

Solving the Puzzle: A Case Study of the Renewable Energy Leadership Prize

For the Boston Green Ribbon Commission

*Prepared by PaulosAnalysis on behalf of
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TABLE OF CONTENTS

| | |
|----|---|
| 03 | NOTE FROM THE GRC |
| 04 | EXECUTIVE SUMMARY |
| 06 | INTRODUCTION |
| 08 | THE RENEWABLE ENERGY LEADERSHIP PRIZE |
| 09 | Judging criteria |
| 10 | THE POLICY CONTEXT |
| 11 | THE RESPONSE TO THE PRIZE |
| 11 | The PowerOptions team |
| 12 | Boston University |
| 15 | Hedging against fluctuations in natural gas prices |
| 16 | A Better City (ABC) |
| 18 | LESSONS LEARNED |
| 22 | CONCLUSION |
| 23 | Interview with Mariella Puerto, Barr Foundation |
| 24 | APPENDIX: Making claims about renewable energy |
| 26 | APPENDIX: Renewable Energy Procurement Initiatives |

NOTE FROM THE GRC

When the Green Ribbon Commission launched the Renewable Energy Leadership Prize, at the suggestion of Mariella Puerto, Senior Program Officer for Climate at the Boston-based Barr Foundation, we little anticipated the journey we were embarking on. Some nine months in, having picked up many fellow travelers along the path, we realized we had on our hands a story that needed to be told. Perhaps it was even a saga, which the dictionary defines as “a long, involved story, account, or series of incidents.” We asked Ben Paulos, a California-based writer, analyst and energy policy expert to report on the story, interview the participants, and reflect back what we learned.

Our purpose is to share our experience with other institutions and businesses that are considering purchasing renewable energy to meet all or part of their load, whether to hedge against rising or fluctuating energy costs, meet sustainability goals, diversify their sources of power, or for any other reason. With Boston’s and the Commonwealth’s goal of cutting greenhouse gas emissions 80 percent by 2050, it is clearly the direction in which all major institutional purchasers need to move.

We also hope to reach those who are in a position to shape the policy framework for a clean energy future in Boston and beyond. As the Prize participants proved, it is no simple matter to structure a power purchase agreement in New England that meets all the needs of all parties for financial return, reasonable risk and cost, and an unassailable quality and quantity of clean energy which they can rightly claim. In laying out the reasons for this, Ben Paulos describes the situation as a “puzzle.” Cindy Arcate, the CEO of PowerOptions, the winner of the Prize, goes one better, calling it “a puzzle with

moving pieces.” If we intend to transition to a carbon free environment within 35 years, it simply must become easier for large-scale consumers to buy clean energy.

Institutions that aspire to purchase renewable energy in Boston today have to be highly motivated to spend the time and effort to battle through the thicket of market obstacles. However, the Prize applicants rose to the challenge, proving that it can be done. The Green Ribbon Commission salutes and thanks PowerOptions, Tufts University, Endicott College, Partners HealthCare, Boston University, A Better City (ABC), Boston Medical Center, Friends of Post Office Square and the other ABC participants who have expended significant amounts of creative staff energy and managerial attention to trying to solve the puzzle. As you will read, their stories are ongoing. And thanks to the Boston-based Barr Foundation, which not only underwrote the Prize itself, but also provided support for this report, as part of its Climate Program and efforts to promote clean energy in the region.

The Boston Green Ribbon Commission is a group of business, institutional and civic leaders supporting the implementation of the City of Boston’s Climate Action Plan (CAP). *Solving the Puzzle: A Case Study of the Renewable Energy Leadership Prize* is one of a series of reports available from the GRC. The others are: New England Overview: A Guide to Large-Scale Energy Infrastructure Issues; A Guide to Electricity Markets, Systems, and Policy in Massachusetts; Introduction to Renewable Energy procurement in Massachusetts; and Public Sector Climate Leadership in Boston. They can be found at www.greenribboncommission.org.

EXECUTIVE SUMMARY

Massachusetts is a green state, and Boston is its green capital. The state has a host of policies that encourage action on climate change, a vibrant competitive market for electricity, and a growing commitment to take climate action on the part of commercial, institutional, and public sector customers.

But while many of these larger customers are installing solar power and becoming more energy efficient, few are choosing renewable energy when they pick their electricity supplier. Such lack of action is a puzzle.

To help solve the puzzle, the Boston Green Ribbon Commission (GRC), with funding from the Barr Foundation, offered a Renewable Energy Leadership Prize of \$100,000 to the institutional non-profit customers that could structure the best deal for buying renewable energy within a fairly short time frame in 2016.

The prize was intended to help cut through the barriers that Boston area institutional customers face when they try to green up their electricity supply: the opportunities that exist (or don't), and the best approaches to designing a workable deal. It was deliberately meant to be a learning journey, through which all participants—customers, brokers, consultants, funders, and the GRC—might gain more insight into the nature of the challenges and thereby come up with possible solutions.

Three teams of buyers submitted applications: PowerOptions, an independent non-profit energy buying consortium, in partnership with Tufts University and Endicott College; Boston University; and A Better City (ABC), a non-profit business membership association that coordinated five Boston institutions.

The three applications took varying approaches to buying renewables, including rooftop solar systems, a New England wind farm, and complex deals arbitraging between different regions and technologies.

After completing a structured scoring process, the expert judges chose the PowerOptions team as the winner, with the plan for Tufts and Endicott to obtain 45 percent of their campus power demand from a New England wind farm, and also share the Prize winnings.

A number of lessons were learned from the contest.

- **Stimulation provokes response:** Stimulating the market with some funding, a competition, and the potential for positive publicity resulted in action, suggesting that there are more projects out there that are ready for a little prodding. The Judges, the GRC, and the supporting consultants were pleased with the size and quality of the response. While there are many more buyers that could have applied, they may have been hindered by the relatively short time line, the very active market for on-site solar, and the requirement to collaborate. Still, the quality of the applications was good.

- **It ain't over till it's over:** All three applicants went through twists and turns in their pursuit of a deal, and as of this writing the pursuit is not finished. Some customers participating in the deals withdrew, developers changed their terms, and deals fell apart or were delayed as market and policy conditions changed. Most notably, Endicott College is no longer part of the PowerOptions deal, replaced by Partners HealthCare.

EXECUTIVE SUMMARY

■ **Importance of motivation:** The three applicants were in different stages of readiness and had some different factors motivating their action. The Prize helped push the applicants to their finish line, by creating deadlines for getting done what some had been planning to do for some time.

■ **Collaboration takes time:** The rules of the contest strongly encouraged collaborations. While this created a barrier to wider participation, it also tested the theory that institutions could collaborate to negotiate stronger green power purchases. While results suggest that more time is needed to structure such deals, it also showed that it did in fact create better deals.

■ **Timing makes a difference:** State solar regulations and federal tax credits were both up in the air at the time of the contest, causing a number of delays and potential dead-ends. The applications, and the response from potential suppliers, were affected by this uncertainty.

■ **Deals can be complex:** All three of the applicants considered or deployed some complicated features in their deals, including forms of arbitrage for both electricity and renewable energy credits, and inter-regional power deals.

■ **Complexity pays:** The complexity was worthwhile because of the significant financial benefits it captured. There were huge price variations between technologies and regions that enabled significant cost savings.

■ **Policy context is critical:** State, regional, and federal policies had big implications for the nature of the deals. The interaction between “compliance” renewables built to follow policy requirements, and “voluntary” renewables done to meet market demand was a major driver of the deal structures.

■ **Making claims:** The policy context and the resulting structure of the deals created complications for how the participants can make environmental claims. In buying and selling voluntary and compliance credits, they will have to be cognizant of federal guidelines for making accurate claims.

■ **A Commitment to Sustainability Really Matters:** While all the applicants were price sensitive, their strategic commitment to sustainability and clean energy played a decisive role in motivating their action. Those with sustainability goals—especially if such goals were deeply integrated into institutional strategy—looked at their options in a different light than institutions without long-term carbon reduction goals.

Altogether, the Prize helped to spur three deals that could result in as much as 66 megawatts of new renewable energy. More importantly, it could serve as a model for other institutional buyers, marketers, funders, and civic groups to take action on climate change by buying renewable energy.

INTRODUCTION

In some ways, Boston is a center for action on climate change. It has committed civic and business leaders, leading technical innovators and researchers, and progressive policies. It sits in a state and region that have been national and even global leaders on carbon reductions.

Despite this, Boston-area institutions have generally not been buying renewable energy to lower their carbon footprints. The Green Ribbon Commission, created as a forum for discussion and action on environmental issues by Boston leaders, had convened members to explore options for buying renewable energy and learned that although there was strong interest in doing so, members were holding back due to a lack of standard options, the complexity of deals, and a bewildering policy landscape.

The Renewable Energy Leadership Prize was designed to catalyze action on climate change by spurring institutions to work through these barriers, essentially offering to buy them the time and the expertise to solve the puzzle.

The following list shows the many puzzle pieces that confront institutional buyers when it comes to acting on clean energy. While they are all individually designed to encourage action, as a group they can make it more challenging for organizations to implement a renewable energy purchasing strategy.

- Massachusetts has some of the most aggressive clean energy and climate goals in the US. It has placed a cap on overall power-sector carbon emissions under the Regional Greenhouse Gas Initiative (RGGI). It is

ranked #1 in energy efficiency policies by the American Council for an Energy Efficient Economy (ACEEE). It has an aggressive renewable energy mandate (RPS), requiring utilities to get at least 20 percent of their power from renewable sources by 2020. And it has a suite of pro-solar policies that have made the state #6 for deployment nationally, with 1600 megawatts of solar expected by the end of 2016.

- Likewise, the City of Boston is a national and global leader on carbon emissions reduction goals. Their Climate Action Plan (CAP) has set goals to reduce emissions 25 percent below 2005 levels by 2020 and 80 percent below by 2050.

- Boston is home to many leading institutions in business, academia, health care, and government, among others. Over half of the city's carbon emissions come from the commercial, institutional, and public (CI&P) sector. Within this sector, about 50 property owners control 60 percent of the non-residential square footage in the city, suggesting that a few large CI&P owners are responsible for as much as 30 percent of the city's emissions. Because these buildings use more energy per square foot than typical commercial buildings, the actual percentage of emissions is likely much higher.

- Many of these institutions have made their own commitments to sustainability, such as pledging carbon reductions. Ten major health care institutions in Boston are members of Practice Greenhealth and many participate in Healthcare Without Harm projects. Nineteen Boston-area universities are members of the

INTRODUCTION

Association for the Advancement of Sustainability in Higher Education (AASHE). Governments at all levels have committed to substantial emission reductions. The city, state, and federal governments own and operate 23 percent of Boston's non-residential building stock and over 11 percent of total building stock.

- Massachusetts restructured its electric power industry in 1997, allowing customers to choose from competitive retailers rather than from their traditional monopoly utilities. There is now a vibrant market of electric suppliers selling over \$2 billion of electricity per year, supplying over 60 percent of state power demand, predominantly to commercial and industrial customers. Over 90 percent of large commercial and industrial customers have switched to the competitive market, along with two-thirds of smaller commercial customers.¹

- Renewable energy costs have decreased dramatically in recent years. For example, installed costs for solar photovoltaics (PV) in the US fell by nearly 52 percent between 2009 and 2014 alone. Declining prices have led to a boom in renewable energy: in 2014 solar PV installations were 30 percent higher than 2013 and more than 12 times the amount installed in 2009, bringing total US installed PV capacity to 18 GW. The US wind power industry also continues to see comparably rapid year-on-year growth with total installed capacity of 63 GW—almost double the installed wind capacity in 2009.

- The significant price drops create opportunities for large organizations to save money by procuring renewable energy, rather than spending a premium. Because of their substantial demand, institutional customers may be able to use their purchasing power to buy renewable electricity at a savings over traditional

sources and at prices lower than current retail rates. Since wind and solar are not dependent on fluctuating fuel prices, customers can lock in electricity costs for the next 20 years or more, creating a hedge against price volatility. Large organizations are also motivated to pursue renewable energy purchasing strategies in order to meet climate and sustainability goals. As a result, the private and institutional sector has the potential to be a major driver of emissions reduction and clean energy growth.

Despite these many enabling factors—policy support, institutional commitments, thriving customer choice, and affordable renewable energy—very few institutional buyers have been choosing clean energy for their electricity supply. Of the 1300 institutions on the US EPA's Green Power Partners list, for example, only 56 are from Massachusetts. Institutional and public sector customers are especially thin, with only eight schools and colleges, four government agencies, and six non-profits.²

To address this gap, the Green Ribbon Commission, with funding support from the Barr Foundation, offered a prize to the institutional buyer who could put together the most compelling deal to buy renewable energy.

¹ Massachusetts Dept. of Energy Resources, <http://www.mass.gov/eea/grants-and-tech-assistance/guidance-technical-assistance/agencies-and-divisions/doer/electric-customer-migration-data.html>.

² US Environmental Protection Agency, Green Power Partners, <https://www.epa.gov/greenpower/green-power-partner-list>. Accessed April 2016.

The Renewable Energy Leadership Prize

The Prize was designed by the Green Ribbon Commission to inspire local large commercial, institutional, and public sector (CI&P) energy consumers to implement renewable energy procurement strategies at scale. Applicants were welcome to join together into teams, as long as the lead group was a nonprofit, governmental, or quasi-governmental organization.

The Prize grew out of the GRC's Renewable Energy Purchasing Network, a group of large Boston energy users that came together to work through technical issues and leverage joint opportunities for developing renewable energy. The network meets regularly to share best practices among GRC network members.

GRC had earlier commissioned a report³ from Boston-based Meister Consultants Group, that "addresses the conundrum that although the price of renewable energy has dropped, the cost of completing a transaction for wind or solar energy remains high." The report blamed deals that are "customized and complicated" for turning off institutional purchasers like universities, hospitals, and businesses, which are accustomed to a more traditional energy procurement process. The report identifies and explains common approaches and strategies that can simplify the process and reduce transaction costs.

The Prize was intended to encourage customers and marketers to overcome these transactional barriers to find workable alternatives.

A panel of eight judges was recruited from Boston area NGOs, consulting firms, government agencies, businesses, and energy companies. The GRC also encouraged third party experts, such as Altenex, Renewable Power Direct, and Customer First Renewables to provide information about their services, should any Prize applicants choose to avail themselves of it. Customer First Renewables offered a day-long technical workshop open to all applicants, which was attended by about seven potential applicant groups.

The judges used the following criteria in evaluating the Prize applications:

- The size of the proposed renewable energy solution, both in absolute terms and as a percent of the organization's average energy consumption.
- That the user's purchase would result in new renewable generation capacity (it would have "additionality").
- The timeline for implementation.
- The level of organizational collaboration involved.

The full set of required and optional criteria are shown in the sidebar.

The Commission issued the RFP for the Prize on July 6, 2015, followed by an information session on July 16 to answer questions from potential bidders. Applications were due by December 1, 2015, and the winner was determined by February 1, 2016.

³ *Introduction to Renewable Energy Procurement in Massachusetts*, Meister Consultants Group, April 2015, at <http://www.greenribbon-commission.org/document/introduction-to-renewable-energy-procurement-in-massachusetts-2015/>.

THE RENEWABLE ENERGY LEADERSHIP PRIZE

Judging Criteria

REQUIRED CRITERIA INCLUDE:

- The total project size must have a capacity of 10 MW or greater.
- Respondents must demonstrate that the project results in the addition of new capacity (“addition-ality”) and the customer must retain and retire the Renewable Energy Credits (RECs).
- It must use a renewable power source as defined under the state Renewable Portfolio Standard.⁴
- The project must have a Letter of Intent or a signed term sheet in place with a renewable energy developer by December 1, 2015.
- Because the goal is to stimulate large-scale renewable energy purchases, the projects that are likely to meet the Prize criteria will likely not be on-site, behind-the-meter renewable installations. Rather they will be large, off-site projects developed as a result of some form of power purchase agreement (PPA) between the prize recipient and a renewable energy project developer.

OPTIONAL CRITERIA THAT WILL ACCRUE EXTRA POINTS IN THE SCORING PROCESS WILL INCLUDE:

- Projects that involve collaboration across multiple organizations.
- Projects that will provide a high percentage of the organization’s (or set of organizations’) energy consumption as defined by the most recent three year average demand.
- Projects that develop supply in Massachusetts or in the ISO-New England region.
- Projects in which a portion of renewable capacity is generated on-site, making a visible demonstration of the customer’s green commitment.
- Organization or team members located within the Greater Boston area.
- Project’s contribution to greenhouse gas reductions in Boston and/or contribution to the objectives of the City of Boston’s Climate Action Plan.⁵
- Overall breadth and depth of organizational commitment to the project (e.g., senior leader visibility/support, cross-functional involvement, resource commitments, timeline).

⁴ Massachusetts Executive Office of Energy and Environmental Affairs, <http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/rps-and-aps-program-summaries.html>

⁵ City of Boston, <http://www.cityofboston.gov/climate/bostonplan/>

The Policy Context

To understand the applications that were received for the Prize, it is first important to know about a few key policy drivers for renewable energy in Massachusetts, and how they interact with voluntary purchases of renewable energy.

Renewable portfolio standard (RPS): The RPS is a state law that requires utilities to get an increasing amount of their energy from renewables. Part of the RPS is set aside for solar power, providing an additional requirement for utilities to buy solar. The initial solar goal of 400 megawatts (MW) was achieved four years early, so a new goal 1600 MW by 2020 is now in effect.

Renewable energy certificates or credits (RECs): All electricity is physically the same, but it is made in different ways. RECs are proof that electricity came from renewable generators, and they can be sold along with or separately from the electricity. RECs make it possible to track the production and sale of renewable energy, and who gets to take credit for its production. They are used by utilities to prove compliance with the state RPS, and by marketers to sell the “green-ness” of renewable energy to customers who want to go green. There are RECs for different types of renewable energy, such as SRECs for solar power. RECs can be bought and sold, but are “retired” when used by a utility for compliance or by a customer who wants to take credit for the environmental benefit. REC prices are determined by supply and demand. REC prices in Massachusetts have ranged from \$50 to \$65 per megawatt-hour (MWh) since 2012. Solar REC prices have ranged as high as \$450 per MWh, or 45¢ per kWh.⁶

Arbitrage: Arbitrage is a financial term that describes “the simultaneous purchase and sale of an asset in order to profit from a difference in the price.” RECs, as financial instruments, can be traded to take advantage of the price differences between regions, between the types of RECs, and the underlying carbon reduction value. Electricity can also be arbitrated, between regions, times, types of generation, and contract terms.

Net metering: Renewable generators sited on the customer’s side of the meter, like solar panels on a roof, are allowed to send power to the grid at times when their output exceeds the customer’s consumption, making the meter run backwards. The net consumption or production is tallied at the end of the month, and the utility bill is set accordingly. The electricity produced is valued at the retail rate, which is higher than the wholesale rate.

Virtual net metering: Customers are allowed to own renewable generators off-site, and subtract the power from their usage as if it were on their building. It is especially useful for customers with roofs that are unsuited or too small for solar, or for urban customers that want to buy wind power.

⁶ US Department of Energy, <http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=5>.

The Response to the Prize

By the deadline of December 1st, the GRC had received three complete applications, though additional parties expressed interest and came to the workshop.

Complete applications were received from three teams: PowerOptions, working with Tufts University and Endicott College; Boston University; and ABC, along with four of their members. A panel of eight judges reviewed the applications and scored them according to a set of required and optional criteria. On February 25, the Commission announced that the PowerOptions team was the winner.

THE POWEROPTIONS TEAM



PowerOptions is a non-profit energy buying consortium, with 500 members

in Massachusetts and annual energy purchases of \$160-200 million. The consortium comprises nonprofit and governmental organizations, including hospitals, colleges and universities, cities and towns, public school districts, museums, housing authorities, and many others.

PowerOptions was created when retail competition opened up in Massachusetts and had the very first competitive electricity offering available for its customers on the day markets opened, July 1, 1998, according to Cynthia Arcate, President of PowerOptions.

PowerOptions conducts competitive solicitations and pre-negotiates supply arrangements for electricity and natural gas, as well as large and small solar systems, on behalf of its members. In a 2011 survey, 80% of their members expressed strong interest in acquiring renewable energy, leading to the launch of the large solar program the following year and a small solar program (less than 300 kW systems) in 2015. The large solar



Cynthia Arcate, President and Chief Executive Officer, PowerOptions

program has since developed 25 MW of solar projects, with another 50 MW in the development pipeline. The small solar program has already yielded 45 projects in the pipeline, amounting to another potential 7-10 MW.

Before the Leadership Prize, PowerOptions had never solicited a power purchase agreement for offshore renewables (except for virtual net metering). The challenge was in shaping wholesale power products for sale to relatively small retail customers.

In response to the Prize, PowerOptions asked members to participate in a joint procurement. Tufts University and Endicott College stepped forward.

Both Tufts and Endicott have made significant environmental commitments, have cut energy use, and have installed solar systems on their campuses with the help of PowerOptions.

THE RESPONSE TO THE PRIZE

Tufts has 3 MW of solar on their Grafton campus, and is building a new high-efficiency combined heat and power (CHP) plant on its main campus in Medford. Endicott College, in Beverly, participates in the Green Gigawatt Partnership, a collaborative of colleges and universities managed by the Association for the Advancement of Sustainability in Higher Education (AASHE).⁷

The plan PowerOptions put together was to tap a new wind farm in New England, to provide up to 45 percent of the annual electricity needs for both Tufts and Endicott. They proposed to use 20 year contracts that could save up to 15 percent on electricity costs, depending largely on the price of natural gas, which sets the market price for New England power plants. The project would avoid up to 14,308 tons of carbon dioxide per year, about 19 percent of the total emissions of both colleges.⁸

The two schools planned to take 12 MW of the output of the 28.8 MW wind farm. Tufts would buy 35,000 MWh per year while the smaller Endicott campus planned to take 4,800 MWh. Both schools proposed to buy and retire at least 25 percent of the RECs associated with the power from the wind project. So they can make the claim that they are supporting renewable energy, the schools would buy RECs from other sources to make up the remaining 75 percent of the purchase. According to Arcate, the New England wind farm RECs cost substantially more than Green-e certified RECs available from other parts of the US; by substituting cheaper RECs, they can keep costs down to a reasonable level for the schools.

PowerOptions planned to give the entire \$100,000 prize to Tufts and Endicott, to help facilitate their participation in the project.

“It’s not just a puzzle. It’s a puzzle with moving pieces.” – ARCATE

However, after establishing the deal and winning the Leadership Prize, things changed. The investors in the wind farm wanted to limit the number of parties involved, so they were not interested in Endicott’s share of less than 2 MW of their project. PowerOptions reopened the offering to its members, and Partners HealthCare, the parent company of Mass General and other hospitals, has joined in.

The current plan is that Partners HealthCare will buy 4.4 MW of wind output, plus most of the RECs that Tufts was not planning to buy. As of this writing, Partners and Tufts have signed term sheets with the wind project with a deadline of end of May to execute a power purchase agreement. Endicott may have an opportunity to participate if there is any unsold capacity, but will otherwise wait for a joint procurement that PowerOptions hopes to arrange in the future.

“It’s not just a puzzle,” comments Arcate. “It’s a puzzle with moving pieces.”

BOSTON UNIVERSITY



Like Tufts and Endicott, Boston University has a long history of environmental action. BU has committed to “be institutionally responsible as a steward of our environment by putting in place programs of infrastructure renovation and usage that will conserve energy and minimize our emission of greenhouse gases.”⁹

As a result, they have cut energy consumption and energy use intensity (or EUI, per square foot) through major campus energy efficiency projects. BU had a goal

⁷ See more at <http://greengigawatt.org/purchases.php>.

⁸ Tufts’ emissions were 66,000 metric tons of CO₂ in 2013 while Endicott’s were 6300 metric tons in 2010, according to each school’s most recent greenhouse gas inventory.

⁹ For more information about Boston University’s energy and carbon efforts, see <http://www.bu.edu/sustainability/what-were-doing/energy/>.

THE RESPONSE TO THE PRIZE



Dennis Carlberg, AIA, LEED AP BD+C, Sustainability Director, Boston University

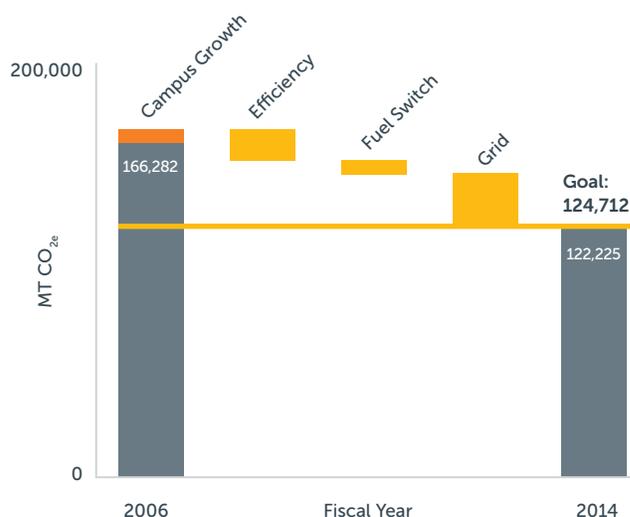
of cutting emissions 25 percent by 2020. They reached that goal six years ahead of schedule.

A substantial portion of those reductions were outside of BU's control. As the New England electric supply transitioned from coal and fuel oil to natural gas, emissions dropped by almost a third, lowering BU's emissions from their electricity purchases.

Dennis Carlberg, Sustainability Director for the university, thought it was important for the sake of transparency to describe that fact on their web site (see Figure 1). "We're a teaching institution," he points out. "We need to be clear about how we're doing what we're doing."

But looking forward, Carlberg says BU can't rely on regional emission cuts to meet their own GHG goals. "A big wake up moment for us was when the Pilgrim nuclear plant announced they were going offline before 2020," he says. "That's a big part of our mix, and the greening of grid power was a big part of our progress.

FIGURE 1. Boston University Emission Reductions, 2006-2014



“We feel it is important to get better control of our future energy mix.” – CARLBERG

We feel it is important to get better control of our future energy mix. If we continue to make progress on energy efficiency and control more of our energy sources we would have more confidence that we would succeed.”

For their entry in the Renewable Energy Leadership Prize, BU planned to install 1 MW of rooftop solar on each of their two campuses (Charles River and BU Medical Center), plus 2.4 MW of offsite solar through “virtual net metering.” They hope to expand the virtual projects to 10 MW if their partners can find sufficient sites. Altogether this would provide about 8 percent of BU's total power consumption.

Under BU's proposed deal, they would use the electricity generated by the solar systems, earning their value at the retail rate through net metering (for the rooftop systems) and virtual net metering (for the off-site systems). The 1 MW solar project on the Medical

THE RESPONSE TO THE PRIZE

Campus was a 50/50 partnership with the nearby Boston Medical Center (which is part of the ABC project described below), as the sites that would house the solar arrays are jointly owned.

The SRECs for BU's solar projects would be retained by the developer, who would sell them to utilities, who would retire them to comply with the solar portion of the renewable energy mandate (RPS). BU would then replace the solar RECs with lower-priced RECs from other sources, like wind generators, so they could own and retire RECs to support renewable energy.

BU's solar projects were put on hold in February due to a state solar policy logjam that was only recently settled.¹⁰ As mentioned above, Massachusetts has a solar mandate of 1600 MW by 2020. About 1000 MW of solar panels have been installed, and developers have already filed plans to use up the remaining balance.

The state has also placed a cap on the total amount of capacity net metering customers can connect to the grid—4 percent of peak demand for private installations and 5 percent for public. That cap has been hit in the National Grid territory and is close to being hit in the Eversource territory, which together cover most of the state. Because the net metering cap is lower than the mandate, development of new solar projects has ground to a halt—including BU's proposed projects.

On April 5, the legislature approved compromise legislation that lifts the net metering cap by three percent, but also cuts compensation rates by 40 percent for private-sector systems over 25 kW. This is expected to get the market going, at least until the higher cap is hit—as soon as the end of 2016—when the policy will have to be revisited.

BU re-started their projects on April 8, 2016, though significantly scaled them back in order to meet the deadline imposed by the new legislation.

As part of the Prize application, BU was also working on an additional, larger project, buying power from a Texas wind farm. Their plan was to sign a long-term contract for a significant part of their load with a Texas wind farm, sell the power into the spot market in Texas, and take ownership of the RECs. When this “contract for differences” was being developed, wind power was less expensive than power generated from natural gas in Texas—allowing them to make a profit on the transaction, which would cover the cost of the RECs and the administrative costs.

But when Texas natural gas prices fell, along with forecasts of future gas prices, gas-fired power prices dropped below wind power prices, and wind power was no longer in the black for BU's deal. (See the sidebar, Hedging against fluctuations in natural gas prices.)

“For the deal to work, we needed to be in the black,” explains Carlberg. “We just needed a small positive cash flow annually beginning in the early years. We are risk averse, like any organization, so we weren't interested in taking on this much risk over 15 years.”

The wind contract could have also offered a hedge against increases in natural gas used for heating their campuses; if gas prices rose in Texas and Boston, their Texas wind farm would be more profitable, helping offset their higher Boston heating bill.

Carlberg says they didn't want to just buy the RECs, without the power, since it didn't offer any financial benefits. “Spending extra is not tenable,” he says.

¹⁰ “Major solar incentive runs out in Mass., surprising many,” Boston Globe, February 9, 2016. <https://www.bostonglobe.com/business/2016/02/09/major-solar-incentive-runs-out-mass-surprising-many-industry/w3Uskmamp30ky3nCJJuFL/story.html>

Hedging against fluctuations in natural gas prices

Natural gas prices fluctuate according to supply and demand, and vary by location. All three of the applicants for the Prize were concerned about the impact of high natural gas prices, and sought to hedge against them by buying renewable energy.

High natural gas prices impact Boston consumers in two ways: directly, when they buy gas to heat their buildings and hot water, and indirectly, when they buy electricity from gas-fired power plants.

Gas prices in New England have been extremely volatile, especially in the cold winter of 2013-14, as demand for gas for space heating competed with gas use in power plants. As shown in the figure, gas and electricity prices in New England shot up to \$80 per MMBtu and \$400 per MWh, well above normal prices. This has led to a debate about whether New England needs new pipelines to bring in additional supplies of gas in the winter, or whether low-carbon alternatives will cover the need.

Wind power can provide a hedge against variations in natural gas power prices. The figure below shows actual U.S. natural gas prices over the past few years, against a sample wind power price. Because wind is a free fuel, and capital and operating costs are largely known in advance, wind power can be a fixed-price product. In this illustration, wind is cheaper than gas power in some months, and higher in others. In recent months, gas prices have been extremely low, undercutting the cost of wind power.

Boston University, when considering their Texas wind power deal, were looking at gas prices' impacts in both Texas and New England. When gas prices

are high in Texas, their wind farm would beat gas-fired power plants, making profits that could be used to pay for the higher cost of gas to heat buildings on the BU campus. When gas prices are low, the wind farm would lose money, but BU would be saving money on their heating bill. In this way, they would be protected from rapid price swings.

FIGURE 2. High Gas Prices Mean High Power Prices

New England wholesale electricity and natural gas prices

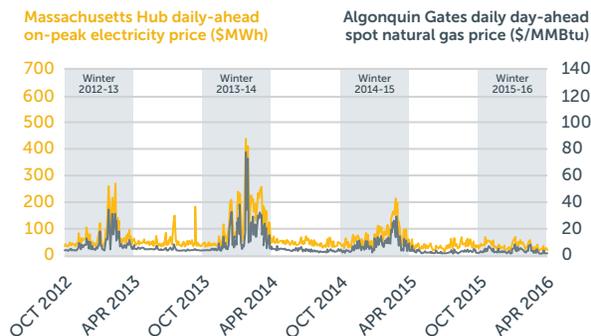


FIGURE 3. Representative Gas and Wind Power Prices



Source: U.S. Energy Information Administration

THE RESPONSE TO THE PRIZE

ABC (A BETTER CITY)



A Better City (ABC) is a nonprofit business membership organization of more than 100 major businesses and institutions in greater Boston, representing a broad range of industries, including financial services, real estate, legal services, construction, higher education, cultural institutions, life sciences, hospitality, utilities, and more.

ABC has managed the Challenge for Sustainability since 2009, which brings together commercial real estate and business leaders in Greater Boston to increase energy and water efficiency, minimize waste, and reduce greenhouse gas emissions. Challenge participants represent about 45 million square feet of space and have cut collective emissions by 14 percent since the program's inception, in pursuit of a 25 percent reduction by 2020.

In response to the Prize competition, ABC recruited Challenge for Sustainability participants and other ABC member organizations into a Collaborative Renewable Energy Procurement (CO-REP). Five members stepped forward to participate in the contest: Boston Medical Center, Friends of Post Office Square (a parking garage and park), and a financial services firm that is remaining anonymous until the deals are finalized. Two other financial services firms participated but later withdrew.

All of the participants committed to getting 100 percent of their electric demand from the procurement. Through a series of discussions, they arrived on a set of joint goals, preferences, and requirements, including:

- Bids for 15, 20, and 25 year terms
- Only projects using wind, solar, or geothermal energy
- Savings in the first year of the contract, if possible
- A local project sited within New England
- Risk mitigation through strong developer experience



Garrett Sprague, Manager of Sustainability Services & Renewable Energy, A Better City

Their discussions also flagged the “sustainability impacts in terms of additionality and arbitrage.” *Additionality* means that the project must create additional benefits beyond what would have happened anyway. Buying RECs from a wind farm that was built to comply with a state law would not be additional, for example. *Arbitrage* refers to the practice of buying and selling RECs of different types, prices, and locations. (See *the sidebars on making claims and hedging*.)

The ABC group initially thought they would own and retire RECs along with the power from a New England project, to make it easy to claim the GHG reductions within the region. But they discovered that being open to arbitrage and inter-regional deals created more options.

For example, since power sector emissions vary widely by region, producing zero-carbon power in one region will displace more pollution than if it were produced in another. New England's grid, largely free of coal, has lower emissions than places that still have many coal plants. So a New England solar project that displaces natural gas power will save less pollution than a similar project in coal-heavy Ohio or West Virginia.

THE RESPONSE TO THE PRIZE

But this raised “the potential for REC arbitrage to complicate the sustainability claim made for a project due to the variation in GHG emission profiles for different [regions]. In other words, if ABC were to trade New England RECs for RECs from another region, making a claim about the transaction becomes more complicated, especially in when explaining it to a lay audience.

According to Garrett Sprague, ABC’s CO-REP coordinator, they also considered some of the same interregional power deals that BU looked at.

“We have a strong interest in local development, but Texas wind is really cheap and has greater carbon emission reductions than a New England project,” he explains. “We were split between wanting to support local development and getting the best deal possible.”

Another factor, he says, is that “replacing high-value compliance RECs with low-cost voluntary RECs can yield substantial economic opportunity, helping projects that otherwise wouldn’t be considered become cost-competitive with the regional wholesale market.”

The RFP that CO-REP created was quite prescriptive, but that turned out not to be an impediment to bidders, according to Sprague. On the contrary, “those factors were key in getting members to sign on,” he says, “since they fully reflected the group’s preferences.”

For the Prize competition, however, timing was a significant problem. ABC knew they likely wouldn’t meet the Prize requirements in time for the December 1 deadline, due to the time needed to recruit participants, process non-disclosure agreements, and convene multiple large organizations to discuss and agree on options.

The more critical deadline became eligibility for the expiring federal renewable energy tax credits. Congress has offered tax credits for renewables since 1992, based on either the investment made in the project (the Investment Tax Credit, or ITC) or on the electricity

“It’s a great time to be a buyer in the market.” – SPRAGUE

produced (the Production Tax Credit, or PTC). These tax credits have been critical to the growth of wind and solar. The PTC had expired at the end of 2014, while the ITC was slated to end in 2017.

In December of 2015—just after the Prize application deadline—Congress extended both the credits, phasing them out over the next five years. That created a bigger pool of bidders for CO-REP and greater certainty.

Finally, ABC and the CO-REP partners were ready. They worked with an advisor, Customer First Renewables, to issue a formal Request for Proposals for a procurement of 105,000 MWh of renewable energy per year, equal to about 15,000 typical households.

The response was overwhelming. They got 42 bids from 38 unique projects in six different power regions and 14 states, stretching from New England to Texas.

“That huge response was surprising,” says Sprague. “We were very enthused. It created a lot of excitement in the project.”

Aspects of the bids were scored, weighted based on price and term, project characteristics, location, and feasibility, and the financial strength, experience, and capability of the project developer.

The CO-REP team winnowed the bids down to three finalists, including projects in New England, North Carolina, and Texas. In April, they picked a North Carolina solar project as the sole finalist and began negotiations around a set of power purchase agreements (one signed by each team member, but with common contract language), which they hope to resolve by late May.

“We found developers with a pipeline of shovel-ready projects that are eager to sell both power and RECs,” Sprague says. “It’s a great time to be a buyer in the market.”

Lessons Learned

If all proposed projects are built according to plan for the three applicants, a total of 44 to 63 MW of additional wind and solar generation capacity will be built.

"The Prize proved the feasibility of structuring viable deals," says Green Ribbon Commission Director Amy Longworth. "The kick-start incentive is nice, but no one would do a project at this scale unless it worked economically on its own merits."

"The deal that PowerOptions structured is especially terrific because it should create a ripple effect," she adds. "They specifically anticipated participation in the same project by additional PowerOptions members, both from within the city of Boston and throughout the region, and designed the arrangement to enable that."

Sarah Creighton of Endicott agrees. "The Prize catalyzed something for all PowerOptions members, so I think you'll see a bunch of customers jumping onto it."

MOTIVATION

While all three applicants faced the same market circumstances, they made different choices partly driven by their belief about the future of energy costs.

Creighton says that diversifying their energy market risk was a key motivation for participating in the contest.

"Power in New England is mostly from natural gas power plants, plus 90 percent of our buildings are heated with gas," she explains. "So we are entirely dependent on price of natural gas."

In the winter of 2013-14, natural gas prices soared during the "polar vortex" winter storm, driving up both heating and electricity costs.

"More diversity in our commodity portfolio spreads out the risk," says Creighton. "The wind contract diversifies our portfolio significantly. Financially that's the real reason it made sense."

Cindy Arcate and Meg Lusardi of PowerOptions lauded the contest for motivating them. "It spurred us to do something we had been thinking about for many years," said Arcate. Despite cutting power deals since 1998, the deal with Tufts and Endicott was the first power purchase agreement they had done for off-site renewables.

"We learned a tremendous amount," she says. "It helped us cut through uncharted waters, both legal and economic. We hope to do it again with other customers."

The GRC expected that the \$100,000 prize would help overcome the "soft cost" hurdles to making a deal—the cost of the lawyers, accountants, and consultants involved.

But Lisa Frantzis of Advanced Energy Economy, who served as a contest judge, wonders if publicity might have been a better motivation. "Give companies a lot of public recognition, make a big splash on announcing the winner," she suggests.

Sprague notes that ABC was motivated more by civic duty.

"ABC wants to help the City of Boston meet their climate action goals," he says. "That's partially what attracted the five companies that joined. They are really interested in what the City of Boston will say. The applicants are well-known local institutions, corporate citizens, and they are doing their civic duty."

LESSONS LEARNED

Dennis Carlberg said the prize helped overcome institutional inertia at BU. “The prize was huge,” he says. “It had a very strict deadline which kept us razor focused.” The deadline helped set the calendar for meetings with vendors and others, for example.

IMPEDIMENTS

Lisa Frantzis thinks the rules of the contest may have been an impediment for some potential applicants. “We asked for collaborations, but it’s not easy to organize bids from multiple organizations,” she says. “We were most likely to attract companies already doing it.”

PowerOptions, with so many institutional customers already, likely had an advantage in this regard. Plus, over 70 percent of their customers had already expressed interest in buying renewable power.

Still, Frantzis thought that many institutional buyers who want to go green may have already acted by buying solar, rather than pursuing more complicated off-site power purchase agreements. “Solar is already so cost effective that many companies may already be doing it,” she thinks. “It’s easier to do rooftop solar with net metering, or buy community solar shares, or buy RECs. They may feel they are already doing their bit.”

The Massachusetts Clean Energy Center counts about 100 commercial, institutional, and public customers with rooftop solar in Boston, including the Greater Boston Food Bank, Roxbury Latin, and the Boston Water & Sewer Commission.¹¹

While some participants were disappointed that only three applications were submitted for the Prize (and only two of those complete), Frantzis was not. “I expected maybe a few more applicants, but not twenty,” she says.

TIMING

Timing may have been a critical factor in the contest, since the federal production and investment tax credits were extended the same month as the applications

were due. ABC, which got bids only after the deadline, seems to have had a wider selection of bids to choose from.

Timing was an impediment for BU, given the policy and market problems at the time of the contest. Carlberg says BU still plans to do their solar and wind deals when factors improve, like when Massachusetts works out their net metering and solar RPS policies, and natural gas prices rise in Texas.

The length of time between when the contest was announced and submissions were due was not a factor for the three applicants, though may have been for other parties that did not submit applications.

COMPLEXITY

All three of the deals ended up being quite complicated.

“It’s more complex than I thought it would be,” says Arcate of PowerOptions. “I can see why people haven’t done it yet.”

Longworth agreed the complexity of the deals may have been a barrier. “All three needed expert consultants, which imposed soft costs that impede the deals,” she says. “Each deal was unique, very different from the others, due to institutional personalities, willingness to pay, and how much value each team placed on being green.”

“Deciding to invest in sustainability is so often an unbalanced equation. There’s often no proven method for measuring the financial upside of sustainability, whereas it’s easy to measure the cost of spending money,” she notes. “So the cost avoider often carries more weight in the choice simply by the ability to be more precise.”

But in the end, the deals were complex in order to save money for the participants. By arbitraging between regions and technologies, they were able to capture significant financial benefits, making the projects more viable in budget-conscious institutions.

¹¹ Communication with Andrew Belden, Mass CEC, April 19, 2016.

LESSONS LEARNED

POLICY AND MARKETS

Perhaps the largest lesson learned is that energy purchase decisions are greatly affected by the policy environment, and that renewable energy in New England is deeply influenced by policy.

First, demand for solar power has been greatly expanded by state policies, like the solar portion of the RPS, community solar programs, and virtual net metering. Although supply is growing quickly, it is not enough to saturate the demand created by the RPS, resulting in very high prices for solar RECs used for compliance. For customers owning large rooftop solar systems, it can be lucrative to sell the SRECs to utilities for compliance purposes.

Second, renewable energy prices and costs are much lower in other parts of the US than in New England, due to the type and quality of the resource, the ease of development, the cost of doing business, and the design of state policies. It is very tempting for customers making voluntary purchases to either buy their power or RECs outside of the region, or to arbitrage their purchase, selling high-priced New England RECs to compliance buyers and replacing them with lower-priced options from elsewhere. The box below shows variations in REC and solar REC prices by state.

All three of the Prize applicants considered or are taking advantage of this arbitrage to save money. “New England RECs are very valuable, selling them reduces the cost of the deal,” explains Arcate of PowerOptions. “Massachusetts RECs are between 5 and 5.5 cents per kilowatt-hour; national RECs are about 0.3 cents.”

For institutional buyers the multifaceted policy landscape arguably makes things more complicated rather than less. They are essentially competing with state policies and programs that drive up demand and prices. This, plus the already high cost of doing business in the region for renewable energy developers, makes prices notably higher than in other regions.

FIGURE A. Compliance REC Pricing in the Midwest, Mid-Atlantic, and Texas

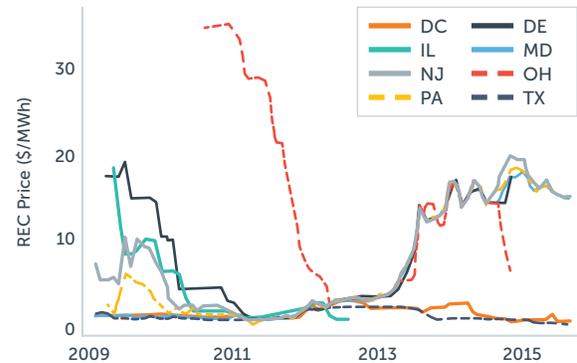


FIGURE B. Compliance REC Pricing in New England

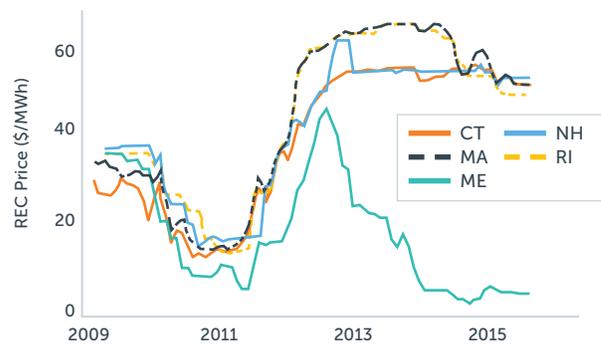
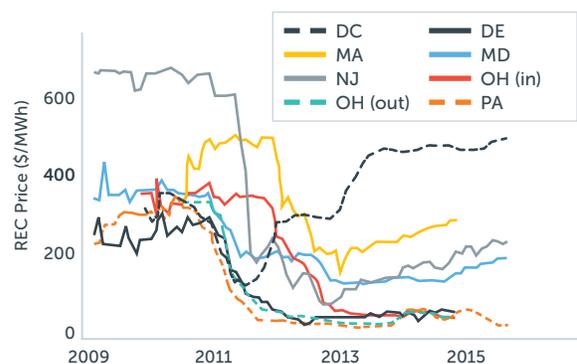


FIGURE C. SREC Pricing



REC prices show wide variation across states and regions, and are highest in the Northeast (figures A and B). Solar RECs (figure C) also show a wide range, but are highest in DC and Massachusetts. Voluntary market RECs are even cheaper, less than \$1 per MWh.

Source: NREL, *Status and Trends in the U.S. Voluntary Green Power Market* (2014 Data), <http://www.nrel.gov/docs/fy16osti/65252.pdf>.

LESSONS LEARNED

IMPLICATIONS FOR MAKING CLAIMS

Many organizations buy clean energy so they can claim to be good environmental citizens. Whether they are driven by the values of the management or staff, or by the desire to attract customers, investors, students, or employees, or by the wish to lead by example, they have decided that having a good environmental reputation is important to their identity.

These organizations, along with regulators and advocates, have long debated how claims should be communicated, resulting in guidance from the Federal Trade Commission, the National Association of State Attorneys General, and the US Environmental Protection Agency, as well as a certification program called Green-e.

As deals become more complex, the importance of communicating clearly increases, so as not to confuse the public. Structuring deals to arbitrage prices by region has implications for making claims about environmental improvement, and for proving that the purchase is making a difference (additionality).

"It's a better financial deal to sell the SRECs, but you lose the ability to make a solar claim," point out Jon Crowe and Chad Laurent of the Meister Consultants Group, who helped design and execute the Prize contest.

"It triggers a debate about what you're doing and how to talk about it," they say. Renewable energy can create a lot of co-benefits, like smog reduction, water savings, local economic development, and reduced fuel imports. Depending on their goals, a buyer can create different co-benefits by choosing a certain type of project in a certain location.

"From the perspective of the Federal Trade Commission, as long as you own a REC you can make a claim," they explain. "But the reality is there are varying levels of greenness and CO2 profiles. All the purchases are helping promote renewable energy markets, but there are varying levels of good, better, and best."

The complications are both positive and negative. For example, a new wind farm in Texas, a state with much more coal power and much higher emissions, could actually have a greater greenhouse gas benefit than a wind farm in New England, which has a cleaner grid.

On the other hand, since wind power prices in Texas are so low, it could be argued that those wind projects would have happened anyway, so buying their RECs for less than \$1 per MWh would make little difference in whether the project would have been built. While Texas has mandated that utilities and power retailers buy renewable energy, that standard was surpassed long ago. New wind farms in Texas are still being developed, since they are price competitive. Since their RECs are no longer needed to comply with the state mandate, they are sold on the national REC market, for less than \$1 per MWh.

Still, it can be hard to prove that a project would or wouldn't have happened without REC sales. The Stockholm Environmental Institute (affiliated with Tufts University) lists four types of tests for additionality, plus other approaches that are being deployed in carbon offset schemes.¹²

The appendix has more information about making clean energy claims.

¹² For more information about additionality see <http://www.co2offsetresearch.org/consumer/Additionality.html>.

Conclusion

Altogether, the Renewable Energy Leadership Prize helped to spur three deals that could result in as much as 66 megawatts of new renewable energy. More importantly, it could serve as a model for other institutional buyers, marketers, funders, and civic groups to take action on climate change by buying renewable energy.

“At the end of the day we anticipate that the Prize will have stimulated a significant amount of demand for new clean energy among Boston institutions,” says GRC Executive Director John Cleveland. “It also launched a creative learning process that other businesses and institutions will be able to leverage and that promises broader uptake of renewables in the region.”



Interview with Mariella Puerto, Barr Foundation



What made you interested in funding the Prize?

In the summer of 2014, I read that George Washington University, American University, and the George Washington University Hospital were going to buy 52 megawatts of power every year from a North Carolina solar farm. It was the largest non-utility solar power purchase in the U.S. and the largest solar project east of the Mississippi River. The icing on the cake was that they get fixed pricing for solar energy for 20 years, at a lower total price than current power.

That immediately got me thinking about how it could be replicated in Boston, since we have so many colleges and hospitals—Eds and Meds—and other public sector institutions.

The Green Ribbon Commission also noticed it, and organized an informal network of Boston institutions to talk about how they could do renewables procurement. There was a lot of interest in joint purchasing to reduce costs and make it easier, but uncertainty about how it might work. My contribution was the idea of offering a prize to continue the momentum and inspire action.

What did you think of the process?

We were fortunate that we had the Green Ribbon Commission to partner with on the prize. They handled the entire process—researching power purchase strategies, issuing the request for proposals, assembling a stellar selection committee of experts, and handling logistics and communications.

What do you think of the results?

My initial hunch was that a prize would catalyze action, and that turned out to be right. There was a risk that there would be no takers and I was pleasantly surprised to see such significant interest.

The rules of the prize placed a high premium on collaborative proposals, on the theory that joint procurement would be better. And I think that was borne out: by combining their buying power, institutions and companies were able to contract directly with generators for a competitive price. By banding together they were able to make the deals more feasible.

I hope their experience crafting and negotiating these deals provides them with a jumping off point to continue their efforts, and to inspire others.

What would you advise to other funders or local organizations considering doing a prize?

I would strongly encourage other funders to consider launching a similar prize. The prize was particularly useful here in Boston, where higher education, health care and private companies have not really stepped up to directly purchase renewable energy. The Prize was an inducement in activating them to commit to the purchases. I'm sure many other places are in the same situation.

The Prize offered a major learning opportunity for the Barr Foundation and for the GRC in what it takes for institutions and companies to engage in renewable energy purchases. A critical precondition is that the institutions see these energy purchases as a way to meet their sustainability goals. There is still work to be done to expand interest in renewable energy purchases and to make it easier for institutions to participate.

APPENDIX: MAKING CLAIMS ABOUT RENEWABLE ENERGY

Because the *renewableness* of renewable energy has been commodified as a renewable energy credit (REC), and can be sold independently from the underlying electricity, marketers and customers must be careful when making claims about their product or purchase.

In short, the *renewableness* of the product is represented by the REC, not by the power. Only the owner of the RECs can claim that they are supporting renewable energy. Utilities need to submit RECs to regulators to comply with state renewable power mandates (RPS), while companies or institutions making sustainability claims need RECs to prove their renewable energy purchases.

According to the Federal Trade Commission's *Green Guides*, "If a marketer generates renewable electricity but sells renewable energy certificates for all of that electricity, it would be deceptive for the marketer to represent, directly or by implication, that it uses renewable energy."¹³

They go on to provide a specific example:

Example 5: A toy manufacturer places solar panels on the roof of its plant to generate power, and advertises that its plant is "100% solar-powered." The manufacturer, however, sells renewable energy certificates based on the renewable attributes of all the power it generates. Even if the manufacturer uses the electricity generated by the solar panels, it has, by selling renewable energy certificates, transferred the right to characterize that electricity as renewable. The manufacturer's claim is therefore deceptive. It also would be deceptive for this manufacturer to advertise that it "hosts" a renewable power facility because reasonable

consumers likely interpret this claim to mean that the manufacturer uses renewable energy. It would not be deceptive, however, for the manufacturer to advertise, "We generate renewable energy, but sell all of it to others."

Endicott College has two solar systems on campus, totaling 1100 kW. The systems are owned by third party developers, and Endicott takes the power while the developers sell the solar RECs to utilities to meet the state RPS.

According to Sarah Creighton, Sustainability Director at Endicott, they are careful about making claims. "Because we don't own the SRECs we can't say 'we are powered by solar,'" she says. "Officially, we 'host' solar."

The US Environmental Protection Agency has encouraged American businesses and other institutional buyers to buy renewable energy through their Green Power Partnership since 2001. They currently have 1300 partners, large and small, who buy anywhere from 3 to 8480 percent of their power from renewable sources.

To be a GPP partner, EPA requires:

"For a purchase to qualify for the GPP, Partner organizations must retire, or not resell, the RECs associated with their green power purchase. An organization's green power supplier may retire the RECs on a Partner's behalf. This requirement prevents two different parties claiming the same green power benefits.

"Owners of on-site systems that sell the RECs associated with the system may no longer claim that the electricity they are using is renewable. The electricity generated from an on-site system where the RECs have

¹³ FTC, <https://www.ftc.gov/news-events/press-releases/2012/10/ftc-issues-revised-green-guides>.

APPENDIX: MAKING CLAIMS ABOUT RENEWABLE ENERGY

been sold does not qualify in meeting EPA usage requirements. Partners may, however, replace the RECs sold from an on-site system through a secondary green power purchase in order to qualify for the GPP.”

An additional complication is that a renewable energy credit is not the same as a carbon reduction credit. Carbon emissions are regulated in New England under the Regional Greenhouse Gas Initiative (RGGI). RGGI puts an overall cap on emissions in the region, then allocates allowances by state. Power plant owners must buy carbon credits in an auction, and submit them to regulators to match their carbon emissions.

Since wind and solar don't produce carbon emissions, they are exempt from buying carbon credits, thus earning a cost advantage.

But because total carbon emissions are capped, greater amounts of renewable energy actually allow existing fossil power plants to emit more per megawatt hour. In theory, this would allow dirtier coal plants to run more often than cleaner gas plants. In reality, low natural gas prices have pushed coal out of the New England market regardless of emission credit prices, and overall emissions are lower than the RGGI carbon cap.

Still, a carbon cap can complicate the carbon reduction benefits of renewable energy, and claims made about it. The carbon reductions from renewable energy depend on the time and place it is generated, and on what other generation it is displacing at that time. And under a carbon cap, it could be argued that renewable energy does not displace any emissions.

The bottom line, according to World Resources Institute, is that RECs should be used to back up claims about renewable energy generation, while carbon reduction credits should be used to make claims about emission reductions.¹⁴

¹⁴ For more information, see <http://www.wri.org/publication/bottom-line-renewable-energy-certificates>.

APPENDIX: RENEWABLE ENERGY PROCUREMENT INITIATIVES

The Renewable Energy Leadership Prize is only one of many efforts to encourage institutional customers to buy renewable energy. Governments, trade associations, and non-profit groups have done this since at least 2001.

RE 100, The Climate Group:

<http://www.theclimategroup.org/what-we-do/programs/re100/>

American Wind Energy Association (AWEA):

<http://www.aweablog.org/the-rise-of-the-non-traditional-energy-buyer/>

Solar Means Business, Solar Energy Industries

Association (SEIA): <http://www.seia.org/map/solar-means-business-report.html>

Business for Innovative Climate & Energy Policy (BICEP), Ceres: <http://www.ceres.org/bicep>

Business Renewables Center, Rocky Mountain

Institute (RMI): http://www.rmi.org/business_renewables_center

Green Power Partnership, US Environmental Protection Agency (EPA): <http://www3.epa.gov/greenpower/>

Corporate Renewable Energy Buyers' Principles, World Resources Institute and World Wildlife Fund (WRI/WWF): <http://buyersprinciples.org>

Future of Internet Power, Business for Social Responsibility (BSR): <http://www.bsr.org/en/collaboration/groups/future-of-internet-power>

Green Gigawatt Partnership:

<http://greengigawatt.org>

We Mean Business, The Climate Group:

<http://www.wemeanbusinesscoalition.org>

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The mission of the GRC is to convene leaders from Boston's key sectors—business, education, health care, civic society,

finance, real estate, professional services, tourism and others—to support the outcomes of the City's Climate Action Plan.

PaulosAnalysis, based in Berkeley, California, does research, advocacy, communications, and consulting on energy policy, technology, and trends.