Accounting for Carbon

Overview of Environmental Commodities for GHG Reduction Claims

9/8/2016 – Draft for Discussion

What are these products?

Renewable Energy Credit (REC)

- Represents all the environments and social benefits related to renewable electricity

- Measured in megawatt hours
- 1 REC = 1,000 kWh
- Primarily use for compliance with state RSP
- All are third party certified
- Renewable electricity displaces the grid's marginal resource
- **Claim "Renewable Electricity"**

Carbon Offset (CO)

- Represents the green house gas (GHG) emissions from a individual project

- Measured in metric tons
- 1 CO = 2,200 lb. of CO_2e
- Primarily use in voluntary markets
- Needs third party certification
- Projects must reduce GHG beyond business-as-usual
- **Claim "GHG Reduction"**

How are these products used?

Fuel	Used	Rate	Fuel Units to lb. CO2	lb. CO2	
Electricity	11,426	0.726	lbs CO2/kWh	8,295	
REC Retired (not sold)	12	-726	lbs CO2/MWh	-8,712	**<-- claim of 100% Renewable Electricity**
Net Electricity				0	<-- Can't go below zero lb.
Electricity after REC Retired				0	
Gasoline	195	19.6	lbs CO2/gallon	3,822	
Natural Gas	321	11.7	lbs CO2/therm natural gas	3,756	
Oil	0	22.61	lbs CO2/gallon oil	0	
Propane	5	12.43	lbs CO2/gallon propane	62	
CO2 Footprint				7,640	
CO2 Footprint				7,640	
Purchased Carbon Offsets	3.5	-2205	Metric Tons of CO2	-7,718	**<-- claim of Net Zero CO2**
Offset CO2 Footprint				-78	

- In the above example all consumed electricity was claimed renewable through the retirement of Renewable Energy Credits
- A Zero CO_2 footprint can only be claimed when non-electricity fuel CO_2 emissions are displaced by the purchase of carbon offsets along with RECs

Source [EPA Carbon Calculator]

How they work

CARBON OFFSET (CO)

Carbon Offset Process

Project Site

- A project site owner partners with carbon offset certificate standards company
- Carbon offset project types include forest management, fugitive methane capture, renewable energy and others

Certification

- The certification company will ensure the project is real
- The certification company will test for additionality and will ensure that it will remove carbon beyond business-as-usual
- The company will also ensure the site has a contractual commitment to maintain the integrity of the carbon reduction

Sales

- Offsets at the whole sale level are sold into compliance markets or voluntary markets in one metric ton units
- Pricing and units of measure varies widely at the retail level ($15 per ton or 80¢ per therm)

Renewable Claim

- Carbon offsets must be certified by a reputable certification company to be valid
- Only the last owner of the REC can claim reduction in GHG emissions

Carbon Offsets

Certificate standards companies which validation and offer verification of carbon emission reduction.

Green-E® Energy Certified RECs

American Carbon Registry (ACR)

SOCIAL CARBON

The Clean Development Mechanism (CDM)

The Climate, Community and Biodiversity (CCB)

Gold Standard (GS)

The Verified Carbon Standard (VCS)

The Climate Action Reserve (CAR)

Carbon Offset Project Types

- Conservation - based forest management
- Hydro power
- Agricultural methane biogas
- Wind power
- Landfill gas
- Waste heat recovery
- Biomass cogeneration
- Afforestation/ Reforestation
- Coal mine methane
- Biomass fuel switch
- Geothermal energy
- Wastewater biogas-to-energy
- Domestic behaviour change
- Cookstoves

Source: Carbon Neutral

Additionality

- Additionality is a term of used in GHG reduction (carbon offset) markets and regimes that means a project is “additional” to what would have happened in a business-as-usual scenario.

- Additionality also makes it possible to separate the GHG emissions reductions from the project producing them (e.g. methane capture, renewable electricity generation, forestry) and apply them to emissions from another source (e.g. driving your car), selling or exchanging them as a distinct commodity.

- Additionality is a fundamental requirement for offset projects. It must be demonstrated or tested in a credible fashion; it cannot be assumed.

Source: CRS

When to Use Carbon Offset

"While proponents view high-quality offsets as a way to support carbon-fighting projects, critics say they are merely a license to pollute. When you buy an offset, you are paying someone to cut her emissions so you don't have to.

That's why your first move should always be to reduce your own emissions. Drive fewer miles, fly less, don't overheat or over-cool your home. But before you resign yourself to moving to a cave, know that high-quality carbon offsets are available to eliminate the last traces of your carbon footprint." NRDC

How they work

RENEWABLE ENERGY CREDIT (REC)

REC Process

Generation

- All types of generation on the ISO-NE grid are certified by the NEPOOL

Certification

- NEPOOL GIS certifies each state RSP program qualified MWh of renewable generation

PPA

- Utilities contract for electricity using power purchase agreements (PPA)
- RPS qualifying PPAs can come with one REC for every MWh of renewable electricity

Trading

- RECs can be traded between utilities to meet RSP compliance obligations
- RECs can be purchase and retired under “green option” programs in the voluntary market

Renewable Claim

- Investor owned utilities purchase REC to meet their compliance obligations and avoid Alternative Compliance Payment (ACP)
- The voluntary market decrease the number of RECs available for compliance spurring investment (test for additionality)
- Only the last owner of the REC can claim the positive environmental attributes associated with this clean energy production

The New England Power Pool Generation Information System (NEPOOL GIS)

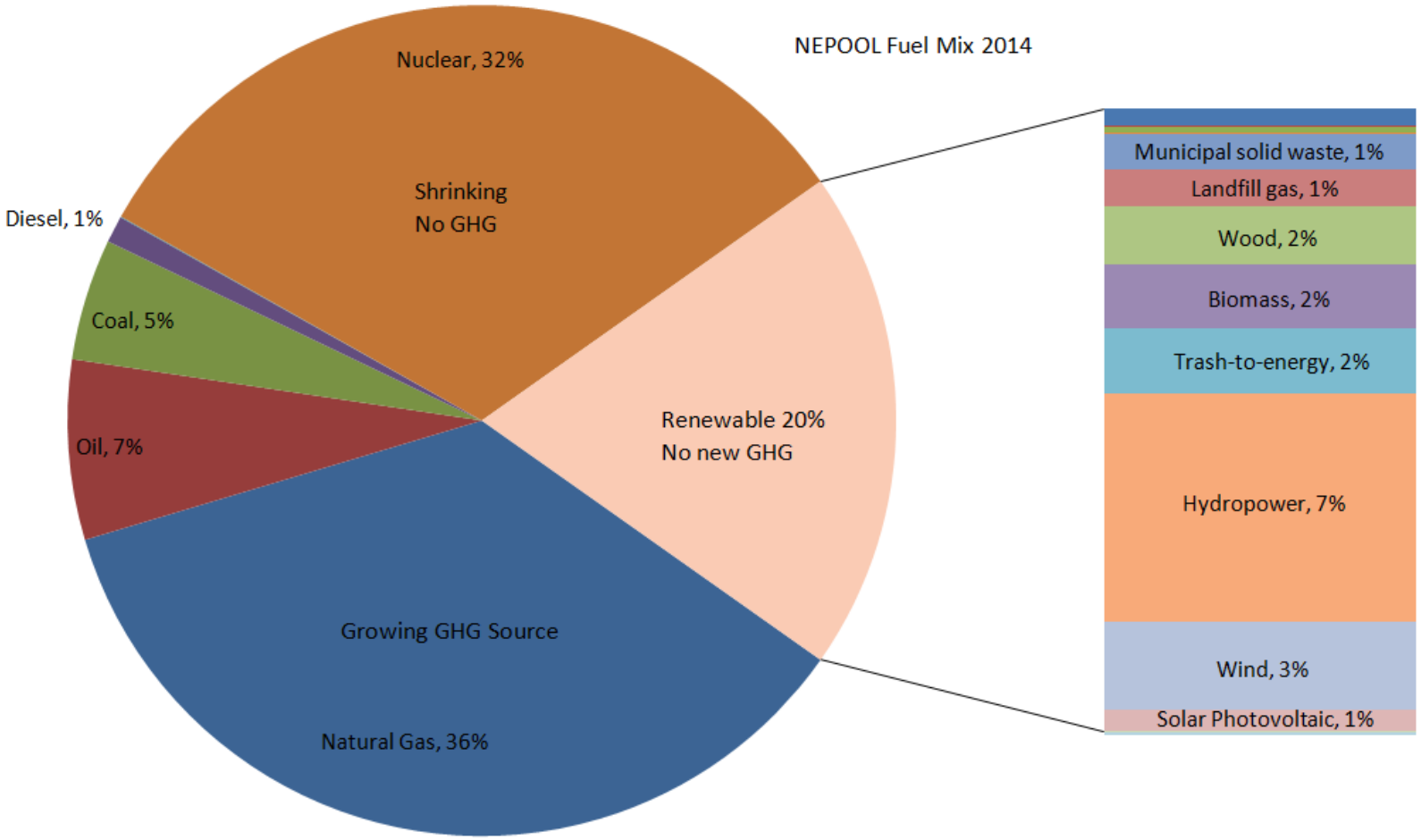
The NEPOOL GIS issues and tracks certificates for all MWh of generation and load produced in the ISO New England control area, as well as imported MWh from adjacent control areas. In addition to the generation, the NEPOOL GIS provides emissions labeling for the New England load serving entities by tracking the emissions attributes for generators in the region. In recent years the NEPOOL GIS has adapted to the various state RPS laws to track combined heat and power, demand response and conservation and load management certificates. The NEPOOL GIS is owned and governed by NEPOOL, and built and operated by APX.

Fuels tracked by the NEPOOL GIS

- Biodiesel
- Biomass
- Coal
- Diesel
- Digester gas
- Efficient Resource (Maine)
- Energy Storage
- Fuel cell
- Geothermal
- Hydroelectric/Hydropower
- Hydrokinetic
- Jet
- Landfill gas
- Municipal solid waste
- Natural Gas
- Nuclear
- Oil
- Solar Photovoltaic
- Solar Thermal
- Trash-to-energy
- Wind
- Wood

Source: NEPOOL GIS

2014 New England Fuel Mix



Source: [NEPOOL GIS]

MA Renewable Energy Portfolio Standard (RPS)

- The Massachusetts RPS is a statutory obligation that suppliers (both regulated distribution utilities and competitive suppliers) obtain a percentage of electricity from qualifying Units for their retail customers.
- Each Class of REC has different Supplier compliance percentages, as well as different qualifying generation units used to meet the compliance percentage.
- Suppliers meet their annual RPS obligations by acquiring a sufficient quantity of RPS-qualified renewable energy certificates (RECs) .
- The New England Power Pool (NEPOOL) Generation Information System (GIS) tracks all electricity generated within the ISO New England (ISO-NE) control area and fed onto the New England grid, as well as electricity exchanged between ISO-NE and adjacent control areas. For each megawatt hour (MWh) of electricity, whether renewable or not, one serial-numbered, electronic certificate is created.
- Certificates that represent renewable generation are coded accordingly and known as RECs
- Suppliers purchase those RECs from the generators, who then transfer the RECs from their own GIS accounts to the Suppliers' accounts to comply with their statutory obligation

Source: DOER Compliance Report

MA Renewable Energy Portfolio Standard (RPS)

- **RPS Class I (REC) (2014 ACP $66.16)**
  - New Renewable Generation Units are facilities that began commercial operation after 1997 and generate electricity using any of the following technologies:
  - Solar photovoltaic, Solar thermal electric, Wind energy, Small hydropower, Landfill methane and anaerobic digester gas, Marine or hydrokinetic energy, Geothermal energy or Eligible biomass fuel

- **RPS Solar Carve-Out (SREC) (2014 ACP $523 declining quickly)**
  - On January 1 st, 2010, new regulations were filed that established a requirement for a growing portion of the RPS Class I renewable energy requirement to come from solar photovoltaic (PV) energy. This carve-out supports distributed solar PV energy facilities across the Commonwealth. The program stopped accepting new applications with the launch of the RPS Solar Carve-Out II Program in April 2014.

- **RPS Solar Carve-Out II (SREC) (2014 ACP $375 declining quickly)**
  - The second phase of the Solar Carve-Out Program began with the promulgation of changes to the RPS Class I Regulation on April 25, 2014. The program is designed to continue supporting new solar photovoltaic (PV) installations until 1,600 MW of capacity is installed across the entire Commonwealth. The program is actively accepting applications for new PV facilities.

Source: DOER

MA Renewable Energy Portfolio Standard (RPS)

- **RPS Class II**
  - RPS Class II mandates that a minimum percentage of electricity sales come from each of two sources, renewable energy and waste energy. The current RPS Class II Renewable Generation obligation is 3.6 percent, and the Waste Energy Generation obligation is 3.5 percent. The obligation does not increase annually.

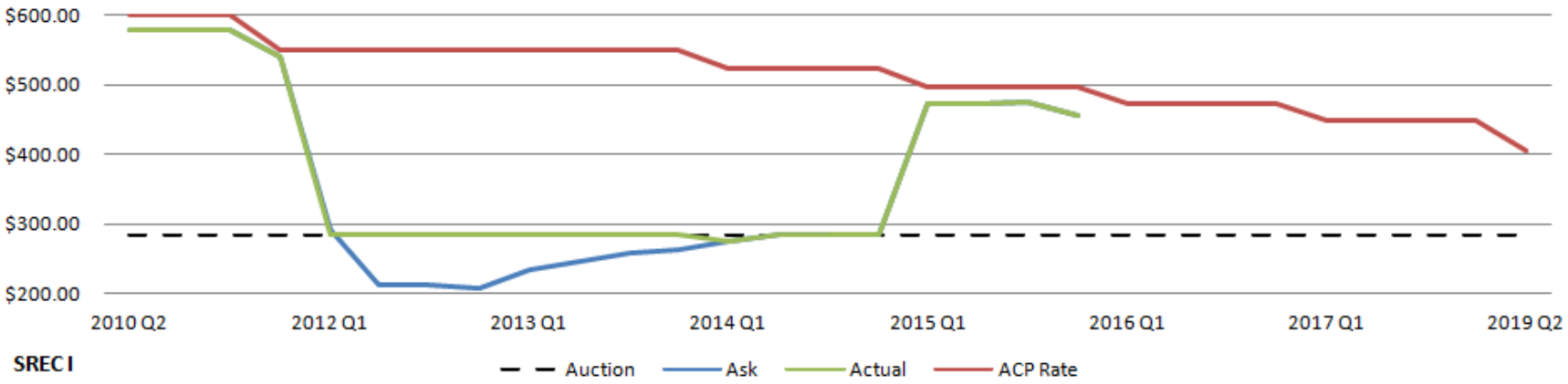
- **RPS Class II Renewables (3.6%) (2014 ACP $27.16)**
  - Similar to RPS Class I, this class pertains to generation units that use eligible resources such as sunlight, wind, ocean, landfill methane gas, small hydropower, and geothermal, but have an operation date prior to January 1 st,1998. Therefore, RPS Class II provides financial incentives for the continued operation of qualified pre-1998 renewable generation units.

- **RPS Class II Waste Energy (3.5%) (2014 ACP $10.86)**
  - This class includes generation units that are classified as Waste Energy Generation Units. Typically these units burn solid waste (mainly garbage) at extremely high temperatures to generate electricity or steam power, in addition to providing funding to support recycling programs in Massachusetts.

- **Alternative Energy Portfolio Standards (APS) (2014 ACP $27.72)**
  - For Massachusetts businesses, institutions, and governments to receive an incentive for installing eligible alternative energy systems, which are not renewable. [*energy efficiency*]
  - Similar to the RPS, it requires a certain percentage of the state's electric load to be met by eligible technologies, which for APS include Combined Heat and Power (CHP), flywheel storage, coal gasification, and efficient steam technologies.

Source: DOER

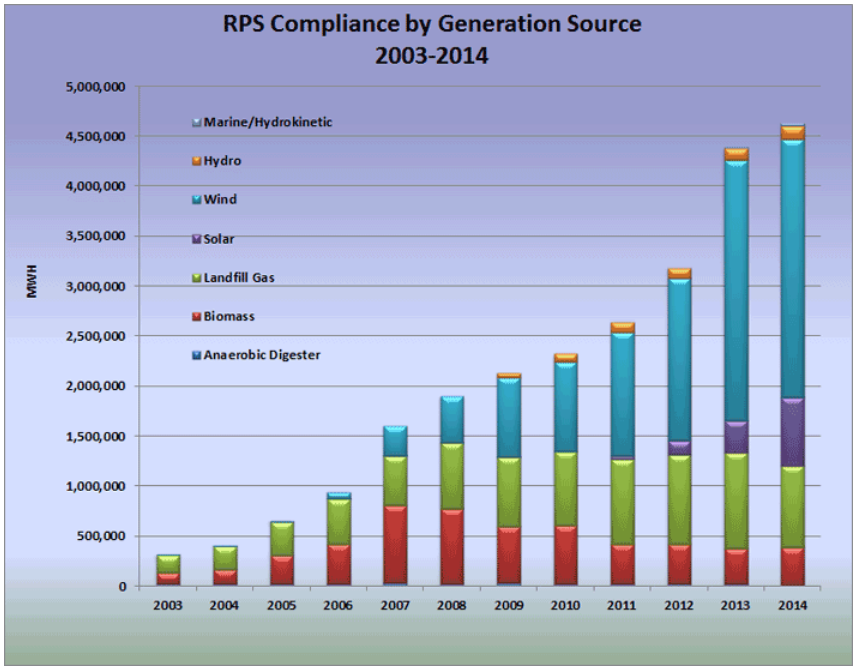
SREC I Example



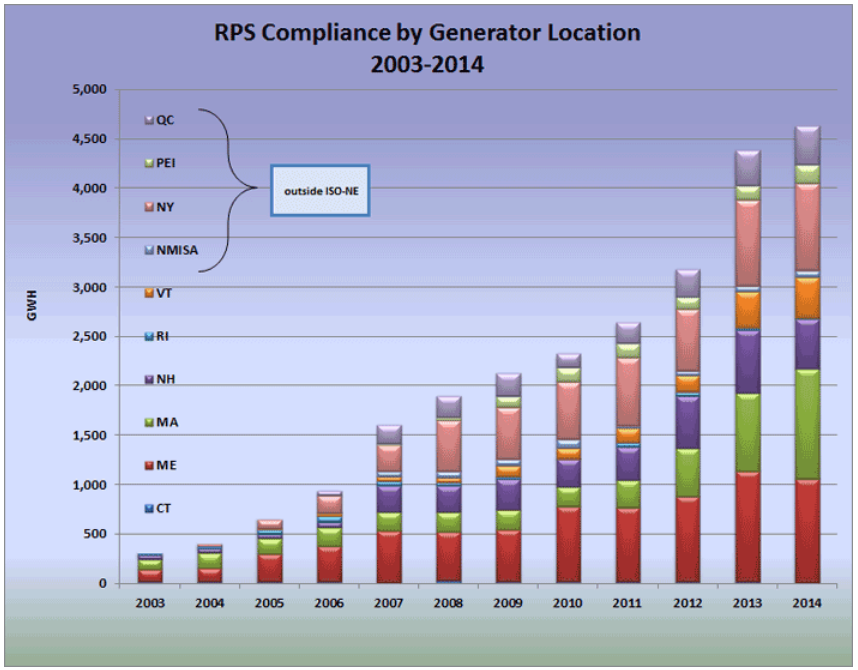
- The above shows the pricing controls of the managed SREC market most notably the Alternative Compliance Payment (ACP) and Auction floor price of $300 less a $15 fee.
- The market swings from oversupplied to undersupplied and back to oversupplied based on that years Compliance Obligation and total MWh produced that year.
- Actual SREC sale price is always lower than the ACP
- SREC can be sold under the auction level if the owner done not want to wait for the auction
- In 2022 the ACP will be $47 above the auction price. Soon after the SREC market will end. When the SREC market closes producers will be able to sell Class I RECs

MA RSP Progress

Generation Type



Generation Location

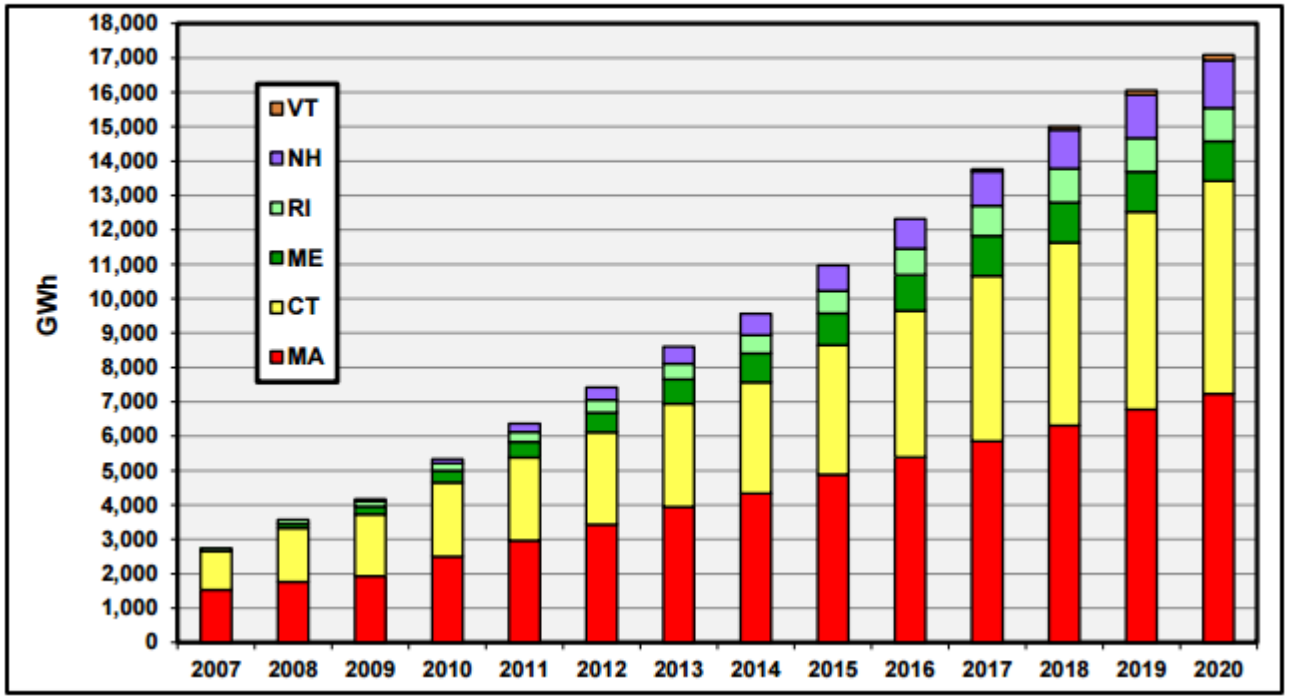


The 2014 net retail load obligation was 48,129,294 GWh.
The class I RPS supplied 4,476,335 GWh or 9.3%
The class II RPS supplied 2,798,165 GWh or 5.8%
The MA RPS and APS can claim 7,274,500 GWh or 15.1% renewable electricity in 2014

Source: EEA

Other New England RSP

Figure Seven
New England Premium RPS Compliance Obligations by State,
Actual (2007-2014) & Projected (2015-2020)



The MA class I RPS supplied 4,476,335 GWh or 9.3% in 2014 *Compliance Report*

Source Links

- CRS Renewable Energy Certificates, Carbon Offsets, and Carbon Claims 5/2012 (Great Read) http://resource-solutions.org/site/wp-content/uploads/2015/08/RECsOffsetsQA.pdf
- NEPOOL GIS Fuel Mix http://www.nepoolgis.com/public-reports/
- MA RPS and APS Program Summaries http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/rps-and-aps-program-summaries.html
- MA Clean Energy Progress http://www.mass.gov/eea/energy-utilities-clean-tech/energy-dashboard/clean-energy-progress/
- MA RPS & APS Annual Compliance Report for 2014 http://www.mass.gov/eea/docs/doer/rps-aps/rps-aps-2014-annual-compliance-report.pdf
- ISO-NE 2014 Emissions Report http://www.iso-ne.com/static-assets/documents/2016/01/2014_emissions_report.pdf