REPORT OF THE ENERGY EFFICIENCY AND RENEWABLES TASK FORCE

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Report of the Energy Efficiency And Renewables Task Force

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Executive Summary

The Task Force on Energy Efficiency and Renewable Resources has concluded that the Commission should take a more active role in promoting both energy efficiency and renewable resources. A number of programs that would accomplish this goal were investigated and analyzed. The Task Force reached a general consensus that PacifiCorp should initiate a green pricing and a net metering program in Utah. PacifiCorp is expected to file a green pricing tariff within the next couple of months as a condition of the ScottishPower/PacifiCorp merger. Although the Task Force did not explicitly set a date for the submission of a net metering application by the Company, members preferred that it happen sooner rather than later.

With regard to energy efficiency and distributed generation, the Task Force recommends that the issues be studied further. The Task Force recognizes that energy efficiency opportunities in Utah may not receive adequate analysis under the Company-wise Integrated Resource Planning process. To better exploit energy efficiency opportunities in the Stat of Utah , the Task Force recommends that PacifiCorp convene a ongoing energy efficiency advisory group which will promote cost-effective energy efficiency with the state. It is hoped that a process similar to Northwest's program can be initiated. The Task force also recommends that the Company work with the Office of Energy and Resource Planning and the Land and Water Fund to identify areas on the distribution system where distributive generation has value in improving reliability. If potential projects are identified then initiate a pilot project that will assess the cost-effectiveness of distributive generation.

The Chairs of the Task Force would like to commend the members of the group who worked hard to gain a better understanding of the issues and worked together to come to a general consensus on our recommendations.

REPORT of the ENERGY EFFICIENCY and RENEWABLES TASK FORCE

I. Introduction

As a result of the order in Docket No. 97-035-01, the Public Service Commission (PSC) of Utah agreed to organize a task force *in the interest of concrete proposals, well analyzed as to the costs and benefits, and specifics of program delivery*...with respect to energy efficiency and renewable resources. The order outlined specific programs for which the Commission required analysis. Included in this list were green pricing, net metering, and energy efficiency. This task force was organized to facilitate this objective. In addition to the requested analysis, the task force deemed an analysis of distributed generation to be relevant to this report. The purpose of this report is to provide and informative analysis of these issues.

The process of developing this report was both lengthy and complex. Consensus was the goal wherever possible. In addition, some concessions in terms of report analysis were necessary. In particular, early task force discussions resulted in a decision to de-emphasize energy efficiency in this report. This decision was premised on the assertion that such issues are extensively studied and analyzed in the Company's Integrated Resource Plan (RAMPP). Some members, however, expressed the opinion that RAMPP was not an adequate venue for analyzing the opportunities for energy efficiency within a particular state. The potential for securing energy efficiency in Utah may be lost as a result of the general overview provided by RAMPP Given the lack of consensus on the issue, the Task Force decided to begin its investigation with an analysis of green pricing and net metering. These issues will require a Commission decision first given that PacifiCorp has promised to file a green tariff offering within 60 days of the final approval of the merger with SocttishPower.

The first portion of this report is dedicated to an informative discussion of green pricing. Included in this analysis is a brief review of other green pricing programs, elements considered as important for a successful program in Utah, and specific recommendations for adopting such a program. As indicated, consensus was the goal wherever possible. Remarks or objections to this section of the report are duly noted in Appendix B.

The second portion of this report provides and analysis of net metering, mirroring the analysis for green pricing. Net metering is not as imminent as green pricing but the task force agrees that such a program would be effective in Utah. Objections are noted in Appendix B.

The third portion of this report provides a brief overview of PacifiCorp's energy efficiency programs and addresses general recommendations for improving demand side management programs in Utah. As noted above, this section of the report provides a more general overview of the issue than subsequent sections. As a result, our recommendation is that

this issue continues to be reviewed by a committee organized to focus on the specific intricacies of energy efficiency.

The fourth portion of this report includes a brief introduction to issues of distributed generation. Analysis of this issue was not specifically requested by the Commission. However, the Task Force felt that this issue should be introduced and that the framework and purpose of this report represented an opportunity to do so. As an extension of net metering, it is the recommendation of the task force that issues of distributed generation continue to be explored.

II. Procedural Background

The Commission requested that all interested parties be invited to participate in Task Force discussions. Additionally, the Commission requested that the Task Force chairperson be a member of the PSC. This Task Force was organized in a manner consistent with the Commission's requirements as indicated in Docket No. 97-2035-01.

A. Task Force Participants

The Task Force was co-chaired by Rich Collins, staff member of the Public Service Commission, and Jeff Burks, Director of the Office of Energy and Resource Planning. A number of other interested parties also participated in task force meetings, issue analysis, and report development. Task Force participants included the following:[1]

Representative	Organization
Richard Collins (co-chair)	Public Service Commission
Jeff Burks (co-chair)	Office of Energy and Resource Planning
Jim Galanis	Office of Energy and Resource Planning
Laura Linebarger	Office of Energy and Resource Planning
Brigham Daniels	Office of Energy and Resource Planning
Eric Orton	Committee of Consumer Services
William (Artie) Powell	Division of Public Utilities
Betsy Wolf	SLC Action Program
Kirsten Dyk	Large Customer Group
Rudd Meyer	Land and Water Fund
John Nielsen	Land and Water Fund
Eric Blank	Land and Water Fund
Dr. David Randle	Whale Center
Mark Case	ETC Group
Brian Hedman	PacifiCorp
Bruce Griswold	PacifiCorp
Ellen Eckels	Wasatch Clean Air Coalition

[1] A number of individuals attended meetings on occasion but were not actively involved in the development of issues or reports. Only active participants are included in this list.

	Karl Peterson	Local Customer

B. Task Force Meetings and Conferences: An Overview

The Task Force met on monthly or bimonthly basis as necessary commencing on April 15, 1999 and concluding on December 15, 1999. At the first meeting, three subcommittees were formed to explore issues and secondary meetings were held by these groups. Participating on the Green Pricing Subcommittee were Rich Collins, Jeff Burks, Laura Linebarger, Rudd Meyer, and Brigham Daniels. Jeff Burks, Rich Collins, Laura Linebarger, Jim Galanis, Karl Perterson, and Brian Hedman participated on the Net Metering Subcommittee. The Energy Efficiency Subcommittee participants included Mark Case, Brain Hedman, Laura Linebarger, Jeff Burks, and Rich Collins. A subcommittee on Distributed Generation was also formed at a Task Force meeting held on September 15, 1999. This subcommittee was headed by John Nielsen, with contributions from Brian Hedman, Bruce Griswold, and Jeff Burks. It should be noted that active discussions were held at general Task Force meetings to review work done by individual subcommittees. Thus, every effort was made to produce a document that was both informative and prescriptive for the Commission, while simultaneously representing the various positions of task force participants.

In addition to regular meetings, seminars designed to inform Task Force members about green pricing, net metering, and distributed generation were also held. Blair Swezey, Principal Policy Advisor at the National Renewable Energy Laboratory, Ed Holt, President of Ed Holt and Associates, and Kim Buchanan, PacifiCorp, provided the task force with an information seminar on Green Pricing on June 3, 1999. Blair Swezey's presentation provided an overview of the various green power markets today and current green pricing programs. Generally, there are four different types of green power markets: (1) utility green pricing programs; (2) retail access pilot programs; (3) portfolio choice; and (4) competitive markets.[2]

Ed Holt's presentation focused on ten key factors for a successful green pricing program. He then facilitated a discussion about what type of green pricing program would work for Utah. This discussion was helpful for organizing the Task Force strategy for analyzing the components for a successful green pricing program in Utah. Subsequently, these elements drove the recommendations for green pricing made by this task force.

Kim Buchanan from PacifiCorp presented some information on the Company's experience with green power marketing. PacifiCorp had performed a survey study designed in part to assess customer willingness to pay for green power. According to the survey there are customers in Utah interested in purchasing environmentally friendly power. Kim Buchanan reviewed some of the results of this survey. The assertion by this Task Force that there are customers in Utah who want the choice of participating in a green pricing program is in part based on this study.

[2] The information in this paragraph is an extrapolation from a packet which Mr Swezey prepared for this meeting.

On July 14 and 15 two conferences were organized to address net metering issues.[3] The first conference was designed to provide a technical assessment of the interconnection issues associated with net metering. In particular, the conference focused on inspecting and interconnecting photovoltaic systems (PV). The presentation was made by Bill Brooks, PE, with Photovoltaics for Utility Systems Application. The conference highlighted the need to have appropriate standards for interconnection in order to assure safety and reliability for the system. To do this, both utilities and regulators need to be familiar with the applicable codes and standards for PV systems. Assuring that standards are implemented requires proper testing, including type testing, field testing, and verification. In summary, the presentation highlighted how to deal with code requirements and interconnection problems. A proposal for an inspection checklist was also made.[4] The task force initiated a discussion about the context of this presentation at the meeting held on August 18, 1999, and later more formally addressed these issues in the net metering section of this report.

The purpose of the second conference, held on July 15, 1999 was to provide an overview of the technical and nontechnical requirements for a successful net metering program. The presentation was made by Thomas Starrs, Kelso Starrs and Associates. Mr. Starrs indicated that net metering generally deals with the integration of small-scale renewable energy systems into the utility grid. The discussion centered on PV because currently it is the only renewable alternative that is commercially available for small-scale generation.

Less formal conferences were held on issues of energy efficiency and distributed generation. On October 27, 1999, Bruce Griswold provided an overview of distributed generation resources and issues. On November 19, 1999, Brian Hedman provided the group with an overview of PacifiCorp's current strategy toward energy efficiency and demand side management (DSM) projects both on a Company basis and on a Utah basis. The results of these discussion are included in the corresponding portions of this report.

In summary, this report is the result of a concerted effort on the part of all active Task Force participants. Technical conferences, subcommittee research and analysis, and Task Force discussions all served to provide the necessary background, goals, recommendations, and comments contained in this report.

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[3] Net metering is a program which allows customers to self-generate electricity as an offset to utility-purchased electricity.

[4] A complete copy of the handouts from this meeting is available through Jeff Burks at the Office of Energy and Resource Planning (OERP).

Green Power Subcommittee Report

I. Introduction

This report analyzes the issues associated with implementing a green pricing program for Utah Power's electricity customers. It provides a discussion of green pricing and various green pricing programs, followed by general recommendations for implementing a program in Utah. Case studies are provided to elucidate the characteristics of green pricing programs nationally. This is narrowed to a discussion of the Utah market and accompanied by an analysis of the guidelines for a Utah program.

II. Background Information

The intent of green pricing programs is to facilitate the development of green energy resources. There is some debate over what can be defined as a "green resource." The following discussion highlights the characterizations of "green" and indicates a specific working definition for this report and its subsequent recommendations. Additionally, a clear definition of green pricing is provided to facilitate an understanding of the linkage between the program and new green resources.

A. Green Power

The term *green power* is a name given to electricity that is generated using resources that have a minimum impact on the environment and a term synonymous with renewable energy resources. Electricity generated from renewable energy such as wind, solar and geothermal resources is generally regarded as having the least environmental impact. Biomass plants and hydro-electric resources are also considered to be green power but are viewed as having more environmental impacts than other renewables, though considerably less than coal and oil fired power plants.

Admittedly, *green* is a matter of degree and comparison. However, research for the National Council on Competition in the Electric Industry (NCCEI) and the Electric Power Research Institute has shown that solar and wind are perceived by utility customers to be the most environmentally benign and are the most preferred green power resource.[5] Accordingly, for purposes of this report, the task force has defined *green power* to include those renewable energy resources with the least impact on human health and the environment, i.e. wind, solar, and geothermal.

B. Public Benefits of Green Power

The increased use of green power has direct positive benefits for the environment and the electricity system. For example, Utah's fossil fuel-fired power plants produce approximately

[5] See Wisconsin Market Research Report, page 19

30% of Utah's SO_2 emissions, 40% of Utah's NOx emissions, and significant amounts of toxic metal emissions. Additionally, more than half of Utah's human-caused CO_2 emissions come from generating electricity from fossil fuels.[6] These pollutants contribute to public health problems, visibility degradation, and other impacts to land and water. The environmental impacts associated with fossil fuel production, transportation, and use for power generation are virtually eliminated by generating electricity with renewable energy resources.

Green power also reduces uncertainty and risks by increasing portfolio diversity of generation sources for a utility. Renewable energy resources have no fuel costs, thus reducing the economic risks of rising fuel prices and higher electricity costs. In addition, because they reduce emissions of air pollutants, renewables energy technologies protect the utility and ratepayers against the risk of higher electric rates resulting from more stringent enforcement of environmental regulations. Finally, the modular nature of renewable resources allows the utility to develop generation facilities as needed rather than risk overbuilding.

C. PacifiCorp's Green Power Generation Resources

PacifiCorp has made some investments in green power resources in the past. PacifiCorp's most significant renewable energy investment is its participation in the Wyoming Wind Energy Project.[7] The Wyoming wind energy site is located at Foote Creek Rim, between Laramie and Rawlins. Under current plans the site will be home to 69 wind turbines capable of generating 41 MW of electricity. PacifiCorp owns 33 MW or 80% of the total generation. A portion of this generation will be designated to serve Utah customers.

In addition to its wind power activities, PacifiCorp owns the 24-megawatt Blundell geothermal plant near Milford, Utah and is a participant in the Solar Two Project that has successfully demonstrated the feasibility of molten salt storage in conjunction with central receiver solar generation technology. PacifiCorp also has smaller solar photovoltaic energy projects in Oregon, Wyoming and Utah.

D. "Green Pricing" Defined

Nationally, market research shows that a significant number of consumers would like the option of buying electricity produced from clean, renewable energy. *Green pricing* is a service that gives customers of regulated utilities an opportunity to buy environmentally preferred electricity and support a greater level of investment in renewable energy technologies by allowing the customer to purchase electricity generated from renewable energy resources through direct payments on their monthly utility bills.

Participating customers pay a price premium for a portion of their electricity based on the

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[6] This includes all forms of energy generation.

[7] PacifiCorp owns 80% of the plant. The Eugene Water and Electric Board owns the remaining 20%.

difference between the cost of the incremental least-cost resource in the utility's portfolio and the incremental costs of adding new renewable resources to the portfolio. Customers who chose not to participate are not charged the premium.[8]

A *green pricing* program results in the regulated utility acquiring more renewable energy generation capacity than it otherwise would under its least-cost plan. It also affords customers the opportunity to express their preference for an environmentally preferred electricity product. It should be noted that participants in a green pricing program do not necessarily receive electricity generated from renewable resources. The physics governing the flow of electricity does not allow for such a possibility. However, participants directly contribute to the increased production of environmentally benign electricity and will reap the environmental benefits even though someone else might "consume" the green electrons. The benefits of green pricing program are not confined to participants alone. The utility may also benefit from green pricing through enhanced public perception, improved customer loyalty, and expanded expertise with marketing and developing renewables.

Surveys done by the Edison Electric Institute (EEI) offer some insight on whether offering a *green pricing* service enhances customers perception of the utility. EEI surveyed national attitudes toward utilities in the areas of "traditional service" and "stewardship service". Traditional service was defined as providing reliable power, maintaining low rates, restoring service outages etc. Stewardship service covered areas such as environmental protection, economic development, education and safety programs. The results showed that of the 16 utility duties ranked by customers, environmental protection was ranked higher than everything but reliability, and emergency service repair. EEI's study concluded that "...customers perceptions of stewardship performance have a relatively strong influence on their overall favor ability ratings of the utility".[9]

Different customers want different services. By offering *green pricing* products utilities can help meet customer expectations and increase customer satisfaction and loyalty. Where a utility is faced with retail competition, they can use this not only to retain existing customers, but to attract new customers as well.

Finally, in markets where retail competition has been introduced, green power has proven to be one of the very few products and services offered by utilities and energy service providers

[8] While the higher cost of the renewable energy used to directly serve green pricing participants is not subsidized by non-participating customers, excess green energy generated but not sold to customers in the program may be paid for by all ratepayers. This could be the case if a renewable energy plant is oversized for the initial market demand. Also, some utilities do charge the cost of program administration or marketing to all customers on the theory that it is educational to all customers, and in some cases marketing is charged to shareholders on the rationale that the utility accumulates goodwill and it favorably positions itself for competition.

[9] See the Electric Power Institute, 1997. *Green Power Guidelines: Volume I: Assessing Residential Market Segments* (TR-109192-VI). Palo Alto, CA:EPRI)

that have proven to have customer appeal. For a utility operating in a regulated market, a green pricing program enables a utility to gain pricing and promotional experience with renewables and establish favorable market position in the event retail competition is approved in their service territory.

E. Nationwide Green Pricing Programs

More than 50 utilities in 18 states have either implemented or announced plans to offer a green pricing option to their customers. Established programs report high participant retention rates, which provide program stability and less challenging risk management on behalf of the utility.[10] Several of the utilities offering green pricing options plan to expand their programs in response to consumer demand. Currently, many programs have lists of willing customers waiting to participate as new resources are introduced.[11] Most utilities have focused their marketing efforts on residential users; however, commercial and industrial users are increasingly adding their names to the list of program participants. Customer participation varies nationally but usually is between 1% and 2% of residential users, and less among commercial and industrial users. Although the percentages are modest, customer participation has boosted the use of renewable generation by 55 MW nationwide with an additional 20 MW planned to come online by the end of 1999.

Three types of green pricing programs are currently offered. The most basic is the *Contribution Program*.[12] In such a program, participants can contribute any sum of money, large or small, to a utility's renewable investment fund. The sum donated is not related to their energy consumption.

The second type is the *Energy-based Program*. There are two types of energy-based programs. The first type is referred to as a *block-based program*, and the second is a *percentage-based program*. In the latter case, customers may choose to purchase a percent of their electricity use from green sources. The amount they pay will very directly with the amount of energy they use per month. The block program requires a block purchase, such as 100 kWh blocks of green power, for which they pay a fixed amount per block.

A third type is the *Capacity-based Program*, whereby customers purchase blocks of capacity, usually in increments of 100 Watts, for a fixed cost. Thus, if a utility constructed an 80

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[10] Most programs are fairly new, so long run statistics on retention rates are unavailable. However, a number of program report retention rates around 90 percent after 1 year or more.

[11] This is not meant to suggest that there exists "pent up demand." Rather, it is meant to indicate that once a green offering is made, there have been cases of more individuals willing to participate than the program can provide. This may arise even when the total number of willing participants is low relative to the customer population. A possible explanation is that it takes time to get the new resources online.

[12] Terminology comes from Blair Swezey's Information Brief on Green Power Marketing, 4th edition.

kW photovoltaic system, it would need to find 800 customers willing to pay the extra cost to fully subscribe the project, assuming that each participant purchases just one block. This approach is most often used for photovoltaic facilities in order to make participation more affordable. Table 1 summarizes the strengths and weaknesses of each type of program.

TABLE 1: Strengths and Weaknesses of Different Green Pricing Program Types

Program Type	Strengths	Weaknesses
Contribution Program	•lowest utility risk •customers familiar with donation concept •greatest flexibility in customer premiums •may be tax deductible if structured correctly	•lowest revenue per participant •not a competitive product--doesn't lead to electricity choice •not a good tool for customer retention •flat market penetrations
Energy-Based Program (tariff)	•most like a product--you get what you pay for •educational value of accustoming customers to electricity choice •significant flexibility in premiums using percent or blocks •highest market penetration percent •most programs of this type	•higher risk--utilities must build before they see revenue
Capacity-Based Program (tariff)	•makes PV more affordable •generates highest average premium among the three types	•customers don't relate capacity to energy use •most suitable for PV •utilities must commit to build before billing customers

III. Case Studies

As noted, there are a number of green programs currently in operation around the country. Three of these programs were chosen for the discussion below, because they were among the most successful. Information was attained from the company and program supporters and reflects program attributes which the task force deemed important for review.[13]

A. Wisconsin Electric

Wisconsin Electric (WE), a subsidiary of *Wisconsin Energy Corp*.(WEC), currently operates a green pricing program under its *Energy For Tomorrow™ Renewable Energy Program*

[13] Each of the companies addressed is an investor-owned-utility.

(EFT). WE promotes this voluntary program as a way for their customers to "personally and positively impact the environment by electing to purchase electricity generated from renewable resources."[14] In this context, it is representative of the goals connected to implementing a program in Utah. WEC has testified before the Senate Committee on Environmental and Public Works that this program has been successful in accomplishing the goal of increased use of renewable energy resources.[15]

Product Information

Wisconsin Electric initiated its offering with a "blended" product, initially including hydro and biomass. These resources were purchased from existing out of state facilities, one of which was underutilized and the other of which was "orphaned."[16] Green power premiums helped make the orphaned facility (a wood-waste burning plant with cogeneration capability) economical to operate. These resource choices were opposed by local environmental groups because they did not result in new renewable resources being constructed to displace dirtier plants. Furthermore, they were not built in-state to provide local economic development opportunities.[17]

The conflict was resolved in part when WE agreed to use 80% of the program funds to build new renewable resources. The agreement fostered support among environmental groups because it clearly represented the original goals of the WE's program. Notably, WE built two 660 kW wind turbines in their service territory within two years of initiating the program.

Marketing Information

WE adopted a relatively progressive marketing strategy for their program, disseminating information through pamphlets, bill inserts, direct mailings, newsletters, novelty items, trade shows, telemarketing, public radio, local television advertisements, and local newspapers. The most effective forums have been telemarketing and direct mail. However, public radio is proving to be an effective forum as well.

Premium

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[14]. This was expressed in a brief overview of WE's EFT program which can be found at their website, www.wisconsinelectric.com/pages/eftfaqs.html.

[15] WEC press release Wednesday, June 2, 1999.

[16] An orphaned facility is one that is too expensive to use under current rates and whose production capabilities are likely to be eliminated from the grid.

[17] It is worthy to note that these criticisms were in part generated because WE had openly claimed that participation in EFT would ultimately lead to the displacement of dirtier non-renewable resources. Thus, an early omission of a discussion on the need to rely on existing resources generated some confusion and conflict over the program. It is probable that some contention can be avoided or mitigated when the resource mix is clearly defined as "new" and only new renewables are marketed in the program.

In its early stages, this energy-based program, only allowed residential customers to participate and they had the option of choosing to buy 25%, 50%, or 100% of their power from a renewable source. Purchases from renewable energy providers are then made by the utility which correspond to the level of energy desired. Since its inception, the program has expanded to allow commercial and other utility customers to participate. These customers have the option of purchasing green power as an energy-based percentage or an energy-based block.

Marketing, power acquisition, and other related costs are included in the premium and are not passed on to nonparticipating customers. Commission rules require that at least 80 percent of the premiums collected must be used for green energy acquisition with the remaining percent are used for marketing. Shareholders are responsible for any marketing expenditures exceeding the 20 percent limit. In addition, any unexpected acquisition costs exceeding the premium revenues are passed on to shareholders.

The per kWh charge is equivalent to a 2-cent premium. Residential customers are not required to sign a contract in order participate in the program and can withdraw from the program or change their options at any time. However, industrial and commercial customers are required to sign a one-year contract.

Customer Response

Approximately 11,500 customers have signed up for the green pricing program yielding a participation rate of 1.5 percent for WE residential customers. Participation rates for firm load customers (i.e., commercial and industrial) is still being evaluated. The retention rates for participating customers is currently around 90 percent, with retention largely dependent on: stability of a participant's income, perception that participation is leading to the development of new renewable resources, and reasonableness of the premium (somewhere between $5-10 per month).

Ratemaking Treatment

A large part of the green energy obtained for this program is purchased from third parties. General ratepayers are responsible for only a portion of these expenditures with their share determined by the current avoided costs. The premium above avoided costs are paid entirely by participants. All of these costs and revenues are recorded below the line. WE has purchased two wind turbines and those costs are allowed in rate base with participants covering the full cost of the resource through revenue credit mechanism. We has an energy balancing account for fuel costs and participants in the green pricing program are exempt from such pass-throughs.

B. Public Service Company of Colorado

New Century Energies, Inc. (NEC) was formed August 1, 1997. NEC operates in Colorado as Public Service Company of Colorado (PSCO). NEC was chosen for review because its customers pay some of the lowest energy rates in the region, as do Utah electricity customers. Thus, there may be some similarities in the way customers respond to a green pricing program in the face of low prices.

Low rates can be perceived as either an impediment to successfully implementing a green pricing program or an advantage.[18] Low rates may be an impediment if "green" prices are substantially higher than current electricity prices. However, customers paying low prices may be more willing to accept small increases in their monthly bill for the privilege of purchasing green power. Regardless of perception, PSCO has been relatively successful in implementing its green pricing program.

Product Information

PSCo opted to focus its green pricing program on a single product, wind. Coloradans have the opportunity to buy wind-generated electricity through PSCo *Wind*source program. *Wind*source is an environmentally sound energy choice that lets consumers buy all or part of their electricity from a wind farm in northeastern Colorado.

Marketing Information

PSCo used a variety of methods to advertise its program. Traditional marketing methods include: direct mail, placements on public television, and one bill stuffer; additionally, radio ads were utilized, a single newspaper print ad was placed and information and sign-up appears in the monthly PSCo newsletter which circulates every several months. PSCo has also produced two articles, a year apart, which were printed in the newsletter for "Great Outdoors Colorado," a non-profit organization. PSCo also made arrangements with channel 9, a local TV station, to install a solar powered "wind cam" at the wind site to show pictures of the turbines during the weather segment of the nightly news.[19] PSCo has additionally used local events, such as the Denver Parade of homes, press events at the wind site, and window stickers for businesses and residential customers. Finally, PSCo established a marketing advisory board fulfilling their agreement to work with environmental and community groups on the marketing.[20] In general, PSCo has been very aggressive in its marketing efforts.

Premium

Residential customers buy wind energy for their homes in "blocks" on a monthly basis. One block represents 100 kilowatt-hours of electricity and costs $ 2.50 a month. PSCO indicates that this is approximately one-sixth of the average household's monthly electricity use. Extrapolating, this implies an average household using 600 kilowatt-hours of electricity a month can expect to pay $15.00 above existing rates if it chooses to buy all its electricity from *Wind*source.

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[18] Rate differentials may not be the best indicator of whether or not a program will be successful. A better indicator, or starting point, may be to consider demographics.

[19] The wind cam was paid for by PSCo.

[20] The Land and Water Fund has been particularly involved in educating the public about PSCo's green pricing program.

Colorado companies can also participate in *Wind*source. Business, industrial, or governmental electric customers have the option of purchasing *Wind*source as "Leaders," or "Supporters." Leaders choose to buy wind energy in an amount that matches their total electric consumption for one building or one activity. Supporters subscribe in a manner similar to residential customers, buying 100-kilowatt-hour blocks of wind energy on a monthly basis. Business customers are asked to commit to *Wind*source for at least three years.

Customer Response

To date, PSCo customers have responded well to wind power. *Since Wind*source was introduced in March 1997 more than 14,500 customers have signed up, including more than 250 businesses. The average purchase for a household has been about 1.5 blocks.

Ratemaking Treatment

The Public Service Company of Colorado's Green Pricing product is treated for ratemaking purposes as an unregulated tariffed offering. All costs and revenues are reported below the line. The premium itself is not cost-based but was agreed to by parties in a settlement. The premium is 2.5 cents per kWh. There was no explicit agreement on how much marketing is to be done or what percentage of the revenues collected should be used for marketing. The Company is required to supply all kWh contracted for by participants and are responsible for any cost overruns over the 2.5 cent premium. The Commission staff has full audit rights to the Company's records and accounts of this program. Recognizing that the vagaries of wind power production might create a mismatch between output and sales, the Company is given a two year period to balance the two. In addition, participants are insulated from the risk of variation in fuel prices by exempting them from the fuel adjustment proceedings.

C. Case Study: Madison Gas & Electric

Madison Gas and Electric (MGE) is an investor-owned public utility located in Madison, Wisconsin. MGE generates, transmits and distributes electricity to almost 132,000 customers in a 250-square-mile area in Dane County. The population in this area totals 263,000. Thus, MGE is a major provider in the region with its green offering available to a vast majority of the customers in the area.

Product Information

In October 1997 MGE filed a petition with the Wisconsin Public Service Commission to implement a green pricing program. The petition resulted in the Commission's approval to purchase and build seventeen 660 kW wind turbines outside of its service territory, but inside Wisconsin. A location inside the service territory would have been preferred; however, MGE wanted to take advantage of sustained wind speeds that do not exist inside its territory. It took roughly a year-and-a-half from the time MGE petitioned for the green pricing tariff until the

turbines produced power. Additionally, MGE has promised to build more renewable projects as customer response warrants program expansion.

Marketing Information

MGE's marketing effort is split into two parts: education and solicitation. To educate its customers, MGE worked closely with several environmental groups in holding public forums and speaking to consumer groups. Environmental groups featured the projects in their newsletters, and the general public was exposed to the program through newspaper articles, bill inserts, and advertising. MGE found that direct mailings were the most successful method of soliciting customers. However, it is noteworthy that a good deal of educational outreach was necessary to prompt customers to respond.

Premium

After some consumer research, MGE determined that residential customers were most likely to participate in a program if costs were $10 per month or less. With this information, MGE decided upon selling its green power in $5 increments. In this program, a $5 premium buys customers a 150 kWh block of energy. Additionally, customers can opt to buy the equivalent of 100% of their power usage. Commercial and industrial users can participate in the program in two ways. First, the minimum participation in the program is the greater of 5% of their energy load or $15. Second, commercial and industrial users can be identified as program "leaders" for a more significant contribution. The minimum amount is $150 per month, however, some smaller users can enter this category with a more modest contribution.

All customers are free to withdraw or change their participation rate at anytime. In turn, if all the power is not sold in the green pricing program, ratepayers assume the risk of the project. If the program falls short of its projected potential, energy not purchased through the program will be incorporated into the general rate.

Customer Response

This program has been met with enthusiasm among consumers, 5142 residential customers and 96 commercial or industrial customers have signed up, representing 4.8 percent and 1 percent of all customers respectively. Not only is this the highest market penetration achieved by a utility program to date, but it is also remarkable for the short time (about six months) in which it was achieved. The program is fully subscribed with 8.22 Mws of wind resources acquired. Greater participation is expected with the Company contemplating a variety of acquisition options for more green power. Retention rates have not been estimated given the program's brief existence.

Ratemaking Treatment

The premium for green energy was calculated by first estimating the average total costs

of the providing wind energy over a ten year period and then subtracting the avoided cost of new generation (the cost of a combined cycle combustion gas turbine was used as surrogate for avoided cost). Program participants are responsible for the entire incremental costs of the program including marketing costs. The costs of the program are included in the calculation of revenue requirement, with the associated revenues used as a revenue credit. If annual revenues are greater than annual costs of the program then participants receive a credit on their bills. If revenues are less than costs then the Company can request an adjustment to the premium. The price change will be effectuated by adjusting the kWh in each $5.00 block.

IV. Elements of Successful Program

The task force has identified seven areas which tend to generate successful green pricing programs. The following is a discussion of the recommended criteria and their accompanying benefits for implementing a successful *green pricing* program in PacifiCorp's Utah service territory.

A. Streamlined Offering

Electricity is a complex phenomenon. Since many of Utah's electricity users are unfamiliar with the current processes and resources used to produce electricity, it would be wise to begin with a simple program that is easy to understand, with known resources in a tangible, disclosed location. The simplest type of offering would be one that is initiated with a single resource and associated premium that is block-based.

B. Participation Premium

Green pricing programs are based on voluntary participation where one is willing to pay a premium for electricity produced from renewable resources. A premium is required because electricity from renewable resources is more expensive than from other more conventional sources. The size of the premium and how it is administered are policy decisions. Many ague that the premium should be cost-based and should reflect the differential in production costs between conventional resources and renewable resources. Others argue for a broader definition of cost-based which includes but is not limited to marketing and educational costs. Still others argue that the premium could be determined by customers willingness to pay and need not be cost-based. Since all electricity users may benefit from green power through higher air quality or improvements to the grid, it can be argued that all users should contribute, particularly for educational and marketing expenses. A majority of the task force is in favor of a cost-based premium where marketing and educational expenses are shared between participants, other ratepayers and shareholders. The mechanism for collecting the premium is discussed in Section D below.

C. New Resources

Though many may participate in a program in which existing renewables are offered in a

green pricing package, the task force believes that new renewable resources should be offered to ensure that consumers are not paying a premium for something that may already be included in rates. Without new green power resources, increases in air quality and system improvements are not realized. For the same reason, the resources should be available before customers begin to pay for green power. However, it is prudent to allow, and even encourage, utilities to make an effort to begin marketing its program and sign up customers before the new resource goes on line.

D. Capacity-based or Energy-based Program

There are two basic ways for the utility to charge green pricing program participants. Empirical evidence suggest that green pricing programs work best when pricing is tied directly to use, therefore, energy-based mechanisms are generally preferred to capacity-based mechanisms. Of the two types of energy-based pricing mechanisms, research indicates that the block-based as opposed to the percentage-based programs are most successful. Block-based pricing may be preferred because participants know exactly how much additional cost is incurred each month. Under a percentage- based system, the additional monthly cost depends on energy usage. In general, the simpler the pricing mechanism, the less costly the education process for potential participants. For these reasons a block-based energy premium is preferred.

E. Marketing

One of the most significant hurdles is that of educating potential participants. Customers should be aware of the generating sources for their electricity and their associated environmental impacts. Certainly, the utility can help in the education process through traditional methods (e.g., bill stuffers, direct mailings, and advertising). Certain methods will be more costly than others. However, utilities may offset some of these costs through utilizing free media opportunities, environmental partnerships, and community-based marketing.[21] These approaches also serve to increase the public perception of the program's legitimacy.[22]

F. Consumer Education

Consumer education is a critical element of success. People need to understand the environmental and economic benefits and costs of green power with respect to the current power mix. Additionally, consumers need to understand that participation in the green pricing program does not affect the reliability of their power supply.

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[21] "Community-based marketing" is a grass-roots effort by nonprofit and government organizations to supplement the utility's marketing through helping to identify key market segments, adding credibility through endorsements, and using relatively inexpensive forms of outreach. It is possible that community-based marketing activities may be subsidized through government and charitable grants.

[22] Ratepayer funding may also be appropriate to the extent that some marketing costs result in education, a public benefit. Shareholder responsibility is also valid to the extent that there are benefits of "goodwill."

G. Entry and Exit Terms

Generally, it is expected that customers prefer a program with a readily accessible method of "sign-up." For example, an Internet sign-up option or a bill insert would provide easy access for customers interested in participating in the program. Easy "entry" should be accompanied by easy "exit." Residential program participants should not be bound to the program and should be allowed to leave the program at any time. Industrial and commercial customers may be required to commit to a minimum contract to protect the utility and its ratepayers from over subscription. [23]

V. Policy Issues

A. Why Green Pricing in Utah?

Implementing a *green pricing* program in Utah could accomplish a number of goals, both public and private. Recent surveys suggest that Utah consumers would like the option of purchasing green power. PacifiCorp's February 1999 survey indicates that about three-quarters of PacifiCorp customers want the Company to provide environmentally-friendly power. About one-third of customers indicated they would pay a 20% premium for a 100% renewable offering. A *green pricing* program would give customers the choice of being able to choose an environmentally preferred electricity product generated from renewable resources. The resulting resource diversity of the utility's generation portfolio would provide benefits to the utility, and the emissions reduction would provide for a cleaner environment that would benefit the general population of Utah and the region.

An example of a possible benefit from implementing a "green tariff in PacifiCorp's Utah service territory would be the reduction of air pollutants associated with regional haze. Electric power generation using "coal-fired" generation technologies have historically been a primary source of haze causing emissions in Utah and the Grand Canyon Visibility Transport Region (Transport Region). The United States' Environmental Protection Agency (EPA) has issued a new rule for reducing haze in national parks and wilderness areas in the ten state Transport Region.[24] The rule explicitly recognizes the contribution renewable energy and energy efficiency can make to reducing haze-causing emissions. Under Section 309 (d) (8) of the regional haze rule, Utah's state implementation plan (SIP) is required to include programs and strategies to expand efforts to increase energy conservation and demonstrate progress towards achieving the Grand Canyon Visibility Transport Commission's (GCVTC) renewable energy goal. The GCVTC goal requires each state in the region to implement policies and programs that

[23] It should be noted that ease of exit potentially places the Company at greater risk in terms of recovering the costs of the program. Some balancing of the associated risk may be necessary.

[24] This mandate was issued by the EPA on April 22, 1999. The action on this day specifically addressed the need to reduce regional haze.

will contribute to renewable energy development and "...that renewable energy comprise 10 percent of the regional power needs by 2005 and 20 percent by 2015". By implementing a *green pricing* program, the state of Utah will be able to take credit under the SIP for reducing haze causing emissions and contributing to the GCVTC renewable energy goal.

B. Cost Allocation and Risks

There are risks associated with implementing a green pricing program. Specifically, if the program requires new renewable resources, the utility accepts a certain degree of risk when it contracts for the new resources. In particular, the expectation is that the utility incurs expenses to build or purchase new green power and additional expenses to market the program. This generally occurs prior to customer participation in order to ensure immediate availability. This puts the utility at risk for recovery of these costs. If the program is under-subscribed or not economically viable, the company will have a resource in its portfolio mix which is not supported by the market. In a regulated environment, a decision about the recovery for under-subscribed costs will be required. In a restructured environment, the risk would either fall on the company or become part of the stranded cost debate.[25] Thus, although the initial risk accrues primarily to the company, all customers face potential long-run risks.

C. Willingness-to-Pay and Willingness-to-Pay Gaps

For years, surveys have demonstrated strong public support for renewable energy.[26] Respondents indicate a "willingness to pay more" to receive environmental benefits. For green pricing this implies that customers are willing to pay a premium to receive their electricity, all or in part, from renewable resources. Further extrapolation would imply that customers would reveal this preference if the option was presented to them. However, this has not been the case in practice. There appears to be a gap between what customers express as preferences in a survey and actual participation rates. This is a classic economic problem associated with goods that have public good attributes and is known as the free rider problem. Public goods have two unique attributes that are lacking in traditional or private goods. The first attribute is known as non-rivalrous consumption, that is one person's enjoyment or consumption of the public good does not preclude another from enjoying or consuming that good. Clean air is a public good that exhibits non-rivalrous consumption, all consumers can enjoy the benefits of clean air without diminishing another's enjoyment.

The second attribute of public goods is that they are non-exclusive, that is once the public

[25] Allocating all the risks of a new resource to shareholders has drawbacks. Namely, it is likely that the utility will be much more conservative in building new resources and thereby under supply the resources relative to the total number of consumers that express interest in the program. This is something that needs be to resolved.

[26] Such surveys are analogous to the survey recently performed by PacifiCorp which indicated support for green power in Utah.

good is provided it is difficult or very expensive to preclude others from consuming and enjoying it. Again, clean air is a good example, once policies are taken to reduce emissions, it is nearly impossible to exclude consumers from the benefits of the cleaner air. Thus, individuals who do not pay for green resources still enjoy the benefits of cleaner air and less environmental degradation.

This gap between expressed and actual willingness to pay is simply referred to as a *willingness-to-pay gap.* The gap between expressed and revealed preferences may occur for a number of reasons besides the free rider problem. Some additional explanations are (1) customers renege when actually faced with higher prices; (2) they may be poorly informed about options; (3) or they may not understand the options. In part to remedy this gap, programs offering green power should be simple. An easily understood program will facilitate both community education and marketing and increase "option awareness." The percentage of customers actually participating in the program will most likely increase if consumers are adequately educated about their options even in the face of higher prices.

D. Risk Mitigation and Insurance Strategies

Few green pricing programs have been designed to combat the free rider problem. During Task Force meetings, strategies were discussed to provide direct and exclusive benefits to participants to increase their incentives to participate. One suggested strategy mitigates the price risk associated with fossil fuels. Although fossil fuels are currently a cheap energy source, future environmental regulations could make them more expensive. Global warming concerns or other environmental degradation could bring about severe restrictions on fossil fuel use. A green pricing program could insulate participants from such risk by allowing customers to purchase green power at a contracted cost-based rate. For example, if a participant purchased two hundred kWh blocks of power from renewable resources at $.05 per kWh, then she would be assured that she could receive the same block of power at that rate even when retail prices rose above that rate. This is analogous to an insurance policy where one pays a premium to be insulated from some risk. In this case, the premium is the higher rate paid for the renewable resource which protects one from the risk of higher retail rates due to environmental restrictions on base-load fossil-fuel generation facilities.

The exact mechanics of the program have yet to be worked out. Much would depend on whether the generation market remains regulated or becomes competitive. Under a regulatory regime, the benefits of this insurance program would be more pronounced as there would be a mechanism for cost recovery of higher priced fossil fuel generated electricity. Under a competitive generation environment, the price of electricity will be determined by the marginal cost of generation, which may be higher or lower than the renewable resource's cost. Regardless, participation in the green pricing program would give participants a right to enjoy the benefits of a lower cost resource. There are various ways to structure this "right" to the renewable resource. A consumer may be granted the right to enjoy the lower costs over the

entire life of the renewable resource asset or it could be prorated based on length of the contract or the length of participation. For example, three years of participation would provide an additional three years (or some multiple) of the lower costs associated with that asset. Such programs would give participants a "selfish" rationale to join and could increase participation rates.

E. Competitive Considerations

Green pricing programs may provide a competitive advantage to participating utilities in managing renewable resources after restructuring. Green pricing programs under regulation provide the incumbent utilities with the opportunity to construct and own renewable resources that are funded primarily from participating ratepayers. This experience in renewable resource management and the unique source of funding may disadvantage potential entrants because the incumbent utilities renewable resources are already constructed. This advantage is exacerbated if the incumbent utilities gain exclusive ownership rights to the renewable resources after restructuring.

F. Expansion of Resources and Programs

Many programs such as Public Service of Colorado have restricted the choice for Green Pricing to one renewable resource. However, to maximize participation and associated benefits of renewable resources other renewable choices should be provided to Utah customers. In particular, a solar option should be offered to both grid-connected and off-grid customers. Sites more than one mile from the grid can often be provided cost-effective electricity service using photovoltaics. However, the high costs of installing photovoltaics on homes and businesses connected to the grid would require a high premium. To counter the high costs, the program could be melded with a net metering program. A green pricing program could help subsidize the installation of photovoltaic systems on private or public property. One particularly promising proposal would put photo voltaic systems on public school roof tops, with the capital costs paid by green pricing participants. This program could be tied with a net meeting program that would allow the school to save money on its electricity use. The savings would then go to the school for additional teachers or supplies. This would create a powerful incentive for parents to participate in the program for their local school. A similar program could be devised for private residences.

G. Ratemaking Treatment

The exact rate making treatment for a green pricing program was not fully analyzed, but a variety of options appear to be available. The first option would record all expenditures and revenues below the line, much like the treatment accorded Public Service of Colorado. The risk of an under subscribed program would rest with stockholders. A second option would treat all expenses and investments associated with the program as any other capacity addition and treat the revenues collected from the premiums as a revenue credit against general revenue

requirement. This would put the risk of a under subscribed program on general ratepayers. A third option would be to treat the cost of the program as a hybrid of the two previous options. Avoided costs calculations could be used to divide the costs of the program into two components. The first component, representing the Company's least cost generation alternative, would be included in revenue requirement and given traditional rate making. The second component is the incremental cost of renewables above avoided costs and that would be accorded below the line treatment. This insulates general ratepayer from the risk of the program yet mitigates the risk born by the utility. A fourth option would be to handle costs and revenues of the program through an energy balancing account. This would require the Commission instituting an energy balancing account, something that was eliminated almost a decade ago.

The most promising treatment appears to be the third option. It could be instituted fairly easily. The Company could sign up participants until it had enough to meet the capacity of a renewable resource plant. The Company would then build the plant and begin charging customers the premium. The rate treatment would occur in a rate case. Most Task Force members agreed that participants should pay the additional costs of the renewable resource, but all ratepayers should pay the costs of the resource associated with a least cost alternative. This would require that the Company divide the cost of the wind turbine into rate based cost, the cost of its least cost alternative generation source and the additional or premium cost of the renewable resource. An estimate of the least cost alternative could be obtained from the Company's Integrated Resource Plan. Under this scenario, costs would officially enter rates under a rate case. Rate making treatment of the revenues collected by the Company prior to the rate case could be determined in the next rate case. Marketing cost should be decided before implementing the program and could be shared between participants, general ratepayers and shareholders.

VI. Recommendations

Recommendations from the *Energy Efficiency and Renewable Energy Task Force* (Task Force) are not intended to represent a binding agreement between all parties participating in this task force. Differences arising in terms of the following recommendations are duly noted in the appendix to this report. It should also be noted that the recommendations of this task force are meant to be informative and follow from a literature review, task force sponsored workshops, discussions with experts and between members, and the indicated elements of a successful program as noted above. The Task Force recommends:

- A *green pricing* program should be implemented in PacifiCorp's Utah service territory and offered to all customer classes. The program will be will designed, properly marketed, adequately supported and sustained over a period of several years.
- The initial *green* resource offered by PacifiCorp be the most cost-effective renewable resource, preliminary studies indicate that this may be wind.
- Only *new* renewable resources should be offered as part of PacifiCorp's *green pricing*

product.

- The *green pricing* offer be an energy-based program allowing customers to purchase kWh blocks at a fixed price.
- Blocks must be 100% *new renewable energy* with a minimum block size of 100 of kWh.
- The premium price paid by customers should be based on the difference between the cost of the utility's incremental least-cost resource and the costs of adding new renewable resources to the generation portfolio.
- Customers who chose not to participate are not charged the incremental costs of providing green power.
- A visible public education campaign be undertaken as a collaborative effort between the company, non-utility consumers and environmental interests who support the creation of a green pricing.
- A solar PV product for both grid-connected and off-grid customers should be incorporated as a pilot program by PacifiCorp. For grid-connected customers, the program should be melded with a net metering program.
- PacifiCorp should consider offering participants in the *green pricing* program "insurance" against future rate increases that result from fossil fuel price adjustments or costs of environmental compliance.
- PacifiCorp attempt to comply with the accreditation guidelines developed by the California's Center for Resource Solutions.

A. Discussion

The *Energy Efficiency and Renewable Energy Task Force* (Task Force) acknowledges the direct public benefits to the environment and electric system of utility investments in renewable energy. In order to expand markets and improve consumer confidence in renewable-based electricity products offered in Utah's regulated utility market it is the recommendation of the Task Force that a *green pricing program* be implemented in PacifiCorp's Utah service territory. Introducing a new type of product requires time to penetrate consumer awareness and understanding. The Task Force supports a well-designed *green pricing* product that is properly marketed, adequately supported and sustained over a period of several years that will be offered to all customer classes and regions in PacifiCorp's Utah service territory..

The Task Force recognizes that electricity is a complex phenomenon and that many of Utah's electricity consumers are unfamiliar with the current processes and resources used to supply electricity to end users. Accordingly, the Task Force recommends any *green pricing* product offering implemented in PacifiCorp's service territory be simple, easy to understand, and offer a tangible renewable energy resource from disclosed locations. In addition, methods for sign-up should be accessible through a number of mechanisms including options for internet

sign-up, direct mail enrollment, phone sign-up at PacifiCorp business centers, and use of special events or locations for targeted, in-person enrollment such as health food stores or conferences. Easy "entry" should be accompanied by easy "exit." Those participating in the program should be allowed to leave the program at any time.[27]

Only *new* renewable resources be offered in PacifiCorp's of *green pricing* program. *New* renewable energy supply is defined as electricity generated from new renewable energy capacity that has been built as a direct result of new demand created by the *green pricing* program. Survey's indicate customers consider wind and solar energy to be the most preferred 'green power" resources. Selecting and packaging *new* wind and/or solar energy will increase the attractiveness of the green offering and likely result in higher participation in the program from PacifiCorp's Utah customers. Moreover, limiting the green product offering to *new* resources, ensures public benefits associated with improvements in air quality and system improvements will be realized.

The Task Force favors an energy-based *green pricing* program allowing customers to purchase kWh blocks at a fixed price. Blocks must be 100% *new renewable energy* with a minimum block size of 100 of kWh. Research indicates that programs which allow the purchase of blocks of energy are most successful and that customers who have the option of purchasing wind power are more likely to participate when they have a choice in selecting the amount they can purchase.[28]

In general, the premium should not exceed direct program costs (excluding marketing costs as discussed below under *Marketing)* plus overhead. The premium should be based on the incremental costs of providing the green resource.[29] Customers should not be charged for the costs of green power until *new* renewable resources required to support the product are available to supply power and operational. In no case should the incremental costs of the energy capacity used for the green pricing program be allocated to customers who are non participants.

Many consumers still view electricity as a commodity where price is the only dimension. Successful marketing of green power may hinge on bundling other attractive, value-added products and services. For example, an energy efficiency program marketed as part of PacifiCorp's green tariff is an added-value product that could attract more participation,

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[27] It should be noted that ease of exit potentially places the Company at greater risk in terms of recovering the costs of the program. Some balancing of the associated risk may be necessary.

[28] "Marketing Green Power: Review of Recent Developments," (June 1999), Prepared by, Bentham Paulos, PaulosAnalysis, for *Energy Center of Wisconsin*, www.ecw.org.

[29] As long as the electricity market is characterized by a regulated monopoly and there is no competition among suppliers, the incremental-cost based premium is appropriate. Generally, customers are willing to pay between $5 and $15 a month over their current rates to receive their electricity form green resources.

especially from commercial customers. The money customers save by implementing energy efficiency improvements could be used to offset the higher "premium" customers will pay by purchasing renewable energy. For those customers who are sensitive to higher electricity bills, coupling and energy efficiency program with the green electricity product could increase participation rates. Two utilities in the U.S. have taken this approach and the Task Force sees an advantage for both customers and PacifiCorp by offering this value-added product.

While the Task Force members believe wind is likely to be the renewable energy resource of choice for an initial PacifiCorp sponsored *green pricing* program, most agree other "green" product choices should eventually be offered. In all likelihood a wind resource marketed to customers of PacifiCorp's *green pricing* program will come from their project at Foote Creek , Wyoming. Offering a solar "green" product specifically targeting sites and customers in Utah could be justified on the grounds that it adds tangibility and visibility to the whole "green power marketing effort. One particularly promising proposal would put photovoltaic systems on public school roof tops, with the capital costs paid by green pricing participants. This program could be tied with a net meeting program that would allow the school to save money on its electricity use. The savings would then go to the school for additional teachers or supplies. This would create a powerful incentive for parents to participate in the program for their local school. A similar program could be devised for private residences.

A majority of the Task Force is in favor of a marketing effort where marketing and educational expenses are shared between participants, other ratepayers and shareholders. All new products must be heavily marketed and promoted to inform consumers of the products existence and benefits. Since all electricity users will benefit if increased green power resources lead to higher air quality or improvements to the risk position of the utilities portfolio, arguments can easily be made that all users should contribute to securing green power. To the extent, however, that benefits accrue to non-program participants (such as other ratepayers or the company offering the product), it is appropriate for some of the program costs to be borne by these parties.[30] At the same time green marketing costs should not place an undue burden on non-participants. One of the opportunities available to the company for sharing marketing expenses is through community-based marketing.[31]

The Task Force supports a visible public education campaign that compliments to marketing efforts of the company as a means of to increase customer awareness and confidence

[30] On this basis, the $5 per 100-kWh suggested by PacifiCorp may be too high.

[31] Community-based marketing" is a grass-roots effort by nonprofit and government organizations to supplement the utility's marketing through helping to identify key market segments, adding credibility through endorsements, and using relatively inexpensive forms of outreach. It is possible that community-based marketing activities may be sponsored through state and federal government programs and foundation grants.

in the program and the green power resource. This public information campaign should be undertaken as a collaborative effort between the company, the Utah Office of Energy and Resource Planning, and the Land and Water Fund of the Rockies with all parties working together to consider the most effective means of providing clear information about renewable energy and the program.

The Task Force supports formation of a stakeholder committee to collaborate with PacifiCorp in the implementation of the green pricing product to improve customer confidence, promote interest and increase program effectiveness. The committee should represent a mix of non-utility consumers and environmental interests who support the creation of a green pricing by PacifiCorp. The prime responsibility is to consult on added-value products the utility could offer in conjunction with a *green pricing* offering, suggest marketing strategies to increase effectiveness and ensure the marketing message about renewables is responsive to Utah customers environmental concerns.

NET METERING SUBCOMMITTEE REPORT

I. Introduction

The following report is designed to explain the concept of **net metering**, describe current net metering programs, and analyze the technical and policy issues involved in implementing a net metering program in Utah for PacifiCorp customers. All aspects of this report are based on the fulfillment of the PSC mandate in Docket No. 97-035-01. The opinions expressed in this report are not representative of all task force members. Separate comments are included in Appendix B.

II An Overview of Net Metering

The following section defines net metering, highlights the goals of net metering, and introduces the spectrum of policy implications associate with net metering programs.

A. What is Net Metering?

Net metering allows users of electricity to reduce their electric bills by generating power using *on-site* energy generating systems.[32] Predominantly, the source of power is environmentally benign such as solar photovoltaic (PV) systems or wind energy systems (discussed below). Generally, net metering programs are offered to residential customers and small commercial customers (100 kW is considered the upper limit of what is termed small). Under net metering, customers have the opportunity to reduce their purchase of utility-generated electricity and run their electric meters backward when their renewable generation is greater than their on-site usage. Essentially, the customer is feeding any extra electricity (beyond what is needed for the customer to meet its own needs) back to the utility. The extra electricity is then credited, or off-set, against the electricity delivered from the utility to the customer at other times during the billing period. This allows the customer to obtain the full benefits of renewable energy generation regardless of whether the customer is using electricity at the same time the system is generating power.

B. How Does Net Metering Work?

Net metering is relatively simple. At the end of a billing period, if a customer uses more electricity than the facility generates, the customer pays the utility for the net kilowatt hours used at the regular retail rate. If customers generate more power than used on-site, the utility either pays the customer for the net kilowatt hours produced, usually at the wholesale power rate (i.e.,

[32] The term *net metering* actually means to measure the difference between the electricity supplied to a customer-generator and the electricity generated by a customer-generator that is delivered to a local distribution system at the same point of interconnection during an applicable billing cycle.

the "avoided cost" rate), or carries forward the net amount into the next billing period, or does not compensate the household. Regardless, the household benefits because they can offset their on-site energy usage with self-generated power that is credited at retail rates.

C. Goals of Net Metering

Many believe that the primary benefit of a net metering program is the private investment in environmentally benign electric generation. The first goal, therefore, should be the encouragement of direct investment in small-scale renewable energy systems which enhance both private and public benefits. Net metering programs are simple, low-cost and easily administered. Net metering increases the value of self-generation by allowing the customer to use the utility system as a "bank" for its energy production. The ability to bank energy provides greater flexibility to the energy producing customer. Consumption need not simultaneously match production for the consumer to gain full advantage of their self-generation capabilities. Net metering also eliminates the need to invest in expensive storage devices (batteries). Such considerations lower the economic threshold for investment in self-generation facilities. Furthermore, the relative simplicity of net metering lowers administration costs of self generation and requires minimal regulatory interaction or program supervision.

The second goal of a net metering program should be to minimize any adverse impacts on non-participating customers. While the program should encourage participation, it must protect the interests of others. Correspondingly, limits may need to be placed on overall customer participation in order to protect the utility and nonparticipating customers from certain financial risks (discussed in more detail later in this report).[33] Certain interconnection standards will be required to ensure safety on the grid, but the limits should not be so exacting as to discourage customer involvement in the program. Additionally, the contract which establishes the relationship between the utility and customer should be "user-friendly." Complicated contractual arrangements may pose a barrier to participation. Without active customer participation, the enhanced private and social benefits of net metering cannot be realized.

D. Common Net Metering Concerns

Some have objected to net metering on the grounds that it imposes financial impacts on utilities and nonparticipating customers. The expense of metering hardware, interconnection costs, and reliability issues may need to be recovered through general rates or these costs may pose financial complications for the utility. It should also be noted that some additional impacts of net metering for the utility may be hard to quantify. Many of these concerns can be ameliorated either in terms of policy implementation or benefit-offset issues which are discussed in greater detail in the *Policy* section of this report. Net metering facilities are a form of distributed generation, and distributed generation has been shown to result in benefits such as

[33] This is not meant to suggest that the primary objective of a net metering program is to protect the utility. In fact, in a deregulated environment, the consumer and all relevant parties would require protection from certain risks.

improved peak load reliability, environmental improvements, distribution diversity, and fuel diversity. While these benefits are also difficult to quantify, they should not be ignored.

An additional concern which often arises over net metering is that it can potentially result in cost-shifting among residential customers. In essence, the utility is required to credit energy from the net metered customer at retail rates which could otherwise be purchased from the market at wholesale rates. This could increase the utility's energy portfolio costs, thus, the utility may need to pursue rate increases to cover these additional costs.[34] A popular response to this concern is to highlight the overall social value of a cleaner environment and increased investment in renewable energy systems. Furthermore, rate increases are not necessarily a direct result of net metering programs for two reasons. First, the scope of net metering programs can be narrowly tailored (by limiting the overall generating capacity eligible for net metering, or by limiting eligibility by technology, system size, customer class, or other criteria). Second, net metering can lower metering and administrative costs for the utility by eliminating the need to separately track, and account for, the electricity delivered from the customer to the utility grid. The *Policy* section of this report will provide an analysis of the components of a successful program which provides insulation from risk for both the customer and the utility.

III. State Experience

Many other states have adopted net metering programs. A synopsis of the attributes and success of various policies is contained in the following section.

A. Authority

To date, 30 states sponsor net metering programs. Nearly a quarter were enacted in the decade following the 1978 Public Utilities Regulatory Policy Act, (PURPA), legislation largely credited with opening the market to small-scale generation. The rest of the state programs have been initiated since 1990.

On a state-by-state basis, net metering programs are implemented through either public or private initiatives. Public initiatives include state laws or public utility commission (PUC) orders while private initiatives, usually in the form of tariffs, are sponsored by investor-owned utilities (IOUs). In all cases, state laws represent a legislative "umbrella" and encompass all utilities (public or IOU).

In most states with net metering, programs have been authorized under the direct jurisdiction of the public utility commissions. In other states, either explicit state legislation or hybrid PUC-state legislation provide the authority to institute net metering programs. In a few states the utility has initiated the request for approving a net metering tariff. Table 1 provides a

[34] This would likely only occur in the event that there were a large number of participating customers. With only a few participants, impacts on costs would likely be negligible.

statewide summary of net metering programs and comparative features.

B. Pricing Policies

To date, the net metering programs have adopted a wide variety of pricing policies for excess generation. Roughly a third require utilities to purchase excess generation at avoided cost, not unlike the terms for PURPA-defined Qualifying Facilities (QFs). An equal percent allow for monthly "carry overs" whereby excess generation in one month is carried over as credit to the next month. Still, another third grants no remuneration for any net excess generation delivered to the utility over a billing cycle.

Of note, only three states require utilities to purchase excess power at retail prices. Both Minnesota and Wisconsin purchase net generation at retail rates for specific customer classes. The Wisconsin program, however, stipulates that only generation from renewables will be purchased. Minnesota, in contrast, will buy excess generation from renewable or cogeneration facilities at an average retail rate.[35]

C. Eligibility

The net metering programs currently in place impose well-defined criteria for eligibility. Aside from meeting standards of safety and reliability, net metering customers are limited in participation according to system resource type, customer base, and/or capacity.

Resource Type

All 30 states with net metering programs make at least some renewable energy resources eligible to participate. Two states (Maryland and New York) strictly limit participation to solar energy systems, while another three states (California, Illinois, and Nevada) limit eligibility to solar and wind energy. Another four states (Montana, New Hampshire, Virginia, and Washington) add hydropower to the eligible resource list. Nine states, paralleling the requirements for "Qualifying Facilities" under PURPA, make all renewable resources and cogeneration systems eligible. Most recently Ohio, Oregon, Rhode Island, and Vermont have made fuel cells eligible for net metering. Only Colorado and Wisconsin make all resources eligible for net metering.

Customer Base

By and large, current net metering programs are quite liberal in extending eligibility to different class of electricity customers. In nearly three of four programs, all customer classes are allowed to participate. California, Maryland and New York limit their programs to residential customers only, while California, Idaho and Vermont (which also includes agricultural

[35] New Mexico has a new legislative policy which allows the utility to choose retail rates or avoided cost..

customers) include both residential and commercial customers.

System Size Limits

States with net metering programs tend to place upper limits on the capacity or size of individual generators. Just under a quarter of the states limit all generation at or below 10 kW peak generating capacity. Three-fourths of the states place upper limits on capacity at10 kW to 100 kW on individual generation. The states are more or less evenly divided within the size ranges: 15-25 kW, 40-50 kW, and 60-100 kW.

Several states place more complex restrictions on allowed capacity. Connecticut, for example, imposes a 50-kW ceiling on cogeneration, but a more generous limit on renewables (100 kW). Indiana deserves special comment since the state imposes limitations on energy (up to 1,000 kWh/month) and not capacity. In similar fashion, Oklahoma imposes an energy limit of 25,000 kWh/month with a capacity limit of 100 kW.

Overall Capacity Limits

In addition to individual system size limitations, some states have imposed limits on total capacities for each utility. Under its net metering program, California pioneered this approach, limiting the total allowed generation to 0.1% of each utility's 1996 peak demand or approximately 50 MW total for the state. Illinois, New Jersey, New York, Virginia and Washington have matched California's overall cap off 0.1%, while a number of states have used lower or higher numbers. New Hampshire's cap is the lowest at 0.05% of peak demand, while Vermont's is the highest at 1.0% of peak demand. Maryland at 0.2% and Oregon at 0.5% fall somewhere in between. Nevada uses a different approach to establish an overall cap on net metering eligibility, limiting net metering to 100 customers for each utility in the state.

IV. Interconnection Issues

The success or failure of a net metering program ultimately turns on the resolution of a wide range of interconnection issues. In most cases, such issues present barriers to adoption and take the form of: 1) unexpected and onerous technical requirements for a utility interface; 2) complex contractual terms and stipulations governing the relationship between the utility and the customer; and 3) fees, charges, and other expenses related to the installation and operation of the generation system.[36]

A. Technical Requirements

[36] Some on the task force have expressed concern that the net metering programs currently in place across the country have failed to meet the objective of encouraging customer based investment in small generation facilities. One explanation is that many of the programs are supported by orders which contain some provision(s) which pose a barrier to the installation of more than a handful a small generation facilities.

Problems of interconnection emerge in part because a regulated utility must act as a "guardian" to system operations. Non-utility generation potentially threatens this objective. Vested with the responsibility for maintaining the overall integrity of their power delivery systems, utilities are directly responsible for grid safety and reliability. As such, any proposal for non-utility interface with the system is reflexively viewed with concern as it may compromise power delivery. Appropriate interconnection standards are designed to encourage the use of qualified generation systems, while simultaneously ensuring the safety and reliability of such units and the local distribution systems interconnected with such units.

From the standpoint of encouraging small-scale renewable generation, perhaps the most important issue is the adoption of a statewide, uniform set of interconnection requirements. Generally, utilities have been given wide latitude in developing individual standards which can frustrate the marketing, distribution, and technical services of those firms selling power generation equipment. Uniform requirements can facilitate development by predetermining requirements allowing equipment manufacturers, system integrators, and installers to develop standardized systems that are eligible for interconnection within any utility's service territory.

Codes and Standards

Codes and Standards (C&S) are necessary to ensure the safety and reliability of small-scale generation. Specifically, codes and standards serve to: 1) promote the broad-scale acceptance of technology across varying local jurisdictions and interconnecting utilities; 2) maintain minimum requirements for generation technologies and their design review and installation; and 3) reduce the cost of testing and certification.

C&S in the United States are determined by a broad range of professional organizations in both engineering and construction. The National Fire Protection Association (NFPA) and the National Electrical Code (NEC) establish standards for system wiring and installation developed in conjunction with the electrical trade and industry experts. Underwriters Laboratories (UL) sets standards for electrical equipment safety developed in coordination with equipment manufacturers. The Institute of Electrical and Electronic Engineers (IEEE) draws on the advice of industry experts in setting standards for both electrical and electronic equipment. Finally, local building codes and standards also impose additional constraints on the design and installation of systems.

In theory, C&S should serve the common interests of both utilities and manufacturers of small-scale systems. At a minimum, C&S should provide predictable design and installation requirements. For utilities, this predictability will lower in-house design review costs. By avoiding the costly and time-consuming expense of reviewing all projects on a case-by-case basis, utilities operating under uniform requirements can improve financial performance, foster better customer relations, and avoid claims of anti-competitive behavior. For equipment

manufacturers, standardized interconnection procedures represent lower design costs.[37] For equipment vendors and installers, standardized interconnection results in greater uniformity, less discretion, and, therefore, lower likelihood of design and installation errors.

B. Contractual Terms and Conditions

Aside from the manifold technical barriers to small-scale generation, contract terms and conditions may prove equally burdensome to prospective generators. Though some contracts are relatively straightforward, many are lengthy and convoluted, prompting regulatory agencies to streamline contracts and remove unnecessary hurdles to adoption.

Among the more onerous of conditions are liability insurance requirements. Whereas utilities have carried policies with large (multi-million dollar) coverages for a broad range of contingencies (property damage, personal liability claims, and injury), net metering advocates argue that such policies should not be required of small-scale generation projects. Claiming that such policies militate against the adoption of renewables, these advocates have sought to limit insurance requirements to coverage consistent with standard homeowner insurance policies.

An additional barrier relates to indemnification clauses. These agreements secure one party against another in the event that the latter causes loss or damage to the former. In the case of customer generation, utilities seek such arrangements to protect against potential damages arising from the interface between its wires and distribution facilities and customers' generators.

Indemnification clauses remain an important source of friction between utilities and customers. In New York, one utility sought provisions for liability relating to its own actions. The New York Public Service Commission rejected this provision, citing that existing negligence and contract terms sufficiently protected the utility.

C. Fees and Charges

An overly complex system of fees and charges is also cited as a major barrier to the promotion of small-scale generation. Frequently, these include permitting fees, interconnection fees, metering fees, and standby charges. In many instances, these costs are detrimental to the project's economics.

Permitting

In most cities and counties, a permit from a local building department must be granted for "improvements" to property value. Often, based on a percentage of the improvement, these permit costs deter certain kinds of investment, particularly off-grid generation. In one case study, a California homeowner paid $500 for a permit to install a 3-kW system, amounting to a

[37] In general, equipment vendors whose basic design adheres to C&S would likely realize lower costs. However, those that might have an equally effective, but non-complying design may be subject to increasing design costs.

loss of eight months worth of anticipated bill savings.

Building permits pose a key and unresolved legal question: Do small-scale power systems constitute personal or real property? To some the mobility of the system implies personal property. To government agencies, the power system may be viewed as a permanent improvement or fixture in the tax base. The resolution of this issue is important for it may ultimately jeopardize the economics of many projects.

Interconnection

Typically charged with reviewing and inspecting large-scale power generation facilities, utility engineers frequently impose upon small-scale generators a level of engineering review and inspection that may be considered excessive. Historically operating within a cost-plus-pricing, regulated framework, these engineers tend to focus on reliability and safety with less regard for costs facing developers. Moreover, in some instances, the result is that engineers have little knowledge of how small-scale systems operate and how the project costs may be influenced by design review and maintenance costs.

While few believe that the public should subsidize these costs, there is a tenable argument that design review, inspection and testing should be streamlined and standardized to ensure public safety at the least cost to those customers choosing to generate power. Ultimately, the process of installing a small-scale generating facility should be no more complicated than installing a large appliance such as a furnace or air conditioner.

Standby Charges

An important barrier to the establishment of net-metered systems is the assessment of standby charges. Following PURPA, utilities have strenuously argued that customer generation imposes significant demand for reserve capacity. Net metering and renewables advocates view this position as a red herring, claiming that utilities' existing reserve capacities are fully capable of responding to the "loss" of a small-scale system given that these systems are already designed for fluctuation in use of large appliances equivalent in load to many small-scale generators.

Metering Options

Most states encourage net metering using the customer's existing meter whenever possible.[38] In some instances, however, utilities or their customers prefer dual meters–or single meters with dual registers–to separately monitor the amount of energy flowing to and from the customer's premises. Meter replacement can be an expensive proposition–usually hundreds of dollars installed–which for the small-scale facilities can easily offset many months, or even years, of anticipated bill savings.

In addition, the New York PSC has found that the manufacturing tolerances and calibration standards for such meters are not as rigorous as those for dual meter systems. In fact, the PSC's research concluded that the error in single meters tends to favor the utility by under-reporting reverse power flows from customers to the utility. As a result, it is imperative for the generating customer to determine how the cost of the more accurate dual meter compares with the loss of revenue from under-reported energy.

V. Policy Issues

Several important policy issues surround the decision to implement a net metering program. The decision should be based on cost benefit analysis where potential benefits outweigh potential costs. However, the direct measurement of cost and benefits of a net metering program is difficult at best. In such a case, benefits should be enumerated, and if possible enhanced. Simultaneously, strategies and policies designed to mitigate and minimize costs should be pursued. If potential costs are minimal then uncertain benefits are less problematic and lower risks are associated with implementation. If potential costs are large then policy makers require more concrete proof of potential benefits to justify the greater risks. This section will try to describe the potential benefits of net metering and suggest ways to enhance those benefits. Cost will be analyzed and strategies developed to mitigate such costs. Broader policy implications are also explored.

A. Benefits

A number of identifiable benefits are associated with an effective net metering program. They include: customer choice, stimulated economic growth, increased investment of small-scale generating facilities, added security to the system resulting from resource diversification, and a reduction of environmental externalities. Many of these benefits are difficult to quantify and the task force did not attempt to do so. However, the task force believes that the benefits exist and are socially desirable.

Choice

[38] It is a little known fact that the vast majority of of meters used in residential and small commercial applications are bi-directional, capable of measuring power flowing in either direction.

As indicated in other reports contained in this document, many customers have expressed a preference for green resources. Net metering is a potentially effective and unobtrusive method for facilitating consumers' request for renewable energy. In the context of net metering, customers actually participate and contribute to the overall portfolio of renewable energy systems. Thus net metering promotes choice and can be used in a regulated or restructured environment. It could be combined with a green pricing program to further encourage investment in renewable resources.

Environmental Impacts

Frequently, investment in self-generation facilities, particularly renewable resources, is not driven solely by cost considerations; non-economic factors such as environmental concerns enter into the decision maker's calculus of these investments. Net metering programs are supported by environmental groups because they generally promote non-polluting energy production that exhibit strong public good qualities.

Economic Growth of Renewable Energy Industry

Net metering programs increase the demand for renewable energy equipment, thereby allowing manufacturing processes the requisite economies of scale to ultimately lower costs. This could lead to increased economic growth as renewable resource industry grows. However, many view this impact as negligible citing the dearth of participants in net metering programs. The various programs implemented across the country by different utilities have simply not yet attracted a participation rate that would have a major influence on the renewable resource industry. Net metering advocates attribute low participation rates to the fact that eligible technologies are still not cost-effective, even with the modes economic stimulation provided by net metering. In fact, there may be more cost-effective ways to facilitate the growth of the renewable industry, but very few programs can match net metering in its simplicity and ease of administration.

Utility Benefits

Utilities may also benefit from net metering programs. One advantage is that the program may reduce load and provide additional sources of power during peak periods. For example, photovoltaic systems produce most of its energy during the heat of the day providing a better load factor for the utility through decreased consumption and increased generation at the distribution level. Net metering can also improve utilities' voltage profiles and reduce transmission and distribution losses. In addition, net metering can reduce utilities' administration costs associated with PURPA Qualifying Facilities (QFs) by reducing metering reading and billing costs. Currently, customers can sell power to their utility under the provisions of the FERC. Most utilities require a second meter for these QFs in addition to the original meter to separately register both the sale and purchase of electricity, with different rates applied to sales and purchases. Utilities reduce administration costs with net metering as only one meter is read, eliminating the need for special record keeping and accounting.

To summarize, a net metering program can encourage investment in environmentally benign customer-owned and operated generation by increasing the financial incentives for customers to invest. Net metering eliminates the cost of a second meter, lowers the utilities administration costs (compared with dual meter programs), provides load leveling benefits, provides voltage support, and reduces transmission and distribution losses. Environmental benefits flow from the reduction of emissions and the promotion of renewable resources.

B. Costs and Risks

The potential benefits of a net metering program, although difficult to quantify, must be compared to the potential costs and risks. These risks include potential cross-subsidization, lost revenue for the utility and its stockholders, reliability and safety issues, and inefficient price signals. As of now the Task Force does not have a means to quantify such costs and benefits, thus our analysis will be limited to discussing both in qualitative terms and discussing of strategies to minimize the risks and maximize the benefits of implementation.

Reliability and Safety

Reliability and safety concerns associated with the interconnection of net metered generation are important policy issues but appear to be technically solvable. Standards must be in place that provide reliability and safety yet do not create artificial barriers for participants. PacifiCorp has dealt with many of these technical issues when implementing its net metering tariffs in other jurisdictions. These standards have been covered in another section of the report.

Impact on Utility Revenues

Aside from technical concerns, net metering introduces a potential conflict of interest between utilities and non-utility generators. Precisely because utility revenues are inextricably linked to electricity sales, non-utility generation is viewed as a threat to profits. Even under deregulation, with utilities continuing to profit from transmission and distribution, any loss of generation translates directly into a loss in revenues. In short, non-system generation may detract from the utility's profit margin. In such cases, increased rates to other customers may be forthcoming.

Cross-subsidization

The issue of cross-subsidization refers to nonparticipating customers who pay more for energy provided by net-metered customers than from alternative sources. This increases the utility's total energy cost above what it otherwise might be. When a net metered customer provides power to the utility and is allowed to spin its meter backward, consumption and production of energy are treated equivalently, when in fact they are not. The full cost of providing electric service to the final customer involves more than the generation of electricity. Additional services are required to deliver power to the final user. These include ancillary

services such as: load following, capacity reserves, black start capability and numerous others. In addition, transmission and distribution services are normally required as well as administration services. Ultimately, the costs of these additional services could fall on nonparticipating customers.

Although differences exist between the cost of generation and the full cost of delivered power, one must consider the advantages of power production at the distribution level. First, the loss of sales to the customer from his own generation is functionally equivalent to demand-side management (DSM) by the customer. DSM has proven to be a cost-effective resource as shown in all of PacifiCorp's Integrated Resource Plans and some DSM costs are borne by nonparticipating ratepayers. A utility's lost revenues associated with DSM programs are discounted from a public policy perspective and are not generally included in cost-effectiveness analysis. It can be argued that lost revenue considerations of net metering programs should similarly be discounted. DSM programs are subject to strict cost effectiveness guidelines and are incorporated into the utilities "least cost plan". Similar analyses can be done with net metering.

The New York Public Service Commission addressed this issue in a net metering implementation proceeding, concluding as follows:

> Net metering results in a reduction of usage at a residence that is conceptually similar to other declines in consumption due to changes in lifestyle, purchases of energy efficient appliance, pursuing energy conservation and the like. Just as the utilities are not permitted to automatically recover lost revenues attributable to reduced consumption, they are not entitled to recover lost net metering revenues. If a utility can instead demonstrate it has incurred a net metering cost attributable to factors other than lost consumption, it may attempt to justify recovery under the applicable rate and restructuring agreement.

When net metered customers produce more energy than they consume, a subsidy issue may arise. Although utility-delivered power requires generation, transmission and distribution functions, net-metered power incurs no additional generation, transmission or distribution costs. The excess power flows figuratively and literately to a neighbor. The utility may see a reduction in revenues resulting from lower sales to net metered customers. Any adverse impact on nonparticipants will occur only in the context of a rate case when the loads used to calculate the rates will be lower as a result of the net metering program. The utility's cost will be spread over fewer kWhs. However, this short-term revenue loss and potential cross-subsidy is negligible if limits are placed on the amount of energy produced under a net metering tariff.

Many proponents of net metering argue that the cross-subsidy issue is over-stated Estimates of the actual costs to nonparticipating customers are very low and are inconsequential. In fact, PacifiCorp has net metering tariffs in place in California, Washington and Idaho but no customers. Most states have placed restrictions on the eligible generating technologies, i.e., small renewable resources, and have placed a cap on the total amount of net metered power that

is accepted. These restrictions greatly reduce the cross subsidy risks. Tom Starrs in written testimony to the Rhode Island Public Utilities Commission, estimated that the cost of the Rhode Island net metering program amounts to $.00000067 per kWh or about $.003 per year for a residential customer and $5.00 per year for a large industrial customer. Some task force members argue that any cross-subsidization is inappropriate.

Pricing of Excess Generation

In the event that net-metered customers produce more energy than they consume, the question arises as to how to measure and compensate the participant for the excess energy. There are a number of options to consider. The first and most beneficial to the participant is to provide a full retail credit for any excess production. This would clearly be a subsidy to the participant and could create incentives for participants to oversize their generation facilities. Another possible solution for pricing excess generation is to price it at avoided cost. PacifiCorp periodically files avoided cost rates for payment to Qualifying Facilities that are less than 1000 kW. This rate could be used to pay for excess power generated by net metering. A third possibility is that excess generation is simply donated to the utility or to a public service program such as low income. This method has been adopted by Indiana, Oklahoma, and Pennsylvania.

Proponents of net metering advocate that any excess production of energy in a given month be used as credit against usage in the following month. At the end of the year, the account could be reconciled and payment made to or from the utility depending on final year-end usage or net generation. Such a pricing scheme would allow the net-metered customer to benefit from seasonal differences in generation and consumption and encourage the installation of generation capacity that approximates annual usage. Variations of this approach have been adopted by California, Colorado, Maine, Montana, New Hampshire, New Jersey, New Mexico (optional), New York, Oregon, Rhode Island, Vermont, Virginia, and Washington.

Net Metering Effects on Relative Prices of Generation

Some argue that the promotion of a net metering program will affect market forces by making small-scale renewable generation relatively less expensive than it otherwise would be by pricing the generation at fully bundled retail prices rather than at the wholesale price for such energy. This could result in relatively more of society's resources being directed toward these small-scale technologies and away from larger scale renewable technologies which command only the wholesale price for their energy. A threshold question for net metering policy is whether it is in society's interest to encourage higher cost small-scale renewable development or whether resources should be directed toward encouraging less expensive large-scale renewable development, perhaps through green pricing programs. Given the limited size of the proposed program, such concerns about the mis-allocation of resources appear to be addressed.

From a strict economic viewpoint, social policy should direct resources where they are most effective. Such policy should depend on analysis which evaluates different programs on

their potential benefits and costs. Programs should be selected that yield the highest benefit cost ratio. Preferably, cost and benefits can be measured by allowing market forces to set prices. However, when market failures distort prices, or when public good qualities are present, public policy should correct such distortions and the promotion of such resources may be justified. The benefits of net metering have been enumerated and exist on a conceptual level, however, there are inherent difficulties in trying to quantify such benefits. In such cases, public policy should try to minimize the costs of implementing a net metering program. This can be accomplished by placing restrictions on the type of resources that are eligible and placing limits on the total amount of generation that would qualify for the program.

VI. Recommendations

The following recommendations follow from task force discussions and professional conferences held to inform the task force about best practices. These recommendations are not meant to represent a binding agreement among all members of the task force. They are premised on consensus, and not all parties participating on the Task Force agree with all recommendations. Objections and/or comments are duly noted in Appendix B of this report.

- ! It is recommended that a net metering program be established in Utah Power's service territory.
- ! It is recommended that eligible technologies be limited to the clean small scale generators. For example, wind and photovoltaic systems are good candidates.
- ! It is recommended that no customer class be excluded from the program.
- ! It is recommended that a limit be placed on system size both in aggregate and at the individual level, individual generation should be limited to 100 kW while system generation should be limited to one percent of the Utah Power's peak load.
- ! It is recommended that customers be credited at retail rates for all power they generate for purposes of offsetting personal use, i.e., the meter will be allowed to spin backwards.
- ! Excess net metered generation in any one month should be credited towards energy consumption in the following month. It is recommended that any excess generation calculated over a given year be donated back to the utility or a charitable organization.
- ! It is recommended that the contractual arrangements not be overly cumbersome and that all parties are protected under the terms and conditions of the contract.
- ! It is recommended that appropriate safety standards be adopted to ensure continued system reliability and safety.

The primary purpose of a net metering program is to encourage private investment in renewable and alternate energy resources. The original intent of net metering programs was to establish customer-based investment in photovoltaics. The Task Force recommends that a net metering program be established in Utah that encourages photovoltaics and wind power production. The task force recognizes that resources other than wind and solar may be

applicable. Additionally, other resources may have distributed generation aspects which are best addressed under a distributed generation program.

All customers should be eligible for participation in the net metering program. This includes residential customers, small businesses, industrial customers, farmers, and churches. It should be noted that the addition of wind to the eligible resource base facilitates diverse customer participation.

Without limits on customer class, concerns emerge over potential impacts both to the grid and also to revenues for the participating utility. Such concerns can be addressed by placing limits on the size of acceptable generation units and on the aggregate size of the program. In terms of individual size, it is recommended that the system not exceed 100 kilowatts. The unit in use should also be located on the property of the customer claiming the benefits. This customer should also be the operator of the resource. The combination of limits on individual system size and operation serve to protect both the utility and nonparticipating customers, while simultaneously operating to reduce potential barriers to entry.[39] It is also recommended that the aggregate size be limited to 1 percent of the capacity necessary to meet the company's average forecasted customer peak. Once this limit is reached, the company is no longer obligated to issue credit for additional power produced by any participant regardless of whether or not it the customer has exceeded personal use.

Power generated for personal use up to the aggregate limit should be credited at retail rates, i.e., the meter will be allowed to run backwards. It is assumed that net metering is designed to assist the customer in offsetting some energy usage with an alternative power source. Since the customer would have normally purchased this power from the utility at retail rates, the credit should be consistent with this rate. This credit should be netted on an annual basis. However, it is recommended that customers not receive credit for additional power produced on an annual basis. Such credits could pose additional administrative expenses to the Company and exacerbate claims of cross-subsidization. If a credit is considered for excess generation, it should be valued at avoided costs. Under the task force's recommendation, excess power would become the property of the utility or distributed in another manner. For example, the Oregon net metering program requires that excess power be credited back to a low-income account.

Specification for credit, customer participation and allowable resources should be clearly defined in a contractual agreement between the utility. However, the contract should not be so cumbersome as to deter entrance into the program. Concurrent with this goal, it is recommended that any order designed to create an effective net metering program not be so onerous as to pose a barrier to entry. Typical barriers include expensive interconnection requirements and/or billing charges which negate any savings the customer might otherwise realize. Such barriers should be

[39] It is possible that without individual size limitations, a single operator could supply all of the net metered energy allowed at the aggregate level. This prevents additional customers from participating.

avoided.

As part of the contractual agreement, customers must agree to adhere to a specific set of standards for safety and reliability. The purpose of the standards is to provided security for the system and not to pose a barrier to participation. Thus, it is recommended that the net metering system used by a customer-generator meet all applicable safety and reliability standards established by the national electrical code, the Institute of Electrical and Electronics Engineers (IEEE), Underwriters laboratories, or the American National Standards Institute.[40] The standards issued by these authorities have been developed with broad participation from utilities, equipment manufacturers, national energy laboratories, and other experts on the design and operation of electrical systems.[41]

[40] This recommendation follows from professional conferences held for the task force and also from the proposed standards contained in a bill currently before Congress. The Congressional bill attempts to establish national guidelines for net metering programs.

[41] "Response of the American Solar Energy Society, American Wind Energy Association, Interstate Renewable Energy Council, and Maryland-DC-Virginia Solar Energy Industries Association to the Request for Information from the Virginia Corporation Commission."

ENERGY EFFICIENCY AND DEMAND-SIDE RESOURCES

I. Introduction

This report includes a brief history of PacifiCorp's activities in Energy Efficiency programs. A critique of local resources, project implementation, and market penetration is provided to facilitate assessment of program benefits and potential. In accordance with the goals set forth for this task force, recommendations for future improvements in the process are also provided.

II. History of PacifiCorp's Energy Efficiency Programs

PacifiCorp is considered a pioneer in energy conservation programs. In the 1970s, PacifiCorp, then known as Pacific Power and Light, began offering residential audits and financial assistance for weatherization services in electrically heated homes. In the mid-1980s, the company formed partnerships with local community action agencies to provide weatherization services to households with limited income. PacifiCorp also offered programs to increase energy efficiency in the construction of new homes, apartments and manufactured homes. These energy efficiency offerings occurred primarily in its Northwest jurisdictions.

Building upon success in other states, PacifiCorp filed the Energy FinAnswer program in Utah in July 1991. Through Energy FinAnswer, commercial and industrial customers receive engineering services and can finance energy efficiency measures through an Energy Service Charge. This was an innovative concept in the utility demand-side management (DSM) because it is structured to provide participating customers a positive cash flow and participants were responsible for a lion share of the costs.

PacifiCorp has been an active and experienced participant in energy efficiency programs since the 1970s. A short history of its involvement is detailed below. The Commission's IRP Standards and Guidelines require equal treatment of supply-side and demand-side resources and provide the main policy tool to insure the company's active participation in energy efficiency investments. Given that PacifiCorp has been active in demand-side management programs, the overview provided emphasizes the main aspects of the issues and/or programs over the last three decades.

A. Demand-Side Management for the 1970s

In home audits and financial assistance for weatherization measures began to be offered to residential customers with electric heat in the late 1970s. Rate increases were instigated after a lengthy period of stable prices. This increased customer and regulator interest in energy

conservation. Energy issues were very newsworthy due to the energy crisis and oil embargo. DSM provided a new focus to conservation, looking at both the demand and supply side of the equation and balancing investment based on cost effectiveness.

B. Energy Efficiency Issues of the 1980s

Pacific Power and BPA cosponsored the Hood River Conservation Project with services to customers beginning in 1983. Commercial programs were implemented including Energy Edge in the mid-1980s and Pacific Environments & Design Advantage in the late 1980s. The Good Cents Program was established in 1984 and targeted residential new construction. In 1985, Weatherization services also became available to limited income households through partnerships with local community action agencies. These services continue to be offered at no cost to qualifying customers. Additionally, Company representatives began working with state building officials and other interested parties to upgrade building codes related to energy efficiency components. Utah Power began a weatherization program in the 1980's and costs were included in rates for a period of time. The program has been cut back substantially as there are a limited number of residential houses that heat with electricity.

C. Energy Efficiency Programs for the 1990's

Energy FinAnswer became available to Utah commercial and industrial customers beginning in 1991. Since 1991, PacifiCorp has provided energy efficiency services to more than 300 Utah businesses including those in the primary metals and oil & gas industries using Energy FinAnswer. FinAnswer received national recognition from the U.S. Department of Energy in 1994 and 1995, User News in 1993 and 1994, Northwest Power Planning Council, State of Oregon, the Edison Electric Institute, AIA, BOMA and the City of Portland. The name is trademarked and has been used as a model by utilities throughout the U.S.

In 1993, PacifiCorp administered a competitive bidding program that resulted in a very large joint effort with CES Way, the Department of Defense and Hill Air Force Base. It ranks among the largest performance contracts with the federal government. The project concluded in 1999 and has resulted in annual energy savings of 25,000 MWH. The H-Pro and Hassle Free programs have also been restructured to bring energy efficient heating, cooling and water heater systems to residential customers . However, the some of these programs have never been formally evaluated or approved by the Commission.

D. Participation Levels

The following table indicates the number of PacifiCorp customers who have participated in various energy efficiency programs.

Residential Weatherized Homes:

Retrofit:

Weatherization Rebates & Loans (1977-1997), Oregon Multi-Family Project (1995-1996) and Home Comfort – CA & WA (1991-1995) 73,600

Low Income Weatherization (1985-1997) 14,500

New Construction

Super Good Cents (1988-1997) and Manufactured Acquisition Program (1992-1997) 24,900

Total Number of Weatherized Homes 113,000[42]

Commercial & Industrial

Energy FinAnswer (1991-1999) 2,000

E. RAMPP Accomplishments

The Resource & Market Planning Program (RAMPP) is in place with annual system and aMW goals approved by the utility commissions. Annual goals have been reached with aMW and dollar investments as follows:

Year	aMW RAMPP Goal	aMW Actual	$ Actual (mil)
1992	8.50	8.57	NA
1993	12.92	15.04	$32.7
1994	15.29	20.79	$34.3
1995	29.90	30.59	$29.9
1996	23.09	24.11	$16.5
1997	15.44	17.33	$ 6.5
1998	9 – 13.5	12.19	$ 7.2

Historically, these programs have been driven by the integrated least cost planning process. Least cost planning optimizes the resources needed to meet future load growth. These resources are a combination of market purchases, traditional generation, renewable generation and conservation. While this model has served to generate many successful conservation programs in the past, it is problematic for the future. Conservation requires a significant

[42] This represents 36% of electrically heated homes in PacifiCorp service territory but these programs are almost exclusively delivered in the Northwest jurisdictions.

infrastructure that involves utility staff, contractors, building and home- owners, equipment vendors, architects and designers among others. As indicated by the table above, the integrated least cost planning conservation levels range widely, from a low of 8.5 aMW to a high of 29.9 aMW. This variation is caused by changes in the load forecasts, the relative costs of conservation and new generation and future uncertainties. Such swings in the level of conservation make it difficult to maintain the infrastructure necessary to effectively implement conservation.

In the future a mechanism which provides a more stable conservation acquisition level will likely be needed. Such a mechanism could be implemented by establishing an appropriate level of ongoing conservation through a collaborative process. Funding for this level could then be established outside traditional electric rates. Costs associated with existing conservation programs would be removed from current rates and replaced with the new funding mechanism. Conservation activity would then be designed to cost-effectively spend the funds accumulated through the new mechanism.

While this would arbitrarily divorce the level of conservation activity from the least- cost planning process, the effectiveness of the programs would be enhanced by the stability of the funding. Contractors and vendors would be able to plan for an expected level of activity year by year. Individual programs would be designed to meet cost-effective criteria and evaluated to assure that

Distributed Generation

I. Introduction

Emerging distributed generation technologies such as natural gas micro-turbines, fuel cells and renewable energy technologies, have the potential to reduce capital expenditures associated with traditional distribution system upgrades, enhance reliability and help avoid central plant generation costs. From an environmental perspective these technologies are attractive because of their superior emissions characteristics relative to many central station technologies. Because of these potential economic and environmental benefits, and the fact that several important DG technologies are renewable, the Energy Efficiency and Renewable Energy Task Force felt it appropriate to include DG among the topics that it would address. This issue brief suggests a pilot project that could help PacifiCorp and the Utah Public Service Commission better understand and take advantage of these new technologies.

A. Technologies

Distributed generation (DG) technologies-- typically defined as generating facilities below 10 MW--are becoming an increasingly important resource alternative for both customers and electric utilities. Currently, distributed generation accounts for about 2,000 MW of electric power in the U.S. and it is estimated by Bechtel Power that the annual world-wide demand will be between 30,000-40,000 MW over the next five years. A variety of DG technologies currently exist that can cost effectively provide intermediate, peaking, or emergency back-up capacity and energy in a wide range of circumstances. From an environmental perspective, non-fossil fuel DG technologies emit virtually no emissions, and new fossil-fuel technologies can be structured so that they emit virtually no SO_2 and relatively small amounts of NO_X and CO_2.

B. Significance of Distributed Generation in Utah

Based on information from the recent merger case, it appears that neither PacifiCorp, nor its merger partner ScottishPower, have much experience with DG. Efforts that have been made have centered around gaining a better understanding of how DG can be used to provide enhanced customer service through retail marketing operations. While enhanced customer service is an appropriate role for DG, there is an additional role that involves using DG to avoid or defer new distribution (as well as generation and transmission) investments and to provide important ancillary service benefits to the electric grid.

II. Recommendations

Although time constraints in finishing the Task Force report limited the amount of time that the group was able to devote to DG, the task force was able to identify several near-term steps the Commission and PacifiCorp could take to gain a better understanding of the role DG could play in Utah's electric system. Our recommendations are presented below.

Recommendation 1: PacifiCorp should seek to identify areas on its distribution system where DG has value in improving distribution system reliability and performance. The Task Force believes that this type of screening process is consistent with current efforts to assess and improve system reliability that the company has committed to as a condition of the proposed PacifiCorp/ScottishPower merger.

Recommendation 2: So that the Commission and other stakeholders can be better informed about how DG alternatives are evaluated, the Task Force recommends that PacifiCorp provide to the Commission a description of the methodology it currently uses to evaluate the costs and benefits of DG to the company's overall transmission, distribution and generation systems.

Recommendation 3: To the extent that one or more cost-effective DG opportunities are found, the Task Force recommends that PacifiCorp and the Commission consider using at least one of these opportunities to design a DG study pilot to gain a more complete understanding of the actual costs and benefits of DG to the electric grid, as well as any potential barriers to its development. Knowledge gained from such a pilot would allow the Commission and PacifiCorp to begin developing appropriate pricing and other regulatory signals to ensure that correct economic incentives exist to invest in DG as part of an overall least-cost resource plan.

In summary, exploring the potential benefits of DG to the distribution system is important. Thus, it is proposed that PacifiCorp identify a geographically-confined portion of its distribution system that is currently experiencing rapid growth, having distribution-related reliability problems, and requires substantial distribution (and transmission) upgrades over the next few years. The idea would be to encourage investment in DG in this area to improve service quality, lower costs, avoid new capital investment and increase reliability. In addition, the pilot would provide an opportunity to develop methods for screening distribution system improvement projects for those that are good DG candidates and would serve to develop methods for quantifying the full range of DG benefits.

By gaining an early understanding of the economics of DG on the distribution system, the Commission and PacifiCorp can begin developing appropriate pricing and other regulatory signals to ensure that the utility and/or customers have the correct economic incentives to invest in DG as part of an overall least-cost distribution system plan.