Renewable Energy
Strategy & Procurement Workshop

BU Wind

October 24, 2018

Photo: karsten-Wurth

BOSTON Green Ribbon COMMISSION

BOSTON UNIVERSITY

Renewable Energy Strategies

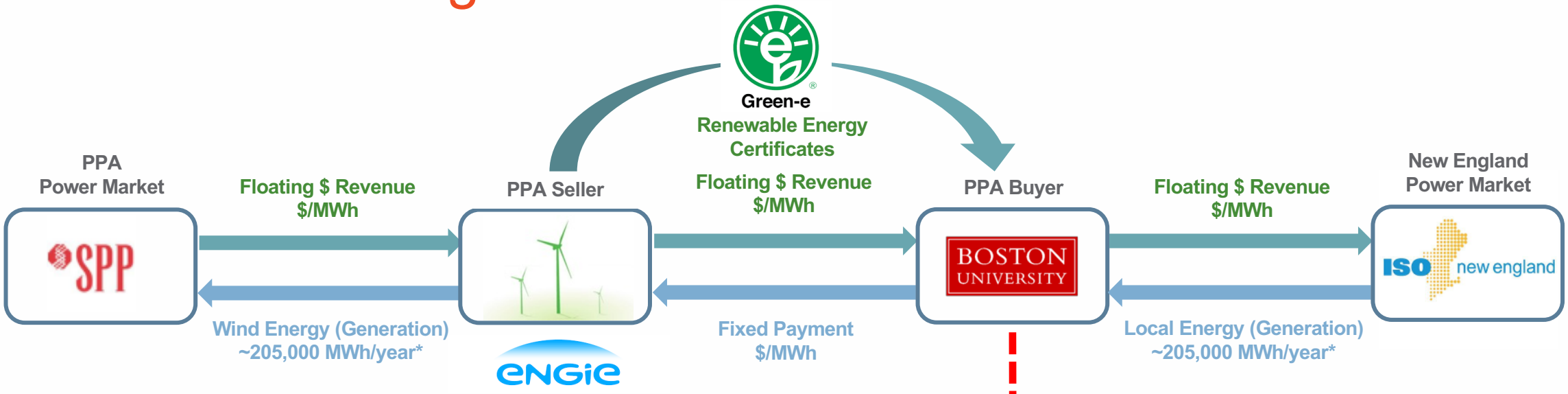
There are three primary ways in which buyers can enter the renewable energy markets to meet their goals:

1. **Owner / Operator –** Develop and operate renewable energy assets on-site
    - Generally outside of core competency
    - Requires significant capital (upfront cost)
    - Hard to reach scale
2. **REC or Carbon Offset Buyer –** Short term purchase of unbundled renewable energy attributes
    - Widely adopted by buyers in all industries
    - Does not provide platform for competitive differentiation from peer group
    - Difficulties in proving additionality (growth of market)
3. **Active Market/Program Participant –** PPA with a specific development project
    - Directly enables projects to be financed/built – can be onsite or offsite
    - Results in buyer being able to “take credit” for development activity (additionality)
    - Low or no upfront cost

Terms

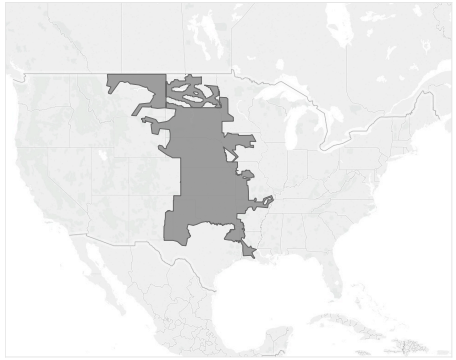
- **ISO/RTO** – Independent System Operator/Regional Transmission Organization, which are the deregulated electricity markets into which the electricity is sold. These function similar to a stock exchange, always balancing buy/sell requests to set the price all resources receive at that instant.
- **MWh** – Megawatt-hour, the unit of electricity in the wholesale markets (1 MWh = 1,000 kWh)
- **Contract for Differences** – Form of contract to buy power from the Seller at a fixed price and have it sold at the floating market price in $/MWh. The floating price is set every 5 or 15 minutes by the ISO/RTO.
- **Additionality** - Generate new renewable energy that would not otherwise have been generated if not for the revenue guaranteed through a long-term agreement to purchase power from the project.
- **REC** – Renewable Energy Certificate, which is generated for each MWh of renewable energy produced and can be retired to make renewable energy claims
- **ITC/PTC** – Investment Tax Credit and Production Tax Credit, which are tax credits provided to new renewable energy projects that effectively lower PPA prices offered to buyers
- **PPA** – Power Purchase Agreement. Can be physically delivered power or financially-settled, often called a VPPA

Power Purchase Agreement



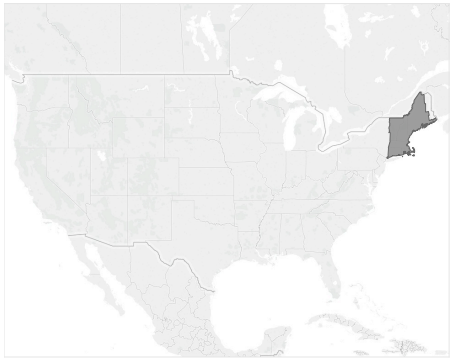
PPA Power Market

SPP Southwest Power Pool



1,482 lbs. CO_2e/MWh

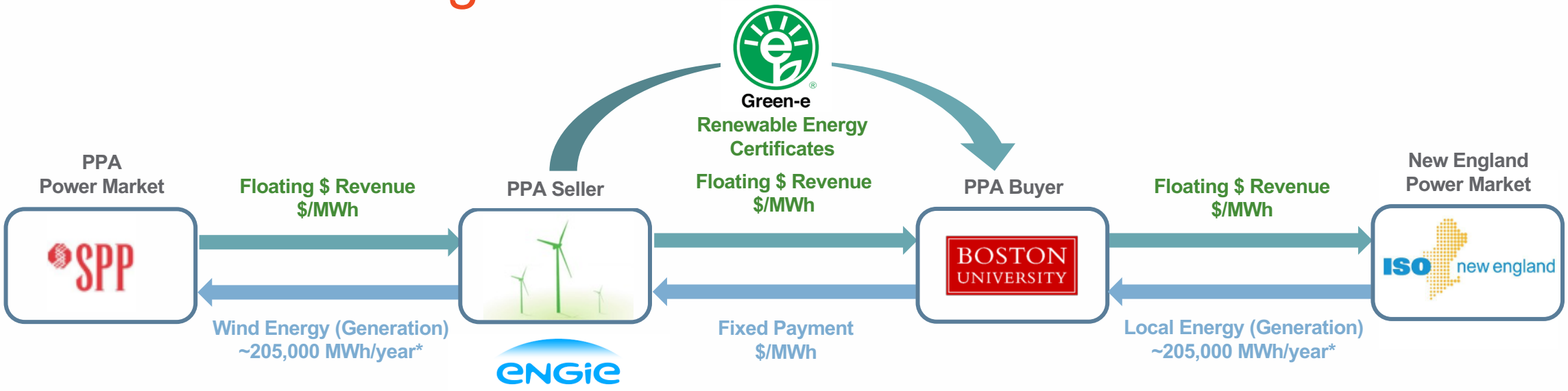
Local Power Market



ISO new england

577 lbs. CO_2e/MWh

Power Purchase Agreement



BU Renewable Energy Procurement Advisor

Edison Energy (formerly Altenex)

- An energy management firm that Fortune 1000 companies, universities and municipalities use to source clean power for their energy portfolios. We are proud to have supported engagements for the procurement of over 3GW, including clients such as: General Motors, The Home Depot, Bloomberg, University of Richmond, and Boston University.
- Key Players:
  - **Christen Blum**, Managing Director, Renewables
  - **Emily Williams**, Senior Director of Energy Markets and Sustainability
  - **Colin Schofield**, Commercial Manager, Renewables
  - **Camden Holland**, Senior Account Manager

BU Due Diligence Team

Phoenix Energy

- Independent energy purchasing consulting firm.
  Clients include: Beacon Capital Partners, Callahan Capital Partners, Hobart & William Smith Colleges, and Northeastern University
- Key player: **John Leidy**, President

Foley Hoag LLP

- Legal counsel providing renewable energy contract negotiations support.
  Clients include for wind and solar PPAs: Akamai, Partners Healthcare, American Honda Motor Company, Hampshire College, and Five Colleges Inc.
- Key player: **Adam Wade**, Counsel

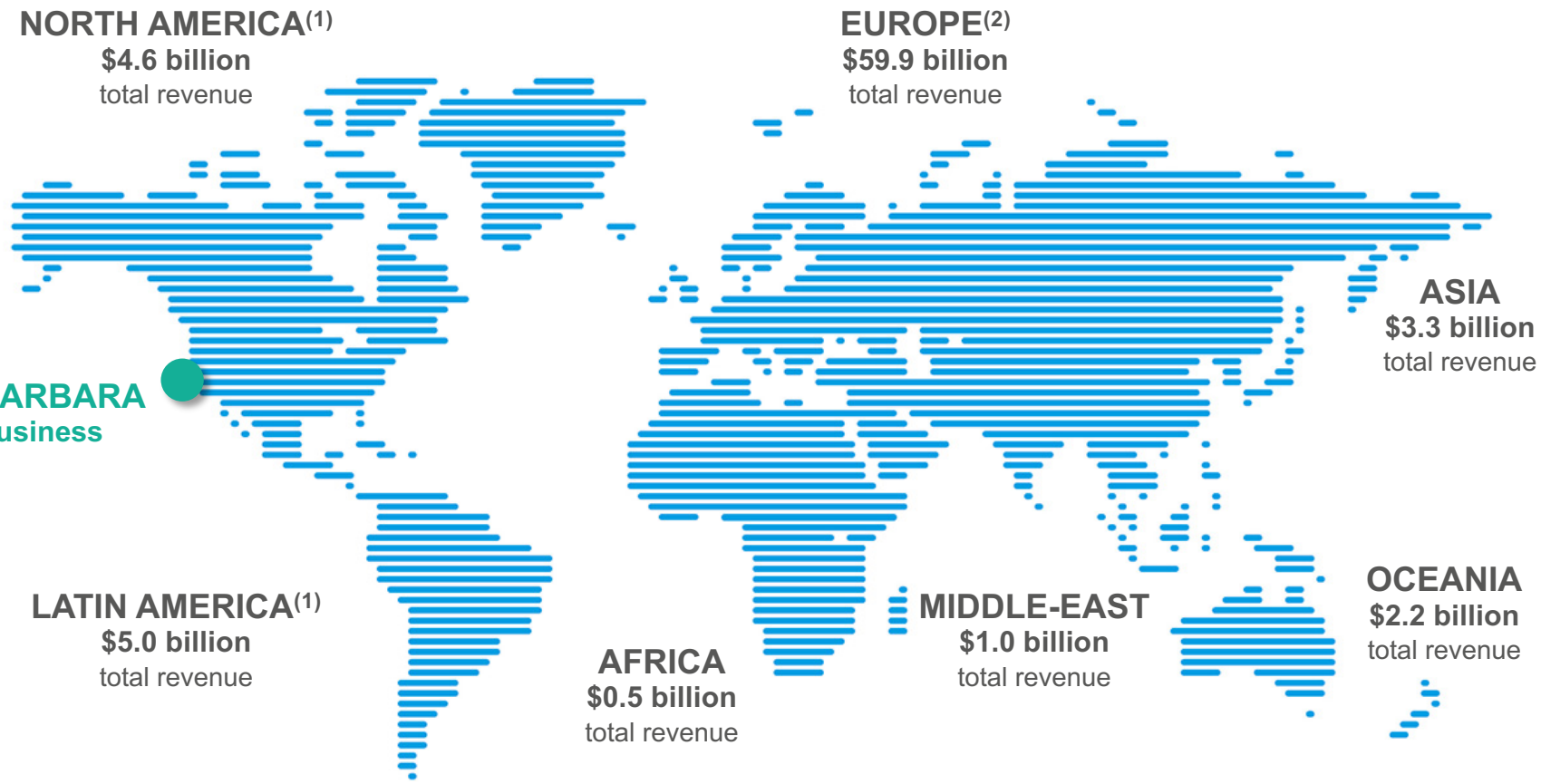
Boston University

- **Gary Nicksa**, Senior VP Operations
- **Dennis Carlberg**, Associate Vice President for University Sustainability
- **Shaun Finn**, Assistant Vice President for Business Affairs
- **Jason Mahler**, Associate General Counsel

ENGIE is present in 70 countries across 5 continents

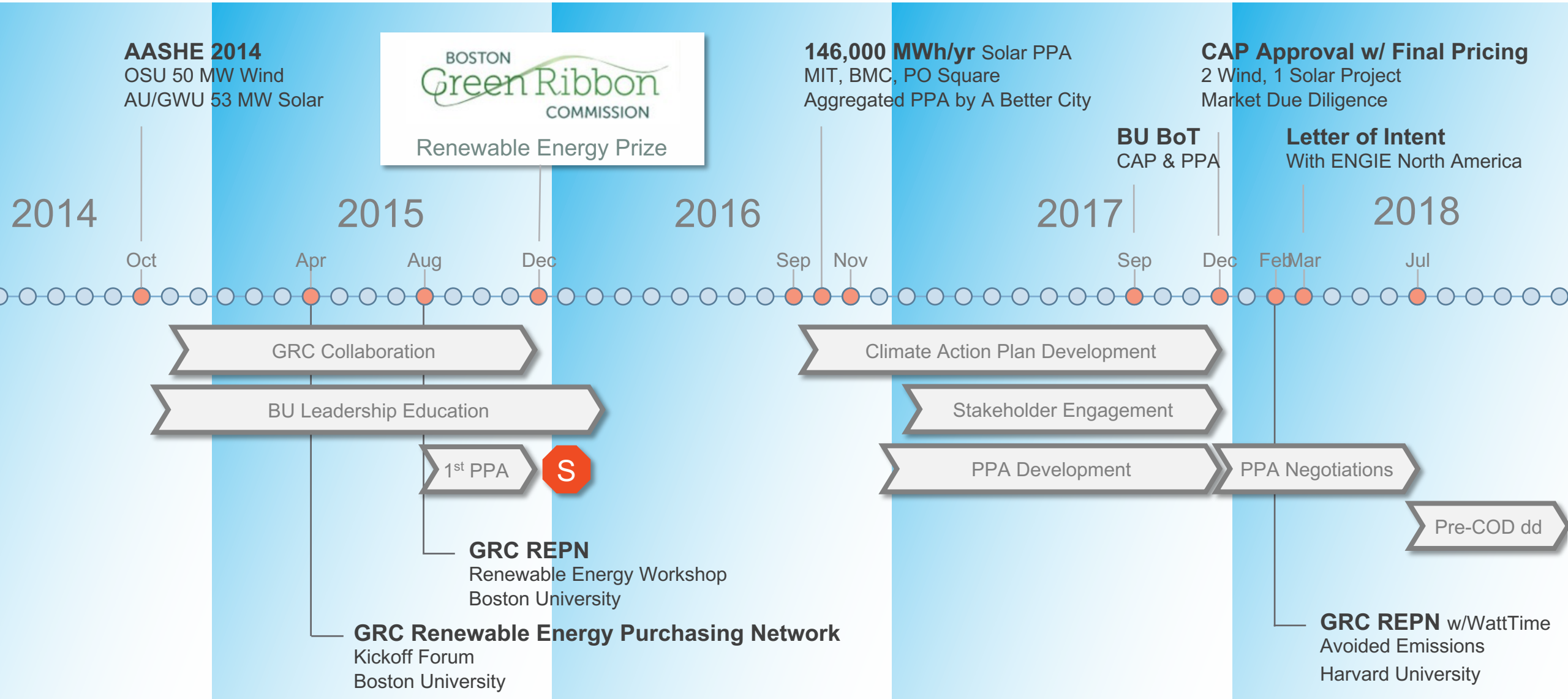
150,000
employees

$76 billion
total revenue



(1) Including Mexico. (2) Including Turkey.

BU Journey


AASHE 2014
OSU 50 MW Wind
AU/GWU 53 MW Solar
BOSTON Green Ribbon COMMISSION
Renewable Energy Prize
146,000 MWh/yr Solar PPA
MIT, BMC, PO Square
Aggregated PPA by A Better City
CAP Approval w/ Final Pricing
2 Wind, 1 Solar Project
Market Due Diligence
BU BoT
CAP & PPA
Letter of Intent
With ENGIE North America
2014
2015
2016
2017
2018
Oct
Apr
Aug
Dec
Sep
Nov
Sep
Dec
Feb
Mar
Jul
GRC Collaboration
BU Leadership Education
1st PPA
S
Climate Action Plan Development
Stakeholder Engagement
PPA Development
PPA Negotiations
Pre-COD dd
GRC REPN
Renewable Energy Workshop
Boston University
GRC Renewable Energy Purchasing Network
Kickoff Forum
Boston University
GRC REPN w/WattTime
Avoided Emissions
Harvard University

Criteria

- **Impact, New Build (Additionality)** – Generate new renewable energy that would not otherwise have been generated
- **Education & Research Opportunities** – Benefit student education and faculty research
- **Green-e Certified RECs** - Project-based Green-e Certified RECs are necessary to validate the claims for the emissions reductions
- **Project Developer Financial Strength** - Long-term owner/operators have resources, experience, & financial strength to manage relationship over term
- **Project Economics (strong NPV/MWh)** - Financial strength based on risk-adjusted, projected cash flows, and impact on BU financial position and credit rating. The driver in a Contract for Differences is the margin modeled between the PPA price and the grid price/MWh. Favorable project economics are a prerequisite
- **GHG Reduction (CO2e lb/MWh)** - Strong correlation between high grid carbon intensity at time of renewable energy production; the purpose is to maximize the BU's impact on global GHG reduction
- **Environmental & Health Co-benefits** - Favor projects with lower construction and operational environmental and health impacts
- **Integration with BU on-site procurement** - Integrate PPA purchases and sales into BU's energy purchasing through hedges or other mechanisms

BU Renewable Energy Project Selection Criteria

Criteria	Weight	Solar 2	Wind 7	Wind 9	Criteria Explanation	Notes
		Weighted Rank				
Impact New Build	Required	☑	☑	☑	Project will generate new renewable power that would not otherwise have been generated	Project additionality is a prerequisite
Education & Research Opportunities	Required	☑	☑	☑	Project will benefit students and faculty by allowing access to the project sites and real time data	Access to real time data and access to the project site(s) is a prerequisite
Green-e Certified RECs	Required	☑	☑	☑	Third party certified project-based RECs	Project-based Green-e Certified RECs are necessary to validate the claims for the emissions reductions
Project Developer Financial Strength	Required	☑	☑	☑	Long-term owner/operators have resources, experience, & financial strength to manage relationship over term	
Bid Size Flexibility	Required	☑	☑	☑	Ability to provide 200,000 MWh/yr or 100,000 MWh/yr capacity to allow flexibility on strategy as determined by BU	
Project Economics (strong NPV/MWh)	30%	3	1	2	Financial strength based on risk-adjusted, projected cash flows, and impact on BU financial position and credit rating	The driver in a Contract for Differences is the margin modeled between the PPA price and the grid price/MWh. Favorable project economics are a prerequisite
GHG Reduction (CO_2e lb/MWh)	30%	3	1	2	Projected likely marginal GHG savings per MWh over the term of the project; favor projects with highest overall GHG reduction with consideration for higher early reductions	Strong correlation between high grid carbon intensity at time of renewable energy production; the purpose of is to maximize the BU's impact on GHG reduction
Environmental& Health Co-benefits	20%	2	1	2	Favor projects with lower construction and operational environmental and health impacts	
Integration with BU on-site procurement	10%	1	1	1	Integrate PPA purchases and sales into BU's energy purchasing through hedges or other mechanisms	
Term Length	10%	2	2	1	Offer 12 vs 15 year term; shorter term length ranks higher	
		2.5	1.1	1.8		

BU Wind

Buy wind power for **100%** of the electricity BU uses every year

Match our load with new, additional renewable energy

How

Buy **205,000 MWh** of wind energy through a PPA

- Power Purchase Agreement for 15 years
- BU will buy 48.6 MW of wind generation capacity annually

Credit: EdisonEnergy

Where

South Dakota where BU can have the greatest **global impact**

- A grid reliant on fossil fuels
- Marginal emissions best align with wind energy generation

Credit: NREL/DOE

When

2020 when this new project is complete and energized

- Financing underway
- Construction start spring 2019

Credit: NREL/DOE

Who

Education & **Internship** opportunities for **BU students**

Research opportunities for **BU faculty**

Credit: Boston University

Why

For maximum **global impact** on greenhouse gas reduction

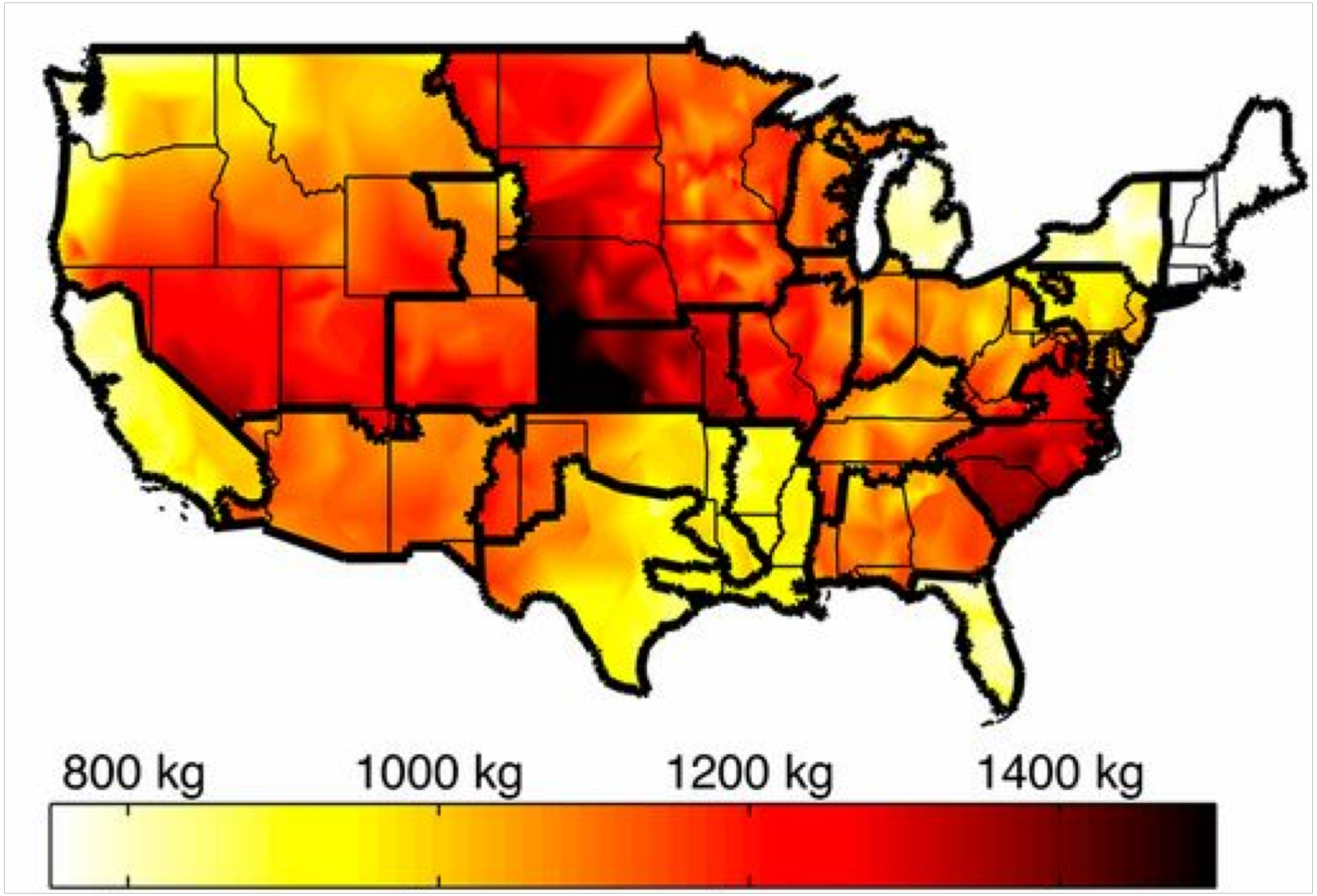
- Goal: Displace the greatest amount of fossil fuel generated CO_2 possible

Reduce BU emissions by **53%**

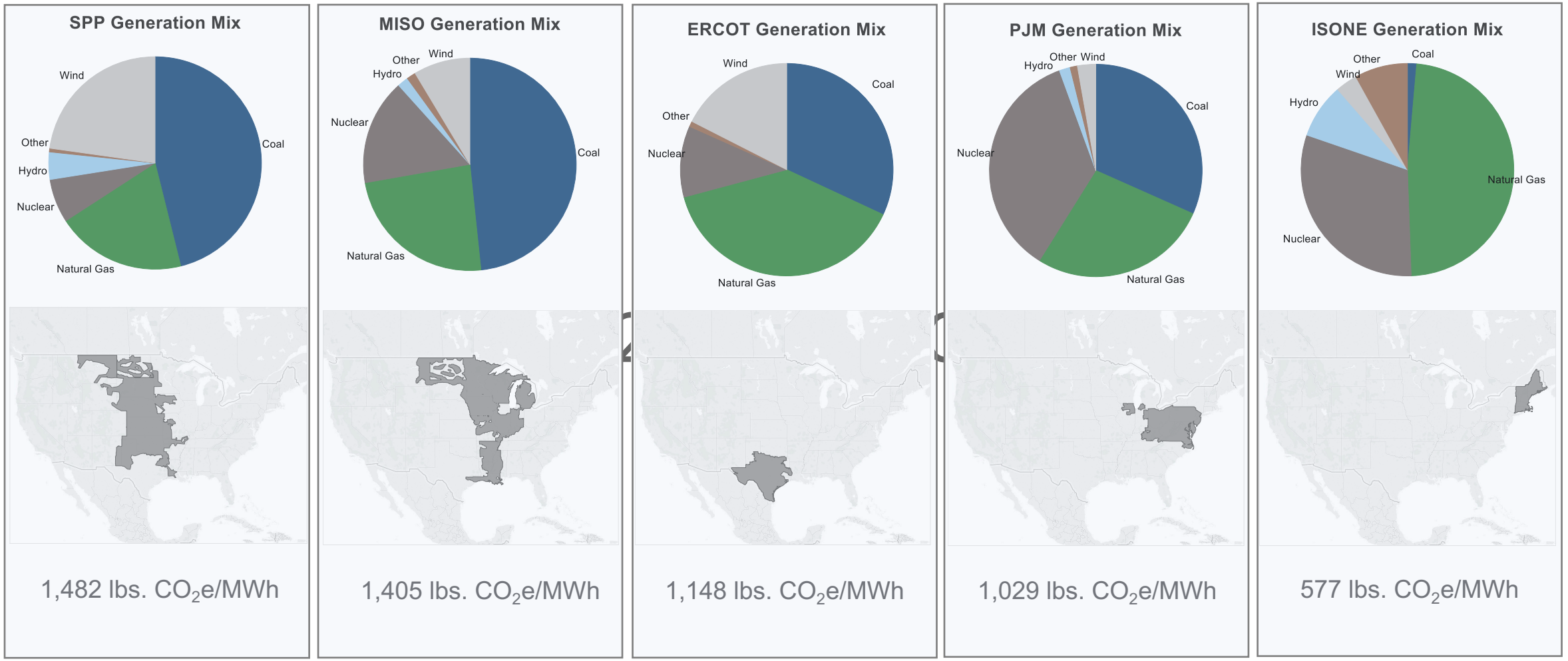
- **2 – 3 x greater** impact on emissions than in New England
- Toward BU's goal to be carbon neutral by 2040

Credit: FIND REFERENCE

Maximizing Global Impact



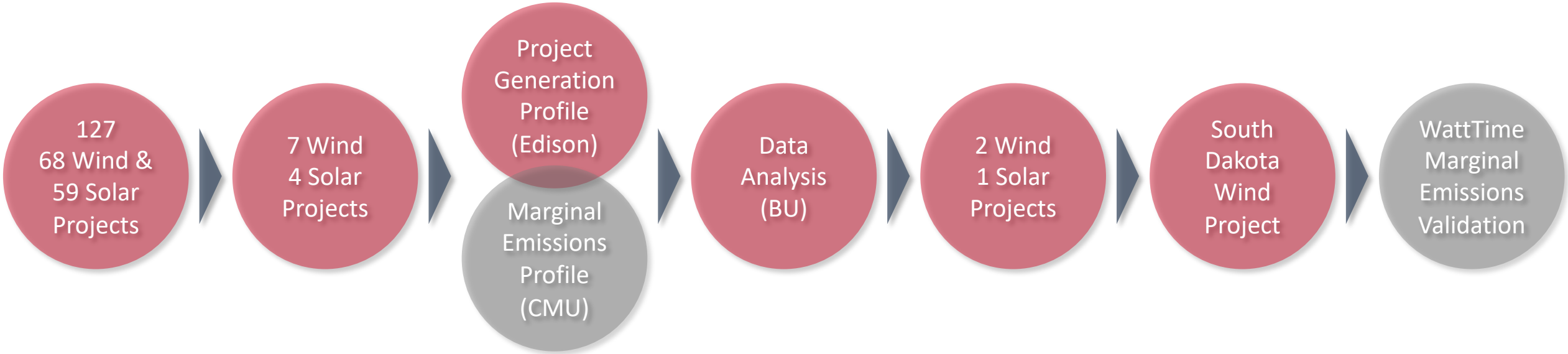
Maximizing Global Impact



Emissions Data based on eGrid 2014 v2 Data by NERC Region: SPP represents average of SPNO, SPSO, MROW, PJM represents average of SRVC, RFCW, RFCE, MISO represents average of RFCM, MROE, MROW, SRMW
Generation Mix based on 2017 ISO Data, by MWh

Credit: EdisonEnergy

Maximizing Global Impact



•Economic & eGrid Screen

Marginal Emissions Screen

Economics & Risk Screen

Criteria Due Diligence

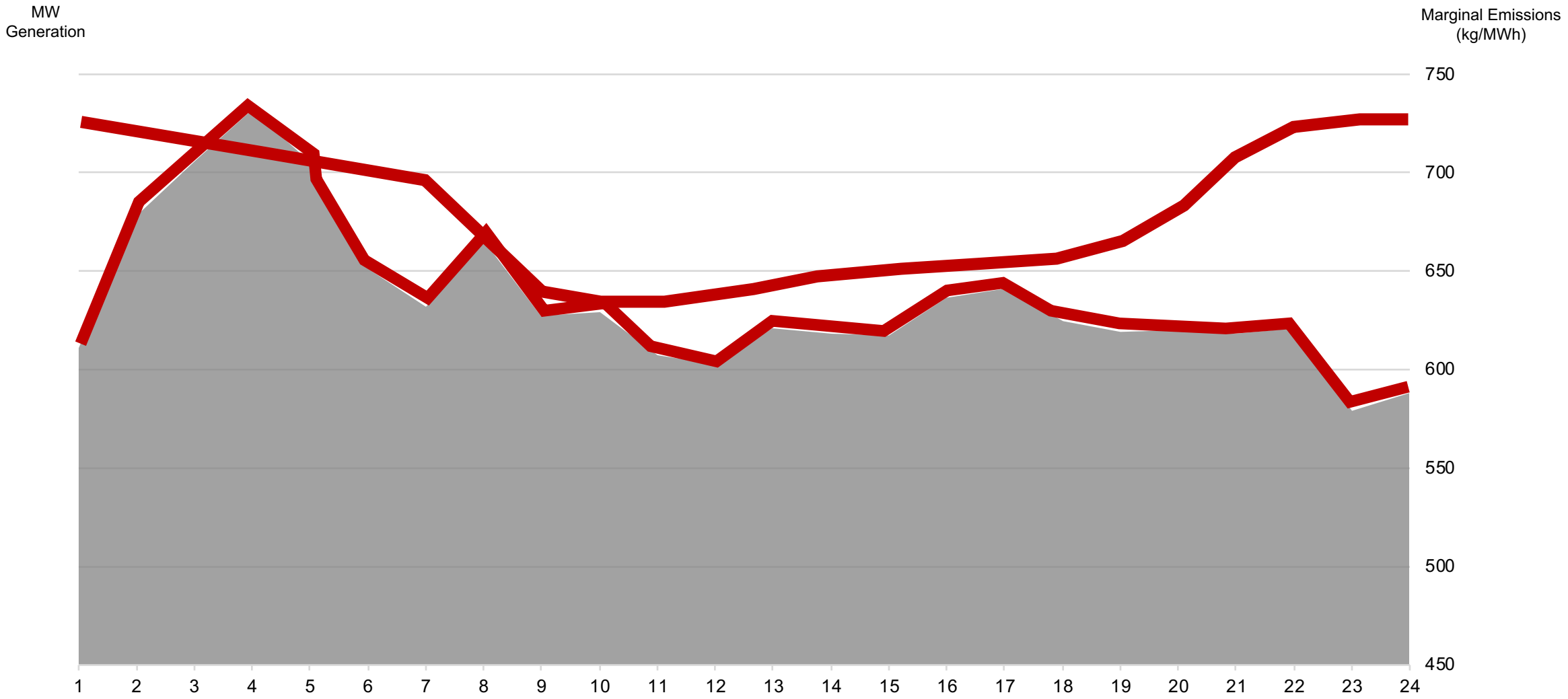
Team Interviews

LOI / Term Sheet

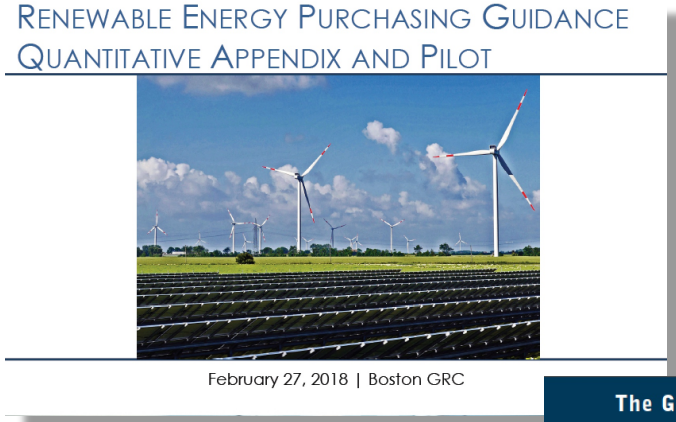
to

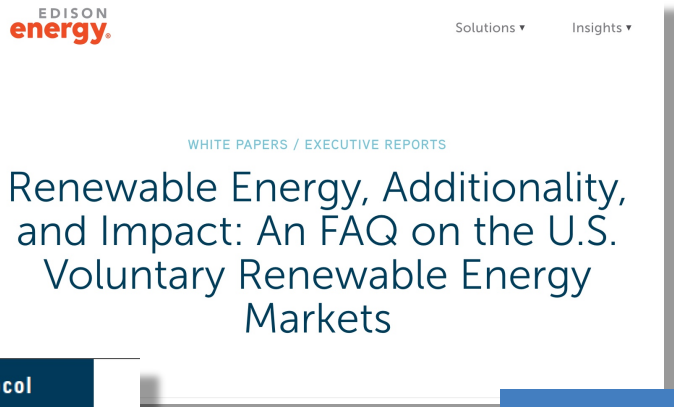
REPA Contract

Align Generation with Marginal Emissions

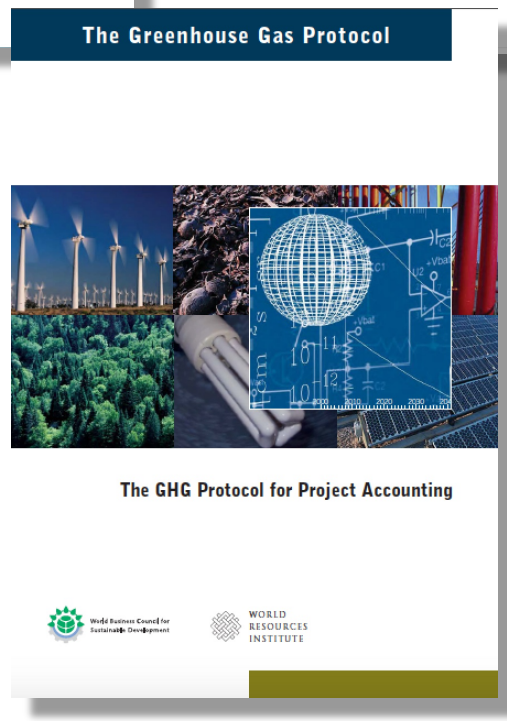


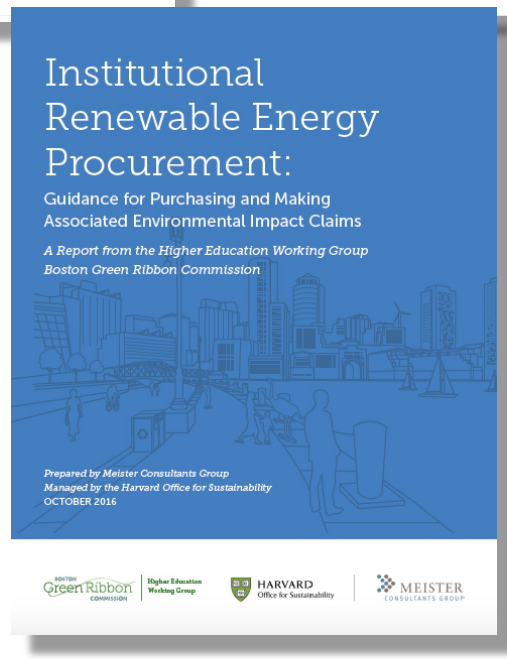
Resources


RENEWABLE ENERGY PURCHASING GUIDANCE
QUANTITATIVE APPENDIX AND PILOT
February 27, 2018 | Boston GRC


EDISON energy
Solutions
Insights
WHITE PAPERS / EXECUTIVE REPORTS
Renewable Energy, Additionality, and Impact: An FAQ on the U.S. Voluntary Renewable Energy Markets


RENEWABLE ENERGY CLAIMS GUIDANCE
Renewable Energy Purchasing Network Meeting
October 21, 2016


The Greenhouse Gas Protocol
The GHG Protocol for Project Accounting
World Business Council for Sustainable Development
WORLD RESOURCES INSTITUTE


Institutional Renewable Energy Procurement:
Guidance for Purchasing and Making Associated Environmental Impact Claims
A Report from the Higher Education Working Group
Boston Green Ribbon Commission
Prepared by Meister Consultants Group
Managed by the Harvard Office for Sustainability
OCTOBER 2016
Green Ribbon Commission
Higher Education Working Group
HARVARD Office for Sustainability
MEISTER CONSULTANTS GROUP

Renewable Energy
Strategy & Procurement Workshop

Questions

October 24, 2018

Photo: karsten-Wurth

BOSTON Green Ribbon COMMISSION

BOSTON UNIVERSITY