Fuel Neutral Greenhouse Gas Emission Reduction: Three Pilot Programs

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ABSTRACT

While the U.S. Congress has not yet voted on a federal cap and trade program associated with greenhouse gas (GHG) emissions, the Northeast is aggressively moving forward with emissions caps and investments in emission reduction programs and projects. Unlike most efficiency programs now operating in the US, the three pilot programs addressed in this paper are fuel neutral in their approach allowing the investment in electric, gas, fuel oil, waste oil, etc. projects. In addition, the programs support the switching from one fuel to another when significant emissions reductions can be demonstrated. Projects that involve switching from various grades of fuel oil to natural gas, biodiesel, or waste biomass are supported, as are switches from inefficient uses of electricity to a cleaner fuel.

Achievements of these pilot efforts include:

- The development of a solid methodology for the investment in GHG emission reduction projects (as generators/emitters have not stepped forward with offset projects)
- The development of a calculation tool that provides for the fair comparison of efficiency projects across all fuels including all source/site factors
- The development of a second tool that calculates GHG emission reductions for both efficiency and direct abatement projects calculating CO_2 emissions equivalents for over 100 greenhouse gases
- A methodology for comparison of fuel based efficiency and switching projects with direct abatement of GHG emitting chemicals (refrigerants, degreasers, industrial fluids, etc)
- The ability for existing efficiency program staff to assist in the deployment of non-SBC funds (emission cap permits provide program funding) to a customer class that includes both SBC paying customers and large industrial customers who do not participate in SBC programs

RGGI and these pilot program efforts represent a significant step in the US when it comes to the reduction of GHG emissions and participation in a global effort to address climate change.

The Regional Greenhouse Gas Initiative (RGGI)

The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based effort in the United States to reduce greenhouse gas emissions. The states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont have joined in this cooperative effort with a goal of reducing power sector CO_2 emissions by at least 10% by 2018. Participating states sell emission allowances through auctions and invest proceeds in GHG reduction efforts including energy efficiency, renewable energy, and other clean energy projects.

Each state has developed and operates a CO_2 Budget Trading Program based on the RGGI Model Rule. Through this Budget Trading Program emissions of CO_2 are limited (capped) from electric power plants, and CO_2 allowances are issued. The total of the allowances issued by the states establishes the regional cap for power sector emissions. Each allowance represents an authorization (permit) to emit one short ton of CO_2. Allowances are traded during regional CO_2 allowance auctions which are held quarterly. Regulated power plants can use CO_2 allowances issued by any of the ten participating states to

demonstrate compliance with an individual state program. In this manner, the ten state programs, in aggregate, function as a single regional compliance market for CO_2 emissions.

RGGI Cap-and-Trade Overview

The RGGI approach to reducing GHG emissions is outlined as:

- A multi-state CO_2 emissions budget ("cap") that will decrease gradually until a 10 percent reduction in emissions is obtained
- The regional emissions cap is held level at 188 million short tons per year until 2015 when it is scheduled to then be reduced 2.5% per year
- Fossil fuel-fired electric power generators with a capacity of 25 megawatts (MW) or greater are required to participate in the program and are required to obtain and hold allowances equal to their CO_2 emissions
- CO_2 allowances are allocated through quarterly, regional CO_2 allowance auctions
- Unused allowances can be bought and sold at market prices
- Proceeds from the CO_2 allowance auctions are to be invested in consumer benefit programs (the rules for eligible projects vary by state) to improve energy efficiency and accelerate the deployment of renewable energy technologies
- Generators may invest directly in offset projects (greenhouse gas emissions reduction or carbon sequestration projects outside the electricity sector) to help meet their compliance obligations
- An emissions and allowance tracking system tracks RGGI CO_2 emissions from regulated power plants and CO_2 allowance transactions among market participants

As of September 2010, $729 million has been raised through RGGI auctions. The price per ton of carbon established at the first auction in September 2008 was $3.07; it reached its highest level in March 2009 at $3.51. Since then the auction price has been dropping and reached a low of $1.86 (the minimum bid level set by the program) at the September 2010 auction.

Current Economic Conditions and RGGI

When RGGI was established it was anticipated that expanding demands for electricity would progressively increase the demand for GHG allowances, thereby driving the auction prices higher. With the first auction price being around $3 per ton, the crafters of the RGGI procedure anticipated that the price might climb as high as $7 to $10 per ton at which point program modifications are automatically triggered.

The March 2009 auction price of $3.51 has decreased at each quarterly auction. It finally reached the mandated price floor of $1.86 at the most recent auction when there was not enough demand for all of the available allowances. The drop in price is considered to be mostly the result of the weakened economy reducing the demand for electricity. As this demand drops, it becomes easier for generators to stay at, or below, the cap levels, thereby reducing the need to purchase more allowances. Although allowances are purchased to be resold at a later date (or sometimes to be retired as when allowances are purchased by environmental activist organizations) the uncertain economic conditions make investing in allowances less attractive. As a result, the total revenues generated by the RGGI process have been less than anticipated.

In addition, the participating states have been hit hard by the economic downturn. As state budgets are stressed, officials look for additional revenue sources to tap for key programs. The RGGI funds are an attractive target of funds that do not come from the general tax fund. Each participating state operates their RGGI program under their own set of regulations (although they must follow a

"Model RGGI Rule") and some of the states have included a regulation that does not allow RGGI proceeds to be utilized for the general fund. Other states have no such rule. All states signed a memorandum of understanding (MOU) to utilize at least 25% of RGGI proceeds for "consumer benefit or strategic energy purposes. Consumer benefit and strategic energy includes the use of the allowances to promote energy efficiency, to directly mitigate electricity ratepayer impacts, to promote renewable or non-carbon-emitting energy technologies, to stimulate or reward investment in the development of innovative carbon emissions abatement technologies with significant carbon reduction potential, and/or to fund administration of this program."

Following the first round of RGGI proceeds, the states went well beyond the 25% commitment established in the MOU and dedicated an average of 80% of their RGGI proceeds for consumer benefit programs, including energy efficiency, renewable energy, direct energy bill assistance, and other programs. However, before much of that program money was spent, some states "raided" their RGGI funds for funding shortfalls in their general funds. In June, the New Hampshire legislature voted to allocate all of the $3 million in proceeds from that month's auction to their general fund, and New York decided to allocate $90 million - half of their $180 million total in RGGI funds - to their general fund. New Jersey diverted $65 million and has plans to transfer an additional $20 million in the coming year.

The raiding of RGGI budgets has not only diminished the funds available for GHG reduction projects, but also erodes support for RGGI and cap & trade programs in general and makes the program a larger target for detractors. Recent news articles have included the following: "Cap and trade is the tax that dare not speak its name" (*Wall Street Journal*) and "Cronyism and corporate welfare rule RGGI grants" (*New Hampshire Union Leader*).

Although current economic conditions are not favorable for the RGGI program, significant money continues to be raised and much of that money is making its way to beneficial efficiency and renewable energy projects.

A Fuel-Neutral Approach to Assessing Efficiency Projects

During 2008-2009, NYSERDA contracted with ERS to develop a fuel-neutral approach for assessing energy efficiency projects that would allow fuel substitution as well as compare projects on a normalized energy unit (Btus in this case) basis.

Prior to the development of the fuel neutral methodology, NYSERDA offered fuel switching incentives calculated on the total reduction in electric energy consumption, with no consideration given to the fuel consumed by the proposed alternative. Therefore projects that resulted in a net increase in energy usage and/or a net increase in carbon production have received incentives. The situation is further complicated in that incentives for switching from electricity to a fossil fuel source are higher than the incentives paid for a similar project that replaces the same existing electric technology with a more efficient electric technology. The result of offering this disproportionally higher incentive for switching fuels is the reduction of the initial cost for fuel switching options, potentially influencing participants purchase decisions in favor of a less efficient, non-electric alternative over a competing more efficient electric option. The impact of such decisions often includes reduced societal benefit with regard to overall resource consumption and environmental impacts, especially GHG emissions.

NYSERDA and ERS agreed that as NYSERDA moves toward all-fuels programs, including the implementation of RGGI supported programs, it was vitally important to adopt a protocol that fairly weighs the costs and benefits of switching fuel sources, allowing for an equitable means of providing incentives for projects that promote efficient use of resources regardless of the existing and proposed fuel sources.

The proposed protocols included supporting projects that:

- Incorporate equipment that is significantly (20% on average) more efficient than the standard practice for the existing and proposed fuels
- Result in reduced source net energy consumption
- Meet the established NYSERDA programmatic cost-effectiveness guidelines
- Will return economic benefits equal to the project incremental cost within a time period equal to half of the expected measure life
- Result in no net gain in carbon production

Adopting the proper methodologies for calculating savings for a fuel neutral program is both important and problematic; as is selecting the incentive levels and their calculation methodology. In almost all cases, projects involve switching from a standard practice or below standard practice initial fuel measure to an efficient new fuel measure, there will be both initial fuel (electric in most cases) and new fuel (gas, oil, bio) savings. For this reason it is critical to accurately convert all fuels involved to a proper common energy unit that fairly incorporates site/source components. The savings algorithms developed for this program utilize a methodology that converts all fuels to a Btu energy unit.

Another complicating issue is the remaining life expectancy of the existing measure. The actual savings obtained by the program cannot be calculated unless this factor is accounted for. The following scenarios apply:

- The initial fuel equipment is at or near the end of life – This scenario represents the critical decision point for switching to another fuel. Savings = the proposed measure energy unit (Btu) consumption, subtracted from the standard practice baseline measure energy unit (Btu) consumption (the baseline measure can be either an initial fuel measure or a new fuel measure depending upon which represents the customers likely course of action if the incentive program was not available)
- The initial fuel equipment is to be replaced prior to the end of life (early retirement measure) – This occurs when there is significant fuel price pressure to switch, or when an industrial process will benefit from a switch in fuels. Savings = the proposed measure energy unit (Btu) consumption, subtracted from the actual existing measure energy unit (Btu) consumption

The research conducted for this program revealed that most incentives for fuel switching programs/measures are provided directly by electric utilities, natural gas companies, or oil suppliers to entice customers to purchase more of the fuels they provide. Entities that provide fuel switching incentives as part of conservation programs primarily offer prescriptive incentives for specific appliances that meet established efficiency standards. Programs that do provide “custom” fuel switching incentives base the incentive level upon energy savings in terms of the old fuel, with no consideration given to consumption of the new fuel (much like the current NYSERDA approach). We found no existing programs that incorporate the new fuel consumption or the environmental impact into the calculation of the available incentive. It is worth noting that California utilities are required to address consumption of the new fuel when reporting program savings when switching fuels.

Providing incentives based on the level of energy saved for measures on a fuel neutral basis (fuel switching) does provide great flexibility and enables programs to potentially influence efficiency improvements involving a wide range of processes and technologies. The challenge is to define a method that allows for the increased consumption of the alternative fuel to be equitably included in the incentive calculation. Several potential methods were considered. The two methodologies that received serious consideration were a site-based Btu method and a source-based Btu method.

Site Btu Method

Simply converting all fuel consumption to a Btu basis and determining a net energy savings would at first glance appear to be the easiest and most straightforward method to evaluate overall efficiency gains and calculate an incentive. The problems with this method include the fact that it fails to recognize true global energy and environmental impacts associated with the measure because it does not address the "upstream" inefficiencies associated with the production of various fuels.

Another flaw results from the fact that the vast majority of fuel switching measures involve moving away from electric end uses, and for virtually all applications the end use efficiency (when evaluated in terms of Btus consumed *onsite*) of the electric equipment being replaced is significantly higher than that of the new fuel equipment being installed, and thus the net *site Btu* consumption increases and no incentive is awarded.

Source Btu Method

The US Environmental Protection Agency has led a drive for the adoption of a more equitable method for comparing overall efficiencies for projects involving multiple fuels that convert all energy streams into what is termed "source energy." This concept was developed in recognition of the different environmental impacts associated with the consumption of "primary fuels" such as natural gas and the consumption of "secondary fuels" such as electricity. National and regional average source-site ratios that reflect the losses associated with production, transmission, and delivery of various fuel types have been developed and are published by ENERGY STAR. Ratios for New York are reflected in Table 1.

Table 1: Source-Site Ratios

Source-Site Ratios for all Portfolio Manager Fuels	
Fuel Type	**Source-Site Ratio**
Electricity (Grid Purchase)[1]	3.2931
Electricity (on-Site Solar or Wind Installation)	1.0000
Natural Gas[2]	1.0089
Fuel Oil (1,2,4,5,6,Diesel,Kerosene)	1.0100
Propane & Liquid Propane	1.0100
Steam	1.4500
Hot Water	1.3500
Chilled Water	1.0500
Wood	1.0000
Coal/Coke	1.0000
Other	1.0000

1 Reflects NY-specific grid and loss information obtained from
http://www.nyserda.org/publications/Patterns%20&%20Trends%20Final%20-%20web.pdf

2 Reflects NY-specific distribution information obtained from
http://www.eia.doe.gov/pub/oil_gas/natural_gas/data_publications/natural_gas_annual/current/pdf/nga07.pdf

All values based on the Energy Star Performance Rating Methodology from
http://www.energystar.gov/ia/business/evaluate_performance/site_source.pdf

The source energy consumption is determined by multiplying the energy consumed onsite by the factor provided in the table.

Steps in determining the NYSERDA incentive level using this process are as follows:

1. Convert the site values to source values by applying the appropriate source-site ratios to the projected reduction in baseline consumption and the projected consumption of the new fuel by the proposed measure.
2. Convert the resulting source baseline savings and source consumption of the new fuel to equivalent Btus.
3. Obtain the net source Btu savings by deducting the equivalent Btus of increased new fuel source consumption from the existing fuel savings. For end-of-life replacements the baseline is represented by the "standard practice" measure that would most likely be installed if the fuel switching incentive was not available.
4. Multiply the resulting savings in MMBtu by the appropriate incentive rate depending on customer class, region, and measure type.
5. Incorporate an optional GHG impact factor - The USDOE has published national average and regional carbon impact constants for various fuel types. Applying these constants to the baseline and post-installation fuel consumption values allows for quick and easy estimation of the annual carbon impact. This value can then be multiplied by an appropriate value per ton of reduction in CO_2 emissions to produce a dollar value associated with the environmental impact. We determined a value of $25.56 per ton of CO_2 by using the average price obtained from RGGI auctions held between 9/2008 and 10/2009 ($2.10 per ton of CO_2) and calculating a net present value over an average measure life of 15 years. At current carbon values, the magnitude of the impact is small, ranging between 1.8% and 2.2% of the total measure cost.

NYSERDA is now in the process of implementing the above recommendations. The implementation is complicated by the fact that the NY regulators have adopted a new Technical Reference Manual (TRM) that includes mandatory methodologies for calculating prescriptive and custom incentives. ERS is assisting NYSERDA in adapting their existing program structures, as well as this fuel neutral approach, to comply with the protocols of the new TRM.

NYSERDA Fuel-Neutral GHG Reduction Customer Bidding Program

Following the development of the fuel neutral methodology, NYSERDA asked ERS and Dunsky Energy Consulting to develop a competitive bidding GHG reduction program for its industrial customers that is fuel neutral and competes on the basis of tons of CO2e reduction per funding amount requested, rather than competing on the relative reduction in energy usage. Funded 100% with proceeds from RGGI auctions, $13 million dollars was earmarked for the program's initial offering.

In order to design a robust program we decided on the following steps:

- Identify the eligible customers.
- Identify the eligible project types.
- Identify the GHGs to be addressed.
- Establish factors for converting those GHGs to CO_2 equivalents (CO_2e).
- Develop NY specific CO_2e factors for fuels used in New York electrical generating facilities.
- Develop a software tool that allows for the real-time conversion of the variety of GHGs to CO_2e units. And allows for both fuel and non-fuel abatement projects to be calculated and compared utilizing consistent methodologies.
- Develop and issue an RFP for competitive bids for GHG reduction projects.
- Review project bids for cost per ton of CO_2e reduction, technical feasibility, and persistence of impacts.

Eligible Customers

Because large industrial customers are often underserved by efficiency programs, and because they represent major potential for GHG reductions, the program is being offered for projects at large industrial process customer facilities regardless of whether they pay into the NY SBC fund. This sector includes manufacturing, forest products, agriculture, and mining/extraction.

Eligible Projects

Potentially eligible project fall under one of two broad categories: (a) efficiency and fuel switching and (b) transportation and non-fuel emission abatement.

Project Category A: Efficiency and Fuel Switching. One of the objectives of the CGGR Industrial Pilot is to provide an opportunity for CO_2e reduction projects not typically eligible for funding through NYSERDA's standard programs. In addition, a priority is placed on projects that involve industrial process improvements while reducing the emissions of CO_2e. Projects eligible to competitively bid for funding include, but are not limited to:

- **Fuel Oil Efficiency Projects –** Efficiency projects that result in the reduction of the on-site consumption of fuel oils. Any fuel oil is eligible, including #2, #6, diesel, residual, #4 and other blends, "black liquor" and other waste oils, etc.
- **Fuel Switching Projects –** Projects that involve a change in the fuel source for an industrial process or building system with a demonstrated reduction in CO_2e emissions.
- **Combined Heat & Power (CHP) Projects –** Projects that utilize a fuel to produce both electrical power and thermal energy that is utilized on-site for a process or space conditioning. Projects must be able to demonstrate a net CO_2 emissions reduction across all fuels involved
- **Other -** Electric and natural gas efficiency projects that are not eligible under other NYSERDA programs.
- **On-Site Biomass Fuel Projects –** Projects that utilize on-site waste biomass for industrial process or space conditioning.
- **Landfill Gas Utilization Projects –** Projects that utilize landfill gas for industrial process.
- **New Construction/Addition Projects –** Projects that introduce a new process or expand upon an existing process.

Project Category B: Transportation and Non-Fuel Emission Abatement. In addition to energy efficiency and fuel optimization, NYSERDA seeks to fund other industrial sector projects that result in reductions in GHG emissions:

- **Industrial Transportation Projects –** Projects that involve the transportation of goods or on-site materials
- **Non-Fuel Emission Abatement Projects –** Projects that permanently reduce or replace the usage of GHG emitting products and/or reduce the direct emissions of GHGs associated with industrial or agricultural processes

Award Criteria

NYSERDA will utilize a project scoring system based on a scale of 0-100 points. Bid projects will be scored on two general grant award criteria:

1. Technical feasibility and management potential for successful project implementation
2. Cost effectiveness in reducing greenhouse gas emissions. Applications will be scored on the basis of short tons of CO_2e avoided per year per award dollar requested.

One of the goals of the project was to develop one software tool that could be used to calculate GHG emission reductions for all of the eligible project types, including projects that are a hybrid of multiple GHG reduction categories. To meet that goal a series of factors were developed and incorporated in the tool:

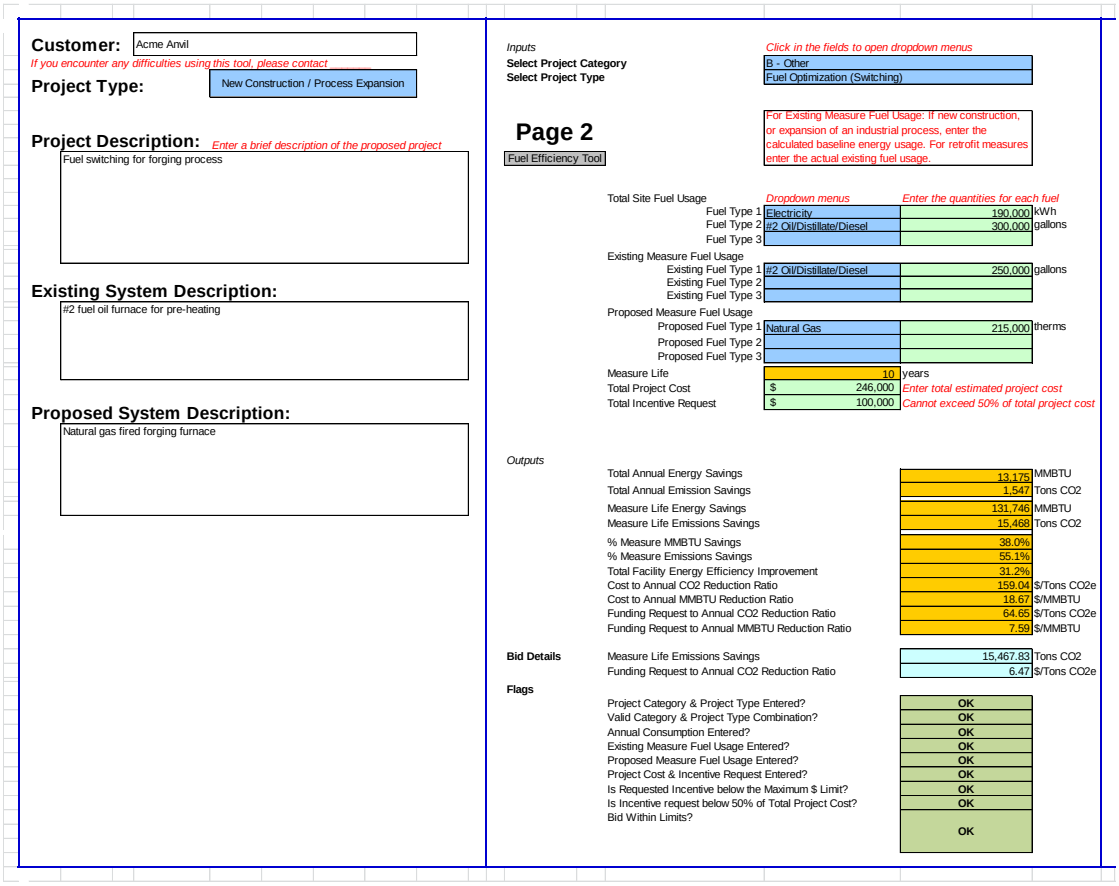
- **New York Specific Electric Generation GHG Factors** – Utilizing recorded data for the mix of fuels used to generate electricity at New York generating stations, factors were developed to calculate the CO_2e emissions on a source basis for electrical consumption at proposed sites.
- **On-site Fuel Consumption GHG Factors** – Every fuel known to be burned in the state was assigned a factor for CO_2e emissions. Fuels include:
    - Fuel oils, including: #2, #4, #6, diesel, residual, "black liquor" and other waste oils
    - Natural gas & propane
    - Coal
    - Biomass, including waste woods
- **Non-Fuel GHG Emitting Consumables** (this includes over 100 substances):
    - Refrigerants
    - Solvents & degreasers
    - Cleaning agents
    - Other industrial chemicals

The tool utilizes these factors to calculate the net GHG emissions in CO_2e units. Applying the measure life and persistence factors for each project category allows the tool to calculate the net emissions for the anticipated life of the project.

Table 2 is a screenshot of the customer interface pages for a fuel switching project.

Table 3 is a screenshot of the customer interface pages for a direct GHG abatement project.

Table 2: Screenshot of the Customer Interface Pages for a Fuel Switching Project



Customer: Acme Anvil

If you encounter any difficulties using this tool, please contact

Project Type: New Construction / Process Expansion

Project Description: *Enter a brief description of the proposed project*

Fuel switching for forging process

Existing System Description:

#2 fuel oil furnace for pre-heating

Proposed System Description:

Natural gas fired forging furnace

Inputs — *Click in the fields to open dropdown menus*

Select Project Category: B - Other

Select Project Type: Fuel Optimization (Switching)

Page 2

Fuel Efficiency Tool

For Existing Measure Fuel Usage: If new construction, or expansion of an industrial process, enter the calculated baseline energy usage. For retrofit measures enter the actual existing fuel usage.

	Dropdown menus	Enter the quantities for each fuel	
Total Site Fuel Usage			
Fuel Type 1	Electricity	190,000	kWh
Fuel Type 2	#2 Oil/Distillate/Diesel	300,000	gallons
Fuel Type 3			
Existing Measure Fuel Usage			
Existing Fuel Type 1	#2 Oil/Distillate/Diesel	250,000	gallons
Existing Fuel Type 2			
Existing Fuel Type 3			
Proposed Measure Fuel Usage			
Proposed Fuel Type 1	Natural Gas	215,000	therms
Proposed Fuel Type 2			
Proposed Fuel Type 3			
Measure Life	10	years	
Total Project Cost	$ 246,000	*Enter total estimated project cost*	
Total Incentive Request	$ 100,000	*Cannot exceed 50% of total project cost*	

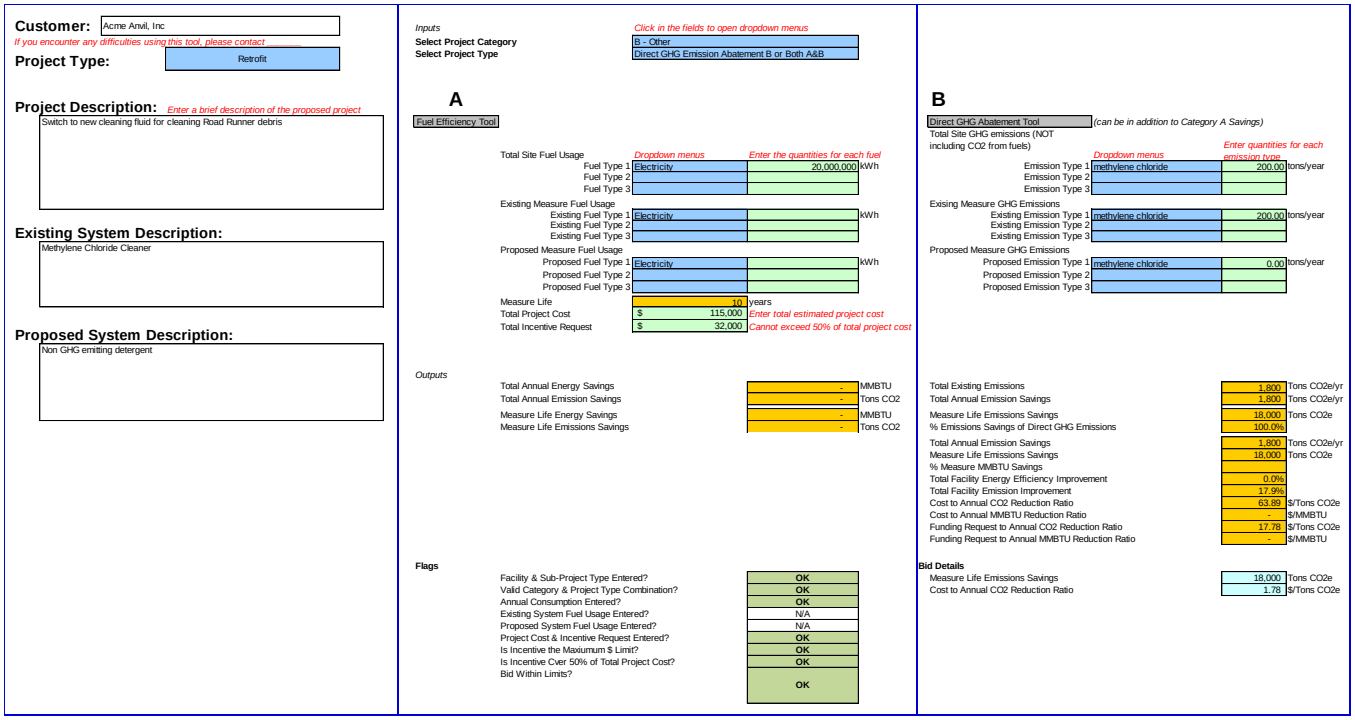
Outputs

Total Annual Energy Savings	13,175	MMBTU
Total Annual Emission Savings	1,547	Tons CO2
Measure Life Energy Savings	131,746	MMBTU
Measure Life Emissions Savings	15,468	Tons CO2
% Measure MMBTU Savings	38.0%	
% Measure Emissions Savings	55.1%	
Total Facility Energy Efficiency Improvement	31.2%	
Cost to Annual CO2 Reduction Ratio	159.04	$/Tons CO2e
Cost to Annual MMBTU Reduction Ratio	18.67	$/MMBTU
Funding Request to Annual CO2 Reduction Ratio	64.65	$/Tons CO2e
Funding Request to Annual MMBTU Reduction Ratio	7.59	$/MMBTU
Bid Details		
Measure Life Emissions Savings	15,467.83	Tons CO2
Funding Request to Annual CO2 Reduction Ratio	6.47	$/Tons CO2e

Flags

Project Category & Project Type Entered?	OK
Valid Category & Project Type Combination?	OK
Annual Consumption Entered?	OK
Existing Measure Fuel Usage Entered?	OK
Proposed Measure Fuel Usage Entered?	OK
Project Cost & Incentive Request Entered?	OK
Is Requested Incentive below the Maximum $ Limit?	OK
Is Incentive request below 50% of Total Project Cost?	OK
Bid Within Limits?	OK

Table 3: Screenshot of the Customer Interface Pages for a Direct GHG Abatement Project



Customer: Acme Anvil, Inc

If you encounter any difficulties using this tool, please contact

Project Type: Retrofit

Project Description: *Enter a brief description of the proposed project*

Switch to new cleaning fluid for cleaning Road Runner debris

Existing System Description:

Methylene Chloride Cleaner

Proposed System Description:

Non GHG emitting detergent

Inputs — *Click in the fields to open dropdown menus*

Select Project Category: B - Other

Select Project Type: Direct GHG Emission Abatement B or Both A&B

A

Fuel Efficiency Tool

	Dropdown menus	Enter the quantities for each fuel	
Total Site Fuel Usage			
Fuel Type 1	Electricity	20,000,000	kWh
Fuel Type 2			
Fuel Type 3			
Existing Measure Fuel Usage			
Existing Fuel Type 1	Electricity		kWh
Existing Fuel Type 2			
Existing Fuel Type 3			
Proposed Measure Fuel Usage			
Proposed Fuel Type 1	Electricity		kWh
Proposed Fuel Type 2			
Proposed Fuel Type 3			
Measure Life	10	years	
Total Project Cost	$ 115,000	*Enter total estimated project cost*	
Total Incentive Request	$ 32,000	*Cannot exceed 50% of total project cost*	

Outputs

Total Annual Energy Savings	-	MMBTU
Total Annual Emission Savings	-	Tons CO2
Measure Life Energy Savings	-	MMBTU
Measure Life Emissions Savings	-	Tons CO2

Flags

Facility & Sub-Project Type Entered?	OK
Valid Category & Project Type Combination?	OK
Annual Consumption Entered?	OK
Existing System Fuel Usage Entered?	N/A
Proposed System Fuel Usage Entered?	N/A
Project Cost & Incentive Request Entered?	OK
Is Incentive the Maxiumum $ Limit?	OK
Is Incentive Cver 50% of Total Project Cost?	OK
Bid Within Limits?	OK

B

Direct GHG Abatement Tool *(can be in addition to Category A Savings)*

	Dropdown menus	Enter quantities for each emission type	
Total Site GHG emissions (NOT including CO2 from fuels)			
Emission Type 1	methylene chloride	200.00	tons/year
Emission Type 2			
Emission Type 3			
Exising Measure GHG Emissions			
Existing Emission Type 1	methylene chloride	200.00	tons/year
Existing Emission Type 2			
Existing Emission Type 3			
Proposed Measure GHG Emissions			
Proposed Emission Type 1	methylene chloride	0.00	tons/year
Proposed Emission Type 2			
Proposed Emission Type 3			

Total Existing Emissions	1,800	Tons CO2e/yr
Total Annual Emission Savings	1,800	Tons CO2e/yr
Measure Life Emissions Savings	18,000	Tons CO2e
% Emissions Savings of Direct GHG Emissions	100.0%	
Total Annual Emission Savings	1,800	Tons CO2e/yr
Measure Life Emissions Savings	18,000	Tons CO2e
% Measure MMBTU Savings		
Total Facility Energy Efficiency Improvement	0.0%	
Total Facility Emission Improvement	17.9%	
Cost to Annual CO2 Reduction Ratio	63.89	$/Tons CO2e
Cost to Annual MMBTU Reduction Ratio	-	$/MMBTU
Funding Request to Annual CO2 Reduction Ratio	17.78	$/Tons CO2e
Funding Request to Annual MMBTU Reduction Ratio	-	$/MMBTU
Bid Details		
Measure Life Emissions Savings	18,000	Tons CO2e
Cost to Annual CO2 Reduction Ratio	1.78	$/Tons CO2e

Table 4 is a partial screenshot of conversion factors for GHG emitting substances. A total of eighty-two non-fuel substances and twenty-nine fuels are included in the factors.

Table 4: Partial Screenshot of Conversion Factors for GHG Emitting Substances

Greenhouse Gas (GHG)	Chemical formula	NYSERDA recommended*	Lookup Value	EPA GWP (100-yr)	Other GWPs		
					SAR (100-yr)	TAR (100-yr)	AR4 (100-yr)
Carbon dioxide	CO_2	1	1	1	1	1	1
Methane	CH_4	21	21	21	21	23	25
Nitrous oxide	N_2O	310	310	310	310	296	298
HFC-23	CHF_3	11,700	11700	11700	11700	12000	14800
HFC-32	CH_2F_2	650	650	650	650	550	675
HFC-41	CH_3F	150	150	150	150	97	
HFC-125	CHF_2CF_3	2,800	2800	2800	2800	3400	3500
HFC-134	CHF_2CHF_2	1,000	1000	1000	1000	1100	
HFC-134a	CH_2FCF_3	1,300	1300	1300	1300	1300	1430
HFC-143	CHF_2CH_2F	300	300	300	300	330	
HFC-143a	CF_3CH_3	3,800	3800	3800	3800	4300	4470
HFC-152	CH_2FCH_2F	53	53	53		43	
HFC-152a	CH_3CHF_2	140	140	140	140	120	124
HFC-161	CH_3CH_2F	12	12	12		12	
HFC-227ea	CF_3CHFCF_3	2,900	2900	2900	2900	3500	3220
HFC-236cb	$CH_2FCF_2CF_3$	1,340	1340	1340		1300	
HFC-236ea	CHF_2CHFCF_3	1,370	1370	1370		1200	
HFC-236fa	$CF_3CH_2CF_3$	6,300	6300	6300	6300	9400	9810
HFC-245ca	$CH_2FCF_2CHF_2$	560	560	560	560	640	
HFC-245fa	$CHF_2CH_2CF_3$	1,030	1030	1030		950	1030
HFC-365-mfc	$CF_3CH_2CF_2CH_3$	794	794	794		890	794
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$	1,300	1300	1300	1300	1500	1640
Sulfur hexafluoride	SF_6	23,900	23900	23900	23900	22200	22800
Perfluoromethane/ PFC14	CF_4	6,500	6500	6500	6500	5700	7390

Current Program Status

The calculation tool and the RFP were completed this past July, and individual project proposals were to be due in October. However the project is currently awaiting additional RGGI generated funds as 50% of the overall NY RGGI funds were utilized to cover NY general fund shortfalls, and the majority of the remaining funds are being utilized for a “green” jobs initiative. In the meantime, NYSERDA will use the calculation tool to track the GHG impacts of C&I efficiency projects funded through existing programs.

Efficiency Maine RGGI Program – Putting the Funds to Work

The State of Maine is utilizing all of its funding (currently $10 million) generated by the RGGI auctions for efficiency and renewable energy projects. Efficiency Maine administers the efficiency programs that are funded through electric utility system benefit charges, RGGI, and a variety of other mechanisms such as the Federal ARRA program. The focus of this paper is industrial programs, so it will not present the residential and commercial efforts funded through the Maine RGGI proceeds. The RGGI funds are being utilized in three ways:

1. Supplemental funding for existing residential and business efficiency, and renewable energy programs
2. Supporting projects for industrial customers that are not eligible for SBC-funded programs
3. Funding an all-fuels competitive bidding large project program for industrial customers

As with the New York program, the goals of the industrial RGGI-funded efforts include:

- Reducing GHG emissions
- Producing operational savings for participating customers
- Improving industrial processes
- Creating or retaining jobs
- Producing replicable results
- Supporting clean energy initiatives

Efficiency Maine solicited projects both through its standard Business Program process and through a competitive bidding process. For the competitive bidding process, applicants were requested to submit the technical details of the proposed project, the energy impacts, the calculated GHG impacts, other associated benefits such as job retention, total project costs, and the requested funding amount.

A team of technical experts was assembled to review proposed projects and rate them on a competitive basis. A total of sixteen projects were funded through this competitive bidding process, with another eleven projects funded through the standard Business Program procedure.

The following three projects are examples of industrial projects funded through the RGGI program.

Waste Wood Combined Heat & Power - Two Maine lumber producers that currently utilize waste wood boilers to heat their facilities and kiln dry wood are updating their boilers and adding steam turbine generators allowing them to simultaneously generate heat and electric power. The generated electricity will be used on-site and will be sold back on the grid when on-site demands are met. Since they are burning waste wood only, the generated electricity is carbon neutral and is replacing grid delivered electricity with its associated GHG impacts. The net site generated electricity ranges from 25% to 40% of the facilities' electrical demand. The two facilities employ over 300 workers and will be adding to their workforce as a result of the project. The grant amounts totaled just over $1.15 million. The projects are calculated to save 8,240,000 kilowatt hours of grid-purchased electricity and 4,230 tons of carbon dioxide annually.

Comprehensive Fuel Oil and Electricity Full-Facility Retrofit – A coastal Maine manufacturer and distributor of specialty chemicals has been funded to complete a comprehensive efficiency project. The project features a new heat recovery system that recycles steam from industrial processes for the heating of water that is then used throughout the facility. Other improvements include optimized boiler controls, updated lighting, and the insulating of steam and hot water pipes throughout the plant. RGGI funds are being used to fund 50% of the total $630,000 project costs. The project will produce annual

savings of approximately 275,000 gallons of #6 fuel oil and 223,860 kWh of electricity, which in turn will reduce CO_2 emissions by over 3,600 tons per year.

Paper Making Heat Recovery and Pulping Process Improvements – A paper making facility is moving forward with a project that involves the installation of new heat exchangers to capture waste heat from its wastewater and papermaking process and the modification of several 7000 horsepower pressurized stone grinders to dramatically increase the efficiency of its pulping process. The paper industry has long been an important part of Maine's economy. This mill dates back to 1899 and has been operated for over 30 years by the present owners. The mill employs 240 workers and is known for making some of the world's best supercalendered paper, an extremely smooth paper used for magazines, catalogs, and annual reports. The $1,082,000 grant allowed the owners to pursue projects that were previously not feasible given the current economic conditions. The project is expected to save approximately 538,000 gallons of # 6 fuel oil, 18,000,000 kilowatt hours of electricity, and 16,373 tons of CO_2 annually.

Summary

The Regional Greenhouse Gas Initiative is a huge opportunity for the Northeast region to demonstrate that cap & trade programs can produce beneficial effects. Its overall concept is simple: charge polluters a fee for contributing to GHG emissions and then use that revenue to fund projects to reduce overall GHG emissions. Unfortunately, the current economic climate makes it difficult for governmental leaders to support such an effort and/or makes it attractive to utilize collected funds for general budget shortfalls. However, the RGGI program does not just curtail GHG emissions, it also supports needed economic activity including the creation and retention of jobs. The project approaches covered in this paper illustrate that cap & trade programs have the potential to expand efficiency programs to all fuels and produce dramatic impacts.

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