An Analysis of the Impact Tiered-Rate Pricing Structures for Electric Utilities have on Coloradans Living with Disabilities and Chronic Disease

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Abstract

This policy memorandum identifies and analyzes data specific to dynamic electric utility pricing and its impact on Coloradans living with disabilities and chronic disease. It specifically addresses the market's inability to distinguish between discretionary and non-discretionary uses of energy. Research has provided various solutions to addressing this policy issue. This policy memorandum is further substantiated through the presentation of a thorough cost-benefit analysis.
Acknowledgements

I would like to take this opportunity to thank the supporting staff at the University of Denver. The realm of public policy is an arduous one, consisting of a multitude of complex buckets, for which our wonky feet cannot resist a one of. I would like to acknowledge my brother, Corey Nett, who without, I would not know what passion and determination looked like.

I would also like to applaud Energy Outreach Colorado for their continued efforts in furthering the discussion and collection of data regarding Coloradans living with disabilities and chronic disease.

Lastly, I would like to acknowledge the Senators and Representatives of Colorado, who moved SB11-087 quickly and decisively through the legislature. Special mention should be made of Senator Betty Boyd, Representatives Rhonda Fields and Don Beezley, Governor Hickenlooper, Xcel Energy’s programs and government staff, and former Chairperson of the Colorado PUC, Ron Binz.
# Table of Contents

Chapter One: Problem Definition ........................................................................................................ 1  
  Disabilities and Chronic Disease in Colorado  
  Tiered-rate Pricing  
  What other States are Doing  
  History of Public Utilities Commission in America  

Chapter Two: Methods ...................................................................................................................... 12  
  Peer-reviewed Journals  
  Interviews  
  NGO's, Think Tanks and GO's  

Chapter Three: Proposed Solutions .................................................................................................. 14  
  Status Quo  
  Medical Exemption  
  Additional Funding for Energy Outreach Colorado  
  Politics and Tiered-rate Structures  

Chapter Four: Issue Analysis .............................................................................................................. 22  
  Economic Analysis  
  Market Specific Issues for Xcel Energy  
  Philosophical Analysis  
  Sensitivity Analysis  
  Unintended Consequences  

Chapter Five: Strategic Recommendations ......................................................................................... 29  
  Recommendation  

Chapter Six: Weaknesses and Limitations ......................................................................................... 30  

Chapter Seven: Cost-Benefit Analysis ............................................................................................... 32  

Works Consulted ............................................................................................................................... 34  

Appendix A ....................................................................................................................................... 36  
  List of Interviewees  

Appendix B ....................................................................................................................................... 37  
  Cost Benefit Analysis & Sensitivity Analysis Table Combined  

Appendix C ....................................................................................................................................... 38  
  Sample: Xcel Energy Residential Bill
Chapter One: Problem Definition

Chapter one defines tiered-rate pricing and identifies the market’s inability to
differentiate between consumers discretionary and non-discretionary demand for energy. Energy
is consumed for a number of reasons; however, many Coloradans depend on specific amounts of
energy out of necessity rather than choice. This chapter will further discuss the evidence
supporting the position that certain disabilities and chronic diseases mandate that consumers use
more energy.

Problem Definition

According to Xcel Energy, “customers that use more energy, will pay more” under the
new dynamic pricing structure. The public policy issue that this presents, however, is that for
medical reasons, many Coloradans cannot reduce their energy use. It is for this very reason that
target-pricing mechanisms fail to produce intended results for Coloradans living with disabilities
and chronic disease. This cohort presents alternate electric energy elasticity’s, as such, “all the
more remarkably, there are no differences in air conditioning use between those who can most
afford it and those who can least afford it...keeping cool is a very high priority for people with
MS, irrespective of their capacity to pay.” This policy analysis aims to provide research which
would indicate the need for a solution, recommend the most beneficial option and present the data
to support such a recommendation.

2 Summers, Dr. Michael and Dr. Rex Simmons. Keeping Cool Survey: Air Conditioner
Use by Australians with MS: Public Policy Related Results & Recommendations. MS Australia 2009.
Disability and Chronic Disease in Colorado

Disability and Chronic Disease are not easily quantifiable cohorts. They are not mutually exclusive; there is a high degree of overlap and many persons with multiple disabilities. Policy option number three, discussed in the ‘analysis’ section, details what other states have used to define the two cohorts in terms of benefit recipients. It includes any and all disabilities and chronic disease which commonly have heat sensitivity or intolerance as a side effect. Most common under this qualifier are Multiple Sclerosis, Lupus, Epilepsy, Cerebral Palsy, and others which qualify due to a pharmaceutical side-effect. Another qualifier includes devices use to treat or lessen the symptoms of one’s disability or chronic disease. Examples include the use of a CPAP, or sleep apnea, machine, an oxygen machine, or a nebulizer.

Coloradans living with disabilities and chronic disease have, on average, a lower weekly income than the national average.

Weekly Income\(^3\) of Coloradans living w. disabilities and chronic disease

\(^3\) Data Set. Institute for Community Inclusion. 
http://www.statedata.info/charts/comparison_1.php
Furthermore, 15% of Coloradans who are physically disabled and working still live below the federal poverty line, compared to the 7% of Coloradans who are not disabled, are working, and also live below the federal poverty line\(^4\).

The state of Colorado is home to a leading non-profit agency that offers funds to those in need; both for low-income individuals and those living with disabilities and chronic disease. Energy Outreach Colorado has been in business since 1989 and has “raised more than $136 million to help Colorado’s neediest families”\(^5\). In 2009-2010, Energy Outreach Colorado [EOC] received 14,510 applications for energy assistance. Of those applications, 13,846 were approved, 26% of which were for households with one or more disabled persons living there\(^6\). To qualify for EOC funds, one must submit to means testing, which often include not only income but assets as well. As the population of persons living with disabilities comprises 17% of the Colorado population,\(^7\)

\(^4\) Data Set. Institute for Community Inclusion. [http://www.statedata.info/charts/comparison_1.php](http://www.statedata.info/charts/comparison_1.php)

\(^5\) [http://www.energyoutreach.org/](http://www.energyoutreach.org/)

populace, yet 26% of households with one or more disabled persons are garnering approval for energy assistance, the unparallel relationship indicates an income/workforce disparity.

<table>
<thead>
<tr>
<th>Disability status and age</th>
<th>Total</th>
<th>Usually Work Full Time</th>
<th>Usually Work Part Time</th>
<th>At Work Part Time For Economic Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons with a disability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Years and Over</td>
<td>5,174</td>
<td>3,502</td>
<td>1,672</td>
<td>425</td>
</tr>
<tr>
<td>16-64 Years</td>
<td>4,406</td>
<td>3,134</td>
<td>1,271</td>
<td>394</td>
</tr>
<tr>
<td>64 and over</td>
<td>768</td>
<td>368</td>
<td>401</td>
<td>31</td>
</tr>
<tr>
<td>Persons without a disability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Years and Over</td>
<td>134,703</td>
<td>109,132</td>
<td>25,572</td>
<td>8,488</td>
</tr>
<tr>
<td>16-64 Years</td>
<td>129,358</td>
<td>106,021</td>
<td>23,337</td>
<td>8,278</td>
</tr>
<tr>
<td>64 and Over</td>
<td>5,345</td>
<td>3,111</td>
<td>2,234</td>
<td>210</td>
</tr>
</tbody>
</table>

*numbers in thousands*  
August 25, 2010  
United States Department of Labor -- Bureau of Labor and Statistics

The table above further highlights the workforce disparity prevalent in the U.S., from labor and statistics data of 2010. The Current Population Survey [CPS] added disability status as a demographic identifier for the first time in 2008. According to the 2009 survey, "the unemployment rate of persons with a disability was 14.5%, higher than the rate for those with no disability, which was 9%". What this statistic fails to take into account is the 'not in the labor force' population, of which "those with a disability – about eight in ten – were not in the labor

---

force in 2009, compared with three in ten of those with no disability. Furthermore, according to the American Community Survey [ACS], which is based on a sample of 178,495 persons in the U.S., 21.8% of Coloradans who are disabled live below the Federal Poverty Line (FPL). Having established that this population is in fact a vulnerable population, Coloradans living with disabilities and chronic disease may prove to be more negatively impacted by tiered-rates that those Coloradans living with no limitations. Those, who for medical reasons have a higher demand for energy, will ultimately be charged at a higher rate for energy that their quality of life depends upon.

Tiered-Rate Pricing

“A rate structure where the unit price of a kWh increases once consumption reaches a set threshold. This type of "increasing tier rate" is most often found where the utility desires to send a strong conservation message to its customer base."  

Tiered-rate pricing for electric utilities was first implemented in the state of Colorado in the summer of 2010. The Public Utilities Commission [PUC] had ruled that Xcel Energy could implement tiered-rate pricing to target consumer behavior via pricing mechanisms during the fall of 2009. The specific structure is outlined here:

- A tiered-rate price would be implemented during the summer months (June-September).

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8 [Ibid]
- Each kWh under the 500 kWh threshold would be roughly $0.09 whereas each kWh over the 500 kWh threshold would cost the consumer roughly $0.14.

- This pricing mechanism applies to residential customers of Xcel Energy who live in Colorado.

- There are currently no exemptions from this pricing mechanism.

- This pricing structure has been reported by both Xcel Energy and the PUC to be revenue-neutral\textsuperscript{11}.

\begin{center}
\textbf{New Summer Tiered Rates}
\textit{June - September}
\end{center}

\begin{center}
\begin{tikzpicture}
\begin{axis}[
    width=\textwidth,
    height=0.5\textwidth,
    axis x line=bottom,
    axis y line=left,
    xlabel=Kilowatt Hours per Month,
    ylabel=Price per kWh,
    xtick={500,1000,1500},
    ytick={14,10.3,9.7},
    yticklabels={14.0\textcent,10.3\textcent,9.7\textcent},
    xticklabels={500,1000,1500},
    legend style={at={(0.5,0.97)},anchor=north west},
]
\addplot [dotted, line width=1.0pt] coordinates {(500,14.0) (1500,14.0)};
\addplot [solid, line width=1.0pt] coordinates {(500,10.3) (1500,10.3)};
\addplot [solid, line width=1.0pt] coordinates {(500,9.7) (1500,9.7)};
\end{axis}
\end{tikzpicture}
\end{center}

\textsuperscript{11} Revenue Neutral: \textit{a policy which has no effect on overall revenue}
[http://www.economics-dictionary.com/definition/revenue-neutral-policy.html]

\textsuperscript{12} http://www.dora.state.co.us/puc/tiered_rates/Summer_Rates.html

nett 6
Tiered rate pricing is used to balance costs, equity and input conservation incentives\textsuperscript{13}. The 2010 seasonal tiered-rate alterations apply only to residential, not commercial or industrial (see below\textsuperscript{14}).

This analysis will focus specifically on electric utilities; however, it is important to note that shadow markets do exist. For instance, dynamic pricing mechanisms have traditionally been used in the public water arena “not only to conserve water but to reduce the amount of capital investment needed to provide peak load service to large volume users\textsuperscript{15}.”

\textsuperscript{14} \url{http://www.co.larimer.co.us/compass/electricity_env_use.htm}. April, 2011.
Whether or not the practice of switching to a tiered-rate structure actually increases conservation, is still a topic for debate. For example, John Cross wrote that “they [PUC’s] argue that price regulation might well encourage firms to expand into uneconomic markets because the increase in capital investment, which is required for expansion, could then be used to justify an increase in profits. This is only one way in which a regulated industry may waste its resources.” In the primary market of electric public utilities, intentional waste is utilized as a profit-increasing mechanism. It may seem counter-intuitive that a service provider could gain from wasting their own product, less a subsidy be provided. Harvey Averch and Leland Johnson were two economists who wrote almost exclusively on public utility regulation in the early 1960’s, and they often referred to the increase in profits through the intentional increase in waste.

Coloradans living with disabilities and chronic disease may be negatively impacted by tiered-rate pricing for electric utilities. This suggestion was made once tiered-rate pricing went into effect in Colorado in June 2010. Anecdotal data began surfacing in the Denver health advocacy community suggesting that electric utility customers, for financial reasons, cut back on prescription medications and food purchases so they could afford their electric payment. Consumer actions like this can create financial, economic, medical, and social problems.

An instance of this problem can be seen in an example offered by the Epilepsy Foundation of Colorado. A mother of a young girl contacted the foundation out of concern regarding her increased electric bill over the summer. Her bill had gone from approximately $400 per month to over $1,000 for the month of July, 2010. She could not cut back on their use of electric due to her daughter’s inability to regulate her body temperature; a side-effect of

medications taken to treat the symptoms of epilepsy. Should this constituent attempt to reduce their residential demand for electric, it would be at a substantial risk to her child’s health. To further accentuate the depth of this market ineffectiveness, many children who are inflicted with epilepsy are enrolled in the Colorado SCHIP+ program, which is funded by the state. Should this constituent demand less energy to save money and cause a health situation for her child, the Colorado community would be paying a much higher price in medical bills than what would have presented itself in the utility bill.

For medical reasons, this consumer could not curb their air conditioning use. This is one example of how inelastic demand for electric is for the disabled population living in Colorado. The same rings true for Coloradans living with Multiple Sclerosis, those on CPAP, life-support, and oxygen machines. Another constituent group impacted by this problem are Coloradans living with mental health issues, including veterans of war. Heat sensitivity is both a symptom of MS as well as a side-effect of psychotropic drugs, often prescribed for mental health issues like Post-Traumatic Stress Disorder.

Having defined and discussed tiered-rate pricing and having presented data supporting the vulnerability of this population, the inability of electric utility providers to decipher between discretionary and non-discretionary consumption of energy should be identified as a problem. The anecdotal data further substantiates the claim that the inability to recognize the two distinct groups could lead to a greater cost placed on society, where the private cost to ameliorate the situation may be negligible.

**What Other States are Doing**

Many states currently use some form of tiered-rate pricing for electric utilities including; California, Colorado, New York, Georgia, Nebraska, Alabama, and Maryland. Much of the data used to determine individuals who would qualify for a medical exemption or for EOC funds has
been modeled from what other state have done. The most significant finding from researching other states has been that Colorado seems to be the only state that uses tiered rates but has no medical exemption or specific funding mechanism for medical necessity.

<table>
<thead>
<tr>
<th>State</th>
<th>Population</th>
<th>Number of People age 16-64 Living with a Disability</th>
<th>Avg. kWh use per month</th>
<th>Avg. kWh cost</th>
<th>Percent of Population Living with a Disability</th>
<th>Number of tiers / Company</th>
<th>Price per kWh highest tier</th>
<th>Price per kWh lowest tier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>5,029,196</td>
<td>263,655</td>
<td>710</td>
<td>$0.1054</td>
<td>5.2%</td>
<td>2 Excel Energy</td>
<td>$0.141</td>
<td>$0.082</td>
</tr>
<tr>
<td>California</td>
<td>37,253,956</td>
<td>1,898,118</td>
<td>580</td>
<td>$0.1456</td>
<td>5.1%</td>
<td>5 PG&amp;E</td>
<td>$0.403</td>
<td>$0.122</td>
</tr>
<tr>
<td>New York</td>
<td>19,378,102</td>
<td>1,109,513</td>
<td>604</td>
<td>$0.1819</td>
<td>5.7%</td>
<td>3 Niagara Mohawk Power Corporation</td>
<td>$0.194</td>
<td>$0.209</td>
</tr>
<tr>
<td>Georgia</td>
<td>9,687,653</td>
<td>632,084</td>
<td>1,171</td>
<td>$0.1014</td>
<td>6.5%</td>
<td>3 Georgia Power</td>
<td>$0.07</td>
<td>$0.03</td>
</tr>
<tr>
<td>Nebraska</td>
<td>1,826,341</td>
<td>98,624</td>
<td>1,028</td>
<td>$0.0961</td>
<td>5.4%</td>
<td>3 Nebraska Public Power</td>
<td>$0.09</td>
<td>$0.05</td>
</tr>
<tr>
<td>Alabama</td>
<td>4,779,736</td>
<td>433,364</td>
<td>1,305</td>
<td>$0.1166</td>
<td>9.1%</td>
<td>2 Alabama Power</td>
<td>$0.08</td>
<td>$0.06</td>
</tr>
<tr>
<td>Maryland</td>
<td>5,773,552</td>
<td>302,745</td>
<td>1,086</td>
<td>$0.1373</td>
<td>5.2%</td>
<td>2 Baltimore Gas &amp; Electric</td>
<td>$0.11</td>
<td>$0.09</td>
</tr>
</tbody>
</table>


History of Public Utilities Commissions in America

The PUC is charged with regulating and setting rates for the public utilities it oversees. Every state in the union has a PUC per federal regulation, and every utility company must garner PUC approval for any desired manipulation of rates or pricing structures. The pro-reform, depression laden era presided over by Roosevelt led to the increased interest and authority of PUC’s in the states. There was a public crisis at hand, and its amelioration would result in electric power for the poorest of American’s while at the same time addressing severe public health issues.

The increases in regulation demanded by PUC’s across the country stemmed from a clear and distinctive fear of increased federal involvement and a fear of public ownership¹⁹.

“If men were angels, no government would be necessary. If angels were to govern men, neither external nor internal controls on government would be necessary. In framing a government which is to be administered by men over men, the great difficulty lies in this: you must first enable the government to control the governed; and in the next place oblige it to control itself.”

Federalist No. 51

Chapter Two: Methods

Chapter two presents the research methodology.

Peer-reviewed Journals

The area of electric utilities offers a wide array of peer-reviewed journals. During the research phase in preparing this analysis, the most difficult problem was finding relevant material to pull from the wealth of related material. The issue of electric pricing falls in the cross-hairs of social welfare and market based economics quite often, and as such, ensuring that the material being utilized was from an unbiased source, or noting biases, became very important. For example, whether or not tiered-rate pricing structures effectively curb consumption is highly debated, though an unbiased cost-benefit analysis [cba] of the data would provide a solid outcome. The problems that arise during research through peer-reviewed journals will be further discussed in the ‘limitations’ section of the analysis.

Interviews\textsuperscript{20}

Face to face in-depth interviews and discussions took place during the creation of this analysis. Early in the research process was the need to determine if this assumed market failure was actually seen by members of the community as problematic. Anecdotal data was relayed heavily though interviews. There were also email exchanges to include question and answer pieces as well as raw data.

\textsuperscript{20} See List, Appendix B.
NGO’s, Think Tanks, and GO’s

Much of the data related specifically to disability was pulled from U.S. based NGO’s and Think Tanks. Entities that fall into this category include Energy Outreach Colorado, Colorado Center on Law and Policy, and the Bell Policy Center. The Government-based organizations that were helpful include the American Community Survey, the Census, numerous U.S. Public Utility Commissions, the Federal Energy Regulation Commission and the Hawaii Public Housing Authority. The ‘limitations’ section will discuss current barriers and voids in national data regarding the relationship between disability and chronic disease and energy demanded, to include discretionary and non-discretionary energy demanded.
Chapter Three: Proposed Solutions

Chapter three approaches the various policy options that could be utilized.

I. Let the present method stand undisturbed, status quo

II. Develop creative funding mechanisms to pool monies to increase funding for
    Energy Outreach Colorado

III. Include a medical exemption exclusively for the defined population

Status Quo

"Usage in the first tier is expected to be less price responsive than
usage in the second tier. The reason is that a share of customer usage is
non-discretionary, being necessary to maintain a minimum standard
quality of life....A lower price elasticity assumption for tier one is
recommended, and should be -0.13, or half the price elasticity of the
second tier."

Mr. Faruqui explicitly states that there is in fact an amount of energy consumed
in a non-discretionary manner, in order to maintain the quality of life for an individual.
Herein lays the problem of the market being unable to distinguish between discretionary
and non-discretionary energy use. This further complicates the markets ineffectiveness
as the demand for energy also cannot be divided between discretionary and non-
discretionary in its current state of policy.

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21 Faruqui, Ahmad. *Rebuttal testimony on behalf of Public Service Company of
Colorado.* Docket No. 09AL-299E. Before the Public Utilities Commission of
the State of Colorado.
The status quo has proved to be unsustainable. Numerous non-profits, for the first time, ran out of dollars toward energy assistance during the summer of 2010- as early as mid-July\textsuperscript{22}.

“Energy Outreach Colorado has distributed benefits to nearly 200% more clients and the average benefit per household has increased over 100% since 2003. In total, the organization distributed nearly 500% more funds in 2004 than in 2003\textsuperscript{23}.” As will be discussed in chapter seven, the consequences of maintain the status quo could prove to be at a very high cost to Colorado.

According to the University of Colorado Health Science Center, inability to pay for home energy costs has become the second most reported cause for homelessness in the state of Colorado.

Lastly, the National Energy Assistance Director’s Association has reported that “in order to pay for home energy, 35% of assistance recipients went without medical or dental care, or failed to fill a medical prescription or took less than the full dose of prescribed medication\textsuperscript{24}.”

Tiered-rates are new to the electric industry and consumers of Colorado. The status quo appears to be a symptom of growing pains, an unintended one at that. At a public hearing held at the PUC offices in the summer of 2010, PUC Chairperson Ron Binz reported that this unintended consequence was sadly an accidental oversight. Research has proved to support his assertion.

\textbf{Develop creative funding mechanisms to pool monies to increase funding for Energy Outreach Colorado}

This could be done in a number of ways. For example, there could be an option added to state tax return documents where Colorado taxpayers could opt to donate a portion of their returns to an energy fund for members of the disabled population. Another option would be to have the

\textsuperscript{22} Sharon O’Hara. The National Multiple Sclerosis Society Colorado-Wyoming Chapter. Sharon.ohara@nmss.org. (2011)


\textsuperscript{24} [Ibid]
Department of Motor Vehicles [CO-DMV] include ‘energy assistance for Coloradans living with disabilities and chronic disease’ to their specialized plate’s options.

Both of these options would require legislation. The current economic climate would also require a very small or negligible fiscal note on both pieces of legislation. The tax check-off legislation has been fruitful for numerous organizations in Colorado, which is still one of the few states offering this funding mechanism. The Pet Overpopulation Fund\textsuperscript{25} is just one of the fifteen organizations listed on the state tax return. Tax based donations to this non-profit have subsidized more than 42,000 sterilization surgeries for Colorado’s population of cats and dogs since 2002. The Alzheimer’s Association\textsuperscript{26} is also on the list, and in 2009-2010 brought in $115,000 through this creative funding mechanism. This option would only be viable in conjunction with another mechanism.

The license plate option, though fruitful for many others, has historically included a fiscal note. However, the FTE included in this note can be directed out of the funds as well as all other administrative costs, as long as the piece of legislation details this structure. The breast cancer awareness plate is the most popular and brings in approximately $84,000\textsuperscript{27} per year. The energy assistance fund would need far more monies than that, should the vulnerable population of consumers be charged electric at higher tiered-prices. As mentioned earlier, the non-profit, Energy Outreach Colorado, is already tasked with raising funds for the very purpose of offering energy assistance to vulnerable populations in Colorado. Therefore, there would not be any additional FTE or capital costs generally associated with start-up costs. EOC applies for federal funds, fundraises, and processes donations.

\textsuperscript{25} Checkoff Colorado. \url{http://www.checkoffcolorado.org/funds/petOverpopulation.php}
\textsuperscript{26} Bob Semro. Alzheimer Association Colorado Volunteer and Policy Analyst, the Bell Policy Center. \url{http://www.alz.org/co/in_my_community_about.asp},\url{http://bellpolicy.org/}.
\textsuperscript{27} Dana Dzvonkowski. The American Cancer Society Cancer Action Network. \url{Dana.dzvonkowski@acscan.org}.
Therefore, by choosing to move ahead with the creative funding mechanisms outlined above, the monies raised could be targeted to a new EOC fund, creating a viable solution to the original problem rooted in utilities inability to differentiate. Furthermore, the EOC already collects and keeps data regarding its applicant’s disability status, and therefore is able to decipher between populations. The average energy assistance is $310-$328 per month in the summer months of June-Sept\(^{28}\). The EOC may face an initial increase in FTE by a small percentage, but would be minimal at best.

**Include a medical exemption exclusively for the defined population**

Research has indicated that other U.S. states which utilize tiered-rates also have some form of baseline allowance, credit, fund, or medical discount for their constituents who have specific disabilities that require increased energy use. For example, PG&E in California provide a medical baseline discount for Californians living with Multiple Sclerosis, on account of a general symptom of MS; heat sensitivity. California also has the CARE program which offers lower and less steeply tiered-rates to customers with low-income and/or disabilities. This would not be plausible in Colorado as the MOUNTAIN STATES LEGAL FOUNDATION determined that a rate adjustment based on social policy was a violation of a statutory prohibition within the Colorado state constitution.

"Preferential rate-making restricted. Although the public utilities commission has been granted broad rate-making powers by art.XXV, Colo. Const., the commission’s power to effect social policy through preferential rate-making is restricted by this section and § 40-3-102 no

matter how deserving the group benefitting from the preferential rate
may be.

There are some flaws to be discussed regarding this language. For example, there is no
definition of social policy. A medical exemption from tiered-rates based on a consumer’s
medical condition would very literally be a medically necessary policy, apart from assumed social
policy. Also, the Pennsylvania PUC “approved a low-income discount rate on the grounds that it
generated benefits for all consumers” under the heading of fiscal policy, again, not assumed social
policy. New York has created similar discounts. For example, Niagara Mohawk Power
Corporation found that “because increased collection activities cause additional collection
expenses to be borne, in various proportions, by Niagara Mohawk’s entire body of ratepayers.”
Therefore, if exemptions and discounts can be framed in a manner to justify financial, economic,
or medical necessity, they can be done so absent of assumed social policy.

In order to create a medical exemption, the following steps must be taken:

1. Pass legislation that would allow for the PUC to have the authority to grant Xcel
   Energy the ability to offer its customers a medical exemption.

Research has indicated that of the U.S. states that have tiered-rates, Colorado is if not the
only, than one of the few that do not offer a medical exemption. The states with more limited
exemptions have non-profits or other entities that offer energy assistance on account of specific
medical conditions. The conditions which qualify consumers for a medical exemption include:

29 MOUNTAIN STATES LEGAL FOUNDATION v. PUBLIC UTILITIES
30 Colton, Roger D. Leading Light or Flickering Flame? Fisher, Sheehan & Colton
31 Summers, Dr. Michael and Dr. Rex Simmons. Keeping Cool Survey: Air Conditioner
   Use by Australians with MS: Public Policy Related Results & Recommendations. MS
   Australia 2009.

NETT 18
2. Work with the Colorado PUC to ensure the quick implementation of the medical exemption.

Regulatory policy shifts are much less swift than legislation. Therefore, this step is both bureaucratic and time consuming. Certain political factions would view this barrier as problematic, and others would celebrate it for its qualities of self-correction. PUC’s typically rely on pilot programs, and therefore on positive economics, predicting how consumers will consume rather than on normative economics, which base action upon how much consumers should consume. It is partially due to the longitudinal approach that regulatory policy shifts require much more time than other policy shifts.

Lastly, the option of a medical exemption has proven to be the most popular option among Coloradans and the identified stakeholder groups. The health advocacy community worked with Colorado legislators to create SB11-200, which does exactly what step one outlines: it allows for the PUC to mandate that Colorado electric utilities offer a medical exemption from tiered-rate pricing for customers based on their medical condition. The political feasibility of this option has shown to be the best of the three. Legislators could not allow for the status quo to remain as their constituents with disabilities and chronic disease were having increased difficulty paying their energy bills. Also, as the sensitivity analysis will suggest, many Coloradans who
have identified as being in the vulnerable population have voiced concern over policy option two, which would increase funds for EOC. The problem most cited is that subjecting this cohort to the tiers is bad policy, and may in fact be a violation of the ADA. Whether this argument would stand up legally, I am unaware, however it has been mentioned.

**Politics & Tiered-Rate Pricing**

A more conservative approach would be to rid of the tiered-rate pricing structure and allow for identical pricing per kWh used across the board. This method would levy identical rates to every consumer, regardless of their rate of consumption. The consumer’s behavior and tendency toward conservation would be their decision. Should the consumer feel they were consuming too much, they would determine if and where to curb consumption.

A bill was brought forth in the Colorado State House during the 2011 legislative session which aimed to rid of tiered-rate pricing and advocated for a mandate of flat residential rates. Representative Scott and Senator John are both aligned to the right of center politically and both are the prime sponsors of this bill, HB11-1271\(^{32}\).

A more liberal approach would be to utilize a more dramatic tiered-rate system, so that the highest of all users pay a significant amount more. PG&E in California has done numerous studies in an effort to identify whether or not the use of more ‘tiers’ would be a more effective way to bolster conservation during peak demand times. This approach would aim to ‘punish’ those who chose to use an extremely high amount of energy and would call for disproportionately high rates for those in the highest tier. This approach has shown to be effective in California,

\(^{32}\) HB11-1271.

however, may not be as effective in other states. This would have to be determined by further analysis.

Currently, Xcel Energy’s two-tiered rate system is a moderate version of dynamic pricing. The use of only two-tiers is more conservative, as alternatively, Pacific Gas and Electric has implemented a five-tiered system. The threshold set by the PUC and Xcel Energy of 500 kWh is quite low. At this rate, most all consumers (60%, per PUC estimates) will surpass the threshold and undoubtedly be charged the higher rate (14.3 cents per kWh versus the flat rate of 9.2 cents per kWh). To be clear, this is where the problem of market ineffectiveness comes in to play.

“In Xcel Energy’s case, approximately 60% of its residential customers will have a portion of their bill charged in the second tier. This sends a price signal to the majority of customers to think carefully about energy decisions. It also raises the value of conservation because kilowatt hours saved in the second block reduce bills at the higher rate.”

To substantiate the claim of conservation, this argument is assuming that consumers are in essence, a closed market. This presents a tremendous flaw in the data presented by the PUC. Because the PUC did not account for roughly 19.3%34 of the state’s population that for medical reasons may depend on higher energy use, their research is in fact missing an important stakeholder group. It is important to recognize that industries in the U.S. will continue to make these kind of errors in analysis should they continue to paint all consumers with one broad brush. It simply provides for a poor population sample.

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33 Colorado Department of Regulatory Agencies. 
http://www.dora.state.co.us/puc/Tiered_rates_index.html.
Chapter Four: Issue and Analysis

Chapter four discusses the aforementioned policy options and their possible outcomes.

**Economic Analysis**

Electric utility companies located in states like New Jersey have faced great initial or capital investment expenses when shifting from flat to dynamic forms of pricing. This is primarily due to the increased technology needed to meet the demands for that specific type of dynamic pricing. An example would be the use of ‘time of day’ [TOD] tiers which require new meters, high-speed internet and to some degree a more informed consumer. The type of dynamic pricing mechanism that Excel Energy and the PUC chose was in part on account of how inexpensive the transition costs would be. Ron Binz, Chairperson of the Colorado PUC, said that the shift from flat to dynamic pricing “would be a revenue-neutral shift". However, after having conducted the cba portion of this analysis; research indicates that there will be an increased cost to the state in loss of tax revenue and an increase cost to Xcel Energy in a loss of franchise fee revenue. Due to the relatively small size of the disability and chronic disease community who would qualify for a medical exemption, Xcel Energy and the Colorado PUC may have found the increases negligible when approaching the scale of monies the new tiered-rate structure presents.

**Market-Specific Issues that Xcel Energy Faces**

The market of electric public utilities in the state of Colorado can be classified as a regulated private monopoly. Standard to this specific market is the practice of cost-plus regulation, where “government regulators gather data on the monopolist’s explicit costs of

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35 Colorado Department of Regulatory Agencies.  
[http://www.dora.state.co.us/puc/Tiered_rates_index.html](http://www.dora.state.co.us/puc/Tiered_rates_index.html).
production and then permit the monopolist to set prices that cover those costs, plus a markup to assure a normal return on the firm’s investment. This specific practice faces the following misgivings:

✓ Defining what constitutes ‘administrative costs,’ which could be purposely distorted to increase the amount the producer plans to recover.

✓ Discourages cost-savings practices by consumers, as they would be forced to reduce their rates (per the equation set by the PUC).

✓ Renders the producer incapable of setting market price equal to marginal cost, at a financial loss.

Energy production is most costly at peak demand times as peak demand times create a heavy load on production plants. When these are overloaded with peak demand, the need for building new infrastructure presents itself; to support the demand. Therefore, as demand increases (assuming it is at peak demand time), the cost of production increases, while the producer is unable to recover said increase due to the regulatory authority of the Public Utilities Commission, whose chairs are gubernatorial appointees.

An important note to make on regulated private monopolies is that “two-thirds or more of a monopolist’s economic profit may fund services provided by governments of various levels.” This discussion highlights the problems that occur in cba’s that lack a sensitivity analysis. Government revenue would be impacted by any increase or decrease in market demand specific

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37 [Ibid]
to public utility goods. Without a sensitivity analysis, it would be easy to miss the standing that

government revenue has in this issue.

**Philosophical Analysis**

“The challenge is that while net societal benefits might be positive, individual
consumer benefits may be positive or negative. A conservative approach
associated with the work of Vilfredo Pareto argues that dynamic pricing should
only be pursued if at least one consumer is better off and no one is worse off. A
more aggressive approach in public policy associated with the work of Hicks and
Kaldor would suggest that dynamic pricing is worth pursuing if the gains to the
winners exceed the losses to the losers. In other words, if the winners can
compensate the losers, go ahead and pursue the policy. Of course, this
compensation would not actually be paid because if it were paid, the Hicks-
Kaldor solution would collapse to the Pareto solution. Clearly, the Hicks-Kaldor
approach would yield much larger societal gains than the Pareto approach.”

If it were up to Vilfredo Pareto, Colorado would not have ever implemented tiered-rate
pricing without a self-correcting measure built into the framework for the vulnerable population.
However, if using the Kaldor-Hicks model, Colorado could move forward with a tiered-rate
pricing structure for electric utilities if those that would gain could compensate those that would
lose. Therefore, through creative funding mechanism, Coloradans who could afford to pay more,
would be inadvertently funding the EOC for the vulnerable population. However, neither model
would move forward based on the status quo. Speaking to the medical exemption, as the cohort
would be no worse off, Pareto would say to move forward, and Kaldor-Hicks would say since the

http://www.smartgridnews.com/artman/uploads/1/The_Ethics_of_Dynamic_Pricing___03-
30-10_.pdf

nett 24
cohort isn’t loosing, and since the alternate consumers could pay more, than it could move forward. Lastly, I would like to mention the scarcity principle, which states that having more of any good thing necessarily requires having less of something else. If choosing one good over another good would impact a consumer’s quality of life, now becomes a philosophical question. If the more energy one demands creates a lessened quantity demanded for medication based on economic insecurity, than a problem has been presented.

**Sensitivity Analysis**

Of the proposed solutions mentioned earlier, one of the solutions would have had a large negative impact that could have been overlooked without the sensitivity analysis. To suggest that a fund be created to pay for the disabled populations energy use above the first tier, one might assume that this population is asking for a handout. In truth, it is the opposite. Speaking from the numerous interviews conducted for this analysis, the disabled population in Colorado understands that there is no free lunch. They are asking to be exempt from a policy aimed at pushing down discretionary energy use. Asking the disability population to curb their energy demand at peak times is a rather ridiculous notion when you think of the impact it could have, and the cost of that implicit impact on society.

The purpose of conducting a sensitivity analysis is to specify and take into account factors that may influence the numbers used for the Cost-Benefit Analysis. An example, though not relevant to this study, can be found in the secondary market of efficient light bulbs. Their increased use may account for cuts in energy demand rather than the quantity demanded lessening on account of the pricing structure. Quite often the Governor’s Office of Energy and Energy Outreach Colorado will work with federal offices to offer subsidized efficient bulbs and make them available to the public at very low prices.
The residential demand for electricity has small price elasticity; therefore, tiered-rate pricing may display too little evidence that “the amounts of electricity that these rates would conserve would be substantial." As expected, regarding high, medium and low energy users, there is a significant difference in the “elasticity of expected usage with respect to $P$, diminishes as income increases…. the overall price elasticity of electricity, $\beta$, is negative, as expected. This is consistent with previous studies in the literature that have typically found electricity demand to be inelastic in the short-run."

<table>
<thead>
<tr>
<th>Mountain States Electricity Elasticity</th>
<th>COEF</th>
<th>STD. ERR.</th>
<th>T</th>
<th>p &gt; (t)</th>
<th>95% CONF.</th>
<th>INTERVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.267</td>
<td>0.048</td>
<td>-5.52</td>
<td>0</td>
<td>-0.362</td>
<td>-0.172</td>
</tr>
</tbody>
</table>

“Price elasticity’s are always presented with ceteris paribus proviso (all else being equal),” however, the market’s inability to differentiate between discretionary and non-discretionary energy proves that methodology inept. Again, consumers of electric energy cannot be held to closed-market standard.

Another interesting aspect to be addressed within the sensitivity analysis is the differences that result from having a PUC appointed versus elected. “Public choice theory suggests that, since household customers constitute the majority of the voting public, elected commissioners may be more likely than appointed commissioners to engage in vote-seeking by


40 Ibid


42 Ibid
directly delivering benefits to their constituents.\textsuperscript{43} Quite interestingly, these same authors found that the political variables used in their study were as significant as financial variables in determining PUC bond rating on a state-by-state basis. Elected PUC’s were most likely to have the lowest bond ratings, while showcasing the highest rates of politicking.

\textit{Unintended Consequences}

As the sensitivity analysis will dictate, unintended consequences will arise out of any shifts in the policy of pricing structure for electric utilities in Colorado. For example, some folks may be alternatively incentivized to use more energy. This scenario could be likely for someone who used a low amount of kWh’s per month. Since they now see a threshold, they may use more energy than they did before. An unintended consequence could arise in that some populations may be more negatively impacted by specific price structuring than are other segments of the population.

According to the University of California Energy Institute, California moved from a two-tiered-rate system of pricing to that of a five. Their research showed that low-income residential consumers were the highest beneficiaries of this shift, but that the benefit was minimal at best. For example, a cost-benefit analysis conducted by the same institute has indicated that should PG&E revert back to two-tiers, the poorest customers would see an increase in their monthly electric bill by slightly less than $8 per month\textsuperscript{44}.


PUC's are also responsible for the well being of the public interest [Reeves v. Queen City Transp., 10 F. Supp. 2d 1181 (D. Colo. 1998), "issuance of a certificate of public convenience and necessity"], it is important that negative unintended consequences such as these be taken into account.

<table>
<thead>
<tr>
<th>Sensitivity Analysis</th>
<th>Stakeholders</th>
<th>Weight</th>
<th>700kWh</th>
<th>1300kWh</th>
<th>2500kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status Quo</td>
<td>Xcel Energy&lt;sup&gt;45&lt;/sup&gt;</td>
<td>.40</td>
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<td>-8</td>
<td>-12</td>
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<tr>
<td></td>
<td>Customers w/DB/CD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Xcel Energy&lt;sup&gt;46&lt;/sup&gt;</td>
<td>.30</td>
<td>-3</td>
<td>-6</td>
<td>-9</td>
</tr>
<tr>
<td></td>
<td>Energy Outreach Colorado</td>
<td>.20</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>State Revenue&lt;sup&gt;47&lt;/sup&gt;</td>
<td>.10</td>
<td>-1</td>
<td>-2</td>
<td>-3</td>
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<tr>
<td></td>
<td>total</td>
<td></td>
<td>-8</td>
<td>-16</td>
<td>-24</td>
</tr>
<tr>
<td>Additional EOC Fund</td>
<td>Xcel Energy Customers w/DB/CD&lt;sup&gt;46&lt;/sup&gt;</td>
<td>.40</td>
<td>+2</td>
<td>+4</td>
<td>+6</td>
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<tr>
<td></td>
<td>Xcel Energy&lt;sup&gt;48&lt;/sup&gt;</td>
<td>.30</td>
<td>+3</td>
<td>+6</td>
<td>+9</td>
</tr>
<tr>
<td></td>
<td>Energy Outreach Colorado&lt;sup&gt;49&lt;/sup&gt;</td>
<td>.20</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td>State Revenue&lt;sup&gt;50&lt;/sup&gt;</td>
<td>.10</td>
<td>-1</td>
<td>-2</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td>total</td>
<td></td>
<td>4</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Medical Exemption</td>
<td>Xcel Energy Customers w/DB/CD&lt;sup&gt;51&lt;/sup&gt;</td>
<td>.40</td>
<td>+8</td>
<td>+16</td>
<td>+24</td>
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<tr>
<td></td>
<td>Xcel Energy&lt;sup&gt;52&lt;/sup&gt;</td>
<td>.30</td>
<td>-3</td>
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<td>-9</td>
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<tr>
<td></td>
<td>Energy Outreach Colorado&lt;sup&gt;53&lt;/sup&gt;</td>
<td>.20</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td>State Revenue&lt;sup&gt;54&lt;/sup&gt;</td>
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<td>+1</td>
<td>+2</td>
<td>+3</td>
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<td></td>
<td>total</td>
<td></td>
<td>6</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

<sup>45</sup> -1 = cost to Xcel Energy customers due to increase in rate alongside inability to curb consumption. 700kWh = X, 1300kWh=X+1, 2500kWh=X+2
<sup>46</sup> Xcel Energy: +1= increase in franchise fee, -1= increase in non-payment, -1=increase in transaction costs
<sup>47</sup> State Revenue: -1= increase in social services demanded by vulnerable population
<sup>48</sup> Xcel Energy Customers w/DB/CD: +1= having second tier price subsidized by EOC, -0.5= public policy implication could prove harmful in that non-profit funding can be volatile
<sup>49</sup> Xcel Energy: +1= increase in franchise fee bore by EOC
<sup>50</sup> EOC: +1= increase in federal monies due to new program targeted to vulnerable population, -1= increase in FTE due to increased monies
<sup>51</sup> State Revenue: -1= loss of state revenue due to EOC state tax exemption
<sup>52</sup> Xcel Energy Customers w/DB/CD: +1= amount of second tier rate x use over 500kWh not passed to consumer, +1 good public policy would dictate that the vulnerable population should not be subject to target pricing mechanisms as their energy use is not discretionary
<sup>53</sup> Xcel Energy: -1= loss in franchise fee funds
<sup>54</sup> EOC: not relevant with medical exemption
<sup>55</sup> State Revenue: -1=loss of second tier-rate x use >500kWh (tax), +1= amount saved by healthier consumers and equitable pricing polices
Chapter Five: Strategic Recommendations

This section details the minimum acceptable effectiveness given the costs; defines the new process that is demanded, and assesses how likely it is that the process for improvement will actually produce the level of effectiveness it aims to reach\textsuperscript{56}.

Recommendation

The recommendation that this analysis has determined to be the best policy option is number three, the creation of a medical exemption. The above information has indicated and as the cba will show, a medical exemption has proven to be the best in terms of both cost-benefit and sensitivity analysis. According to Bardach’s \textit{twenty dollar bill test}, a medical exemption option would pass with flying colors. This policy option \textit{has} been done by states who utilize dynamic pricing for their utilities. The use of tiered-rate electric pricing is new in Colorado, and as such, there is no time better than now to improve that policy.

Chapter Six: Weaknesses and Limitations

This section identifies the areas which proved problematic during the research and analysis process, which may or may not have impacted the study.

Areas for Improvement

Historically, there have been numerous studies conducted to determine the effectiveness of block-rate pricing, though none specific to consumers living with disabilities and chronic disease. This fact became evident in the very beginning of the research for this analysis. What also became apparent is the nation-wide problem of inadequate and disorganized data regarding Americans living with disabilities and chronic disease. As mentioned earlier, it was not until 2008 that most national survey data, like the census, began collecting disability-specific data.

The lack of relevant data on this cohort became a constant barrier to fulfilling the quantitative measures initially intended for this piece. Without the assistance of Energy Outreach Colorado and MS Australia, I am unsure if there would have been any non-assumption data points used in the cba.

A noted weakness of the literature is that historically, actual tariff schedules have been conducted en media res, which differs from the current practice of ex post analysis. Therefore, the analyses are fundamentally different and lack continuity and symmetry. However, the involvement and intentional bureaucracy presented by the PUC has helped to mitigate this problem. The PUC pilots have proven to utilize numerous analytical methods, and the innate slow-movement of the PUC guarantees a more precise analysis.

A highly debatable issue arises in the question of intentional fragmentation resulting in an intentional bureaucracy. The negative unintended consequence discussed above regarding medically necessary energy use will become that much more of a problem when the issue of
governmental fragmentation is involved. Through the lens of the constitutional framers', the creation of a system of checks and balances within public utilities may be the perfect mechanism of control and governance. A shift in tiered-rate pricing and alternative pricing structures is taking place in a reform era that due to the 'red-tape' of government, isn't allowed to occur to quickly.
Boardman et all make an argument that directly challenges the Hicks-Kaldor test; “some programs that are inefficient should be undertaken if they increase income equality sufficiently…..some projects that make the income distribution less equal should not be undertaken, even though the Hicks-Kaldor test implies that they are efficient." This model would suggest that even if the medical exemption proved to be more costly, it may also be the better policy decision. This model would be in complete contradiction to those discussed in the philosophical analysis section of this analysis. The use of weights in the cost-benefit analysis [cba] also furthers the point Boardman et all were making. FIGURE 1 indicates that (a+b) is equal to the consumer surplus lost to the high-income consumer, while (a) is equal to the consumer surplus lost to the low-income consumer. A price increase, say from (P₁) to (P₂), would result in a loss of consumer surplus to both parties. Boardman further says that “since the

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58 [Ibid]
principle of *one person, one vote* is deeply imbedded in the concept of ‘democracy,’ measures of changed in consumer surplus for different persons should be adjusted to what they would be if everyone had the same income⁵⁹.” This is a helpful point to present regarding the *weighting* used in the cba, and further highlights the importance of the consumer and social cost in this analysis.

The status quo is designed as a mechanism to impact the high-income, high-consumers of energy. However, an unintended negative consequence has proved problematic for a rather large portion of the population, of which are vulnerable, and nonetheless, each wielding one vote. Therefore, an alternative policy initiative should be undertaken to correct for this oversight. This issue would be simplified if the private sector could correct for it on its own, however, legislation is required.

The stakeholders include Xcel Energy customers living with a disability or chronic disease that would require energy assistance due to their disability. Energy Outreach Colorado data from 2009 showed that 3,811 Coloradans applied for energy assistance in 09-10 due to their disability or chronic disease⁶⁰. Though 3,632 were accepted from the 3,811 applicants, I’ve decided to use the entire number of applicants who applied on account of medical necessity. I chose to do this because I have not included means-testing in this policy option, as EOC has for their energy assistance program. Weights were distributed from a consumer perspective, as this analysis is written.

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<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Weight</th>
<th>Policy Option I</th>
<th>Policy Option II</th>
<th>Policy Option III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Status Quo</td>
<td>Additional EOC Fund</td>
<td>Medical Exemption</td>
</tr>
<tr>
<td>Benefits</td>
<td></td>
<td>700 kWh, 1300 kWh, 2500 kWh</td>
<td>700 kWh, 1300 kWh, 2500 kWh</td>
<td>700 kWh, 1300 kWh, 2500 kWh</td>
</tr>
<tr>
<td>Xcel Customers w/ DB/CD</td>
<td>.40</td>
<td>n/a</td>
<td>$54,421.08 **</td>
<td>$54,421.08 **</td>
</tr>
<tr>
<td>Xcel Energy [franchise fee 3%]</td>
<td>.30</td>
<td>$11,087.73</td>
<td>$23,840.09</td>
<td>$8,055.70</td>
</tr>
<tr>
<td>Energy Outreach Colorado</td>
<td>.20</td>
<td>n/a</td>
<td>+1 Increase in federal moneys</td>
<td>n/a</td>
</tr>
<tr>
<td>State Revenue (G) **</td>
<td>.10</td>
<td>$11,664.85</td>
<td>$25,081</td>
<td>$10,069.93</td>
</tr>
</tbody>
</table>

**Total benefits**: $22,752.58 | $48,921.09 | $101,258.12 | $72,546.71 | $248,097.59 | $599,199.34 | $631,992.79 | $235,460.35 | $578,395.47

**Costs**

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Weight</th>
<th>Policy Option I</th>
<th>Policy Option II</th>
<th>Policy Option III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-2 increased transaction cost &amp; increase in non-payment</td>
<td>-1 Increased transaction cost</td>
<td>+1 Decreased transaction cost</td>
</tr>
<tr>
<td>Xcel Customers w/ DB/CD</td>
<td>.40</td>
<td>$398,020.84</td>
<td>$855,798.16</td>
<td>$1,771,352.80</td>
</tr>
<tr>
<td>Xcel Energy</td>
<td>.30</td>
<td>-1 inability to meet demand</td>
<td>$46,646.64 **</td>
<td>$186,586.56</td>
</tr>
<tr>
<td>Energy Outreach Colorado</td>
<td>.20</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>State Revenue (G) **</td>
<td>.10</td>
<td>-2 increased cost to social services</td>
<td>-1 Gainer tax exemption</td>
<td>n/a</td>
</tr>
</tbody>
</table>

**Total costs**: $398,020.84 | $855,798.16 | $1,771,352.80 | $390,246.40 | $824,700.40 | $1,693,606.40 | $345,194.68 | $642,071.52 | $1,244,518.72

**TOTAL (NPV)**: $3,255,268.26 | $896,877.07 | $1,470,094.60 | $1,176,699.69 | $576,602.81 | $1,094,400.06 | $281,200.89 | $497,613.17 | $666,183.25

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**Footnotes**:

1. As this analysis is posed from a consumer vantage point, the cohort for which a market problem presents itself is the most weighted of the stakeholders. Xcel Energy carries the second most weight. Xcel Energy has made great efforts in working with the PUC to develop strong environmental policy, which is one large political faction that supports the tiered-rate pricing structure. However, there are no entities against a medical exemption for this cohort. The Colorado PUC, Xcel Energy, the Governor's office, and the health advocacy community are all in large support of the medical exemption, which proves to be the least costly of the alternatives.

2. Benefit is to the consumer; amount is what EOC is paying that would have been placed on the consumer.
iii Benefit is to the consumer; amount is what consumer is exempt from. As tiered-rate pricing was posed as being revenue-neutral, that conclusion is not what my data indicates concerning the cohort specific to this analysis.
iv +1 here indicates a positive benefit in the amount of X
v This increase would be due to increase sales tax revenue, which go to the state general fund.

Average cost of energy assistance per household per month June-September: $310-$328
For the purpose of this analysis, the mean of these two numbers will be used as the ‘per household per month assistance’ required during the summer months.

MS Australia has kept detailed data-sets and comprised numerous substantial studies regarding MS and heat intolerance. Furthermore, after researching average temperatures in different Australian municipalities, Victoria was found to be very similar to Denver during those particular months.

New tier- base rate = 5.1 cents. Consumer = EOC applicants with at least one disability/chronic disease [3,811 2009-2010].

Assume b/c of medical condition, **use is 700 kWh per month**

At 700 kWh, if subsidize second tier, the amount to consumer would be $64.40 (plus admin costs), and to the EOC fund, an amount of $10.20. Amount due by EOC fund of $38,872.20.

Assume b/c of medical condition, **use is 1300 kWh per month**

At 1300 kWh, if subsidize second tier, the amount to consumer would be $119.60 (plus admin costs), and to the EOC fund, an amount of $40.80. Amount due by EOC fund of $155,488.80.

Assume b/c of medical condition, **use is 2500 kWh per month**

At the 2500 kWh, if subsidize second tier, the amount to consumer would be $230.00 (plus admin costs), and to the EOC fund, an amount of $102.00. Amount due by EOC fund of $388,722.00.

vi State tax in the amount of 0.0373 is levied on all residential electric bills
vii Amount is what consumers will be billed. Policy options two and three share the same amount here as both are responsible for the first tier price for all energy consumed, however, never at the second tier rate.

viii The vulnerable population of Coloradans living with disabilities and chronic disease, if offered a medical exemption, would save Xcel Energy monies in the area of transaction costs, which “increase with the use of tiered-rates(Faruqui, Ahmad).”

ix This amount is what the EOC is subsidizing for the consumer, though tax exempt.
x This -1 represents the cost of X to the government due to the tax exempt status of EOC, whereas the status quo would include a benefit of increased tax revenue for the state.

xi Total kWh over 500 x 5.1 cents x no. persons [3811] x state tax [.0373] = loss of government revenue due to exemption from paying higher rate.
Works Consulted


Hawaii Public Housing Authority (HPHA). *Revised utility rates and allowances for federal public housing residents who purchase their own Utilities, effective fiscal year beginning July 1, 2010*. Honolulu, Hawaii.


www.state.nj.us/emp/docs/pdf/Avg_Residential_Utility_Rate)(8-31-10).pdf.
Appendix A

List of interview participants:

- Julie Reiskin, President and CEO, Colorado Cross-Disability Coalition
- Sharon O’Hara, Executive Vice President, the National Multiple Sclerosis Society
  Colorado-Wyoming
- Alan Bieber, Director or Web and Data Management, Energy Outreach
  Colorado
- Jayla Sanchez-Warren, Programs, Colorado Area Agency on Aging
- Amanda Callahan, Programs and Advocacy, Mental Health America Colorado
- Ruth Pederson, Executive Vice President, Colorado AIDS Project (CAP)
- Ron Binz, Former Chairperson, Colorado Public Utilities Commission
- Barbara Ferguson, Administrative Assistant, Colorado Public Utilities Commission
- Mike Beasley, Head of Government Affairs, Xcel Energy
- Ethnie Treik, Lobbyist, Xcel Energy
- Pat Bohland, Head of Credit and Consumer Management, Xcel Energy
- Kate Warman, Program Director- Education & Outreach, Xcel Energy
- Senator Betty Boyd, President Pro-Temp and Chair of the Health and Human Services Committee, Colorado State Senate
- Representative Jim Kerr, Health and Environment Committee Member, Colorado State House
To find your electric use in kilowatt hours on your monthly Xcel bill, see red arrow below.

<table>
<thead>
<tr>
<th>Customer Name</th>
<th>Service Address</th>
<th>Account No.</th>
<th>Due Date</th>
<th>Amount Due</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mar 02, 2010</td>
<td>$238.50</td>
</tr>
</tbody>
</table>

**Electric Service - Account Summary**

<table>
<thead>
<tr>
<th>Invoice Number</th>
<th>Residential General 577.00 x 0.031530</th>
<th>$18.19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meter No.</td>
<td>GRSA</td>
<td>$11.00</td>
</tr>
<tr>
<td>Rate</td>
<td>Residential General</td>
<td></td>
</tr>
<tr>
<td>Days in Bill Period</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Current Reading</td>
<td>20468 Actual 02/10/2011</td>
<td></td>
</tr>
<tr>
<td>Previous Reading</td>
<td>29691 Actual 01/10/2010</td>
<td></td>
</tr>
<tr>
<td>Kilowatt Hours Used</td>
<td>977</td>
<td></td>
</tr>
</tbody>
</table>

**Gas Service - Account Summary**

<table>
<thead>
<tr>
<th>Invoice Number</th>
<th>Residential 191.00 x 0.109238</th>
<th>$10.60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meter No.</td>
<td>GRSA</td>
<td>$11.00</td>
</tr>
<tr>
<td>Rate</td>
<td>Residential General</td>
<td></td>
</tr>
<tr>
<td>Days in Bill Period</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Current Reading</td>
<td>9444 Actual 02/10/2011</td>
<td></td>
</tr>
<tr>
<td>Previous Reading</td>
<td>9426 Actual 01/10/2011</td>
<td></td>
</tr>
<tr>
<td>Therm Multiplier</td>
<td>0.979</td>
<td></td>
</tr>
<tr>
<td>Thems Used</td>
<td>191.0</td>
<td></td>
</tr>
</tbody>
</table>

**Comparison Information**

<table>
<thead>
<tr>
<th>Gas $146.65 per month</th>
<th>$3.43 per day</th>
<th>Billing Period</th>
<th>Kwh Usage/Month</th>
<th>Therm Usage</th>
<th>Avg. Daily Temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric $78.85 per month</td>
<td>$2.01 per day</td>
<td>This Year</td>
<td>577</td>
<td>131</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Last Year</td>
<td>630</td>
<td>153</td>
<td>30°F</td>
</tr>
</tbody>
</table>

Please refer to the address below and return this portion with your payment by the Due Date to avoid late payment fees. Make your check payable to Xcel Energy.

Account Number: 53-2510817-8
Date Due: Mar 02, 2010
Amount Due: $238.50

- Amount Enclosed: $
<table>
<thead>
<tr>
<th>Monthly Usage Kilowatt Hours (kwh)</th>
<th>Bill Under Old Rates</th>
<th>Bill Under New Tiered Rates</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>39.16</td>
<td>36.39</td>
<td>-7.1%</td>
</tr>
<tr>
<td>500</td>
<td>80.70</td>
<td>56.08</td>
<td>-30.6%</td>
</tr>
<tr>
<td>605 (avg)</td>
<td>80.85</td>
<td>82.84</td>
<td>2.5%</td>
</tr>
<tr>
<td>1000</td>
<td>114.50</td>
<td>127.62</td>
<td>11.4%</td>
</tr>
<tr>
<td>1500</td>
<td>168.42</td>
<td>199.15</td>
<td>18.2%</td>
</tr>
<tr>
<td>2000</td>
<td>222.28</td>
<td>270.69</td>
<td>21.8%</td>
</tr>
<tr>
<td>3000</td>
<td>329.99</td>
<td>413.75</td>
<td>25.4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monthly Usage Kilowatt Hours (kwh)</th>
<th>Bill Under Old Rates</th>
<th>Bill Under New Tiered Rates</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>37.72</td>
<td>36.39</td>
<td>-3.5%</td>
</tr>
<tr>
<td>500</td>
<td>58.30</td>
<td>56.08</td>
<td>-3.8%</td>
</tr>
<tr>
<td>605 (avg)</td>
<td>69.11</td>
<td>66.42</td>
<td>-3.9%</td>
</tr>
<tr>
<td>1000</td>
<td>109.75</td>
<td>105.32</td>
<td>-4.0%</td>
</tr>
<tr>
<td>1500</td>
<td>161.21</td>
<td>154.56</td>
<td>-4.1%</td>
</tr>
<tr>
<td>2000</td>
<td>212.86</td>
<td>203.79</td>
<td>-4.2%</td>
</tr>
<tr>
<td>3000</td>
<td>315.56</td>
<td>302.20</td>
<td>-4.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monthly Usage Kilowatt Hours (kwh)</th>
<th>Bill Under Old Rates</th>
<th>Bill Under New Tiered Rates</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>458.40</td>
<td>436.67</td>
<td>-4.7%</td>
</tr>
<tr>
<td>500</td>
<td>708.22</td>
<td>673.01</td>
<td>-5.1%</td>
</tr>
<tr>
<td>Average</td>
<td>876.24</td>
<td>862.74</td>
<td>-1.5%</td>
</tr>
<tr>
<td>1000</td>
<td>1,396.28</td>
<td>1,353.03</td>
<td>1.3%</td>
</tr>
<tr>
<td>1500</td>
<td>1,963.33</td>
<td>2,033.06</td>
<td>3.6%</td>
</tr>
<tr>
<td>2000</td>
<td>2,590.38</td>
<td>2,713.09</td>
<td>4.7%</td>
</tr>
<tr>
<td>3000</td>
<td>3,844.48</td>
<td>4,073.14</td>
<td>5.9%</td>
</tr>
</tbody>
</table>