BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Implement the Commission's Procurement Incentive Framework and to Examine the Integration of Greenhouse Gas Emissions Standards into Procurement Policies) Rulemaking 06-04-009 (Filed April 13, 2006)

California Energy Commission Docket #07-OIIP-01

COMMENTS OF WESTERN RESOURCE ADVOCATES AND REQUEST TO CONSIDER AN ALTERNATIVE LOAD-BASED CAP & TRADE MECHANISM

Western Resource Advocates (WRA) is an environmental law and policy center in the interior Western United States, with offices in Boulder, CO, Salt Lake City, UT and Carson City, NV. WRA's Energy Program, which promotes environmentally and economically sound utility resources, works in Arizona, Utah, New Mexico, Nevada, Colorado and Wyoming. WRA is a party to this proceeding, and attended the Commissions' *en banc* hearing on August 21, 2007.

The Administrative Law Judge (ALJ) has requested comments related to emission allowance allocations for both a *load-based* cap & trade and a *deliverer/first seller* approach for the electricity sector. In that October 15, 2007 request, the ALJ has also permitted parties to comment on particular questions, as well as "any other issues they deem to be related to this topic."

To date, the discussion surrounding a cap & trade for California and the West has focused on the *load-based* and *first seller* approaches. The comments and discussions to date, as well as the numerous inquiries contained in the ALJ's requests for comments, demonstrate that these two approaches involve many difficult and complex issues with no easy solutions. Of particular importance – as identified in the current request for comments – is the issue surrounding allowance allocations. Whether to give away allowances, sell them or auction them, along with the accompanying issues of who is, will and should be entitled to allowances, now and in the future, are extremely complex and difficult issues with billions of dollars at stake. WRA fears that debate and resolution of these issues and others (if they can be resolved at all), will delay the quick and substantial carbon reductions needed to avoid catastrophic climate change.

WRA also recognizes that participants have invested significant efforts in developing the *load-based* and *first seller* approaches. However, at this juncture, it appears that stepping back and considering an alternative, simpler, mechanism might in fact accelerate rather than slow implementation of a CO_2 reduction program – if that alternative can provide a vehicle to ensure genuine CO2 reductions and resolve or bypass the difficult issues associated with the *load-based* and *first seller* approaches.

In this spirit, WRA has been developing an alternative, load-based, cap and trade mechanism that it believes is simpler, easier to implement and administer, less vulnerable to manipulation and gaming, and more effective in genuinely reducing CO_2 in the atmosphere than the other methods being considered. This mechanism does not rely upon tracing electricity from load to source, and also does not involve an allocation of allowances. So, it avoids many of the difficulties policymakers face with the other proposals. We also believe it is easier to implement and administer than other approaches being considered, and thus could be deployed much more uickly. Although targeted to the electricity sector, because of its common "currency" – tonnes of CO_2 – this alternative would link with source-based cap & trade systems in the Eastern United States (e.g. RGGI), and multi-sector systems in Europe and elsewhere. Energy efficiency is fully rewarded in this system, and approved offsets could be easily accommodated. We are calling this approach, which relies upon earning, trading and retiring CO_2 Reduction Credits, the "*CO_2RC*"

(pronounced "cork") method.

In short, rather than providing *allowances to pollute*, this alternative works by awarding *credits for reducing CO_2* emissions, with one credit awarded to a generator for each metric ton less than 1000 per gigawatt-hour that the generator emits. So, a combined cycle combustion turbine (CCCT), which emits 400 tonnes CO_2 per GWh, would receive 600 *CO_2RC* s for each GWh generated. A wind generator would receive 1000 *CO_2RCs* for each GWh. An older pulverized coal plant would receive no *CO_2RCs*. One thousand credits per GWh of energy saved are also awarded to utilities for energy efficiency. To secure CO_2 reductions, load-serving entities within California or the Western Climate Initiative (WCI) would procure credits, from their own or other generators, for each gigawatt-hour they serve. Those credits would then be retired in amounts needed to comply with state emission reduction targets.

A Working Paper that more fully describes the *CO_2RC* method, and how it addresses many of the issues confronting policymakers developing a Western cap & trade, is attached to this Request as an exhibit. WRA welcomes comments, suggestions and critiques from parties or the Commission regarding the *CO_2RC* method, with the goal of advancing this debate toward developing the best approach for quickly reducing CO_2 emissions in California and beyond.

WHEREFORE, for the foregoing reasons, Western Resource Advocates requests that the Commissions consider the *CO_2RC* method described in the Exhibit to these Comments as an alternative to the *load-based* and *first-seller* approaches currently being examined, and take such actions as they deem just and proper.

Respectfully submitted,

WESTERN RESOURCE ADVOCATES

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of the **Comments of Western Resource Advocates and Request to Consider an Alternative Load-Based Cap & Trade Mechanism** in R.06-04-009 to all known parties of record in this proceeding by delivering a copy via email or via U.S. mail, first class postage prepaid.

Executed in Boulder, Colorado, on the 30th day of October 2007.

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WESTERN RESOURCE ADVOCATES

CO_2RC
AN ALTERNATIVE LOAD-BASED CO_2 CAP & TRADE FOR THE WEST[1]

A WESTERN RESOURCE ADVOCATES' WORKING PAPER

OCTOBER 29, 2007

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[1] Steven Michel and John Nielsen authored this working paper for Western Resource Advocates (WRA). WRA is an environmental law and policy center with offices in Boulder, CO, Salt Lake City, UT and Carson City, NV. WRA's Energy Program promotes environmentally and economically sound energy resource choices for the Interior West.

CO_2RC
AN ALTERNATIVE LOAD-BASED CO_2 CAP & TRADE FOR THE WEST

Summary

Provide all generators credits based upon how clean they run. Allow those credits to be traded. Require load-serving entities to obtain and retire enough credits to meet CO_2 emission reduction goals.

This paper presents an alternative load-based cap & trade mechanism that is simpler, easier to implement and administer, less vulnerable to manipulation and gaming, and more effective in reducing atmospheric CO_2 than other approaches being considered for the West. A key feature of this alternative is the positive approach it takes toward emission reductions – instead of providing *allowances to pollute*, this alternative awards *credits for not polluting*, i.e. reducing CO_2 emissions. For each gigawatt-hour (GWh) of electricity produced, generators in the West receive one CO_2 Reduction Credit (CO_2RC) for each metric ton ("tonne") less than1000 that they emit. So, a generator that emits CO_2 at a rate of 700 tonnes per GWh would receive 300 CO_2RCs for every GWh of electricity generated. To secure CO_2 reductions, load-serving entities (LSEs) obtain a specified number of credits for each GWh served. LSE's can obtain these credits from their own generation or any other generator in the West. Those credits are then retired in the amounts needed to comply with a state's emission reduction target. To ensure that CO2 emissions are reduced in absolute terms, the credit requirements adjust over time to account for growth in electricity use.

This mechanism does not rely upon tracing electricity from load to source, and also does not involve a distribution of allowances. So it bypasses many of the difficulties of other proposals. Because of this, and because it is easy to implement and administer, the mechanism can be deployed quickly. Moreover, because of its common "currency" – tonnes of CO2 – it will link with source-based cap & trade systems in other sectors, the Eastern United States (e.g. RGGI), and multi-sector systems in Europe and elsewhere. Energy efficiency is appropriately rewarded in this system with 1000 CO_2RCs per GWh saved, and offsets are easily accommodated. We call this method, which relies upon earning, trading and retiring CO_2 Reduction Credits, the "CO_2RC" (pronounced "cork") method.

Introduction

Currently, the states of California, Oregon, Washington, Arizona, New Mexico and Utah, and the Canadian provinces of British Columbia and Manitoba have joined the Western Climate Initiative (WCI). Other states and provinces in the United States, Canada and Mexico are also formally observing this Initiative, which requires consideration of a load-based cap & trade to reduce greenhouse gas emissions in the participating states and provinces. A utility *load-based* cap & trade differs from a traditional, *source-based*, cap & trade in that, rather than directly regulating stack emissions from power plants in a particular region (source-based), a load-based cap & trade regulates emissions from power plants – wherever they are – serving customer loads in a particular region.

The Initiative, originally signed on February 26, 2007, has sparked a good deal of discussion and thinking about how a load based cap & trade might work, and how to resolve the challenges and difficulties associated with such a mechanism. Both the California Market Advisory Committee (MAC) and California Public Utilities Commission have examined load-based mechanisms that would require tracing electricity from particular load centers back to the generation source, in order to regulate the particular emissions associated with serving those particular loads. Tracing electricity from load to source, however, can be difficult and problematic. And requiring emission attributes to follow electricity can cause uneconomic transactions.

The design of a load-based mechanism to reduce CO_2 emissions can be simplified, however, by accepting that a generator's emission attributes can be separated – or unbundled – from the production attributes. There is no reason why load-based CO_2 regulation must require emission benefits to follow the electricity from which they are created, nor any compelling reason why those benefits cannot be traded, sold or retired separately from the associated electricity. In a slight reversal of traditional cap & trade approaches, rather than providing allowances to pollute, this alternative, which we are calling the "*CO_2RC* method" (pronounced "cork"), provides credits for pollution reduction. And states or provinces, by requiring load-serving entities (LSEs) to procure emission credits for each GWh served, can accomplish their emission reduction targets in a simpler and more effective way than by tracing electricity from load to source, and indirectly regulating the generating facilities associated with those loads. The CO_2RC concept is similar to how renewable energy compliance is shown with RECs. A more detailed description follows.

The highest CO_2-emitting generators today are older, subcritical, pulverized coal plants, which can emit as much as 1000 tonnes CO_2/ GWh[2]. Under the *CO_2RC* method,

[2] "Carbon Dioxide Emissions from the Generation of Electric Power in the United States,"

for each GWh produced, a generator in the Western Electricity Coordinating Council (WECC) would receive one CO_2 Reduction Credit, or CO_2RC, for each tonne less than 1000 that it emits. So, a combined cycle combustion turbine (CCCT), which emits 400 tonnes CO_2 per GWh, would receive 600 CO_2RC s for each GWh generated. A wind generator would receive 1000 CO_2RCs for each GWh. An older pulverized coal plant would receive no CO_2RCs. All generators in the WECC would be eligible for CO_2RCs because that organization represents the Western grid – the marketplace in which electricity in the West can be relatively freely traded.[3] In conjunction with awarding CO_2RCs to generators, states or provinces would require LSEs to procure and retire enough CO_2RCs to meet the emission reduction targets established by the state, province or region. As LSEs procure and retire more CO_2RCs, power plant CO_2 emissions are necessarily reduced.

The remainder of this paper addresses how the CO_2RC method matches up with some of the more dominant principles and issues identified in California's *Market Advisory Committee Report*[4], specifically:

1) Simplicity, administrative ease and economic efficiency
2) Leakage issues and the CO_2RC method
3) Accounting for growth to achieve absolute CO_2 reductions in the West
4) Providing genuine CO_2 reductions with only partial WECC participation
5) How the CO_2RC method accommodates energy efficiency and offsets
6) Linking the CO_2RC method with other sectors and CO_2 cap & trade regimes
7) How the CO_2RC method handles CO_2 allowance allocations

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1) Simplicity, administrative ease and economic efficiency

Implementing and administering the CO_2RC method is straightforward. Generating facilities have relatively standard emission rates depending on their fuel type, model, location and vintage. In addition, the Clean Air Act requires most generators to report their CO_2 emissions, so a database of emissions is readily available.[5] A regulatory agency would award CO_2RCs based upon the energy output and

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Department of Energy, Environmental Protection Agency, July 2000: http://www.eia.doe.gov/cneaf/electricity/page/co2_report/co2emiss.pdf

[3] Although some power enters the Western Grid from the East or ERCOT through DC interties, the level of these transactions is quite small.

[4] Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California ; Market Advisory Committee to California Air Resources Board (CARB), June 30, 2007 (the " *MAC Report*").

[5] See *MAC Report* at 73.

emission rate for each generator each year. An electronic bulletin board could facilitate the purchase, sale or trade of these credits. As will be explained later, to establish eligibility for CO_2RCs, a generator need only provide the agency with three things: 1) its CO_2 emissions rate; 2) its output dedicated to WCI loads; and 3) documentation delineating CO_2RC ownership.[6]

Once the crediting mechanism is in place, states would implement their emission reduction goals by adjusting the CO_2RC procurement requirements for their LSEs. For example, each state could require a uniform percentage reduction from what it determines to be its LSEs' emissions during a "baseline" period. Local state commissions or air quality bureaus could oversee compliance. CO_2RCs could be sold in bilateral contracts, or on a web-based exchange that would likely evolve. Because CO_2 is a global pollutant, it does not matter that the emission benefit does not come from the same generator as the electricity.

Table 1 demonstrates a simple application of the CO_2RC method in a two-state system, with one load-serving entity in each state. To simplify the example, we assume that each LSE serves all its load with pulverized coal generation at an emission rate of 1000 tonnes CO_2 per GWh. The LSEs in States A and B serve one and two GWh of load respectively, and we assume no growth in electricity use over time.[7] Also in this example, each state requires its LSE to cut CO_2 emissions by 1 percent per year from its baseline.

TABLE 1

	State A			**State B**			**Region A & B**		
	Load served *GWh*	Emissions *tonnes*	CO_2RCs required	Load served *GWh*	Emissions *tonnes*	CO_2RCs required	Load served *GWh*	Emissions *tonnes*	CO_2RCs required
Baseline Year	1	1,000	0	2	2,000	0	3	3,000	0
Year 1 (-1%)	1	990	10	2	1,980	20	3	2,970	30
Year 2 (-2%)	1	980	20	2	1,960	40	3	2,940	60
Year 3 (-3%)	1	970	30	2	1,940	60	3	2,910	90

[6] An issue to be considered in the transition to the CO_2RC system is who owns CO_2RCs associated with purchased power agreements that do not assign emission benefits. Generator retention of CO_2RCs could trigger unjustified windfalls to generators at the expense of end-users, while buyer ownership destroys generator incentives to acquire CO_2RCs. One solution is to require generators to demonstrate explicit contractual CO_2RC disposition as a condition of any CO_2RC award – facilitating contract renegotiations in those contracts silent as to ownership of environmental attributes. An alternative safeguard would be to sell, rather than give, CO_2RCs to eligible wholesale power-selling generators, and distribute the proceeds to consumers.

[7] In Section 3 of the paper we show how CO_2RC requirements are established to assure absolute emission reductions as electricity usage grows.

As seen in Table 1, to meet the emission reduction requirements in year 3, LSEs must collectively obtain 90 CO_2RCs, representing CO_2 emission reductions of 90 tonnes. So by year 3, the emissions across the two states are reduced from 3000 tonnes per year to 2910 tonnes per year, a three percent reduction. This reduction is achieved by increasing plant efficiencies, deploying lower emitting resources such as renewables, buying CO_2RCs from a generator or LSE with a surplus, or any number of other ways.

One might ask how the CO_2RC system would curtail dirtier generation when that power is typically inexpensive, and can be sold independent of CO_2RCs. It is important to keep in mind that CO_2RCs are *only* produced when actual KWhs are generated and delivered. Consider an extreme example, where every LSE bought only unsequestered coal-fired power. In this example, there would be a great scarcity of CO_2RCs in the market, and the price of CO_2RCs would rise dramatically. The high CO_2RC price would enable cleaner generators to charge lower prices for their energy and beat dirtier coal. The clean generators would have to do this because, if they did not sell any energy, they would not receive valuable CO_2RCs. As the CO_2RC requirements increase over time, this drives dirtier generation out of the market. And as dirty generation is retired and replaced with clean generation, new CO_2RCs are awarded to reflect the additional CO_2 reduction. When a utility retires a coal plant and replaces the output with renewable energy, it receives 1000 CO_2RCs per GWh replaced.

The CO_2RC method is also economically efficient. It provides an incentive for reducing CO_2 emissions directly to the owner or developer of generation facilities, rather than indirectly by means of a mandate on LSEs to seek out power sources with low emissions. And not requiring emission benefits to follow electricity helps avoid uneconomic outcomes. This is because the purchase or development of clean energy is not constrained by transmission to *particular* load centers. Clean energy can be built wherever there is a transmission path to an unserved load – it need not be uneconomically constrained to serve a particular load center. This allows more flexibility for renewables to be built where the resources (wind, solar, geothermal) exist, and not necessarily where transmission allows import into a particular state. It also avoids an impetus for unnecessary transmission construction.

2) Leakage Issues and the CO_2RC method

The *MAC Report* identifies two sources of leakage, contract shuffling and legal challenges for Commerce Clause violations. The CO_2RC method reduces or eliminates each of these concerns.

One of the difficulties in implementing a load-based cap & trade system for the electric sector stems from the notion that regulators must trace electricity from load to source in order to determine the particular emissions associated with a particular load. For much of the electricity served in the West this is difficult or impossible. There are thousands of transactions each hour, often without any designation of the source generation.[8] System sales[9] are common. While regulators can trace some sales by contract terms, and other sales can be assumed to come from the generation owned by an LSE, many transactions are simply not traceable.[10] And even when sales are traceable, regulation can be avoided through power swaps or "contract shuffling," which targets clean generation to states that have emission requirements,[11] and enables generators to avoid the emission requirements of participating states. Trying to police these swaps, or other gaming schemes in a complex mechanism, can overwhelm the resources available in many states.

Moreover, because the California Independent System Operator (CAISO) has received FERC approval for its Market Redesign and Technology Upgrade (MRTU), the power market is likely to move further away from unit-specific contracts, and thereby "erode" an LSE's ability to select specific clean generators.[12] When average emission rates are assigned to all unspecified generation sources as a default, as some have suggested[13], those unspecified generators lose much of their incentive to reduce emissions because improvements benefit only the overall average emission level, not that of the emission-reducing generator. Such averaging might even enable new pulverized coal plants, which can benefit from blending their emissions into an average.

By unbundling the emissions from the power, the *CO_2RC* method avoids the difficult task of matching loads with generation sources and emissions. Because of this, and the uniform treatment of all power plant emission sources in the WECC, the leakage issue disappears – there is no advantage to contract shuffling or swapping generation because it does not matter whether the generator is actually serving a particular load. All generators receive, or do not receive, credits based upon their CO_2 footprint. The *CO_2RC* method will not create uneconomic power transactions in an attempt to game, or satisfy, requirements for specific generator emissions. It also accommodates the recent California power pooling market developments because an LSE's power purchases can be independent of its *CO_2RC* procurement. The *CO_2RC* method provides an incentive (the sale of *CO_2RCs*) to *every* generator in the West to reduce CO_2 emissions. When a generator lowers its emission rate, it receives *CO_2RCs* equal to the full CO_2 reduction benefit, and there always remains a substantial incentive for every generator to lower its CO_2 footprint further.

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[8] According to the *MAC Report*: "one public comment reported that in the CAISO control area alone there are 15,000 transactions per hour with 99 load schedules and 800-1000 custody exchanges between market participants per hour.

[9] System sales are sales not linked to a particular generator, but rather served from the entire generation mix owned by a utility.

[10] The *MAC Report* at 42 concludes that both of the approaches it examined (load-based and first seller) "would need to approximate emissions from some out-of-state sources."

[11] The *MAC Report* at 44 states that "[b]oth the load-based and first seller approaches appear to provide similar incentives for contract shuffling."

[12] *MAC Report* at 46.

[13] The *MAC Report* at 45 found that load-based mechanisms which attempt to trace electricity "must rely on the use of default values based on averages over sub-regions of the electricity system."

Uniform treatment of generation inside and out of the regulating jurisdiction is also a positive attribute of the CO_2RC method. Every generator, wherever located, receives credits based upon its CO_2 emissions.[14] Likewise, all LSE's in the participating states can comply without discriminating between in-state or out-of-state power or emissions. These characteristics will help suppress Commerce Clause legal challenges.

3) Accounting for growth to achieve absolute CO_2 reductions in the West

Because an LSE's CO_2RC requirements are based upon the amount of energy a generator serves, regulators must adjust the CO_2RC requirements as electricity usage grows. Otherwise, absolute emission reductions will not be achieved. An example shows how to assure absolute CO_2 reductions with the CO_2RC method.

Assume an LSE's base year CO_2 emissions are 7000 tonnes associated with 10 GWh of base year energy sales. This LSE has an average emission rate of 700 tonnes/GWh which is 300 tonnes/GWh less than the 1000 tonnes/GWh emitted by an old coal plant. Thus, in the base year the LSE receives 300 CO_2RCs per GWh or 3000 CO_2RCs in total. To keep the example simple, we also assume that only one state, in a closed electricity market, is participating, and that this state has only one LSE that owns all the generation. If policymakers want to reduce base year emissions by 10 percent, that will mean that emissions in the state in the target year must be reduced 700 tonnes (10% of 7000) to 6300 tonnes. If there is no growth, the CO_2RC requirement to achieve the target is straightforward. The LSE must now hold an additional 700 CO_2RCs for a total of 3700. The LSE's CO_2RC requirement grows from 300 CO_2RCs/GWh in the base period to 370 CO_2RCs/GWh in the target year, which means the emissions associated with meeting the LSE's load falls from 7000 tonnes in the base year to 6300 tonnes in the target year.

Suppose, however, that electricity consumption increases to 12 GWh in the target year, and the state neglects to consider this growth in setting its CO_2RC requirement. In this case, the LSE will still only submit 370 CO_2RCs per GWh and the average emission rate associated with meeting the LSE's load will remain at 630 tonnes/GWh. But at 12 GWh of consumption this will result in total emissions of 7560 tonnes[15] – more than the base period emissions rather than less. To achieve the absolute emission reductions sought, the state must up its CO_2RC requirement to assure no more than 6,300 tonnes of CO_2 emissions. The simplest way to do this, and assure real emission reductions with system growth, is for the state to require (in this case) 370 CO_2RCs per GWh only up to the LSE's baseline of 10 GWhs, and require an additional

[14] Later in this Paper we suggest possibly not awarding CO_2RCs to generators dedicated to non-WCI retail loads - to avoid WCI-funded windfalls to non-WCI generators.

[15] 630 tonnes/GWH x 12 GWh = 7560 tonnes.

1000 CO_2RCs per GWh for all GWhs exceeding the baseline amount.[16] This adjustment assures that genuine CO_2 reductions occur even as electricity consumption grows. It also provides a substantial impetus for LSEs to deploy energy efficiency as an alternative to unnecessary growth.

4) Providing genuine CO_2 reductions with only partial WECC participation

A *temporary* concern with any cap & trade system proposed for the West stems from non-WCI states or regions that are nevertheless part of the WECC. Non-participating WECC states and regions can create excess CO_2RCs that deflate CO_2RC values and undermine efforts to genuinely reduce CO_2 emissions. Because WCI states want to include all WCI load-serving generation in their emission targets, simply restricting CO_2RCs to generation located in participant states does not work. Currently, the six participating states and two provinces consume two-thirds (66.5%) of the energy in the WECC[17].

For a cap & trade system to reduce CO_2, there must be a genuine scarcity of CO_2RCs (or allowances) in the marketplace. The load-based and first seller approaches address this issue by restricting allowance allocations to those generators or marketers actually selling into the participant states' markets. One could, of course, apply this same restriction to the CO_2RC method. However, even assuming one can identify the specific generation serving WCI loads, such a restriction adds incredible complexity to the method, fosters uneconomic outcomes (by requiring transmission paths for emission attributes), and may not achieve the targeted reductions because of contract shuffling.

There are several approaches available within the CO_2RC system to assure genuine CO_2 reductions when non-WCI generators are potential CO_2RC recipients. One is for WCI states to escalate the CO_2RC requirements of their LSE's s to absorb all WECC CO_2RCs.[18] Another is for regulators to limit the eligibility of certain non-WCI generators to obtain CO_2RCs. As more states or regions join WCI, the need for these adjustments is reduced, and becomes unnecessary when the entire WECC participates. The common thread in these approaches is that, to be effective in reducing CO_2, there must be a scarcity of CO_2RCs, and participant states must absorb all of the CO_2RCs

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[16] A formula to calculate an LSE's CO_2RC requirement in a target year with growth is:

$CO_2RCs = (1000 \times GWh_T) - (CO_{2B} \times (1-R))$, where

GWh_T = Target year energy served

CO_{2B} = Base year CO_2 emissions

R = required % CO_2 reduction from base year

[17] 553,291 GWh/yr (participants) vs. 831,570 GWh/yr (WECC). Sources: WECC and Energy Information Agency of DOE.

[18] Instead of escalating the CO_2RC requirement , WCI States could also proportionately discount CO_2RC values, i.e. reducing CO_2RC values rather than increasing CO_2RC requirements, so that one CO_2RC represents less than one tonne of reduced CO_2.

produced in the WECC market.

The following tables provide an example of how we envision escalating CO_2RC requirements might work. Table 2 presents the assumptions used in the example. We assume a market with three states. States A & B are participants in the WCI, while State C is not. Each of the states has one LSE that meets part of its demand with owned generation, and part with purchased power. State C sells 15 GWh of power to States A & B, while State C purchases 5 GWh of power from State B. The average emission rate for all purchased power in the three-state region is 800 tonnes/GWh.

TABLE 2

	State A	State B	State C
(a) WCI participation	Yes	Yes	No
(b) Energy consumption	20 GWh	30 GWh	10 GWh
(c) Energy production & average emissions rate	10 GWh 1000 tonnes/GWh	30 GWh 550 tonnes/GWh	20 GWh 725 tonnes/GWh
(d) LSE loads served by owned generation & associated emissions rate	10 GWh 1000 tonnes/GWh	25 GWh 500 tonnes/GWh	5 GWh 500 tonnes/GWh
(e) LSE loads served by purchased power & average emissions rate	10 GWh 800 tonnes/GWh	5 GWh 800 tonnes/GWh	5 GWh 800 tonnes/GWh
(f) LSE power sold to market & average emissions rate	0 GWh	5 GWh 800 tonnes/GWh	15 GWh 800 tonnes/GWh

Table 3 shows that by increasing the CO_2RC requirements, States A & B can achieve a genuine 10% reduction in State A & B load-based CO_2 emissions (3,450 tonnes) in a market with incomplete participation. By grossing up the CO_2RCs required in States A & B to absorb the 3,500 CO_2RCs of non-participant State C, the system achieves lower CO_2 emissions by an amount equal to 10% of States' A & B emissions. In the example, rather than requiring 3,800 and 15,150 CO_2RCs respectively (which is the amount A & B would require if State C were a participant), States A & B would require 5,200 and 17,250 CO_2RCs for compliance, and thereby achieve a genuine CO_2 reduction of 3,450 tonnes throughout the region in the target year.[19]

[19] This example assumes that States A and B absorb the excess CO_2RCs in proportion to their relative energy requirements. Other allocation mechanisms are also possible.

TABLE 3

	State A	State B	State C
(A) Load-based CO_2 emissions in base year[20]	18,000 tonnes	16,500 tonnes	6,500 tonnes
(B) CO_2RCs awarded in base year[21]	2,000 CO_2RCs	13,500 CO_2RCs	3,500 CO_2RCs
(C) Add'l CO_2RCs req'd for 10% reduction in States A&B[22]	1,800 CO_2RCs	16,500 CO_2RCs	0 CO_2RCs
(D)Add'l CO_2RCs in A & B to absorb State C amounts[23]	1,400 CO_2RCs	2,100 CO_2RCs	(3,500) CO_2RCs
(E)Total target yr CO_2RCs req'd by States A,B & C [24]	5,200 CO_2RCs	17,250 CO_2RCs	0 CO_2RCs
(F) Effective target year CO_2 emissions after CO_2RC redistribution [25]	14,800 tonnes	12,750 tonnes	10,000 tonnes
(G) Effective target year CO_2 reduction after CO_2RC redistribution [26]	3,200 tonnes	3,750 tonnes	(3,500) tonnes
(H) Total target year CO2 reduction [27]	3,450 tonnes		

An obvious concern with the previous example is that WCI states may need to purchase substantial CO_2RCs from non-WCI generators in order to assure genuine emission reductions. This creates what many could view as an unjustified wealth transfer from WCI to non-WCI states – for example, a generator with an emission rate of 400 tonnes per GWh, serving native retail load in a non-WCI state, nevertheless receives 600

[20] From Table 2 lines (d) and (e)
[21] ((b) x 1000) - A
[22] For States A & B = (0.1x A)
[23] For States A & B = (b)/50 x 3,500
[24] B+C+D
[25] ((b) x 1000) – E
[26] A-F
[27] Sum of G

CO_2RCs per GWh – which must be purchased by LSEs of participating states. In the example in Tables 2 and 3, this issue shows up as the CO_2RCs associated with 5 GWhs per year served by "owned" generation in State C, i.e. 2,500 CO_2RCs. This generation is dedicated to State C's customers, and requiring WCI customers to purchase these CO_2RCs may be unnecessary and unfair.

One way to mitigate this impact is to not award any CO_2RCs to generation dedicated to non-WCI loads. This does not eliminate all inequities of a system without full participation, but could mitigate much of it. In the example shown by the Tables, refusing CO_2RCs to generation dedicated to non-WCI loads means that instead of absorbing 3,500 C CO_2RCs from State C, States A and B would absorb only 1,000 CO_2RCs.[28] A further way to address this concern is to sell CO_2RCs to non-WCI generators at a price high enough to allow the proceeds to ease consumer impacts. As WCI policymakers more closely examine the emissions profiles for generation dedicated to WCI and non-WCI loads, they will better be able to decide to what extent non-WCI generator CO_2RCs should be restricted or sold.

5) How the CO_2RC method accommodates energy efficiency and offsets

One advantage of the CO_2RC method is the ease with which it accommodates energy efficiency and approved offsets. Unlike other cap & trade mechanisms that may not provide appropriate incentives for end-use efficiency,[29] the CO_2RC method provides a strong and consistent incentive to acquire efficiency by reducing an LSE's CO_2RC requirement by 1000 CO_2RCs for every GWh saved. Using the formula set out in an earlier footnote, one sees mathematically how, as an LSE's served energy (GWh_T) is reduced, the LSE's CO_2RC requirement is likewise reduced by 1000 per GWh:

$$CO_2RCs \text{ required } = (1000 \times GWh_T) - (CO_{2B} \times (1-R)), \text{ where}$$

GWh_T = Target year energy served
CO_{2B} = Base year CO_2 emissions
R = required % CO_2 reduction from base year

Because the "currency" of the CO_2RC method is tonnes of avoided CO_2, it can also accomodate approved offsets, which would reduce an LSE's CO_2RC requirements one for one. Moreover, as we will discuss next, this common "currency" provides an avenue for the CO_2RC method to link with other CO_2 reduction measures in other sectors of the economy, and source-based cap & trade systems from other regions and countries.

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[28] If this restriction still results in intolerable excess CO_2RCs in the WECC, CO_2RC eligibility could perhaps be restricted further by providing CO_2RCs to non-WCI generators only for CO_2 reductions below base year levels, or to new generators.

[29] *MAC Report* at 50.

6) Linking the CO_2RC method with other sectors and CO_2 cap & trade regimes

The CO_2RC method links seamlessly with other CO_2 reduction systems in the United States and beyond. This is because of the common, tonnes CO_2, currency of both source-based cap & trades and the CO_2RC method. In other words, a source-based cap & trade can use CO_2RCs interchangeably with allowances in its system. And allowances from source-based systems can be used interchangeably with CO_2RCs in a CO_2RC-based system. This occurs even though an allowance is an authorization to emit one tonne of CO_2 while a CO_2RC represents a one tonne CO_2 reduction.

The example in Table 4 illustrates this interchangeability, and assumes two different CO_2 reduction systems. System A uses the CO_2RC method and emits 1000 tonnes of CO_2 per year. System B uses a source-based cap & trade and emits 2000 tonnes per year. Both systems target 20% CO_2 reductions in year 2. As such, System A requires that 200 CO_2RCs be presented and retired in year 2, and system B reduces its available allowances in year 2 from 2000 to1600. This reduces CO_2 emissions on the two systems a total of 600 tonnes.

TABLE 4

Year & Target	System A (CO_2RC) emits 1000 tonnes CO_2	System B (Allowance) emits 2000 tonnes CO_2
1 - zero reduction	0 CO_2RCs	2000 CO_2 allowances
2 - 20% reduction	200 CO_2RCs	1600 CO_2 allowances

Now let us say that CO_2 reductions are cheaper on System A than System B. So, B buys 400 CO_2RCs from A, and adds those CO_2RCs to its allowances. This gives B 2000 allowances in Year 2, and eliminates B's reduction requirement. However, to meet System A's requirements, A must provide 200 CO_2RCs for compliance, plus an additional 400 CO_2RCs to sell to B. So, the total reduction across the two systems is still 600 tonnes CO_2.

The same result works in reverse, i.e. if reductions are cheaper on System B. In that case, A buys 200 allowances from B, and uses those allowances to meet its CO_2RC requirements. A, therefore, does not reduce CO_2 at all. B, however, has only 1400 CO_2 allowances remaining (because it sold 200 to A), so it must reduce its CO_2 emissions by 600 tonnes (2000 tonnes – 1400 tonnes), again accomplishing the 20% reduction across the two systems.

One can expand this example to show the CO_2RC method's ability to link with source-based cap & trade models in the Eastern Grid,[30] the European Union, and elsewhere. And, for the same reasons, it appears that the CO_2RC method would also accommodate CO_2 reduction programs in economic sectors beyond electricity. For example, if states in the West want to reduce emissions from industrial sectors and oil & gas field operations, they can do so by developing a source-based cap & trade system for those sectors, and exchange allowances in that system back and forth with CO_2RCs in the electricity sector.

7) How the CO_2RC method handles CO_2 allowance allocations

One of the most difficult issues confronting policymakers designing a more traditional cap & trade is how to allocate allowances to emit CO_2. A number of equity considerations come into play in both the distribution of CO_2 allowances, and whether to give, sell or auction allowances to emitters. How allowances are distributed can create windfalls to generators, excessive costs to electricity customers, and potential revenues to be used by lawmakers. Moreover, if allowances are administratively distributed, that allocation may need to be revisited whenever there are changed circumstances such as new market participants and retired and new generation. The allowance allocation issue has the potential to divert, delay and confuse CO_2 reduction goals while policymakers grapple with a multitude of equity issues and dollars.

The CO_2RC method simplifies the allocation issue because allocations are specifically dictated by the emissions of generators operating at any given point in time. The cleaner the generation, the more CO_2RCs that generator receives. A transaction fee for CO_2RCs to qualifying generators is appropriate to fund administrative costs and perhaps other endeavors. Nevertheless, the CO_2RC method provides an explicit and simple means for awarding CO_2RCs that rewards exactly the behavior that policymakers are trying to promote: CO_2 emission reductions.

Once CO_2RCs are distributed, states would next determine how many CO_2RCs their LSEs must present for compliance. State policymakers could, for example, establish a CO_2 reduction target based upon a percentage reduction from LSE emissions associated with loads during a baseline period.[31] These emission targets and the LSE's loads in the compliance year would then determine the LSE's compliance year CO_2RC requirements. In this scenario, CO_2RC requirements would vary from state-

[30] Currently represented by the Regional Greenhouse Gas Initiative, or "RGGI."

[31] To determine emission levels during the baseline period, an average emission rate would have to be assigned to all undesignated power needed to serve that LSE's customers during the historic baseline period. It is important to recognize, however, that this "average emission rate" is very different from the average used in a generation-tracking load-based system. In the CO_2RC system, the average is used only to establish a baseline from which to reduce emissions. It is not used for compliance, and does not impact any generator's incentive to reduce emissions.

to-state, and LSE to LSE, and would spread the cost of compliance across all electricity consumers within the WCI footprint.

Conclusions

The CO_2RC method effectively addresses many of the design, implementation and administrative issues confronting policymakers. The method is straightforward, easy to administer, avoids difficult allowance distribution issues, and eliminates leakage because it involves all generators in the West. The CO_2RC method supports the most efficient energy and emission reduction solutions by unbundling electricity from emission attributes, and it links seamlessly with other cap & trade systems and other economic sectors. The method also provides full value and strong incentives for end-use efficiency. While WCI participants must absorb some CO_2RCs from non-participants in order to assure genuine CO_2 reductions, the CO_2RC method accommodates such manipulations at what is likely to be minimal cost. Most important, the CO_2RC method provides all generators a direct financial incentive to reduce CO_2 emissions at the lowest cost. All in all, the CO_2RC method appears to be an effective load-based cap and trade model to efficiently reduce CO_2 emissions in the West.