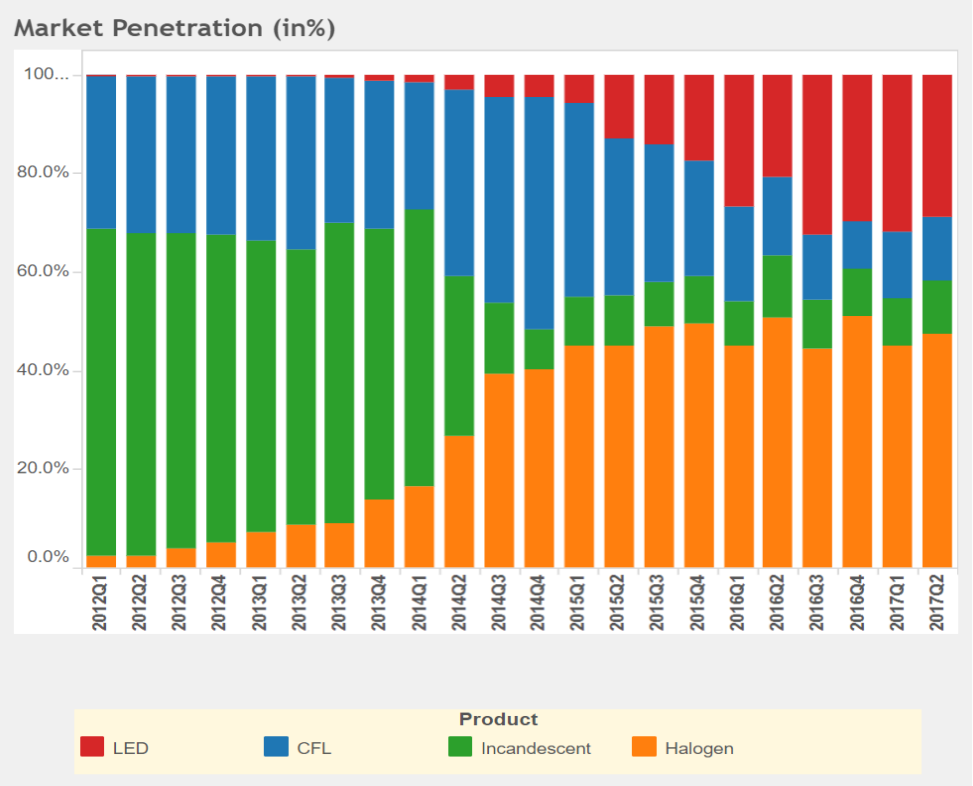
[48] See Colorado Lighting Market Study, Attachment DAB-2 to Beaman Direct, p. 21.

[49] "Second Quarter 2017 Year-Over-Year LED A-Line Lamp Shipments Up, Halogen, Incandescent and CFL Shipments Continue to Decline." National Electrical Manufacturers Association (NEMA). Oct. 13, 2017. https://www.nema.org/Intelligence/Pages/Second-Quarter-2017-Year-Over-Year-LED-A-Line-Lamp-Shipments-Up.aspx

[50] See *Demand-Side Management Annual Status Report 2016*. PSCo. p. 16 and p. 34.

104.7 GWh/yr of electricity savings and a benefit-cost ratio of 1.72.[51] Furthermore, based on its recent lighting market study, PSCo is assuming a net-to-gross energy savings level of 0.91 for its home lighting program in 2017-18, meaning a relatively low level of free ridership and thus high market impact. Studies of LED light bulb adoption in other states demonstrate the importance of maintaining utility incentives in order to increase the market penetration of energy-efficient LED light bulbs.[52]

Figure HG-A-1: Market Shares for Different Types of A-Type Light Bulbs



Source: See Footnote 49.

[51] See PSCo's *2017/18 Demand-Side Management Plan Electric and Gas*, Revised Nov. 17, 2016. p. 27 and p. 49. It should be noted that the actual benefit-cost ratio of the Home Lighting and Recycling program has been significantly higher than the projected benefit-cost ratio in recent years.

[52] D. Barclay et al. "Back to the Future: Why Lighting Programs May Have Never Been More Important. *Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings.* ACEEE. 2016 http://aceee.org/files/proceedings/20165/data/index.htm

Q. What comments do you have on energy efficiency market transformation in the commercial lighting market?

A. Turning to commercial lighting, PSCo's lighting market study found that about 77% of the lighting in commercial buildings is fluorescent lighting. As of 2015, about half of this was more efficient types of fluorescent lighting (T8 and T5 lamps) but about half was inefficient T12 type fluorescent lighting. The penetration of LEDs into the commercial fluorescent lighting market was less than 1% in 2015. After many years of promotion and incentives, the commercial lighting market in the PSCo service territory in 2015 was only about half converted to efficient types of fluorescent lighting.

Federal energy efficiency standards on fluorescent lamps were expected to have largely eliminated inefficient T12 fluorescent lamps in the marketplace, but PSCo found that this was not the case. A loophole in the federal standards, namely allowing continued production and sale of T12 lamps with a high color-rendering index (CRI), was being exploited to maintain widespread sale and use of low-cost but inefficient T12 lamps.[53] As a result of finding that there still is a high penetration of inefficient fluorescent lighting in commercial buildings, PSCo restarted financial incentives to encourage building owners to replace inefficient T12 fluorescent lighting with a more efficient option, in this case LED lighting.

The commercial lighting market illustrates another important point about market transformation. For many years utilities like PSCo promoted adoption of efficient types of fluorescent lighting, namely T8 and T5 lamps along with electronic ballasts. These technologies provided around 30% energy savings compared to older T12 lamps with

[53] This example demonstrates that well intentioned energy efficiency standards may not have the desired impact of transforming a market, and that local market studies are critical for understanding real world market conditions.

electromagnetic ballasts. And as just noted, PSCo's commercial fluorescent lighting market was approximately half transformed to these more efficient technologies as of 2015.

But technological innovation led to the development and commercialization of a brand new energy-efficient lighting option—LED lights. LED light tubes (so-called TLED lamps) can now replace fluorescent lamps. Complete LED fixtures can now replace fluorescent light fixtures (luminaires). This new technology, which had close to zero market penetration as of 2015, reduces energy consumption compared to efficient fluorescent lighting by approximately 50% simply through LED light tube replacement.[54] And by installing occupancy sensing, personal tuning and/or daylighting controls in conjunction with LED lights, an additional 24-38% energy savings can be realized.[55]

Thus, the market transformation process is beginning again - this time from both inefficient and efficient fluorescent lighting to LED lighting in commercial buildings. Likewise, LED lights are now available for other commercial and industrial applications such as high intensity discharge (HID) lighting, directional lighting (reflector lamps) and outdoor lighting. LED lamps are available for virtually all commercial and industrial lighting applications, including replacing what used to be promoted by PSCo and other utilities as efficient options.

In summary, the LED market transformation process is just getting underway, following on the previous partial transformation of the same market to more efficient fluorescent lighting. Thus, market transformation can be a multi-stage process occurring over decades.

[54] See Attachment HG-2e, PSCo Discovery Response to SWEEP 4-8.
[55] D. York et al. *New Horizons for Energy Efficiency: Major Opportunities to Reach Higher Electricity Savings by 2030*. Washington, DC: ACEEE. Sept. 2015. p. 119.
http://aceee.org/sites/default/files/publications/researchreports/u1507.pdf

Q. What is the overall energy savings potential from transformation of the lighting market to LED lighting?

A. The U.S. Department of Energy projects that the LED lighting revolution is in its early stages with about 6% of the roughly 6.9 billion lighting units in the nation LEDs as of 2015 (mainly screw-in A type LED lamps).[56] DOE projects that the LED lighting market share (fraction of all lamps in use) will grow to 30% by 2020, 59% by 2025, 78% by 2030 and 86% by 2035. If these targets are realized, the total amount of electricity used for lighting in the U.S. in 2035 would drop by 55%, compared to a scenario without LED lamps. And with further advances in LED lamp efficiency along with widespread adoption of lighting controls, the total amount of electricity use for lighting in 2035 could drop by 75%.[57] This analysis projects market transformation taking place with dramatic impacts on energy use, but through a process that is expected to take two decades. Utilities can play an important role in accelerating this transition, as well as promoting and incentivizing the adoption of LED lighting "best practices"; e.g., LED lighting with advanced controls.

Q. Are there indicators of market impact and trends in market impact for PSCo's portfolio of energy efficiency programs?

A. Yes there are. The net-to-gross (NTG) energy savings value for PSCo's portfolio of programs is one such indicator. The NTG ratio indicates the level of free ridership; i.e., program participants that are estimated to adopt the energy efficiency measure in the absence of the utility program. Spillover effect is the number of adopters of an efficiency measure as a result

[56] *Energy Savings Forecast of Solid-State Lighting in General Service Applications*. Report prepared by Navigant Consulting Inc. for the U.S. Department of Energy. Sept. 2016. p. 18. https://www1.eere.energy.gov/buildings/publications/pdfs/ssl/energysavingsforecast14.pdf
[57] Ibid. p. 19.

of a utility program, but without actually participating in the program. A NTG ratio of 1.0 means there is no free ridership in a program (assuming no spillover effect as well). A low NTG ratio, such as 0.50, signifies a high level of free ridership.

If PSCo is being forced to implement energy efficiency products or programs with a high level of free ridership in order to meet the energy savings goals set by the Commission, it would be observed through the NTG ratio of individual programs and the NTG ratio of the portfolio as a whole. Table HG-A-1 includes the overall NTG ratio for PSCo's portfolio of programs each year during 2009-16. These values show that PSCo achieved a portfolio NTG ratio of 0.85-0.90 each year during the eight-year period. The portfolio NTG ratio has been increasing in recent years (2015-16), and the portfolio NTG value of 0.895 in 2016 was the highest value since 2009. This means that PSCo's energy efficiency programs as a whole are experiencing relatively low free ridership and are having a high market impact, while achieving the energy savings goals established by the Commission.

V. DSM Market Potential Study

Q. What has the experience been with DSM Market Potential Studies conducted by PSCo as part of DSM Strategic Issues dockets in the past?

A. PSCo's previous DSM market potential studies greatly underestimated achievable energy savings potential and overestimated the cost of achieving energy savings. For example, the previous DSM Market Potential prepared by PSCo and included in its filing in Docket No. 13A-0686EG estimated annual achievable energy savings potential of just 277 GWh per year during 2013-2020, assuming PSCo pays incentives equal to 75% of the incremental cost of

energy efficiency measures.[58] In the 2013 docket, the Commission adopted a goal of saving 400 GWh per year, which PSCo was able to achieve in 2015 and 2016, and is on track for achieving in 2017. And PSCo has achieved the energy savings goals at far less than the cost per unit of energy saving projected in the 2013 Market Potential study. Previous Market Potential studies prepared by PSCo exhibited the same problems.

Q. Do you have general comments on the DSM Market Potential Study conducted by PSCo in 2016 to support its filing in this Proceeding, contained in Attachment SWW-2?

A. Yes I do. I believe that the DSM Market Potential Study prepared for this docket suffers from many of the same shortcomings as previous DSM Market Potential studies prepared by PSCo. These shortcomings include excluding a number of available energy efficiency options, not incorporating some of the energy efficiency measures that PSCo is successfully promoting within its DSM programs, and being overly conservative about the savings potential from other technologies. In addition, the Market Potential Study projects unrealistically high costs for achieving limited energy savings, as I explain below.

Q. Are there available residential energy savings measures that PSCo is successfully promoting that are left out of or undervalued in the achievable potential scenario in the DSM Market Potential Study?

A. Yes there are. In the residential sector, the achievable potential scenario in the study appears to exclude early retirement of second or third refrigerators or freezers, even though PSCo is running a successful product that is removing unneeded older refrigerators and freezers from the housing stock. In 2016, PSCo's Refrigerator and Freezer Recycling product achieved 3.9

[58] *Update to the Colorado DSM Market Potential Assessments (Revised).* Xcel Energy. June 2, 2013. Provided as Exhibit No. JAP-1 in the Direct Testimony and Exhibits of Jeremy A. Petersen in Docket No. 13A-0686EG, June 17, 2013.

GWh/yr of electricity savings with a benefit-cost ratio of 1.80 under the modified TRC test.[59] Furthermore, PSCo's 2016 Residential Energy Use Study – Colorado Market shows that 34% of households served by PSCo have two or more refrigerators, suggesting that there is still very substantial potential for energy savings from a Refrigerator and Freezer Recycling product.[60] Moreover, PSCo projects in its 2017/18 DSM plan that the Refrigerator and Freezer Recycling product will achieve nearly 5 GWh of energy savings per year during 2017 and 2018.[61]

The achievable potential scenario in the study also appears to exclude energy savings from evaporative cooling, which is another very successful product within PSCo's residential energy efficiency program. In 2016, PSCo's Evaporative Cooling product also achieved 3.9 GWh/yr of electricity savings with a benefit-cost ratio of 5.70 under the modified TRC test.[62] This was the single most cost-effective product implemented by PSCo in 2016.

The achievable potential scenario in the Market Potential Study includes very little energy savings from high efficiency appliances, only about 1.4 GWh of savings during 2019-23 or less than 0.3 GWh per year.[63] This in spite of the fact that PSCo is implementing an ENERGY STAR retail products pilot program that is already delivering energy savings in excess of this amount. In addition, even greater energy savings are possible with highly efficient refrigerators, clothes washers and clothes dryers such as those meeting the CEE's Tier 3 standards or the EPA's ENERGY STAR Most Efficient specifications.

[59] *Demand-Side Management Annual Status Report 2016*. p. 16.
[60] *2016 Residential Energy Use Study – Colorado Market.* PSCo. Aug. 2016. p. 35.
[61] *2017/2018 Demand-Side Management Plan Electric and Natural Gas*. PSCo. Revised Nov. 17, 2016. pp. 24 and 31.
[62] *Demand-Side Management Annual Status Report 2016*. PSCo. p. 16.
[63] See Response to Discovery Request OCC 1-2, Attachment OCC 1.2L, tab ElecEnergy_EndUse. Large spreadsheet available to all discovery recipients and to Trial Staff of the PUC. SWEEP requests that Trial Staff makes this available to the Commission and Advisory Staff to avoid attaching such a large document to this testimony. This request applies to footnotes 64, 65 and 68.

The primary analysis in the DSM Market Potential study (the Reference Scenario) is also flawed in that it includes some outdated technologies that PSCo is no longer promoting (or phasing out promoting) such as CFLs and programmable thermostats. These outdated technologies should have been removed from the study and replaced by state-of-the-art technologies, namely LED lamps and WiFi-enabled smart thermostats. And with respect to these state-of-the-art technologies, the Market Potential study failed to include up-to-date cost and performance assumptions. For example, the study assumed that the first cost of a general service LED light bulb that replaces a 43-watt halogen incandescent lamp is $14.88.[64] In reality, ENERGY STAR LED light bulbs are now selling for about $2.50 each when sold in four packs without a utility rebate.

Q. Are there available commercial energy savings measures that were left out of or undervalued in the achievable potential scenario in the DSM Market Potential Study?

A. Yes there are. In the commercial sector, the achievable potential scenario includes very little energy savings from energy efficiency improvements in data centers, only about 9 GWh during the 2019-23 time period or about 1.8 GWh per year on average.[65] This is in spite of the fact that PSCo is successfully implementing a Data Center product as part of its DSM portfolio. In 2016, PSCo's Data Center product achieved 6.5 GWh of first year electricity savings with a benefit-cost ratio of 2.12 under the modified TRC test.[66] Furthermore, the Data Center product is gaining traction and is projected to yield 8.2 GWh of first year energy savings in 2017 and 9.8 GWh in 2018.[67]

[64] See Response to Discovery Request OCC 1-2, Attachment OCC 1.2K, tab Measure Appendix, line 1986. See footnote 63.
[65] See Response to Discovery Request OCC 1-2, Attachment OCC 1.2L, tab ElecEnergy_CustSeg. See footnote 63.
[66] *Demand-Side Management Annual Status Report 2016*. PSCo. p. 16.
[67] *2017/2018 Demand-Side Management Plan Electric and Natural Gas*. PSCo. Revised Nov. 17, 2016. pp. 24 and 31.

The achievable potential scenario includes relatively modest energy savings from energy management systems (EMS), only about 4.9 GWh per year of savings on average during 2019-23. This in spite of the fact that PSCo's EMS product achieved 8.8 GWh of first year savings in 2016 and is targeted to achieve a similar level of savings in 2017 and 2018. The savings potential in this area could increase even further with the addition of Energy Information Systems to the product, a step recently taken by PSCo.

Q. What are the shortcomings in the analysis of the achievable energy savings potential from high efficiency lighting in the commercial and industrial sectors?

A. The study indicates very low achievable energy savings potential for more efficient lighting in the commercial and industrial (C&I) sectors, relative to the actual potential for energy savings through widespread adoption of LED lighting. In particular, the study indicates total achievable lighting savings of 256 GWh in the commercial sector and 59 GWh in the industrial sector over the five-year period 2019-23.[68] Combined, this is equivalent to saving 63 GWh per year on average.

With the rapid advances in LED lighting for commercial and industrial applications, the achievable energy savings potential is much greater than what the study indicates. This is demonstrated by the performance of PSCo's business lighting products (Lighting Efficiency and Lighting – Small Business) in 2017. PSCo reported savings of 130.8 GWh (first year savings) in the first three quarters of 2017 for these two products combined.[69] Assuming the program maintains the same level of energy savings per month in the fourth quarter, the total savings in 2017 will reach 174.4 GWh. This high level of energy savings is being realized in

[68] See Response to Discovery Request OCC 1-2, Attachment OCC 1.2L, tab ElecEnergy_EndUse. See footnote 63.
[69] Q3-2017 Colorado DSM Roundtable handout. PSCo. Nov. 13, 2017. https://www.xcelenergy.com/company/rates_and_regulations/filings/colorado_demand-side_management

part because PSCo is seeing a 51% average reduction in lighting wattage and electricity use when fluorescent lamps are replaced with LED lamps, as of 2017.[70] Moreover, electricity savings in the C&I lighting area is on the rise—the projected savings in 2017 is 65% greater than the 105.2 GWh saved by C&I lighting programs in 2016.

Total commercial and industrial lighting electricity use in the PSCo service territory is estimated to be at least 2,400 GWh[71], with technical savings potential of 50-75% through adoption of LED lighting and advanced lighting controls.[72] Given this very large energy savings potential, the fact that the technologies (LED lamps, LED troffers and advanced lighting controls) are still improving in performance and declining in cost, and the time it takes to transition such a large market, total achievable energy savings potential of 174 GWh per year or greater from more efficient lighting in the C&I sectors is likely to persist for at least six years.

With technological advances, growing consumer awareness and well-designed/well-funded utility programs, it is reasonable to assume that the achievable C&I lighting energy savings will increase over time, not decrease. One reason for this is that LED lamp and luminaire efficacy (a measure of energy efficiency) is projected to significantly improve over the next decade.[73] Growth in LED lighting adoption (on an annual basis) is possible and desirable especially among small and medium-size businesses, given the high level of non-

[70] Attachment HG-2e, PSCo Response to Discovery Request SWEEP 4-8.
[71] The Energy Information Administration estimates that lighting accounts for 17% of commercial sector electricity use nationwide (seehttps://www.eia.gov/consumption/commercial/reports/2012/lighting/). Applying this fraction to total electricity commercial sector electricity use in the PSCo service area suggests that commercial lighting alone consumes about 2,200 GWh per year. With the addition of lighting in the industrial sector, the total exceeds 2,400 GWh per year.
[72] *Energy Savings Forecast of Solid-State Lighting in General Service Applications*. Report prepared by Navigant Consulting Inc. for the U.S. Department of Energy. Sept. 2016. pp. 18-19. https://www1.eere.energy.gov/buildings/publications/pdfs/ssl/energysavingsforecast14.pdf.
[73] Ibid. p. 80.

participation of these businesses in PSCo's DSM programs during 2009-16. PSCo estimates that over 65% of businesses (nearly all of which are small or medium sized) did not participate in any DSM program during 2009-16.[74] One strategy for increasing program participation and adoption of LED lighting by small businesses is to conduct intensive marketing and direct installation in particular geographic areas for a limited time period. This strategy, known as geo-blitzing, is being successfully implemented by Rocky Mountain Power Co. in Utah but has not been deployed as of yet by PSCo.[75]

Q. What does the DSM Market Potential study assume about the energy efficiency of general purpose A-type light bulbs?

A. As explained on p. 32 of Mr.White's Direct Testimony, the primary analysis in the study (termed the Reference Scenario) assumes robust adoption of CFL lamps during 2018-19 and then some further energy savings from the adoption of specialty LEDs and CFLs lamps, as well as ordinary CFLs, starting in 2020 in the context of Phase 2 of the EISA federal light bulb standards. The study also includes an Alternative Lighting Scenario, which largely excludes standard CFLs since PSCo is no longer promoting CFLs in its Home Lighting program starting in 2018. The Alternative Lighting Scenario, which emphasizes LED lamps rather than CFLs, shows less penetration of energy-efficient lighting and considerably less achievable energy savings potential during 2019-23 compared to the Reference Scenario. Because it excludes CFLs, the Alternative Lighting scenario more closely tracks the reality of the Company's programs than the Reference Scenario.[76]

[74] *Demand-Side Management Annual Status Report 2016.* PSCo. p. 36.
[75] "Geo-blitzing Direct Installation with Small Business Customers." Presentation of Jason Berry at the 2017 Southwest Utility Energy Efficiency Workshop, SWEEP. http://www.swenergy.org/Data/Sites/1/media/events/regional-workshops/2017/presentations/09-Berry.pdf.
[76] White Direct, p. 33, lines 1-8.

However, it is not reasonable that there would be less energy savings in the scenario with LED lamps dominating (the Alternative Lighting Scenario) compared to the scenario with CFL lamps dominating. Compared to CFLs, LED lamps are a superior lighting technology in that they are dimmable, provide instant on, do not contain mercury, and have a longer lifetime than CFLs. LEDs are also better suited than CFLs for use in specialty applications and reflector lamps such as those located in recessed can fixtures. In addition, the price of LEDs has dropped significantly in the past couple of years. For all these reasons, LED lamps are quickly displacing CFLs in the lighting market nationwide as shown in Figure HG-A-1 above (see page 10). The DSM Market Potential study is not realistic in projecting less adoption of LEDs compared to CFLs in the residential sector in comparing the two scenarios.

The Alternative Lighting Scenario projects total achievable energy savings potential across all sectors of just 328 GWh in 2018 with an estimated annual energy efficiency budget of $87.2 million.[77] In contrast, PSCo's actual DSM plan for 2018 contains an energy savings target of 429 GWh at an estimated annual energy efficiency budget of $77.7 million.[78] The fact that the Alternative Lighting Scenario in the DSM Market Potential study underestimates the Plan savings target in 2018 by 101 GWh while projecting a higher utility budget for achieving nearly 24% less energy savings demonstrates the inaccuracy and excessive conservatism of the DSM Market Potential study. The study is simply not credible if it is so far off in projecting energy savings potential and program costs for 2018.

Q. What does PSCo assume regarding federal efficiency standards on general purpose A-type light bulbs?

[77] See the 2016 Demand-Side Management Potential Study, Attachment SMW-2 to the White Direct Testimony, PSCo. p. 91.
[78] *2017/2018 Demand-Side Management Plan Electric and Natural Gas*. PSCo. Revised Nov. 17, 2016. p. 32.

A. As explained by PSCo witness Donna A. Beaman, PSCo assumes that a federal standard of 45 lumens per watt (the backstop standard in EISA) will be implemented by the U.S. Department of Energy (DOE) starting in 2020. However, PSCo also assumes that the expansion of covered lamps to include reflector lamps and other specialty lamps issued by the Obama Administration on Jan. 19, 2017 will not be implemented or enforced.[79] Also, PSCo assumes that there will be significant availability of inefficient halogen A lamps beyond Jan. 1, 2020 due to factors such as shelf-stocking and hoarding practices. Consequently, PSCo assumes there will be some continued residential lighting energy savings potential during 2020-23, but much less than in recent years or projected for 2017 and 2018. The assumed residential lighting energy savings potential during 2020-23 is even lower in the Alternative Lighting Scenario than the Reference Scenario.[80]

Q. Do you have comments regarding PSCo's assumptions about the federal efficiency standards on general purpose A-type light bulbs?

A. Yes. Whether or not the federal backstop light bulb efficiency standard will be promulgated and enforced by the U.S. DOE, and what the scope of any such standard would be, are still unresolved questions. The U.S. DOE issued a Notice of Data Availability (NODA) and Request for Information on General Service Incandescent Lamps and Other Incandescent Lamps on August 15, 2017. In response, the National Electrical Manufacturers Association (NEMA), which represents lighting product manufacturers, replied with detailed comments on Oct. 16, 2017.[81]

[79] Beaman Direct, p. 43, ln. 14 – p. 44, ln. 9.
[80] White Direct, 2016 Demand-Side Management Potential Study, Attachment SMW-2, p. 91.
[81] Comments of the National Electrical Manufacturers Association (NEMA) on Energy Conservation Program: General Service Incandescent Lamps and Other Incandescent Lamps, in response to the Notice of Data Availability (NODA) and Request for Information, Docket Number EERE-2017-BT-NOA-0052. Oct. 16, 2017.

In its comments, NEMA argued that: a) the backstop requirement in EISA should not be adopted or enforced by the U.S. DOE; b) the current standards for general service incandescent lamps should not be amended; c) the DOE acted improperly when it expanded the definition of general service incandescent lamps to include reflector and other specialty lamps and these types of lamps should remain exempted from general service incandescent lamp standards; and d) if new general service lamp standards are promulgated, DOE should adopt separate energy efficiency standards for incandescent, compact fluorescent and LED lamps.

Thus, the nature of the second phase of the EISA general service light bulb standards, potentially taking effect in 2020, is not resolved. Given the anti-regulatory leanings of the Trump Administration, NEMA may get what it is requesting. In addition, if the DOE does promulgate the backstop standard and/or maintains the expanded definition of general service incandescent lamps, the lighting industry is likely to sue the DOE and delay the implementation of the 2020 standards. This means that there could be more opportunity for cost-effective energy savings from promoting energy-efficient residential lighting products, in particular LED lamps, than PSCo is assuming in its Market Potential study.

Q. Do you have any other comments on PSCo's DSM Market Potential Study?

A. Yes. There are additional strategies for achieving cost-effective energy savings that are not included in the DSM Market Potential Study, which focuses on energy efficiency measures. One of these strategies is promoting Strategic Energy Management (SEM) in larger commercial and industrial facilities. SEM achieves energy savings through better operational

https://www.nema.org/Policy/Documents/PublicVersion.EERE-2017-BT-NOA-0052.NEMAComments.NODA.RFI.October%2016%202017.pdf.

practices, setting energy savings goals and establishing a process of continuous improvement. Indeed PSCo is proposing a new methodology for counting energy savings from C&I behavioral actions that reduce energy use in this docket,[82] but does not appear to include energy savings from C&I behavioral actions in the DSM Market Potential study. One recent analysis of 124 industrial participants in SEM programs in the Pacific Northwest and Ohio found that SEM program participation resulted in 4.8% electricity savings on average.[83]

Another strategy for increasing energy savings is to target a product or program to a specific sector, such as the product that PSCo already implements for data centers. Other utilities in the Southwest region implement successful programs or program components targeted to schools, multifamily buildings, and oil and natural gas producers. A targeted product for the cannabis industry could be especially valuable in the PSCo service territory given the rapid growth in cannabis production, high energy intensity and large electricity savings potential (30% or greater) in cannabis grow facilities.[84] This sectoral targeting approach, which could increase the achievable energy savings potential in the PSCo service territory, was not considered in the DSM Market Potential Study.

Other strategies for increasing achievable energy savings include increased use of upstream and midstream incentive approaches in order to change market conditions[85]; use of data mining and analytical techniques to better segment customers and improve the

[82] White Direct, pp. 70-75.
[83] D. Worsley et al. "Success Factors for Utility-Sponsored Strategic Energy Management Initiatives." *Proceedings of the 2015 ACEEE Summer Study on Energy Efficiency in Industry*. ACEEE. 2015. http://aceee.org/files/proceedings/2015/data/index.htm.

[84] N. Kolwey. *A Budding Opportunity: Energy Efficiency Best Practices for Cannabis Grow Operations*. Boulder, CO: SWEEP. Nov. 2017. http://www.swenergy.org/data/sites/1/media/documents/publications/documents/A%20Budding%20Opportunity%20%20Energy%20efficiency%20best%20practices%20for%20cannabis%20grow%20operations.pdf
[85] PSCo already implements upstream and midstream incentives in some of its programs, but use of this effective market conversion technique could be expanded.

effectiveness of program marketing; and adding financing components, either utility-provided or third party financing, to increase program participation. Once again, these approaches were not considered in the DSM Market Potential Study.

PSCo acknowledges that the new AMI meters it will install through the AGIS initiative will give the Company more insight into customer usage habits and allow the Company to better target customers with energy-efficient products and services.[86] In addition, the data provided by new AMI meters will enable third party energy service providers to better engage with customers and help them achieve energy savings and peak demand reduction. However, the Market Potential Study again did not take into account this capability which will become available in the PSCo service area during 2020-23.

Finally, the Market Potential study includes programmable thermostats as an energy efficiency measure even though the energy savings from these devices are questionable. Consequently, programmable thermostats were delisted by the EPA ENERGY STAR program.[87] A new generation of WiFi-enabled smart thermostats has demonstrated the potential to provide significant electricity savings especially when implemented with HVAC optimization strategies and controls. Two field evaluations of WiFi-enabled smart thermostats with optimization controls found approximately 15% cooling electricity savings on average, much greater savings than is provided by traditional programmable thermostats.[88]

[86] White Direct, p. 54.

[87] ENERGY STAR. 2009. "Programmable Thermostats Specification." www.energystar.gov/index.cfm?c=archives.thermostats_spec

[88] C. Aarish and M. Jones. "Smart Thermostats and the Triple Bottom Line: People, Planet and Profits." *Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings*. ACEEE. 2016. http://aceee.org/files/proceedings/2016/data/index.htm.

VI. Proposed Energy Savings and Peak Demand Reduction Goals

Q. Do you support the energy savings energy efficiency peak demand reduction goals proposed by PSCo in this docket?

A. I do not. As I explained in Section II above, PSCo historically has proposed low energy savings goals which were rejected by the Commission. PSCo has been able to achieve much greater energy savings than it proposed in the previous three DSM Strategic Issues dockets, in response to higher energy savings goals established by the Commission, and do so very cost effectively. Once again, PSCo is proposing relatively low energy savings goals recognizing the pattern that has been established of the Commission setting higher goals than those proposed by the Company.

The arguments that PSCo uses to justify lower energy savings goals do not stand up to scrutiny, as I discuss in Section IV above. PSCo has been able to achieve the energy savings goals established by the Commission at a low utility cost per unit of lifetime energy savings, and this value was not increasing as of 2016. In addition, the benefit-cost ratio for PSCo's energy efficiency programs under the Utility Cost test has been approximately 3:1 in recent years, meaning customers as a whole are realizing hundreds of millions of dollars of reduced utility system costs as a result of PSCo's DSM programs. In addition, PSCo has been able to maintain a high level of peak demand reduction from energy efficiency programs and provide significant benefits for low-income consumers, while meeting the energy savings goals established by the Commission. And in recent years, PSCo has exceeded the energy savings goals set by the Commission at a cost well below the approved budget for energy efficiency programs.

The DSM Market Potential Study prepared by PSCo in this docket is significantly flawed, as discussed in Section V above. The study excludes a number of efficiency measures that PSCo is successfully implementing within its portfolio of DSM programs and underestimates the savings potential from other measures relative to savings levels PSCo is currently achieving. The potential study greatly underestimates achievable energy savings potential in the C&I lighting area. The main scenario in the study used by PSCo to set its proposed energy savings goals, the Alternative Lighting Scenario, significantly underestimates energy savings potential and overestimates program costs compared to PSCo's approved DSM plan for 2018. In summary, the DSM Market Potential Study should not be used as the basis for setting energy savings goals, just as the DSM Market Potential studies were not a sound basis for establishing energy savings goals in previous DSM Strategic Issues dockets.

Q. What state and local policies should be taken into account in setting energy savings goals?

A. As discussed in Section III, in 2017 Governor Hickenlooper established a goal of achieving 2% electricity savings per year by 2020, in conjunction with setting CO_2 emissions reduction goals for the electric sector. Denver and other local jurisdictions have set ambitious CO_2 emissions reduction goals and are implementing new energy efficiency initiatives to help meet the goals while saving consumers and businesses money. Continuing strong energy savings goals for PSCo, and well-performing energy efficiency programs in response to these goals, will help the state as well as Denver and other cities and counties served by PSCo meet their climate action and energy efficiency goals.

The Colorado legislature recently showed its support for utility energy efficiency programs by extending the requirement for energy savings goals for an additional ten years. And the Commission has showed its support by approving decoupling for residential and small business customers, a policy that PSCo proposed in large part so that it would not be harmed financially when it helped its customers save energy. In summary, all of these policies support setting energy savings for 2019-23 at the highest levels that are technically feasible, economically justified and achievable.

Q. What energy savings goals do you recommend the Commission adopt for the period 2019-2023?

A. The goals I propose are presented in Table HG-A-3 below. The table compares the goals I propose with those proposed by PSCo, and also presents the goals as a percent of projected electricity sales (with the goals converted from savings at the generator level to savings at the customer level). In summary, I propose moving up to an energy savings goal of 500 GWh per year for PSCo's portfolio of energy efficiency programs during 2019-23. The goals would continue to be expressed in terms of first year energy savings at the generator level.

Table HG-A-3: Proposed Energy Savings Goals (GWh/yr at generation level)

Year	SWEEP Goals	PSCo Goals	SWEEP Goals as a % of Projected Sales
2019	**500**	**350**	**1.62**
2020	**500**	**350**	**1.61**
2021	**500**	**325**	**1.58**
2022	**500**	**325**	**1.57**
2023	**500**	**325**	**1.54**
Total	**2,500**	**1,675**	**--**

Note: In converting from electricity savings at the generator level to the customer level, a conversion factor of 1.075 was used. This was the actual ratio of savings at the generator and customer levels for the energy efficiency portfolio in recent years.

Considering the entire five-year period, the energy savings goals I propose are 49% greater than the goals proposed by PSCo. As a fraction of energy sales, the goals (at the customer level) range from 1.54% to 1.62% of projected retail electricity sales.

Q. What is the justification for the energy savings goals you propose?

A. I start with the energy savings goals proposed by PSCo but exclude the addition for emerging technologies. I then make the following adjustments based on my critique of the DSM Market Potential Study explained in Section V above:

- Increase the goals by 10 GWh per year to account for the additional savings potential from refrigerator and freezer recycling, evaporative cooling, residential appliance energy savings, and adoption of WiFi-enabled smart thermostats with optimization controls;

- Increase the goals by 12 GWh per year to account for the higher energy savings potential in data centers and through adoption of energy management systems, relative to the assumptions in the Market Potential Study;

- Increase the goals for energy savings from energy-efficient C&I lighting by 110 GWh in 2019, 120 GWh in 2020, 130 GWh in 2021, 135 GWh in 2022, and 140 GWh in 2023 in recognition of the much greater energy savings potential from the adoption of LED lighting and lighting controls compared to the assumptions in the Market Potential Study, and the expectation that the energy efficiency of LED lighting products will continue to improve over time[89];

- Increase the goals for energy savings from energy-efficient residential lighting to the levels in the Reference Scenario, and increase the savings in 2021-23 to 20 GWh per year in recognition of the overstated cost of LED lamps in the Market Potential Study and the uncertainties related to the implementation of new EISA light bulb standards in 2020, resulting in incremental savings of 45 GWh in 2019, 14 GWh in 2020, 13 GWh in 2021, 14 GWh in 2022 and 16 GWh in 2023.

Q. What assumptions do you make for savings from emerging technologies in the energy savings goals you propose?

[89] *Energy Savings Forecast of Solid-State Lighting in General Service Applications*. Report prepared by Navigant Consulting Inc. for the U.S. Department of Energy. Sept. 2016. p. 80. https://www1.eere.energy.gov/buildings/publications/pdfs/ssl/energysavingsforecast14.pdf.

A. I agree with PSCo that the energy savings goals should be increased to account for a contribution from emerging technologies, which were not included in the Market Potential Study. There are numerous emerging technologies that are not yet promoted within PSCo's DSM programs yet offer great promise including advanced lighting controls, variable refrigerant flow air conditioners and heat pumps, advanced controls for rooftop AC systems, new types of motors such as Q-Sync and switched reluctance motors, and heat pump clothes dryers. PSCo is investigating a number of these technologies and is considering adding some of them to its energy efficiency programs starting in 2018.[90]

PSCo assumes that emerging technologies contribute 25 GWh to the energy savings goals it is proposing each year during 2019-2023. I recommend a different approach for incorporating savings from emerging technologies. Given the time it takes for emerging technologies to get established in the marketplace and gain consumer acceptance, I believe it is more reasonable to assume a modest contribution from emerging technologies in 2019 but then a growing contribution from year-to-year. In all likelihood, the energy savings provided by emerging technologies in 2023 will be much greater than the savings in 2019. Consequently, I include the following contributions from emerging technologies in the energy savings goals I propose: 2019 – 10 GWh; 2020 – 20 GWh; 2021 – 30 GWh; 2022 – 40 GWh; and 2023 – 50 GWh.

Q. Please summarize the calculation of the energy savings goals you propose?

A. Table HG-A-4 explains the derivation of my proposed energy goals, starting from the goals proposed by PSCo based on its Market Potential Study and adding the adjustments explained

[90] See Q3-2017 Colorado DSM Roundtable presentation. PSCo. Nov. 13, 2017. https://www.xcelenergy.com/company/rates_and_regulations/filings/colorado_demand-side_management.

above. The total potential is close to or slightly above 500 GWh per year each year during 2019-23. As a result, I propose a flat goal of 500 GWh per year during the five-year period. This is a 25% increase relative to the goal of 400 GWh per year established by the Commission for 2015-2020 in the previous DSM Strategic Issues docket.

Table HG-A-4: Derivation of SWEEP's Proposed Energy Savings Goals (GWh/yr at generation level)

Year	PSCo Goals (excluding emerging tech.)	Adjustments to DSM Potential Study	Addition for Emerging Technologies	Total Energy Savings Potential
2019	**325**	**177**	**10**	**512**
2020	**325**	**156**	**20**	**501**
2021	**300**	**165**	**30**	**495**
2022	**300**	**171**	**40**	**511**
2023	**300**	**178**	**50**	**528**

Q. What benefits would result from setting the energy savings goal at 500 GWh per year, rather than the much lower goals proposed by PSCo?

A. There would be numerous benefits including greater participation by customers thereby enhancing the equity of PSCo's DSM programs. Equity would be especially aided by increasing the participation of small and medium-size businesses in the C&I lighting efficiency programs.

I also maintain that the energy savings goal I propose would lead to greater net economic benefits for customers given that the main source of incremental savings, C&I lighting efficiency upgrades, was very cost-effective as of 2016. Furthermore, C&I lighting efficiency is getting more cost effective over time (all else being equal) given that the cost of LED lighting products is declining while energy performance (efficacy) is improving. In addition, achieving incremental energy savings in the residential lighting area will enhance equity and add to the net economic benefits given that this product also has been highly cost effective.

Establishing higher energy savings goals will result in a greater peak demand reduction from energy efficiency programs. The main area of incremental energy savings, C&I lighting, has a relatively favorable ratio of peak reduction to energy savings although not as high as the ratio for cooling efficiency improvements or new construction products.[91] The topic of appropriate peak demand reduction goals from energy efficiency programs is addressed below.

Establishing higher energy savings goals will also result in greater reductions in CO_2 and other pollutant emissions, thereby improving public health and helping the state of Colorado as well as local jurisdictions meet their greenhouse gas emissions and climate action goals.

Q. Are the energy savings goals you propose compatible with concerns and objectives that PSCo has articulated, in light of its evolving electric system?

A. Yes they are. The energy savings goals I have proposed will result in more peak demand reduction than the energy savings goals proposed by PSCo, not less peak demand reduction (see discussion below). In addition, the goals I propose should motivate PSCo to pursue "smart" energy savings from internet-connected control technologies such as advanced lighting and air conditioning controls, as well as internet-connected air conditioners, water heaters and other appliances. Higher energy savings goals should also motivate PSCo to stimulate greater adoption of connected smart thermostats; e.g., by requiring installation of a WiFi-enabled smart thermostat in the Company's new homes program.

All of these "smart" energy efficiency options also offer demand response potential, and thereby providing PSCo with greater ability to manage demand in ways that support

[91] Based on 2016 program performance, achieving an additional 100 GWh of energy savings from C&I lighting efficiency improvements would reduce peak demand by about 18 MW. See *Demand-Side Management Annual Status Report 2016.* PSCo. p. 16.

integration of an increasing amount of intermittent renewable energy sources in the electric system. Indeed a number of states with strong utility energy efficiency commitments including California, New York and Maryland are combining energy efficiency and demand response offerings in ways that can support renewables integration and provide greater value to both the utility and consumers.[92]

Q. Would the energy savings goals you propose lead PSCo to comply with the energy efficiency goal in Governor Hickenlooper's Executive Order on a Clean Energy Transition?

A. Yes they would. Achieving the goal of 2% energy savings through energy efficiency by 2020 requires saving about 580 GWh per year in the PSCo service area (savings at the customer level) given that PSCo projects retail energy sales of about 29,000 GWh in 2020. A DSM goal of saving 500 GWh at the generator level is equivalent to saving about 465 GWh at the customer level. However, this is net savings, which adjusts for free ridership. It is reasonable to use gross savings in complying with the goal in the Executive Order since gross savings represents the full energy savings resulting from PSCo's programs. PSCo's portfolio of energy efficiency programs had a net-to-gross energy savings ratio of 0.895 in 2016. Using this value, 465 GWh of net energy savings is equivalent to 520 GWh of gross energy savings.

In considering the total energy savings that PSCo is facilitating, it is reasonable to add the energy savings that PSCo is projecting from its IVVO initiative which was approved in Proceeding 16A-0588E. PSCo projects that its customers will realize about 340 GWh of energy savings per year once the voltage controls implemented under the IVVO initiative are

[92] B. Buckley, "Putting More Energy into Peak Savings: Integrating Demand Response and Energy Efficiency Programs in the Northeast and Mid-Atlantic." *Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings*. ACEEE. 2016. http://aceee.org/files/proceedings/2016/data/index.htm.

fully operational. The initiative will take about five years to implement during 2018-22, meaning savings of about 68 GWh per year on average from each year of installation. Adding this value to the gross energy savings from the DSM goals I propose leads to total savings of 588 GWh per year. This satisfies the 2% energy savings target in the Governor's Executive Order.

Q. How do the goals you propose compare to energy savings goals in place in other states that are considered leaders in utility energy efficiency programs?

A. As shown in Table HG-A-3 above, the energy savings goals I propose are equivalent to 1.54-1.62% of PSCo's projected retail energy sales during 2019-23. According to the American Council for an Energy Efficient-Economy (ACEEE), seven states (Arizona, Illinois, Maine, Maryland, Massachusetts, Rhode Island, and Vermont) have energy savings standards or goals for electric utilities that are higher than those I have proposed for PSCo.[93] All but Illinois have annual savings goals or standards of 2% or greater.

Arizona is a state that has adopted strong energy savings standards for its investor-owned electric utilities via Commission decision.[94] The Standards require utilities to save 2.5% of sales per year during 2016-2020 from energy efficiency programs, with up to 10% comprised of savings credits from demand response programs. Arizona is a state where savings and standards are expressed in terms of gross savings, without a net-to-gross savings adjustment. Removing the demand response credit and using a 0.89 average net-to-gross ratio, the Arizona standards call for saving approximately 2.0% of sales per year during 2016-2020 on a net savings basis. Thus, the energy savings standards in effect in Arizona are about 25%

[93] W. Berg, et. al. 2017. *The 2017 State Energy Efficiency Scorecard.* American Council for an Energy-Efficient Economy, Washington, DC. Sept. 2017, p. 43. http://aceee.org/research-report/u1710.
[94] Findings of Fact in Docket No. RE-00000C-09-0427. Decision No. 71436. Arizona Corporation Commission, Dec. 18, 2009.

higher than the energy savings goals I am proposing for PSCo based on an "apples-to-apples" comparison.

Massachusetts is the top state in the nation in terms of utility energy savings achievements and goals. In 2016, the investor-owned electric utilities across the state achieved energy savings equal to 3% of retail sales on a net savings basis. Furthermore, Massachusetts has adopted an energy savings target of 2.9% of sales per year during 2016-20 also on a net savings basis.[95]

Q. What conclusions do you draw from this?

A. Clearly there are states with higher energy savings goals or standards than those I have proposed for PSCo during 2019-2023, as a percentage of retail electricity sales. Utilities in these states are maximizing the implementation of cost-effective energy efficiency resources and are meeting the ambitious but achievable goals adopted by state policy makers.

Q. What energy efficiency demand reduction goals are you proposing, and what is the basis for your proposed goals?

A. I have reviewed the ratio of demand reduction to energy savings achieved by PSCo in its energy efficiency programs in recent years. The ratio in terms of MW of peak reduction per GWh of energy savings ranged from 0.178 to 0.190 during 2011-16. In 2016, the value was in the middle of this range, 0.184 MW per GWh of energy savings. These values are for energy efficiency programs only; they do not include demand response programs. I also note that the business lighting products, which I assume will be a major source of energy savings in the future, had a ratio of 0.179 MW per GWh of energy savings in 2016.

[95] W. Berg, et. al. 2017. *The 2017 State Energy Efficiency Scorecard*. American Council for an Energy-Efficient Economy, Washington, DC. Sept. 2017, p. 43. http://aceee.org/research-report/u1710.

In order to establish my demand reduction goals, I assume that PSCo is able to achieve 0.180 MW of demand reduction per GWh of energy savings during 2019-2023. This is towards the lower end of the range during 2011-16 and therefore is a conservative value in my opinion. With this coefficient and the energy savings goal of 500 GWh per year, my proposed energy efficiency demand reduction goal is 90 MW per year during 2019-23.This is 38.5% higher than the 65 MW annual goal proposed by PSCo.

Q. What would be the benefits of your proposed energy efficiency demand reduction goals, compared to PSCo's proposed goals?

A. I am proposing an additional 25 MW of demand reduction per year from energy efficiency programs, relative to PSCo's proposed goals. This means a total incremental reduction of 100 MW by 2022 and 125 MW by 2023. Achieving this level of incremental demand reduction would help reduce the resource shortfall that PSCo is projecting in 2022 and 2023 given the most recent ERP Phase II assumptions and the demand response goals that PSCo is proposing in this docket. Given these assumptions, PSCo is projecting resource shortfalls of 129 MW in 2022 and 574 MW in 2023.[96] The incremental demand reductions that would result from the goals I am proposing here would eliminate most of the shortfall in 2022 and a portion of the shortfall in 2023, cutting the projected shortfall in 2023 from 574 MW to 449 MW.

VII. <u>Energy Efficiency Budget</u>

Q. What budget is PSCo proposing for energy efficiency programs during 2019-23, in order to meet the energy savings goals it has proposed?

[96] Attachment HG-2f, PSCo Response to Discovery Request SWEEP 1-54.

A. As explained in Mr. White's Direct Testimony,[97] PSCo is proposing an energy efficiency portfolio budget of $70 million per year along with the flexibility to exceed the budget by 10% per year without seeking additional approval from the Commission. Using the midpoint of the energy savings goals proposed by PSCo which is 335 GWh per year, PSCo's proposed budget is equal to about $0.21 per GWh/yr of energy savings.

Q. What budget are you proposing for the energy savings goals you have proposed?

A. I base my budget proposal on PSCo's track record of program expenditures needed to achieve a given level of energy savings. PSCo achieved energy savings during 2010-14 at a program cost of $0.165-0.170 per GWh/yr of energy savings. This coefficient was relatively constant during a period in which the energy savings goals and achievements were rising. The program cost per unit of savings increased in 2015-16 to an average of about $0.18 per GWh/yr of energy savings.

I believe it is reasonable assume that this value, a portfolio cost of $0.18 per GWh/yr of savings, can be maintained in the future. I base this assumption in part on the fact that the cost of LED lighting products is declining, meaning that utility costs should drop for incentivizing the adoption of this key energy savings technology. A decline in incentive costs for LED lighting can offset cost increases needed to achieve energy savings in other areas.

Using a coefficient of $0.18 per GWh/yr of energy savings and my proposed energy savings goal of 500 GWh per year results in an estimated annual energy efficiency program cost of $90 million. I believe this is a reasonable budget level for my proposed energy goal. However, I also support the budget flexibility proposed by PSCo meaning the Company

[97] White Direct, p. 53.

could increase this budget by up to 10% if necessary; i.e., expend up to $99 million per year on energy efficiency programs without having to seek additional approval from the Commission. Past experience has shown that giving PSCo this budget flexibility is reasonable. The Company went over budget only once in 2012 when high levels of program participation resulted in the utility exceeding its energy savings goal by a wide margin.

Q. Are PSCo's customers requesting a reduction in funding for energy efficiency programs, which PSCo has proposed in its filing.

A. No they are not. PSCo reports it received only five complaints from its customers about DSM between 2012 and 2017. And only one of these complaints was related to the Company's DSM expenditures.[98]

VIII. Disincentive Offset and Shareholder Incentive Mechanism

Q. Have you reviewed PSCO's proposals for modifying the electric energy efficiency incentive and disincentive offset mechanisms as presented in the Direct Testimony and Supplemental Direct Testimony of PSCo witnesses Scott Brockett and Steven Wishart?

A. Yes I have.

Q. What is PSCo proposing with respect to a financial disincentive offset associated with residential and small commercial customers?

A. As explained in Mr. Wishart's Supplemental Direct Testimony,[99] PSCo is not proposing a financial offset for lost fixed cost recovery from residential and small business customers in

[98] Attachment HG-2g, PSCo Response to Discovery Request SWEEP 1-40.
[99] Supplemental Direct Testimony and Attachments of Steven W. Wishart, PSCo, Hearing Exhibit 109, September 29, 2017 ("Wishart Supplemental").

this docket. This is because the Commission approved a decoupling mechanism for these customer classes in Proceeding No. 16A-0546E.

Q. What is your response to PSCo's proposal regarding disincentive offset for residential and small commercial customers?

A. I agree with PSCo's position. The revenue decoupling mechanism, as long as it is in effect, protects PSCo from financial harm due to reduced electricity sales and revenues from the Company's DSM programs. The decoupling mechanism ensures that PSCo will receive its approved revenue in each of these customer classes, in between rate cases, and no more or no less. Thus, there is no justification for any further disincentive offset. In fact, PSCo and other decoupling supporters argued in Proceeding No. 16A-0546E that decoupling is justified in part because it protects the Company from financial harm due to the effects of energy efficiency programs. PSCo is maintaining a consistent position by not requesting a disincentive offset associated with lost fixed cost recovery from residential and small commercial customers in this proceeding.

Q. What is PSCo proposing with respect to financial disincentive offset for large C&I customers?

A. As explained in Mr. Wishart's Supplemental Direct Testimony, PSCo is proposing that it be allowed to collect a disincentive offset approximately equal to the estimated lost fixed cost recovery from the large C&I customer classes associated with the projected energy savings from these classes based on the Company's proposed total energy savings goal of 350 GWh per year. This lost fixed cost recovery amount is estimated to be about $6.5 million. In addition, PSCo is proposing to collect this amount from all customers, not just large C&I customers.[100] The

[100] Attachment HG-2h, PSCo Response to SWEEP Discovery Request 2-23.

fundamental basis for this proposal is that large C&I customers are not included in the decoupling pilot approved by the Commission.

Q. What has PSCo said previously about the need for a financial disincentive offset associated with lost fixed cost recovery from large C&I customers?

A. In the decoupling application that PSCo filed in Proceeding No. 16A-0546E, Ms. Jackson testified that "*We have not identified the same issues related to the Company's fixed cost recovery within our Commercial and Industrial rate classes. Rates for these customers are based on demand charges, and demand billing determinants do not face the same erosion applicable to average use per customer for the Residential and small Commercial classes."*[101] Consequently, PSCo proposed revenue decoupling only for the residential and small commercial customer classes.

Q. What is your response to PSCo's proposal for a disincentive offset associated with lost fixed cost recovery from large C&I customers in this proceeding?

A. In past proceedings, SWEEP has supported some form of disincentive offset or decoupling mechanism so that PSCo is not harmed financially when it implements effective energy efficiency programs for its customers. Consistent with this position, SWEEP believes that PSCo should be able to collect an appropriate disincentive offset related to the energy savings realized by large C&I customers that participate in PSCo's DSM programs. However, I do not support two aspects of PSCo's disincentive offset proposal.

First, I do not agree that a specific disincentive value should be set in this Proceeding that is not subject to change or true up based on the actual amount of lost fixed cost recovery that

[101] Direct Testimony of Alice K. Jackson, Proceeding 16A-0546E, p. 28, ln. 10-14.

PSCo experiences from large C&I customers participating in DSM programs in any particular year. Instead, I support awarding PSCo a disincentive offset based on the actual lost fixed cost recovery from large C&I customers ex-post program implementation each year. This amount can and should be provided in PSCo's Annual DSM report. After the report is reviewed by the Commission and assuming the Commission does not have any concerns with PSCo's numbers or calculations, PSCo should be allowed to recover the actual lost fixed cost recovery from customers over 12 months. This amount may be more or less than the $6.5 million proposed by PSCo.

This approach allows for adjustments if necessary depending on whether or not a historical or future test year is approved in the rate case preceding the determination of lost fixed cost recovery, and whether or not a multi-year rate plan is approved. The basic concept I am suggesting is to set the disincentive offset based on the actual amount of lost fixed cost recovery, rather than an estimated value. In addition, this approach functions well if the Commission approves energy savings goals that are different than those proposed by PSCo, or if the energy savings goals change over time (as PSCo has proposed).

Q. Under your proposal, are you proposing that PSCo be able to collect interest on the amount of lost fixed cost recovery for the period of time in between when the lost fixed cost recovery occurs and when it is collected?

A. Under my proposal, there would be a time lag of approximately two years between when lost fixed cost recovery occurs and when it is collected. In return for allowing PSCo to collect the full amount of lost fixed cost recovery associated with the energy savings by large C&I customer due to their participation in DSM programs, I am not proposing that interest be collected on the lost fixed cost recovery amount prior to its collection. However, I would not

object if the Commission decides that it is appropriate to allow the lost fixed cost recovery amount to accrue interest because of the time lag between occurrence and collection, under my proposal.

Q. Do you agree with PSCo's proposal that all customers pay for the disincentive offset associated with lost fixed cost recovery from large C&I customers?

A. I do not. Residential and small commercial customers will be subject to a separate mechanism – decoupling – to ensure that PSCo is not harmed financially by lost fixed cost recovery due to the effects of DSM program participation by these customers. Residential and small commercial customers should not pay for a portion of the disincentive offset associated with the lost fixed cost recovery due to the effects of DSM program participation by large C&I customers. The large C&I customers are the cause of the lost fixed cost recovery that PSCo is proposing to collect (and I am supporting allowing PSCo to collect), thus large C&I customers (and only large C&I customers) should pay for the lost fixed cost recovery they cause.

As to the details of the lost fixed cost recovery assignment, I suggest it be done separately for each large C&I customer segment based on the amount of actual lost fixed cost recovery for each segment; i.e., one lost fixed cost recovery amount per kWh for the SG rate class, one for the PG rate class, etc. But if this approach is not considered feasible, I would not object to a uniform amount per kWh for all large C&I customers.

Q. Please describe PSCo's proposed performance incentive mechanism?

A. In his Direct Testimony, Mr. Wishart describes the new energy efficiency Scorecard that PSCo is proposing to use for establishing an energy efficiency performance incentive starting

in 2019.[102] The Scorecard approach proposes to base the incentive amount on performance across a broad range of metrics including first year energy savings, lifetime energy savings, energy efficiency demand reduction, low-income bill reduction, and utility benefit-cost test ratio. The goals for each of these metrics would be proposed by PSCo and decided by the Commission in each DSM plan docket. Then the performance of the Company relative to the goals for each of the metrics would determine the amount of performance incentive that PSCo would collect from its customers, each year. The performance incentive would be a percentage of the net economic benefits of the energy efficiency programs, with a maximum performance incentive equal to 19% of the net economic benefits (see Table SWW-D-4).

Q. Do you support the energy efficiency Scorecard approach that PSCo is proposing for determining its energy efficiency performance incentive starting in 2019?

A. I do not. I have a number of concerns with this approach which I describe below. First, this is a much more complicated approach to determining the performance incentive than past approaches which based the performance incentive solely on the level of annual energy savings relative to the savings goal set by the Commission and the net economic benefits of PSCo's DSM programs. The Scorecard approach is overly complex in my view, and is a "solution in search of a problem."

The previous (and current) approach of basing the incentive solely on annual energy savings and net economic benefits has worked well and does not warrant a major overhaul. The previous/current approach has motivated PSCo to exceed the energy savings goals set by the Commission every year since this process began in 2009, as shown in Table HG-A-1

[102] Direct Testimony and Attachments of Steven W. Wishart, PSCo, Hearing Exhibit 103, July 3, 2017 ("Wishart Direct"), p. 22.

above. And the current approach has motivated PSCo to do a good job in controlling program costs and in generating large economic benefits for customers. This is not surprising since the previous/current approach awards the Company an incentive based on a percentage of the net economic benefits provided by DSM programs. Putting aside the concern of PSCo that the combination of the disincentive offset and incentive amounts have not been large enough to offset lost fixed cost recovery and truly make energy efficiency and DSM investments more profitable than alternative supply side investments, the previous/current incentive approach has worked very well.

Two other significant concerns I have are that the Scorecard approach proposed by PSCo will make DSM plan dockets more complicated and contentious, and that setting the goals for the different metrics in these dockets could be subject to manipulation by PSCo to its financial advantage. In the past, PSCo and most (or all) interveners have been able to reach Settlement Agreements in DSM plan dockets, which makes these dockets easier for all parties and for the Commission. It also makes DSM program design a more collaborative process that has led to some improvements in the DSM plan in the past, which benefits the Company and its customers.

However, if in the future establishing reasonable goals for the five metrics proposed by PSCo are part of the DSM plan approval process, and if there is "money on the table" for PSCo depending on where the goals are set and how challenging the goals are, the DSM plan dockets will become much more contentious. In my view, it will be very difficult if not impossible to reach settlement agreements in the DSM plan dockets if PSCo's Scorecard proposal is adopted. This is a significant drawback.

PSCo will have an incentive to set relatively low goals for all of the metrics when its performance incentive is based on the Company meeting or exceeding the metrics. It will be difficult for interveners and the Commission to know if the proposed values for metrics such as lifetime energy savings or utility benefit-cost test ratio proposed by PSCo are reasonably challenging or not.

I want to elaborate further on why I think the proposed energy efficiency Scorecard is a "solution in search of a problem." As I noted above, PSCo exceeded the annual energy savings goals set by the Commission every year during 2009-16, and PSCo indicates it expects to exceed the Commission's energy savings goal again in 2017.[103] In addition, PSCo has performed very well in the recent past on some of the other metrics it is proposing to include in the new energy efficiency Scorecard.

Q. Please elaborate on your concerns with including lifetime energy savings in the proposed energy efficiency Scorecard.

A. Regarding lifetime energy savings, Table HG-A-1 includes the average lifetime of energy savings for the energy efficiency portfolios every year since 2009. The average lifetime of energy savings has not been dropping in recent years; in fact average lifetime has been increasing with 2016 having an average energy savings lifetime of 14.7 years. This is the highest value of any year since the expansion of DSM starting in 2009, triggered by the passage of HB 07-1037. The recent increase in average energy savings lifetime is understandable given that LED lighting is becoming a significant source of energy savings and LED lighting has a relatively long lifetime. With the contribution of LED lighting to total energy savings increasing over time, it is likely that the average lifetime of energy savings

[103] Attachment HG-2b, PSCo Response to Discovery Request SWEEP 1-4.

will continue to rise at least in the next few years. For example, PSCo indicates that LED lights accounted for 47.5% of light bulbs incentivized through its Home Lighting and Recycling program in 2016, and the Company expects that LED lights will account for 87% of light bulbs incentivized in 2017 and 100% in 2018.[104]

There is no need for the Commission to reward PSCo for increasing lifetime energy savings when factors in the energy efficiency market are naturally leading to this outcome. Likewise, linking the performance incentive to lifetime energy savings, as PSCo has proposed, at a time when the average lifetime of energy is trending upwards is one way for PSCo to manipulate the determination of the performance incentive to its financial advantage.

Q. Please elaborate on your concerns with including peak demand reduction from energy efficiency programs in the proposed energy efficiency Scorecard.

A. Regarding peak demand reduction from energy efficiency programs, Table HG-A-1 includes the peak demand reduction from energy efficiency programs every year since 2009. As I noted above, the table shows that the peak demand reduction from energy efficiency increased every year compared to the previous year, except in 2013 which followed a year when there was a sharp spike in the peak demand reduction from energy efficiency programs. The peak demand reduction from energy efficiency programs has been trending upward in recent years, with the reduction achieved in 2016 being nearly as high as the maximum year (2012). In short, PSCo has increased its achieved peak demand reduction in conjunction with

[104] Attachment HG-2i, PSCo Response to Discovery Request SWEEP 3-1.

increasing energy savings over time, in response to the higher energy savings goals established by the Commission.

Similar to my arguments related to lifetime energy savings, there is no need for the Commission to reward PSCo for increasing the peak demand reduction from energy efficiency programs when this metric is trending upwards. Moreover, it is simply not true that PSCo has achieved the Commission's energy savings goals at the expense of peak demand reduction or that maintaining strong energy savings goals is inconsistent with achieving robust peak demand reduction.

This pattern is continuing in 2017. Through the first three quarters, PSCo reports that its energy efficiency programs have achieved 81.1% of the annual peak reduction target for energy efficiency programs while achieving 76.8% of the energy savings target for the programs.[105] In fact, PSCo is doing better in peak demand reduction than in energy savings relative to the goals in each area, while remaining on track to meet the annual energy savings goal set by the Commission.

Q. Please elaborate on your concerns with including the Utility Cost test ratio in the proposed energy efficiency Scorecard.

A. Regarding including the Utility Cost test (UCT) ratio in the Scorecard, PSCo is proposing it be rewarded for performance in an area where it has always performed well. Table HG-A-1 includes the UCT benefit-cost ratio for PSCo's overall portfolio of DSM programs each year since 2009. The table shows the benefit-cost ratio was in excess of 3.0 every year except for 2015 when it dipped to 2.91. Once again, PSCo is proposing a solution—providing a

[105] Public Service Company of Colorado (PSCo) 2017 DSM Savings & Annual Targets Q3-2017. Nov. 13, 2017. https://www.xcelenergy.com/company/rates_and_regulations/filings/colorado_demand-side_management.

financial incentive from ratepayers to PSCo if the Company performs well under the Utility Cost test —for a problem that does not exist. The UCT ratio of PSCo's actual DSM programs has been very strong, and PSCo is incentivized to keep it strong by the current performance incentive structure and the performance incentive structure I am proposing; i.e. awarding the Company an incentive based on a percentage of the net economic benefits it achieves through its DSM programs. By maintaining a high benefit-cost ratio under the UCT, PSCo increases net economic benefits and thus its performance incentive.

Q. Please elaborate on your concerns with including the net benefits of electric low-income programs in the proposed energy efficiency Scorecard.

A. Regarding including the net benefits to participants from electric low-income programs, PSCo already implements a strong set of low-income programs (both electric and gas programs) at the total funding level of about $7 million per year in recent years. This is much more than utilities in neighboring states are spending on low-income energy efficiency programs. In addition, PSCo has a very capable lead contractor (Energy Outreach Colorado) that does an excellent job implementing impactful low-income energy efficiency programs.

Low-income programs, both electric and natural gas programs, remain cost-effective in spite of declining natural gas prices and avoided costs in general. In fact, the net economic benefits of PSCo's electric low-income programs in 2016 equaled about $9.5 million, which was significantly higher than the net economic benefits realized in any of the previous four years.[106]

[106] Attachment HG-2j, PSCo Response to Discovery Request SWEEP 1-43.

Consequently, PSCo does not need nor should it be given a financial incentive that is collected from ratepayers to increase the net benefits of its low-income electric energy efficiency programs, as the Company has proposed as part of it energy efficiency Scorecard. If low-income program net benefits are part of the performance incentive calculation, PSCo will be motivated to set the target at a level it knows it will be able to exceed and thereby gain additional incentive dollars from its customers.

If the Commission wants PSCo to expand or modify its low-income energy efficiency programs, it should simply direct the Company to do so. Furthermore, the majority of the funding for low-income programs is on the gas DSM side, not on the electric side. SWEEP supports an increase in funding for low-income energy efficiency programs within the natural gas efficiency portfolio in particular, given that the overall natural gas energy efficiency budget is relatively modest and that gas low-income programs are more impactful and cost-effective than electric low-income programs.[107] But this should be done without including low-income program electric benefits in the calculation of PSCo's electric energy efficiency performance incentive.

Q. What performance incentive mechanism structure do you recommend the Commission adopt in this proceeding?

A. Given my perspective that the Scorecard approach proposed by PSCo is too complicated, unnecessary and potentially subject to gaming, along with my perspective that previous incentive mechanism approaches have worked well, l am proposing a performance incentive structure similar to previous approaches. In particular, I am proposing awarding PSCo an

[107] In 2016, electric low-income programs had a modified TRC ratio of 1.18 while natural gas low-income programs had a modified TRC ratio of 1.39. In 2015, the ratios were 1.09 (electric) and 1.54 (natural gas). See PSCo DSM Annual Status Reports 2015 and 2016.

incentive expressed as a percentage of the net economic benefits, with the percentage based on a sliding scale dependent on annual energy savings achievement relative to the goals set in this docket. This is the same approach that was adopted in the first two DSM Strategic Issues dockets, Proceeding No. 07A-420E and 10A-554EG.

This approach incentivizes PSCo to maximize energy savings as well as the value of this energy savings (which contributes to net economic benefits). It also incentivizes PSCo to control costs, maximize the peak demand reduction from energy efficiency measures, and maximize lifetime energy savings as increasing all of these factors leads to higher net economic benefits under the modified TRC test.

Q. Please provide the specific performance incentive structure that you recommend the Commission adopt in this proceeding, in conjunction with the energy savings goals you have proposed?

A. In conjunction with the energy savings goals I recommend and the removal of disincentives through either decoupling (for the residential and small commercial classes) or recovery of lost fixed costs (for the large C&I classes), I propose adoption of performance incentives shown below in Table HG-A-5.

Table HG-A-5: Proposed Incentive Structure with 500 GWh Annual Energy Savings Goal

Annual energy savings relative to goal (%)	Incentive as a % of net economic benefits
80-84.9	3
85-89.9	4
90-94.9	5
95-99.9	6
100-104.9	7
105-109.9	8
110-114.9	9
115-119.9	10
120-124.9	11

125-129.9	12
130-134.9	13
135-139.9	14
≥140	15

As shown in Table HG-A-5, PSCo would receive a small incentive if it reaches 80% of the energy savings goal, which is 400 GWh per year of first year energy savings given the energy savings goal I have proposed. The incentive as a percentage of net economic benefits increases if PSCo is able to achieve greater energy savings for its customers. The incentive is equal to 7% of net economic benefits if PSCo achieves 100% of the 500 GWh per year energy savings goal. This is higher than the current performance incentive that PSCo receives when it achieves 100% of the energy savings goal, which is 5% of net economic benefits. I believe that 7% is reasonable going forward giving that the absolute value of net economic benefits is falling due primarily to declining avoided costs.

The incentive percentage rises if PSCo is able to further increase the amount of energy savings its customers realize through Company-sponsored energy efficiency programs. The maximum incentive I am proposing is equal to 15% of the net economic benefits. PSCo would receive this incentive amount if it achieves 140% of the annual energy savings goal or greater, which is annual energy savings of 700 GWh with my proposed energy savings goal. Under my proposal, the large majority of the net economic benefits (at least 85%) remain with customers, with customers keeping at least 90% of the net economic benefits in all likelihood. My proposed maximum incentive, 15% of net economic benefits, is less than the maximum incentive of 19% of net economic benefits proposed by PSCo with its Scorecard approach.

Q. Given that the net economic benefits from energy efficiency programs are declining, do you believe that the incentive amounts you are proposing are reasonable?

A. I do. First, it should be recognized that the performance incentive would be offered to PSCo in conjunction with other policies that fully remove any financial disincentive that PSCo would experience as its customers save energy through participation in the Company's energy efficiency programs. This was not the case in the past, as PSCo has frequently pointed out. Second, it should be recognized that recovery of energy efficiency program costs are expensed through mechanisms that provide assured and rapid cost recovery of approved program expenditures, as long as total expenditures do not exceed the budget cap set by the Commission. Energy efficiency is not a capital investment and there are no regulatory time lags in cost recovery like those for supply-side investments. In this context, the incentive amounts I have proposed are reasonable even though the net economic benefits provided by energy efficiency programs are declining under the modified TRC test.

Q. Are you proposing the same performance incentive structure if the Commission adopts the energy savings goals proposed by PSCo?

A. No I am not. The savings goals proposed by PSCo, significantly less than the goals I propose, do not warrant as generous an incentive structure as the one proposed above. However, in the event that the Commission approves the energy savings goals proposed by PSCo, I still believe that the energy efficiency Scorecard approach should be scrapped.

Q. Please provide the performance incentives structure that you recommend the Commission adopt if the Commission approves the energy savings goals proposed by PSCo.

A. In conjunction with the energy savings goals proposed by PSCo, I propose the incentive structure provided in Table HG-A-6. In this case, I do not believe it is reasonable to provide PSCo any incentive for achieving less than what I consider to be 100% of weak energy savings goals. Furthermore, the incentive structure I propose in Table HG-A-6 would incentivize PSCo to achieve more than the minimum energy savings represented by its proposed energy savings goal. The incentive is small for achievement of just 100% of the goal, and the maximum incentive would not be achieved until PSCo achieves 160% of the annual energy savings goal.

Table HG-A-6: Proposed Incentive Structure with PSCo's Proposed Energy Savings Goals

Annual energy savings relative to goal (%)	Incentive as a % of net economic benefits
100-104.9	3
105-109.9	4
110-114.9	5
115-119.9	6
120-124.9	7
125-129.9	8
130-134.9	9
135-139.9	10
140-144.9	11
145-149.9	12
150-154.9	13
155-159.9	14
≥160	15

Q. Have you reviewed the demand response performance incentive that PSCO is proposing?

A. Yes I have.

Q. What is PSCo proposing with respect to a demand response performance incentive?

A. As explained in Mr. Wishart's Direct Testimony, PSCo is proposing a demand response (DR) performance incentive, separate from the energy efficiency programs performance incentive.[108] The specific DR incentive that PSCo is proposing is to allow the Company to receive 5% of the value of the avoided capacity benefits resulting from its DR programs each year.

Q. Do you support the demand response performance incentive that PSCo is proposing?

A. I support the concept of allowing PSCo to receive a financial incentive that is based on the performance of its DR programs. However, I have a significant concern with the specific incentive structure proposed by Mr. Wishart and I have an alternative DR incentive proposal. My concern is that PSCo is proposing to base the incentive on the gross benefits of its demand response efforts and not the net benefits. This differs from the structure of the performance incentive for energy efficiency programs which is based on net economic benefits.

The value of the avoided capacity benefits is only one side of the benefit-cost calculation for DR programs. PSCo also incurs costs in the form of payments to DR program participants. The performance incentive should be based on the net benefits achieved, not the gross benefits. Consider the example provided on p 35, lines 9-12 of Mr. Wishart's Direct Testimony. In this example, he assumes 460 MW of demand response capacity with an avoided capacity value of $39 million. Under PSCo's incentive proposal, the Company would receive 5% of this value, which is $1.9 million. However, this ignores the costs necessary to obtain the DR capacity. In the example provided by Mr. Wishart, what if these

[108] Wishart Direct, p. 33.

costs are $37 million in the same year? The net benefits of the DR programs would be just $2 million and under PSCo's proposal the Company would receive a performance incentive of $1.9 million which is equal to 95% of the net benefits. This would not be reasonable.

Q. Given this concern, what is your alternative demand response performance incentive proposal?

A. I propose allowing the Company to receive an incentive equal to 10% of the net economic benefits of its DR programs each year. This means that customers would retain 90% of the net benefits. This approach incentivizes PSCo to maximize the "DR bang per buck", not just the total amount of DR capacity it achieves. In addition, I propose that this incentive be based on actual DR program costs and benefits each year, in the same manner that the energy efficiency performance incentive is calculated and received by the Company.

IX. Demand Response Goals

Q. Have you reviewed PSCO's proposed demand response goals?

A. Yes I have.

Q. Do you support the demand response goals proposed by PSCo, as presented by Mr. Shawn White in Table SMW-D-8?

A. I am concerned about the demand response goals proposed by PSCo, which lead to less peak demand reduction than is contained in the 2016 ERP. In particular, I am concerned about the significant reduction in DR capacity from the Saver's Switch program, which is projected to drop from 193 MW in 2019 to 159 MW in 2023.[109] This does not seem logical with the recent addition of smart thermostats to the Saver's Switch program. In addition, the

[109] Attachment HG-2k, PSCo Response to Discovery Request OCC 4-15.

implementation of AMI meters should increase the cost-effective, achievable DR potential. However, I do not have alternative DR goals to propose at this time. If there is an opportunity to do so, I may propose alternative goals at a later time.

X. Geo-targeting DSM

Q. Have you reviewed PSCo's DSM geo-targeting proposal?

A. Yes I have.

Q. Do you support the concept of geo-targeting as proposed by PSCo?

A. Yes, I agree that it makes sense to focus DSM efforts to some extent on constrained distribution feeders in order to postpone or eliminate the need for costly distribution system upgrades. However, I have some concerns with PSCo's specific geo-targeting proposal.

Q. What concerns do you have, and what modifications are you proposing to PSCo's geo-targeting proposal?

A. First, I have a concern with the proposal explained in Ms. Beaman's Direct Testimony indicating that the Company will offer to spend up to the full incremental benefit of avoided distribution capacity on the incremental level of DSM spending in order to achieve increased peak demand reduction on targeted distribution feeders.[110] If the Company spends the full incremental benefit of avoided distribution capacity, there would be no net benefit for the full utility system. In my view, there should be some benefit for the utility system; i.e., customers as a whole, from undertaking a DSM geo-targeting initiative. Therefore, I recommend that

[110] Beaman Direct, p. 30, ln. 9-13.

the cap on incremental spending be set at some value less than 100% of the incremental benefit of avoided distribution capacity, say at 75% of the incremental benefit.

Second, I have a concern that DSM geo-targeting is a new and still unproven concept within PSCo's service area. It is unknown at this time whether a geo-targeting effort would be successful in achieving enough peak demand reduction on a distribution feeder to defer or potentially avoid distribution system investments. Therefore, I recommend that the Commission approve DSM geo-targeting on a pilot basis in this proceeding, rather than approve an open-ended, potentially wide-scale use of DSM geo-targeting.

The pilot could be limited in terms of the annual budget for geo-targeting or the number of projects, with a project defined as a targeted initiative for a particular constrained area. In addition, the pilot could be limited in time. For the sake of specificity, I propose allowing PSCo to implement up to three geo-targeting projects during a three-year pilot period. Each project should be evaluated in terms of its incremental costs and benefits, considering the standard cost effectiveness tests. The results of these project evaluations should be provided to the Commission and interested stakeholders as part of ongoing DSM program reporting. Based on the results of the geo-targeting pilot, PSCo and the Commissions should consider expanding DSM geo-targeting in its next DSM Strategic Issues docket.

XI. <u>Commercial and Industrial Behavioral Savings</u>

Q. Have you reviewed PSCo's proposed methodology for claiming energy savings from behavioral actions taken by commercial and industrial customers?

A. Yes I have.

Q. Do you support the notion that PSCo should be able to claim energy savings from behavioral actions taken by commercial and industrial customers?

A. Yes, I support allowing PSCo to estimate and claim energy savings from C&I behavioral measures and operations and maintenance (O&M) improvements that result from future Strategic Energy Management (SEM) offerings. Most utilities refer to behavioral/O&M savings from SEM programs simply as O&M savings, so I refer to them as O&M savings going forward. As I explain below, numerous other utilities or third party energy efficiency program administrators are evaluating the energy savings provided by O&M measures in a rigorous manner.

Q. Do other utilities claim energy savings from behavioral/O&M actions taken by commercial and industrial customers as part of SEM programs?

A. Yes. Table HG-A-7 below provides a list of utilities and third party program administrators in North America with SEM programs that measure O&M savings using the top-down method proposed by PSCo; i.e., performing a regression analysis to measure overall facility savings and then subtracting out savings from hardware-based capital projects.

Table HG-A-7: Utility SEM Programs that Measure O&M Savings

Utility/Program Administrator	State	Brief Program Description and Incentives
AEP	OH	Continuous Energy Improvement; performance incentives of $0.02/kWh for O&M savings; SEM training and coaching provided through cohort approach
Bonneville Power Administration (BPA)	WA, OR, ID	High Performance Energy Management; performance incentives of $0.025/kWh for O&M savings; SEM training and coaching through cohort approach
Efficiency Vermont	VT	Continuous Energy Improvement; SEM training and coaching through cohort approach or individually
Energy Trust of Oregon	OR	Strategic Energy Management; performance incentives of $0.02/kWh and $0.20/therm for O&M savings; SEM training and coaching provided through cohort approach
Pacificorp/ Rocky Mountain Power	UT	Strategic Energy Management; performance incentives of $.02/kWh for O&M savings; SEM training and coaching through cohorts or individually
Puget Sound Energy	WA	Resource Conservation Manager; performance incentives of $.02/kWh and $.15/therm for O&M savings; SEM training and coaching provided individually
Southern Cal Edison – So Cal Gas	CA	Continuous Energy Improvement; SEM training and coaching individually or through cohorts

Source: Consortium for Energy Efficiency (CEE);[111] utility SEM program web sites.

Q. Can you briefly explain the justification for why these SEM programs are allowed to measure and claim savings from O&M measures using this top-down method?

A. Yes. These programs typically have well-qualified contractors, who train customers on ways to identify and implement no and low-cost energy-saving measures (O&M measures). These measures include adjusting settings on pump or compressed air systems, adjusting control settings on HVAC systems, finding and fixing compressed air system leaks, turning off

[111] *SEM Program Case Studies Report 2014*. Consortium for Energy Efficiency (CEE), Boston, MA. https://library.cee1.org/content/sem-program-case-studies-2014.

equipment when it is not in use, and cleaning or changing filters. In some cases an SEM program also provides incentives and training for the customer to install improved energy information and monitoring systems (hardware and software) to help customers find additional O&M savings.

Q. Does PSCo's EIS offering have these characteristics? Would the Company's future SEM offerings also have these characteristics?

A. Yes, the Company's EIS initiative (implemented within its EMS product) has all these characteristics, including well-qualified contractors that help customers find and implement O&M measures. It also includes helping customers install and use energy monitoring systems to find additional O&M savings over time. The EIS initiative provides this training and assistance to customers on an individual basis. Future SEM offerings would likely provide similar training and assistance to groups or cohorts of companies, involving well-qualified contractors to provide these services.

Q. Have some of the SEM programs shown above been evaluated? Can you briefly summarize the findings?

A. Yes, several of the programs listed in Table HG-A-7 have been evaluated. Four SEM program evaluations and their results are summarized in a recent report by Cadmus.[112] This report explains that although there are challenges to successfully measuring O&M savings for SEM programs, these can be overcome through coordination with SEM program contractors and use of experienced SEM evaluators. Since that report, an additional SEM

[112] Ochsner, H., et al, "Does SEM Achieve Verifiable Savings? A Summary of Evaluation Results." Cadmus. *2015 ACEEE Summer Study of Energy Efficiency in Industry Conference Proceedings*. http://aceee.org/files/proceedings/2015/data/index.htm.

program evaluation, for Efficiency Vermont's SEM program, has also been completed with positive results.[113]

Q. Do you support the methodology that PSCo has proposed for claiming energy savings from behavioral/O&M measures implemented by commercial and industrial customers, and do you have any recommendations for modifying this methodology?

A. For its EIS and SEM products, I support PSCo being able to measure the O&M savings as the Company has proposed—by measuring overall facility savings using a regression model ("top-down" approach) and subtracting savings from hardware-based capital projects. PSCO may also choose to subtract out savings from re-commissioning measures in order to count the re-commissioning measures' savings separately from other O&M savings, if for example re-commissioning is a separate DSM product.

The example provided in Mr. White's Direct Testimony implies a measure life of 10 years, which is too long for O&M measures in my opinion.[114] But I understand this is just an example. I understand that the Company will propose a specific measure life fr O&M measures in future DSM plan filings. Until then we understand the Company will assume a measure life of one year for the O&M measures, which is conservative but acceptable as a placeholder. The typical measure life for O&M measures in utility SEM programs is 3-6 years.[115]

[113] "Continuous Energy Improvement Pilot Evaluation," Cadmus, July 2016. http://publicservice.vermont.gov/sites/dps/files/VT%202015%20CEI%20Behavior%20Pilot%20Evaluation%20Summary.pdf.
[114] White Direct at p. 73.
[115] *2016 Industrial SEM Program Summary*. Consortium for Energy Efficiency (CEE). Boston, MA. https://library.cee1.org/sites/default/files/library/13001/CEE_2016_Industrial_SEM_Program_Summary_Public.pdf.

XII. Natural Gas DSM Policy

Q. What is PSCo proposing with respect to natural gas DSM policy in this proceeding?

A. As explained by Mr. Brockett, PSCo is proposing to continue the policy of establishing natural gas DSM budgets and energy savings targets in DSM plan proceedings.[116] He notes that relatively low natural gas prices are making it difficult for the Company to identify and implement cost-effective natural gas energy efficiency programs.

Q. How has PSCo been performing with respect to its natural gas DSM programs?

A. In 2016, PSCo's gas DSM programs saved 614,558 Dekatherms (Dth) of gas per year, slightly under the Company's goal of saving 615,040 Dth per year.[117] The gas DSM programs had an overall benefit-cost ratio of 1.61 under the modified TRC test, with PSCo spending about $14.4 million on the programs.

But in 2017, PSCo was only at 53% of its annual gas savings target through the first three quarters of the year and indicated it expected to fall short of meeting its annual gas savings target of saving 636,078 Dth per year.[118] Gas DSM spending was only at $8.0 million through the first three quarters of 2017.

Q. Is there a public interest in having PSCo implement well-funded and effective natural gas energy efficiency programs?

A. Yes. Investments in new homes and commercial buildings, and long-lived equipment such as space heating systems, will remain in place for decades or longer. There is a societal interest in helping to make these investments as energy-efficient as possible, interests such as reducing pollutant emissions, conserving finite fossil fuel resources, and limiting

[116] Brockett Direct, pp. 73-74.
[117] *Demand-Side Management Annual Status Report 2016.* PSCo. pp. 18-21.
[118] See Q3-2017 Colorado DSM Roundtable presentation. PSCo. Nov. 13, 2017. https://www.xcelenergy.com/company/rates_and_regulations/filings/colorado_demand-side_management.

vulnerability to potential future price spikes. In addition, federal funding for weatherization of homes occupied by low-income families has been cut in recent years, meaning there is a need for PSCo and other utilities to step up their funding of low-income home weatherization. Also, gas DSM programs can result in substantial non-energy benefits to program participants, non-energy benefits that have greater value than is now taken into account in the cost-benefit analysis through the non-energy benefits adder.[119]

Q. What level of natural gas DSM spending is taking place and savings is being achieved by leading gas utilities in the region?

A. Questar Gas Company (recently purchased by Dominion Energy), the sole investor-owned gas utility in Utah, has been implementing well-funded, comprehensive gas DSM programs since 2007. In 2016, Questar/Dominion spent about $23 million on its gas DSM programs for residential and commercial customers in Utah and the company expects to spend approximately the same amount in 2017. In 2016, Questar/Dominion Gas helped its customers save about 901,000 Dth per year compared to 614,500 Dth per year saved by PSCo.[120] Questar/Dominion Gas is also significantly smaller than PSCo in terms of number of customers and gas sales. Questar/Dominion Gas serves about 900,000 eligible residential and commercial customers in its gas DSM programs compared to about 1.37 million eligible gas customers served by PSCo.

[119] L. Skumatz. "Non-Energy Benefits/NEBs – Winning at Cost-Effectiveness Dominos: State Progress and TRMs." *Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings*. ACEEE. 2016. http://aceee.org/files/proceedings/2016/data/index.htm. Also, T. Woolf, et. al. 2012. *Energy Efficiency Cost-Effectiveness Screening*. Synapse Energy Economics, Inc. and the Regulatory Assistance Project. http://www.raponline.org/document/download/id/6149.

[120] H. Geller. "Update on Utility Energy Efficiency Policies and Programs in the Southwest." Presentation at the 2017 SWEEP Regional Workshop. Tempe, AZ, Nov. 30, 2017. http://www.swenergy.org/Data/Sites/1/media/events/regional-workshops/2017/presentations/01-Geller.pdf.

Q. What specific recommendations do you have regarding PSCo's natural gas DSM programs?

A. Given the considerations discussed above, I recommend that the Commission direct PSCo to increase customer participation and cost-effective energy savings achieved by gas DSM programs. Increasing participation will enhance the equity of the programs among customers by reducing the number of non-participants. Increasing cost-effective energy savings will help customers lower their energy bills and will provide greater net cost savings for customers as a whole. If necessary, PSCo should increase incentive levels and expand program offerings in order to meet and if possible surpass its gas DSM savings targets. In addition, I recommend that the Commission direct PSCo to consider increasing its gas DSM budget starting in 2019 in order to achieve these objectives.

Low-income gas DSM programs are of particular interest given the high energy cost burden faced by low-income households.[121] In 2016, PSCo spent $3.77 million on its low-income gas program thereby helping low-income households reduce their natural gas use by 83,833 Dth per year. The low-income program had a benefit-cost ratio of 1.39 under the modified TRC test in 2016.[122] In the first three quarters of 2017, PSCo spent only $1.52 million on the low-income gas DSM program. In contrast, expenditures on the low-income natural gas DSM program were in the range of $4-5 million per year in 2010, 2011 and 2013.

Given the important energy and non-energy benefits of the low-income natural DSM program, I recommend that the Commission direct PSCo to increase its expenditures on the

[121] A. Drehobl and L. Ross. *Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities.* Washington, DC: ACEEE. April 2016. http://aceee.org/sites/default/files/publications/researchreports/u1602.pdf.
[122] *Demand-Side Management Annual Status Report 2016.* PSCo. p. 20.

gas low-income program starting in 2019 as long as this can be done while maintaining a cost-effective program. In particular, I recommend the Commission direct PSCo to increase the budget for the gas low-income program to at least $5 million per year assuming the program remains cost effective.

XIII. Non-Energy Benefits

Q. What is the history of Commission policy on non-energy benefits (NEBs) adders that are used in the benefit-cost analysis of PSCo's DSM programs?

A. Dating back to the original set of DSM policies adopted by the Commission in 2008, PSCo has been authorized to include a value for NEBs in its benefit-cost analysis of DSM programs using the modified TRC test. The initial values adopted in Proceeding No. 7A-420E were a 10% adder for electric DSM programs other than low-income programs, a 5% adder for gas DSM programs other than low-income programs and a 20% adder for low-income programs, with separate consideration of avoided customer O&M costs. The adders are applied to utility system benefits. In Proceeding No. 10A-554EG, the adder for low-income *programs* was increased to 25%. The adders were not changed in the last DSM Strategic Issues docket, Proceeding No. 13A-0686EG. In addition, PSCo has not proposed changing the NEBs adder values in its filing in this proceeding.

Q. How large have the NEBs adders been since they started to be used in 2009?

A. Table HG-A-8 shows the actual NEBs adders determined each year since 2009 for electric DSM programs, along with the projected NEBs adders for 2017 and 2018 based on PSCo's approved 2017/18 DSM plan. The actual values are taken from PSCo's DSM Annual Status Reports.

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Table HG-A-8: NEBs Adder Values for Electric DSM Programs

NEBs Value (million $)									
2009	**20010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017 (est.)**	**2018 (est.)**
27.4	30.0	28.8	30.8	29.4	25.3	25.8	26.9	18.5	18.5

Source: PSCo DSM Annual Status Reports for 2009-16; PSCo 2017/18 DSM Plan Electric and Gas

Table HG-A-8 shows that the NEBs values were in the range of $25-31 million per year during 2009-16. However, they are projected to drop to $18.5 million in 2017 and 2018. The decline is due to the drop in utility avoided costs, not because less energy savings or peak demand reduction is projected in 2017 and 2018. The NEBs values are likely to decline even further during 2019-23 given that PSCo is projecting that avoided energy costs will continue to drop,[123] unless the NEBs adder percentages are adjusted.

Q. What factors are included in NEBs and what are some estimates of the value of these factors?

A. NEBs include benefits such as improved public health due to reduced air pollutant emissions, increased worker productivity from better quality lighting, HVAC improvements or better industrial process control, increased comfort in energy-efficient homes, increased property values after energy efficiency upgrades, and reduced utility bill arrearages and service disconnects/reconnects in low-income households after home weatherization. As discussed in Section III above, the public health benefits from reduced air pollutant emissions alone are worth on the order of $75 million at the level of energy savings PSCo achieved in 2016 (value of the benefits over the lifetime of energy efficiency measures installed in 2016).

[123] Wishart Direct, p. 32, ln. 2-3.

One literature review provided the typical values for NEBs from studies of the individual NEBs associated with home weatherization and other home retrofit programs. The review found that the typical utility system NEBs adder was 24%, the typical societal NEBs adder was 55%, and the typical participant NEBs adder was 144%.[124] These values are much greater than the NEBs adder values adopted by the Commission for PSCo.

Q. Is it reasonable for the NEBs adder values to decline significantly starting in 2017, and even further starting in 2019?

A. No it is not. As long as the total amount of energy savings doesn't change, the NEBs should not change. It is not reasonable for the valuation of the NEBs to significantly decline simply because utility system avoided costs are falling.

Q. Do you have a recommendation for how the Commission should address this issue?

A. Yes. In order to maintain total NEBs values at the level in recent years for a given level of energy savings; i.e., a total NEBs value of around $25 million for 400 GWh of energy savings, I recommend increasing the NEBs adder percentages in a period of lower utility system avoided costs. In particular, I recommend the Commission adopt NEBs adders of 20% for electric DSM programs other than low-income programs, 10% for gas DSM programs other than low-income programs and 50% for low-income programs starting in 2019. Avoided customer O&M costs should continue to be considered separately. The percentages I propose are twice the current levels but are still conservative given the public health benefits of reduced air pollutant emissions and studies of actual NEBs values such as

[124] L. Skumatz. "Non-Energy Benefits/NEBs – Winning at Cost-Effectiveness Dominos: State Progress and TRMs." *Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings*. ACEEE. 2016. http://aceee.org/files/proceedings/2016/data/index.htm.

the one cited above. These new NEBs percentages should continue to be used until they are reviewed again and potentially modified in the next DSM Strategic Issues docket.

XIV. Other Issues

Q. Are there other DSM policy-related issues raised by PSCo that you would like to comment on?

A. Yes. First, I would like to support the Company's proposal regarding secondary site savings.[125] These are legitimate energy savings and/or peak demand reduction. Any secondary site energy savings or peak demand reduction that is claimed should be subject to the same monitoring and evaluation rigor as is used to determine primary energy savings.

Second, I would like to support the Company's proposal regarding use of vendor incentives.[126] PSCo has demonstrated that upstream or midstream incentives can be a very effective DSM strategy, and it is reasonable to assume that a portion of the vendor incentive is passed through to customers. PSCo has proposed determining the percentage of the vendor incentive that is passed through to customers as part of its regular DSM product evaluation process. This is appropriate. In addition, I recommend that the Commission allow PSCo to assume values for the percentage of the vendor incentive that is passed through to customers in its DSM plan assumptions, product by product, based on the best information available at the time a DSM plan is developed.

Q. Are there other DSM policy-related issues that you would like to comment on?

[125] White Direct, p. 68, line 9 – p. 70, line 14.
[126] Beaman Direct, p. 51, line 8 – p. 53, line 7.

A. Yes. I would like to comment on the issue of collaboration between PSCo and either local governments or the state of Colorado on energy efficiency initiatives. Local governments and the state are increasingly adopting energy efficiency initiatives to help meet their clean energy and climate action goals. For example, Denver recently adopted commercial building energy performance benchmarking and disclosure requirements, and is also considering adopting building retrofit requirements as part of its Energize Denver initiative.[127] In addition, Denver recently adopted a Green Roof policy through a ballot initiative. Likewise, the state has adopted policies such as a commercial building PACE financing policy to advance more efficient energy use, and at times provides grants or technical assistance in targeted areas such as for schools or agricultural facilities.

PSCo has an opportunity to partner with and support these local and state efforts, thereby increasing the energy savings and peak demand reduction it achieves through its DSM programs. I recommend that the Commission encourage PSCo to support these state and local energy efficiency initiatives through its DSM programs. In particular, I recommend that the Commission allow PSCo to provide financial incentives as well as count the energy savings and peak demand reduction that is achieved towards its DSM goals, when it participates in the implementation of energy efficiency policies adopted at the local or state level. This should include providing financial incentives to help customers comply early with any energy efficiency mandates adopted at the state or local level, or to comply through an energy efficiency path when there are multiple paths to compliance with a clean energy mandate. For example, if Denver's Green Roofs requirement is modified to allow an energy

[127]Commercial and Multifamily Building Benchmarking Ordinance, City and County of Denver. 2017. https://www.denvergov.org/content/denvergov/en/environmental-health/environmental-quality/Energize-Denver/CommercialMultifamilyBuildingBenchmarking.html.

efficiency path to compliance (as well as Green Roofs and solar energy paths), PSCo should be allowed to provide financial support to and claim energy savings credits from customers that choose the energy efficiency path. A Commission policy on these matters will help to avoid uncertainty and controversy in the future, and is appropriate in a DSM Strategic Issues docket.

XV. Summary and Recommendations

Q. Please summarize your testimony and your recommendations.

1) PSCo has exceeded the electric energy savings goals established by the Commission for 2009-2016 at a cost that in most years was below the Company's approved DSM budget. PSCo's electric DSM programs have been cost-effective by a wide margin with 2009-16 programs providing total net economic benefits for customers of $1.26 billion according to PSCo's own estimates.
2) The Company was able to achieve energy savings that were much higher than the goals it proposed in previous Strategic Issues dockets, in response to the Commission setting higher goals than those proposed by the Company. PSCo was able to exceed the electric energy savings goals established by the Commission at a utility cost per unit of energy savings far below what it claimed would be the case in the previous Strategic Issues dockets. PSCo has consistently underestimated the electric energy savings that it has been able to achieve and overestimated the cost for achieving energy savings.
3) Policies recently adopted by the Colorado legislature, by Colorado Governor Hickenlooper, by cities such as Denver, and by the Commission in related dockets

suggest that PSCo's goals should be set at levels that maximize cost-effective, achievable energy savings.

4) Regarding the evolving DSM landscape, PSCo has raised issues that are not consistent with factual information including: a) the degree to which wind curtailment is an issue constraining energy efficiency; b) the degree to which the previous energy savings goals have led to less cost-effective energy efficiency programs; c) the contention that by increasing rates, energy efficiency programs do not save consumers and the utility money; d) the need to refocus energy efficiency programs on peak demand reduction; and e) characterization of energy efficiency goals as binding.

5) Market transformation needs to be considered carefully. For LED lighting, market transformation is just getting underway following on the previous partial transformation to more efficient fluorescent lighting. Thus, market transformation can be a multi-stage process occurring over decades. PSCo's energy efficiency programs as a whole are experiencing relatively low free ridership and are having a high market impact.

6) PSCo is implementing relatively few DSM products that are not cost effective. As PSCo notes, there are some good reasons to include non-cost-effective products or measures in the Company's DSM portfolio. I recommend the Commission reaffirm its policy that cost effectiveness screening apply at the program level, and not the product or measure level.

7) The DSM Market Potential Study prepared for this docket suffers from many of the same weaknesses as previous market potential studies. It excludes a number of available energy efficiency options including products that PSCo is successfully implementing in its current DSM plan, and is overly conservative about the savings potential from other measures such as more efficient lighting in the commercial and industrial sectors. In

addition, the Market Potential Study projects unrealistically high costs for achieving limited energy savings. The DSM Market Potential Study should not be used as the basis for establishing future energy savings goals without adjustments.

8) The DSM shareholder incentive structure gives the Company an incentive to urge the Commission to set relatively low energy savings goals. In other words, it is easier for the Company to meet and surpass the goals and thus receive an incentive if the goals are set at relatively low levels.

9) I recommend that the Commission establish energy savings goals of 500 GWh per year for PSCo's electric energy efficiency programs during 2019-23. These goals are based on adjustments to PSCo's Market Potential Study including adding savings from cost-effective products now implemented by PSCo but left out of the Achievable Potential Scenario in the study and increasing savings in areas such as C&I lighting where the study is overly conservative. In addition, I assume that the achievable savings from emerging technologies increases over time, which is more realistic than assuming constant saving from emerging technologies during 2019-23. The energy savings goals I propose are equivalent to 1.54-1.62% of projected electricity generation during 2019-23, which in percentage terms is less than the energy savings goals or requirements adopted by leading states.

10) Compared to the energy savings goals proposed by PSCo, the goals I propose would result in: a) greater participation by customers thereby enhancing the equity of PSCo's DSM programs, b) greater economic benefits for customers, and c) greater reduction in air pollutant and greenhouse gas emissions thereby enhancing public health and helping local jurisdictions and the state meet their climate action goals.

11) Consistent with the energy savings goals, I propose increasing the goals for peak demand reduction from energy efficiency programs to 90 MW per year. Higher peak reduction goals compared to those proposed by PSCo would help reduce the resource shortfall that PSCo is projecting in 2022 and 2023.

12) The goals I propose should motivate PSCo to pursue increased adoption of "smart" technologies such as internet-connected air conditioners, water heaters, lighting or appliances, and WiFi-enabled smart thermostats, thereby enhancing demand response potential and providing PSCo with greater ability to manage demand in ways that support integration of an increasing amount of intermittent renewable energy sources in the electric system.

13) The energy savings goals I propose along with the projected energy savings from PSCO's IVVO initiative would enable PSCo to comply with the 2% electric energy savings target issued by Governor Hickenlooper.

14) In conjunction with the energy savings goals I propose, I recommend that the Commission approve an annual energy efficiency program budget of $90 million but also allow 10% budget flexibility, meaning PSCo could spend up to $99 million on energy efficiency programs without having to seek additional approval from the Commission.

15) I recommend that the Commission allow PSCo to receive a disincentive offset based on the actual lost fixed cost recovery from large C&I customers after program implementation each year. This disincentive offset should be collected from large C&I customers only, not all customers.

16) I recommend that the Commission reject the performance incentive Scorecard approach proposed by PSCo. This approach for determining the performance incentive is more

complicated than past approaches and it would make DSM Plan dockets more contentious. It is a "solution in search of a problem." PSCo has been performing well on the four metrics proposed for the Scorecard (other than first year energy savings) - lifetime energy savings, peak reduction from energy efficiency programs, cost effectiveness under the Utility Cost test, and the net economic benefits provided by electric programs for low-income households. There is no need for customers to pay incentives to the Company for good performance in these areas.

17) I recommend that the Commission adopt a shareholder incentive mechanism similar to those successfully used in the past - allowing the Company to receive a small percentage of the net economic benefits provided by its energy efficiency programs based on energy savings achieved relative to the energy savings goals. The percentage would increase to a maximum of 15% of net economic benefits under my proposal. I propose starting the incentive at 80% of the goal with the more challenging energy savings goals that I propose, but at 100% of the goal if the Commission approves the weaker energy savings goals proposed by PSCo.

18) I support providing the Company a performance incentive for its Demand Response programs, but not the specific incentive mechanism proposed by PSCo. I recommend that the Commission allow the Company to receive an incentive equal to 10% of the net economic benefits of its DR programs each year. This approach incentivizes PSCo to maximize the "DR bang per buck", not just the total amount of DR capacity it achieves.

19) I recommend that the Commission approve DSM geo-targeting on a pilot basis in this proceeding, rather than approve an open-ended, potentially wide-scale use of DSM geo-targeting. In particular, I propose allowing PSCo to implement up to three geo-targeting

projects during a three-year pilot period. Each project should be evaluated in terms of its incremental costs and benefits, considering the standard cost effectiveness tests.

20) I support allowing PSCO to estimate and claim energy savings from C&I behavioral measures and operations and maintenance (O&M) improvements that result from future Strategic Energy Management (SEM) offerings. I also support PSCo measuring the O&M energy savings as the Company has proposed - by measuring overall facility savings using a regression model and subtracting savings from hardware-based capital projects.

21) I recommend that the Commission direct PSCo to increase customer participation and cost-effective energy savings achieved by gas DSM programs. In addition, I recommend that the Commission direct PSCo to consider increasing its gas DSM budget starting in 2019 in order to achieve these objectives. Given the important energy and non-energy benefits of the low-income natural DSM program, I recommend that the Commission direct PSCo to increase the budget for the gas low-income program to at least $5 million per year as long as this can be done cost effectively.

22) In order to maintain a total value for non-energy benefits (NEBs) near the level in recent years (for a given level of energy savings), I recommend increasing the NEBs adder percentages during a period of lower utility system avoided costs. In particular, I recommend that the Commission adopt NEBs adders of 20% for electric DSM programs other than low-income programs, 10% for gas DSM programs other than low-income programs and 50% for low-income programs starting in 2019. The percentages I propose are twice the current levels but are still conservative given estimates of the public health benefits from reduced air pollutant emissions as well as studies of actual NEBs values.

23) I recommend that the Commission support the Company's proposals regarding secondary site savings and treatment of vendor incentives.

24) I recommend that the Commission encourage PSCo to support state and local energy efficiency initiatives through its DSM programs. In particular, I recommend that the Commission allow PSCo to provide financial incentives as well as count the energy savings and peak demand reductions that are achieved towards its DSM goals, when it participates in the implementation of energy efficiency policies adopted at the local or state level.

Q. Does this conclude your testimony?

A. Yes.

CERTIFICATE OF SERVICE

I, Kirsten Frysinger, hereby certify that on this 5th day of December, 2017, I served a true and correct copy of the ANSWER TESTIMONY OF HOWARD GELLER on behalf of SWEEP in Proceeding No. 17A-0462EG upon each of the persons appearing below either through the E-Filing system or by other means in accordance with applicable law.

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/s/ Kristen Fryzek