



Energy Efficiency: Beyond kW and kWh

Selling Environmental Benefits and More

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Introduction

- New opportunities for energy efficiency programs and suppliers to enhance financial viability
- Monetization of environmental and regional power market value of efficiency
 - What are finance mechanisms?
 - How do they work?





Market #1

Greenhouse Gas (GHG) offset markets





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





Why is this important?

1941



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

2004



Photos: U.S. Geological Survey and Bruce Molnia



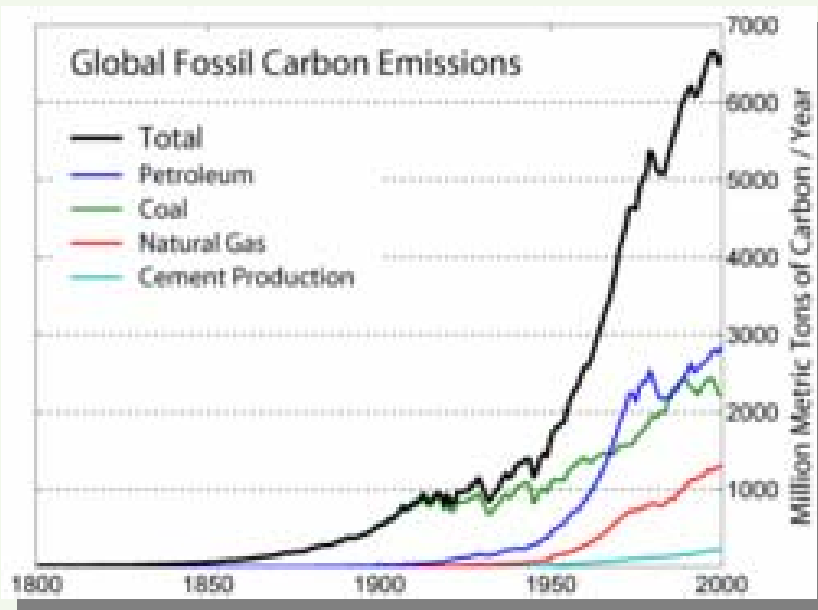
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CO₂

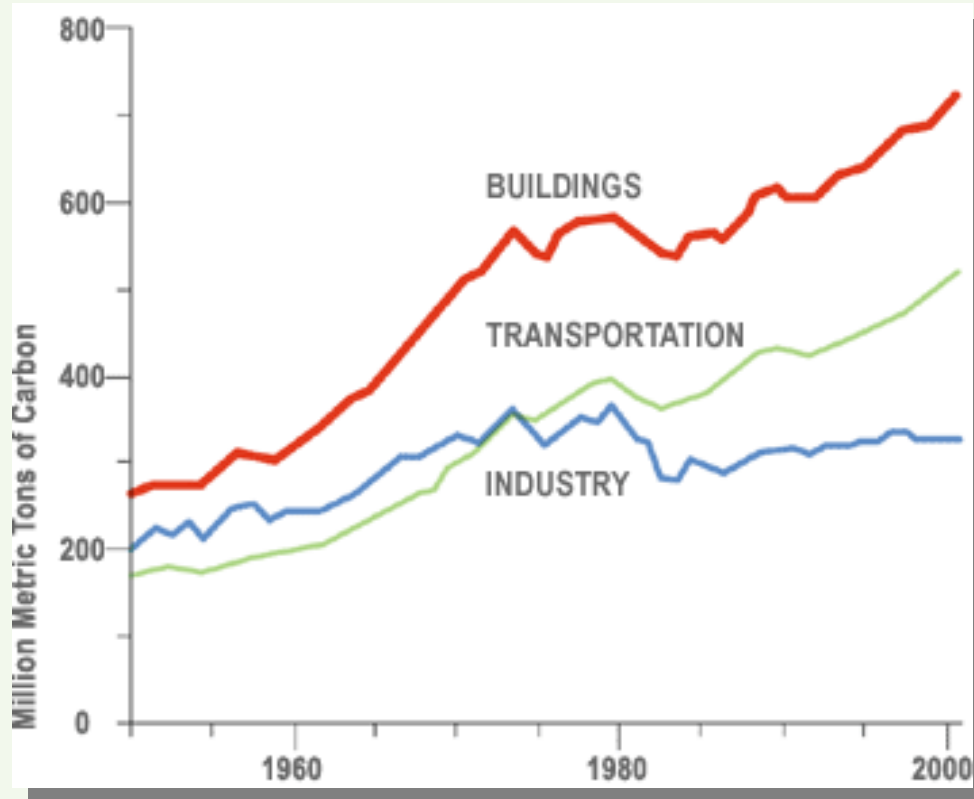
- Since the start of the Industrial Revolution, atmospheric CO₂

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

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



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Greenhouse Gases

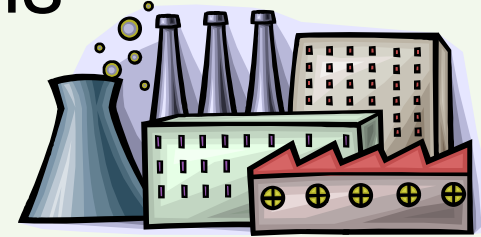
- Water vapor, carbon dioxide, methane, nitrogen oxides, and ozone contribute to global warming/climate disruption
- **Offsetting** = a way to mitigate damage in order to restore balance; a defined and measured amount of carbon emission reduction used in a voluntary or mandatory compliance system





Site reduction vs. offsets

- Factory A - 10 tons emissions with a 9 ton allowance cap
- Options:
 - 1. Reduce emissions to 9 tons (may not be possible)
 - 2. Buy 1 ton of reduced emissions from another location (this 1 ton is an offset)



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Greenhouse Gas Offsets: Verification, Certification and Accounting

- Administered by
 - Non-profit voluntary programs: Chicago Climate Exchange, Environmental Resource Trust, Carbon Neutral network
 - Government voluntary programs: California Registry and U.S. Department of Energy
 - For Compliance with mandatory Cap and Trade programs -- Currently MA 7.29, RGGI for 2009; expected in California soon





CO₂ – Primary source of GHG

- Human sources of atmospheric CO₂:
fossil fuels burned for heating, power generation and transport
- Energy Efficiency can reduce the need for heating and power generation, thus reducing CO₂ and potentially creating offsets





Greenhouse Gas Offsets

- Denomination is either “royal” English units tons CO₂ equivalent or consistent with Kyoto Metric Tonnes CO₂ equivalent
- Values in US voluntary markets: \$3-\$5
Kyoto: \$15+





GHG reduction factors

- 1 kWh electric use reduction in NE ~ 0.8 lbs CO₂ based on Regional Power Generation mix
- 1 therm of gas use avoided ~ 11.5 lbs of CO₂ reduction





Example of 1 ENERGY STAR Home

- “Laurelwood” - North Smithfield, Rhode Island
 - Increased insulation, advanced air sealing, ENERGY STAR appliances and lighting, efficient furnace
- Electricity annual savings*
 - 1559 kWh = 1247 lbs CO₂
- Natural gas annual savings
 - 236 therms = 2714 lbs CO₂



**average per unit, first 31 units*



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Carbon Cap and Trade: Creates a market for your offsets

- Regional CO₂ cap-and-trade programs
 - RGGI
 - Southwest Climate Initiative
 - Powering the Plains
 - West Coast Governor's Initiative
 - Oregon Climate Trust
 - Climate Action Plans
- National CO₂ cap-and-trade programs??





Carbon Cap and Trade

- A mandatory program administered by a governmental entity
 - Government issues (“mints”) allowances up to the Cap for each compliance period, up to total amount of emissions from regulated entities
 - Initial allowances may be given to regulated entities or auctioned to them (major policy issue)





Carbon Cap and Trade

- Regulated entities (generally large resources) must conduct business operations such that they have an allowance for each ton of GHG emitted during a compliance period
- Entities can trade among themselves to achieve mandated result





Carbon Cap and Trade

- Non-regulated entities – such as EE projects at locations not owned by regulated entities – can verify the reductions of emissions to the satisfaction of the program administrator
- These non-regulated entities will receive a GHG offset (see above) that can be sold to regulated entities, which they can use for compliance



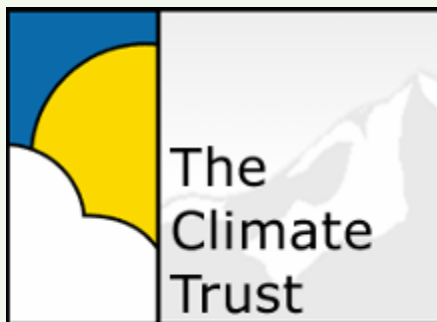


Example: Trading in voluntary program

Property owners transfer legal title to resulting CO₂ offsets to The Climate Trust



City of Portland assists property owners in improving energy efficiency



Climate Trust funds City of Portland program





Regional Greenhouse Gas Initiative

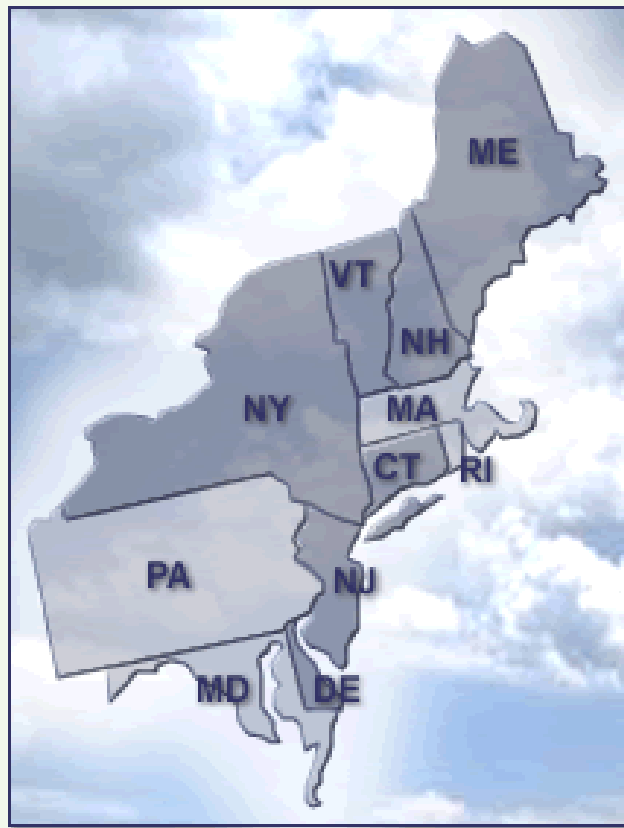


- First mandatory Cap and Trade in U.S.
 - MA, RI, & MD have joined 7 original states
 - Minimum of 25% of allowances auctioned for Public Benefit (EE)
 - NY, VT, & MA have committed to 100% auction





Regional Greenhouse Gas Initiative



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





Market #2

- Environmental/Emissions Markets





Environmental/Emissions Markets

- NO_x emissions reductions
- EPA mandated cap on emissions to eliminate smog
- State Implementation plans required when emissions exceed the cap: “non-attainment”





NO_x – Nitrogen oxides

- General term for oxygen compounds of nitrogen
 - Nitric oxide, nitrogen dioxide, Dinitrogen monoxide, nitrous oxide, nitrogen (III) oxide, Dinitrogen tetroxide, Dinitrogen pentoxide
 - Produced during combustion
 - Reactions can produce acid rain, smog, and ozone
 - Aggravate asthmatic conditions





NO_x – Public Benefit Set Aside

- Ability to claim allowances that a state has “set aside” for Public Benefit
- Administered state-by-state
 - MA is example of early action
- Denominated in Tons (royal)





Example: Massachusetts

- 1996 & 1997 DEP regulations developed to create a set aside of NO_x allowances for energy efficiency – 5%
- CSG was primary intervener
- Set asides essentially lowered cap by 5%; allowances would revert to polluters in the event that Clean Energy providers could not claim





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
- Measures assumed to last 7 years
- 5/12 rule applied
- No double dipping





Valuing offsets (Mass.)

- 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)
- CO_2 : 1 MWh = 1,236 lbs reduction = .62 tons
1 ton = \$.50-\$20
1 kWh = .00062 tons x \$2 = \$.0012 per year
x \$20 = \$.012 per year





CAIR & CMRA

- Under new EPA guidelines, similar Public Benefit set asides may be included in multiple states for different pollutants including:
 - NO_x
 - SO_x
 - Mercury





Market #3

- Capacity Markets



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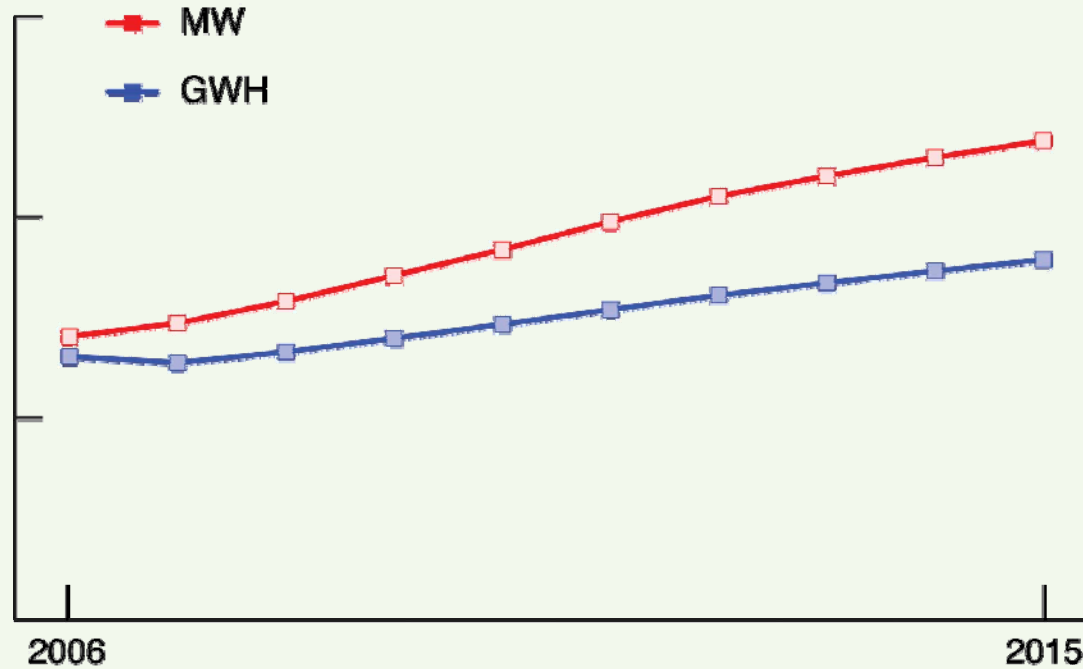
Capacity Supply

- 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





Approaches to power market needs

- Traditional:
 - Build new power plants by regulated utilities
 - Establish a new market to buy additional power plant capacity in competitive markets
- New Capacity Market:
 - New England ISO and Power Pool proposed new capacity market based on traditional model
 - CSG intervened in settlement negotiations





Advantages of Demand Resources

- Avoid reserve requirements - 15%
- Avoid T and D losses 6-12%
- Clean (efficiency, renewables, DR) or cleaner (CHP) than traditional fossil fuel generation
- Reduce market clearing prices for energy
- Local resource - higher employment and economic multiplier benefits
- Quicker deployment as a rule
- Less price volatility of fuel source
- Let's not forget national security and oil addiction





Settlement: Agreement to incorporate Demand Resources into market

- Committees charged with writing the rules to:
 - Qualify Demand Resources for transitional payments (done)
 - Qualify and incorporate Demand Resources into FCM auctions (completed 2-15-07)





Transition period

- Fixed payments for all qualifying resources
 - Dec. 1, 2006-May 31, 2007 \$3.05/kW-month
 - June 1, 2007-May 31, 2008 \$3.05/kW-month
 - June 1, 2008-May 31, 2009 \$3.75/kW-month
 - June 1, 2009-May 31, 2010 \$4.10/kW-month
- Demand resources qualify during transition





Settlement Agreement

- 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





Capacity payments

- Must be secured by participation in the Capacity market
- Denominated in \$ per kW/month winter or summer season
- State programs can participate
- Independent (merchant) suppliers can participate





Value potential

- 2 year round kW of load reduction in an ENERGY STAR Home through reduced AC, appliances, lighting etc. = \$36 (transition) to \$100 (\$8 clearing price) per year for 20 years or a NPV of up to \$1,000 or more





Market #4

- White Tags



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White Tags

- A term of art for verification that one MWh of electricity was not used during a specified time period as the result of an approved energy efficiency measure
- Administered:
 - CT first state with an official program
 - Sterling Planet launched initiative to create a voluntary market
- Denominated in MWh in a specific month and year





Use of White Tags

- Compliance Markets such as Renewable Portfolio Standards
- Voluntary Markets where a MWh of reductions can be sold as part of “green power” products
- Need similar measurement; verification and accounting to offsets and capacity values





Challenges to all these markets

- Complex participation requirements
- Minimum size to participate
- Measurement and Verification Standards
- Aggregation and balancing needed
- Trading and sales needs specialists





CSG experience

- \$12 million per year in “green tag” sales.
- \$200,000 in NO_x allowance sales
- First voluntary carbon sales starting
- \$2.4 million in early “pilot” capacity sales
- Just received first check for new capacity market
- Staff of 7 to manage emissions and tag trading





NEPOOL Alternative Resource Sector

- FERC orders creation of sixth sector within NEPOOL to represent EE, DR, DG, and Renewable Generation
- CSG intervention at FERC in 1999 and later dockets paved the way (along with others)
- Equal governance power to these resources compared with generation, transmission etc.
- This sector controls 15% of voting power in the region; CSG votes 40% of this sector - single largest voting bloc





Closing thoughts



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Thank you!

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