



New Clean Energy Markets

ACI Home Performance Conference

Stephen Cowell, CSG

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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_x, Capacity, Demand Resources
 - What is our impact on CO₂ 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

Photos: U.S. Geological Survey and Bruce Molnia

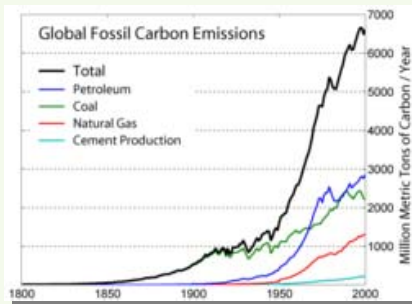




Market #1: Carbon

- Since the start of the Industrial Revolution, atmospheric CO₂

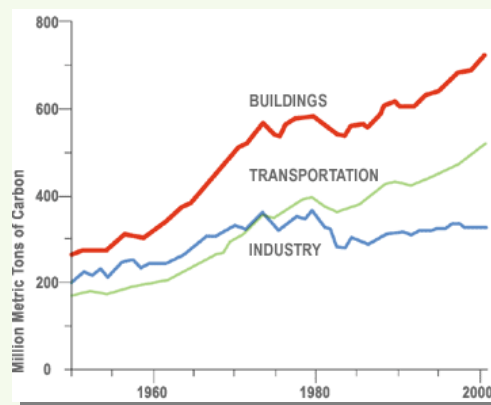
concentration has increased by about 40% - most since 1945



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Buildings guilty of GHG emissions



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

Source: Architecture 2030; U.S. Energy Information Administration statistics

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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

- CO₂ – Carbon dioxide
- Greenhouse Gas (GHG) Offsets
- Compliance Markets: RGGI/Kyoto
- Cap and Trade vs. mandatory site based reductions
- NO_x – 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

Used with permission of Dr. Hummel.



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.
 - NY, MA, VT, RI, CT and ME have publicly stated their commitment to 100% of allowances toward consumer benefit programs
 - CT, ME, RI & VT: statutory requirements to this effect





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





RGGI offsets

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



Other regions: WCI

- Western Climate Initiative
 - Feb. 2007: AZ, CA, NM, OR, WA governors
 - Spring 2007: UT, Canadian provinces BC, MB
 - Jan. 2008: Montana
 - Identifying, evaluating, implementing GHG reduction measures
 - Working cooperatively





How WCI differs from RGGI

- RGGI caps emissions from larger fossil fuel electric generation units
- Western Climate Initiative may include transportation and manufacturing sectors
- WCI considering whether to follow RGGI lead on indirect emissions; decision due late 2008



GHG reduction factors

- 1 kWh electric use reduction in NE ~ 0.91 lbs CO₂ based on Regional Power Generation mix
- 1 therm of gas use avoided ~ 11.5 lbs of CO₂ reduction
- 1 gallon of oil use avoided ~22.38 lbs of CO₂ reduction





Residential emissions

- Direct (fuel combustion onsite) or indirect (generation elsewhere for electricity use)
 - Direct emissions: easier to measure & determine ownership; indirect are not easy
 - RGGI assumes generator owns emissions; EE onsite therefore cannot claim offsets/CO₂ savings
 - Auction \$ invested in EE programs may compensate for this



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 CO₂
 - = **5.22 tons of carbon reduction**



Builder/photo: Fort Drum Mountain Community Homes





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 CO₂
 - = **3.58 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_x Allowance markets





Environmental/Emissions Markets

- 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_x set asides
- 687 tons of allowances available
- DOER could claim on behalf of efficiency programs
- ESCOs and customers could claim

Value example:

NO_x: 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

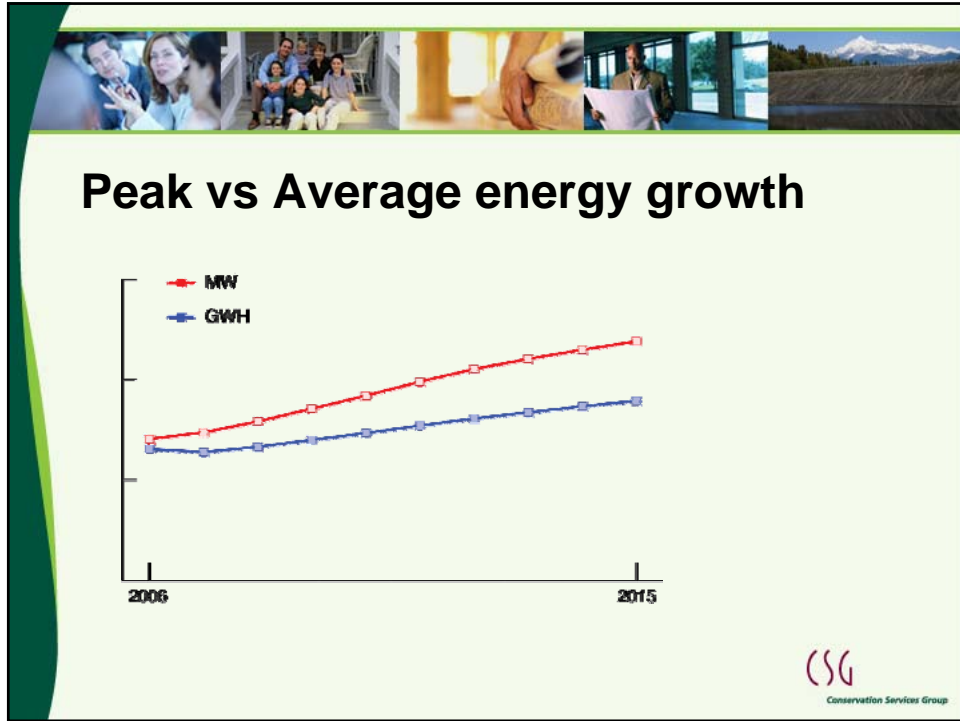
- Capacity Markets



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





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- 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
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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





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.

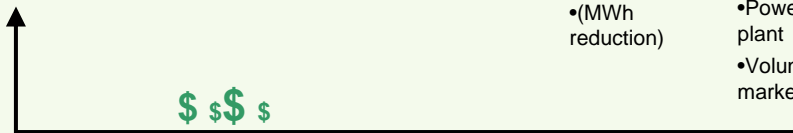


- inspection
- sampling
- baseline
- metering
- deemed

- kW
- kWh

- FCM
- CO₂ 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

