CARBON CAP & TRADE

Introduction

Imagine walking into your local gym and being told that a water shortage is requiring the gym owners to monitor and manage gym member water use. What strategies might the gym owners use to keep water use down? How might you behave under each option?

Maybe the owners would simply place a surcharge on every gallon of water used for showering, hand washing, toilet flushing, and refilling your water bottle at the fountain. This water tax might raise money for the gym owners, but would it reduce water use?

Maybe the owners would develop a scheme that places a maximum limit on the total amount of water used by the entire gym each month and provides incentives for efficient users and penalties for wasteful users to keep overall usage within the limit. What if the scheme creates a series of water allowances for each member based on their gym attendance? What if the owners keep a tally on usage for each member and allow efficient members and those who rarely visited the gym to trade their allowances to those who use more water? This cap and trade scheme might keep water use within the capped limits, but would it be too complex to manage?

For these two options and other alternatives, the devil is likely in the details. Though this metaphorical example used a water shortage as the natural resource being managed, governments at local, state, federal, and international scales use similar approaches to manage both resource usage as well as environmental pollution. There are both positive and negative implications to any regulatory policy.

Without comparing and contrasting policies, this fact sheet provides a brief overview of the carbon cap and trade scheme, one of the most commonly discussed options for a greenhouse gas (GHG) emissions reduction program for the United States. As energy production and consumption is a significant driver of climate change, a carbon cap and trade policy might require all Americans to think about energy and its associated emissions in the same ways our gym members think about water in our example above.

What is Carbon Cap and Trade and Who Will It Affect?

Carbon cap and trade is a performance-based policy tool that integrates mandatory GHG emissions limits (the "cap") with saleable allowances (the "trade"). By merging pollution regulations with a market-based approach, this policy is designed to reduce GHG emissions over time. Specifically, this approach allows regulated industries to determine how best to comply with the policy. Example compliance strategies can be found in Table 1.

As of December 29, 2009, a new U.S. EPA rule requires all "suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions…to submit annual reports."[1] This rule is the first step toward more complete climate change regulation and focuses on the industries contributing the largest proportion of GHG emissions in the U.S. These same industries are also likely to include the point source (i.e., single origin) emitters most affected by carbon cap and trade regulation.

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[1] Final Mandatory Reporting of Greenhouse Gases Rule (http://www.epa.gov/climatechange/emissions/ghgrulemaking.html)

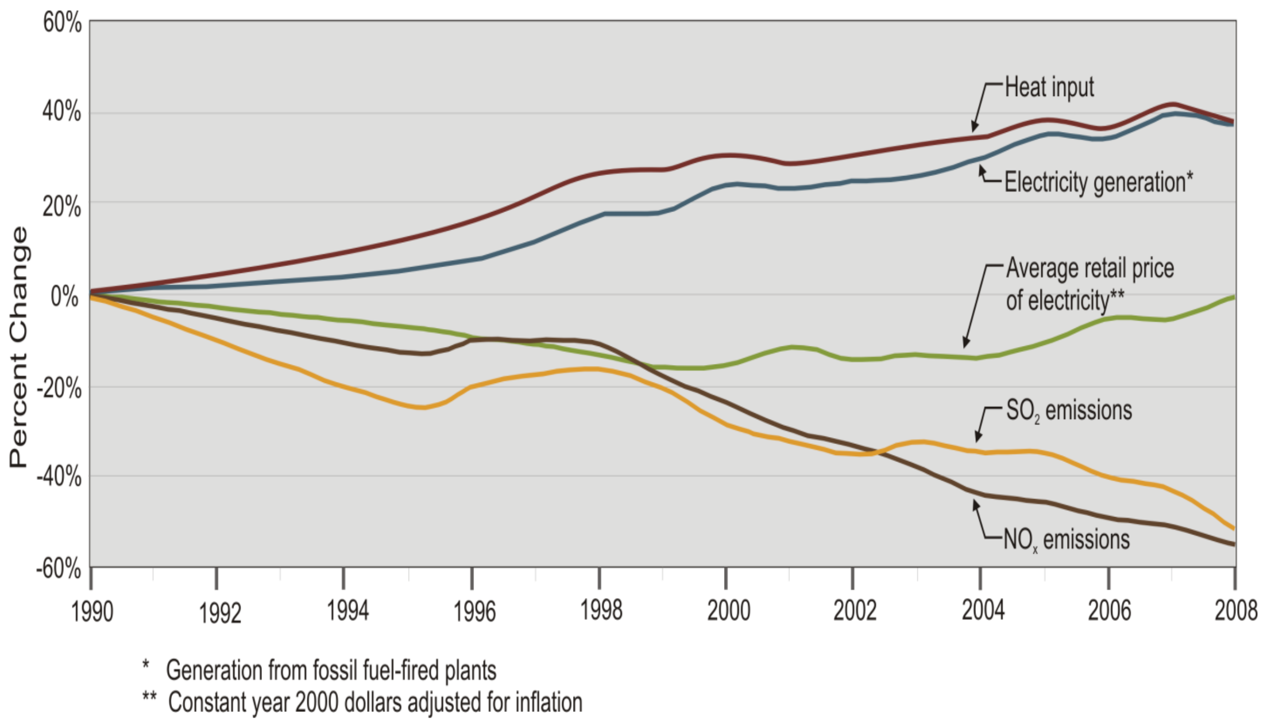
Cap and Trade: Components and Benefits

A carbon cap and trade program would likely be based on lessons learned from the successful Acid Rain Program (ARP) within the U.S. EPA Clean Air Markets. Established in 1990 within the Clean Air Act Amendments, the ARP manages sulfur dioxide (SO_2) and nitrogen oxides (NO_x), the major molecules that contribute to acid rain. Though ARP uses a more traditional "rate-based regulatory system" for NO_x, the program uses a cap and trade scheme to reduce SO_2 emissions.

ARP has been effective due to a combination of factors. First, the scope of the SO_2 cap and trade program was fairly narrow as it applied only to electric generators. Second, proven alternatives to reduce SO_2 emissions were available, including low-emitting fuels and pollution controls. Third, companies had options for how best to cost-effectively meet their emissions reduction caps.

Since active trading in the ARP began in 1995, SO_2 emissions have dropped by 52% compared to 1990 levels[2] despite fossil fuel power generation from ARP units increasing nearly 40% (Figure 1). Additionally, one study suggests "the [human] health benefits due to ARP implementation in 2010 are valued at $170-$410 billion (2008 dollars)"[3] all while the average retail price of electricity has stayed at or below 1990 levels when adjusted for inflation (Figure 1).

Figure 1: Trends in Electricity Generation, Fossil Energy Use, Prices, and Emissions from the Electric Power Industry, 1990-2008[4]



[2] ARP 2008 Progress Report (http://www.epa.gov/airmarkets/progress/ARP_4.html)
[3] Ibid
[4] Energy Information Administration (electricity generation, retail price); EPA (heat input and emissions, representing all affected ARP units), 2009 (http://www.epa.gov/airmarkets/progress/ARP_2.html)

In theory and based on the successes of the ARP, a functional carbon cap and trade program would help ensure lower compliance costs and lower administrative costs for both the government and industry when compared to alternative options. Additionally, it would reward innovation and early adoption and penalize non-compliance and failure to act. Other benefits would include increased transparency on GHG emissions sources and their progress on reduction targets, flexibility in compliance strategies, and potential for job creation in carbon accounting, regulated emitters, and all industries offering compliance products or services.

Key Components of Cap and Trade Air Pollution Programs[5]

Three criteria that are critical to the successful design and implementation of an environmentally effective and economically efficient trading program are: (1) the cap on emissions, (2) accountability, and (3) simplicity of design and operation.[6] Additional components include as follows below.

- Cap establishing GHG emissions thresholds needed to result in the desired climate response.
  - Phased approach, with the reduction target cap becoming more stringent over time.
- Point (and scope) of regulation determines which entities will be directly capped.
  - Upstream: Allowances procured by producers and importers of fossil fuels.
  - Downstream: Allowances procured by consumers of fossil fuels, in particular, large emitters of GHG such as electric utilities and major manufacturing plants.
- Allowance allocation for one or more years based on emissions history, industry sector, and other characteristics.
  - Allowances can be auctioned and/or distributed for free.
  - Proceeds from auction(s) can be recycled among households and/or affected industries.
- Annual reconciliation that balances allowance limits, sales, purchases, and banks.
- Allowance trading in secondary markets among emitting entities.
- Flexible compliance, giving each emitter freedom to choose the most efficient (cost, time, etc.) approach toward emissions reduction
  - Includes the ability to purchase offsets from non-capped sources.
- Stringent accountability through measuring, monitoring, and verification of actual emissions and offset projects.
- Clear and enforceable penalties levied for non-compliance.

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[5] Components based on the U.S. EPA SO_2 Trading Program (http://www.epa.gov/airmarkets/progress/ARP_4.html)

[6] U.S. Environmental Protection Agency, Office of Atmospheric Programs. Tools of the Trade: A Guide to Designing and Operating a Cap and Trade Program for Pollution Control. *Cap and Trade: Essentials.* http://www.epa.gov/captrade/

Table 1: Potential Marketplace Approaches within Carbon Cap and Trade

Compliance Strategy	Benefits	Challenges
GHG emissions controls	• Reduces emissions through improved technology to prevent and/or capture pollution at the source • Often includes engineered solutions that persist in performance when properly maintained	• Often includes technologies that are high cost and slow to implement • May require technological advances that do not yet exist or are not yet cost-effective
Efficiency and optimization measures	• Reduces the carbon intensity of manufacturing a product or delivering a service • Often includes engineered solutions that persist in performance when properly maintained	• May include technologies that are high cost or have large barriers to implement • May require technological advances that do not yet exist or are not yet cost-effective
Conservation measures	• Reduces the demand for a particular high carbon intensity product or service • Often includes measures that are low cost and fast to implement	• Persistence of emissions reductions may degrade over time • Depends on human behaviors, which can be highly variable and unpredictable
Purchase allowances and offsets	• Allows emitters out of compliance to purchase emissions offsets to meet their cap (assumes offsets cost less than alternative compliance measures)	• Measuring, monitoring, and verifying accuracy and authenticity of emissions offsets
Sell allowances	• Allows emitters below their cap to make money selling their excess allowances	• Measuring, monitoring, and verifying accuracy and authenticity of emissions offsets • Hoarding behavior by emitters • May require limits in the number of allowances that a single emitter can obtain
Bank allowances	• Creates flexibility for emitter as to how allowances can be used in the future	• Anticipating value of selling allowances in a future year is uncertain and involves risk

Lifestyle & Impacts

So now you might be asking yourself, how will a carbon cap and trade program affect Floridians? By design, it is expected to benefit Floridians from a reduction in the most severe effects anticipated to result from uncontrolled climate change. These benefits might include improved human health, reduced threat of sea level rise, reduced threat of species extinction and habitat alteration, and other climate related risks to both human and non-human life. However, as climate change is a global issue, it will take global action to realize these benefits.

As a market-based program, cap and trade may benefit Floridians through innovations that lead to low- or no-carbon energy sources and other products and services that evolve from the competitive entrepreneurial spirit anticipated in the scheme's flexible compliance framework. As a result of the way a cap and trade program would reorganize emitting industries around GHG emissions reductions targets, Floridians may need to prepare for lifestyle changes around products and services related to the point source emitters that fall within the domain of the regulations.

Electric utilities will likely respond to a cap and trade program by switching to generation (e.g., natural gas, nuclear and renewable) with lower GHG emissions, incorporating new technologies, and/or by investing in carbon offsets (e.g., agriculture, forest, and soil management options). Energy costs may rise with a cap and trade program and utilities can be expected to implement rates and programs that encourage overall load reductions and assist consumers in reducing usage in peak hours.[7]

However, some analyses suggest the benefits of significant, immediate, and sustained climate change mitigation action outweigh the costs of delayed or no action.[8] Fortunately, "low hanging fruit" mitigation activities like energy efficiency and conservation in homes, commercial buildings, and consumer electronics are often low cost, quick to implement, and offer rapid returns on their investment.[9]

Recently, 10 Northeastern U.S. states signed on to the Regional Greenhouse Gas Initiative (RGGI), a cap and trade program that regulates emissions of electricity generators. RGGI is the only functioning U.S.-based carbon cap and trade program. While Florida has not yet adopted any mandatory carbon reduction regulations, in June 2008, Florida Governor Charlie Crist, signed legislation authorizing the Florida Department of Environmental Protection (FDEP) to develop proposed rules for a similar cap and trade program for Florida electric utilities. This rulemaking process is ongoing, and updates can be found on the FDEP website:

- http://www.dep.state.fl.us/climatechange/rulemaking.htm
- http://www.dep.state.fl.us/air/rules/ghg/electric.htm

Potential Hurdles & Other Policy Options

As with any performance-based policy measure, there is a risk of inaccurate measurement, over/double counting, under counting, market manipulation, and other circumstances that may undermine the effectiveness of the measure. One of the most significant challenges of applying the cap and trade model to the issue of GHG emissions is the lack of proven technologies for reducing emissions. Furthermore, a carbon cap and trade program would apply to a much broader set of emission sources than the ARP example and may be applied economy-wide adding to the complexity of determining both economic and environmental impacts.

Despite the momentum of carbon cap and trade as the most likely policy option for the United States, there are still other alternatives, such as a carbon tax, under consideration. Additionally, the current bills being discussed in Congress suggest the details of any GHG emissions reduction legislation are likely to undergo extensive negotiation and deliberation as policymakers bring a broad spectrum of knowledge, expertise, and opinions to the table. Regardless of the final legislation, Americans can anticipate a non-linear (i.e., proportionally less near-term versus long-term) target aiming for approximately 80% reductions in GHG emissions by the year 2050 phased over progressively more stringent annual caps.

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[7] Parmesano, Hethie. Implications of Carbon Cap and Trade for Electricity Rate Design, with Examples from Florida. UF 37th Annual PURC conference, February, 2010.

[8] See statement, released on March 29, 1997, and endorsed by over 2500 economists including nine Nobel Laureates (http://www.rprogress.org/publications/1997/econstatement.htm)

[9] Pacala, S. and R. Socolow, *Stabilization wedges: Solving the climate problem for the next 50 years with current technologies.* Science, 2004. **305**: p. 968-972. (http://dx.doi.org/10.1126/science.1100103)

Added Value of the Florida Energy Systems Consortium

Some of the innovations and GHG emissions reduction compliance strategies may originate or be refined from research currently being conducted by faculty within the Florida Energy Systems Consortium (FESC). From technological research, to policy evaluation, to behavioral campaigns and community outreach, FESC is helping Floridians and our governmental agencies to prepare for all potential futures with federal or state GHG emissions regulations.

References and Resources

See the following links for more information about cap and trade and GHG emissions regulations:

- Florida Department of Environmental Protection, Division of Air Resource Management, Electric Utility Greenhouse Gas Cap and Trade Workshop Series. http://www.dep.state.fl.us/air/rules/ghg/electric.htm
- U.S. EPA – Clean Air Markets: Cap and Trade: Basic Information http://www.epa.gov/captrade/basic-info.html
- U.S. EPA – Clean Air Markets: Cap and Trade Resources http://www.epa.gov/airmarkets/resource/cap-trade-resource.html
- U.S. EPA – Final Mandatory Reporting of Greenhouse Gases Rule http://www.epa.gov/climatechange/emissions/ghgrulemaking.html
- Regional Greenhouse Gas Initiative http://www.rggi.org

Acknowledgements

Authors: Hal S. Knowles III[a], Patricio A. Rocha[b], Tapas K. Das[b], and Julie Harrington[c]

Editors: Kathleen C. Ruppert[a] and Barbra Larson[a]

Reviewer: Julie Ferris[d]

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[a] Program for Resource Efficient Communities, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL
[b] Department of Industrial and Management Systems Engineering, University of South Florida, Tampa, FL
[c] Center for Economic Forecasting and Analysis, Florida State University, Tallahassee, FL
[d] Florida Department of Environmental Protection, Division of Air Resource Management, Tallahassee, FL

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