Colorado's 30% Renewable Energy Standard: Policy Design and New Markets

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Executive Summary

Colorado HB10-1001, signed by Governor Bill Ritter Jr. on March 22, 2010 increased the state's Renewable Energy Standard (RES) to 30% by 2020 for Investor Owned Utilities (IOUs), Xcel Energy and Black Hills Corporation. Furthermore, the legislation created a requirement that 3% of all electric sales must come from renewable Distributed Generation (DG) by 2020. This paper summarizes the key policy elements contained in HB10-1001 and provides estimates of new market creation for renewable utility sale as well as DG in Colorado over the next decade[1].

Background

Colorado was the first state in the U.S. to adopt a RES by a vote of the people. After four consecutive years of failing in the legislature, the measure was taken to the ballot through a citizen's initiative in 2004. Amendment 37 created a 10% RES standard for Investor Owned Utilities (IOUs) to be achieved by 2015. Amendment 37 also established net metering and interconnection standards for the state's IOUs as well as a "carve out" for solar generation. Under Amendment 37 in addition to the 10% goal, 4% of that renewable energy must be solar generation with half of that being "central" or utility scale solar and the other half from rooftop type of distributed installations.

In November, 2006 Governor Bill Ritter Jr. was elected on a campaign of creating a 'New Energy Economy' for Colorado. In 2007, Xcel Energy the state's largest IOU serving ~60% of the electric load, was on track to reach the existing 10% standard by the end of the year - seven years early.

In 2007 at the beginning of Governor Ritter's first term, House Bill07-1281 was introduced and passed, doubling the renewable energy standard to 20% for IOUs and, for the first time, including the Rural Electric Coops and Municipal Electric Utilities with their own 10% goal by 2020.

Three years later, Governor Ritter once again led the charge to increase the renewable energy standard. In the 2010 legislative session, HB10-1001 increased the standard to 30% for IOUs and modifying the "solar carveout" to a larger 3% Distributed Generation (DG) requirement. This standard is the highest in the Rocky Mountain West and the most aggressive in the country.

[1] It is important to note that this paper summarizes the GEO's best estimate to date on what the expected renewable utility-scale and distributed generation markets will be in Colorado over the next decade. These estimates are subject to change however with new renewable energy rules about to be issued by the Public Utilities Commission as part of Docket No. 10R-243E and the subsequent filing of Xcel Energy and Black Hills Corp. Renewable Energy Standard Resource Plans later this year.

Introduction

The purpose of this paper is to outline the policy considerations behind HB10-1001 and to estimate the impacts that the legislation will have on creating new markets for renewable generation. Although the 2020 goal calls for 30% renewable energy generation and 3% DG, the law includes the standard "stair-steps" in a series of three phases; 2011-2014, 2015-2019 and 2020 as outlined in Table 1.

Table 1. Minimum Total RES and DG generation percentage requirements by year for IOUs.

Year	Total RES	DG
2011	12%	1%
2012	12%	1%
2013	12%	1.25%
2014	12%	1.25%
2015	20%	1.75%
2016	20%	1.75%
2017	20%	2%
2018	20%	2%
2019	20%	2%
2020	30%	3%

It is important to note that while the minimum compliance steps ratchet up in somewhat large increases, particularly between 2019 and 2020, actual utility compliance plans will demonstrate more orderly market growth with the objective of exceeding minimum compliance in interim years in order to achieve the 2020 goal. Figure 1 below outlines graphically the expected Residential Retail DG acquisition schedule for IOUs as an illustration of this point.

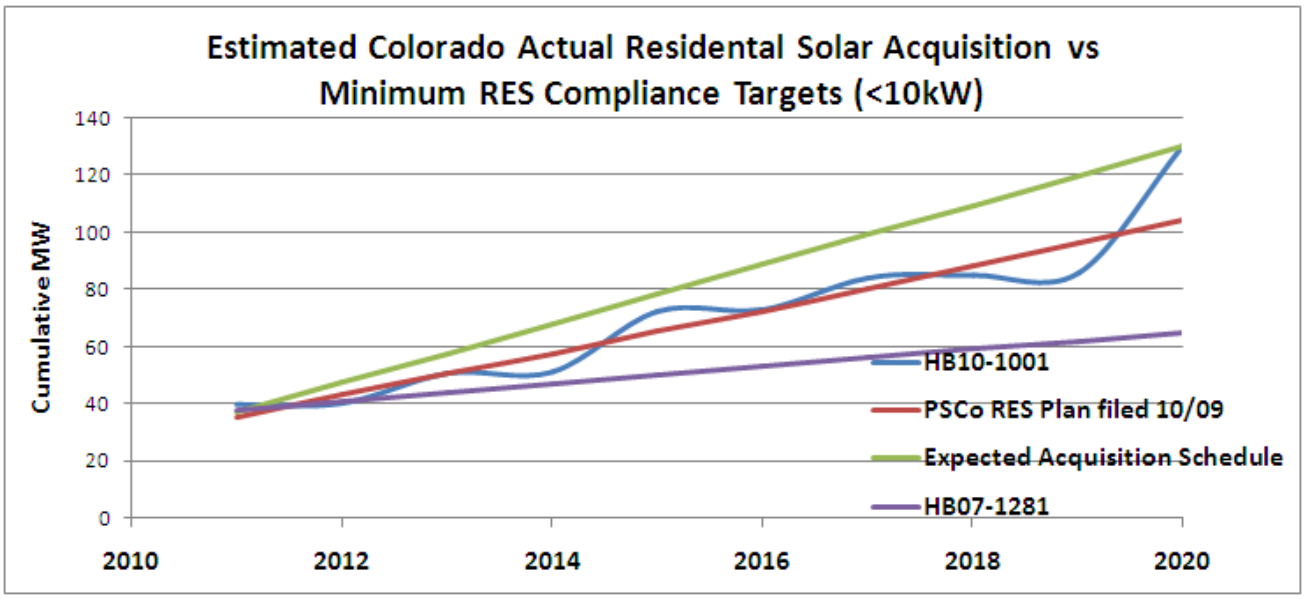

Figure 1: Colorado residential solar sector market size over the next decade.

HB10-1001 Policy Components

Renewable Distributed Generation

Perhaps the most significant policy change from HB07-1281 to HB10-1001 was a transition from a solar-only IOU carve out of 0.08% of total retail electric sales (4% of 20%) to a 3% DG requirement under which all eligible energy resources apply.

Generally speaking, renewable DG is any eligible energy resource[2] that is closer to the end user than a central power plant. The legislation creates the categories of 'Retail Distributed Generation' and 'Wholesale Distributed Generation'. Retail DG is by definition customer-sited (behind the meter) and also subject to an annual onsite energy consumption net metering cap of 120 percent (a standard previously put in statute with SB09-51). Wholesale, or non-customer sited, DG is defined as any renewable electric resource less than 30MW in nameplate capacity that is not Retail DG.

Expanding markets for Distributed Generation

There are many benefits to the consumer, utility and society from renewable distributed generation. DG reduces the need for construction of new transmission lines and it can be strategically located in areas of grid stress to provide greater reliability and prevent power outages.

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[2] Eligible Energy Resources are defined in CRS 40-2-124 (a): “Eligible energy resources” means recycled energy and renewable energy resources. A fuel cell using hydrogen derived from an eligible energy resource is also an eligible electric generation technology. Fossil and nuclear fuels and their derivatives are not eligible energy resources. “Renewable energy resources” are: biomass (plant matter, animal waste, methane from landfills and wastewater treatment), solar, geothermal, wind and new hydro with a nameplate rating of 10MW or less.

There are also direct savings from DG to utilities and their bill payers. In January, 2009, Arizona Public Service published a study which found the monetary benefit of solar distributed generation to their utility is between 8 and 14 cents/kWh[3]. Public Service Company and the Governor's Energy Office (GEO) are partnering on a similar study to evaluate the total cost and benefits from distributed solar generation in the Company's service territory.

Market Segmentation

While the size of a market is important to attracting manufacturing and development investment in the state, long-term market certainty is arguably equally important. HB10-1001 directs IOUs to acquire half of all DG from Retail and half from Wholesale resources thus ensuring market certainty for investors.

More specifically, within Retail DG, HB10-1001 further directs how funding should be allocated according to residential and non-residential classes. The legislation specifies that the amount of funding spent by the utility to achieve 50% of the DG standard from Retail and Wholesale projects should be allocated according to how much each sector of the market pays into the Renewable Energy Standard Adjustment (RESA)[4]. Within Xcel Energy service territory the class revenue breakdown is roughly 40% Residential and 60% non-Residential customers. In practice this would mean that if $40M is spent on Retail DG in a given program year, 40% of $40M must be spent on Residential Retail DG systems.

The market segmentation structure described here is intended to protect the long-term viability of the residential and non-residential Retail and Wholesale DG markets. It is intended to ultimately provide renewable energy manufacturers, developers and installers the assurance they need to invest in the state for the long term.

RES Compliance Multipliers

The RES legislation retained a pre-existing in-state 1.25X compliance multiplier for Wholesale DG, but removed it for Retail DG. This multiplier allows utilities to count one Renewable Energy Credit (REC)[5], the unit of compliance with the RES, as 1.25 RECs generated from Wholesale DG.

Multipliers for projects located in state were removed for Retail DG (previously all in-state solar generation received an extra 25% compliance credit). Retail DG, by definition, is sited in-state since the systems are located behind a Colorado customer's meter.

In-state compliance multipliers are an effective mechanism for spurring development of a specific type of project or energy resource to be constructed in the state. By developing in state resources, a utility contributes to the overall economic vitality and strength of Colorado's communities. However,

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[3] R.W. Beck/Arizona Public Service, February 2009. *Distributed Renewable Energy Operating Impacts and Valuation Study.* http://solarfuturearizona.com/

[4] The RESA is collected as a percentage of sales within the Xcel Energy and Black Hills customer base and may be used to pay for the *incremental* costs of renewable energy over traditional energy resources.

[5] A REC represents the environmental attributes of one MegaWatt-hour of renewable energy generation.

whenever they are exercised, ultimately the size of the market (number of MegaWatts installed) is reduced. The intent of the 1.25 in-state multiplier is to incentivize generation projects to be built within the state without unnecessarily dwindling the size of the market with a higher compliance multiplier.

Paying for the 30% RES within the RESA 2% Retail Rate Impact Cap

IOUs are governed by a 2% retail rate impact cap on incremental costs for the purchase of renewable generation. To date, all of the RESA funds that have been collected by Xcel Energy and Black Hills have been spent on incentivizing the installations of photovoltaic systems (utility-scale wind projects have not carried an incremental costs above traditional energy since 2001 in Colorado). These 2% collections total roughly $65M per year for Xcel Energy and Black Hills combined. The RESA is a finite amount of funding, administered by the IOUs, with which to incentivize the renewable energy market. A portion of the RESA is spent on incentives to purchase RECs which are then used to meet the 30% RES and 3% DG requirements. The following changes to the RESA requirements will allow the utilities to purchase more generation by making better use of limited RESA funds:

Advancing RESA funding

Advancing or securitizing RESA funding will allow IOUs to earn their after tax weighted average cost of capital for borrowing forward future RESA collections. This allows funding to be brought forward to today to build new markets for non-solar generation and to drive the same market transformation that we've seen with solar in Colorado. The advancement of RESA funds must adhere to the 2% annual rate impact cap. In 2009, for example, over 80% of the RESA funds collected were spent on upfront rebates for residential systems (<10kW), however these systems only constituted approximately 40% total installed capacity that year. By allowing the upfront rebates to be amortized over time through securitization, more funding will be available each year for other DG systems while accommodating increasing demand for smaller residential systems.

Standard Rebate Offer level

The $2/Watt Standard Rebate Offer (SRO) for solar was established in statue by Amendment 37. The SRO is one part of a two part utility incentive for solar projects. Total rebates from the utilities include both the SRO as well as the price offered for the purchase of 20 years worth of solar RECs (S-RECS and SO-RECs, or on-site S-RECs), which are retired for RES compliance.

IOUs have the discretion to reduce S-REC and SO-REC payments based upon market conditions, but until HB10-1001 the SRO was a statutory minimum offer of $2/Watt. For residential systems in Xcel Energy territory, for example, the combined SRO and SO-REC rebate started at $4.50/Watt in 2007 and is now at $2.45/Watt, reflecting a reduction in the SO-REC offer from $2.50/Watt to $0.45/Watt.

It's not unreasonable, given this reduction in the SO-REC rate, that the market may no longer need a $2/Watt standard rebate offer plus SO-REC incentive to drive investment. Granting the Public Utilities Commission the authority to reduce the SRO upon request by IOUs will allow the program to respond to changes in the solar market and solar pricing using the newly established

flexibility in both the standard rebate offer and REC pricing. Finally, a market driven price will mean tens of millions of dollars may be available to install more MegaWatts of renewable energy with the same revenue resources.

RESA contributions for existing solar customers

HB 10-1001 fixed a cross subsidization issue that is caused by customers who have been able to net-meter sufficient renewable power to the point where they are demanding a net-zero of utility generated power annually. Because the 2% RESA is collected as a 'rider' on a customer's bill (it is collected as a percentage of the cost of utility power used at the end of the month) these customers have been effectively excluded from paying into the RESA fund. The new law directs the PUC to determine a fair payment for these customers to continue to make into the fund as an alternative to the energy charge.

It's important to note that the 2% covers all of the incremental costs of integrating renewable energy into the grid. The intertie lines and infrastructure upgrades that may be required to integrate a utility-scale renewable energy project are borne by the project itself. They are part of a developer's bid and are ultimately paid for through incentives from the 2% RESA fund. Meanwhile, the costs that bill payers bear for fossil fuel generation fluctuates year to year and are increasing. In contrast, the incremental cost to consumers for renewable energy is statutorily limited within HB10-1001 at 2% with no risk of increasing, thus protecting bill payers from the specter of renewable energy increasing their monthly costs.

Finally, market forces have been driving down the costs of renewable energy in recent years. For example, the cost of an installed residential solar system in Colorado has dropped nearly 50% in the last four years (from $9.50/Watt in 2007 to as low as $5.50/Watt today).

Best Value

The Best Value language is about keeping our utility construction jobs in Colorado. It is a directive to the Public Utilities Commission to consider a set of factors that will be evaluated when utility proposals are brought to the Public Utilities Commission for review, including: availability of training programs, employment of Colorado workers, competitive wages, and benefits offered to workers.

The Best Value language means we are going beyond simply selecting projects based upon delivering the cheapest MegaWatt of power, and instead looking at a more comprehensive set of costs and benefits to the bill payer. The General Assembly has already directed the PUC to look at a set of environmental and sustainability factors, including availability of water. The Best Value metrics are and extension of that authority.

Solar Certification

HB10-1001 will generate hundreds of new solar projects and tens of thousands of new jobs over the next decade in Colorado. The solar certification puts the state in an active role of ensuring that the safety of installers, consumers and utility linemen are protected by requiring a minimum workmanship standard.

The standard requires one in four solar job site workers to have the North American Board of Certified Energy Practitioners (NABCEP) solar installer credential for all ratepayer and publicly-subsidized projects. This new standard will drive a higher caliber of work product for the industry, send thousands of people to the state's local community colleges for training, and will protect consumers from the potential dangers of sub-standard installations that could occur in a rapidly growing market.

Incremental Market from HB10-1001

In our estimation, HB1001 will create the increased demand for over 650 MW of utility-scale generation and approximately 500 MW of distributed generation over the resource standard established in 2007 (HB07-1281).

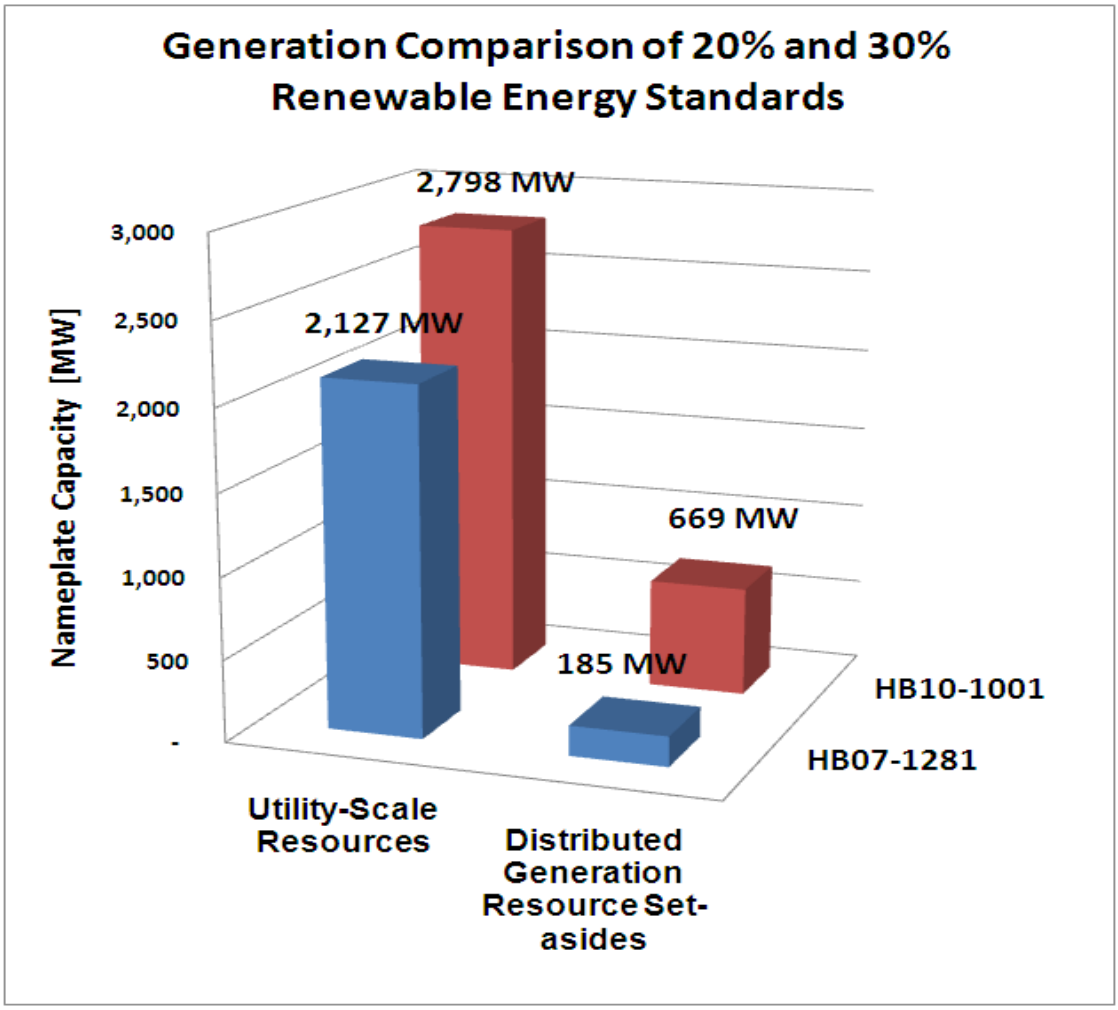

Figure 2. Comparision of estimated renewable energy minimum generation requirements from HB07-1281 and HB10-1001[6].

[6] GEO Modeling Assumptions behind Figures 1 & 2: PSCo 2020 Retail Electric Sales = 38,000 GWh, Black Hills 2020 Retail Electric Sales = 2,500 GWh; Half of all DG is Retail and all Wholesale DG receives the 1.25 in-state multiplier that it is eligible for,

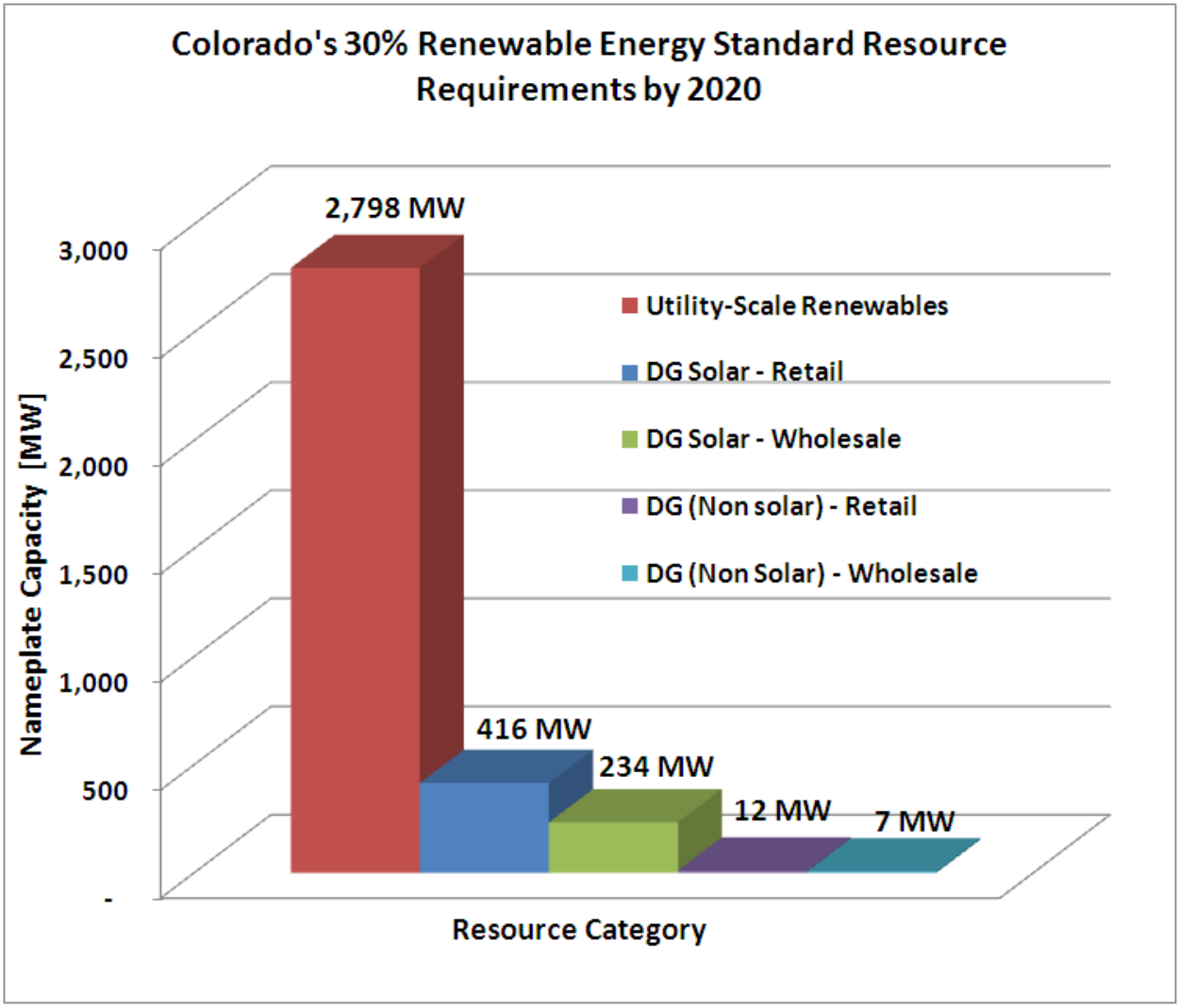

Figure 3. Estimated breakdown of 3% Renewable Distributed Generation requirement in HB10-1001.

Job Creation

As of 2007, Colorado employed over 90,000 people either directly or indirectly the new-energy sector[7]. We have the fourth-highest concentration of renewable energy and energy research employees in the country. We know the doubling of the RES in 2007 was a catalyst that attracted companies like Vestas (which will employ more than 2,500 people when they are fully operational). We can expect more companies like Vestas, SMA, Ascent Solar, Abound Solar, SunRun, SolarCity and Zephyr to increase their

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Utility-Scale resource Capacity Factor (CF) = 30%, DG Solar-Retail CF = 15%, DG Solar-Wholesale CF = 20%, DG (Non-Solar) Retail CF = 60%, DG (Non-Solar) Wholesale CF = 70%, Percentage of DG from Solar resources = 90%.

[7] American Solar Energy Society, 2008: *Green Collar Jobs for the US and Colorado: Economic Drivers for the 21st Century.*

business investment in the state, as well as new companies to establish a strong Colorado presence directly from the increase in our renewable energy standard.

In a study of the economic development benefits of 1,000 MW of solar photovoltaic power installed by 2020, VoteSolar and Environment Colorado estimate that 33,325 total new construction-period jobs, over 3,000 annual construction-period jobs, $4.3 billion in lifetime economic output, and 30 million tons of CO_2 avoided (equivalent to taking 669,730 cars off the road) would result. Although the minimum DG requirements in HB10-1001 do not equal 1,000MW (they are likely closer to 700MW) when extended to the full population of Colorado (not just those served by Xcel Energy) the standard is proportionately equal to a state wide 1,000 MW standard.

By the end of 2008, with 22MW of installed solar PV, Colorado ranked third in the country in photovoltaic installations behind CA and NJ[8]. Despite this high ranking, Colorado ranked relatively low in terms of minimum RES standards for solar generation.

HB07-1281 would have required approximately 185 MW of capacity by 2020. For comparison, the number one and two ranked states, California and New Jersey have 3000MW and 1,500MW solar generation goals respectively. In order for the state to retain its leadership position nationally and to continue to attract manufacturing investment, Colorado needed to increase its minimum DG standard. This was accomplished with the passage of HB 10-1001.

Prior to the passage of Amendment 37 in 2004, there were between 50 and 100 solar companies doing business in Colorado - primarily driven by off grid mountain homes and early adopters. Today, due to the aggressive standards and policies in Colorado, there are more than 400 solar companies in the state.

The Retail DG portion of the RES is a strong job creation engine. When compared to central power stations, more labor is involved in customer sited installations, leading to both a greater economic impact and also higher installation costs per MW installed. In the Wholesale DG market, economies of scale result in a lower installed cost per MW, however fewer jobs per installed MW are typically created. There is an inherent trade-off embedded in distributed generation markets that policy makers need to be aware of to maximize both installed renewable generation and job creation.

With HB 10-1001, Colorado has achieved a balance that will both maximize job creation while minimizing the incremental costs of renewable energy.

[8] Larry Sherwood, Interstate Renewable Energy Council, July 2010. U.S. Solar Market Trends, 2009

Conclusions

Colorado's 30% Renewable Energy Standard is the 'Best in the West' and among the strongest in the country. The most notable element from a policy design and market creation perspective is the 3% Distributed Generation requirement. The Governor's Energy Office estimates that the incremental demand for renewable energy will be, at a minimum, over 650 MW of utility-scale resources and nearly 500MW of distributed generation above the previous standard established in 2007. Furthermore, HB10-1001 institutionalizes a number of funding mechanisms that will allow finite IOU RESA accounts to incentivize this incremental generation capacity and adapt to changing market forces.

HB10-1001 will create new markets for locally developed renewable energy, it will further grow our utility scale renewable energy markets, it will mean millions of dollars in property tax revenue to our counties, it will create tens of thousands of new jobs, and it will do all of this while ensuring quality and safety of installations and without increasing the cost of electricity to the bill payer.

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Tom Plant *is the Director of the Colorado Governor's Energy Office (GEO) and was appointed by Governor Bill Ritter in 2007. Prior to GEO, Tom served in the Colorado House of Representatives from 1998 through 2006 including two years as Chairman of the House Appropriations committee and one year as Chairman of the Joint Budget Committee. Tom was Executive Director of the non-profit Center for ReSource Conservation from 2004-2007. In the late 1980s, Tom worked in the Climate Change department of the Union of Concerned Scientists in Washington, DC exploring the causes of global climate change and policy options to address the threats of climate change. Prior to UCS, and after graduating from Colorado State University, Tom worked in Oklahoma as an exploration Geologist.*