Market-Based Revenue-Neutral Carbon Burning Fee-Dividend Program

Presentation to

Steve Linton-Smith

Staff of U.S. Representative Mike Coffman

by Colorado CD6 constituents /volunteers for

Citizens Climate Lobby.org

Presenters: Pete Dignan and Milt Hetrick

Oct 23, 2013

Overview

- Introductions — 5 min
  - Market-Based Revenue-Neutral Carbon Burning Fee-Dividend Economic Adjustment (Pigouvian Correction)
  - Citizens Climate Lobby - National Organization www.CitizensClimateLobby.org
  - Citizens Climate Lobby - Colorado Volunteers www.cclcolorado.org
    - Work within the system and offer information
    - Propose constructive legislation that is consistent with our democracy and our market-based free enterprise system
    - Non-partisan issue that affects our children's, our grandchildren's and our country's future
    - Maintain a National & Colorado web site . All lobbying is transparent to all citizens.
- Acknowledgment of Rep. Coffman's Accomplishments — 5min
  - Support of our Veterans
  - Speaking out about Immigration Reform – path to citizenship
  - Concern about Rare Earth Metals
- Background / Perspective: Finite Earth – Our Life Support System — 5 min
  - Step off our planet for a moment
  - Look back and reflect on what's important to live sustainably
- Our Concern — 5 min
  - Our economic system is influencing us to make choices that are not sustainable
  - Energy Sector economics need to be updated to correct for profound "externalities"
- Proposed Legislative Goals for Draft Legislation — 5 min
  - Do update economic system using market-based approach recommended by conservative economists
  - Do maintain individual freedoms
  - Do influence energy consumers to live sustainably
  - Avoid growing government or increasing deficit / debt
  - Encourage corporate responsibility to "do no harm" and avoid further regulation
- Conclusions
  - CCL Colorado Volunteers and CCL National Staff are available for support
    - to provide more information & answer questions
    - to conduct legislative research
  - CCL Colorado non-partisan Web Site (www.cclcolorado.org) will be updated to reflect Rep. Coffman's Perspectives
- Questions & Feedback from Rep. Coffman Staff — 5 min

Acknowledgment of Rep. Coffman's Accomplishments

- Support of our Veterans
- Speaking out about Immigration Reform – path to citizenship
- Legislation related to Congress' compensation
- Reduction in "permanent" Military bases around the world
- Concern about Rare Earth Metals
- Supported a "clean" CR not linked to ACA

We placed a "List of Legislation" sponsored by Rep. Coffman on the CCL Colorado web site for the benefit of our Colorado CD6 volunteers.
See: www.cclcolorado.org/Opinions/MikeCoffmanLegislation.htm

The “Blue Marble” – Our Life Support System

Sunlight: **170,000 TW**
Fossil Fuel Burning: **17 TW**

Planet Earth as we now can see it – and we can see Earth as some of the Sun’s energy reflects off the clouds, the oceans, the land. The energy retained supports all Life.

Earth as it is – our Finite Life Support System

Life depends on a thin layer of water we call the "deep oceans " – just a coat of blue paint.[4]

Life depends on a thin layer of air we perceive as the boundless sky above.[5]

- 7 billion humans [1] now share this **common** finite water and air supply with inestimably numbers of bacteria, archaea and eukaryotes (animals and plants).
- 1.9 million living species have been documented.[2]
- Together we form Earth's interdependent network of Life. [3]

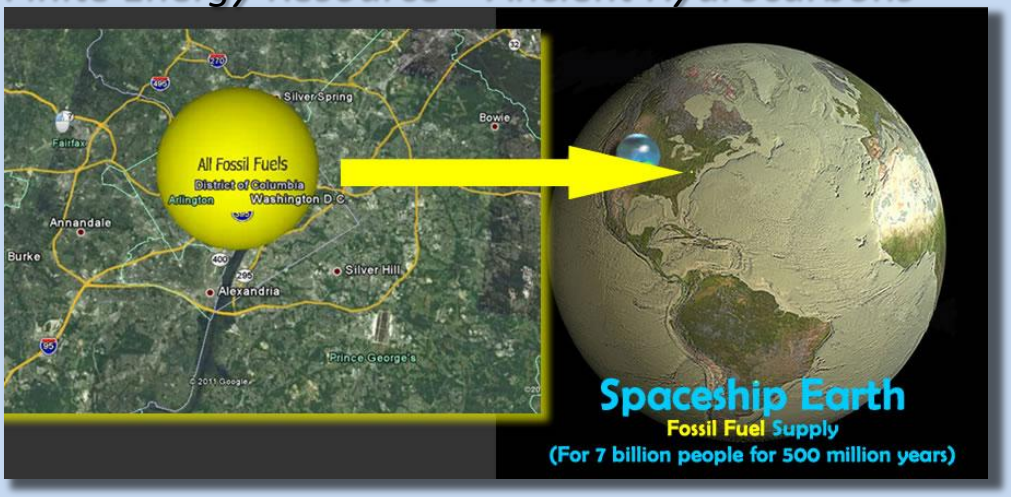
Did you spot our planet's fossil fuel tank? It's there…..

… and notice that our planet is bathed in constant Sunlight.

Finite Earth – Energy Perspective

If ALL the known reserves of ancient hydrocarbon (coal, petroleum, natural gas, tar sands oil, shale oil) were extracted and converted into an equivalent amount of oil, it would fit in the yellow tank. [6]

Finite Energy Resource – Ancient Hydrocarbons



Solar Resources - inexhaustible

The Sun provides 10,000 times more energy than humans now consume - every day.

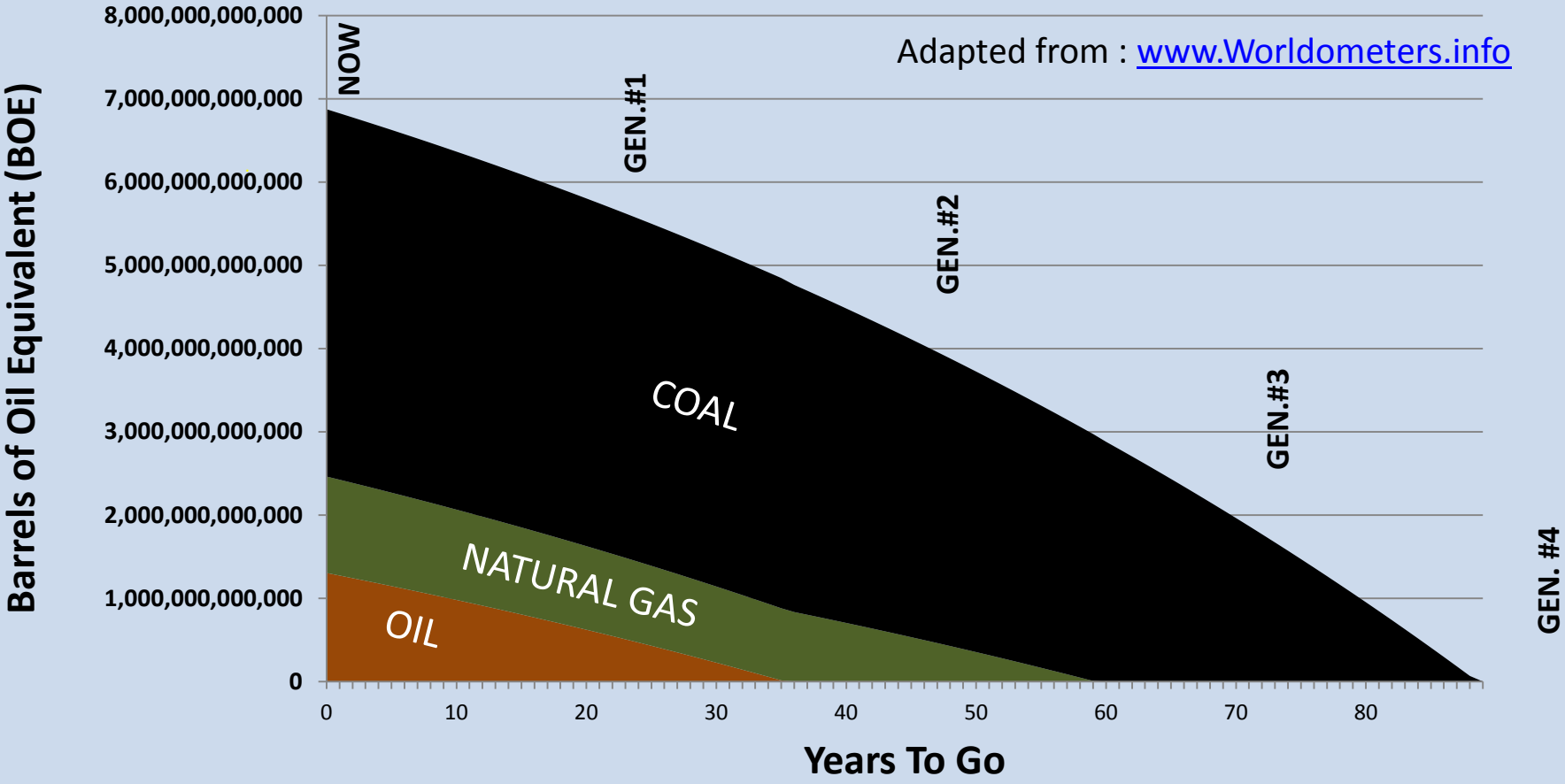
–and it will continue to do so for the next several billion years – essentially inexhaustible.
(Ref: Energy, Vaclav Smil, pg22.)

- Our planet is expected to be habitable for another 500 million years – that's 20,000,000 more human generations.
- With just a 1% / year increase in today's fossil fuel consumption rate, **our 'fossil fuel' tank will be empty in 4 more generations.** (Ref: www.Worldometers.info [6])
- The transition from finite reserves of "fossil fuel" to an inexhaustible supply of solar, wind and wave energy is inevitable - one way or another.

This observation does not require any science – just math.

Ancient Hydrocarbons ('Fossil Fuel') Available Globally

(Assumes 1% / year increase in consumption rate)



NOTE: Milt's Great Granddaughter, Isabella, (b. Sept 10, 2013) will see our planet run out of fossil fuel - unless we change our current behavior

Coal Ref: http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=1&pid=7&aid=6

Energy Policy for a Finite Earth

- An "All of the Above" Energy Policy is not sustainable for a finite planet – and is in fact irresponsible behavior if we care about our grandchildren and beyond.
- The vast majority of us in the U.S. try to be politically correct, economically astute, and law abiding people. So what's the problem?
- Our human-created political / economic / legal systems are influencing us Americans to make unsustainable energy choices in a finite Real World
    - Burning one-time-only ancient hydrocarbon reserves without any thought of paying this energy resource back is irresponsible and a **disservice** to future generations. Ancient hydrocarbons are far too valuable to burn. Better uses include transforming iron to steel, for plastics, for carbon fibers for L/W materials, etc.
    - Extracting & burning ancient hydrocarbons has detrimental effects on other humans, on other living systems AND on our global Life Support System – another **disservice**.

Good News.

- **We have viable alternative (inexhaustible) sources of energy.**
- **Economists know how to update our economic system so we can make energy choices that are sustainable.**

“Incidental Uncharged Disservices” - Pigouvian Tax

- In 1920, economist Arthur C. Pigou [7] observed that
  - “Industrialists will seek their own private interest.“
  - “When the social interest diverges from the private interest, the industrialist has no incentive to internalize the social cost”
  - As a result there are “**incidental uncharged disservices**” embedded in the free-market system (using Pigou’s terminology)
  - Today’s economists call these disservices “**externalities**”
- Pigou recommended a tax on the ‘offending product’ to adjust the market and bring the economy back to a healthy equilibrium.
- A Pigouvian correction can be justified if it represents the actual (Real World) cost of the “incidental uncharged disservice.”
- A Pigouvian Correction covers costs of repair and/or restoration.

Pigouvian Correction = Reparation Costs + Replacement Costs

"Internalize the Externality"

- N. Gregory Mankiw, professor of economics at Harvard and former Chair of the Council of Economic Advisors to President George W. Bush addresses the externalities of the fossil fuel industry and asks [8]:

  "…how do we, as a society, ensure that we all make the right decisions, taking into account both the personal impact of our actions and the externalities?" Mankiw suggests there are three approaches:

  1) "One approach is to appeal to individuals' sense of social responsibility…..unrealistic."

  2) "Use government regulation to change the decisions that people make… huge bureaucratic nightmare."

  3) **"Internalize the externality"** by charging a fee (commensurate of the disservice)for burning carbon,

  "that fee would be built into the prices of products and lifestyles… people would naturally look at the prices they face and, in effect, take into account the global impact of their choices." (a **Market-Based** correction)

- According to Mankiw, "I am confident that the economics profession has it right. The hard part is persuading the public and the politicians."

Ref: "A Carbon Tax That America Could Live With," N. Gregory Mankiw , New York Times, August 31, 2013, http://mobile.nytimes.com/2013/09/01/business/a-carbon-tax-that-america-could-live-with.html?emc=edit_tnt_20130831&tntemail0=y&

Externalities of Burning Fossil Fuels

Pigouvian Correction = Reparation Costs + Replacement Costs

Example: Externalities of burning 1 metric ton of coal to generate electrical power -

- **Reparation Costs** (pick one externality for illustration): Burning 1 metric ton of coal generates 2.86 metric tons of CO_2 that is dumped as "waste" into our common atmosphere. Nature can no longer keep up with our burning rate and CO_2 levels have increased from 300 ppm to over 400 ppm during my lifetime.
  - Reparation /Mitigation Costs to capture and sequester CO_2 ranges from $168 / metric ton of CO_2 for a pulverized coal-fired plant to $49 per metric tonne of CO_2 for a natural gas fired plant.[9]

- **Replacement Cost** (to harvest an equivalent amount of energy from renewable sources)
  - Burning a metric ton of Bituminous coal releases about **28,820,000 BTUs** [10] of energy stored in the earth (and generates about 2.86 metric tons of CO_2.) [11]
  - This amount of energy is equivalent to **8446 kWh** of electrical power.
  - Today, without any subsidies, we can install a solar PV system that generates electrical power for $.113 / kWh. (Personal Experience) To generate 8446 kWh or the equivalent amount of energy in 1 metric ton of coal would require $954.
  - Today's Replacement Cost for this ancient energy equates to $334 / metric ton of CO_2 produced from burning Bituminous coal
- Pigouvian Correction (for two externalities) = $455 to $502 / metric ton of CO_2

Pigouvian Correction for Burning Coal Exceeds $450 to $500 / metric ton of CO_2

Legislative Objectives:

Roles:

- Citizens propose legislative objectives.
- Elected representatives draft actual legislation.

Goals:

- Update the U.S. Economic system with a Pigouvian Correction to the energy sector.
- Add carbon burning fee at the first point of sale (mine, wellhead, border, etc.)
- Increase the burning fee at a pace that motivates transition to renewable energy within one generation – certainly no more than two generations. Increase fee to at least $100 per metric ton of CO_2 within 10 years.
- Protect low- and middle-income households from increased energy costs associated with the carbon tax with revenue-neutral dividend.
- Protect American businesses with border adjustment tariffs that also encourage other nations to adopt equivalent carbon pricing.
- Assure any bill is 100% revenue-neutral to avoid growth of government spending.
- Avoid introducing complicated “loopholes” for fossil extraction industry to avoid fee. Keep it simple and Market-Based

Proposed Carbon Fee-Dividend – How it Works[1]:

- A fee is placed on carbon-based fuels at the source (well, mine, port of entry).
- This tax starts at $15 per ton of fossil CO_2 emitted, and increases steadily each year by $10 as a Pigovian Correction to the free market.
- All of the money collected is returned to American households / stockholders as a dividend – each taxpayer owns one share.
- Under this plan 66% percent of all households would break even or receive more in their dividend check than they would pay for the increased cost of energy, thereby protecting the poor and middle class [2].
- A predictably increasing carbon price will send a clear market signal which will unleash entrepreneurs and investors in the new clean-energy economy.

References:

[1]The Citizens Climate Lobby. "CCL draft legislation for Carbon Fee and Dividend." http://citizensclimatelobby.org/files/images/FeeAndDividendLegProposal081811.pdf

[2]"Tax Shifts". March 21, 2011. The Carbon Tax Center. Last accessed: 5-23-13. http://www.carbontax.org/issues/tax-shifts/

Conclusions

- Ancient hydrocarbons are too valuable to burn / consume as a FUEL when other energy sources are available.
- We need these concentrated forms of carbon – to turn iron into steel, to construct carbon fibers for light weight materials, for various graphite applications, for transforming into recyclable petrochemicals (e.g. plastics), etc.
- The largest market failure in the history of humanity is the under-pricing of ancient hydrocarbons.
  - Wind, solar, and biomass generate 2.5 – 9.25 times as many jobs as coal, oil, and gas for every $1 million contribution to GDP.
  - Burning one-time-only ancient hydrocarbons costs American jobs, is unsustainable/immoral behavior that compromises future generations, and is altering
- Conservative Economists and Citizens Climate Lobby believe the best solution – one that can find common ground with both Republicans and Democrats – is a market-based revenue-neutral carbon fee-dividend program for carbon tax that returns proceeds to households.

Request to Representative Coffman

Introduce *or*
Cosponsor *or*
Support

a house bill for a steadily-rising burning fee/tax on carbon-based fuels, that:

- Returns 100% of revenue to taxpayers

(Revenue-Neutral)
- does not grow government
- does not take money out of the U.S. economy

- Provides a Pigouvian correction to the American economic system

(Market-Based)
- does internalize significant "externalities"
- does help the U.S. transition smoothly to inexhaustible sources of energy
- recognizes the Real World of today and the complex interdependence of our global life support systems

- Restores America as a global leader in both Democracy and Human Rights
  - demonstrates we value People above Profit
  - demonstrates our respect for future generations

Questions / Feedback

For additional information about the proposed market-based revenue-neutral carbon fee-dividend program, please contact local CCL volunteers:

Pete Dignan pete.dignan@cclcolorado.org

Milt Hetrick milt.hetrick@cclcolorado.org

or see

The National Citizens Climate Lobby web site:
www.citizenscliimatelobby.org

The Colorado Chapter web site:
www.cclcolorado.org

References

[1] http://www.census.gov/popclock/[2] http://www.theguardian.com/environment/2009/sep/29/number-of-living-species

[3] http://films.com/id/11468/Interdependence_of_Life.htm

[4] http://ga.water.usgs.gov/edu/earthhowmuch.html

[5] http://www.ucar.edu/learn/1_1_1.htm

[6] www.Worldometers.info

[7] Arthur C. Pigou, *The Economics of Welfare*. London: Macmillan. 1920. http://en.wikipedia.org/wiki/Pigovian_tax

[8] N. Gregory Mankiw "A Carbon Tax That America Could Live With,", New York Times, August 31, 2013, http://mobile.nytimes.com/2013/09/01/business/a-carbon-tax-that-america-could-live-with.html?emc=edit_tnt_20130831&tntemail0=y&

[9] Jeremy David and Howard Herzog, THE COST OF CARBON CAPTURE, Massachusetts Institute of Technology (MIT), Cambridge, MA, USA http://sequestration.mit.edu/pdf/David_and_Herzog.pdf

[10] http://www.blm.gov/ut/st/en/prog/energy/coal/electricity_conversion.html

[11] http://www.eia.gov/coal/production/quarterly/co2_article/co2.html

BACKUP CHARTS

Representative Coffman's Perspectives on Carbon Fee-Dividend

(http://www.cclcolorado.org/Opinions/ColoradoCongressionalReps.htm#Coffman)

District 6

Representative
Michael Coffman

BIO

District 6 Census Data

Contact Information

Web Site:http://coffman.house.gov/
E-mail: Contact Via 'Web Form.'

Washington D.C. Office:
1508 Longworth HOB
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Main District Office:
Cherry Creek Place IV, Suite 305
3300 South Parker Road
Aurora, CO 80014

Voice: 720-748-7514
FAX: 720-748-7680

MAP to Aurora office from Google Maps

Additional Info

Committees
Subcommittees

House Committee on Armed Services
- Subcommittee on Seapower and Projection Forces
- Subcommittee on Strategic Forces

House Committee on Small Business
- Subcommittee on Economic Growth, Tax and Capital Access
- Subcommittee on Healthcare and Technology

House Committee on Veterans' Affairs
- Subcommittee on Economic Opportunity
- Subcommittee on Oversight and Investigations - Chair

Sponsored Legislation

113th Congress (13 Bills)
112th Congress (21 Bills)
111th Congress (11 Bills)

LEGISLATION TO ESTABLISH A CARBON FEE-DIVIDEND

REPRESENTATIVE COFFMAN'S POSITION / PERSPECTIVES / CONCERNS

SUMMARY

Pros:
No information

TO BE DEFINED

Cons:
No information

Areas where the Carbon Fee could help Colorado District 6:
No information

DATES AND NOTES FROM CONTACTS

6/26/13 An initial contact with a Congressman's staff member in DC
10/2/13 Initial meeting with Steve Linton-Smith

Note: Legislation to establish a Carbon Fee has not been introduced in the House for the 113th Congress. In the event such legislation is initiated, Representative Coffman's perspectives will be posted here.

Campaign Contributions From Coal, Oil, Natural Gas...

112th Congress (2011-2012) $218,050
111th Congress (2009-2010) $63,750

(Ref: DirtyEnergyMoney.com)

Climate Change

- There is no question that climate change is real and has existed since the beginning of time, and will always be a factor that can negatively impact our environment. *The role that carbon emissions, from human activity, have on climate change is still a subject of debate.* **But what is clear is that we should do all that we can to reduce carbon emissions in order to improve the quality of our environment.** However, we should do so under a balanced approach that considers the economic impact of the rate at which we reduce our carbon emissions.
- I have consistently supported an all-of-the-above energy strategy. I have voted to appropriate Federal dollars to research renewable energy solutions that are not only beneficial to our environment, but will hopefully become cost competitive with traditional fuel sources.
- No doubt, there will always be those with extreme views about climate change. They do not care if their radical environmental solutions punish working middle class families. For families, who are already struggling under a weak economy, policies that do not allow for a balanced approach will only lead to job losses and higher energy costs.

Energy

- Americans must be allowed to develop American energy and end our reliance on imported oil. The United States must have an "all of the above strategy" when it comes to developing our energy resources. **This includes renewable energies such as wind, solar, bio fuels, and hydro power.** We must also increase our use of nuclear power. America's natural gas, oil and coal reserves should be used as a bridge until more cost effective substitutes can be produced.

Taking a Market-Based Approach on Carbon

- A market-based solution is favored by a number of conservatives:
  - Art Laffer, Reagan's economic advisor
  - Greg Mankiw, advisor to George W. Bush and Mitt Romney
  - George Shultz, Secretary of State under Reagan
- These conservatives embrace a revenue-neutral carbon tax because it asks fossil fuel sector to be responsible for their externalities.
  - It corrects the distortion in the free market that gives carbon-based energy an edge over alternative technology.
  - Once this correction is in place, the market will move away from fossil fuels and towards other sources of energy, (and incidentally reduce greenhouse gas emissions as well.)
  - Returning the carbon burning fee revenue to households will enable Americans to make this transition without economic pain.
- A market-based approach is preferable to more EPA regulations

Who Supports a Carbon Fee-Dividend Program

- "Among economists, the issue is largely a no-brainer. In December 2011, the IGM Forum asked a panel of 41 prominent economists about this statement: "A tax on the carbon content of fuels would be a less expensive way to reduce carbon-dioxide emissions than would a collection of policies such as 'corporate average fuel economy' requirements for automobiles." Ninety percent of the panelists agreed."
- According to Mankiw, "I am confident that the economics profession has it right. The hard part is persuading the public and the politicians."
- Mankiw established the Pigou Club to identify those who support a Pigouvian correction, an "elite group of pundits and policy wonks with the good sense to advocate higher Pigouvian taxes."
  - Anne Applebaum, William Baldwin, Gary Becker, David Brooks, Clive Crook, Greg Easterbrook, Christopher Farrell, Martin Feldstein, Fred Foldvary, Robert Frank, Bill Frenzel, **Thomas Friedman**, David Frum, Jason Furman, Jane Galt, Ted Gayer, Al Gore, **Alan Greenspan**, Tim Harford, Kevin Hassett, William Hoagland, Joe Klein, Morton Kondracke, **Charles Krauthammer**, Paul Krugman, Arthur Laffer, Tony Lake, David Leonhardt, Brink Lindsey, Ray Magliozzi, **Greg Mankiw**, Dan McFadden**, Gilbert Metcalf**, Mike Moffatt, Paul Mulshine, Bill Nordhaus, Richard Posner, Jonathan Rauch, Ken Rogoff, Nouriel Roubini, Robert Samuelson, Andrew Samwick, Isabel V. Sawhill, **George Schultz**, Robert Shapiro, Charles Stenholm, Andrew Sullivan, Nicholas Stern, **Joe Stiglitz**, Rob Stavins, **Larry Summers**, John Tierney, Hal Varian, **Paul Volcker**

Ref: "A Carbon Tax That America Could Live With," N. Gregory Mankiw , New York Times, August 31, 2013, http://mobile.nytimes.com/2013/09/01/business/a-carbon-tax-that-america-could-live-with.html?emc=edit_tnt_20130831&tntemail0=y&

Carbon to CO_2 Conversions

Metric ton vs. U.S. ton?

Metric ton = 1000 kg = 2240 lbs (approx.) = tonne
U.S. ton = 2000 lbs = short ton

Carbon Dioxide or Carbon?

Carbon emissions can be reported in units of carbon (C) or carbon dioxide (CO_2).

One molecule of CO_2 contains one carbon atom and two oxygen atoms. Carbon has a mass of 12 amu (atomic mass units); An Oxygen atom (O) has a mass of 16 amu, therefore O_2 has a mass of 32 amu.

By weight, CO_2 mass is 44 amu.

To convert carbon dioxide weight to carbon weight, multiply the amount of carbon dioxide by 12/44.

To convert a tax rate per unit of carbon dioxide to a rate per unit of carbon, multiply the former rate by 44/12 = 3.67.

The Table can be used to translate from one set of units to another. **Example:** Given a fee of $15/U.S. Ton of Carbon (See bottom row), this translates to $4.58 /Metric Ton of CO_2 (see first column)

$15 / ton				
Given a Fee of	**Translates to**			
	/Metric Tons CO_2	/Metric Tons Carbon	/U.S. Ton CO_2	/U.S. Ton Carbon
$15 /Metric Ton of CO_2	**$15**	**$55**	**$13.40**	**$49.10**
$15 /Metric Ton of Carbon	$4.09	$15	$3.72	$13.40
$15 /U.S. Ton of CO_2	$16.80	$61.60	$15	$55
$15 /U.S. Ton of Carbon	$4.58	$16.80	$4.09	$15

Coal to CO_2 Conversions

Metric ton vs. U.S. ton?

Metric ton = 1000 kg = 2240 lbs (approx.) = tonne
U.S. ton = 2000 lbs = short ton

Carbon Dioxide or Coal?

Coal is about 78% Carbon. Therefore 1 ton of coal burns, it produces 2.86 tons of Carbon Dioxide (CO_2).

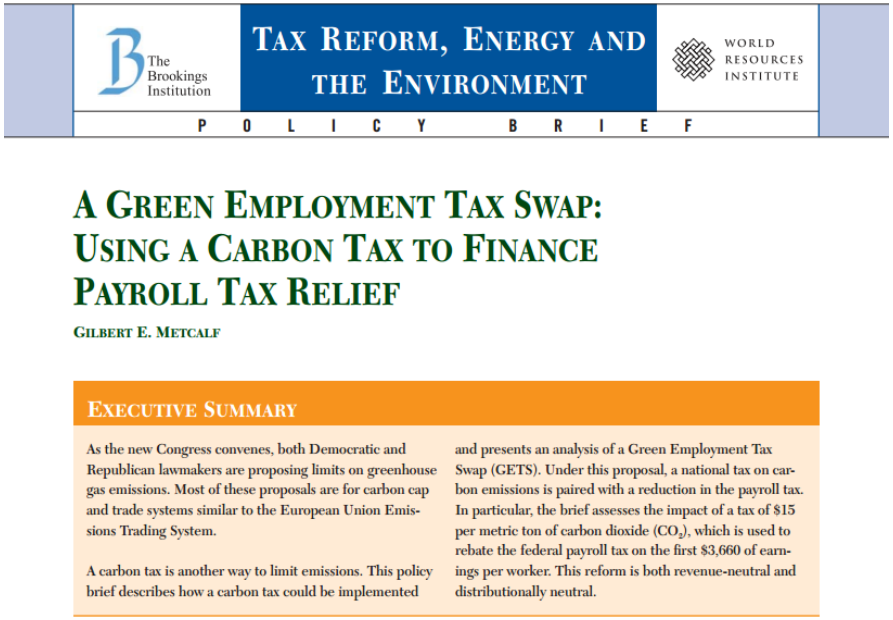
To convert a tax rate per unit of carbon dioxide to a rate per unit of coal, multiply the former rate by 2.86.

The Table can be used to translate from one set of units to another. Example: Given a tax rate of $15 / Metric Ton of CO_2, this translates to $39 /U.S. Ton of Coal .

$15 / ton				
Given a Fee of	**Translates to**			
	/Metric Tons CO_2	/Metric Tons Coal	/U.S. Ton CO_2	/U.S. Ton Coal
$15 /Metric Ton of CO_2	$15	$42.90	$13.40	$39
$15 /Metric Ton of Coal	$5.24	$15	$4.67	$13.39
$15 /U.S. Ton of CO_2	$16.80	$48.05	$15	$42.90
$15 /U.S. Ton of Coal	$5.87	$16.80	$5.24	$15

More Details About a Carbon Fee-Dividend Program

- Gilbert Metcalf, Professor of Economics at Tufts University, conducted a detailed economic analysis of Pigouvian tax of $15 / metric ton of CO_2 for the Brookings Institute.
- http://pdf.wri.org/Brookings-WRI_GreenTaxSwap.pdf



The Brookings Institution

TAX REFORM, ENERGY AND THE ENVIRONMENT

WORLD RESOURCES INSTITUTE

POLICY BRIEF

A GREEN EMPLOYMENT TAX SWAP: USING A CARBON TAX TO FINANCE PAYROLL TAX RELIEF

GILBERT E. METCALF

EXECUTIVE SUMMARY

As the new Congress convenes, both Democratic and Republican lawmakers are proposing limits on greenhouse gas emissions. Most of these proposals are for carbon cap and trade systems similar to the European Union Emissions Trading System.

A carbon tax is another way to limit emissions. This policy brief describes how a carbon tax could be implemented and presents an analysis of a Green Employment Tax Swap (GETS). Under this proposal, a national tax on carbon emissions is paired with a reduction in the payroll tax. In particular, the brief assesses the impact of a tax of $15 per metric ton of carbon dioxide (CO_2), which is used to rebate the federal payroll tax on the first $3,660 of earnings per worker. This reform is both revenue-neutral and distributionally neutral.

… A tax of $15 per metric ton of CO2 would nearly double the price of coal, assuming the tax is fully passed forward. Petroleum products would increase in price by nearly 13 percent and natural gas by just under 7 percent.
As a point of comparison, a carbon tax of this magnitude would raise gasoline prices by approximately 13 cents per gallon, assuming the tax is fully passed forward into consumer prices. This represents a price increase of less than 7 percent using average gas prices for 2005.

The largest impact would be on the coal industry. Coal consumption would decline by nearly one-third. Successful carbon capture and sequestration (CCS) will blunt the impact on the coal industry. Pricing carbon is a necessary condition for a financially viable CCS program. The impact on petroleum and natural gas output is very small. Emissions of CO2 would fall by over 700 million metric tons of CO2, a decline of 12.1 percent. Most of the decline results from decreased coal use. …

http://www.climatechange2013.org/images/uploads/WGIAR5-SPM_Approved27Sep2013.pdf

A total of 209 Lead Authors and 50 Review Editors from 39 countries and more than 600 Contributing Authors from 32 countries contributed to the preparation of Working Group I AR5.

C. Drivers of Climate Change

(IPCC WGI AR5, page SPM-8 27, September 2013)

Natural and anthropogenic substances and processes that alter the Earth's energy budget are drivers of climate change.

Radiative forcing (RF) quantifies the change in energy fluxes caused by changes in these drivers for 2011 relative to 1750, unless otherwise indicated.

Positive RF leads to surface warming, negative RF leads to surface cooling.

RF is estimated based on in-situ and remote observations, properties of greenhouse gases and aerosols, and calculations using numerical models representing observed processes.

Some emitted compounds affect the atmospheric concentration of other substances. The RF can be reported based on the concentration changes of each substance. Alternatively, the emission-based RF of a compound can be reported, which provides a more direct link to human activities. It includes contributions from all substances affected by that emission. The total anthropogenic RF of the two approaches are identical when considering all drivers. Though both approaches are used in this Summary, emission-based RFs are emphasized.

Total radiative forcing is positive, and has led to an uptake of energy by the climate system. The largest contribution to total radiative forcing is caused by the increase in the atmospheric concentration of CO2 since 1750.

(see Figure SPM.5). {3.2, Box 3.1, 8.3, 8.5}

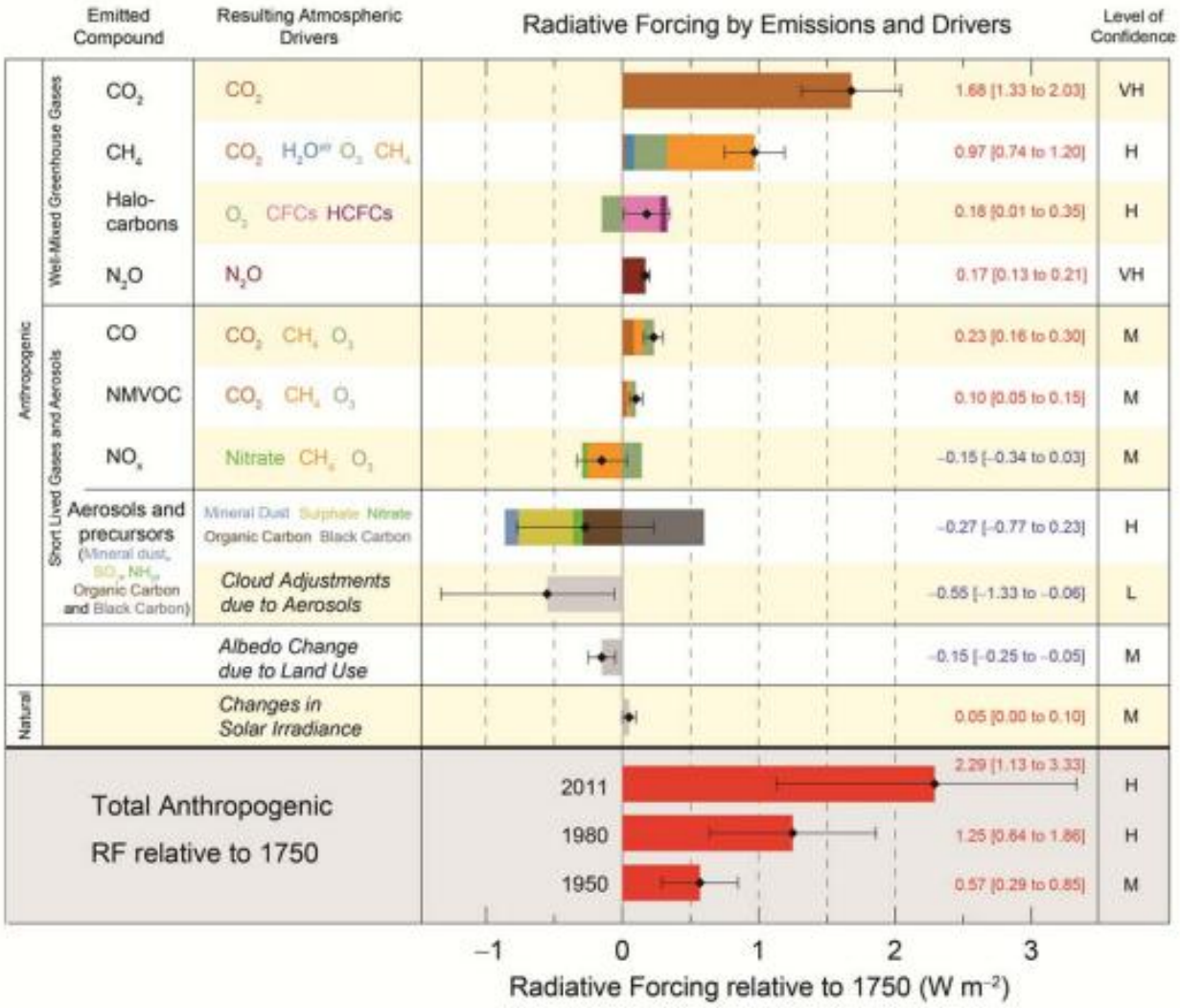


Figure SPM.5: Radiative forcing estimates in 2011 relative to 1750 and aggregated uncertainties for the main drivers of climate change. Values are global average radiative forcing (RF15) partitioned according to the emitted compounds or processes that result in a combination of drivers.

LEAGUE OF CONSERVATION VOTERS

NATIONAL ENVIRONMENTAL Scorecard

508

National	2012 Score
U.S. Senate Average	56%
U.S. House Average	42%

Colorado

Senators	State	2012 Score	Lifetime Score
Bennet, Michael	CO	100%	90%
Udall, Mark E.	CO	93%	97%
Representatives	**District**	**2012 Score**	**Lifetime Score**
DeGette, Diana L.	CO-01	97%	97%
Polis, Jared	CO-02	100%	94%
Tipton, Scott	CO-03	11%	13%
Gardner, Cory	CO-04	11%	11%
Lamborn, Doug	CO-05	6%	5%
Coffman, Mike	CO-06	9%	6%
Perlmutter, Ed	CO-07	83%	82%

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» Climate Change and Hurricane Sandy *October 2012*
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» Impacts and Adaptation Options in the Gulf Coast *June 2012*
» Climate Change & International Security: The Arctic as a Bellwether *April 2012*
» Extreme Weather and Climate Change *December 2011*

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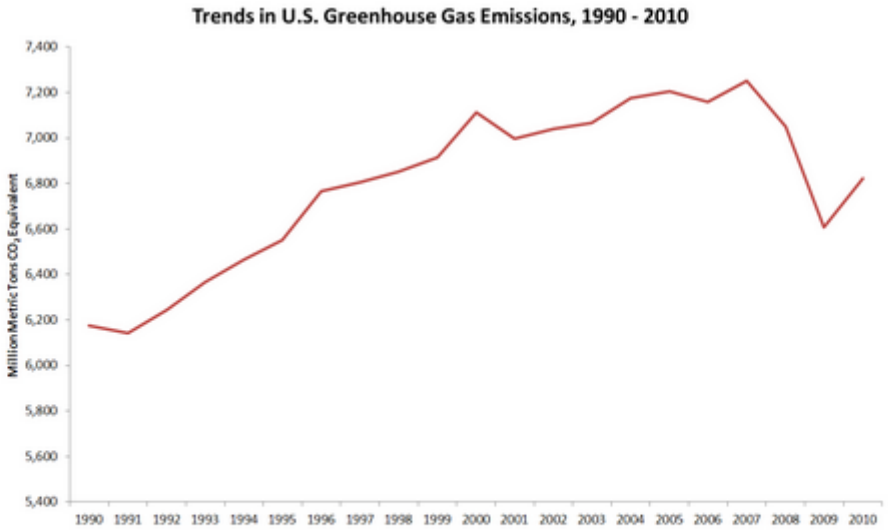
U.S. TRENDS IN GREENHOUSE GAS EMISSIONS

This figure shows the trend in U.S. greenhouse gas emissions between 1990 and 2010. Emissions increased by 10.5 percent between 1990 and 2010.

Greenhouse gas emissions declined in 2008 and 2009 for two main reasons:

1. A larger share of electricity was generated with natural gas (and to a much lesser extent renewable energy). This offset coal-fired electricity generation, which emits about two times the amount of carbon dioxide (a greenhouse gas) as natural gas-fired electricity generation per unit of electric energy.
2. Economic activity decreased during the Great Recession, which ran from December 2007 until June 2009.

Emissions increased 3.1 percent from 2009 to 2010, as economic growth returned to the United States.



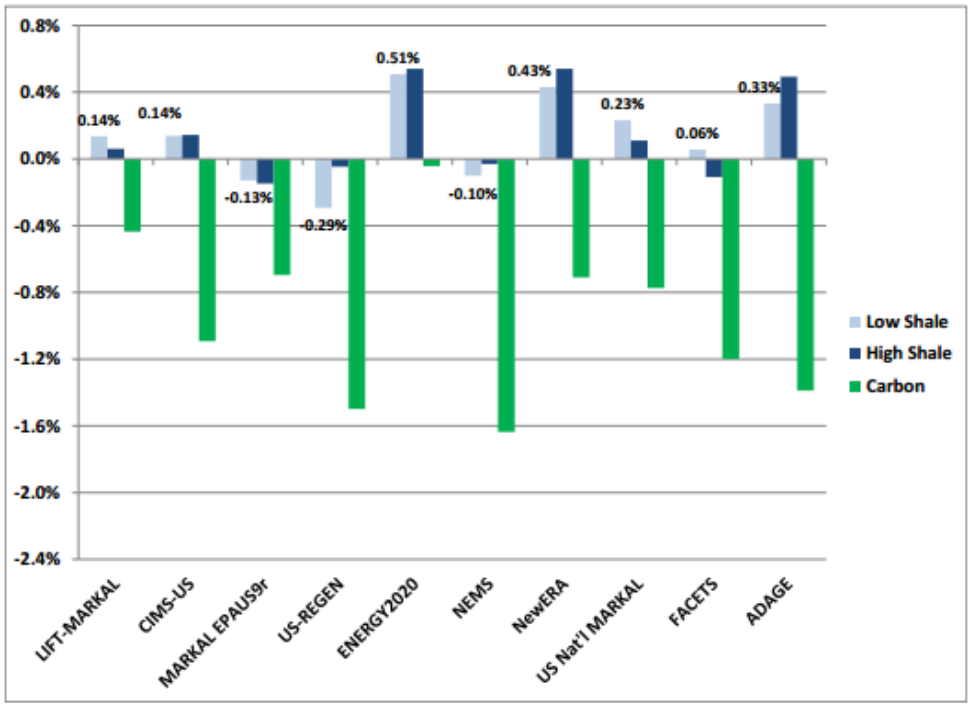
Source: Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2010 (EPA 2012)

The shale-gas boom won't do much for climate change.

(without a price on carbon)

By Brad Plumer, Washington Post, Published: October 21, 2013

Figure 12. Total US CO_2 Emissions, 2010-2035 (% per annum)



EMF Report 26
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CHANGING THE GAME?:
EMISSIONS AND MARKET
IMPLICATIONS OF NEW NATURAL
GAS SUPPLIES

Energy Modeling Forum
Stanford University
Stanford, CA 94305-4121

- **2) The shale-gas boom won't do much to solve climate change — at least not on its own.** In recent years, a glut of natural gas has helped displace coal power in the U.S. power sector and reduce carbon-dioxide emissions significantly. After all, burning natural gas for electricity produces about half the carbon dioxide that burning coal does.
- Yet many of the experts in the Stanford study don't expect carbon emissions to keep falling — at least not without further policy changes. That's because cheap natural gas is also likely to displace even cleaner sources of energy like nuclear, wind, and solar. What's more, low natural-gas prices will discourage efforts to conserve energy and boost efficiency.
- As a result, most models expect U.S. carbon emissions to rise between 2010 and 2035,
- **Bigger cuts in emissions would likely require Congress to place a price on carbon — that's what the green bars show - the effects of a carbon tax, which would drive emissions down.**

MEETING MINUTES
Steve Linton-Smith

- CCL volunteers Pete Dignan and Milt Hetrick met with Steve Linton-Smith in the Congressman Coffman's Denver office on 10/23/2013.
- Meeting was approximately 45 minutes in length.
- After a brief discussion of the proposed legislation to initiate a price on carbon, Mr. Dignan asked Mr. Smith "What would be required for Rep Coffman to be able to support this or similar legislation?" Mr. Linton-Smith indicated he did not want to speak for Rep. Coffman on this topic and suggested that CCL set up a meeting directly with the Representative. Mr. Dignan agreed to schedule a meeting and bring 3-4 other CD6 constituents.
- Mr. Hetrick discussed a few charts in the backup materials that provide a basis for the proposed Carbon Fee as a much needed Pigouvian correction to our economic system.
- When shown the page of the CCL Colorado website that provided information about Rep. Coffman and his legislative record, Mr. Linton-Smith indicated that "The Representative would not be happy to see the information about Oil and Gas contributions to his campaign – he already knows what it is." Mr. Hetrick will follow-up this comment to verify the $218,000 contribution in 2012 from oil and gas sources is correct.

Action Items from Meeting

Oct 2013

1. Provide source data for the 4 million jobs that would be generated by the Carbon Fee-Dividend program? ***Pete***
2. Schedule meeting with Rep. Coffman. May take several months to get on his schedule. ***Pete***
3. Verify the 2012 Oil and Gas contributions to the Coffman campaign that are identified on the CCL Colorado web site are correct. ***Milt***