



# Distributed Generation Incentives for Colorado Consumers

## Staff Report

**House Bill 07-1228  
Docket 07M-230E**

**17 December 2007**

Colorado Public Utilities Commission  
Suite 250  
1560 Broadway  
Denver, CO 80202

# Colorado Public Utilities Commission

Richard P. Mignogna, Ph.D., P.E.  
*Principal Author*

Doug Dean  
*Director*

## **Acknowledgements**

The author appreciates the contributions of Messrs. Frank Shafer and John Reasoner of the Commission's Advisory Staff, of Mr. Warren Wendling, who conducted the research into other state programs, and the editorial review by Ms. Geri Santos-Rach and Ms. Sharon Podein.

## **Abstract**

This report presents the results of Staff's investigation into incentives for promoting distributed generation in Colorado as required by House Bill 07-1228. The statute requires the Colorado Public Utilities Commission to develop, and report to the legislature, its policies for fostering distributed generation. The statute also charges the Commission with determining whether a system of credits, similar to those employed in the electric Renewable Energy Standard (RES), would work for consumers who produce distributed generation. The analysis and recommendations presented were developed taking into consideration written public comment, a Staff workshop, a review of programs offered in other states, and additional research conducted by Staff.

# STATE OF COLORADO

## PUBLIC UTILITIES COMMISSION

Ron Binz, Chairman  
Polly Page, Commissioner  
Carl Miller, Commissioner  
Doug Dean, Director

## Department of Regulatory Agencies

D. Rico Munn  
Executive Director



Bill Ritter, Jr.  
Governor

17 December 2007

Colorado Public Utilities Commission  
1560 Broadway  
Denver, CO 80202

Dear Commissioners:

House Bill 07-1228 requires the Commission to develop a policy to establish incentives for consumers who produce distributed generation (DG) and also to consider whether a credit program similar to the renewable energy credits defined in *40-2-124 C.R.S, et. seq.* would “work” for consumers who produce DG. The statute further requires the Commission to present the policy and findings regarding a credit program to the House Committee on Transportation and Energy and the Senate Agriculture, Natural Resources, and Energy Committee. No deadline for this presentation was specified in the statute.

On June 15, 2007 you issued an order opening docket 07M-230E to accept comments and conduct an investigation to inform the Commission’s policy development. In the ensuing weeks, Staff accepted written comments from numerous parties. On August 21, 2007 Staff conducted a workshop to solicit additional public input and discuss with interested parties incentive mechanisms that might foster DG.

The following report represents the culmination of Staff’s information gathering and analysis activities in this docket. It includes Staff’s analysis and recommendations concerning policy initiatives that the Commission may wish to consider in developing the Commission’s policy and its recommendations to the General Assembly. We hope that you find it useful in sorting through the myriad alternatives that exist for promoting renewable distributed generation in the New Energy Economy.

Sincerely,

A handwritten signature in black ink that reads "Richard P. Mignogna".

Richard P. Mignogna, Ph.D., P.E.  
Staff of the Colorado Public Utilities Commission  
Research and Emerging Issues Section

1560 Broadway, Suite 250, Denver, Colorado 80202, 303-894-2000

[www.dora.state.co.us/puc](http://www.dora.state.co.us/puc)

TTY Users 711 (Relay Colorado)

Permit and Insurance (Outside Denver) 1-800-888-0170

Consumer Affairs 303-894-2070

Fax 303-894-2065

Transportation Fax 303-894-2071

Consumer Affairs (Outside Denver) 1-800-456-0858

## Table of Contents

Acknowledgements.....	ii
Abstract.....	iii
Transmittal Letter .....	iv
Table of Contents.....	v
Executive Summary.....	1
Written Comments.....	2
Public Workshop.....	2
Incentives to Promote Distributed Generation.....	3
Analysis and Discussion .....	6
Program Funding .....	7
Potential Incentive Mechanisms for DG in Colorado.....	8
Credits for Distributed Generation .....	9
Credits for Thermal Production .....	9
Solar Services Model.....	11
Administration of Programs.....	11
Policy and Incentive Recommendations.....	12
<b>DISTRIBUTED GENERATION INCENTIVES FOR COLORADO CONSUMERS .....</b>	<b>15</b>
1.0 Introduction.....	15
1.1 Background.....	15
1.2 Scope of Investigation .....	16
2.0 Public Comments.....	18
2.1 Written Comments.....	18
2.1.1 Initial Written Comments .....	18
2.1.2 Reply Comments .....	18
2.1.3 Summary of Written Comments .....	19
2.2 Public Workshop.....	21
2.2.1 Summary of Public Workshop Comments .....	22
2.2.2 Summary of Public Workshop Discussion Items .....	26
3.0 Incentives to Promote Distributed Generation.....	31
3.1 Rationale for Incentives .....	31
3.2 Review of Other States’ Programs.....	33
3.2.1 Washington State Feed-In Tariff .....	33
3.2.2 Oregon DG Incentives .....	34
3.2.3 City of Berkeley, CA Solar Finance Program .....	35
3.2.4 City of Los Angeles, CA Solar Incentive Program .....	35
3.3 Existing Incentive Programs and Initiatives Available in Colorado.....	36
3.3.1 Colorado Incentives .....	36
3.3.2 Applicable Federal Incentives .....	38
4.0 Analysis and Discussion .....	40
4.1 Goals .....	40
4.2 Public Versus Private Development .....	40
4.3 Distributed Generation and Net Metering .....	41
4.3.1 Net Metering.....	41

4.3.2	Expansion of Net Metering Statewide .....	42
4.4	Technology Selection .....	44
4.5	Program Funding .....	45
4.5.1	System Benefits Charge.....	45
4.5.2	Utility Bill Adjustments (Riders).....	46
4.5.3	Direct Government Funding Via Taxes and Other Assessments .....	46
4.5.3.1	Clean Energy Fund .....	47
4.5.3.2	Other Discretionary Funding Possibilities.....	48
4.6	Potential Incentive Mechanisms for DG in Colorado.....	48
4.6.1	Performance-Based Versus Capacity-Based Subsidies .....	48
4.6.2	Tax Credits.....	49
4.6.3	Low Interest Loans .....	50
4.7	Credits for Distributed Generation .....	50
4.7.1	Set-Asides (Carve-Out).....	51
4.7.2	Multipliers.....	51
4.8	Thermal Production .....	52
4.9	Solar Services Model.....	54
4.9.1	Statutory and Regulatory Implications in Colorado .....	55
4.10	Administration of Programs.....	57
4.10.1	Evaluation, Measurement, and Verification (EM&V).....	58
5.0	Recommendations.....	59
5.1	Guiding Principles .....	59
5.2	Incentives for Distributed Electrical Generation .....	60
5.3	Incentives for Distributed Thermal Generation .....	60
5.4	Net Metering.....	60
5.5	Program Administration .....	61
6.0	Bibliography .....	63
Appendix A	House Bill 07-1228 .....	64
Appendix B	Summary of Research into Other States’ Incentive Programs .....	72
Appendix C	DSIRE Database of Colorado Homeowner Incentives for Renewable Energy ..	84
Appendix D	DSIRE Database of Federal Incentives for Renewable Energy .....	100
Appendix E	Synopsis of Written Public Comments.....	116

## Executive Summary

In the spring of 2007 the Colorado general assembly enacted several measures designed to promote the development of renewable energy in Colorado. One of these measures, House Bill 07-1228, requires the Colorado Public Utilities Commission (PUC) to develop, and report to the legislature, a policy to encourage distributed generation (DG) in Colorado.

The statute charges the Commission with three main tasks:

- 1) Develop a policy to establish incentives for consumers who produce distributed generation;
- 2) Consider whether a credit program similar to the Renewable Energy Credit (REC) program of § 40-2-124, et seq. C.R.S., would work for consumers who produce distributed generation; and
- 3) Present the Commission-developed policy and findings regarding the REC program to the House Committee on Transportation and Energy, and the Senate Agriculture, Natural Resources, and Energy Committee.

As used in this report and in the context of HB07-1228, distributed generation refers to customer-sited, non-utility owned renewable resources. Small generators owned by the utilities or independent power providers may also be considered distributed generation – the principal differences being scale, ownership, and interconnection. However, because the statute directs the Commission to develop a policy for consumer-owned distributed generation, and because net metering standards in the Commission's rules apply only to customer-sited systems no larger than 2 MW, this report focuses on such systems.

To comply with the statute, on June 18, 2007 the Commission opened Docket 07M-230E to accept comments and archive research that would assist in developing the policies required by the new statute. In this report we present the results of Staff's investigation into a recommended Commission policy regarding distributed generation incentives for Colorado consumers.

Public input to this process included the submission of written comments and a public workshop. An investigation into other states' programs was conducted by Staff's contractor, Mr. Warren Wendling. Mr. Wendling's summary report is included in this document as appendix B. Staff's recommendations in this report are the result of its analysis of the public input we received combined with additional investigation and analysis.

## Written Comments

Initial written comments, due on July 6, 2007, were received from ten parties representing government officials, utilities, and renewable industry representatives. Reply comments were received from seven parties representing the same diverse interests.

Two common themes emerged from the written comments of non-utility representatives. First, only photovoltaic solar and utility-scale wind technologies have benefited from Colorado's current renewable energy standard (RES) thus far. Small wind, biomass electric, and thermal technologies (including solar thermal, geothermal, and biomass thermal) were generally viewed as benefiting little, if at all, from existing RES incentives. A number of remedies were suggested, including new carve-outs in the RES to support these technologies, a special set-aside for DG in general, and new REC credit multipliers.

Second, there is nearly universal support among the non-utility parties for a statewide, uniform policy to promote customer-sited renewable development. Typically, this means extending the Commission's net metering policy to all utilities and technologies in the state. We should emphasize that support for net metering does not necessarily require RES-style rebates and REC payments.

Comments filed by utility representatives, however, either opposed or at most were more restrained in support of these two themes. Representatives of the rural electric associations (co-ops) emphasized that, without statutory changes, any policies or recommendations that the Commission may develop in response to HB07-1228 cannot be binding on the co-ops or Tri-State G&T because they are outside of the Commission's jurisdiction.

## Public Workshop

The public workshop held on August 21, 2007 at the PUC drew 32 individuals from the same cross section of organizations represented in the written comments. The workshop began with short presentations by 17 speakers who voiced their positions and concluded with an open discussion of four general topics:

- *Arguments for and against a statewide net-metering policy.*
- *The desirability of crediting distributed generation toward the renewable energy standard.*
- *Should thermal generation receive RECs that could be applied against the electric RES?*

- *What types and sources of funding for incentives, other than RES-based REC and rebate payments, might foster the growth of distributed generation?*

The short presentations generally affirmed the two principal themes identified in the written comments. However, the speakers also offered a number of other interesting ideas concerning incentives, net metering, energy efficiency, and thermal (heat) production. These comments are summarized in section 2.2.1 of this report.

The four workshop discussion items generated a lively debate. Predictably, statewide net metering was the most contentious issue surrounding distributed generation in Colorado. Proponents of statewide net metering cited its benefits to consumers and the environment, and argued for consistent treatment of all electricity consumers throughout the state. Speakers opposed to statewide net metering argued for local control of customer-owned utilities and expressed concerns about administrative costs, rate impacts, cross subsidization, and the system reliability issues associated with net metering.

The question of crediting distributed generation toward the RES and whether thermal production should receive RECs that could be applied toward the RES was less polarizing. In general, there was support for providing incentives to promote thermal production but concern about diluting the RES.

The final topic of discussion at the workshop concerned funding new incentive programs. A system benefits charge (SBC) was deemed worthy of further investigation. Questions were raised about the fairest way to collect and the most efficient way to administer such a fund. State tax credits were also proposed as a possible incentive mechanism that should be explored.

### **Incentives to Promote Distributed Generation**

Chapter 3 focuses on a review of possible incentives that could be employed to encourage distributed generation. Incentive payments – rebates, tax credits, or other mechanisms – are intended to stimulate the industry by subsidizing the development of what is otherwise an uneconomic resource. The theory is that, with experience, the costs of the subsidized system will diminish due to several factors:

- Economies of scale
- Learning curve progress

- Increased competition on the part of
  - System providers as new entrants are drawn into the industry, and
  - Customers for incentive payments
- Technological advance

To the extent that any or all of these occur, the need for incentives should diminish over time. But, deciding that a particular technology should benefit from incentives is only the first step. One still needs to determine:

- Who will be the recipient of the incentive payments?
- Where will the funds come from?
- Should incentives be capacity based or performance based?
- What is the proper level of incentive payments?
- When should the incentives diminish or be removed (*i.e.*, when will the program be declared a success)?
- How do federal incentives impact the need for and the design of state incentive programs?
- Who will administer the incentive program?

Chapter 3 begins by describing selected incentive programs from other states that appear particularly worthy of consideration. The first program profiled is a *feed-in* tariff developed by the state of Washington and modeled on incentives provided in other countries. In this program, customers with state-certified solar systems apply to their utility for compensation in the amount of 15 cents per kWh generated, subject to a \$2,000 per year cap. This program also features a unique economic development component: customers deploying equipment manufactured in-state qualify for a subsidy multiplier of 3.6, bringing their total remuneration to as much as 54 cents per kWh.

The city of Los Angeles also has a performance-based incentive program for solar PV based on a 10-step declining block schedule starting at 14 cents per kWh and decreasing to 5 cents per kWh by the end of the program. Los Angeles also provides a local content incentive of an additional 2 cents per kWh if the PV modules are manufactured in the city. It also offers a technology incentive of 2 cents per kWh if building

integrated photovoltaic (BIPV) technology is deployed in place of conventional flat plate silicon.

Oregon has also implemented several aggressive distributed generation friendly policies. The first is a 50-percent Business Energy Tax Credit allowing businesses to recover up to 50 percent of eligible project costs over 5 years. Other incentives include consumer tax credits for both solar PV and solar water heating systems, a requirement that new public buildings invest 1.5 percent of project costs in solar PV and water heating systems, an exemption from state property taxes for net metered generation equipment, and a low interest loan program.

Another truly unique incentive program to help consumers afford PV systems has just been introduced by the city of Berkeley, California. In November 2007, Berkeley became the first city in the nation to finance solar systems for property owners who would repay the loan via a 20-year assessment on their property. This program provides home owners with lower cost financing than they could obtain individually owing to the city's ability to secure low interest bonds.

Chapter 3 concludes with a review of state and federal incentives presently available to Colorado consumers. This discussion begins with a review of incentives available to residential and commercial customers of the state's two investor owned utilities and includes a discussion of how net metering facilitates those programs.

The Chapter next discusses incentives offered by Colorado's municipal and rural electric utilities. Though also subject to the RES, these utilities are not required to offer the same level of net metering service or solar incentives to their customers. Some do, however, offer limited support for net metering and distributed generation though the level of such support is regarded as insufficient by renewable proponents.

Colorado also offers favorable property tax treatment to the owners of renewable generating facilities. Other state support for distributed generation includes an exemption from state sales tax (enacted in HB07-1279) and authority for local jurisdictions to offer property and sales tax credits and rebates (enacted in SB07-145). Federal incentives for DG generally involve favorable tax treatment. A 30-percent investment tax credit (ITC) for solar systems, capped at \$2,000 for residential consumers, is available through 2008.<sup>1</sup> Current IRS regulations also treat the rebates offered to residential consumers as well as net metering income as exempt

---

<sup>1</sup> As of this writing, an extension of the 30-percent ITC was still being debated by Congress.

from taxation. Business customers will find that their rebates are taxable though they will benefit from an ITC that is not capped.

## **Analysis and Discussion**

Chapter 4 begins with a discussion of the elements of a well-designed incentive program. The report emphasizes that any public policy initiative to support renewable energy, including DG, should begin with clear and transparent goals that are objective and measurable. Arbitrary targets, established without considering their achievability or implications, may not yield the desired results and should be avoided. Further, a well-designed program strives to ensure that the population that bears the costs (*i.e.*, ratepayers or taxpayers) is congruent with the population that benefits.

This report also discusses whether it is preferable to subsidize current, readily available technologies such as conventional silicon-based photovoltaics or instead use the funds to promote advanced, emerging technologies, such as thin-film PV, that possess greater potential for future cost reductions and increased efficiencies. Whichever approach is adopted, the report recommends that any program adopted should ensure that:

- The subsidy declines over time, and
- The subsidy does not reduce the consumer's electricity cost to the same level as purchasing power from the utility, that is, full grid parity.

In Staff's view, it is important that both constraints be met so that developers have an economic incentive to continue working to reduce costs with the goal of reaching grid parity without subsidies.

The chapter next discusses potential refinements to the existing program of incentives for DG. An often-cited criticism of the present net metering system (even for IOU customers under the Commission's net metering rules) concerns the requirement for a year-end payout of the net excess generation at the utility's avoided cost. Because of the seasonal nature of generation and consumption, many customers would benefit from allowing continual rollover of the net excess generation rather than having to accept a payout at the end of the year. Alternatively, some customers have proposed that customers should be able to select their own closing period based on their individual needs. However, the year-end payout is stipulated in the statute as part of the standard rebate offer for customer-sited solar installations.<sup>2</sup>

---

<sup>2</sup> See §40-2-124(1)(e), *C.R.S.*

The report concludes that conditions must be created to allow for expansion beyond the two IOUs for distributed generation to reach its full potential in Colorado. Approximately 40 percent of Colorado's electric customers are now unable to take full advantage of distributed generation opportunities due to restrictions placed on net metering by the co-ops and municipal utilities. Staff concludes that no incentive for distributed generation can be successful statewide until this is rectified. In some cases, these restrictions may partially result from limitations found in the wholesale supply contracts that the co-ops have executed with their primary suppliers, PSCo and Tri-State G&T.<sup>3</sup> It is also worth mentioning that the PUC's 2007 Sunset Review strongly recommended that net metering be extended to the state's cooperative and municipal utilities.

Two approaches to remedy this situation are identified. The first requires the co-ops to implement net metering similar to that required of the IOUs. Alternatively, the RES for co-ops and municipal utilities could be revised to establish a set-aside for customer-sited DG (without preference for technology). The practical effect of the latter approach would be to encourage these utilities to implement more progressive net metering policies to comply with the RES.

### Program Funding

From a review of programs in other states, it is apparent that there are many different approaches employed to funding renewable programs in general and distributed generation in particular. System benefits charges (SBC) are perhaps one of the most common mechanisms. Utility bill adjustments commonly known as *riders*, such as the Renewable Energy Standard Adjustment (RESA) used by Colorado's two IOUs are another. Of the two, the system benefits charge is recommended as the preferred choice.

Although collected by a utility, an SBC is typically used to provide funding for programs that are administered by a government agency or independent administrator. Utilities and consumers seeking incentive payments apply to the administrator for reimbursement according to the rules established for the incentive program. In addition, the SBC typically provides a pool of funds that is independent of rate impact caps, although the SBC may be designed with a maximum rate impact in mind. This, in fact, is one of the benefits of an SBC – it provides a known, stable funding source with less opportunity for creative interpretation than a funding source that is subject to a rate impact cap. Additionally, with this model

---

<sup>3</sup> See section 4.3.2 of the report describing a dispute concerning a 26-kW PV system installed on the Yampa Valley Justice Center.

there is no inherent conflict of interest between the administrator and the ratepayer/consumer as there may be with utility-administered programs.

If society as a whole benefits from increased renewable generation, it may be more equitable to fund renewable programs via taxes or other assessments rather than ratepayer surcharges. The present system of allowing each utility to establish its own renewable energy surcharges can result in inequities across utility jurisdictions. In some cases, the present system has customers of one utility subsidizing DG systems that are outside of its service territory, while the customers of another utility pay nothing but receive the economic development and environmental benefits.

In Colorado, there are presently two funds that are potential sources of funding for distributed generation incentives. The first is a \$2 million budget request recently announced by the Governor's office which will provide matching funds for rebates in utility territories not subject to the RES standard offer program. The second is the Governor's Clean Energy Fund created by Senate Bill 07-246 which will collect more than \$39 million over three years from the Colorado Limited Gaming Fund. According to the statute (§24-75-1201, C.R.S.), the GEO will have broad discretion to use these monies to promote renewable energy generation in Colorado.

#### Potential Incentive Mechanisms for DG in Colorado

The two common approaches to determining incentive payment amounts are pay for performance and pay for capacity. Because the goal is to produce more renewable energy rather than just capacity, there is nearly universal agreement that pay for performance incentive programs are superior to capacity-based subsidies.

The state of Colorado presently does not offer any tax credits for photovoltaic or other distributed generation systems. One of the advantages of using tax credits as an incentive mechanism is that it spreads the cost of the incentives among all citizens. In this manner, tax credits serve largely the same function as grant programs or incentives paid from taxpayer dollars. The limitations on this approach imposed by the Taxpayer Bill of Rights (TABOR) are unknown, and this may be a profitable area for additional research.

As noted above, low interest loan programs have been implemented in California and Oregon as a mechanism for fostering distributed generation, and there may be an opportunity to implement a similar program in Colorado. The Clean Energy Fund described above could potentially be one source of revenues for such a program. Alternatively, the Colorado Clean Energy Development Authority created in 2007 by House Bill 07-1150 may

be the logical entity to create a source of low cost financing to support distributed renewable generation for consumers.

### Credits for Distributed Generation

In HB07-1228 the legislature specifically charged the Commission with investigating the potential for developing a REC-like credit program for distributed generation. Although not stated specifically, the implication was that a system of DG credits could be created and applied to the Renewable Energy Standard since this is the only existing mechanism for valuing renewable credits. In fact, to the extent that the distributed generator is an eligible electric renewable energy resource, distributed generation credits already exist. In that sense, DG-related RECs are no different from any other RECs. The main issue is whether a sufficiently liquid market exists for these credits to have any redeemable value.

Until the extension of the RES to the co-ops and larger municipal utilities, there were, for all practical purposes, only two customers for RECs in Colorado: Aquila and PSCo. With the co-ops and larger municipal utilities now brought under the renewable energy mandate, there are now 26 potential Qualifying Retail Utility (QRU) customers for RECs. However, there are still only two QRUs with a net metering requirement or a solar set-aside and those two, by virtue of their existing incentive programs, are well stocked with solar/DG credits for the near term. Without extending net metering to the municipal and cooperative QRUs, there will be no expansion of the market for DG credits.

There are two general approaches that may be employed to foster specific technologies or DG in general: carve-outs (set-asides) and multipliers. Typically, carve-outs are superior to multipliers for this purpose. However, for the reasons detailed in sections 4.7.1 and 4.7.2, each of these approaches will face its own set of challenges.

### Credits for Thermal Production

In HB07-1228 the legislature also charged the Commission with investigating the possibility of issuing RECs for thermal production, which could be applied toward compliance with the existing renewable standard. There are at least three reasons why this would not be a useful approach:

- Applying thermal production against the RES would effectively dilute the standard, making compliance that much easier, and Colorado's RES is already diluted by existing multipliers and lesser targets for cooperative and municipal QRUs.

- The first test of whether a technology should be credited against the RES is a determination of what energy resource is being offset by the renewable generator. If the renewable or distributed generator is displacing electricity, then an argument may be made for providing credit against the RES. If it is displacing natural gas used for heating, then perhaps the credit should come from a gas standard (or possibly a demand side management program). In Colorado, thermal production is primarily displacing natural gas, not electrical generation.
- Another test of whether a technology should qualify for credit against the electric standard is whether the technology sends electricity back into the grid when not connected to load. If, as with thermal production, it does not, then it is not amenable to net metering.

For these reasons, thermal production, while perhaps worthy of some form of subsidy, should not be considered for net metering benefits and compliance with the RES. In addition, it will be difficult for a utility to measure the production from a thermal system and subsequently use it to offset a customer's electricity use without developing a new protocol for measuring and reporting the thermal production to the utility.

One final difficulty can be found in the direction provided by §40-2-124, C.R.S., the RES statute, to create a tradable REC market.<sup>4</sup> While one state may allow thermal production to count toward its renewable energy standard, those RECs will not necessarily qualify under another state's RPS. Multiple, inconsistent definitions for RECs will not be conducive to the creation of a liquid, tradable REC market.

While not supportive of applying thermal credits toward the RES, Staff does believe that solar thermal, biomass thermal, and geothermal systems are valuable additions to Colorado's energy mix and are deserving of incentives or other public subsidy. The question is what form these incentives should take. Many of the incentive approaches described earlier including tax credits, rebates, and low interest loan programs may be more appropriate.

---

<sup>4</sup> §40-2-124(1)(d), C.R.S. requires the Commission to establish: "A system of tradable renewable energy credits that may be used by a qualifying retail utility to comply with this standard. The commission shall also analyze the effectiveness of utilizing any regional system of renewable energy credits in existence at the time of its rule-making process and determine whether the system is governed by rules that are consistent with the rules established for this article."

### Solar Services Model

Over the past two years, a *solar services model* has developed to help ease the adoption of PV solar systems by customers lacking the capital to purchase such systems. Under this approach, the electricity customer/host pays the developer for electricity produced by the solar system and receives the benefits of net metering from the utility. The developer has two income streams: revenue from the sale of solar energy to the customer and the value of the RECs purchased by the utility. Behind the scenes is an investor who monetizes the tax credits and depreciation.

With one exception, this utility model is not permitted under Colorado law. While a customer may self-generate, a renewable energy developer may not supplant the certificated utility providing service to a customer within the utility's territory. The single exception occurs when the certificated utility waives its exclusive right (and obligation) to serve all customers in its defined territory.

This issue was explored in the PSCo 2007 RES Compliance Plan docket. In that proceeding, PSCo waived its right to be the sole provider of electric service, but only for those projects that were selected in its solicitation and that would be providing it with RECs for compliance with the RES. The company did not waive its right to be the sole provider of service generally, effectively making it the sole arbiter of who can participate in the market for solar services and who cannot. The importance of this issue to developers, prospective net metering customers, and consumers in general was not widely understood.

As a possible remedy to this dilemma, Staff suggests that consideration be given to expanding §40-40-101, the Colorado Geothermal Heat Suppliers Act, to apply to all DG technologies. Under this approach, the relaxed regulatory schema currently applied to suppliers of geothermal heating systems would be extended to solar and other renewable DG suppliers. While this does not directly provide incentives for distributed generation in Colorado, it will remove an institutional impediment to DG development. In conjunction with the expansion of net metering to the municipal utilities and co-ops, this approach would enable the solar services model, which has become the most popular mechanism for developing DG projects in the country.

### Administration of Programs

In Colorado and elsewhere, there is an ongoing debate concerning who should administer incentive programs for renewable energy and energy

efficiency. Under the current RES rules, the QRU is charged with administering the solar incentive program. However, there is arguably a conflict of interest created by allowing the utility to be the administrator responsible for managing ratepayer funds that are used to pay the utility's costs of compliance with the RES.

This conflict is exacerbated by the QRU's ability to obtain pre-funding for its RES expenditures and magnified still further by the clause in HB07-1281 that prevents the Commission from restricting the QRU's ownership of RECs. Under these conditions, there is insufficient incentive for the utility to exercise due care with ratepayer funds and invest them in the most cost effective manner. Placing a consumer funded program in the hands of the utility with no accountability is poor public policy.

Colorado already has multiple organizations that are responsible for disbursing incentives designed to spur renewable energy development. These incentives vary widely depending on utility service territory. Program efficiency and equitable treatment of consumers argue for these programs, to the extent possible, to be brought under one office. This would help ensure that all Colorado consumers receive equal treatment and have equal access to renewable incentive programs.

In addition to being an important economic development tool, the Renewable Energy Standard and related incentive programs form the cornerstone of Colorado's contributions toward achieving energy security and combating climate change. The success of such an important policy initiative cannot be known without a comprehensive program of evaluation, measurement, and verification. These activities should be undertaken by public trustees or their agents and not left to self-reporting by the affected utilities that have been advanced public funds to implement the programs.

### **Policy and Incentive Recommendations**

Staff's recommendations for commission policy regarding distributed generation are founded on eight guiding principles, enumerated in section 5.1, that provide the foundation for the development and implementation of DG programs. Generally, they concern establishing clear, measurable, and transparent goals; aligning those who pay with those who benefit; equity across different regions, utilities, and customer segments; recognizing that net metering and DG imply displacing electric energy from the grid; understanding that there are broad societal goals and expectations for renewable energy in Colorado and an equally broad universe of incentives to help achieve them; and realizing that incentive

programs should be designed with an eye toward ultimately being able to eliminate them.

Staff makes several broad recommendations with regard to DG incentives:

- Adequate incentives for electric renewable distributed generation presently exist within the IOU service territories. However, incentives for distributed generation should be expanded in the service territories of the non-regulated co-ops and municipal utilities. This will require a more progressive net metering policy within these utilities and a DG set-aside may be the most effective mechanism for achieving it.
- Incentives should be provided for thermal generation. But, because these resources do not displace electricity, thermal credits should not be applied against the RES. Grants, low interest loans, tax credits, and even DSM programs may provide more effective and equitable support.
- Statewide net metering is important to the future success of the RES and energy policy in Colorado. There is unlikely to be much growth in distributed generation in cooperative and municipal utility service territories without a more progressive and equitable net metering policy by these utilities.
- Wholesale suppliers to the cooperative and municipal utilities must not impose contract terms that conflict with the goals for statewide net metering or any other aspect of the renewable standard.
- A useful change to the net metering protocol in the RES would be to eliminate the year end payout in favor of a perpetual rollover of net excess energy.
- Uniform renewable and distributed generation policies should be implemented statewide. Program efficiency and customer equity concerns argue for the administration of incentive programs supporting renewable energy and distributed generation to be centralized under one administrator rather than each utility. Uniform, centralized administration of the program would provide an incentive to builders who could standardize their offerings irrespective of service territory. A system benefits charge, equally applied across utilities, would fund the program in place of RESAs that are now unevenly applied.

- The Geothermal Heat Suppliers Act, §40-40-101 *et. seq.*, C.R.S., should be amended to include all eligible renewable resources. This would grant third-party developers – operating as renewable energy suppliers – the ability to operate in Colorado without obtaining a waiver from the local utility. This model would also provide the appropriate and necessary protections for consumers.
- Desirable policy goals may be advanced by using some of the monies in the Clean Energy Fund to subsidize solar and geothermal heat pump systems for low income consumers. In addition, the Clean Energy Development Authority may be an appropriate vehicle to introduce a program offering low interest loans to Colorado consumers who wish to purchase solar or other DG systems for their homes.

## DISTRIBUTED GENERATION INCENTIVES FOR COLORADO CONSUMERS

### 1.0 Introduction

#### 1.1 Background

In response to Governor Ritter's call for a New Energy Economy, the Colorado legislature in the spring of 2007 enacted several measures designed to promote the development of renewable energy in Colorado. One such measure, House Bill 07-1228, requires the Colorado Public Utilities Commission (PUC) to develop, and report to the legislature, its policy to foster distributed generation (DG) in Colorado. Section 7 of HB-1228 creates §40-2-109.5 of the *Colorado Revised Statutes* which reads<sup>5</sup>:

**40-2-109.5. Incentives for distributed generation - definition.** (1) THE COMMISSION SHALL DEVELOP A POLICY TO ESTABLISH INCENTIVES FOR CONSUMERS WHO PRODUCE DISTRIBUTED GENERATION, INCLUDING, BUT NOT LIMITED TO SMALL WIND TURBINES, THERMAL BIOMASS, ELECTRIC BIOMASS, AND SOLAR THERMAL ENERGY. THE COMMISSION SHALL CONSIDER WHETHER A CREDIT PROGRAM SIMILAR TO THE RENEWABLE ENERGY STANDARD SET FORTH IN SECTION 40-2-124 WOULD WORK FOR CONSUMERS WHO PRODUCE DISTRIBUTED GENERATION. THE COMMISSION SHALL PRESENT THE POLICY AND FINDINGS REGARDING A CREDIT PROGRAM TO THE HOUSE OF REPRESENTATIVES TRANSPORTATION AND ENERGY COMMITTEE AND THE SENATE AGRICULTURE, NATURAL RESOURCES, AND ENERGY COMMITTEE, OR THEIR SUCCESSOR COMMITTEES.

(2) AS USED IN THIS SECTION, "DISTRIBUTED GENERATION" MEANS A SYSTEM BY WHICH A CONSUMER GENERATES HEAT OR ELECTRICITY USING RENEWABLE ENERGY RESOURCES FOR HIS OR HER OWN NEEDS AND MAY ALSO SEND SURPLUS ELECTRICAL POWER BACK INTO THE POWER GRID.

---

<sup>5</sup> HB07-1228 also contains several other provisions unrelated to distributed generation. Only Section 7 of the Act is germane to this report.

The statute charges the Commission with three main tasks:

- 1) Develop a policy to establish incentives for consumers who produce distributed generation;
- 2) Consider whether a credit program similar to the Renewable Energy Credit (REC) program of § 40-2-124, et seq. C.R.S., would work for consumers who produce DG; and
- 3) Present the Commission-developed policy and findings regarding the REC program to the House Committee on Transportation and Energy, and the Senate Agriculture, Natural Resources, and Energy Committee.

To comply with the statute, on June 18, 2007, the Commission opened docket 07M-230E to accept comments and archive research that would assist in developing the policies required by the statute.

## 1.2 Scope of Investigation

The order opening docket 07M-230E established a deadline of July 6, 2007 for the submission of initial written comments and July 20, 2007 for the submission of reply comments. To supplement the written submittals, Staff conducted a workshop on August 21, 2007 to solicit additional public input and discuss with interested parties incentive mechanisms that might foster DG. During the written comment period, Staff, with the assistance of its contractor Warren Wendling, began an investigation into other states that have policies to foster DG.

Note that the definition of distributed generation in §40-2-109.5 encompasses more than just the generation of electricity. It also includes the generation of heat using a variety of thermal technologies. This distinction is important because, while the RES clearly includes distributed generation of electricity from renewable resources among the resources eligible for compliance with the existing RES, the production of heat as an end product is not contemplated as an eligible resource under the existing RES.<sup>6</sup> While using renewable technologies for generating thermal (heat)

---

<sup>6</sup> Some have argued that permitting thermal generation to count toward compliance with the renewable standard is justified because the RES refers to a Renewable **Energy** Standard which, taken literally, implies more than just the generation of electricity. However, the text of §40-2-124, C.R.S. clearly pertains only to providers of “*retail electric service*” and the resource standard requires the qualifying utilities to generate a specified portion of their “*retail electricity sales*” using renewable generating technologies.

energy is desirable, applying such thermal production against the renewable electric standard is not without controversy and raises a number of issues which we will address in this report.<sup>7</sup>

Chapter 2 of this report summarizes the public comments received during this investigation. Chapter 3 describes the role of incentives and summarizes the results of our investigation into other state programs that promote distributed generation, including specifically thermal production. Here, we also review existing Colorado incentive programs and initiatives.

Chapter 4 presents an analysis and discussion of alternative mechanisms for fostering distributed generation. There, we also delve into the issues surrounding the creation of a thermal credit system and the application of such credits toward compliance with the renewable electric standard. Chapter 5 contains Staff's recommendations concerning 1) incentives to foster distributed generation and 2) applying thermal production credits toward the RES.

Because House Bill 07-1228 directed the Commission to develop and present its policy in consideration of the benefits to consumers, this work effort has focused primarily in that realm. However, there are a number of important issues surrounding the impact of net metering and interconnection for distributed generation on utility operations and the grid that are beyond the scope of this investigation. The interested reader is referred to references [2], [3], and [6] for a more in depth treatment of those considerations.

Note also that the definition of distributed generation in the statute implies net metered, customer-produced generation (as opposed to utility owned generation even though it may be at the distribution level).

---

<sup>7</sup> It is important to note that HB07-1228 as originally introduced would have directed the Commission to *"establish a Btu renewable energy credit program to allow customers who use renewable energy in forms, including, but not limited to, a biomass thermal system or a geothermal space heating and process heating system, to calculate the Btu production and convert the Btu production to a Btu renewable energy credit."* It also provided for a 50% bonus (*i.e.* 1.5 multiplier) for thermally derived credits and specifically noted that such credits may be used for compliance with the RES. Subsequent revisions of the legislation softened this directive, allowing the Commission to study the issue and develop its own policy regarding the desirability of such a system.

## 2.0 Public Comments

As noted above, the Commission provided for both initial and reply comments followed by a public workshop. Here, we will review the comments received during this process. A synopsis of the comments received from each party is included in appendix E.

### 2.1 Written Comments

Written comments were received from 15 parties, a few of whom supplied both initial written comments and reply comments. Below, these written comments are described.

#### 2.1.1 Initial Written Comments

Initial written comments were due on July 6, 2007. Comments were received from the following parties:

- Mr. Scott Hasse
- Colorado Solar Energy Industries Association (CoSEIA)
- Southwest Windpower, Inc.
- Rocky Mountain Farmers Union and Colorado Working Landscapes (RMFU/CWL)
- Public Service Company of Colorado (PSCo)
- Governor's Energy Office (GEO)
- Interwest Energy Alliance (Interwest)
- Ratepayers United of Colorado (RUC)
- Colorado Timber Industry Association (CTIA)
- Colorado State Forest Service<sup>8</sup>

#### 2.1.2 Reply Comments<sup>9</sup>

Reply comments were due on July 20, 2007. Reply comments were received from the following parties:

---

<sup>8</sup> The comments of the Colorado State Forest Service and the Colorado Timber Industry Association were verbatim duplicates of one another.

<sup>9</sup> Comments have been designated as initial or reply only according to the time period in which they were received. In a few cases, the reply comments were not truly replies to earlier submissions but advanced new arguments not previously set forth. Considering the informal nature of this docket and the desire to gather as much input as possible, there seemed little reason to adhere to customary rules for "reply" comments.

- Colorado Solar Energy Industries Association
- Colorado Rural Electric Association and Tri-State G&T, Inc. (CREA/Tri-State)
- Colorado Carbon Reduction Initiative (CCRI)
- Environment Colorado (EC)
- Ms. Nancy LaPlaca
- Governor's Energy Office (GEO)
- Forest Energy Colorado, LLC

### 2.1.3 Summary of Written Comments

Two common themes emerged from the written comments of non-utility representatives. The first of these is that, thus far, only photovoltaic solar and utility-scale wind have experienced growth as a result of Colorado's renewable energy standard.<sup>10</sup> Small wind, biomass electric and thermal technologies (including solar thermal, geothermal, and biomass thermal) were generally viewed as benefiting little, if at all, from the existing RES incentives. This appears true, at least to date. Several respondents suggested remedying this deficiency by creating new carve-outs in the RES for each of these technologies. Others suggested a set-aside for distributed generation in general without regard to technology type. Less popular, but also mentioned, was the creation of new REC credit multipliers for thermal production similar to the existing multipliers for in-state electricity generation and community projects. Implicit in these suggestions is a redefinition of Renewable Energy Credits to include thermal energy production.<sup>11</sup>

Second, there is nearly universal support among the non-utility parties for a statewide, uniform policy to promote customer-sited renewable development. Typically, this includes extending the Commission's net metering policy to all utilities and technologies in the state, though there could be other mechanisms to support customer-sited DG. We should emphasize that support for net metering does not necessarily imply RES-

---

<sup>10</sup> In this report, we speak generally about resources that have "benefited" from the requirements of the RES. A carve-out or set-aside is not to be confused with either an incentive or a subsidy. The former is a requirement in the RES for a specific amount of generation while an incentive implies direct or indirect financial assistance offered to the developer or owner of a renewable generating system to compensate it for the above market costs of providing electricity. A subsidy implies a direct cash payment to the generator, such as a rebate or REC payment, and is a particular type of incentive. Incentives may also include grants, low-interest financing, and tax credits/exemptions in addition to subsidies.

<sup>11</sup> The conversion of energy from heat to electricity is 3,415 Btu = 1 kWh.

style rebate and REC payments, though many respondents were not specific about the mechanisms the state should employ to support net metering.

Comments filed by utility representatives, however, were often contrary to these sentiments. However, Public Service Company of Colorado (PSCo) noted that it would support new net metering tariffs for small wind and other DG technologies but expressed a concern about how a REC-like credit program would work with technologies that do not produce electricity. PSCo also expressed concern about using the RES budget to provide incentives for DG that generates heat but does not provide RECs to credit against the RES. This issue of applying thermal production to the electric standard is discussed more fully in Chapter 4. PSCo further indicated that it may support incentives for DG that produces heat as part of its gas DSM programs.

The Colorado Rural Electric Association (CREA) and Tri-State G&T largely disagreed with the proponents of DG and net metering. Commensurate with its position espoused during the HB-1281 emergency rule making, CREA/Tri-State claims that any policies the Commission may develop for DG cannot be binding on the co-ops or Tri-State because they are outside of the Commission's jurisdiction. They further claim that rate-related incentives for DG, as suggested by several of the parties to this docket, cannot be recommended to the General Assembly by the Commission because the co-ops and Tri-State are not subject to the Commission's ratemaking jurisdiction.

With regard to extending the Commission's net-metering policies to the co-ops, CREA and Tri-State note that:

- There already exists a statewide net metering law (§40-9.5-301, *et. seq.*, *C.R.S.*) requiring co-ops to adopt rules for net-metered systems.<sup>12</sup>
- In the process of revising and then passing HB07-1169, the legislature rejected the notion that all co-ops should be subject to the same net metering rules as the IOUs.

---

<sup>12</sup> This statute, enacted in 2002, applies only to cooperative electric associations. Municipal utilities are not covered. While the statute requires each REA to establish net metering rules, most proponents of net metering continue to oppose the restrictions that the statute allows the REAs to impose. The provisions most disliked by net metering proponents allow REAs to invoke a 25kW limitation on the size of a DG system and credit the customer at the utility's avoided cost rate rather than its retail rate.

- Given the diversity of co-op system characteristics, uniform net metering rules are inappropriate.

Isolated comments of particular interest were received from some respondents. These include:

- Rocky Mountain Farmers Union and Colorado Working Landscapes suggested segmented bidding by utilities to expand the market for RECs.
- Interwest Energy Alliance discussed the need to modify utility rate structures, particularly in the area of demand charges, to support distributed generation.
- Interwest Energy Alliance also noted that a separate credit program for DG is NOT needed. Interwest claims that the current REC trading system is adequate and that RECs from DG should remain with the system owner and utilities should not be allowed to require that the owner transfer them to the utility in exchange for interconnection and net metering. This view was shared by CoSEIA but opposed by Environment Colorado who suggested that a separate credit program for DG thermal resources is warranted.
- CoSEIA and Environment Colorado proposed rebates specifically for solar thermal systems with CoSEIA proposing a specific set-aside in the RES for solar thermal. CoSEIA further suggests the use of engineering estimates to determine the level of such rebates and REC payments as is presently done with the small PV systems under PSCo's and Aquila's standard offer programs.
- Colorado Carbon Reduction Initiative said that the PUC should consider a statewide carbon tax as a method of funding a DG program and described two possible mechanisms for implementing such a tax. Either approach would shift the burden of funding a DG incentive program from IOU ratepayers to purchasers of all greenhouse gas (GHG) emitting fuels including gasoline.

## **2.2 Public Workshop**

The public workshop was held on August 21, 2007 in the main hearing room at the PUC. Thirty-two (32) individuals representing utilities, the renewable energy community, environmental organizations, and other state agencies attended. The workshop lasted for approximately five hours

during which parties were allowed five minutes to make an oral presentation. The remaining time was used for a discussion of four general topics:

- *Arguments for and against a statewide net-metering policy.*
- *The desirability of crediting distributed generation toward the renewable energy standard.*
- *Should thermal generation receive RECs that could be applied against the electric RES?*
- *What types and sources of funding for incentives, other than RES-based REC and rebate payments, might foster the growth of distributed generation?*

### 2.2.1 Summary of Public Workshop Comments

Seventeen individuals gave short presentations during the first phase of the workshop. These speakers and their affiliations were:

- Sam Weaver, Cool Energy, Inc.
- John Covert, Colorado Working Landscapes
- Tony Frank, Rocky Mountain Farmers' Union
- Morey Wolfson, Governor's Energy Office
- Jeff Lyng, Governor's Energy Office
- Eric Stern, Governor's Energy Office
- Ron Larson, Ratepayers United of Colorado
- Ken Regelson, Colorado Solar Energy Industry Association
- Chris Martin, Headwaters Energy
- Anne Hopfenbeck, Public Service Company of Colorado
- Sue Radford, Colorado Carbon Reduction Initiative
- Damian Vilpa, Simply Efficient
- Mike Bergey, Bergey Windpower
- Nancy LaPlaca, *pro se*
- Rick Gilliam, Interwest Energy Alliance
- Kent Singer, Colorado Rural Electric Association and Tri-State G&T
- Blake Jones, Namaste Solar

For the most part, these presentations affirmed the two principal themes expressed in the written comments:

- Only photovoltaic (PV) solar and utility scale wind have benefited from the RES incentives thus far, with other technologies being under-represented. There was a continuation of support for carve-outs for other technologies or, at a minimum, distributed generation in general. This includes extension of the definition of RECs to thermal production.
- Speakers also expressed strong support for a uniform, statewide net metering policy the same as, or similar to, that which applies to the state's investor owned utilities.

Aside from additional support for these two themes, there were a number of other interesting propositions proffered by speakers in their oral presentations. These are summarized below without regard to their veracity.

- Sam Weaver of Cool Energy, Inc., a firm specializing in solar thermal and combined heat and power, encouraged the Commission to adopt rules that reward both thermal energy production and electrical generation equally. He also stated that it is more cost effective to reward energy production rather than capacity deployment.
- John Covert of Colorado Working Landscapes stated that net-metering should be "rebatale." Presumably, by this he meant that any equipment that generates net metered energy (irrespective of technology) should qualify for rebates. He also urged that a separate program of financial incentives be created to support larger, community-based projects.
- Tony Frank of Rocky Mountain Farmers' Union called for the creation of a separate system of tradable production tax credits (PTC). He felt that the PTC, which now exists for wind, could be made more valuable if they were a tradable commodity.
- Morey Wolfson of the Governor's Energy Office expressed a few general comments. He said that the Commission's policy should recognize market failures. This is generally taken to mean that regulatory intervention should be employed when markets do not satisfactorily foster renewable generation on their own. He also noted that input from the PUC will be important to inform the legislature about options.
- Jeff Lyng, also of the GEO, called for the prescreening of energy service companies. He noted that there are presently twelve (12)

international energy service firms pushing DG in performance contracts. He further stated that statewide net metering would be an incentive to builders who could standardize their offerings irrespective of service territory.

- Ron Larson, representing Ratepayers United of Colorado, reminded workshop attendees that RUC's written comments identified eleven additional technologies, not mentioned in HB07-1228, that merit "special consideration."<sup>13</sup> Dr. Larson also asked whether Xcel or the State should fund research into these technologies, and suggested that perhaps the Commission should force Xcel to devote a percentage of its revenues to research. Lastly, he stated that energy storage must be an integral part of the Commission's recommendations.
- Chris Martin of Headwaters Energy suggested that energy efficiency and conservation should play a role in any Commission plan to support DG. He proposed that consumers receiving rebates be required to use a portion of their rebate for energy efficiency improvements. Mr. Martin also raised an often stated social equity concern that people who can afford to install solar systems on their homes are relatively well to do while those who pay for the systems are not.
- Anne Hopfenbeck representing Public Service Company of Colorado stated that the company supports the development of distributed generation but the complexity lies in how to encourage it. She noted that the company thinks about thermal production (heat) differently than electrical generation. PSCo views thermal production as more akin to a type of demand side management (DSM), while the system benefits of distributed electrical generation vary depending on the load profile of the generator.
- Sue Radford from the Colorado Carbon Reduction Initiative proposed a statewide carbon tax, the proceeds of which could be used to fund a DG program. She further noted that "pricing structures must be implemented that reflect non-fungible nature of electricity".
- Mike Bergey, president of Bergey Windpower, called for statewide annual net metering for "appropriately sized" DG systems and that

---

<sup>13</sup> Most of these technologies, however, may not be readily amenable to consumer DG at the present time. The interested reader is referred to RUC's written testimony filed in this docket for descriptions of these technologies.

there should be no merchant power sold at retail. He believes that there is a pent-up demand for small-scale wind power and suggested that rebates should be offered for wind turbines up to 50 kW in capacity. He also noted that Taxpayer Bill of Rights (TABOR) restrictions make the implementation of tax credits difficult. As a result, he recommended that the state investigate other incentive structures. Mr. Bergey suggested a capacity-based incentive of \$2.50 to \$3.00 per Watt and believes that this level of incentive could absorb 20 to 30 percent of the PV rebate program.

- Rick Gilliam, representing the Interwest Energy Alliance spoke about the relative benefits of DG and also about the importance of rate structure. He noted that traditional rates tend to average electricity costs over time and that some states are moving toward inverted block structures to encourage energy conservation.<sup>14</sup> He also discussed how DG can help remedy a social equity concern, citing the example of an Oregon program in which excess generation from DG is donated to a low income energy assistance program.
- Kent Singer, speaking for the Colorado Rural Electric Association and Tri-State G&T reiterated his clients' written comments opposing a statewide net metering policy. CREA and Tri-State believe that statewide net metering would result in a loss of the local control they now enjoy.
- Blake Jones was the final presenter to speak in this portion of the workshop. Like some of the earlier speakers, he also recommended inverted block pricing for electricity and suggested that time of use (TOU) rates may provide an incentive for REAs to adopt true net metering.<sup>15</sup>

---

<sup>14</sup> Inverted block pricing (also known as inclining tier block rates) is a utility pricing model in which each incremental block of consumption is priced at a higher unit rate. This may be contrasted to the flat rate or average pricing model, presently enjoyed by most Colorado electric customers, in which they are charged a constant unit rate regardless of usage.

<sup>15</sup> Time-of-use (TOU) rates also attempt to modify consumer behavior but differently than inverted block rates do. TOU rates aim to send a price signal to consumers such that consumption during periods of high demand will be charged a higher price than consumption when demand is low. This reflects the higher price that utilities must pay for energy during periods of peak demand. Inverted block pricing, in contrast, simply attempts to encourage conservation without regard to when that energy is used.

### 2.2.2 Summary of Public Workshop Discussion Items

The four workshop discussion items generated a lively debate. As identified earlier, these four topics concerned:

- *Arguments for and against a statewide net-metering policy.*
- *The desirability of crediting distributed generation toward the existing renewable energy standard.*
- *Should thermal generation receive RECs that could be applied against the electric RES?*
- *What types and sources of funding for incentives, other than RES-based REC and rebate payments, might foster the growth of distributed generation?*

Statewide net metering was the most contentious issue surrounding distributed generation in Colorado. Arguments offered in favor of statewide net metering include:

- There should be consistent treatment of and opportunities for consumers throughout the state. Discriminatory treatment of consumers should be avoided.
- It is more efficient to implement policies on a statewide basis.
- Statewide net metering would help grow businesses throughout the state.
- Net metering helps to lessen utility generation, distribution, and transmission costs.
- Net metered systems can be sized to match a user's load profile.
- Net metering would allow the development of technologies in areas where they will work the best (*e.g.*, biomass, solar, wind, etc.).
- Net metering would help decrease the societal costs of burning fossil fuels.
- Single meter net metering is the simplest to understand and implement.

- Fostering additional net metering would help customers benefit from economies of scale.
- Net metering would provide the impetus for change among the REAs.

However, there were many arguments offered in opposition to the adoption of a statewide net metering policy:

- Implementing such a policy would require a legislative mandate for regulation of the co-ops, at least in the area of net metering.<sup>16</sup>
- Statewide net metering would inhibit local control of customer-owned utilities. There is a need to address regional concerns.
- Opponents are concerned with the precedent of extending PUC oversight to the REAs, even if only in the area of net metering or interconnection standards.<sup>17</sup>
- The administrative costs of administering a net metering program would be burdensome to the co-ops and result in higher rates to consumers.
- Recovery of fixed-costs and variable operating costs could result in differing customer impacts across utilities.
- Excessive DG on distribution feeders can result in system reliability problems in addition to cost recovery issues.
- Standardized net metering and interconnection may not be compatible with each REA. A one size fits all policy may not work for all utilities.
- A statewide net metering policy covering small DG systems may be easier to create than one for larger systems.

---

<sup>16</sup> We note that HB07-1169 has already provided a legislative mandate for the co-ops, requiring that they adhere to the Commission's interconnection standard.

<sup>17</sup> *Ibid.*

- Statewide net metering creates subsidization issues. There is a concern over unequal treatment of customers.<sup>18</sup>
- Net metering for REAs has already been addressed in the Energy Policy Act of 2005.<sup>19</sup>

With regard to the desirability of crediting distributed generation toward the renewable energy standard in general, and whether thermal production specifically should receive RECs that could be applied against the electric RES, the following observations were offered:

- It would be a simple matter to extend RES rebates and incentives to other (nonsolar) electric technologies.
- Nonsolar electric technologies should be subsidized at levels proportional to incentives for solar.
- The solar set-aside should be expanded to include all electric generating technologies and then let the market determine the

---

<sup>18</sup> The issue of cross subsidization in the context of net metering is complex and controversial and a comprehensive discussion is beyond the scope of this report. Under flat rate pricing, the cost of infrastructure (largely transmission and distribution) is built-in or averaged into the per kWh unit rate that all customers pay. Opponents claim that net metering customers rely on the same infrastructure but reduce their consumption thereby paying less than their fair share of the allocated infrastructure costs. The nonparticipants are then left with a larger share of this burden. Moreover, net metering could not occur without this distribution infrastructure. This is termed cross subsidization of one ratepayer group by another. The bigger problem for utilities is that the reduction in demand for grid supplied electricity may result in them being unable to recover the full costs of this infrastructure. However, all businesses must periodically reallocate fixed costs and overhead in response to changing demand and this situation is no different. In that regard, we would note that all cost allocation is imperfect. We would also note that the amount of the cross subsidy will depend on the penetration of net metering on the system. And, to the extent that such a cross subsidy exists, it is not likely to be onerous at low levels of net metering penetration. Furthermore, some net metering proponents would argue that if the costs of environmental externalities are considered, the subsidy is in the opposite direction.

<sup>19</sup> Section 1251 of Energy Policy Act of 2005 requires non-regulated utilities with retail sales greater than 500,000 MWh per year to commence consideration of a net metering standard by August 8, 2007 and complete its determination by August 8, 2008. This legislation does not require utilities to implement net metering but only that they consider it by the deadline. A utility that has already implemented or considered a similar provision has no further obligations under the Act. Per the Energy Information Administration, based on 2004 retail sales data, the non-regulated Colorado utilities that must comply with this provision are the cities of Fort Collins, Longmont, Loveland, and Colorado Springs as well distribution cooperatives Delta Montrose Electric Association, Holy Cross Energy, Intermountain REA, LaPlata Electric Association, Mountain View Electric Association, Poudre Valley REA, and United Power, Inc.

allocation within this carve-out. Note that this would provide an incentive to all DG with market forces determining the penetration levels for each technology.

With regard to providing thermal production with credits that could be applied to the RES, the following observations were offered:

- Thermal credits might be offered if the RES included thermal production. Alternatively, thermal credits could be applied to a new thermal energy standard. Others felt that developing an entirely new standard for thermal production was an inefficient use of funds.
- Thermal credits might better be coordinated with gas conservation and demand-side management programs.
- Applying thermal technologies against the RES would dilute the RES and its limited funds.
- It is difficult for thermal production credits to pass a total resource cost (TRC) test.<sup>20</sup>
- In making this determination, it is necessary to understand the system benefits of the various technologies (*e.g.* solar, thermal, conservation, etc.)

The final topic of discussion at the workshop concerned the adequacy of financial incentives and potential sources of funds. With regard to these topics, the following observations were recorded:

---

<sup>20</sup> This assertion was offered without proof. Two important considerations would be 1) whether we are speaking of water heating or space heating, and 2) whether the thermal system is displacing electricity or natural gas.

- System benefit charges<sup>21</sup> should be investigated. These could be assessed as an electric surcharge that could not be bypassed or perhaps a carbon tax. Mr. Del Worley, the General Manager of Holy Cross Energy, stated that his utility would support a system benefits fund if the proceeds were used in its territory. This highlights the need for a fair way to collect and administer such a fund.
- The question of who should administer a system benefits fund was raised: the utilities, a third-party nonprofit entity, or a state agency?
- It was noted that net metering alone (that is, without incentive payments) is not sufficient to move the market.
- Some states provide consumers with tax credits for the purchase of renewable energy generating equipment.
- Staff of the Commission raised the issue of whether in-state manufactured renewable generating equipment should be provided additional tax credits or perhaps additional credit against the RES.
- Relatively small pools of money (\$3 to \$4 million) would help move the market for solar thermal and small wind.
- It is difficult to determine how to categorize the benefits of ground source heat pumps. Are they demand side management (DSM) or distributed thermal production? This issue is addressed further in chapter 4.

---

<sup>21</sup> System Benefits Charges (SBCs), often known as public benefit funds, are fees placed on electricity bills that are used to fund certain public benefits such as support for renewable energy, energy efficiency, low-income customer programs, energy R&D, or other functions that the competitive market is unlikely to provide on its own. As noted by the DOE, *"System Benefits Charges are designed to be competitively neutral and, consequently, usually are non-by-passable. That is, every customer pays the charge regardless of what provider sells them electricity. System Benefits Charges also are designed not to competitively disadvantage the entity charged with collecting the fee. SBCs are usually assessed as a fee per kilowatt-hour (kWh), but they also may be assessed as a flat fee per customer"*

([http://www.eere.energy.gov/states/alternatives/system\\_benefits.cfm](http://www.eere.energy.gov/states/alternatives/system_benefits.cfm)). A Public Benefits Fund may include system benefits charges but also be augmented by other sources of revenue such as tax payments, royalties, or other assessments and transfers.

### **3.0 Incentives to Promote Distributed Generation**

Numerous mechanisms exist for modifying consumer's energy production and consumption behaviors. Rebates and tax credits are two of the most common. In this chapter, we will discuss the motivation behind providing such incentives for renewable energy in general and distributed generation in particular. Also discussed are the selected approaches taken by other states with the same goals in mind. The chapter concludes with a review of existing incentive programs and initiatives in Colorado.

#### **3.1 Rationale for Incentives**

Generally speaking, the rule of thumb that is often followed when establishing policy is to reward (encourage) desired behavior with financial incentives and tax (discourage) undesirable behavior. For example, in the present energy arena, greater use of renewable generation is encouraged while the discharge of pollutants into the environment is discouraged. Hence, the current approach is to provide rebates to encourage greater renewable energy generation while the threat of a carbon tax to discourage the release of CO<sub>2</sub> is ever present. When market mechanisms by themselves are insufficient to produce the desired policy result, regulation may be employed to mandate desired outcomes and prohibit undesirable ones.

The development and deployment of new technologies, such as renewable energy generating technologies, may require government intervention to achieve the desired result in a given time frame. A current example is the penetration of high definition television (HDTV). Manufacturers delayed the introduction of HDTV sets because of the absence of HD programming. At the same time, broadcasters were reticent to broadcast an HDTV signal that no one could receive. It was not until the FCC mandated that broadcasters turn off their analog signal by February 2009 that this stalemate began to move off dead center. And so it is with higher cost (at least in the near-term) of renewable energy systems. Renewable energy standards (also commonly known as renewable portfolio standards or RPS)

and rebate programs are the mechanisms employed in this country to foster the development of renewable energy.<sup>22</sup>

Incentive payments – rebates, tax credits, or other mechanisms – are intended to stimulate the industry by subsidizing the development of what is otherwise an uneconomic resource. The theory is that, with experience, the costs of the subsidized system will diminish due to several factors:

- Economies of scale
- Learning curve progress
- Increased competition on the part of
  - System providers as new entrants are drawn into the industry, and
  - Customers for incentive payments
- Technological advance

To the extent that any or all of these occur, the need for incentives should diminish over time. But, deciding that a particular technology should benefit from incentives is only the first step. One still needs to determine:

- Who will be the recipient of the incentive payments?
- Where will the funds come from?
- Should incentives be capacity based or performance based?
- What is the proper level of incentive payments?
- When should the incentives diminish or be removed (*i.e.*, when will the program be declared a success)?
- How do federal incentives impact the need for and the design of state incentive programs?
- Who will administer the incentive program?

---

<sup>22</sup> Feed-in tariffs (FIT) are the preferred policy approach employed in most of Europe and parts of Canada. FIT laws place a legal obligation on utilities to purchase electricity from renewable energy resources at a guaranteed price (generally per kWh). The aim is to offer customers who invest in renewable energy resources, an electricity buy-back rate that ensures profitable investment and facilitates an economic payback within the life of the system. Feed-in tariffs should be considered as a policy alternative to net metering and REC programs as they are generally not compatible.

Unfortunately, many incentive programs are developed without giving sufficient consideration to these design issues. Moreover, according to a recent study by the National Renewable Energy Laboratory, state renewable standards may have collectively mandated more demand for renewable energy than industry can supply, thus driving up costs for renewable energy [5]. This presents an interesting conundrum in that the very mechanism being relied upon to reduce costs is having the opposite effect, at least in the short term. It also highlights the need for a measured approach to the deployment of renewable generation lest ratepayers get stuck with a higher bill than would otherwise be necessary.

### **3.2 Review of Other States' Programs**

The *Database of State Incentives for Renewable Energy (DSIRE)* provided the starting point for our investigation into other states' incentive programs for distributed generation. Wendling Consulting LLC undertook a study of state incentive programs and provided its analysis of the requirements of HB07-1228 and how other states incentivize various modalities of distributed generation (see the report in appendix B).

Almost any incentive structure one can imagine has been implemented at the state level somewhere. State incentive programs for renewable energy include production tax credits, investment tax credits, rebates, REC payments, grants, loan guarantees, tax free bonds, property and sales tax exemptions, and *feed-in* tariffs. Before visiting the incentive programs in Colorado, we will first discuss some of the more interesting and unique incentive programs offered in other states.

#### 3.2.1 Washington State Feed-In Tariff

In November 2006, Washington voters approved Initiative 937 creating only the second voter initiated RPS in the country. But, even before approving an RPS for the state's major utilities, Washington provided incentives to spur renewable energy production by consumers. In the spring of 2005, the Washington legislature passed Senate Bill 5101 providing for an "investment cost recovery incentive" for residential and commercial customers who install solar, wind, and anaerobic digester renewable systems for the generation of electricity. This incentive is essentially a *feed-in* tariff that compensates the customer for actual generation during the year.

Once each year, customers with state-certified renewable systems may apply to their utility for compensation in the amount of 15 cents per kWh generated. This payment is capped at \$2,000 per year for all customers and is paid by the utility. Cost recovery for the utility is obtained via a tax credit that is claimed by the utility. Aside from being one of the few feed-in tariffs offered in the U.S., there is one other unique aspect to the Washington program, a multiplier for in-state manufacturing of the associated equipment. To help promote in-state manufacturing of PV components, the incentive payment is multiplied by a factor of 2.4 if the solar modules are manufactured in Washington state and by an additional 1.2 (for a total factor of 3.6) if the inverter is manufactured in state. These multipliers can bring the feed-in tariff to as much as 54 cents per kWh generated. Furthermore, RECs or other environmental attributes from the system remain with the owner and do not transfer to the utility in return for the incentive payment. This incentive program sunsets on June 30, 2014.

### 3.2.2 Oregon DG Incentives

In 2007, the state of Oregon instituted a new RES requiring 25 percent renewable generation by 2025. In addition to its new RES, Oregon passed a number of other aggressive DG-related incentives. First, the state implemented a 50-percent Business Energy Tax Credit for solar PV and thermal installations. Via this credit, businesses can recover 50 percent of eligible project costs up to a maximum credit of \$10 million over 5 years (the credit is for 10 percent annually for 5 years). Next, to promote solar in new residential construction, builders can obtain a \$9,000 tax credit for installing solar PV and hot water in new single family dwellings. Owners of existing homes may also claim tax credits of \$6,000 for PV and \$3,000 for solar water heating systems. In a further boost for DG, in 2007 the Oregon legislature also passed an act requiring that all public buildings receiving state funds invest 1.5 percent of project costs in solar PV and water heating systems.<sup>23</sup> And finally, Oregon's Solar Teamwork bill exempts net metered generating systems from state property taxes and also provides a mechanism for utilities to provide low interest loans to consumers who wish to purchase renewable generation systems.

---

<sup>23</sup> Passive solar may also qualify if the system will reduce energy usage by at least 20 percent.

### 3.2.3 City of Berkeley, CA Solar Finance Program

In November 2007, the city of Berkeley, California became the first city in the nation to establish a program to finance the cost of solar systems for property owners who repay the loan via a 20-year assessment on their property. Under the program, the property owner hires a city-approved solar installer who designs the system for the property. The city will pay the installer for the system and its installation, minus any applicable rebates, and will add an assessment to the property owner's tax bill to pay for the system. The additional tax burden, which will include an amount to cover administrative fees and interest, will be lower than what the consumer could obtain individually owing to the city's ability to secure low interest bonds. The solar system tax levy would "run with the land" (*i.e.* stay with the property) should the property be sold prior to system being paid off.

### 3.2.4 City of Los Angeles, CA Solar Incentive Program

In September 2000, the Los Angeles Department of Water and Power (LADWP) in 2000 began its effort to install 100,000 solar systems on city roof tops by 2010. Similar to Colorado's standing rebate offer, the program originally paid a flat rate per Watt for California Energy Commission listed equipment. In October 2007, the incentive payment structure was changed from a capacity-based system to a performance-based system. Under the present system, the incentive payment is calculated based on the PV-Watts first year projected generation from the system. This generation is then reduced by a degradation factor of 0.9 and then multiplied by the production incentive expressed in cents per kWh and then applied to the 20-year expected life of the system. The production incentive is determined based on a 10-step declining block schedule that begins at 14 cents per kWh. The residential incentive declines to 5 cents per kWh by the time 76.6MW of capacity has been installed and phases out at 93.3MW.<sup>24</sup> In an effort to promote local economic development, LADWP will provide a local content incentive of an additional 2 cents per kWh if the PV modules are manufactured in Los Angeles. To further stimulate emerging technologies, the 2 cent per kWh bonus may be applied if building integrated photovoltaic (BIPV) technology is deployed instead of conventional flat plate silicon technology.

---

<sup>24</sup> Although this is termed a performance-based incentive, for residential systems, the entire 20-year incentive is paid up front.

### 3.3 Existing Incentive Programs and Initiatives Available in Colorado

Numerous state and federal programs currently exist in Colorado to support renewable energy and distributed generation. In addition, many of the utilities in Colorado have their own programs to help subsidize the costs of renewable energy generation for their customers. Some of the more notable state and federal incentives are reviewed below. Appendix C contains a listing from the DSIRE database of Colorado incentives for renewable energy and appendix D contains a similar listing of federal incentives from the DSIRE database.

#### 3.3.1 Colorado Incentives

As noted, several Colorado utilities offer various incentives to their customers to subsidize renewable energy and distributed generation. The most prominent of these are the solar and net metering programs managed by Colorado's two IOUs, Public Service Company of Colorado (Xcel Energy) and Aquila. These well known programs, which provide the most generous support for DG in Colorado, are mandated by the RES. Both PSCo and Aquila offer their customers a combined rebate and REC purchase program for systems up to 10kW<sub>dc</sub> of capacity. The total \$4.50 per Watt combined rebate and REC payment is comprised of a rebate of \$2 per Watt, as stipulated in the statute, and an additional \$2.50 per Watt for the up front purchase of 20 years worth of RECs from the system.

Staff's assessment of Internal Revenue Service (IRS) rules indicates that, for consumers, the \$2.00 rebate will be tax free but the \$2.50 REC payment will be treated as ordinary income.<sup>25</sup> The reason for the differing treatment is that the \$2.00 per Watt rebate should come under an IRS exclusion for utility energy conservation subsidies from taxable income while the \$2.50 REC payment is structured as a purchase of renewable energy credits from the customer. The impact of the exclusion from taxable income for the \$2.00 per Watt rebate is discussed further in section 3.3.2 below.

---

<sup>25</sup> IRS Publication 17 states "You can exclude from gross income any subsidy provided, either directly or indirectly, by public utilities for the purchase or installation of an energy conservation measure for a dwelling unit." The same publication defines energy conservation measure as including "installations or modifications that are primarily designed to reduce consumption of electricity or natural gas, or improve the management of energy demand." On-site solar systems appear to meet this definition.

Colorado's municipal and rural electric utilities, though also subject to the RES, are not required to offer the same level of net metering service or solar incentives to their customers. Some of these utilities do, however, offer limited support for net metering and distributed generation though the level of such support is regarded as insufficient by renewable proponents.<sup>26</sup>

In the realm of property taxes, §39-4-102(1)(e), C.R.S. provides for the property taxes on renewable facilities to be based on the value of a "comparable nonrenewable energy facility." This effectively assesses the renewable facility at the overnight construction cost of a much smaller combined or simple cycle gas plant.<sup>27</sup> According to information from the Colorado Division of Property Taxation, this will likely result in a threshold value for solar PV facilities of approximately \$900 per kW. The actual assessed value of a given facility will be based on a combination of the cost approach, income approach, and market approach for the facility in question, but will not exceed the threshold value. Considering the difference in cost between a PV facility and a gas plant of equivalent capacity, this is likely to result in an advantageous assessment for the renewable generator.

Two bills were enacted in 2007 that provide incentives, or the possibility of new incentives, for distributed generation. HB07-1279 exempts renewable electricity generating systems from state sales tax. Given the state sales

---

<sup>26</sup> House Bill 07-1169, *Concerning Net Metering for Customer-Generators of Cooperative Electric Associations*, repealed and reenacted only one section (§40-9.5-304, C.R.S.) of the statutes governing net metering for customers of cooperative electric associations. The section that was reenacted, which concerns the *Safety and performance requirements* of net metering installations in co-op service territories, extends the Public Utility Commission's interconnection standards codified as 4 CCR 723-3665, *Small Generation Interconnection Procedures*, to cooperative electric associations. Beyond that, HB07-1169 provides no additional support for net metering. The other elements of the co-op net metering statute (§40-9.5-301 through §40-9.5-303 and §40-9.5-305 through §40-9.5-306, C.R.S.) remain unchanged. The end result is that co-ops are required to offer net metering to their customers subject to the following minimum requirements: 1) the net metered system has a generating capacity of not more than 25 kW unless the utility agrees to a higher capacity or unless otherwise limited by an existing contract for wholesale power purchased by the electric utility, 2) the total capacity of all net metered systems on the utility's system does not exceed one percent of monthly peak demand, and 3) customer-generated electricity is credited to the customer at the utility's avoided cost of generation. As will be described later in this report, the restriction imposed by existing wholesale power purchase contracts has become problematic in at least one case.

<sup>27</sup> Overnight cost is the total of all costs of building a plant accounted for as if they were spent instantaneously, requiring no time-dependent expenses such as interest. To that extent, the measure fails to accurately reflect the total cost of construction. The longer the time needed for construction, the greater the difference between the overnight cost and the true cost of construction.

tax rate of 2.803 percent, this exemption will save consumers as much as \$1,000 or more on the purchase of a typical home PV system. The exemption does not apply to thermal production systems.

SB07-145, the Renewable Energy Incentives Act (§30-11-107.3, C.R.S. for counties and §31-20-101.3, C.R.S. for municipalities), allows counties and cities to offer property tax and sales tax credits and rebates to residential and commercial purchasers of *renewable energy fixtures* (both electrical and thermal). It is unknown whether any local jurisdictions have thus far enacted such incentives.

On November 1, the Governor's office issued a press release announcing the Governor's FY08-09 budget request which includes a request of \$2 million for a residential solar rebate program. The announcement indicated that these funds would be used as a match for funds contributed by utilities that do not presently have solar rebate programs.

### 3.3.2 Applicable Federal Incentives

Certain federal incentives are available to Colorado consumers to assist with their costs of installing renewable distributed generation. Most fall within the realm of tax credits that are available to consumers who file federal income tax returns.

The Energy Policy Act of 2005 provides for a 30 percent investment tax credit (ITC) for utility customers who invest in solar electrical generation or solar water heating. Unfortunately, this credit, which is presently set to expire at the end of 2008, is capped at \$2,000 for residential consumers.<sup>28</sup> The tax credit, which presently reverts to 10 percent after 2008, is not capped for businesses which also enjoy the benefit of depreciation as well. Efforts are presently underway to extend the federal tax credits for several years and to remove the \$2,000 ITC cap on residential systems. As of this writing, these efforts appear to have been thwarted in 2007 federal energy legislation.

Above, we noted that rebates provided by the utility would likely be nontaxable. However, nontaxable rebates that reduce the first-cost of the system to the consumer will lower the basis of the asset thus, for business customers, the investment tax credit and depreciation will both be calculated on the reduced basis. Depending upon a firm's specific tax situation, it may find that the ITC and depreciation benefits outweigh the

---

<sup>28</sup> The IRS regulations provide for separate tax credits of 30 percent each for solar electric and solar water heating systems with each credit separately capped at \$2,000.

benefits of a nontaxable rebate. The same does not hold true for a residential customer for whom the ITC is capped and who may not be claiming depreciation on the system. Last, the PV tax credits will hold no value to tax exempt entities, persons subject to the alternative minimum tax, and those without sufficient tax liability.

With regard to the tax treatment of net metering income, IRS Publication 525 states: *"If you are a customer of an electric utility company and you participate in the utility's energy conservation program, you may receive on your monthly electric bill either:*

- *A reduction in the purchase price of electricity furnished to you (rate reduction), or*
- *A nonrefundable credit against the purchase price of the electricity.*

*The amount of the rate reduction or nonrefundable credit is not included in your income."*

Net metering income would appear to meet the second of these two incentives and would therefore be considered non-taxable income. However, as noted above, the sale of RECs to the utility would likely not receive such favorable tax treatment.

While an in-depth treatment of incentive program design is beyond the scope of this report, federal tax implications should be carefully considered in developing new incentive programs.

## **4.0 Analysis and Discussion**

### **4.1 Goals**

Just as with the development of a renewable portfolio standard, the place to begin discussing incentives for distributed generation is with the goals for the program. The arbitrary selection of a program set-aside or target for DG, without an understanding of how distributed generation relates to overall energy policy goals, is poor public policy. Considering the current concerns over greenhouse gas emissions, one approach may be to determine a target contribution toward GHG reductions and then calculate the amount of DG that would be required to meet it. However, we caution that simple offsets of GHG emissions per kWh generated may not be an appropriate calculation since small amounts of distributed generation are unlikely to result in a one-for-one reduction in the output of utility scale power plants.

Perhaps another approach would be to seek the maximum amount of DG capacity that may be installed within a specified budget constraint. Here, the success of such a program would be contingent upon the most cost effective deployment of DG resources. Careful consideration must be given to the elasticity of the demand for incentive payments so that optimal use may be made of the public or ratepayer funds accumulated for this purpose.

Last, as was brought out by one speaker at the workshop, perhaps we should consider what can be done to encourage smaller investments that are more affordable by a broader group of constituents. Whatever the case, good program design begins with clear and transparent goals that are objective and measurable. Hence, we will conclude this chapter with a discussion of the need for evaluation, measurement, and verification of incentive programs designed in support of public policy.

### **4.2 Public Versus Private Development**

A reasonable question that ratepayers and taxpayers may ask is what is being done with the additional funds they are being asked to contribute to fund any subsidy? Is the money going to private interests with little, if any, direct benefit to the providers of those funds? Or, would it better serve the public interest to ensure that such funds are used to subsidize DG systems for public buildings such as schools, museums, and government offices where the taxpayers funding the system would benefit

from the reduced capital expenditures and lower operating costs that result from the DG installation? A principle that may be employed in this regard is that we should strive to ensure that the population that bears the costs (*i.e.*, ratepayers or taxpayers) is congruent with the population that benefits.

We note that HB07-1281 added a 1.5x multiplier to the RES for community based projects. But, without a liquid market for RECs and a stable clearing price for REC transactions, this will not necessarily result in lower cost deployments of DG resources.

### **4.3 Distributed Generation and Net Metering**

As used in this report and in the context of HB07-1228, distributed generation refers to customer-sited, non-utility owned renewable resources. But this is not necessarily the case. Small generators (no larger than 10 MW) owned either by the utility or an independent power provider may also be considered a form of distributed generation – the principal differences being scale, ownership, and interconnection. The interconnection standards in the Commission’s RES rules envision distributed renewable facilities up to 10 MW in capacity though net metering is limited to customer-sited systems no larger than 2 MW. Because the statute directs the Commission to develop a policy for consumer-owned DG, and because net metering standards in the Commission’s rules apply only to customer-sited systems no larger than 2 MW, in this report we will focus on customer-sited, net metered systems of 2 MW or less.

#### **4.3.1 Net Metering**

One of the often-cited criticisms of the present net metering system (even for IOU customers under the Commission’s net metering rules) concerns the requirement for a year-end payout of the net excess generation at the utility’s avoided cost. Many net metered systems accumulate a positive balance throughout the spring and summer months that is not entirely expended by December 31. At the end of the calendar year, these customers receive payment for the balance in their account only to once again begin paying retail rates in January. Net metering customers would benefit if they could continue to roll this balance over beyond

December 31, and Staff of the Commission repeatedly fields suggestions from these customers that the close out period should be in the spring.<sup>29</sup>

The goal for net metering should be to allow customers to receive the full value from their investment in distributed generating systems while not turning them into *de facto* wholesale suppliers to the certificated utility. For this to occur, DG systems should first be appropriately sized to serve the load of the customer and not more. Given appropriately developed subsidies and net metering at the avoided cost rate, over sizing the system is not likely to be an economically sound investment in any event. The concerns of net metering customers and the utilities may be most beneficially addressed by providing for a continuous rollover of the net excess generation produced by the DG system, without ever having a cash payout to the customer from the utility. Should the customer remove the system or close the account, any net excess generation accumulated in the account would simply be forfeited.<sup>30</sup> This allows customers to receive the full benefit from their investment in the DG system without the utility needing to be concerned about an ever increasing liability on its books for which a bill will ultimately come due.

#### 4.3.2 Expansion of Net Metering Statewide

It seems clear that for DG to reach its full potential in Colorado, conditions must be created to allow for its expansion beyond the two IOUs. We have already discussed the fact that most of the burden for the RES has been placed on approximately the 60 percent of electric customers served by the IOUs. Not only are the costs of the RES primarily shouldered by this subset of customers, but the remaining 40 percent of electric customers are unable to take full advantage of distributed generation opportunities because of restrictions placed on net metering by the co-ops and municipal utilities. No incentive for distributed generation can be successful statewide until this is rectified.

In the public workshop, Mr. Wolfson of the Governor's Energy Office stated that the Commission's policy should recognize, and presumably address, market failures. One illustration of just such a failure, and of the type of co-op net metering restrictions alluded to above, may be seen in a current

---

<sup>29</sup> Some callers suggest that net metering customers should each be allowed to select their own closing date. We note that the requirement for an end-of-year closing for IOU customers originated with the Amendment 37 ballot initiative and is stipulated in the statutes at §40-2-124(1)(e), C.R.S.

<sup>30</sup> An alternative that would be in the public interest would be to donate the net excess generation to a low-income energy assistance program.

dispute concerning a 26-kW PV system recently installed on the Yampa Valley Justice Center. According to the developer who installed this system, the local cooperative utility, Yampa Valley Electric Association (YVEA), refuses to net meter the system because its wholesale supply contract with PSCo limits it to DG systems of not more than 10 kW in capacity. While PSCo has offered to purchase any net excess generation from this system, wheeling charges may make that option uneconomic. Additionally, there appears to be uncertainty over which utility would own the RECs if the system were net metered. This type of quandary could be avoided by appropriate legislation and regulation extending the Commission's net metering standard statewide.

There are two approaches one might take to address the issue of statewide net metering. The most direct approach would be along the lines of the goals for HB07-1169 as originally introduced, which would have required the co-ops to implement net metering similar to that required of the IOUs. Alternatively, the RES for co-ops and municipal utilities could be revised to require a customer-sited DG set-aside (without preference for technology). The requirement for customer-sited systems might force these utilities to implement more progressive net metering policies to comply with that portion of the RES.

Further support for statewide net metering can be found in the *2007 Sunset Review Final Report* for the PUC which included a recommendation that net metering be extended to all of the state's utilities. Quoting from the *Key Recommendations* included in the report:

*"...Amendment 37 and the resultant law require only investor-owned utilities to offer customer-sited generation and net-metering programs to customers: cooperative electric associations and municipal utilities are exempted from the mandate. Consequently, almost half of Colorado's electricity consumers do not have access to these programs. Requiring cooperative electric associations and municipal utilities to offer consumers customer-sited generation incentives and net-metering—as investor-owned utilities currently must—would allow all Coloradans to participate in the greening of the state's energy portfolio, while also helping cooperative electric associations and municipal utilities satisfy their renewable energy portfolio requirements."* [1]

Finally, Colorado may also wish to consider establishing trial TOU metering programs in the municipal and cooperative utility service areas. This

technology, often viewed as a mechanism to drive energy efficiency, may also ease resistance by these utilities to true net metering.<sup>31</sup>

#### 4.4 Technology Selection

Another important policy question may be asked with regard to the technologies that are subsidized by the incentives. Is it better to subsidize current, readily available technologies such as flat plate crystalline silicon PV and ground source heat pumps or to direct those funds into promoting building integrated photovoltaic (BIPV) and thin-film PV that possess greater potential for future cost reductions and increased efficiencies? Does targeting one technology over another provide a competitive advantage to the supported technology at the expense of the other? Those responsible for assessing and spending taxpayer and ratepayer funds have a responsibility to ensure that those funds are expended in the most cost effective manner and not succumb to the lobbying efforts of the myriad special interests who would lay claim to them.

One approach may be to develop technology tiers such that all costs above a certain threshold are subsidized regardless of the technology. This would bring the consumer's cost for all technologies to the same level and would put all technologies on an equal footing in the market place making the program technology neutral. Doing so would remedy the criticism that only PV and utility scale wind technologies benefit from the RES. The potential impact on overall program costs and number of program participants would have to be studied. However, under this approach, consumers could select any technology that otherwise suited their needs knowing that they would not be economically disadvantaged for selecting one technology over another.

An alternative approach would be to subsidize only those technologies that are perceived to hold the greatest promise for the future. While this may be a more efficient use of funds in the short term, it puts officials in the position of having to pick technology winners which may be a dangerous precedent, especially if they're wrong.

---

<sup>31</sup> One of the reasons that some utilities oppose net metering is the possibility that a small generator might draw expensive energy from the grid during periods of peak use while supplying energy back to the grid during periods of low demand. Although this is generally not a problem for solar installations it could occur with nonsolar generators. TOU metering would help rectify this concern by crediting these small generators with the proper value for the energy provided depending on when it is delivered. This, however, is beyond the capability of conventional bidirectional net meters.

Whichever approach is adopted, two considerations must remain:

- The subsidy must decline over time, and
- The subsidy should not reduce the consumer's electricity cost to the same level as purchasing power from the utility, that is, full grid parity.

In Staff's view, both constraints must be met for there to remain an economic incentive for developers to continue to reduce costs with the aim of reaching grid parity without subsidies.

## 4.5 Program Funding

As is evident from the discussion of incentives in chapter 3, a number of different mechanisms may be employed to fund subsidies for renewable energy in general and distributed generation in particular. In Colorado, for the investor owned utilities subject to the RES, the method of choice has been the Renewable Energy Standard Adjustment (RESA) which prefunds the renewable programs of Aquila and PSCo.<sup>32</sup> Because they are not required to develop Compliance Plans, at this time it is not known how the new QRUs -- the municipal utilities and co-ops who must comply with the RES beginning in 2008 -- intend to fund their renewable programs.<sup>33</sup>

### 4.5.1 System Benefits Charge

Thus far and to the best of our knowledge, none of the renewable programs in Colorado are being funded by a system benefits charge (SBC). An SBC can be structured as a flat rate or as a per kWh charge similar to a bill adjustment. One difference between an SBC and a bill adjustment such as the RESA is that the SBC, although collected by utilities, is typically used

---

<sup>32</sup> While the RESAs are intended to provide up-front cost recovery for the entire renewable programs of the two IOUs, they will effectively be used to fund only the solar programs for the two utilities. In the case of Aquila, its wind costs are built into its Electric Commodity Adjustment which it uses to pay for energy provided to it by PSCo. This leaves its RESA of 1.0 percent available to fund its solar program. PSCo on the other hand, in the Commission's decision on its 2007 Compliance Plan, received a waiver of the rule that would otherwise have required it to count its wind energy purchases as new renewable energy subject to the retail rate impact limitation. Hence, the entire amount collected under its RESA (0.6 percent in 2006 and 2007 with a request for 2.0 percent in 2008) is also being used primarily to fund its solar program.

<sup>33</sup> Each IOU, in contrast, submits to the PUC for its approval a Compliance Plan detailing how it intends to comply with the RES during the upcoming Compliance Year.

to provide funding for programs that are administered by a government agency or independent administrator. Utilities and consumers seeking incentive payments apply to the administrator for reimbursement according to the rules established for the incentive program. In addition, the SBC typically provides a pool of funds that is independent of rate impact caps, although the SBC may be designed with a maximum rate impact in mind. This, in fact, is one of the benefits of an SBC – it provides a known, stable funding source with less opportunity for creative interpretation than a funding source that is subject to a rate impact cap. Furthermore, with this model there is no inherent conflict of interest between the administrator and the ratepayer/consumer as there may be with utility-administered programs.

#### 4.5.2 Utility Bill Adjustments (Riders)

Utility bill adjustments or *riders*, such as the RESA, are another mechanism that may be employed to collect funds for renewable subsidies. Unlike the RESA, which provides up-front cost recovery for the utility, bill adjustments do not necessarily need to be collected in advance of expenditures, but may be a conventional cost recovery mechanism for acquisitions that have been declared used and useful. In the latter case, there would be less concern over whether ratepayers are paying for utility acquisitions that are prudent and cost effective. On the other hand, one might consider these ratepayer advanced funds as an investment that should give ratepayers (perhaps via an agency with a fiduciary responsibility to protect ratepayer interests) a voice into how those funds are spent.

#### 4.5.3 Direct Government Funding Via Taxes and Other Assessments

If society as a whole benefits from increased renewable generation, it may be more equitable to fund renewable programs via taxes or other assessments rather than ratepayer surcharges. If this were the approach, all Coloradans who benefit from the renewables would share in their cost. The present system of allowing each utility to establish its own renewable energy surcharges can result in inequities across utility jurisdictions. In some cases, the present system has customers of one utility subsidizing DG systems outside of its service territory, while the customers of the utility through which the system interconnects pay nothing yet still receive the economic development and environmental benefits.

In Colorado, there are presently two funds that are potential sources of incentives for DG. The first is the \$2 million matching fund described above for rebates in utility territories not subject to the RES standard offer

program. The second is the Governor's Clean Energy Fund which will be described next.

#### 4.5.3.1 Clean Energy Fund

Senate Bill 07-246 created a discretionary Clean Energy Fund (§24-75-1201, C.R.S.) to be administered by the Governor's Energy Office. This fund will receive revenues collected by the Colorado Limited Gaming Fund (§12-47.1-701(1), C.R.S.) transferred to it at the end of each fiscal year. Per the statute, the Governor's Energy Office may expend moneys from the fund:

- (a) To attract renewable energy industry investment in the state;
- (b) To assist in technology transfer into the marketplace for newly developed energy efficiency and renewable energy technologies;
- (c) To provide market incentives for the purchase and distribution of energy efficient and renewable energy products;
- (d) To assist in the implementation of energy efficiency projects throughout the state;
- (e) To aid governmental agencies in energy efficiency government initiatives;
- (f) To facilitate widespread implementation of renewable energy technologies; and
- (g) In any other manner that serves the purposes of advancing energy efficiency and renewable energy throughout the state.

According to the Fiscal Note accompanying this legislation, the Clean Energy Fund is estimated to have available \$7 million for disbursement in FY07/08, an additional \$8.526 million for disbursement in FY08/09, and another \$24.144 million for disbursement in FY09/10 for a 3-year total of \$39.67 million.<sup>34</sup> While it is presently unknown how these funds will be spent, this is clearly a significant source of discretionary funds that could be used to incent deployment of additional distributed generation in Colorado.

---

<sup>34</sup> Compare this amount to the approximately \$13 million per year provided by PSCo's 0.6% Renewable Energy Standard Adjustment which is entirely funding its 2007 compliance with the RES.

#### 4.5.3.2 Other Discretionary Funding Possibilities

Other options may exist for aligning the funding of renewable programs with goals for enhanced environmental quality, reductions in fossil fuel use, and economic development. The first would use the state's mineral severance tax fund to provide monies for renewable and distributed generation incentive programs. In this manner, the nonrenewable resource utilization that is at the core of the environmental problem would help pay for the remedy. Similarly, the implementation of a carbon tax has been the subject of much discussion lately. While there still needs to be a clearer definition of the place in the commodity stream at which a carbon tax would be levied (*i.e.*, the point of regulation), this would make an obvious source of renewable funding that would align benefits and costs.

### **4.6 Potential Incentive Mechanisms for DG in Colorado**

#### 4.6.1 Performance-Based Versus Capacity-Based Subsidies

The two common approaches to determining incentive payment amounts are pay for performance and pay for capacity. There is nearly universal agreement that pay for performance incentive programs are superior to capacity-based subsidies. First, the goal is to *produce* more of the energy we need using renewable systems, not simply build more generating capacity. Clearly, performance-based incentives better meet this goal. Second, performance-based incentives, which pay as energy is generated, better ensure that ratepayers' monies will be used as intended. Still, for small residential systems, up front rebates or pseudo performance-based incentives (such as California's) are often found because they are ostensibly simpler to administer and provide a greater market stimulus.

For over-10 kW systems, Colorado's RES requires that solar incentives be paid predominantly on a performance basis. There is still the opportunity for an up front rebate of up to \$200,000 for the first 100 kW of capacity.

Per the Colorado RES, both IOUs subject to the solar set-aside require incentive recipients to execute 20-year contracts which are assignable should the property be sold. Nonetheless, we cannot help but be concerned that under Colorado's current system, ratepayers' investments in 20 years of future RECs are not adequately protected. Perhaps a middle ground would be a hybrid approach that provides for up front rebates until such time as a utility's minimum obligation is met and then shift to a true performance-based approach for acquisitions beyond that.

Paying for performance would also smooth out the spending of ratepayers' RESA funds although this may negate some of the stimulus provided by the large up front payment. But, providing incentives only for performance would be better aligned with the goal of producing renewable energy, not capacity. Feed-in tariffs, in which distributed generators are paid on the basis of energy delivered, predominate in most other parts of the world. And, as we've seen in the case of Washington, this approach has now taken hold in the U.S., as well. Furthermore, the problem of a diminished market stimulus that could result from a reduction in the up-front rebate may be cured by an extension of the solar services model that will be described below.

#### 4.6.2 Tax Credits

The state of Colorado presently does not offer any tax credits for photovoltaic or other distributed generation systems.<sup>35</sup> One of the advantages of using tax credits as an incentive mechanism is that it spreads the cost of the incentives among all citizens. In this manner, tax credits serve the same function as grant programs or incentives paid from taxpayer dollars. One argument against this approach would be that, since the DG system reduces the load on a specific utility, the subsidy is most appropriately paid by that utility's customers. However, to the extent that emissions, environmental degradation, and energy security are broader societal concerns, a counter argument could be made that all taxpayers should share in the cost.

Another argument in favor of tax credits is that they provide a mechanism for administering an incentive program without the need to create a new bureaucracy. And, the amount of the credit could be increased to meet other goals such as fostering in-state manufacturing for economic development. But, here again we face the difficulty of monitoring and verifying that taxpayers are receiving full value for their investment. In Colorado, the problem is further aggravated by the Taxpayer Bill of Rights (TABOR) Amendment which limits government flexibility in allocating revenues to suit specific programmatic needs. Thus, the type of generous tax credits offered by the state of Oregon to its residents may be problematic in Colorado. It is not known whether tax exemptions, as opposed to tax credits, would face similar difficulties.

---

<sup>35</sup> As described above, it does offer certain tax exemptions for qualifying property.

#### 4.6.3 Low Interest Loans

Earlier, we described innovative low interest loan programs being implemented in Berkeley, CA and the state of Oregon. Perhaps an opportunity for similar programs exists in Colorado. The Clean Energy Fund described earlier could potentially be one source of revenues for such a program. Alternatively, the Colorado Clean Energy Development Authority created in 2007 by House Bill 07-1150 may be the logical entity to create a source of low cost financing to support distributed renewable generation for consumers.

### **4.7 Credits for Distributed Generation**

One of the issues of particular concern to the legislature in passing HB07-1228 was the potential for developing a REC-like credit program for DG.<sup>36</sup> Although not stated specifically, the implication was that a system of DG credits could be created and applied to the Renewable Energy Standard since this is the only existing mechanism for valuing renewable credits. In fact, to the extent that the distributed generator is an eligible electric renewable energy resource, distributed generation credits already exist. They are no different from any other RECs. The main issue is whether or not a sufficiently liquid market exists for these credits to have any redeemable value.

Prior to the extension of the RES to the co-ops and larger municipal utilities, there were, for all practical purposes, only two customers for RECs in Colorado: Aquila and PSCo. With the co-ops and larger municipal utilities now brought under the renewable energy mandate, there are now 26 potential Qualifying Retail Utility (QRU) customers for RECs. However, there are still only two QRUs with a net metering requirement or a solar set-aside and those two, by virtue of their existing incentive programs, are well stocked with solar/DG credits for the near term. Without extending net metering to the municipal and cooperative QRUs, there will be no expansion of the market for DG credits. That is, with one exception: create a separate carve-out in the RES for distributed generation.

---

<sup>36</sup> Repeating from the statute at §40-2-109.5(1), C.R.S., "THE COMMISSION SHALL DEVELOP A POLICY TO ESTABLISH INCENTIVES FOR CONSUMERS WHO PRODUCE DISTRIBUTED GENERATION, INCLUDING, BUT NOT LIMITED TO SMALL WIND TURBINES, THERMAL BIOMASS, ELECTRIC BIOMASS, AND SOLAR THERMAL ENERGY. **THE COMMISSION SHALL CONSIDER WHETHER A CREDIT PROGRAM SIMILAR TO THE RENEWABLE ENERGY STANDARD SET FORTH IN SECTION 40-2-124 WOULD WORK FOR CONSUMERS WHO PRODUCE DISTRIBUTED GENERATION.**" (emphasis added).

#### 4.7.1 Set-Asides (Carve-Out)

Some state RPS programs have created a multitude of technology tiers or separate set-asides to specifically favor selected technologies according to the needs of that state. The solar set-aside in the Colorado RES represents one such carve-out. Creating a new carve-out for distributed generation in the RES would partially overlap with the existing solar set-aside. Recall that a number of the written and oral comments concerning this issue lamented the fact that the RES provided incentives for PV solar and utility scale wind without providing meaningful support to other renewable resources.

A potential remedy to this deficiency would be to create a new carve-out for distributed generation. Here again, two possibilities arise: 1) replace the existing solar carve-out with a more general DG carve-out, or 2) create a new, nonsolar DG set-aside on top of the existing solar set-aside. Staff views either of these approaches as needlessly adding an additional layer of complexity to the RES. With regard to the first alternative, replacing the existing solar carve-out with a general DG carve-out is not likely to be well received by the nascent solar industry that the RES has seeded. As to the second alternative, because the economics of nonsolar DG technologies (such as small wind, etc.) are fundamentally different from solar, some effort must be expended to design incentive programs that will encourage development of these other technologies. The value of these incentive programs must be rationalized to the existing subsidy for solar lest the state get back into the position of picking technological winners and losers (which it has admittedly already done with the solar carve-out).

#### 4.7.2 Multipliers

An alternative approach to fostering the development of specific technologies is to apply multipliers with respect to the credit received toward compliance with the RES. It is important to recognize that multipliers do not reward generators with additional tradable RECs. Multipliers are merely an attempt at changing the relative economics with respect to compliance. Thus, applying multipliers can be confusing because the broader REC marketplace will not reward the generator with additional economic assets in the form of additional RECs.

Colorado's RES presently includes three multipliers: 1.25x for in-state generation, 1.5x for community based projects, and 3.0x for solar in co-op territory. Based on experience to date, Staff believes that the 1.25 multiplier to favor in-state generation is probably unnecessary. Its only

real impact is to effectively reduce the renewable standard by 20 percent.<sup>37</sup> As for the 3x multiplier for solar, it does not appear to be large enough to overcome the cost differential between solar and less costly renewable technologies such as wind. The jury is still out on the 1.5x multiplier for community based projects, but it too is likely to prove unnecessary with the advent of the solar services model for commercial scale projects.

As we've seen, one problem with multipliers is that the factor must be carefully selected to provide an appropriate price signal that equalizes the handicap suffered by the more expensive technology. This is extraordinarily difficult as rapid technological change and cost reductions create a constantly moving target. If the multiplier is not set appropriately, it will not have the desired effect. And, embedding a multiplier in a statute ensures that regulatory bodies will be powerless to adjust the multiplier in response to a changing marketplace and decreasing production costs. Thus multipliers, when they are used, are better left to regulatory discretion than legislative edict. The bottom line on multipliers, however, is that most knowledgeable parties regard them as inferior to carve-outs for fostering the development of particular renewable resources.

#### 4.8 Thermal Production

A separate but related question to the issue of carve-outs and multipliers is whether credit should be provided against the RES for thermal technologies. It is true that a handful of states allow thermal credits to count against their renewable standard. This decision, however, should be made on a case by case basis. Although it is a simple matter to convert thermal energy, measured in Btu, to an electrical equivalent using a factor of 3,415Btu/kWh, the more fundamental issue comes back to the design of and goals for the RES.

Recall that in section 1.2, we emphasized that the Renewable Energy Standard is, in spite of its name, actually a Renewable *Electric* Standard. Thus, applying thermal production against the RES would effectively dilute the standard making compliance that much easier.<sup>38</sup> Think of this as akin to grade inflation in an academic setting. To the extent that a more

---

<sup>37</sup> With a multiplier of 1.25x, the effective requirement for renewable generation is only 1/1.25 or 80 percent of the nominal standard.

<sup>38</sup> Colorado's 20 percent renewable standard is already diluted more than some would like by 1) the 10-percent standard for co-ops and municipal QRUs, 2) the 1.25x multiplier for in-state generation, and 3) the ability to purchase unbundled RECs from out of state for compliance.

comprehensive energy standard is desired, perhaps that is what should be developed.

The first test of whether a technology should be credited against the RES is a determination of what energy resource is being offset by the renewable generator. If the renewable or distributed generator is displacing electricity, then an argument may be made for providing credit against the RES. If it is displacing natural gas used for heating, then perhaps the credit should come from a gas standard (or possibly a demand side management program). However, this distinction is not always easily made.

In Colorado, the bulk of hot water and space heating is fueled by natural gas. In some markets such as Florida, these functions are primarily provided using electricity. If one of the relatively few consumers in Colorado who does heat with electricity replaced his system with a solar or biomass thermal system, should he then receive credit toward the RES? According to our principal above perhaps he should. But, this would be impractical.<sup>39</sup>

The situation becomes even more convoluted when considering geothermal (ground source) heat pumps. In Colorado, these devices displace primarily natural gas when heating in the winter and electricity when cooling during the summer. Into which category should they fall? Furthermore, when operating, they consume some measure of electricity which may, in the absence of other information, be considered brown power. Should their production be credited against the electric standard? If so, should it first be netted out against the energy consumed by the system?

One final test of whether a technology should qualify for credit against the electric standard is whether the technology sends power back into the grid when not connected to load. If it does not, then it is not amenable to net metering. Thus, thermal technologies, while deserving of some form of subsidy, cannot be considered for net metering benefits. Similarly, it will be difficult for a utility to measure the production from a thermal system and subsequently use it to offset a customer's electricity use without

---

<sup>39</sup> In Arizona, thermal production is credited against the RES. A call to the Staff at the Arizona Commission yielded the following explanation. Arizona generates a considerable portion of its electricity using natural gas. Furthermore, there is only one natural gas pipeline into the region and natural gas supplies are always tight. Though solar hot water and space heating may not offset electrical usage, it frees up an equivalent amount of scarce natural gas for other purposes, principally electrical generation. Hence the decision to allow thermal production to be credited against that state's electric standard.

developing a new protocol for measuring and reporting the thermal production to the utility.

Another potential difficulty can be found in the direction provided by §40-2-124, C.R.S., the RES statute, to create a tradable REC market.<sup>40</sup> While one state may allow thermal production to count toward its renewable energy standard, those RECs will not necessarily qualify under another state's RPS. Multiple, inconsistent definitions for RECs will not be conducive to the creation of a tradable REC market.

We are not claiming that solar thermal, biomass thermal, and geothermal systems are not energy efficient and worthy of incentives or other public subsidy. Staff believes they are. The only question is what form these incentives should take. Because these technologies have a significant conservation component to them, perhaps they are better considered for incentives under DSM programs. As we discussed above, there are a host of funding mechanisms that may be employed for encouraging worthy thermal production technologies including tax credits, rebates, and low interest loan programs, among others. It would, however, be inappropriate and contrary to good RPS design to simply add them to the list of eligible technologies without making commensurate modifications to the fundamental structure of the renewable standard.

#### **4.9 Solar Services Model**

Over the past two years, a solar services model has developed to help ease the adoption of PV solar systems by customers lacking the capital to purchase such systems. Pioneered by SunEdison and MMA Renewable Ventures, this multiparty transaction originally developed as a mechanism to finance solar installations for commercial customers, taking advantage of federal tax credits that may not be available to the customer. More recently, entrepreneurial firms are attempting to extend it to the residential marketplace.

At the heart of the model is a tax qualified investor with an appetite for the 30 percent investment tax credit (ITC) and depreciation benefits available

---

<sup>40</sup> §40-2-124(1)(d), C.R.S. requires the Commission to establish: *"A system of tradable renewable energy credits that may be used by a qualifying retail utility to comply with this standard. The commission shall also analyze the effectiveness of utilizing any regional system of renewable energy credits in existence at the time of its rule-making process and determine whether the system is governed by rules that are consistent with the rules established for this article."*

to investors. On the other side of the transaction is a utility customer seeking to purchase electricity from a renewable resource but without sufficient free cash flow to invest in such a system. In the middle is a developer who brings these two parties together and manages the installation and operation of the project. The project is enabled by a long term purchase power agreement (PPA) under which the customer agrees to purchase energy from the renewable generator (developer). In Colorado, the RES requires that such transactions be for 20 years. The benefit to the customer is that he acquires energy at a known price for the term of the agreement.<sup>41</sup> As a net metering customer, he also benefits from the sale of net excess energy back to the utility though this is not likely to be significant for a commercial customer with an appropriately sized system. Making the deal, so to speak, is the subsidy provided under the RES. In Colorado, this subsidy takes the form of ratepayer-funded rebates and REC purchases made by QRUs who must comply with the RES. The REC purchases from these systems come under Commission's rules which require that QRU resource acquisitions over 100 kW be made by competitive acquisition. However, modifications to the RES made by HB07-1281 prevent the Commission from restricting utility REC ownership so long as the utility is under the retail rate impact limitation. This is problematic because it allows a QRU to conceivably pay above market prices for RECs with the Commission having little to say in the matter.

#### 4.9.1 Statutory and Regulatory Implications in Colorado

Colorado remains what could be considered a traditionally regulated utility market. This is in contrast to several states that have "restructured" their markets in the hope that competition would hold electricity prices down. As a traditionally regulated state, each certificated utility is granted a defined service territory in which it has an obligation to serve all customers and the right to prevent others from serving those customers. This means that no other provider of electricity may sell power to customers within the utility's defined service territory.

With the advent of the solar services model, we now have new commercial providers of electricity seeking to sell power to customers under a PPA within the utility's service territory. With one exception, this utility model is not permitted under Colorado law. While a customer may self-generate, a renewable energy developer may not supplant the certificated utility providing service to a customer within the utility's service territory. The

---

<sup>41</sup> The energy purchase price may be above or below the tariff rate charged by the local utility and is often indexed with a mild escalator to account for inflation.

single exception occurs when the certificated utility waives its exclusive right (and obligation) to serve all customers in its defined territory.

Although not specifically discussed in the workshop, this issue was explored in the Public Service Company of Colorado (PSCo) 2007 RES Compliance Plan docket. In that proceeding, PSCo waived its right to be the sole provider of electric service, but only for those projects that were selected in its solicitation and that would be providing it with RECs for compliance with the RES. The company did not waive its right to be the sole provider of service generally, effectively making it the sole arbiter of who can participate in the market for solar services and who cannot. Unfortunately, the importance of this issue to developers, prospective net metering customers, and consumers in general was not widely understood.

It is easy to envision a scenario in which a PSCo customer seeks to contract with a solar services provider outside of PSCo's renewable acquisition programs. Perhaps the customer intends to keep and retire the RECs to support its own environmental initiatives or, with some two dozen new QRUs in the state, sell them to another utility. Under the present regulatory schema, it would be precluded from doing so without first obtaining a waiver from PSCo. Again, PSCo, not the Commission, becomes the sole arbiter of who can serve these customers. Similarly, other utilities may exercise the same right in their service territories effectively blocking an entire class of customers from hosting distributed generation systems.<sup>42</sup>

Staff suggests a possible remedy to this dilemma. §40-40-101 *et. seq.*, C.R.S., the Colorado Geothermal Heat Suppliers Act, passed in 1984, allows for a relaxed regulatory schema covering suppliers of geothermal heating systems. This Act requires the Commission to issue operating permits to providers of geothermal heat when it finds that the applicant:

- is fit, willing, and able to provide the proposed services, and
- has made an adequate showing that the geothermal heat supply and distribution system appears reasonably capable of delivering the proposed services.

---

<sup>42</sup> Note that the problem here is not with the DG system, per se, but with the business relationship. Any customer may self generate, but that implies that the customer owns the system. Under the solar services model, the customer is purchasing energy from a non-regulated retail provider under a PPA. This is specifically prohibited in Colorado's traditionally regulated utility schema in which only a certificated utility can sell electricity to retail customers unless, as in the case of the PSCo acquisition described earlier, the utility grants a waiver of its exclusive right to serve. One might reasonably ask what would motivate a utility to grant such a waiver?

Importantly, this permit *“may not be denied because the area which the applicant proposes to serve is already being served by a gas or electric utility.”* Thus we already have what appears to be the sole statutory exception to the right of a certificated utility to exclude others from providing a retail utility service in its territory. While the heat suppliers act applies only to geothermal heating systems, we note that such systems are one of the technologies specifically mentioned in HB07-1228. Moreover, the relaxed regulatory schema currently applied to suppliers of geothermal heating systems could be rendered technology agnostic by extending it to all providers of DG systems irrespective of technology.

While this will not directly provide incentives for DG in Colorado, it will remove an institutional impediment to DG development. In conjunction with the expansion of a net metering requirement to the municipal utilities and co-ops, this approach would enable the use of the solar services model, which has become the most popular mechanism for developing DG projects in the country.

#### **4.10 Administration of Programs**

The debate over who should administer incentive programs has been ongoing since renewable standards have been in existence. In Colorado, whether administration of the RES should fall to a third party administrator or be left in the hands of the utilities was one of the most contentious issues during the rulemaking process. Under the current RES rules, the QRU is charged with administering the solar incentive program.

There is arguably a conflict of interest created by allowing the utility to be the administrator responsible for managing ratepayer funds that are used to pay the utility’s costs of compliance with the RES. This conflict is exacerbated by the QRU’s ability to obtain pre-funding for its RES expenditures and magnified still further by the clause in HB07-1281 that prevents the Commission from restricting the QRU’s ownership of RECs. Under these conditions, there is insufficient incentive for the utility to exercise due care with ratepayer funds and invest them in the most cost effective manner. Placing a consumer funded program in the hands of the utility with no accountability is poor public policy.<sup>43</sup>

---

<sup>43</sup> We would note that this conflict of interest also exists in regard to utility administration of energy efficiency or DSM programs.

Colorado already has multiple organizations that are responsible for disbursing incentives designed to spur renewable energy deployment.<sup>44</sup> These incentives vary widely depending on utility service territory. Program efficiency goals and equitable treatment of consumers argue for these programs, to the extent possible, to be brought under one office. This would help ensure that all Colorado consumers receive equal treatment and have equal access to renewable incentive programs.

#### 4.10.1 Evaluation, Measurement, and Verification (EM&V)

In addition to being an important economic development tool, the Renewable Energy Standard and related incentive programs form the cornerstone of Colorado's contributions toward achieving energy security and combating climate change. The success of such an important policy initiative cannot be known without a comprehensive program of evaluation, measurement, and verification. Without closing the loop in this manner, how are policy makers, and their constituents, to judge the efficacy of these programs?

A comprehensive discussion of program EM&V is beyond the scope of this report. However, future initiatives must include allowances for comprehensive evaluation and verification. Moreover, these activities should be undertaken by public trustees or their agents and not left to self-reporting by the utilities that have been advanced public funds to implement the programs. Self reporting by the utility may be the first step in judging compliance but it is not an option for judging the success of public policy initiatives. That requires a more rigorous and uniform program of evaluation, measurement, and verification.

---

<sup>44</sup> Thus far, we have multiple utilities offering various incentives (some dictated by the RES and some not), various state agencies responsible for grants, tax credits, tax exemptions, and loan programs, and local government agencies offering promotions to those fortunate enough to live within their jurisdictions.

## 5.0 Recommendations

### 5.1 Guiding Principles

Staff's recommendations for Commission policy regarding distributed generation are founded on eight guiding principles that provide the foundation for the development and implementation of DG programs.

- Establishing clear, measurable, and transparent goals is a necessary first step in program design. Evaluation, measurement, and verification are required throughout and provide accountability to ratepayers and taxpayers. As stated by John Sheehan at a recent NREL Carbon Policy Forum: *"Without a measurable societal benefit, policies will surely not deliver any."* [4]
- It is fundamentally inequitable to place a greater burden of compliance with the renewable energy standard on one company and its customers than on others.
- With respect to incentive programs, we should strive to make the population that pays congruent with the population that benefits.
- To earn RECs for compliance with the RES, the distributed generation technology should be amenable to net metering, that is, it should displace energy from the grid.
- The policy goals of renewable energy development are to provide an energy resource that meets society's need for clean energy with less environmental degradation, greater energy security, more efficient use of scarce resources, and economic development at the lowest cost. Incentive targets should be established that are congruent with, and flow from, these policy goals.
- In developing incentive programs and policy, John Sheehan recommends *"Focus on societal needs, not technology-specific solutions and not special interest needs... Without a holistic system-wide approach, loop holes and perversions of the policy are inevitable."* [4]
- There are numerous alternative approaches to providing incentives other than using funds contributed by ratepayers for compliance with the RES. These include tax credits and exemptions, rebates and cost sharing, grant programs, and low interest loans, among others.

- The goal of incentive programs is to stimulate sufficient marketplace activity and cost reductions so that the incentives may be phased out.

## 5.2 Incentives for Distributed Electrical Generation

From our discussion above, adequate incentives for electric renewable distributed generation already exist within the IOU service territories. Distributed electrical generation should be expanded in the service territories of the non-regulated co-ops and municipal utilities. As discussed, this will require a more progressive net metering policy within these utilities. Enacting a DG set-aside within the territories of cooperative and municipal utilities may be the most effective mechanism for extending DG into these territories.

## 5.3 Incentives for Distributed Thermal Generation

Consistent with our earlier discussion, providing incentives for thermal generation appears warranted. However, because thermal renewable resources typically do not displace electricity in Colorado, Staff recommends that thermal credits not be applied against the RES. Separate incentives through grant and loan programs or tax credits could be equitably applied in both the IOU and non-IOU service territories. Furthermore, because the outcome of thermal DG is often indistinguishable from DSM strategies such as increasing insulation, the Commission may wish to investigate a mechanism by which thermal resources such as solar hot water might be incorporated into DSM programs.

## 5.4 Net Metering

A statewide, uniform net metering policy is important to the future success of the RES and energy policy in Colorado. Commensurate with the second principle above, equitable treatment across all ratepayers demands that net metering be extended to the co-ops and municipal utilities at the earliest opportunity. Citing the PUC Sunset Review again:

*“Amendment 37 was passed by the people of Colorado, not just the customers of Colorado’s larger investor-owned utilities. All Coloradans should be able to actively participate in the greening of the state’s energy portfolio, and, at present, they are not.”*

*For these reasons, municipal utilities and cooperative electric associations should be required to offer customer-sited generation incentives and net metering.” [1]*

Aside from the equity principle so well expressed above, there is not likely to be much distributed electrical generation in cooperative and municipal utility territories without a more progressive net metering policy by these utilities. Any regulation or legislation extending net metering to the co-ops and municipal utilities must also ensure that wholesale suppliers to these utilities do not impose contract terms on them that conflict with the goals for statewide net metering or any other aspect of the renewable standard.

In addition to extending net metering to the municipal and cooperative utility service territories, a useful change to the net metering protocol in the RES would be to eliminate the year end payout in favor of a perpetual rollover of net excess energy. This would make the net metered systems more useful to customers who install them. When the customer's account is closed, any remaining net excess generation would be forfeited.<sup>45</sup>

REC ownership would be retained by the generator except in cases where the owner receives an incentive payment in which case the RECs would be retired. RECs would not have to be surrendered to the utility in return for net metering as is presently required by some co-ops.

## **5.5 Program Administration**

There seems little reason why uniform renewable and distributed generation policies should not be implemented on a statewide basis. Program efficiency and customer equity concerns argue for the administration of incentive programs supporting renewable energy and distributed generation to be centralized under one administrator rather than each utility. A system benefits charge, equally applied across utilities, would fund the program in place of RESAs that are now unevenly applied. This would also address issues with the confusing and poorly understood retail rate impact cap. Uniform, standard contracts for customer-sited systems could be developed that would be used throughout the state by all developers. Rather than having 26 different programs, the state would have one program, and developers and builders could standardize their offerings irrespective of service territory.

---

<sup>45</sup> This general approach could be fine tuned in a number of ways. As mentioned earlier, the energy forfeited could be donated to a low income program. Another possibility would be to allow a 12-month rolling window for the balance of net excess generation.

Staff recommends that the Geothermal Heat Suppliers Act, §40-40-101 *et. seq.*, C.R.S., be amended to include all eligible renewable resources, not just geothermal. This would grant all third-party developers operating as solar services providers – or more generally, renewable services providers – the ability to operate in Colorado without obtaining a waiver from the local utility. The Commission would certify these providers and issue operating permits for their systems. As noted earlier, during the workshop the GEO noted that there were presently at least a dozen energy service providers that have entered the state and he suggested that these firms should be prescreened. These energy service providers have taken on a utility-type role and there is a need to ensure that appropriate consumer protections are in place before they are needed.

Last, Staff believes that desirable policy goals may be advanced by using some of the monies in the Clean Energy Fund to subsidize solar and geothermal heat pump systems for low income consumers. To further aid consumers who wish to finance the purchase of renewable DG systems, the Clean Energy Development Authority, established by HB07-1150, may be an appropriate vehicle to introduce a program offering low interest loans to Colorado consumers who wish to purchase solar or other DG systems for their homes.

## 6.0 Bibliography

1. Colorado Department of Regulatory Agencies, 2007, 2007 Public Utilities Commission Sunset Review; Office of Policy, Research and Regulatory Reform, Colorado Department of Regulatory Agencies, Oct 2007, 80p.
2. Haynes, R., and Whitaker, C., 2007, Connecting to the Grid: A Guide to Distributed Generation Interconnection Issues, 5<sup>th</sup> ed.; North Carolina Solar Center contract to the Interstate Renewable Energy Council, 44 p.
3. Rawson, M., and Sugar, J., 2007, Distributed Generation and Cogeneration Policy Roadmap for California; California Energy Commission Staff Report, March 2007, 38 p.
4. Sheehan, J., 2007, Impacts of Policy Mechanisms on Biofuels and Agriculture; presentation to the National Renewable Energy Laboratory Carbon Policy Forum, Lakewood, CO, 27 Nov 2007.
5. Swezey, B., Aabakken, J., and Bird, L., 2007, A Preliminary Examination of the Supply and Demand Balance for Renewable Electricity; NREL Technical Report TP-670-42266, Oct 2007, 10p.
6. U.S. Department of Energy, 2007, The Potential Benefits of Distributed Generation and Rate-Related Issues That May Impede Their Expansion: A Study Pursuant to Section 1817 of the Energy Policy Act of 2005; U.S. Department of Energy, Feb 2007.