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CLEARING THE AIR: THE IMPACT OF CARBON CAP AND TRADE REGULATIONS ON RENEWABLE ENERGY

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ABSTRACT

Legislators and regulators at the federal, state, and even local levels are seeking ways to reduce emissions of carbon dioxide (CO_2). Emerging CO_2 policies would seem to offer promise for the renewable energy industry. However, improperly structured regulations could actually *eliminate* the ability of renewable energy to create emissions reductions.

This paper addresses the current status of SO_2 cap and trade regulations in the U.S. and demonstrates why those regulations fail to capture the benefits of renewable energy, and in fact, undermine the renewable energy industry. The paper argues that future regulations for CO_2 must correct this deficiency. Finally, the paper suggests three approaches to cap and trade policy that would allow the renewable energy industry to participate in – and benefit from – emissions reduction legislation:

1. An output-based allocation
2. A set-aside for renewable energy
3. A load-based allocation

The authors conclude that both voluntary and compliance market participants expect and should receive emissions reductions as part of their purchase of renewable energy, and that legislators and regulators should craft CO_2 policy to ensure that these outcomes are accomplished.

1. INTRODUCTION

Legislators and regulators at the federal, state and even local levels are seeking ways to reduce emissions of various air pollutants including carbon dioxide (CO_2), the leading cause of Global Climate Change. On the west coast, policy makers in California, Oregon and Washington are actively discussing a cap on west coast CO_2 emissions. In the northeast, at least seven states are engaged in similar policy discussions with the same goal. The EPA estimates that approximately 39% of CO_2 emissions in the United States are caused by the production of electricity, and planned additions to capacity are mostly fossil fuel-based; hence, there is broad agreement that the reduction of CO_2 from the electricity sector is essential if CO_2 emissions reductions are to occur.

Emerging CO_2 policies at the state level would seem to offer great promise for the renewable energy industry because most renewable energy generation occurs with near zero and at times net negative carbon emissions, making it an attractive technology for those interested in reducing CO_2 emissions. However, the good intentions of legislatures will have little effect on the rate of renewable energy development without proper regulatory mechanisms. Improperly structured regulations could actually eliminate the ability of renewable energy to create emissions reductions.

This paper addresses the current status of cap and trade regulations in the U.S. and demonstrates why those regulations are failing to capture the benefits of renewable energy, and in fact, undermine the renewable energy industry. The paper argues that future regulations must correct this deficiency. Finally, the paper suggests three approaches to cap and trade policy that would allow renewable energy to participate in an emissions reduction strategy.

2. A SHORT HISTORY OF TWO MARKETS

The market for renewable energy can be thought of as two markets: voluntary and compliance. The voluntary market is made up of residential, institutional, commercial and industrial customers making voluntary purchases to support "green" power. The compliance market is also made up of customers: the citizens, legislators and regulators, pressing for the further development of renewable energy.

2.1 The Voluntary Market for Green Power

Voluntary consumer decisions to purchase green power represent a powerful market support mechanism for the development of renewable energy resources. Currently, more than 50% of all U.S. consumers have the option to purchase green power from a retail electricity provider. Consumers can also support renewable energy through the purchase of renewable energy certificates, also called green tags, regardless of whether they have access to a green power product from their retail power provider, and without having to switch to an alternative supplier. Green tags are often sold separately from the commodity electricity and represent the unique attributes (principally emissions reductions) of electricity generated from renewable energy.

TABLE 1: ESTIMATED GREEN POWER SALES BY MARKET SEGMENT, BILLION KWH

	2003	2004	% Growth
Utility Green Pricing	1.3	1.8	43%
Competitive Markets	1.9	2.6	40%
REC (green tag) Markets	0.7	1.7`	162%
Retail Totals	**3.9**	**6.2**	**62%**

NREL: 10/05 Totals may not add up due to rounding.

2.2 The Compliance Market for Green Power

Across the country, state legislatures are enacting legislation with the goal of expanding the development of renewable energy. There is now legislation promoting renewable energy in 21 states and Washington, DC, covering nearly 40% of U. S. electricity load. If states meet their established targets, these policies could support approximately 33,000 MW of new renewable energy capacity by 2017.[i]

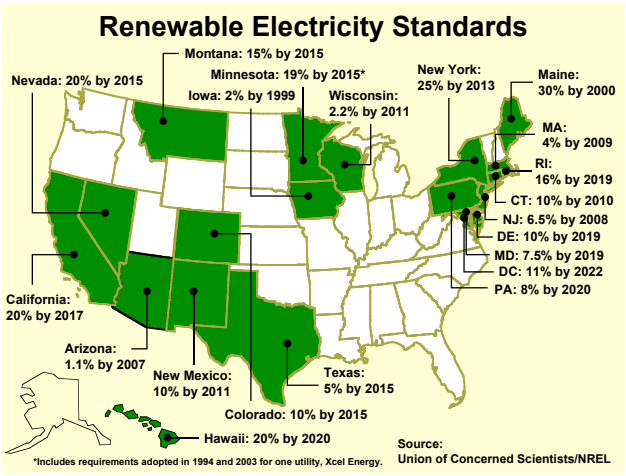

Fig. 1: Renewable Electricity Standards by State

3. MEETING CUSTOMER EXPECTATIONS

What is driving the extraordinary growth in both the voluntary and the compliance markets for green power? Our research indicates that the decision-makers in both customer categories are largely motivated by the same desire: environmental benefits.

3.1 Voluntary Market Expectations

To confirm that voluntary market purchases are driven by a desire for environmental benefits, all one needs to do is review the press releases from major green power purchasers. Here are some typical examples:

HSBC Bank (7th largest U.S. purchaser) (press release): "… HSBC became the world's first major bank to commit to carbon neutrality and today its US banking unit announced that it has offset a substantial quantity of its carbon emissions by purchasing 45,454 MWh of clean, wind energy certificates."

Johnson and Johnson (2nd largest U.S. purchaser) (company web site): "We are committed to achieving substantial reductions in CO_2 emissions through… such off-site means as purchasing green power and trading carbon emissions credits."

U.S. General Services Administration (5th largest U.S. purchaser) (press release): "Electricity produced from renewable resources reduces the amount of CO_2, a key greenhouse gas, as well as sulfur dioxide (SO_2) and nitrogen oxides (NOX) into the atmosphere."

In fact, the vast majority of public announcements regarding corporate or institutional green power purchases make emissions-related claims, particularly with respect to CO_2.

3.1 Compliance Market Expectations

We have reviewed state legislation from across the country, and in virtually every case, legislators clearly state that an important intent of their legislation promoting renewable energy is creating air quality and other environmental benefits. While air quality improvements are not the only driver for legislators, they are clearly listed as an expected outcome in most, if not all legislation supporting renewable energy as evidenced by the following examples:

Arizona: "…any Load-Serving Entity selling electricity…must derive at least .2% of the total retail energy sold from new solar resources or environmentally-friendly renewable electricity technologies…" [Ariz. Rev. Stat. Sec. R14-2-1618(A) (2001).]

California: "Increasing California's reliance on renewable energy resources may promote stable electricity prices, protect public health, improve environmental quality, stimulate sustainable economic development, create new employment opportunities, and reduce reliance on imported fuels. The development of renewable energy resources may ameliorate air quality problems throughout the state and improve public health by reducing the burning of fossil fuels and the associated environmental impacts." [Senate Bill No. 1078. Chapter 516. Article 16. Section 399.11.]

Illinois: "The General Assembly finds and declares that it is desirable to obtain the environmental quality, public health, and fuel diversity benefits of developing new renewable energy resources" [20 ILCS 687/6-2.]

Maryland: "The General Assembly finds that: …The benefits of electricity from renewable energy resources, including long-term decreased emissions, a healthier environment, increased energy security, and decreased reliance on and vulnerability from imported energy sources, accrue to the public at large…" [Code of Mar. Public Utility Companies. 7-701-2]

New Mexico: "The legislature finds that: (1) the generation of electricity through the use of renewable energy presents opportunities to promote energy self-sufficiency, preserve the state's natural resources and pursue an improved environment in New Mexico." [Senate Bill 43. 46th Legislator]

New York: "It shall be the energy policy of the state: To… accelerate development and use within the state of renewable energy sources… in order to promote the state's economic growth, to create employment within the state, to protect its environmental values, to husband its resources for future generations, and to promote the health and welfare of its people." [State Energy Policy. Section 3-101(1)]

Clearly these legislators desired to create air quality and other environmental benefits through the passage of their legislation. The realization of those desires varies from state to state for two reasons: 1) the implementation language developed by regulators varies in its clarity; and 2) some regional and federal regulations (particularly cap and trade regulations) reduce or eliminate the ability of new renewable energy resources to receive legal credit for air quality benefits.

4. CAP AND TRADE – OPPORTUNITY AND THREAT

The vast majority of the pro-renewables legislation recently passed at the state level, takes the form of renewable portfolio standards. However, the federal government and states in the West and the Northeast are considering additional legislation capping CO_2. The structure and implementation of cap and trade rules will have a dramatic affect on the renewable energy industry and, if implemented incorrectly, may reduce or eliminate the ability of portfolio standards and voluntary customer purchases to reduce CO_2 emissions.

4.1 Existing Cap and Trade Rules

Under the Clean Air Amendments of 1990, the federal government elected to cap emissions of sulfur dioxide (SO_2), and allow trading of "allowances" to emit SO_2. The number of allowances allocated was based on the SO_2 intensity of fuel inputs. This is commonly referred to as an "input-based" system. Virtually all of the allowances were granted to existing emitters. A small number of allowances was set aside for renewables, but the program was poorly designed and few if any allowances were obtained by renewable energy facilities.[1]

As Figure 2 demonstrates, under the input-based cap and trade system, the government allocates all allowances to existing emitters. To simplify the explanation, we have assumed a national electricity system requiring 1,000 GWH of electricity with a cap on SO_2 of 1,000 tons per year. Hence, each GWH of output requires, on average, one allowance. (Numbers are for example only.)

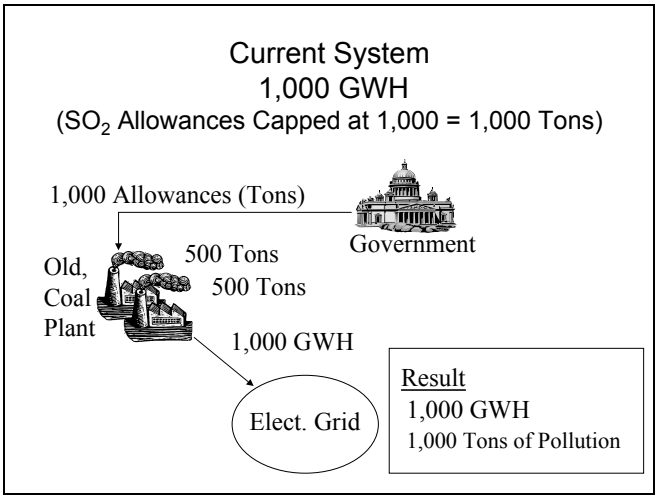

Fig. 2: Current Input-Based Cap and Trade System

The result (in this example) is that the two coal plants both operate at capacity, generating a combined 1,000 GWHs while emitting 1,000 tons of SO_2.

This system was designed to allow other resources to be added to the grid without increasing the total pollution

[1] The federal government also required caps on nitrogen oxides (NO_X) and left many of the implementation details to the states. Space limitations prevent further discussion of the NO_X rules in this paper.

under the cap. Figure 3 demonstrates what happens when the electric load increases by 500 GWH per year and that load is met with cleaner natural gas. The emissions cap remains at 1,000 tons.

As Figure 3 demonstrates, the government continues to allocate all of the allowances to the coal facilities. In order for the gas plant to produce electricity, it must purchase allowances from the coal facilities. Because the gas plant is cleaner than the coal plant, it only needs to purchase 250 allowances to produce the 500 GWHs required. The coal facility can reduce its emissions by 250 tons for less than it will charge the gas plant for the 250 allowances. So it reduces emissions and sells 250 allowances to the gas plant. The result is that 1,500 GWHs are produced and emissions remain at 1,000 tons. The system has accomplished its goals in a cost-effective manner.

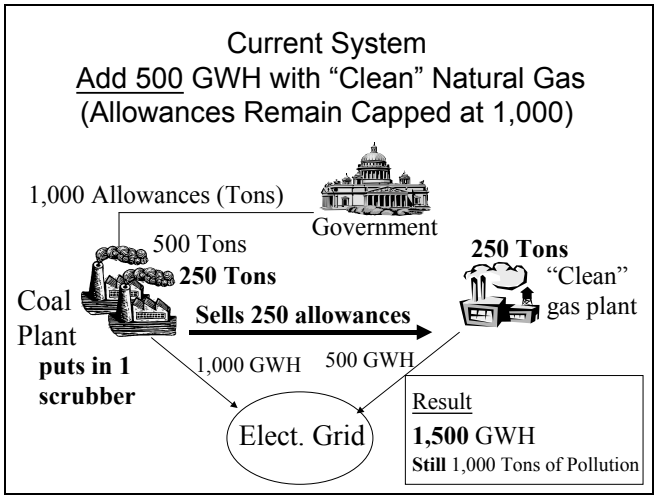

Fig. 3: Current System with 500 GHW Natural Gas Added

It is interesting to observe what happens when a wind facility, rather than a natural gas facility, is used to meet the additional 500 GHW load.

In Figure 4, the government again allocates all of the allowances to the coal facilities. Because the wind energy facility can produce electricity without emissions, it does not need to purchase allowances from the coal facilities. Therefore, the coal facilities retain all their allowances and make no changes to their emissions. The result is that 1,500 GWHs are produced and emissions remain at 1,000 tons. The system has again accomplished its goals in a cost-effective manner. However, in regards to total emissions, there is no difference between adding the 500 GWHs using the wind facility vs. adding 500 GWHs using the gas facility. In the end, the wind facility can make no claims to have *reduced* SO_2 emissions. Sellers of renewable energy are hence unable to deliver SO_2 reduction benefits to their customers. Under this type of cap and trade system, the amount of SO_2 emitted is not determined by the technology used to generate energy. It is determined by the number of allowances available for use.

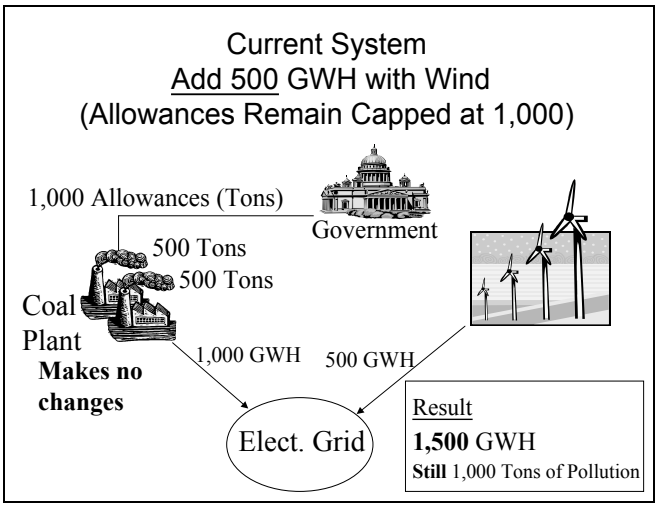

Fig. 4: Current System with 500 GWH Wind Added

The allowances are valuable *assets* that the emitters will utilize. Emitters receive those allowances even if their facilities shut down. This is an important point, as arguments have been made that once the older facilities shut down, surely society will attain the emissions reductions it desires. Unfortunately, this is not the case. Even if new renewable energy facilities brought enough energy online to shutter an old emitting facility, said facility would simply sell its allocation of allowances to other remaining emitters, allowing those emitters to increase emissions. For instance, an operating coal plant might purchase allowances from a shuttered facility as a way to postpone pollution equipment maintenance, or it might choose to burn dirtier (and cheaper) coal. In the end, all of the allowances that are available in the marketplace will be used because they have economic value. The only way to ensure a reduction in pollution under this type of cap and trade system is to reduce the number of allowances in the marketplace.

4.1 The Risk with CO_2 Legislation

Carbon dioxide is not currently regulated under cap and trade rules. Therefore, when renewable energy enters the grid and displaces fossil fuels, it does indeed reduce the amount of CO_2 entering the atmosphere. The amount of CO_2 reduction varies from region to region and season to season. But it is clear that less CO_2 is emitted, and it is clear that those reductions are caused by the presence of renewables on the system, displacing fossil-fueled sources that are no longer dispatched.

Emerging legislation on both the federal and state levels to reduce CO_2 emissions is often modeled on SO_2 regulation

(an input-based cap and trade system). If the SO_2 model is adopted for CO_2, sellers of renewable energy will be unable to deliver CO_2 reduction benefits to their customers, undermining the primary driver for both voluntary and compliance markets. (These sellers may still be able to sell to the regulated entities that require lower-emission energy supplies, but the number of buyers would be smaller and market power would shift from the sellers to buyers; a limited monopsony effect). This is a serious threat to the renewable energy industry.

5. ALTERNATIVES

It is essential that emerging regulations to limit CO_2 emissions recognize the emissions reduction benefits of renewable energy and allow it to create emissions benefits and deliver them to customers. As states consider CO_2 legislation, the renewable energy community is advocating for such policies.

5.1 Output-Based Cap and Trade

Under this system, electricity producers are allocated allowances based on their percentage contribution to the grid (in MWHs). If a generator delivers 10% of the grid's energy, the generator receives 10% of the allowances. As Figure 5 demonstrates, a "clean" natural gas plant provides 500 GWH (1/3rd of the total demand) to the grid, while coal facilities provide 1,000 GWH (2/3rds). The government therefore allocates 1/3rd of the allowances (333) to the gas plant, and 2/3rds (667) to the coal plants.

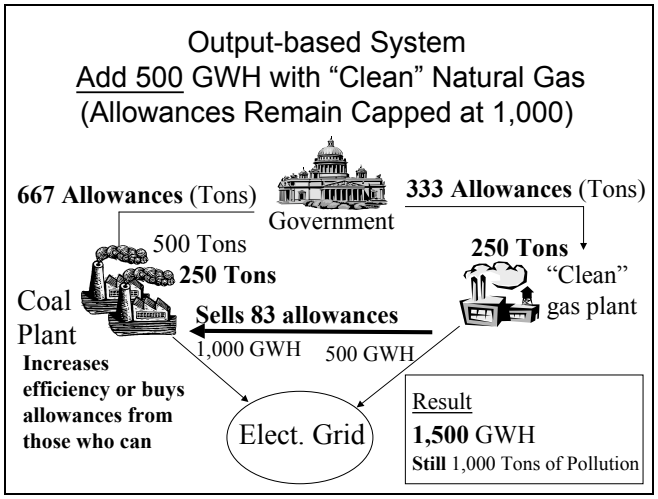

Fig. 5: Output-Based System-500 GWH Natural Gas Added

Because the gas plant operates "cleanly", it only requires 250 allowances to generate 500 GWH. It therefore has 83 allowances available for sale. Those allowances are purchased by one of the coal facilities. This leaves the coal facilities with 750 allowances (667 + 83). The coal facility would normally need 1,000 allowances to deliver 1,000 GHW to the grid. Therefore, the coal facility will need to reduce its emissions.

It is interesting to observe in Figure 6, what happens when a wind facility rather than a natural gas facility is used to meet the additional 500 GHW load.

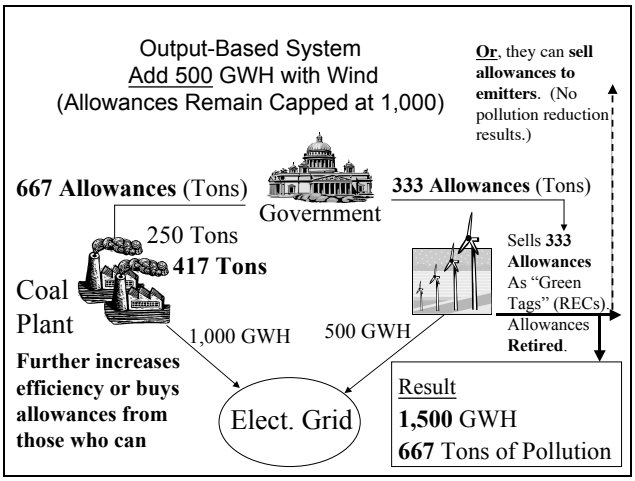

Fig. 4: Output-Based System-500 GWH of Wind Added

Again, the government allocates allowances based on the percentage contribution to the grid. The wind facility receives 333 allowances and the coal plants receive 667. Because the wind energy facility can produce electricity without emissions, it does not need to use its allowances to emit. The allowances remain *assets* that the wind facility can use in a variety of ways. It can choose to "deliver" the allowances as part of a green power product. The product can be delivered to a voluntary customer, or to a compliance customer (a utility, for instance) to meet that customer's regulatory requirement. Either way, the result is that there are 333 fewer allowances available in the marketplace because those allowances are removed from the market when they are sold as green power. This reduction in allowances reduces total emissions, because the coal facilities must reduce emissions further due to the lack of available allowances.

This is precisely the result that both voluntary customers and state regulators desire when they support renewable energy purchases.

The renewable energy facility also has the option of selling the allowances to the coal facilities, which it would be inclined to do if the coal facilities offer a higher price than the voluntary or compliance markets offer. If the wind facility chooses to sell the allowances to the coal facilities, no emissions reductions would result, and the electricity sold by the wind facility would not be considered "green" in the voluntary market. The energy would also be unlikely to

qualify under state renewable energy mandates because a major purpose of those mandates is to reduce emissions, which the wind facility does not accomplish if it sells the allowances to emitting facilities.

5.2 Allowance Set-Aside for Renewables

Under a set-aside system, legislators or regulators set aside a certain number of the total available allowances for new renewable facilities.[2] These new installations apply for the allowances. The result is the same as with an output-based system, however, set-aside systems can be administratively burdensome and treat renewables differently than they treat other generators.

All of the alternatives above are based on capping emissions on the *generation* of electricity. There are alternatives to this approach.

5.3 Load-Based Cap and Trade

Under this system, regulators cap the emissions not of the *generators*, but of the *retail* sellers of electricity. (For the sake of simplicity, we will refer to them as "utilities".)

In Figure 7, the government sets a total emission cap, *and* a cap on individual utilities. In this case, the emissions of Utility "A" are capped at 350 tons. The utility purchases 350 GWH from 2 coal plants, which emit a total of 350 tons of CO_2.

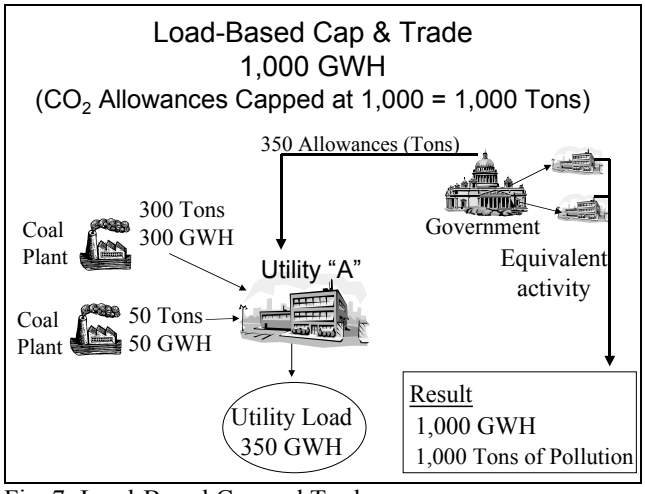

Fig. 7: Load-Based Cap and Trade

[2] In order to ensure that emissions reductions occur, it is essential that the allowances that are set aside "come off the top" of the total number of allowances available. Simply adding the allowances on top of the original allocation would create no net emissions reductions.

Figure 8 shows what happens when the utility's load increases by 500 GWH. The utility cannot purchase additional energy from the coal facilities without exceeding its emissions cap. The logical choice is to purchase from a zero-emissions facility such as a wind farm. The result is that the utility meets its increased load, without exceeding its emissions cap.

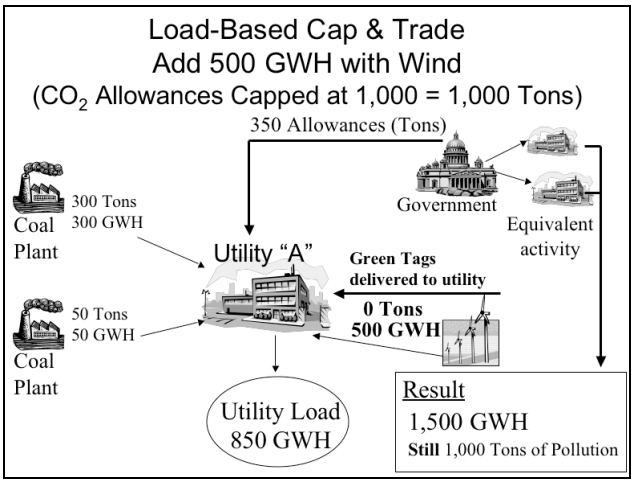

Fig. 8: Load-Based Cap & Trade-500 GWH of Wind Added

5.3.1 Assigning a Value to "System Power"

Many utilities purchase a portion of their power in the energy markets, rather than under long-term contracts with specific energy facilities. Given the fluidity of these markets, it is nearly impossible to know with any certainty the emissions characteristics of system power on a real-time basis. In order to ensure that the emissions associated with utility purchases of system power are counted toward utility emissions caps, it will be necessary for regulators to assign an emissions factor to system power and update it on a regular basis.

5.3.1 Adding Voluntary Purchases

When voluntary green power purchases are made under a load-based system, the customers are often purchasing RECs. The result is that the energy remaining after the REC has been sold no longer contains its emissions benefits and must be classified as system power. This prevents the utility purchasing the "null" energy from counting the emissions benefits already being claimed by the voluntary customer. For the voluntary customer, calculating the emissions benefits associated with their purchase is simple: it is the difference between the emissions characteristics of system power, and those of the renewable energy facility from which the customer purchased the RECs.

TABLE 2: COMPARISON OF ALTERNATIVE ALLOCATION SYSTEMS

SYSTEM	PROS	CONS
Output-Based	-Direct benefits to renewable energy projects. -Voluntary market creates additional reductions.	- Works poorly for regional cap and trade system, increasing costs of local generation and driving utilities to purchase cheaper, dirtier electricity from outside the capped region.
Set-Aside	-Direct benefits to renewable energy projects. -Voluntary market creates additional reductions.	-Can be complex and expensive to administer. -Creates burden on clean energy developers who must apply for allowances.
Load-Based	-Direct benefits to renewable energy projects. -Voluntary market creates additional reductions. -Pushes utilities to contract with low-emitting suppliers.	- Untried.

6. CONCLUSION

The voluntary and compliance markets for renewable energy are growing rapidly. Customers in the voluntary market and legislators passing pro-renewables legislation expect that the new renewable energy added to the grid will improve air quality. SO_2-style (input-based) cap and trade regulations eliminate the ability of those parties to achieve those goals. Under a cap and trade system, the only way to reduce air pollution for the associated pollutant is to reduce the number of allowances. Without the ability to claim air quality improvements, the demand for new renewable energy will likely be substantially reduced. There are alternatives to the SO_2-style cap and trade system that are much more beneficial to renewables and deliver to customers (both voluntary and regulatory) the benefits for which they are willing and in some cases, eager to pay. It is essential for renewable energy industry stakeholders to understand what is at stake and build alliances to ensure that renewable energy can and does continue to deliver to its customers what those customers expect: real environmental benefits.

7. ACKNOWLEDGMENTS

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