



# **Local & Regional Responses to Greenhouse Gases (and other nasty problems)**

Solutions for Success  
Stephen Cowell, CSG  
February 6, 2008



# About CSG

- Founded in 1984; nonprofit corporation
- 300 staff, 14 offices nationwide
- More than 100 clients
- Design, develop, and deliver energy efficiency and clean energy programs and projects
- Over 1 million homes and facilities served
- Net Zero Greenhouse Gas and Climate Leader





# Introduction

- Focus on emissions
  - Voluntary / compliance markets
  - Carbon, No<sub>x</sub>, Capacity, Demand Resources
  - What is our impact on CO<sub>2</sub> emissions?
  - How does our work make a difference?
  - What is the value of pollution reduction?
  - How do we harvest the value?





# Why is this important?

**1941**



**2004**



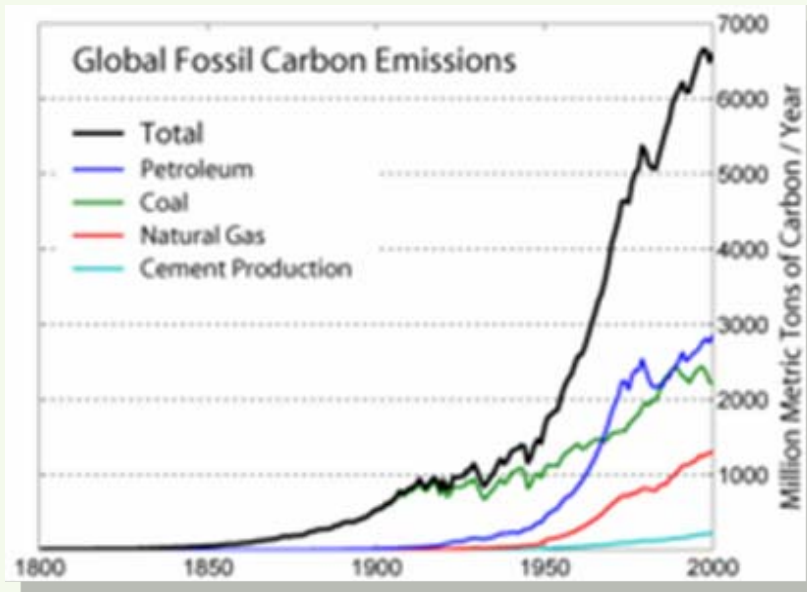
Riggs Glacier, Glacier Bay National Park  
2,000 feet thick



# Market #1: Carbon

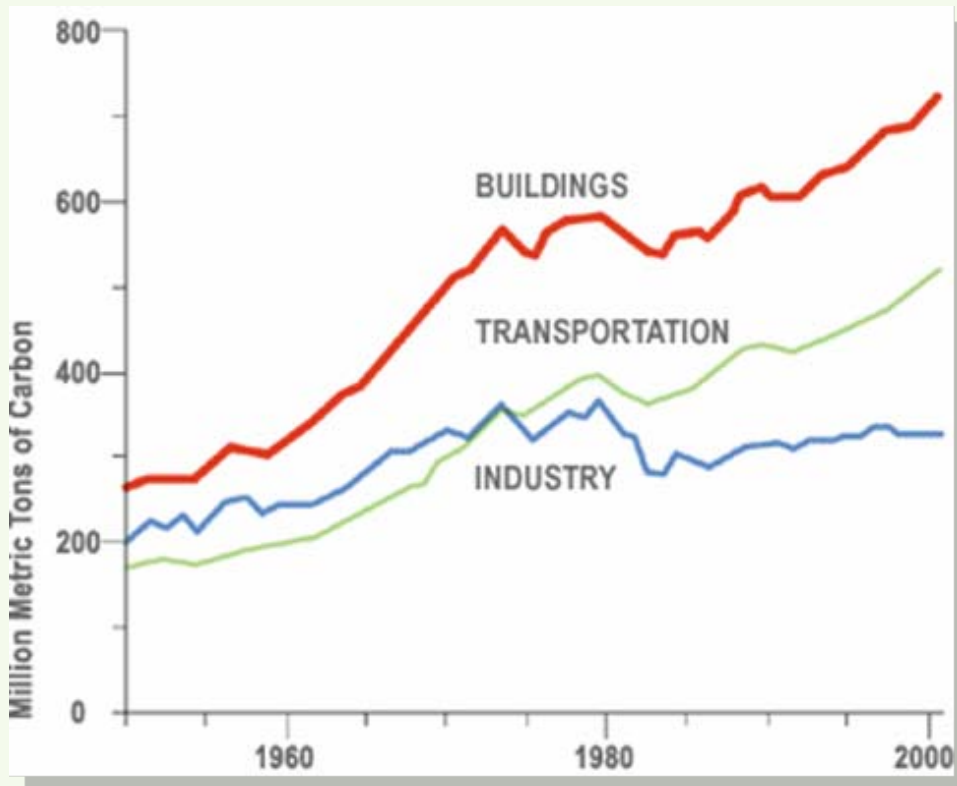
- Since the start of the Industrial Revolution, atmospheric CO<sub>2</sub>

concentration has increased by about 40% - most since 1945





# Buildings guilty of GHG emissions



Buildings are responsible for almost half (48%) of all US greenhouse gas emissions annually



## Residential buildings

- Contribute more than 50% of the buildings sector pollution
- Last longer (hopefully) than other buildings: homes should last 100 years while commercial stock will turn over
- **No climate solution exists without significant contribution from reduced carbon emissions from homes!**





## Key terms

- CO<sub>2</sub> – Carbon dioxide
- Greenhouse Gas (GHG) Offsets
- Compliance Markets: RGGI/Kyoto
- Cap and Trade vs. mandatory site based reductions
- NO<sub>x</sub> – Nitrogen oxides
- Capacity Value
- White Tags/Green Tags
- Measurement, Verification, Accounting





# Short tutorial on Carbon Markets

- Slide show developed by Holmes Hummel



Microsoft  
PowerPoint Presentation



# Greenhouse Gas Markets

- **Voluntary programs:** Chicago Climate Exchange, Environmental Resource Trust, Carbon Neutral network
- **Government voluntary programs:** California Registry and U.S. Department of Energy
- **Government Compliance Markets:** mandatory Cap and Trade programs -- Currently MA 7.29, RGGI for 2009; CA





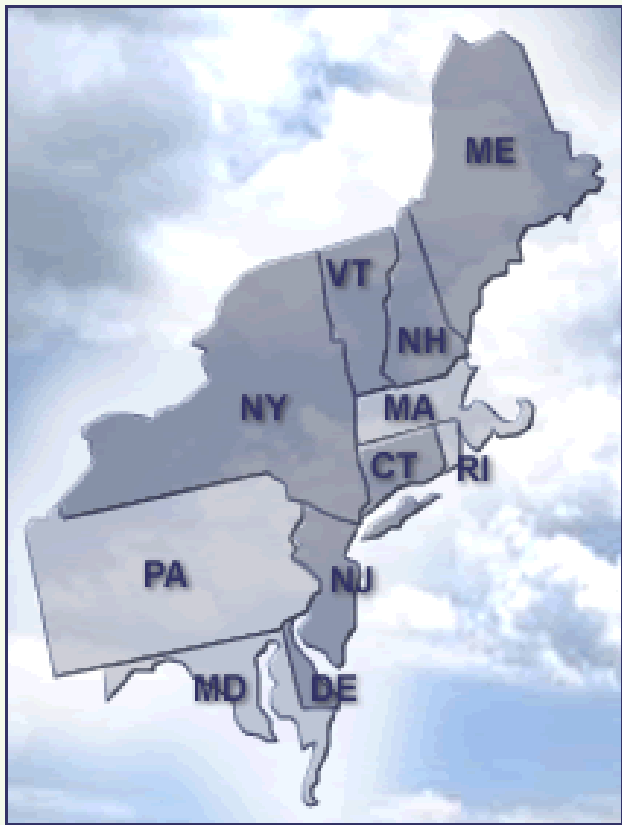
# Function of Markets

- Verification of claims
- Measurement and Accounting of amounts
- Certification of transactions
- Exchange of funds (not always)





# Regional Greenhouse Gas Initiative

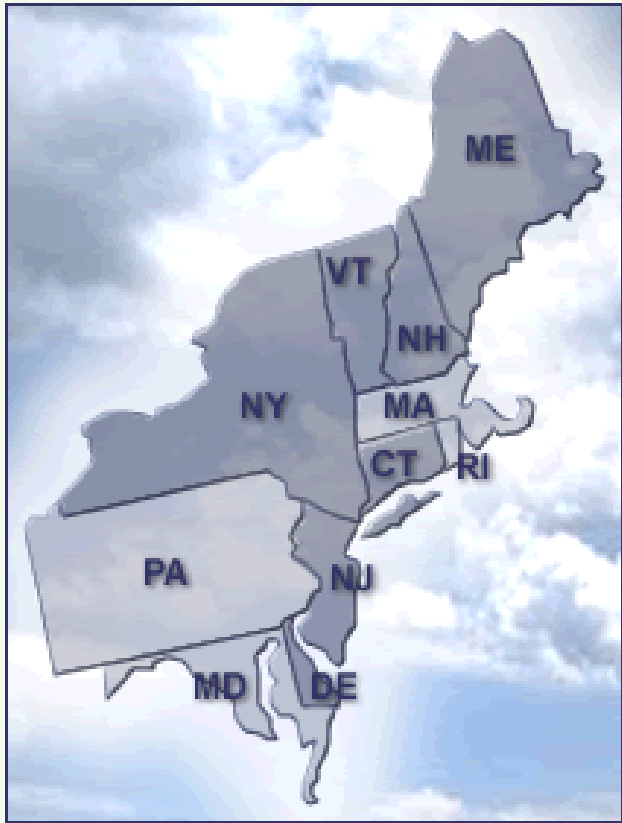


- First mandatory Cap and Trade in U.S.
  - MA, RI, & MD have joined 7 original states
  - Minimum of 25% of allowances auctioned for Public Benefit (EE)
  - NY, VT, & MA have committed to 100% auction





# Regional Greenhouse Gas Initiative

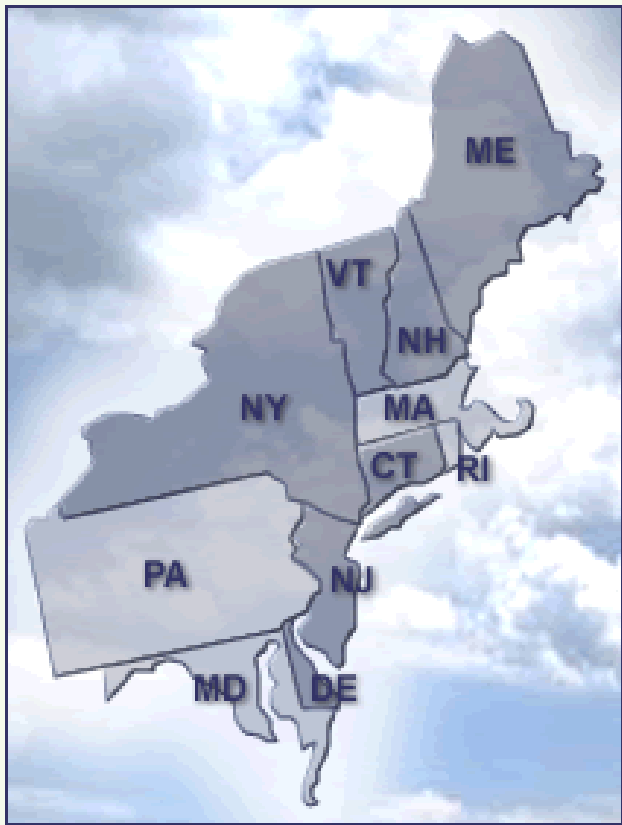


- Public pressure increasing to auction allowances with revenues to be used for EE projects





# Regional Greenhouse Gas Initiative



- Prices and revenue
  - How many allowances will be controlled by RGGI?
    - MA share = 26 million tons
    - Expected price per allowance: \$1 to \$5 per ton
    - \$26-130 million
    - SBC in MA currently = \$120+ million





## NY RGGI plans

- New York will be doing a 100% auction of credits
- New York is aiming to have the first auction in June, though the date has not yet been set
- There is no plan yet as to how the auction revenue will be spent, but some expectation it will include efficiency programs





## RGGI offsets

- Project start date—projects must have become operational after December 30, 2006
- Electric efficiency cannot quality
- Fossil fuel efficiency can participate
- Demand based on cost and rules





# Greenhouse Gas offsets

- Denomination is either “royal” English units tons CO<sub>2</sub> equivalent or consistent with Kyoto Metric Tonnes CO<sub>2</sub> equivalent
- Values in US voluntary markets: \$3-\$5  
Kyoto: \$15+





## GHG reduction factors

- 1 kWh electric use reduction in NE ~ 0.91 lbs CO<sub>2</sub> based on Regional Power Generation mix
- 1 therm of gas use avoided ~ 11.5 lbs of CO<sub>2</sub> reduction
- 1 gallon of oil use avoided ~22.38 lbs of CO<sub>2</sub> reduction





# Example of 1 ENERGY STAR home

- Fort Drum, New York development
  - Increased insulation, advanced air sealing, ENERGY STAR appliances and lighting, efficient furnace and central A/C
- Electricity annual savings
  - 4009 kWh
- Natural gas annual savings
  - 892 therms = 10,438 lbs CO<sub>2</sub>
  - = **5.22 tons of carbon reduction**





## Example of a home retrofit

- Buffalo, New York (Kingston Place)
  - Measures: insulation (ceiling, walls, rim joist), air sealing, programmable thermostat, new 94% efficient gas furnace, windows, ENERGY STAR lighting, water heater insulation, ventilation
- Electricity annual savings
  - 2286 kWh
- Natural gas annual savings
  - 613 therms = 7,167 lbs CO<sub>2</sub>
  - = **3.58 tons of carbon reduction**





## Example of a home retrofit

- Buffalo, New York (Summer Street)
  - Measures: insulation (ceiling, walls), air sealing, programmable thermostat, new 92% efficient gas furnace, gas hot water heater, ENERGY STAR lighting, windows
- Electricity annual savings
  - 2184 kWh
- Natural gas annual savings
  - 630 therms = 7,337 lbs CO<sub>2</sub>
  - = **3.67 tons of carbon reduction**





# Value potential

@ \$3 per ton:

- 5 ton per year reduction = \$15/yr
- 20 year value ~ \$200\*

@ \$20 per ton:

- 5 ton per year reduction = \$100/yr
- 20 year value ~ \$1,600\*

*\* Depends on the discount rate used*





# Issues needing resolution

- Additionality (free riders)
- Leakage in a regional or state plan
- Voluntary vs. Compliance Market tracking
- Load based or source based requirements





## Market #2

- NO<sub>x</sub> Allowance markets





# Environmental/Emissions Markets

- $\text{NO}_x$  emissions reductions (nitrogen oxides)
- EPA mandated cap on emissions to eliminate smog
- State Implementation Plans required when emissions exceed the cap: “non-attainment”
- Ability to claim allowances that a state has “set aside” for Public Benefit





## Example: Massachusetts

- 2004 – first year for NO<sub>x</sub> set asides
- 687 tons of allowances available
- DOER could claim on behalf of efficiency programs
- ESCOs and customers could claim

Value example:

NO<sub>x</sub>: 1 MWh during 5 month season = 1.5 lbs emissions or .00075 tons

1 allowance = 1 ton = \$2,000

1 MWh = \$1.50 per year (\$.0015 per kWh)





## Market #3

- Capacity Markets





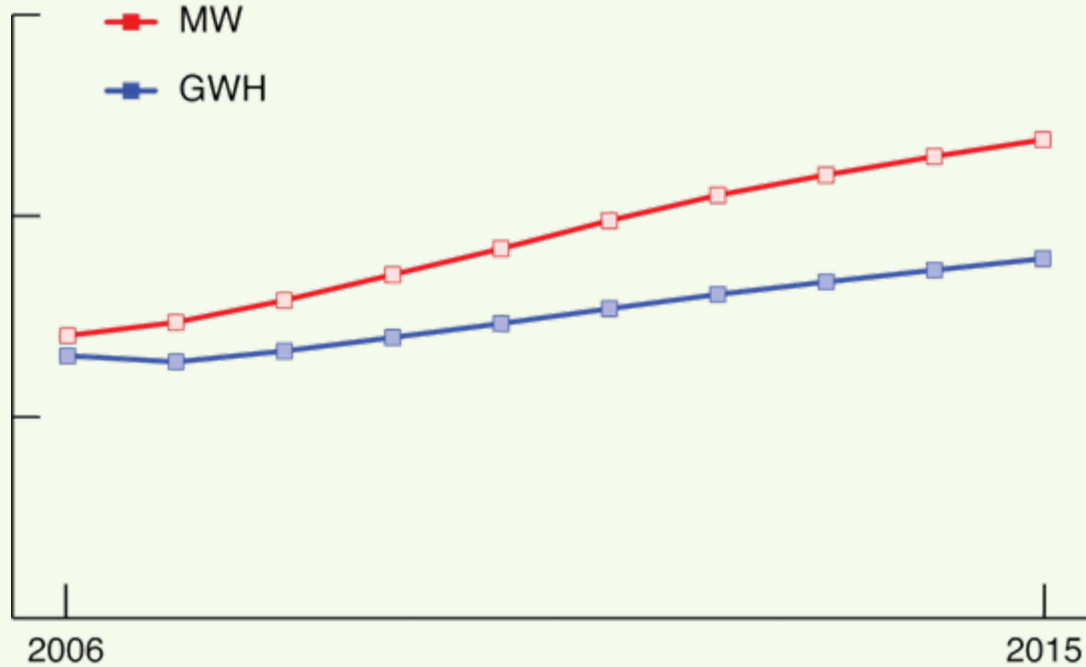
# Capacity

- Capacity = amount of electricity available from a generating unit or needed by users at any moment in time
  - Measured in kilowatts (energy = that amount over time or kilowatt-hours)
- Power Markets and System Operators need both kW and kWh





# Peak vs Average energy growth





# New England Settlement Agreement

- Agreement to incorporate Demand Resources into market
- Forward Capacity Auction
  - Three years forward
  - Existing capacity gets one year commitment
  - New capacity to select 1 to 5 year commitment
  - Opportunities to de-list or retire by bids
- Demand resources fully participate and have special treatment
- Measurement and Verification required
- Approved by FERC





## Value potential

- 1 year-round kW of load reduction in an ENERGY STAR home through reduced AC, appliances, lighting etc. = \$36 (transition) to \$60 (\$4.50 clearing price) per year for 20 years or a NPV of up to \$ 400 or more





## **FCM value from efficiency programs in Massachusetts (proposed 168 million/yr)**

- 2007- \$ 1.8 million
- 2008- \$ 5.3 million
- 2009- \$ 9.3 million
- 2010- \$23.7 million
- 2011- \$31.3 million
- 2012- \$39.9 million





## Market # 4

- Demand Resources delivering Transmission and Distribution system benefits





# Marshfield, Massachusetts

- MTC supported project
- Heavily residential customer base
- 25 MW distribution circuit 90% loaded in summer
- Proposed solution:
  - 2MW of EE, PV, and Demand Response
  - 2MW of biodiesel generation





# Merging opportunities without chaos

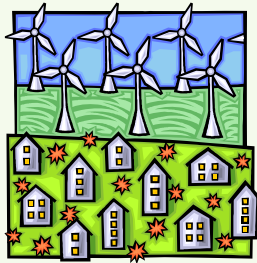
- Multiple sources of funds
- Different objectives
- Different rules: market; regulator; customer; system operator; voluntary or compliance





**\$ → Projects → M&V → Ingredients → Products → Buyers**

- FCM
- RGGI
- NOx
- SBC
- T & D inv.



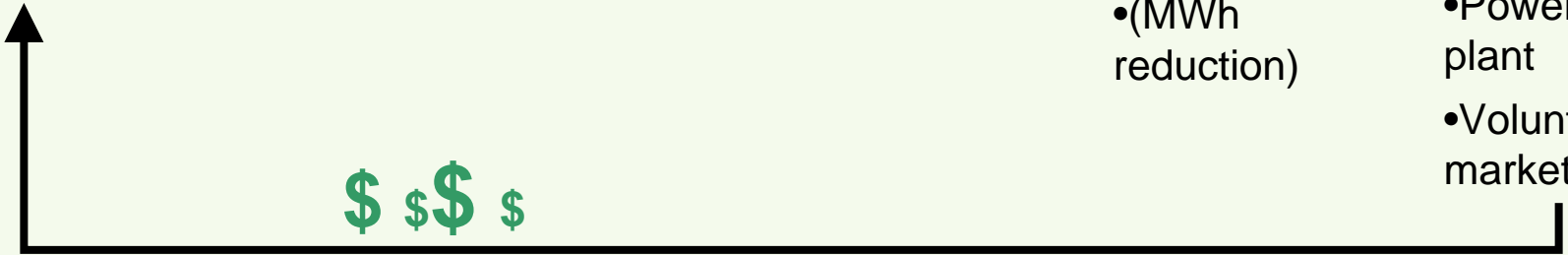
- inspection
- sampling
- baseline
- metering
- deemed

- kW
- kWh

- FCM
- CO<sub>2</sub> tons (reduction)
- NOx tons (reduction)
- White tags
- (MWh reduction)

- Utility
- State program
- Comp. Supplier
- CCX
- Power plant
- Voluntary market

\$ \$ \$ \$





# Challenges to all these markets

- Customer packages are more complex
- Complex participation requirements
- Minimum size to participate
- Measurement and Verification Standards are required for market confidence
- Accounting systems are needed for transparency
- Aggregation and balancing needed
- Trading and sales needs specialists





***Thank you!***

Steve Cowell

stephen.cowell@csggrp.com

508.836.9500 x13262

[www.csggrp.com](http://www.csggrp.com)



Conservation Services Group