Making Sense of RECs – Monetizing Value in Evolving Markets

February 23-25, 2010

Steve Dean, ASA, P.E.
DAI Management Consultants, Inc.

DAI
MANAGEMENT
CONSULTANTS

The Current State of REC Markets

What are RECs? Why do they exist?

• Many names are used: Renewable Energy Credit, Renewable Energy Certificate, Tradable Renewable Certificate, Renewable Resource Credit, Portfolio Energy Credit, Green Credit, etc.

• A "REC" is a government-created property right that represents the (positive) environmental attributes of 1 MWh of electricity.

- A 1 MW coal plant operating for 1 hour produces 1 MWh of energy
- A 1 MW solar plant operating for 1 hour produces 1 MWh of energy *plus* 1 REC

• More correctly, a REC is only produced (in a particular jurisdiction) for a "qualifying" facility's environmental attributes. Each jurisdiction determines what constitutes qualifying renewable energy within its borders.

• A jurisdiction first creates a requirement for load-serving entities to procure (*i.e.*, an RPS) a certain quantity of qualifying renewable energy (RECs) and then endows certain types of generators with the ability to create RECs, creating an incentive for those generators to trade with the load-serving entities.

• RECs are used as a means of subsidizing a specific type of capacity (*i.e.*, renewable capacity) by raising its revenues and thereby inducing incremental market entry.

• The advantage of using RECs as the market entry incentive is that subsidies can be tailored arbitrarily narrowly depending on policy preferences. RECs can distinguish not only between non-renewable and renewable power, but also between wind and solar or new hydro and older hydro, etc. This ability minimizes "leakage," or the ability of unintended participants to receive the incentives.

Renewable Portfolio Standards and the Creation of Demand for RECs

• A Renewable Portfolio Standard ("RPS") is a state legislative requirement that load-serving entities must procure a certain percentage of their delivered power from "qualifying" renewable sources. Approximately 2/3 of states have some form of RPS.

• It is the demand created by RPSs that led to the need to create RECs. Consider a utility with retail sales of 1,000,000 MWh/year. If the state implements a 10% RPS, the utility would be required to acquire 100,000 RECs (per year). These RECs could come from existing qualifying projects, from qualifying projects it develops internally, or from RECs purchased from third parties.

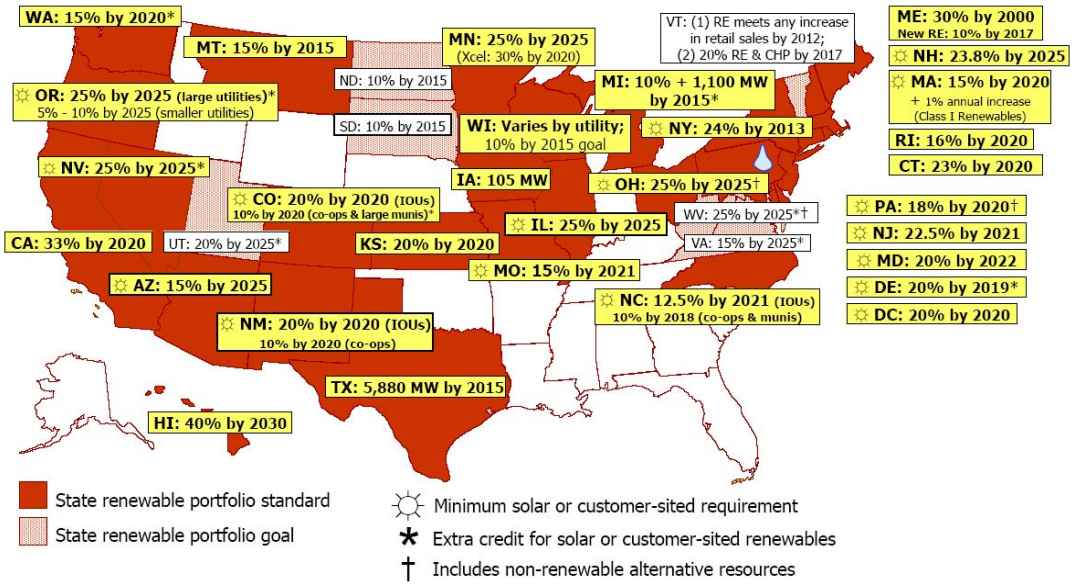
• A prerequisite for *trading* RECs, however, is a system for *tracking* them. Renewable energy tracking or registration systems ensure that the environmental attributes of 1 MWh of electricity are sold only once, that they are produced by qualifying resources, and that trades are conducted according to the rules of each jurisdiction.

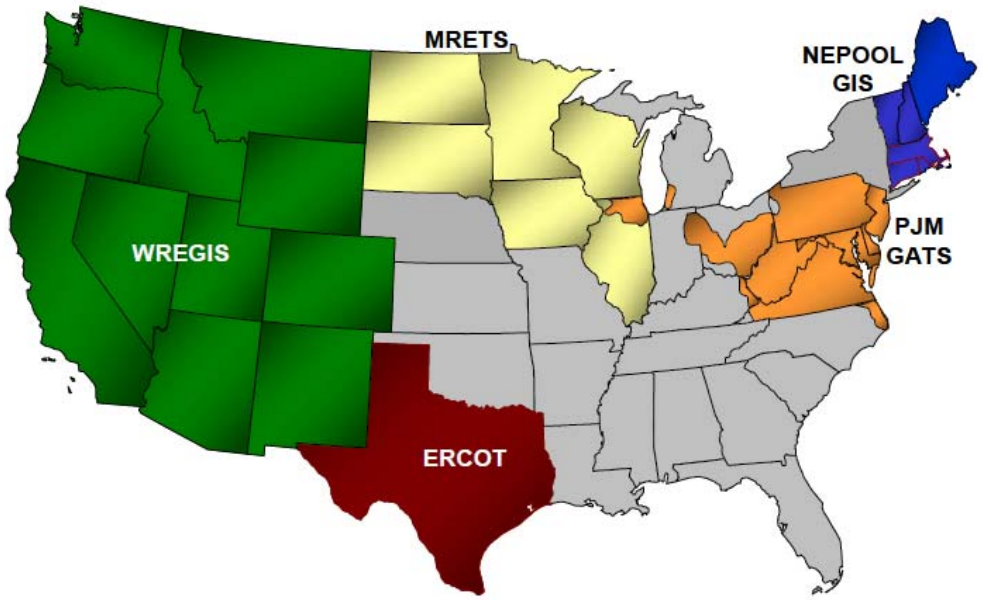
• There are currently five tracking systems in the U.S.:

- WREGIS: The Western Renewable Energy Generation Information System
- ERCOT: Texas's REC tracking authority
- MRETS: The Midwest Renewable Energy Tracking System
- GATS: PJM's Generation Attributes Tracking System
- GIS: ISO New England's Generation Information System

State Renewable Portfolio Standards and Renewable Energy Tracking Systems

Renewable Portfolio Standard by Target and State





Renewable Energy Tracking and Registration Systems

DAI MANAGEMENT CONSULTANTS

RPSs, Tracking Systems, and Boundary Issues for RECs

- The fact that the RPSs evolved "up" from the individual state level instead of "down" from the federal level has created a remarkably complex operating environment.
- One of the central challenges to renewable projects in monetizing renewable attributes is navigating this highly-localized and highly heterogeneous market.
- Each state has its own RPS targets.
- Each state has its own definitions of qualifying renewable energy.
- Each state sets guidelines on the use of (or prohibitions on the use of) out-of-state resources.
- These standards create boundary problems for many generators. For example, a generator could find itself in State X for purposes of satisfying a RPS, in tracking system Y for identifying trade counterparties, and in NERC region Z for energy market transactions. Each system's boundaries and rules add complexity and reduce options in the process of monetizing the renewable attributes.
- Boundary problems are one of the primary barriers to the "financeability" of RECs:
    - Boundary issues limit access to potential counterparties
    - Boundary issues inhibit standardization of the traded instruments
- The following chart highlights some of the variation in the key characteristics of REC/RPS programs.

Distinguishing Characteristics of RECs/RPSs by State (of States with an RPS)

	Arizona	California	Colorado	Connecticut	Delaware	Illinois	Iowa	Kansas	Maine	Maryland	Massachusetts	Michigan	Minnesota	Missouri	Montana	Nevada	New Hampshire	New Jersey	New Mexico
Allow unbundled RECs?	×	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	✓
Solar Carve-Out?	✓	×	✓	×	✓	✓	×	×	×	✓	×	×	×	✓	×	✓	✓	✓	✓
Mandatory?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Includes Alternative Non-Renewable Energy?	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Alternate Compliance Payment	×	✓	×	✓	✓	✓	×	×	✓	✓	✓	×	×	×	✓	×	✓	✓	✓
Able to Procure Out of State?	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓
2010 Target	2.5%	20.0%	5.0%	14.0%	5.5%	5.0%	105 MW	N/A	3.0%	5.5%	5.0%	N/A	15.0%	N/A	10.0%	12.0%	1.0%	8.3%	N/A
2020 Target	10.0%	33.0%	20.0%	27.0%	20.0%	17.5%	105 MW	20.0%	10.0%	18.0%	15.0%	10.0%	30.0%	10.0%	15.0%	22.0%	11.0%	22.5%	20.0%
2030 Target	15.0%	33.0%	20.0%	27.0%	20.0%	25.0%	105 MW	20.0%	10.0%	20.0%	25.0%	10.0%	30.0%	15.0%	15.0%	25.0%	16.0%	22.5%	20.0%

	New York	North Carolina	North Dakota	Ohio	Oregon	Pennsylvania	Rhode Island	South Dakota	Texas	Utah	Vermont	Virginia	Washington	Washington DC	West Virginia	Wisconsin	Federal
Allow unbundled RECs?	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Solar Carve-Out?	✓	✓	×	✓	✓	✓	×	×	×	×	×	×	×	✓	×	×	×
Mandatory?	✓	✓	×	✓	✓	✓	✓	×	✓	✓	×	×	✓	✓	×	✓	✓
Includes Alternative Non-Renewable Energy?	×	×	×	✓	×	✓	×	×	×	×	×	×	×	×	✓	×	×
Alternate Compliance Payment	×	×	×	✓	✓	✓	✓	×	✓	×	×	×	✓	✓	×	×	✓
Able to Procure Out of State?	×	✓	✓	✓	✓	✓	✓	✓	×	✓	×	✓	✓	×	✓	✓	N/A
2010 Target	N/A	0.0%	N/A	0.5%	N/A	6.7%	4.5%	N/A	3272 MW	N/A	N/A	4.0%	N/A	5.5%	N/A	N/A	N/A
2020 Target	25.0%	10.0%	10.0%	8.5%	20.0%	15.7%	16.0%	10.0%	5880 MW	N/A	20.0%	7.0%	15.0%	20.0%	15.0%	10.0%	17.5%
2030 Target	25.0%	12.5%	10.0%	12.5%	25.0%	18.0%	16.0%	10.0%	10000 MW	20.0%	20.0%	15.0%	15.0%	20.0%	25.0%	10.0%	25.0%

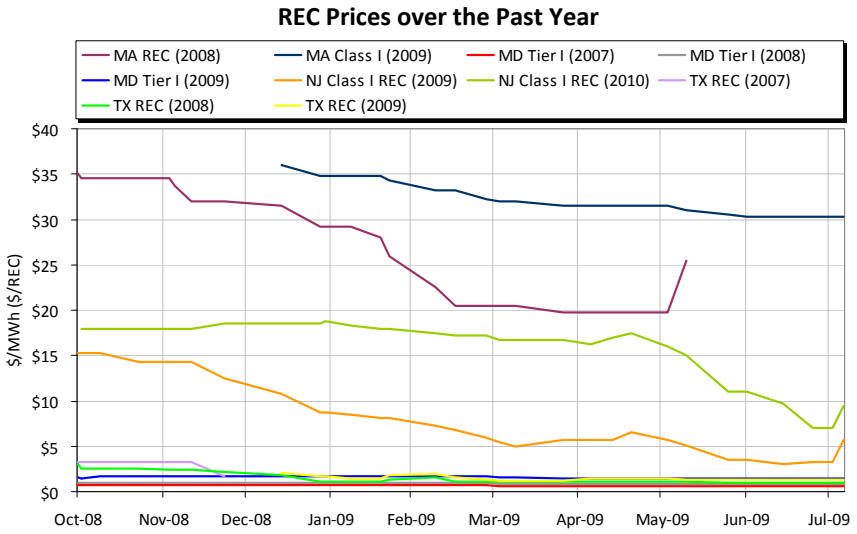
Federal standard is proposed as part of the ACES bill

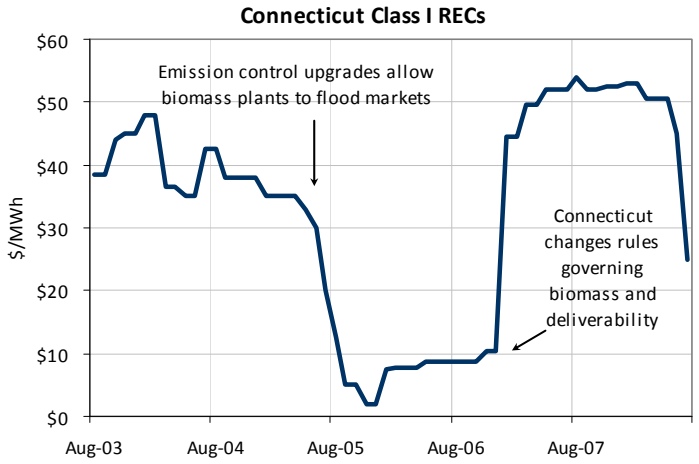
Hawaii and Alaska are excluded here. Hawaii has an RPS; Alaska does not. Results here are general and may not reflect every situation.

DAI Management Consultants

Market Complexity as a Challenge to Monetization

- Three consequences of this complex market environment are (*i*) wide variation in prices between jurisdictions, (*ii*) high volatility in prices over time, and (*iii*) a changing regulatory landscape.
- The wide variation in prices between jurisdictions is the clearest evidence that not all RECs are created equal, but an additional factor complicating investor acceptance of RECs is the risk of a changing regulatory landscape.
- RECs are legislative and regulatory creations. And what the legislator/ regulator creates, they can also take away.
- The example of Connecticut is instructive. When constraints on inter-market REC tradability were overcome and biomass capacity flooded the market, prices collapsed, only to have the legislature change the rules and send prices shooting back up.



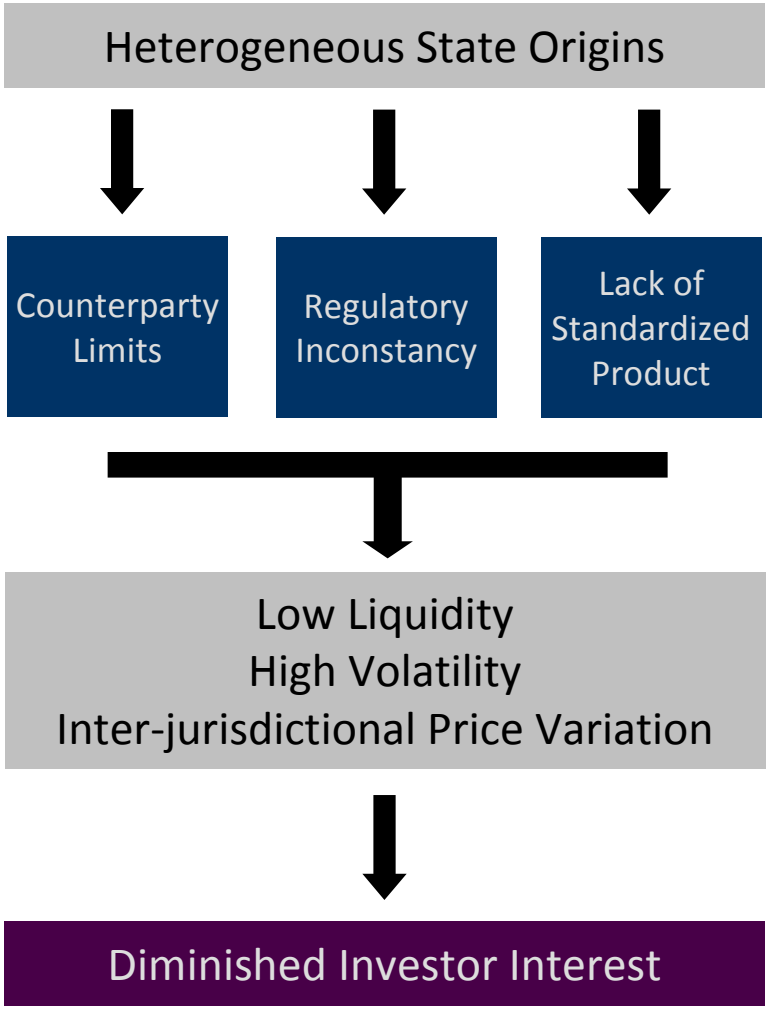


DAI MANAGEMENT CONSULTANTS

Monetization Options for Renewable Projects

Connecting Market Design and Structure to REC Financeability

- What options are *possible* vs what options are *available*?
- As an analogy, in many regions, it's like going to a restaurant with a large menu, only to be told they're out of everything.
- Options available to renewable generators for monetizing their environmental attributes:
  - Bilateral contracting
  - Compliance credit markets
  - Voluntary credit markets



Bilateral Contracting

• One option for renewable projects is to sign a PPA with an off-taker who will also take the RECs. This is often the best or only option when long-term commitment is required.

• Bilateral contracting is also often the only method available in markets that prohibit trading or disallow unbundling RECs from energy.

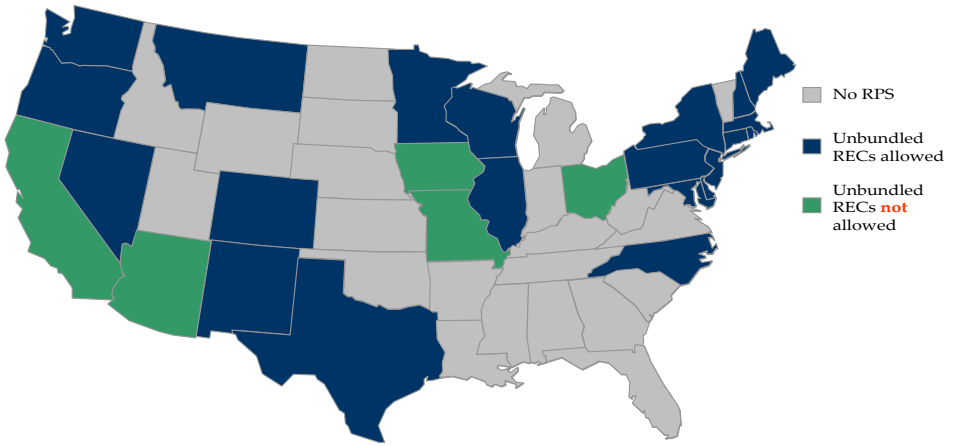
• Bilateral contracting can also be the only avenue available for certain types of renewable capacity not treated uniquely by the market.

- For example, California does not (through its RPS) provide special treatment for solar projects and does not (yet) allow unbundling. There are no solar RECS or solar multipliers. As a result, solar projects would be at a disadvantage in California *relative to other renewables* if the state's utilities/PUC did not offer preferential contracts (the "market price referent" and "above market funds"-based contracts).

• Although popular with lenders who value their security, one downside to bilateral contracting is that projects are then often "held hostage" to the off-taker.

• The "price" of securing a long-term commitment is often a contract price well below forecasted market levels (Example: 20-year fixed price PPAs with the $40-$60/MWh range, with only 1% annual escalation).

Compliance Credit Markets



- Compliance markets refer to those markets in which RECs are issued/traded for purposes of compliance with a mandatory RPS.
- The key questions with regard to compliance RECs are whether or not they are unbundled and whether or not there is a "carve-out." A carve-out requires a state's utilities to include a particular type of renewable generation in their renewable mix (*e.g.*, solar). Generally, in such areas, there exist separate RECs for different types of renewable energy. For example, New Jersey has both "regular" RECs and solar RECs, and the solar RECs trade at much higher prices (given the comparatively higher cost of solar over wind, for example).
- One challenge with bundled compliance markets is monopsony, or a market with a single buyer. In some regions where trade in RECs is limited, the only likely buyer of the RECs is the incumbent utility. Many renewable projects then are forced to compete for that single buyer, which approximates a reverse auction environment.
- On the positive side, sellers are guaranteed that a market exists, since the RECs are required for compliance purposes.
- On the negative side, many investors are concerned about rule changes and the lack of effective hedging instruments. As a results, there are few ways to "lock-in" long-term prices.

Voluntary Credit Markets

- Voluntary credits, which are sometimes referred to as “green tags” or “green credits,” are RECs that are purchased without the intent to comply with a legal or regulatory requirement.
- Typical purchasers of voluntary RECs are institutions seeking to benefit from “green” purchasing practices or to “clean” their purchases of electricity from non-renewable sources in the event they are unable to procure renewable-generated electricity.
- The most significant limitation on voluntary credits is liquidity and market depth. The largest purchasers of voluntary RECs in the country (the US Air Force, Intel, Whole Foods) purchase only 500,000 MWh to 1.3 million MWh per year. Among the Top 50 U.S. purchasers, the 50th is only buying 66,000 MWh/year. For comparison, 1.3 million MWh/year is approximately the output of a single 425 MW wind farm.
- As a result, depth is substantially limited in most markets, with prices rarely exceeding the single digits even when buyers are identified.
- Seller options are typically limited to transacting through a broker (who may be taking a proprietary position), a marketer (who is strictly an agent for connecting buyers and sellers), or an aggregator (often a retail electric provider). Contracts are routinely quoted for 3-7 years periods. Credit quality can become an issue, depending on the purchaser.
- Voluntary REC prices are also effectively capped by the prices charged by the green power aggregators, who can often represent a “provider of last resort” role in most markets.

National Voluntary REC Products

Certificate Marketer	Product Name	Renewable Resources	Residential Price Premiums
3 Phases Renewables	Green Certificates	100% biomass, geothermal, hydro, solar, wind	1.2¢/kWh
3Degrees	Renewable Energy Certificates	100% new wind	1.5¢/kWh
NativeEnergy	CoolWatts	100% new wind	0.8¢/kWh
NativeEnergy	Remooable Energy	100% new biogas	0.8¢/kWh-1.0¢/kWh
Bonneville Environmental Foundation	Solar Green Tags	100% new solar	5.6¢/kWh
Bonneville Environmental Foundation	Wind & Solar Green Tags Blend	50% new wind, 50% new solar	2.4¢/kWh
Bonneville Environmental Foundation	Wind Green Tags	100% wind	2.0¢/kWh
Bonneville Environmental Foundation	Denali Green Tags (Alaska only)	100% new wind	2.0¢/kWh
Bonneville Environmental Foundation	Zephyr Energy (Kansas Only)	50% new low-impact hydropower	2.0¢/kWh
Carbon Solutions Group	CSG CleanBuild	biomass, biogas, wind, solar, hydro	0.9¢/kWh
Carbonfund.org	MyGreenFuture	99% new wind, 1% new solar	0.5¢/kWh
Choose Renewables	CleanWatts	100% new wind	1.7¢/kWh
Community Energy	NewWind Energy	100% new wind	2.5¢/kWh
Enpalo	US CleanGen	100% new wind	1.0¢/kWh
Good Energy	Good Green RECs	various	0.4¢/kWh-1.5¢/kWh
Green Mountain Energy	BeGreen RECs	wind, solar, biomass	1.4¢/kWh
Juice Energy	Positive Juice - Wind	100% wind	1.1¢/kWh
MMA Renewable Ventures	PVUSA Solar Green Certificates	100% solar	3.3¢/kWh
Maine Renewable Energy/Maine Interfaith P&L	Maine WindWatts	100% new wind	2.0¢/kWh
Mass Energy Consumers Alliance	New England Wind Fund	100% new wind	~5.0¢/kWh (donation)
Premier Energy Marketing	Premier 100% Wind REC	100% wind	0.95¢/kWh-2.0¢/kWh
Renewable Choice Energy	American Wind	100% new wind	0.5¢/kWh
SKY energy, Inc.	Wind-e Renewable Energy	100% new wind	2.4¢/kWh
Santee Cooper	SC Green Power	landfill gas, solar	3.0¢/kWh
Sky Blue Electric	Sky Blue 40	100% wind	4.2¢/kWh
Sterling Planet	Sterling Wind	100% new wind	1.85¢/kWh
TerraPass	Green-e RECs	100% new wind	0.5¢/kWh
Village Green Energy	Village Green Power	solar, wind, biogas	2.0¢/kWh-2.5¢/kWh
Waverly Light & Power	Iowa Energy Tags	100% wind	2.0¢/kWh
WindCurrent	Chesapeake Windcurrent	100% new wind	2.5¢/kWh
WindStreet Energy	Renewable Energy Credit Program	wind	~1.2¢/kWh

RECs as Collateral

Lender Concerns about RECs

• DAI has worked on a number of projects (wind, solar, biomass) over the past few years that involve RECs – both compliance and voluntary.

• Based on that experience, lenders cite three main classes of concerns about attributing any value (collateral value) to REC-related revenue:

- Ephemeral Pricing (markets are thin and opaque, with unclear dynamics)
- Regulatory Inconstancy (there is a fear of changing rules or new rules that alter demand)
- Volatility (the inability to hedge in a meaningful way leaves banks exposed)

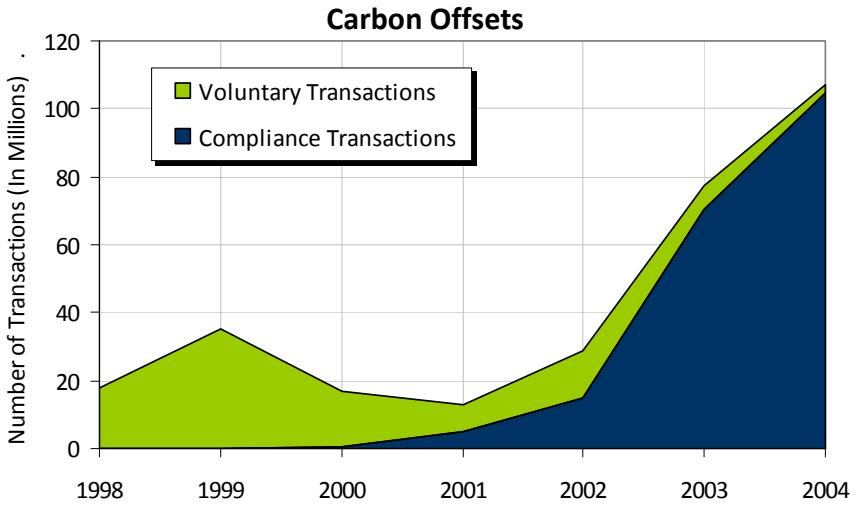
• One lender on REC revenue: "that's the equity's upside."

• There is a near-universal reluctance to attribute value to RECs – even though they *will* attribute value to energy revenue, and energy and RECs are produced in equal measure. That implies – clearly – that concern emerges from the regulatory environment for RECs.

- Energy is needed for electricity; RECs are only needed because regulators say you need them.

• One question about RECs as a policy tool: are they effective if they're difficult to use? How do they encourage *incremental* capacity (*i.e.*, capacity that wouldn't have been there otherwise)?

On Extracting Value



- Lenders' solution: "Lock it down"
- That means using bilateral contracts or selling RECs into the compliance or voluntary markets
- For some projects, bilateral contracts may be infeasible or undesirable.
  - Prices are too low
  - The entities who want energy and RECs are different, but unbundling is disallowed
- Liquidity becomes a concern for unbundled REC market sales.
- Consider the example of carbon offsets: as compliance demand increased, it displaced and ultimately eliminated the voluntary demand. Will the same happen to RECs?

REC Market Observations

- Voluntary markets are unlikely to provide meaningful support.
- Compliance markets work when focused, stable, and open:
  - Solar, biomass (carve-out markets)
  - Most Northeast REC markets, to the extend they allow region-wide trading
- Investors will support REC revenue if projects can demonstrate liquidity and predictability in REC revenues. Solar projects have been successful in this regard in New Jersey, for example.
- Increasingly, especially with lower natural gas prices, bilateral contracts are being used to support renewable projects. The "penalty" from bundling has dropped, as many utilities have realized that unbundled REC markets weren't doing enough to help them achieve their RPS goals.

Emerging Issues

- Two issues are likely to shape the landscape for RECs going forward:
  - CO_2 legislation
  - A Federal Renewable Portfolio Standard
- CO_2 legislation, and any resulting cap-and-trade allowances employed, are likely to raise electricity prices. This increase will provide a direct subsidy to many renewable projects, as non-carbon emitting generators.
- If this "indirect" subsidy is large enough, RECs may no longer be required to induce entry of renewables. In other words, a successful CO_2 program may eliminate the need for a REC program. It remains an open question, given the uncertainty surrounding CO_2 legislation, how these programs will co-exist.
- One clue to their possible future relationship is actually a part of proposed CO_2 legislation. The American Clean Energy and Security Act of 2009 ("Waxman-Markey") would not only regulate carbon, but also create a Federal RPS.
- As proposed, the Federal REC program would be required to work with existing state REC programs. In other words, it would be *supplemental* to them.
- The advantages of a Federal REC program would be inter-jurisdictional equivalence, a more expansive set of trading partners, and, ideally, less regulatory volatility. But if the Federal RPS is required to preserve existing state RPSs, it's unclear how many of these potential benefits may be realized.

DAI Management Consultants, Inc.
1370 Washington Pike
Bridgeville, PA 15017

(412) 220-8920 voice
(412) 220-8925 fax
www.daimc.com
info@daimc.com