CAP AND TRADE

The Telmarc Group, Notes No 62

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The Telmarc Group - March 2009

1 INTRODUCTION

Cap and Trade can be viewed simply as a system in which somewhat arbitrary limits to CO2 emissions are imposed upon certain areas and that if they are exceeded then the area must buy credits from some other areas which have not exceeded the limits where the purchase price is determined by some market based mechanism. If it is impossible to buy a credit when a region exceeds the limit then there may be a fine imposed by a Governmental entity.

We examine the Cap and Trade proposal in this paper by developing a simple analytical model. The model is somewhat simplistic but does reflect the correct relationships and uses the base line statistics from the Department of Energy. The intent here is not to discuss global warming but rather to analyze in a growable framework the implications of the Administrations Cap and Trade policy. The greatest issue presented in this plan, however, is the total lack of stability of the United States and even global economies at the time of this writing. Although we believe that the Administration should focus on solving or at least ameliorating the current economic meltdown, markets just do not like uncertainty, the Administration seems intent on aggressively pursuing a plant to deal with all issues simultaneously. It is our belief that any model developed in such an environment is subject to gross instabilities. Yet some thought must be applied.

Let us begin; the following is a statement of Eileen Claussen who is President, Pew Center on Global Climate Change February 26, 2009

"President Obama's budget contains the key building blocks for creating the clean energy economy we so badly need. It re-emphasizes the President's support for an economy-wide greenhouse gas cap-and-trade program, sets aggressive but achievable targets for reducing emissions, invests in new low-carbon technologies and helps those families, communities, and businesses that need assistance in transitioning to a low-carbon economy. Most importantly, the budget also recognizes that now is the time to act and calls for a trading system to be up and operating by 2012. Excerpt from the President's budget."

She follows this with the excerpt from the Obama Budget:

"The Administration is developing a comprehensive energy and climate change plan to invest in clean energy, end our addiction to oil, address the global climate crisis, and create new American jobs that cannot be outsourced. After enactment of the Budget, the Administration will work expeditiously with key stakeholders and the Congress to develop an economy-wide emissions reduction program to reduce greenhouse gas emissions approximately 14 percent below 2005 levels by 2020, and approximately 83 percent below 2005 levels by 2050. This program will be implemented through a cap-and-trade system, a policy approach that dramatically reduced acid rain at much lower costs than the traditional government regulations and mandates of the past. Through a

100 percent auction to ensure that the biggest polluters do not enjoy windfall profits, this program will fund vital investments in a clean energy future totaling $150 billion over 10 years, starting in FY 2012. The balance of the auction revenues will be returned to the people, especially vulnerable families, communities, and businesses to help the transition to a clean energy economy[1]."

The problem is simply the emission of CO2 by the three major fossil fuels; gas, oil, and coal. Simply coal is a very polluting fuel. The following Table shows what some of the problem is. Coal is almost twice as polluting as natural gas and petroleum oils are in between. Clearly nuclear, wind, and solar are zero polluters. However nuclear has few homes and there is no grid to wind and solar and in addition environmentalists seem to hate every one for some reason.

CO2/Btu (Quadrillion Btu/Million metric Tons)

Petroleum	Natural Gas	Coal
77	53	95

Thus we analyze here the way to get to the emissions that are targeted using a cap and trade. Let us first list the emissions. The intent is that by 2050 the emissions are at 20% of what they were in 2005. The following Table is exemplary of what is being targeted up until 2030[2]. We focus on this period only. The data below is for electric power generation only. The intent of Cap and Trade seems however to cover all sources which we shall discuss shortly.

1.1 The Basic Data

The total summary of emissions is presented in the Table below. This is a gross overview of the emissions in the current time period. The Administrations ingoing proposal is to get them to 20% of the 1990 level by 2050. That is a dramatic reduction and as we stated we propose a reduction to 20% of the 2005 levels as shown in the following.

[1] Source URL: http://www.pewclimate.org/statement/obama-budget/2.26.09 http://www.whitehouse.gov/omb/budget/ http://www.pewclimate.org/print/6408

[2] The data is drawn from DoE Reports http://www.eia.doe.gov/oiaf/forecasting.html

Table: Carbon Dioxide Emissions by Sector and Source (million metric tons carbon dioxide equivalent, unless otherwise noted)

	2006	2007	2008	2009	2010
Residential					
Petroleum	89	88	94	95	89
Natural Gas	237	257	268	270	261
Coal	1	1	1	1	1
Electricity	871	904	878	872	887
Total	1,198	1,250	1,242	1,239	1,238
Commercial					
Petroleum	45	45	43	43	42
Natural Gas	154	163	170	170	167
Coal	6	7	6	6	6
Electricity	837	872	856	851	878
Total	1,043	1,088	1,076	1,070	1,093
Industrial					
Petroleum	420	406	420	410	385
Natural Gas	395	405	418	412	405
Coal	186	175	181	187	175
Electricity	652	653	641	621	618
Total	1,653	1,640	1,660	1,630	1,583
Transportation					
Petroleum	1,975	1,974	1,866	1,841	1,865
Natural Gas	33	35	36	36	36
Electricity	4	4	4	4	4
Total	2,013	2,014	1,907	1,882	1,904
Electric Power					
Petroleum	66	66	38	38	38
Natural Gas	339	376	371	360	343
Coal	1,947	1,980	1,960	1,939	1,995
Other	12	12	12	12	12
Total	2,364	2,433	2,380	2,349	2,388
Total by Fuel					
Petroleum	2,596	2,580	2,461	2,427	2,419
Natural Gas	1,159	1,237	1,264	1,249	1,212
Coal	2,140	2,162	2,147	2,133	2,177
Other	12	12	12	12	12
Total	5,907	5,991	5,884	5,820	5,819

Many observations can be made concerning the above Table. Coal is the greatest polluter and it does so primarily in the production of electricity. Petroleum is second with its dominant use in autos. To reduce that use frankly means returning to bicycles

and somehow trying not to breath, the CO2 generated from the exercise of a human would defeat the purpose. For obvious reasons the horse and other animals would also be prohibited.

1.2 Possible Approaches to Reduction

The following Table depicts each area; its dominant CO2 emitters, what would be an optimal replacement strategy and what possible downside risks could be,

Area	*Dominant Source*	*Optimal Strategy*	*Downside Implications*
Residential	Electricity Natural Gas	Since electricity is the dominant source then the pressure must be on the reduction of electricity emissions.	Since this primarily depends on electricity there is no major issue at this point.
Commercial	Electricity Natural Gas	Since electricity is the dominant source then the pressure must be on the reduction of electricity emissions.	Since this primarily depends on electricity there is no major issue at this point.
Industrial	Electricity Petroleum and Natural Gas	Since electricity is the dominant source then the pressure must be on the reduction of electricity emissions. However Petroleum and Natural Gas are significant and thus the Industrial players may very well find themselves controlled at the source, namely their plants with a cap and trade.	Since this primarily depends on electricity there is no major issue at this point.
Transportation	Petroleum	This means some form of dramatic gas mileage improvement, especially with growth in autos as well as alternative cars such as electric.	The increased taxes on gasoline at the pump would potentially cause a total collapse to the US economy. We are not Europe, we are spread out and borderless which has been the reason we are so creative. Kill that and you kill the US
Electric Power	Coal is dominant	We discuss this herein. The options are nuclear, wind, solar.	This really is an issue of replacement and build out of grids. The loss of coal revenues will totally bankrupt sections of the country. It also assumes that there is no way to get clean coal emissions which is simply false. It is a question of price.

1.3 How Cap and Trade May Work

In this paper we consider a simple cap and trade system.

1. The Administration places a cap on CO2 emissions by region or nationally. This cap will be a complex issue because part of the problem is do you cap at the source or at the end point of use. We will assume here that you cap at the source. The cap also will be reduced year by year until it meets some arbitrary goal.

2. Emitters of CO2 are adjudged as contributing emissions based upon the amount of fuel the use not by actual CO2 emitted. Thus there is a certain amount of CO2 in metric Ton, mTon, emitted per X BTU of coal or the like.

3. Emitters can then determine what their cap is on some pro rata basis using fuel expended.

4. Then an emitter is either in excess or surplus, namely they emit too much or emit too little.

5. Then we assume some exchange to swap these credits and debits, at a small fee of course, and there is some guru who has established and profits from the exchange.

6. If the emitters exceed the cap they then pay the Government for this excess, say at $50 to $1,000 or more per mTon of CO2.

The following Table is the proposed target reductions for a cap and trade;

Year	*Reduction*	*Total Emissions Target (000,000 metric Ton)*
2006	100%	
2007	100%	
2008	100%	
2009	100%	
2010	98%	2,302
2011	96%	2,255
2012	94%	2,208
2013	92%	2,161
2014	90%	2,114
2015	88%	2,067
2016	86%	2,020
2017	84%	1,973
2018	82%	1,926
2019	80%	1,879
2020	78%	1,832
2021	76%	1,785
2022	74%	1,738
2023	72%	1,691
2024	70%	1,644
2025	68%	1,597
2026	66%	1,550
2027	64%	1,503
2028	62%	1,456
2029	60%	1,409
2030	58%	1,362

The further out periods actually become much more difficult to achieve with any form of fossil fuel. It should be remembered that not only are emissions being reduced but the population is increasing at the same time so there is an automatic reduction in emissions per person!

Simple, yes but it is the dynamics that catch you.

1. You may initially think that wind and solar and nuclear will win, since they emit no CO2.

2. The dynamic then begins. The environmentalists may very well object to each of the non-CO2 producing means. Wind makes the Cape and the waterfront in New Jersey look bad or kill birds or the like. Nuclear, well we all know nuclear, everyone hates it. And solar, well there are crowds who oppose that as well since it changes the ecology of the desert. Thus the zero emitters are blocked while the cap decreases each year to 20% of the 1990 number, which is about 10% of now!

3. But also the population keeps getting larger and each person demand more BTU per person and thus the total demand is exploding.

4. Coal being the greatest emitter and taxed the most is displaced by gas and oil, increasing the demand on gas and oil, driving the price of gas and oil higher and higher.

5. Since the environmentalists stopped all zero emitters, the excess emissions are now taxed at more than $50 per mTon thus exponentially adding to the cost of a BTU.

6. The combined emission tax and costs of gas and oil drive the cost of BTU into an unstable mode.

The developers of this have failed to account for the dynamics and instabilities in this process. This is the deadly embrace problem.

First, the exchange for a Cap and Trade will have its own options and Credit Default Swap markets as well and these may be extra-territorial since we are taxing the heck out of everything here. It will be an unregulated market for better or worse.

Second, the dynamics of the process are not well understood. The model we present herein shows that with a growing exogenous population that the demands per person are unbounded. The model also shows that increased demand for gas will drive up prices and thus make this more costly and then with the added tax from any failure to meet a cap will be additive to the consumer driving capital from the market and dramatically reducing growth. In addition, with the cap being national there will also be the effect of driving out industrial users who will seek other locations not affected by caps and thus a further pressure on reducing American industrial competitiveness. These secondary effects will dominate in the midterm and will further exacerbate the problem. Finally are the lag effects. The power grid must be expanded first before any substantial new sources and be added. This will require significant environmental compromises which will result in litigation and delay. Then we expect to see the same as deployment of nuclear, wind and solar are attempted. Thus it is possible that in the 2010-2030 time periods nothing substantial will occur except the increase of the cap taxes.

Third, there is always the market finding ways around the barrier imposed. For example, if this is a US only cap and trade, what would stop Mexico from building hundreds of coal burning electricity plants at the border, and then sending the electricity across the border under a NAFTA clause and thus swamping the US with low costs electricity, all within the US cap and trade, but spewing the CO2 from the border across the US. This is but one example of the unintended consequences. One must investigate all such possible consequences.

Fourth, the cap and trade approach assumes that the Government can soak up capital and put it to better use than entrepreneurs. This will mean that if some entrepreneur can find a way to reduce the CO2 from coal that there very well not be the capital to exploit that opportunity because the capital has been extracted for other uses most of which are not beneficial.

However the exogenous effectors of delay such as the environmentalists will allow for reduction in caps while delaying the introduction of alternative means. The market distortions will result in uncertainties and shortages each reflected in explosive prices.

1.4 A Very Simple Example

Let us consider a very simple example. Let us assume that we continue as we are now, and that we use the DoE numbers to 2030. We also assume that we look at constant dollars and that we have the caps as of 2005 and we reach 20% of 2005 by 2050 starting in 2010.

The following Table depicts the result. In this simple example we have a few steps.

First we set the start year and the end year and from that we calculate the percent reduction from the start year.

Second, then we calculate the total emissions from coal, oil and gas. This is subtracted from the cap determined in the first step.

Third, we set the fee for emission on an annual basis. Note that this is an added tax above and beyond the fees that may result from trades and price escalations.

Fourth we determine the gross fee charged for excess.

Fifth we determine that fee per person per year.

Note from this Table that the tax per person rises to over $2,000 per year. This is almost $6,000 per household. The Government would obtain $200 billion per year by 2020. This tax removes massive amounts of capital from the economic system and places it in the hands of the Government. The tax is also totally regressive.

Reduction	*Year*	*Total Emissions Target (000,000 mTon)*	*Oil Emissions*	*Gas Emissions*	*Coal Emissions*	*Total Emissions*	*Excess Emissions (000,000 mTon)*	*Tax per mTon CO2*	*Tax on Excess $000,000*	*Population*	*Tax Per Person per Year*
100%	2006		66	339	1,947	2,352					
100%	2007		66	376	1,980	2,422					
100%	2008		38	371	1,960	2,368				303,597,646	
100%	2009		38	360	1,939	2,337				306,272,395	
98%	2010	2,302	38	343	1,995	2,376	74	$50.00	$3,712	308,935,581	$12.02
96%	2011	2,255	38	334	2,023	2,395	140	$75.00	$10,530	311,600,880	$33.79
94%	2012	2,208	39	338	2,039	2,416	208	$100.00	$20,842	314,281,098	$66.32
92%	2013	2,161	39	333	2,045	2,416	256	$125.00	$31,947	316,971,485	$100.79
90%	2014	2,114	39	326	2,046	2,411	297	$150.00	$44,567	319,667,598	$139.42
88%	2015	2,067	39	329	2,058	2,426	359	$175.00	$62,801	322,365,787	$194.81
86%	2016	2,020	39	337	2,064	2,440	420	$200.00	$83,970	325,062,633	$258.32
84%	2017	1,973	39	345	2,073	2,457	484	$225.00	$108,794	327,755,597	$331.94
82%	2018	1,926	39	353	2,081	2,473	547	$250.00	$136,848	330,443,861	$414.13
80%	2019	1,879	39	355	2,089	2,484	605	$275.00	$166,383	333,127,039	$499.46
78%	2020	1,832	39	355	2,089	2,483	651	$300.00	$195,327	335,804,546	$581.67
76%	2021	1,785	40	364	2,082	2,485	700	$325.00	$227,564	338,489,500	$672.29
74%	2022	1,738	40	372	2,093	2,504	766	$350.00	$268,056	341,195,095	$785.64
72%	2023	1,691	40	387	2,092	2,519	828	$375.00	$310,351	343,921,378	$902.39
70%	2024	1,644	40	399	2,099	2,537	893	$400.00	$357,230	346,669,052	$1,030.46
68%	2025	1,597	40	402	2,114	2,556	959	$425.00	$407,436	349,439,199	$1,165.97
66%	2026	1,550	40	403	2,133	2,576	1,026	$450.00	$461,812	352,228,788	$1,311.11
64%	2027	1,503	40	400	2,163	2,603	1,100	$475.00	$522,388	355,035,364	$1,471.37
62%	2028	1,456	40	394	2,195	2,629	1,173	$500.00	$586,617	357,861,695	$1,639.23
60%	2029	1,409	40	388	2,236	2,664	1,255	$525.00	$658,914	360,710,638	$1,826.71
58%	2030	1,362	41	382	2,285	2,708	1,346	$550.00	$740,122	363,584,435	$2,035.63

1.5 The Administration Proposal

In this body of this White Paper we present a simple cap and trade system which assumes an independent third party exchange. We assume that the Government issues a set of credits to each generator of electricity based upon a national or regional scheme. Thus the credits limit emissions and the independent exchange allows for trade of credits amongst the players at a nominal price. If one cannot meet the cap then one can purchase an added credit at some increasing price thus motivating a shift from one method to another.

However this is NOT what the Administration proposes. What it proposes is that the Government auctions all credits to the highest bidder until all credits are out. Then the bidders go to an exchange and buy and sell them further marking up the credits. Then there is a hard cap and there is no carry over from year to year. This is a hard and fast system. We know having participated in auctions that they can be notoriously inefficient. The winners curse if the main downside and the prices are frequently bid up. Thus this credit bidding will just be passed down to the consumer and it becomes a highly regressive tax.

The basic elements of any cap and trade are thus the following:

1. Cap: Who sets the cap and how is it allocated, monitored and managed.

2. Credits: Credits are needed to generate BTUs and CO2. There may be penalties if the Cap is exceeded without the credits.

3. Issuance of Credits: This can be done on a regional out of Government basis or by a means which involves the Government.

4. Exchange: This is a third party exchange or an auction or any other means to reallocate on some financial basis the credits to achieve an economically effective scheme.

5. Excesses: There must be a way to deal with excess needs. That is cold winters or hot summers.

6. Reserves: This is saving credits year to year of using some now to be banked from latter years.

All of these and other issues must be incorporated in an effective cap and trade system. In addition one must also recognize that if it is found that this does not stop the alleged warming then it must end. However the Administration proposal is really a taxation

scheme hidden in the garb of a cap and trade system. Indeed the amount of capital extracted from the economy may very well be massive and by itself it may equal healthcare in a short period of time.

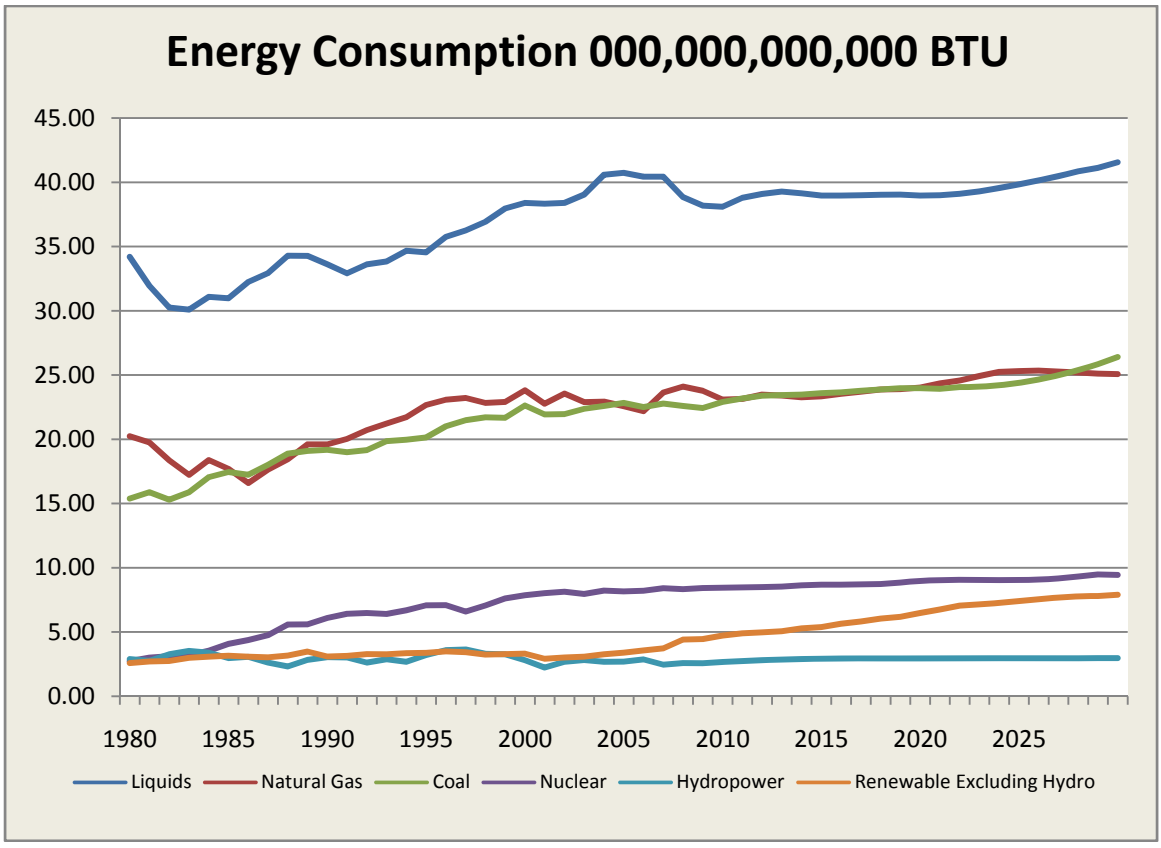
We focus primarily on electricity generation in this report. Expansion to industrial is fairly straight forward. However the expansion to transportation and residential is not so readily accomplished.

2 CURRENT AND PROJECTED DEMANDS

In this section we focus primarily on Electric power generation since as we have shown before it is a major contributor.

2.1 Demands in BTU

The following Figure depicts the current DoE projects for Energy consumption by specific means of such production.



The above demonstrates several key facts:

1. In totality petroleum still is the largest player dominated by transportation and residential and commercial.

2. Coal and gas compete for second place. Clearly if one institutes a cap and trade then the coal drops and gas increases.

3. There is a projected growth of nuclear but it is quite limited. To meet the caps this must see dramatic acceleration which we are not at all optimistic about.

4. There is an optimistic growth in renewables.

The following Table summarizes the details for the target period.

Table: Demand Electric Power (quadrillion Btu, unless otherwise noted)

Year	*Distillate Fuel Oil*	*Residual Fuel Oil*	*Liquid Fuels Subtotal*	*Natural Gas*	*Steam Coal*	*Nuclear Power*	*Renewable Energy*	*Electricity Imports*	*Total*
2006	0	0.54	0.65	6.39	20.46	8.21	3.76	0.06	39.67
2007	0	0.56	0.67	7.06	20.84	8.41	3.45	0.11	40.67
2008	0	0.38	0.49	7.00	20.66	8.34	3.84	0.12	40.56
2009	0	0.39	0.49	6.79	20.44	8.42	4.06	0.09	40.42
2010	0	0.38	0.49	6.46	21.03	8.45	4.41	0.08	41.06
2011	0	0.38	0.50	6.30	21.32	8.47	4.57	0.09	41.38
2012	0	0.38	0.50	6.38	21.49	8.50	4.68	0.07	41.75
2013	0	0.38	0.50	6.27	21.55	8.53	4.80	0.08	41.86
2014	0	0.38	0.50	6.14	21.57	8.63	4.97	0.08	42.03
2015	0	0.38	0.50	6.20	21.69	8.68	5.05	0.06	42.30
2016	0	0.38	0.51	6.35	21.75	8.69	5.25	0.06	42.73
2017	0	0.38	0.51	6.50	21.85	8.71	5.39	0.06	43.13
2018	0	0.38	0.51	6.65	21.94	8.74	5.53	0.07	43.55
2019	0	0.39	0.51	6.70	22.02	8.85	5.62	0.07	43.90
2020	0	0.39	0.51	6.69	22.01	9.00	5.77	0.07	44.18
2021	0	0.39	0.51	6.86	21.95	9.04	5.88	0.07	44.42
2022	0	0.39	0.51	7.01	22.05	9.05	5.92	0.06	44.73
2023	0	0.39	0.51	7.30	22.05	9.05	6.02	0.04	45.09
2024	0	0.39	0.51	7.52	22.12	9.05	6.09	0.05	45.46
2025	0	0.39	0.52	7.58	22.28	9.05	6.18	0.06	45.79
2026	0	0.39	0.52	7.60	22.49	9.09	6.22	0.08	46.13
2027	0	0.39	0.52	7.53	22.81	9.17	6.27	0.10	46.53
2028	0	0.40	0.52	7.43	23.15	9.32	6.37	0.11	47.02
2029	0	0.40	0.52	7.31	23.58	9.48	6.38	0.08	47.48
2030	0	0.40	0.53	7.20	24.10	9.44	6.40	0.10	47.90

2.2 Emissions of CO2

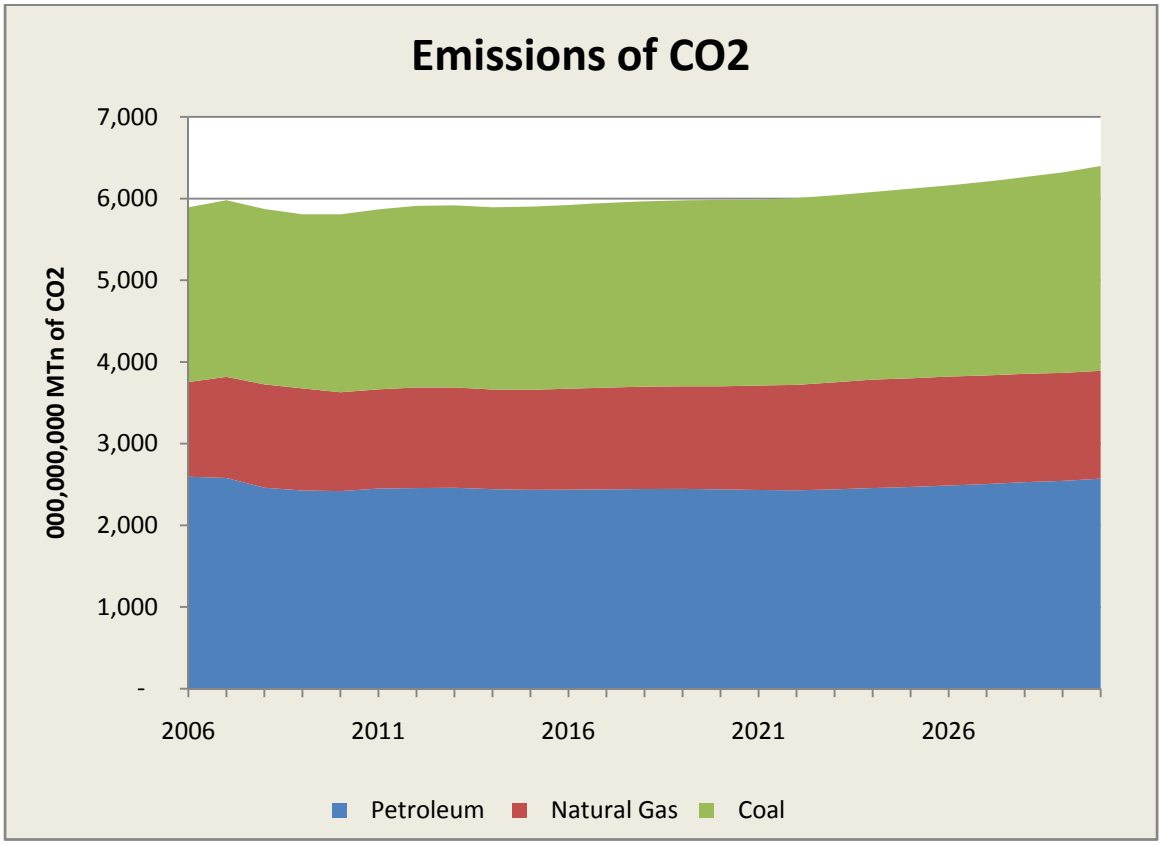
The separate sources of energy which emit CO2 can be analyzed in detail however we will focus on electricity since it is the dominant factor. The emission of CO2 in autos and other transportation methods will be examined elsewhere[3].

[3] Telmarc will issue a White Paper on the transportation elements in mid 2009.

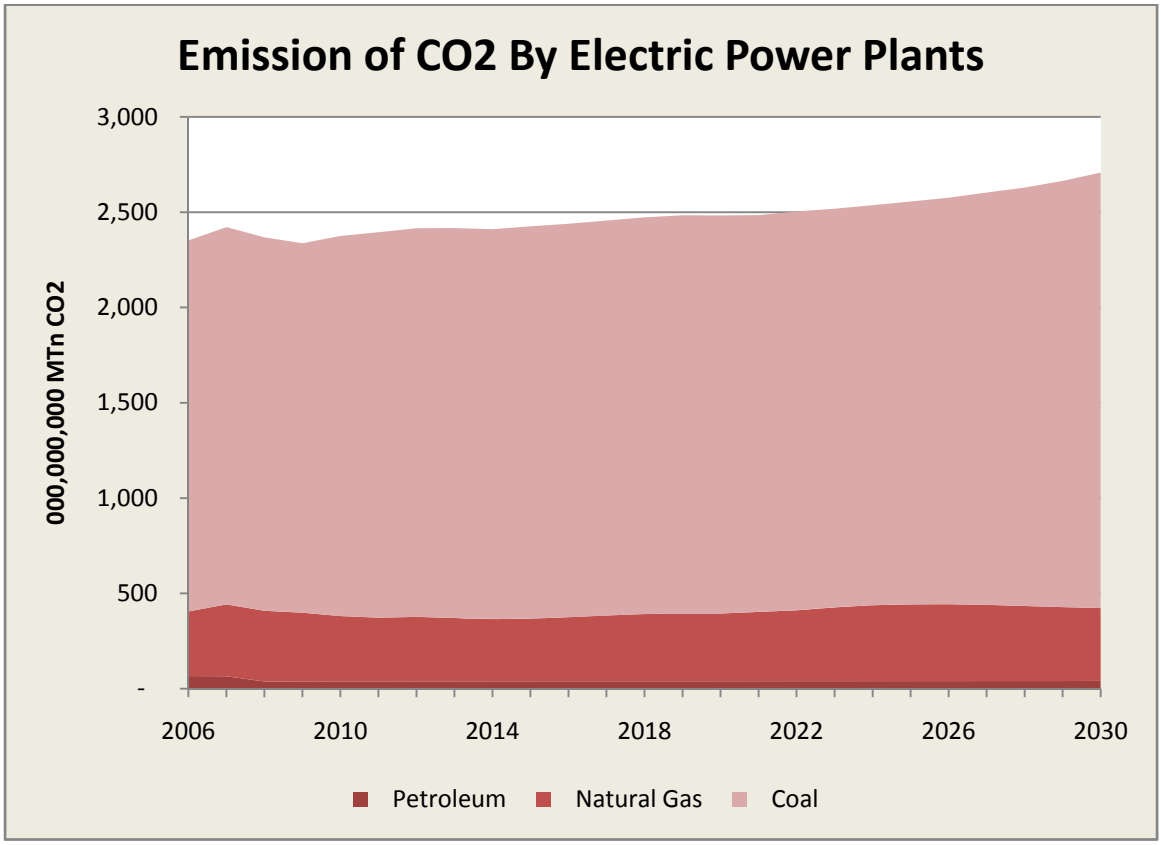
Emissions Electric Power (million metric tons carbon dioxide equivalent, unless otherwise noted)

Year	*Petroleum*	*Natural Gas*	*Coal*	*Other*	*Total*
2006	66	339	1,947	12	2,364
2007	66	376	1,980	12	2,433
2008	38	371	1,960	12	2,380
2009	38	360	1,939	12	2,349
2010	38	343	1,995	12	2,388
2011	38	334	2,023	12	2,407
2012	39	338	2,039	12	2,428
2013	39	333	2,045	12	2,428
2014	39	326	2,046	12	2,423
2015	39	329	2,058	12	2,437
2016	39	337	2,064	12	2,451
2017	39	345	2,073	12	2,468
2018	39	353	2,081	12	2,485
2019	39	355	2,089	12	2,496
2020	39	355	2,089	12	2,495
2021	40	364	2,082	12	2,497
2022	40	372	2,093	12	2,516
2023	40	387	2,092	12	2,530
2024	40	399	2,099	12	2,549
2025	40	402	2,114	12	2,568
2026	40	403	2,133	12	2,588
2027	40	400	2,163	12	2,615
2028	40	394	2,195	12	2,641
2029	40	388	2,236	12	2,676
2030	41	382	2,285	12	2,720

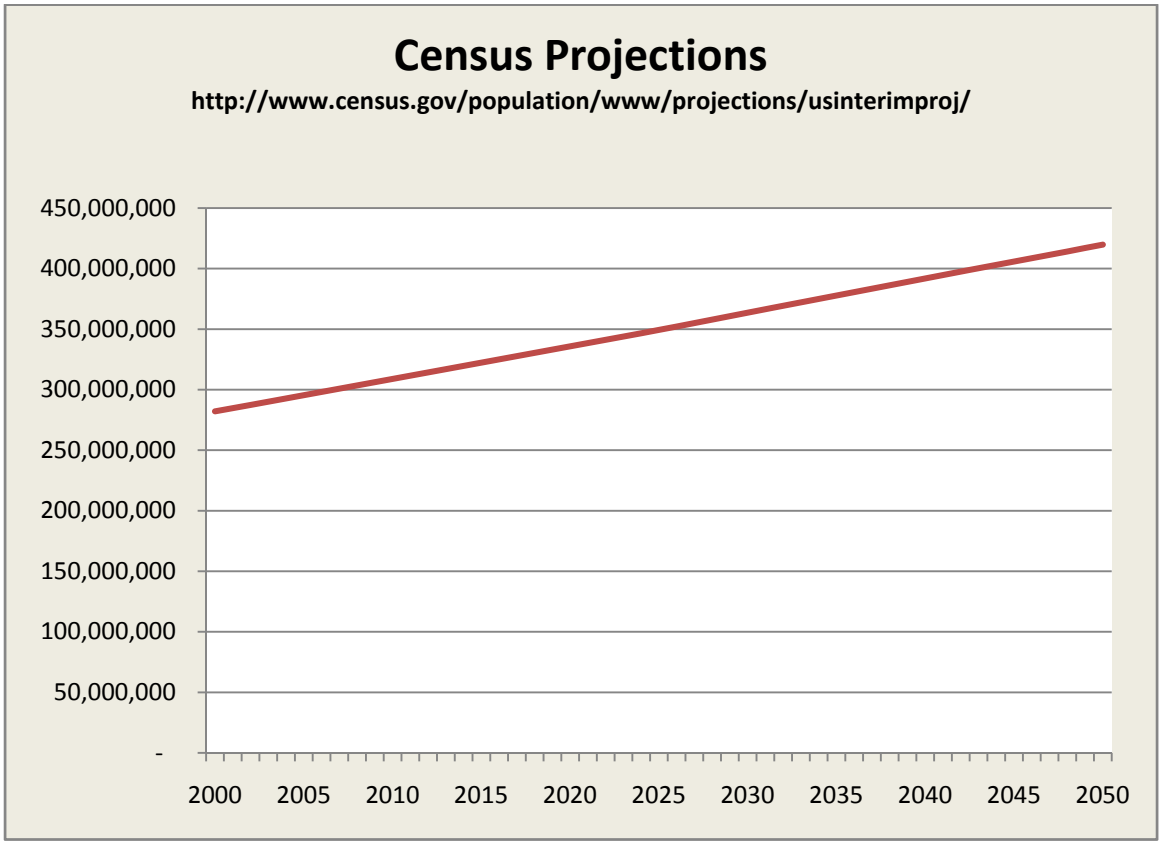
The following graph depicts the emissions of CO2 in the total market for the three main elements over this period.



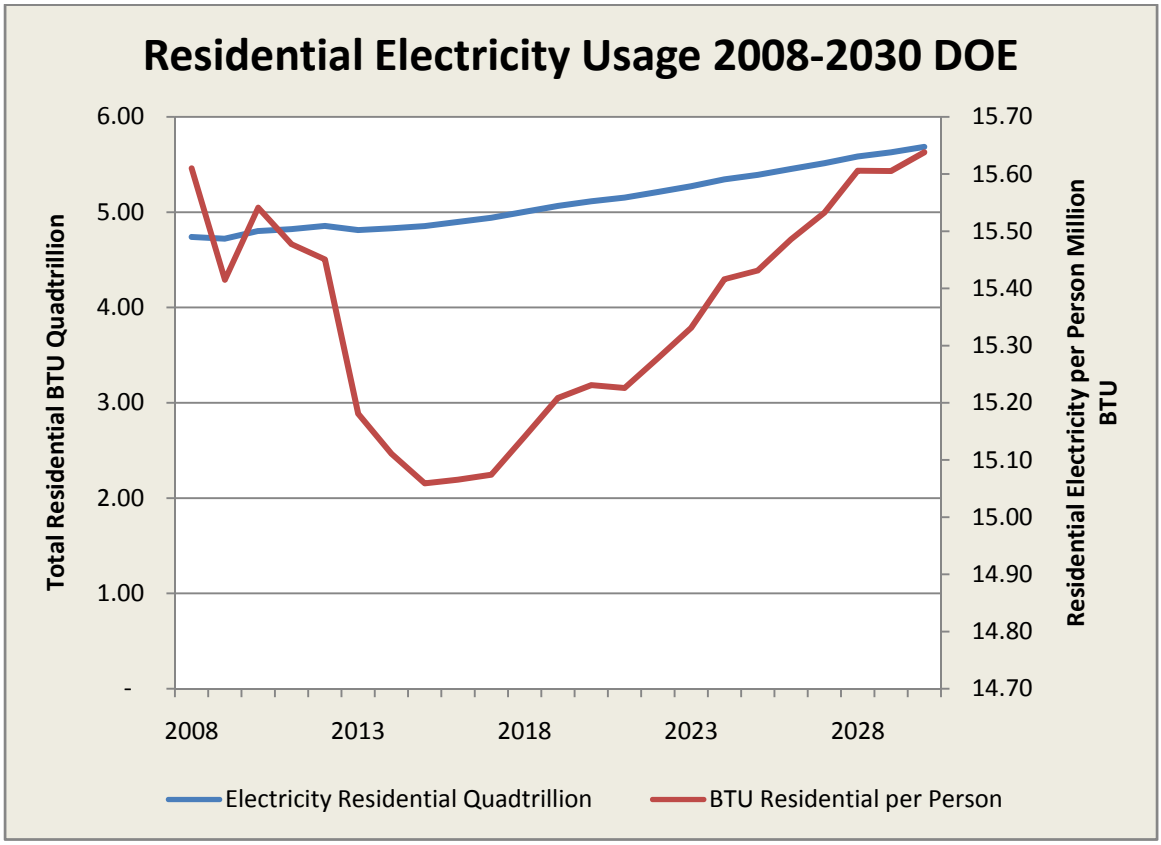
The following is CO2 emission for electricity alone.



The final key statistic that reflects the dimension of the issue is the population growth. The following Figure is the Census bureau projections during the study period. By 2050 we are almost at 450,000,000 populations from just over 300,000,000 at the present. This is a fifty percent increase and yet we must reduce the CO2 emissions to 20% of what it was in 1990, when the population was about 250,000,000. That means roughly we have doubled the population and reduced emissions by 80%. Thus the emissions per person are to be driven down almost



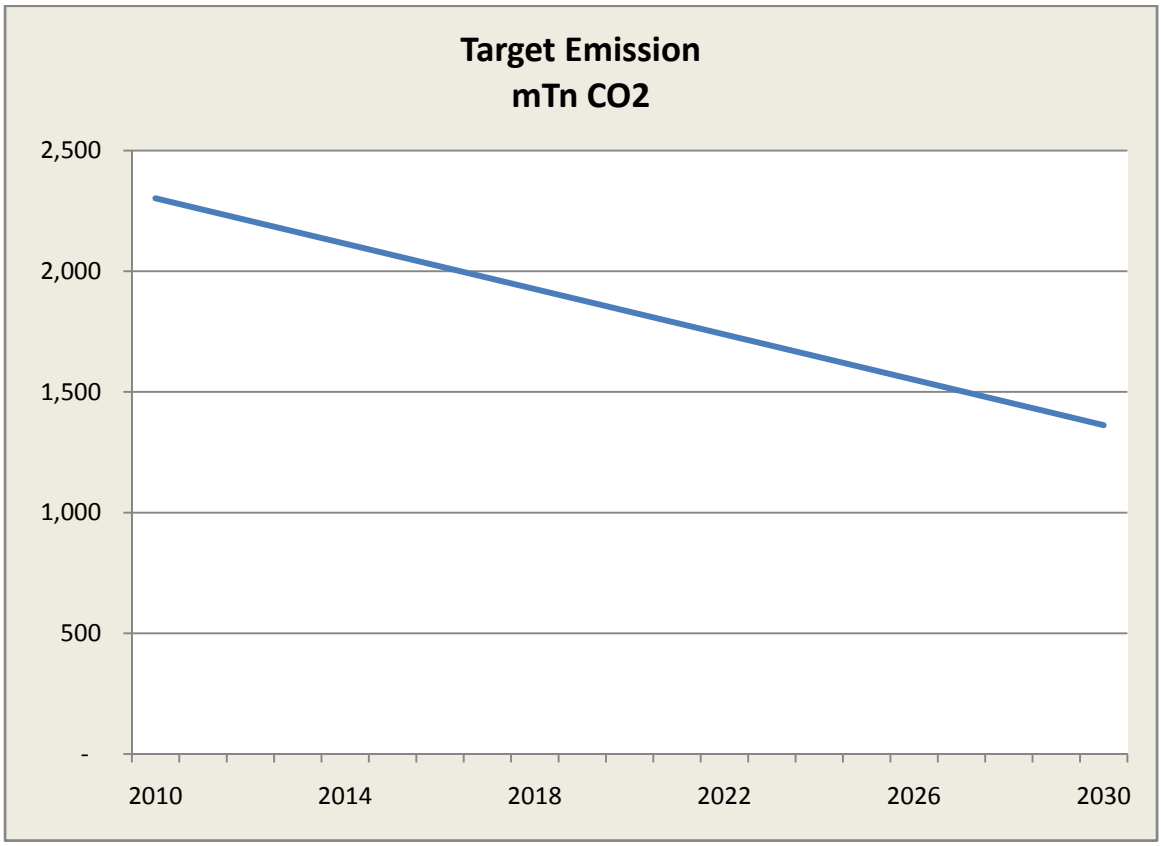
Finally we present in the following the per person usage of electrical energy in the time period.


Residential Electricity Usage 2008-2030 DOE
Total Residential BTU Quadtrillion
Residential Electricity per Person Million BTU
6.00
5.00
4.00
3.00
2.00
1.00
-
15.70
15.60
15.50
15.40
15.30
15.20
15.10
15.00
14.90
14.80
14.70
2008
2013
2018
2023
2028
Electricity Residential Quadtrillion
BTU Residential per Person

3 TARGET EMISSIONS

In this section we review the target emission standards. The current position is to get to 20% of the 1990 emissions by 2050. We assume that we get to 20% of 2005 by 2050. That is less of a stringent target and yet it also is a significant burden.

The following graph depicts the targeted CO2 emissions that reflect the later of the two above stated goals.



The following Table present the targeted changes required to meet some of this reduction. It shows the elimination of coal by 2022. This means the end to a massive US industry and the destruction of hundreds of thousand jobs as well as the massive destruction of small coal mining communities. All one has to do is drive through West Virginia and see what will result, what little is there now will just disappear.

Reduction	Year	Total Emissions Target (000,000 mTon)	Oil Emissions	Gas Emissions	Coal Emissions
100%	2006				
100%	2007				
100%	2008				
100%	2009				
98%	2010	2,302	38	343	1,995
96%	2011	2,255	38	334	2,023
94%	2012	2,208	39	338	2,039
92%	2013	2,161	39	424	1,896
90%	2014	2,114	39	478	1,706
88%	2015	2,067	39	637	1,517
86%	2016	2,020	39	743	1,327
84%	2017	1,973	39	849	1,138
82%	2018	1,926	39	1,008	948
80%	2019	1,879	39	1,114	758
78%	2020	1,832	39	1,273	569
76%	2021	1,785	39	1,379	379
74%	2022	1,738	39	1,486	190
72%	2023	1,691	39	1,592	-
70%	2024	1,644	39	1,645	-
68%	2025	1,597	39	1,645	-
66%	2026	1,550	39	1,645	-
64%	2027	1,503	39	1,698	-
62%	2028	1,456	39	1,698	-
60%	2029	1,409	39	1,751	-
58%	2030	1,362	39	1,751	-

The drop in the above will continue. We have assumed in the above that offsets of coal have somehow been replaced by gas. The issue of course is that gas demand will increase and so will gas prices. There have been studies on elasticity of gas demand and pricing but our estimate is that gas will increase three to fourfold in price under this scenario in constant dollars.

4 CAP AND TRADE SYSTEM

We now look in a bit more detail on the cap and trade system. Consider the Figure below. This is a bit more complicated than the one we presented in the Introduction. It assumes that there is an open market for credits that can be bought and sold via an exchange. We further assume, like a free market exchange, that options can be created and then that credit default swaps and the like may get patched on. Thus there is a buying and selling of credits and the producers will work in that market. We further assume that if the buyers and sellers have adequate credits to clear the market that the Government will play no role. This may be wishful thinking but let us begin there.

Then we assume that if the targets or caps cannot be met that then the buyers and sellers must purchase the credits from the Government bank at possibly ever increasing rates as the cap is lowered. Again this is a proposal which may or may not ever be what the Government settles on. However, it includes most of the key factors which one could see. There are perturbations by allowing credits to be held over from year to year and the like but they all fundamentally are isomorphic to this model. As has been stated: "you can put lipstick on a pig but it is still a pig".

The basic algorithm is as follows:

1. Government established cap provides a maximum of emissions.

2. There then must exist an allocation of emissions per unit. What a unit is must be defined. Assume a unit is a power plant at some KW or BTU level of production. Then the cap is determined on emissions per BTU. That is the cap per plant is X metric Tons of CO2 per BTU. The problem is how to measure the CO2. This most likely will be accomplished by the mix of fuels generated. Thus a coal plant is known to have Y mTon CO2 per BTU. A wind plant has zero. Thus the wind plant can sell credits to the coal plant. This increases the price of coal power further driving it out of business. However if clean cola can be produced there is no metric for it so no matter what coal will be gone.

3. If the caps cannot be met, say there are no sellers of credit left, and then the plant can pay the Government an ever increasing fee for the credits, increasing to a point where it becomes uneconomical to run the business.

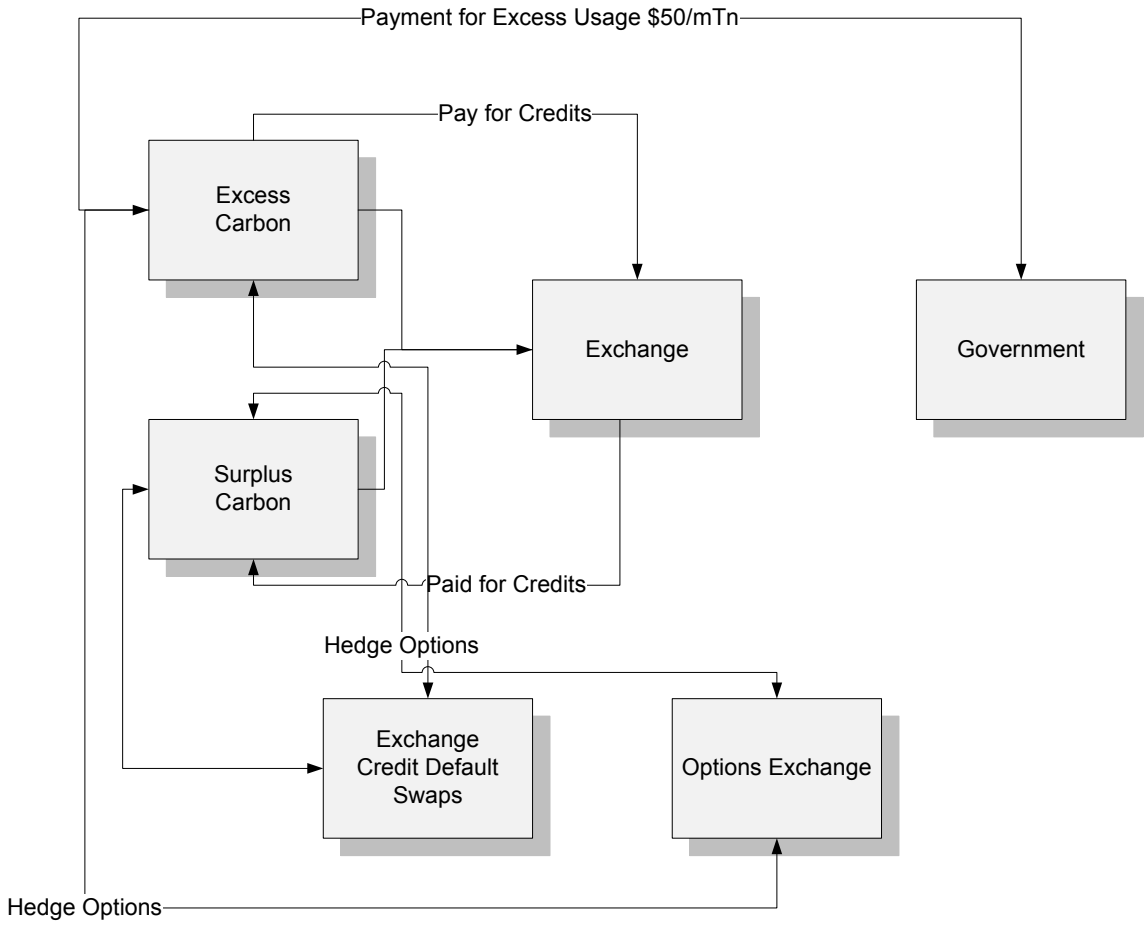
4. There is a question as to what the price is at the market level versus what the price is from the Government. Will the Government set a price above market clearing or set a process separate from market clearing.

5. As coal moves to gas, gas will increase in price as demand increases thus making it uneconomical.

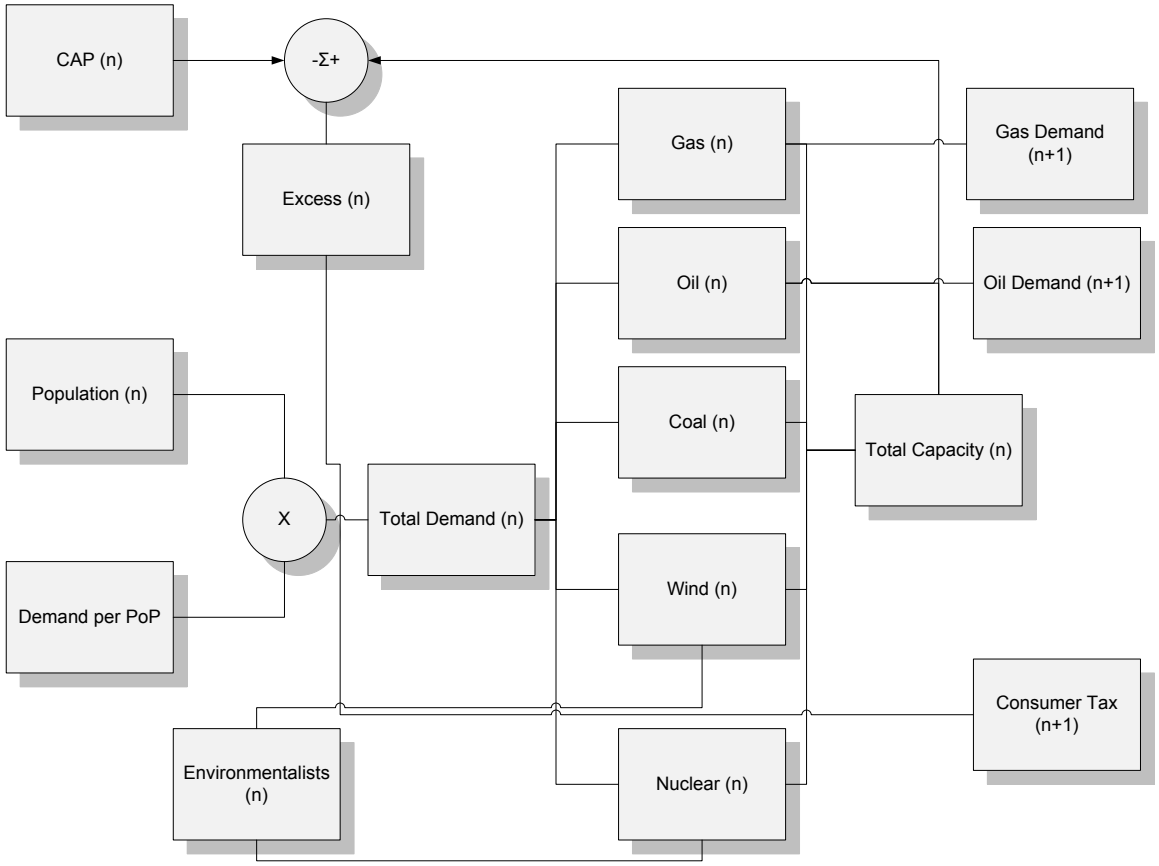
6. The main assumption is that alternatives can be built. There are major questions here due to massive time lags. These are environmental, economic, and basic limits on resources. Thus the timing is an issue.

7. Transborder leakage is also an issue. Canada has one plan and the US a second.

8. Finally there is the auto issue which may or may not be resolved.



Now the next step is to recognize that this is a dynamic system. From time to time changes are being made and the system will adapt. There are endogenous and exogenous adaptations. Mankind is an evolutionary creature and will always find new ways to avoid the problems raised by Governments.



The above demonstrates the dynamics for interval n-1, n, n+1. There are models which can be developed which demonstrate the lack of stability of these approaches. Delays, uncertainties, market elasticities and the like tend to create cyclic instabilities which will ebb and flow and in addition we have identified certain market instability points leading to massive shortages and explosive pricing. We suspect that the developers of these schemes are devoid of any expertise to understand these effects. One need think of nothing more than California and Enron's power sale.

5 CASE STUDIES

We now consider a case study of four cases[4]. They are:

1. A fixed $50 per mTon fee and no implementation of non CO2 emitters

2. A variable $50 to $550 per mTon fee and no implementation of non CO2 emitters

3. A fixed $50 per mTon fee and optimal implementation of CO2 emitters

4. A fixed $50 to $500 per mTon fee and optimal implementation of CO2 emitters

The analysis works as follows:

We take the demand as given and then we try to meet the demand by:

1. Adding capacity of non CO2 generation if possible. Then modifying others.

2. Then paying a tax if in excess.

3. We look at the gross market assuming that the internal market discussed above was efficient and cost less.

Now we have the BTU Table as follows. We have in this case added both wind and nuclear at a 40:60 replacement rate to offset the loss of CO2 fuels. We have also phased out coal as discussed earlier. We use gas as a replacement for shortfall.

[4] The model in Excel is available upon request. Email tmcgarty@telmarc.com

Year	Oil BTU	Gas BTU	Coal BTU	Wind or Renewable BTU	Nuclear BTU	Other	Total Demand BTU
2006							39.67
2007							40.67
2008							40.56
2009							40.42
2010	0.49	6.46	21.04	4.41	8.45	0.20	41.06
2011	0.50	6.30	21.34	4.57	8.47	0.20	41.38
2012	0.50	6.38	21.51	4.68	8.50	0.19	41.75
2013	0.50	8.00	20.00	4.80	8.53	0.03	41.86
2014	0.50	9.00	18.00	4.81	8.87	0.84	42.03
2015	0.50	12.00	16.00	4.86	8.87	0.07	42.30
2016	0.50	14.00	14.00	4.94	8.87	0.41	42.73
2017	0.50	16.00	12.00	5.06	9.32	0.26	43.13
2018	0.50	18.00	10.00	5.21	9.76	0.08	43.55
2019	0.50	19.00	8.00	5.39	10.20	0.80	43.90
2020	0.50	21.00	6.00	5.61	10.65	0.42	44.18
2021	0.50	22.00	4.00	5.86	11.09	0.97	44.42
2022	0.50	24.00	2.00	6.15	11.54	0.54	44.73
2023	0.50	26.00	-	6.47	11.98	0.14	45.09
2024	0.50	25.00	-	6.83	12.42	0.72	45.46
2025	0.50	25.00	-	7.21	12.87	0.20	45.79
2026	0.50	24.00	-	7.64	13.31	0.68	46.13
2027	0.50	24.00	-	8.10	13.75	0.18	46.53
2028	0.50	23.00	-	8.59	14.20	0.73	47.02
2029	0.50	22.00	-	9.11	14.64	1.23	47.48
2030	0.50	22.00	-	9.67	15.09	0.65	47.90

The CO2 is the constraint. These are shown below. Here we account for the CO2 from each emitter and compare it to the cap.

Year	Total Emissions Target (000,000 mTon)	Oil Emissions	Gas Emissions	Coal Emissions
2006				
2007				
2008				
2009				
2010	2,302	38	343	1,995
2011	2,255	38	334	2,023
2012	2,208	39	338	2,039
2013	2,161	39	424	1,896
2014	2,114	39	478	1,706
2015	2,067	39	637	1,517
2016	2,020	39	743	1,327
2017	1,973	39	849	1,138
2018	1,926	39	955	948
2019	1,879	39	1,008	758
2020	1,832	39	1,114	569
2021	1,785	39	1,167	379
2022	1,738	39	1,273	190
2023	1,691	39	1,379	-
2024	1,644	39	1,326	-
2025	1,597	39	1,326	-
2026	1,550	39	1,273	-
2027	1,503	39	1,273	-
2028	1,456	39	1,220	-
2029	1,409	39	1,167	-
2030	1,362	39	1,167	-

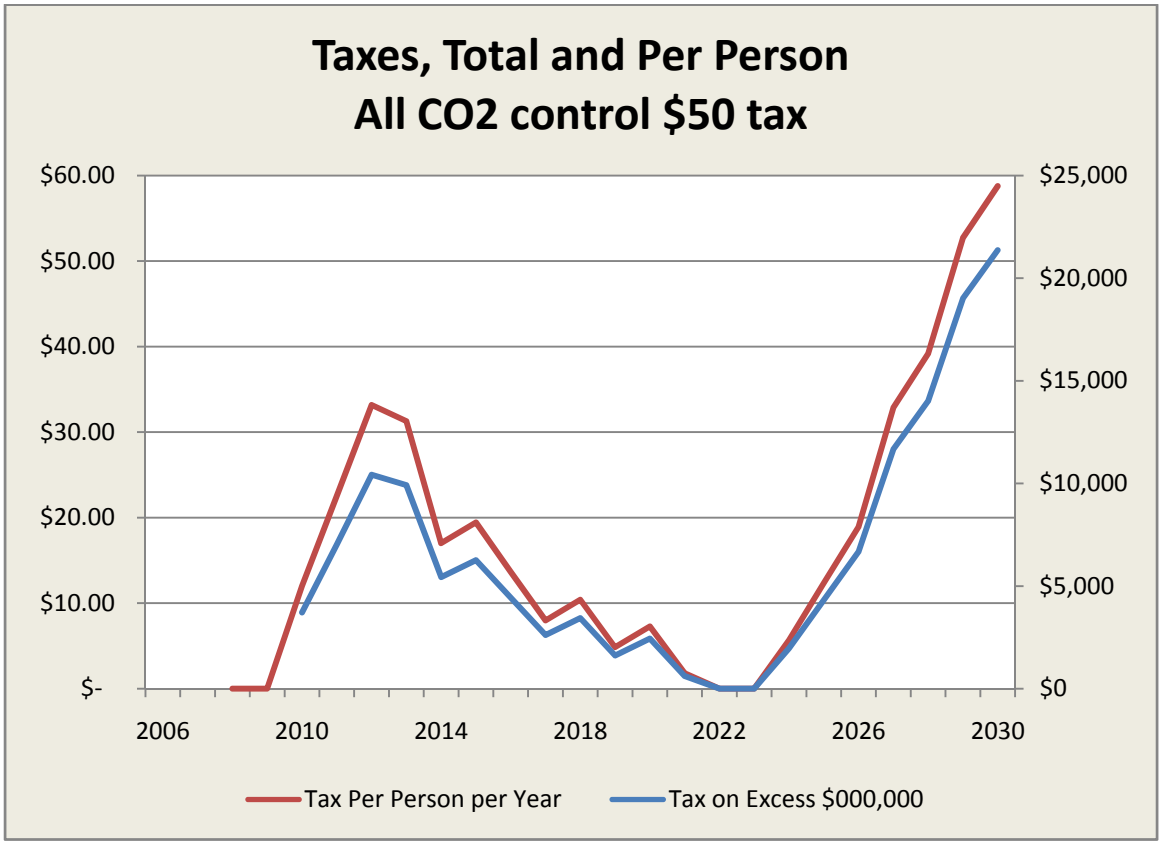
Then we calculate costs. There are two costs we look at. First are the excess costs for the tax on emissions in excess of caps. The second is the excess amortization of the capital, CAPEX, required for non CO2 plant deployment. This is summarized as follows.

Year	Excess Emissions (000,000 mTon)	Tax per mTon CO2	Tax on Excess $000,000	Population	Tax Per Person per Year	Added Amort CAPEX per person per year
2006				-		
2007				-		
2008				303,597,646	$ -	
2009				306,272,395	$ -	
2010	74	$ 50.00	$ 3,712	308,935,581	$ 12.02	
2011	140	$ 75.00	$ 10,530	311,600,880	$ 33.79	
2012	208	$ 100.00	$ 20,842	314,281,098	$ 66.32	
2013	198	$ 125.00	$ 24,787	316,971,485	$ 78.20	
2014	109	$ 150.00	$ 16,309	319,667,598	$ 51.02	$ 0.75
2015	125	$ 175.00	$ 21,922	322,365,787	$ 68.00	$ 2.61
2016	89	$ 200.00	$ 17,751	325,062,633	$ 54.61	$ 4.43
2017	52	$ 225.00	$ 11,754	327,755,597	$ 35.86	$ 15.38
2018	16	$ 250.00	$ 3,931	330,443,861	$ 11.90	$ 26.15
2019	(74)	$ 275.00	$ -	333,127,039	$ -	$ 36.74
2020	(110)	$ 300.00	$ -	335,804,546	$ -	$ 47.17
2021	(200)	$ 325.00	$ -	338,489,500	$ -	$ 57.43
2022	(236)	$ 350.00	$ -	341,195,095	$ -	$ 67.53
2023	(273)	$ 375.00	$ -	343,921,378	$ -	$ 77.46
2024	(279)	$ 400.00	$ -	346,669,052	$ -	$ 87.23
2025	(232)	$ 425.00	$ -	349,439,199	$ -	$ 96.84
2026	(238)	$ 450.00	$ -	352,228,788	$ -	$ 106.29
2027	(191)	$ 475.00	$ -	355,035,364	$ -	$ 115.59
2028	(197)	$ 500.00	$ -	357,861,695	$ -	$ 124.74
2029	(203)	$ 525.00	$ -	360,710,638	$ -	$ 133.74
2030	(156)	$ 550.00	$ -	363,584,435	$ -	$ 142.58

The above analysis assumes that everything works! That is that wind and nuclear can be placed on line in the shortest possible time and with no overruns. The per person costs of this approach is low. It also assumes a total write off of any and all sunk costs and assumes that the cost of refurbishing existing plants is zero. Frankly these are all greatly over exaggerated possibilities, but it is an end point. We consider four such cases as follows.

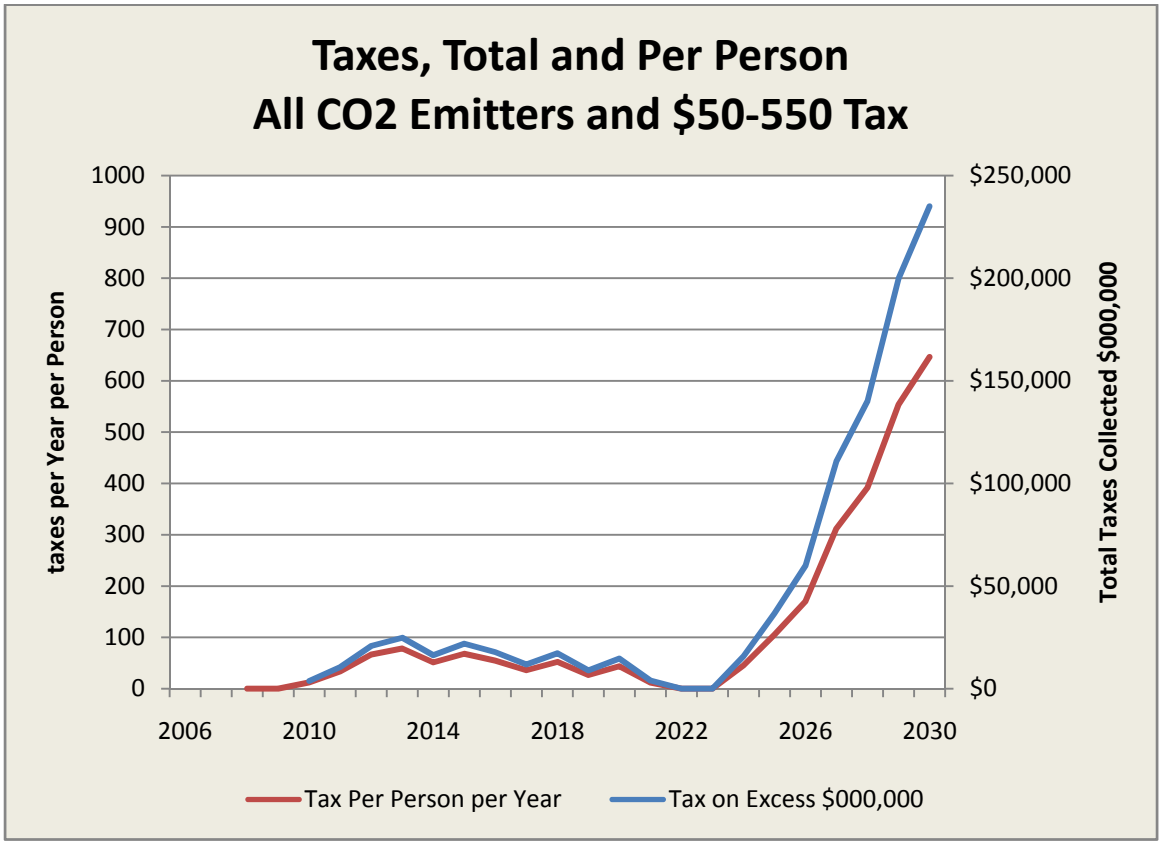
5.1 Case 1: $50 per mTon and no Non CO2 Emitters

This is the most favorable case. It assumes a fixed $50 tax and that everything works. The peak per person cost is just over $30 per year.



5.2 Case 2: $50-550 per mTon and no non-CO2 Offsets

This case assumes the best deployment case but escalates the fee. The result is $80 per person in the peak year. Again we believe that this is overly optimistic on deployment.

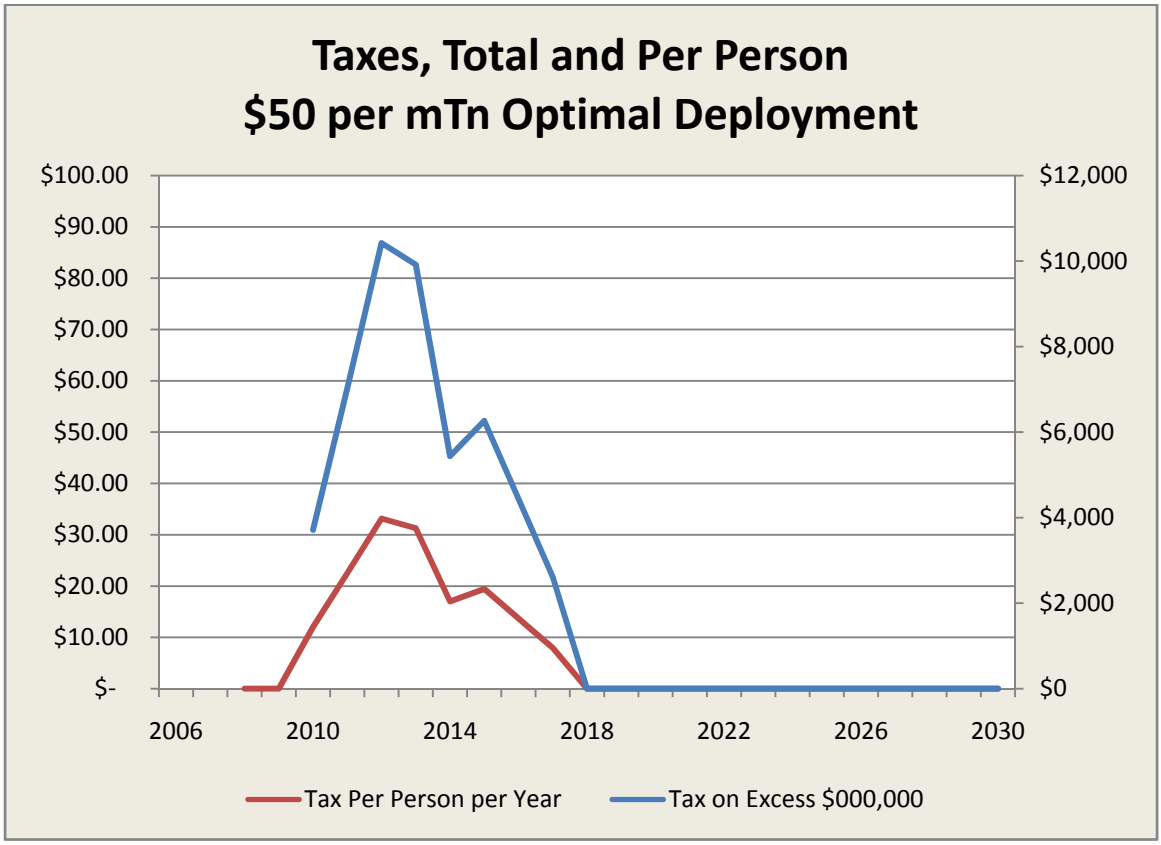


5.3 Case 3: $50 per mTon and Optimal Deployment

Now we assume the other extreme. Namely we assume no deployment at all. The result is shown in the following Table where we have the cap and the production. The best we can do is to switch out from coal as we stipulate earlier and then move more to gas. As we have also stated earlier there is no calculation on the resulting price which we estimate to be four times current price. Thus in constant dollars the cost to heat a home and provide electricity will go from $5,000 to $20,000 in current dollars. No Administration official has spoken to this point which we believe will be a deal breaker.

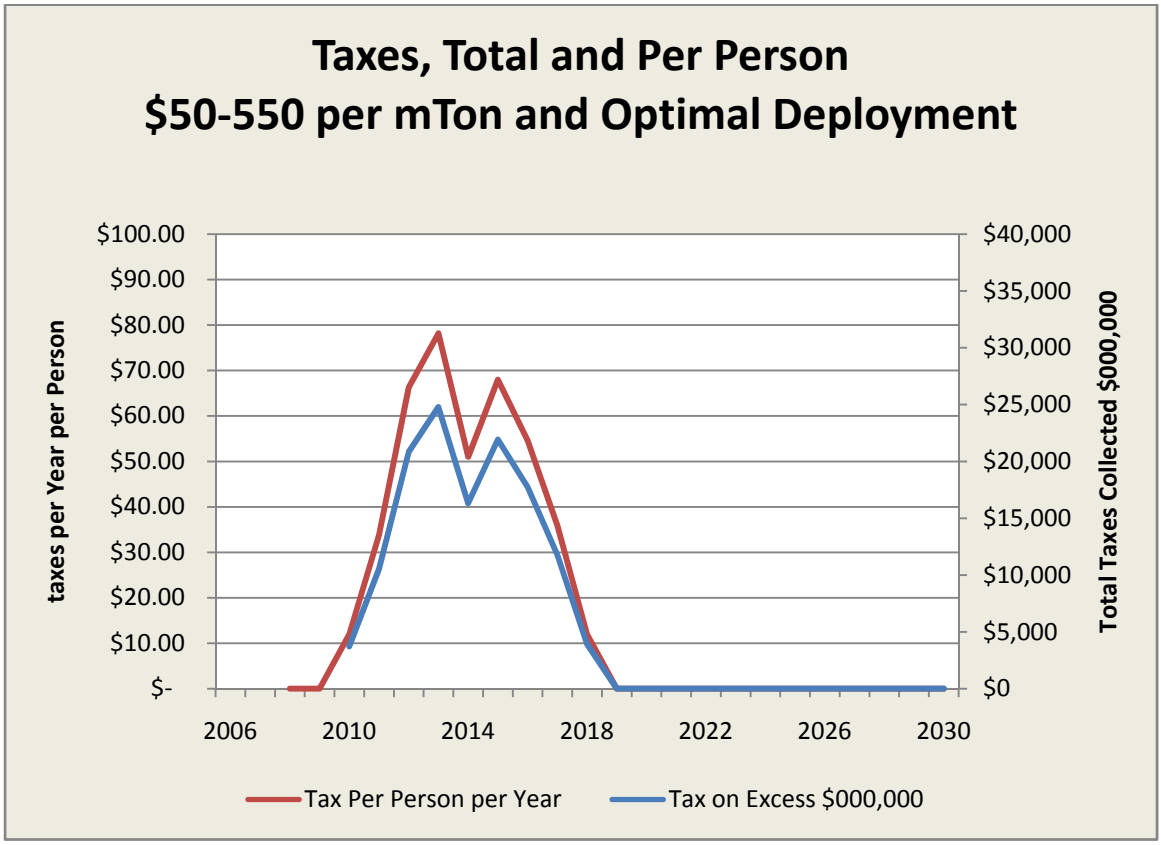
Year	*Wind*	*Nuclear*
2006		
2007		
2008		
2009		
2010	-	100
2011	-	100
2012	-	100
2013	-	100
2014	2,000	100
2015	7,000	100
2016	12,000	100
2017	17,000	105
2018	22,000	110
2019	27,000	115
2020	32,000	120
2021	37,000	125
2022	42,000	130
2023	47,000	135
2024	52,000	140
2025	57,000	145
2026	62,000	150
2027	67,000	155
2028	72,000	160
2029	77,000	165
2030	82,000	170

The following graph depicts the case. First it peaks at $80 and then it reappears and explodes. The total annual taxes grow to $25 billion.



5.4 Case 4: $50 to $550 per mTon and Optimal Deployment

Frankly this may actually be close to the real world. It is the exploding tax and the slowest role out of non CO2 emitters. The following graph depicts the results.


Taxes, Total and Per Person
$50-550 per mTon and Optimal Deployment
taxes per Year per Person
$100.00
$90.00
$80.00
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
$-
$40,000
$35,000
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$0
Total Taxes Collected $000,000
2006
2010
2014
2018
2022
2026
2030
Tax Per Person per Year
Tax on Excess $000,000

6 THE ADMINISTRATION PROPOSAL

We now will apply the model to the Administrations proposal for a cap an trade system. We have made certain simple assumptions as to how this would function. They are detailed a bit more herein.

6.1 Assumptions

These assumptions are as folows:

1. Use the same baseline that we have used before.

2. Assume that the Government uses a 100% Auction system to sell credits. Assume that credits are required for any and all emissions.

3. Look at the Electricity market because of simplicity and because it dominates the overall numbers.

4. Neglect any transborder issues.

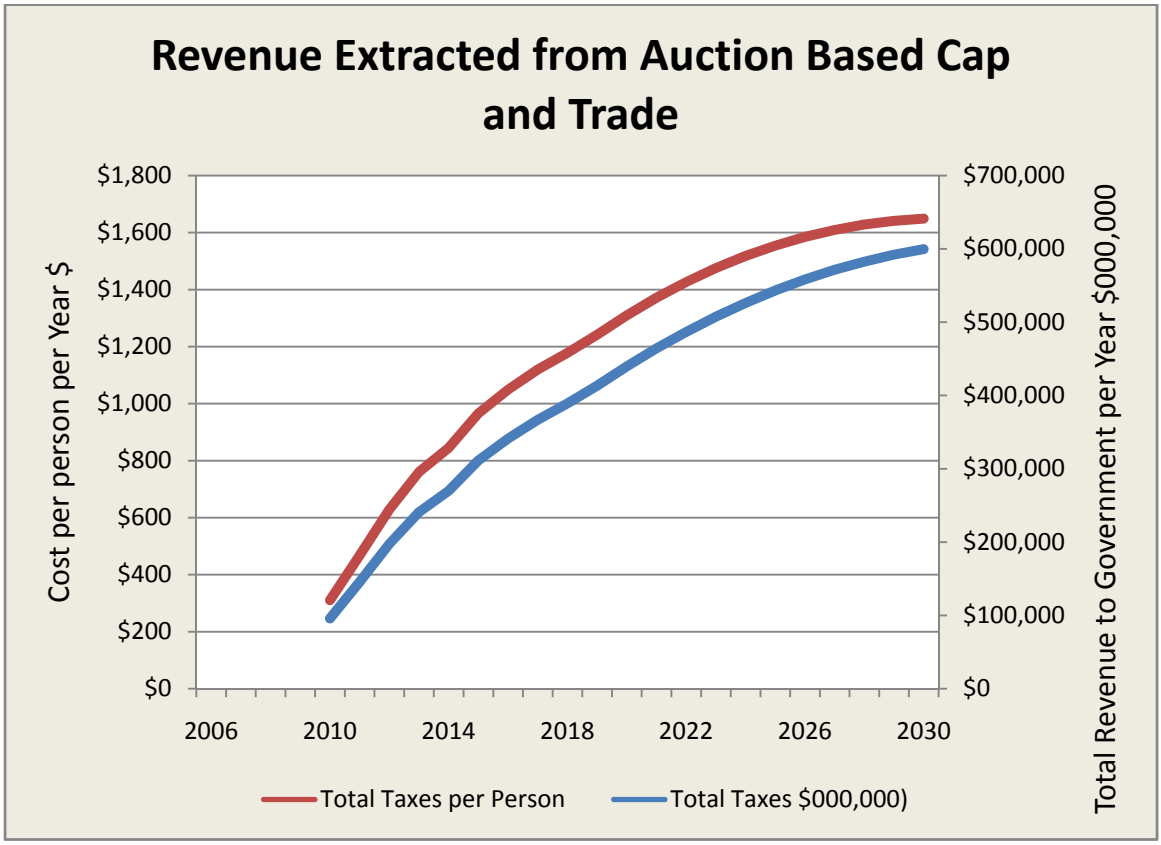
5. Assume that there is a minimum bid price, say 20% of a cap and that bids are up to 80% of the cap.

6. Assume that the cap applies for any emission in excess of the CO2 cap. Namely we allow for some leakage but at a defined excess cap price.

7. Assume the case of increasing caps and also assume the optimal deployment of nuclear, wind and other non-emitters. We understand that this last assumptions is highly optimistic. However the results explode financially if they are not met.

6.2 Administration Proposal Estimates

We have calculated an estimate of what the Administration's proposed 100% Auction based cap and trade proposal will cost. The results are shown below and are based upon the model we have developed before. This uses the same data but now assumes that the Government runs an auction for credits with a strict cap. By strict cap we mean it sets a price, quite high, if you exceed the cap. The Auction sells or clears at 80% of the excess cap.



The analysis above also assumes that a full compliance is made by deploying wind, nuclear and the like in a timely fashion. This is a highly optimistic plan. The above Figure shows several interesting results from the Administration's proposal. They are:

1. In constant dollars the tax per person goes from $310 to $1,650 per year. To get the number per household you multiply by 2.5 yielding $775 to $4125. This is just for electricity and does not include any additional costs for industrial pass through and the like.

2. This fee takes $95 billion and growing to $600 billing per year out of the economy and places it in the Government coffers! This removes massive amounts of capital from productive sources and places them in the hands of Congress and the Executive!

6.3 Prior COB Studies

In an early 2008 blog comment from the then CBO head Orszag, he wrote on the alternative CO2 control options:

"In this study, CBO examined a variety of incentive-based policies for reducing CO2 emissions, including a tax and a cap-and-trade system:

1. A tax would set an upper limit on the cost of emission reductions—firms would undertake reductions that cost less than the tax—but would leave the amount of emissions uncertain.

2. An inflexible cap-and-trade program would set an upper limit on the amount of emissions but would leave the cost of reducing emissions uncertain.

3. A flexible cap-and-trade program would maintain the structure of a cap-and-trade program, but would include features designed to limit the cost of meeting the cap. Specifically, a cap-and-trade program could include one or more of the following:

i. A price ceiling (often referred to as a safety-valve) and/or a price floor;
ii. Provisions that permit firms to "bank" unused allowances in one year for use in a future year
and/or "borrow" future allowances for use in an earlier year;
iii. Provisions to make the cap less stringent if the price of allowances rises beyond an agreed upon amount. A "circuit breaker" would directly modify the cap. Alternatively, the government could indirectly modify the cap by changing the terms under which firms could use borrowed allowances."

He then continues:

"*The study finds that:*

A tax could achieve a long-term emission reduction target at a much smaller economic cost than an inflexible cap. Provided that the tax was set equal to the expected benefit of reducing a ton of CO2, a tax could thus result in substantially greater net benefits (benefits minus costs) than a comparable cap-and-trade program. The advantage of a tax stems from the long-term nature of climate change (which depends on the build-up of emissions over many decades, but is not sensitive to the amount of emissions in any given year) and the uncertain and variable nature of the cost of reducing emissions (which will vary from year to year based on the weather, conditions in energy markets, and the availability of new technologies).

An inflexible cap-and-trade program would provide more certainty about annual emissions than would a tax; however, that certainty would come at a cost: The cap would require too many reductions when the cost of achieving them was high and would mandate too few reductions when the cost was low.

Flexible cap-and-trade programs could achieve some, but not all, of the efficiency improving/cost minimizing advantages of a tax:

Out of the flexible cap designs that CBO considered, a cap-and-trade program that

included both a safety valve and either a price floor or banking provisions could offer the greatest potential to minimize the cost of meeting a given long-term target.

Including a circuit breaker, or altering the extent to which firms could use borrowed allowances, could help prevent the price of allowances from going higher than policymakers wanted. Either approach, however, would be less direct, and less effective than including a safety valve.

Either a tax or a cap-and-trade program could be relatively easy to implement. Some flexible design features, such as banking, borrowing or a safety valve, would be straightforward to implement. In contrast, price volatility in the allowance market could make it difficult for the government to know when to implement a circuit breaker (or to change the terms associated with borrowing allowances). Minimizing the cost of reaching a global emissions target would entail undertaking the lowest-cost emission reductions regardless of where in the world they were located. If coordinated among emitting countries, a tax would help minimize the cost of achieving any given target. Linking the cap-and-trade programs of various countries could help minimize global costs, but could create some significant concerns:

- *Countries would give up sovereignty over the price of allowances traded in their programs.*
- *Poor monitoring or enforcement in any one country could undermine the integrity of the allowances traded throughout the whole system.*
- *Flexible design features, such as a safety valve, banking, or borrowing, would become available to all regulated entities in the linked system.*
- *Major emitting countries could help minimize global cost of reducing emissions by establishing national cap-and-trade programs that each included a safety valve set at roughly the same level."*

6.4 Administration Budget Proposal

In this paper we have presented a cap and trade with strict caps but with a Government free Exchange for the credits. We assumed that the transaction costs were cleared in an open market manner. However this is NOT what the Administration seems to be proposing. From the Administration's overview of the 2010 Budget they state:

"***Begin a Comprehensive Approach to Transform Our Energy Supply and Slow Global Warming***.

The Administration is developing a comprehensive energy and climate change plan to invest in clean energy, end our addiction to oil, address the global climate crisis, and create new American jobs that cannot be outsourced. After enactment of the Budget, the Administration will work expeditiously with key stakeholders and the Congress to develop an economy-wide emissions reduction program to reduce greenhouse gas

*emissions approximately 14 percent below 2005 levels by 2020, and approximately **83 percent below 2005 levels by 2050.** This program will be implemented through a **cap-and-trade system**, a policy approach that dramatically reduced acid rain at much lower costs than the traditional government regulations and mandates of the past. **Through a 100 percent auction** to ensure that the biggest polluters do not enjoy windfall profits, this program will fund vital investments in a clean energy future **totaling $150 billion over 10 years**, starting in Fy 2012. **The balance of the auction revenues will be returned to the people, especially vulnerable families**, communities, and businesses to help the transition to a clean energy economy*."

Now this implies the following:

1. The Government will auction off rights to generate CO2 emissions to the highest bidder. This will be akin to the FCC spectrum auctions. They have had major problems and have been dominated by the largest carriers. This means that the proposed national 100% auction will generate massive industry consolidation and massive monopolization of the power industry as well as of industrial production. The Administration continually fails to understand the unintended consequences which will flow from their actions.

2. The Government will maximize its returns on ALL CO2 emissions. In our model the intent was to cap emissions. In the Government model it is to cap emissions as well as collecting a massive amount of tax by having a monopoly on the auction process.

3. Government auctions are inefficient and time consuming and tend to either maximize prices, thus becoming a highly regressive tax, or result in people just walking away. The FCC spectrum auctions give many examples. Fraud also has been rampant in these auctions.

4. The tax collected in this process will just be handed down to the consumer and business. This is a massive tax and will draw capital from the US economy and destroy massive amount of entrepreneurial efforts. It appears that the current Administration is bent on destroying the American entrepreneur at all costs. They seem to believe that they and they alone have the insight to "invest in America" and "to make the right choices" in what is to be done, the market be damned. The more one looks at this cap and trade scheme the more Americans should be terrified that their future shall disappear in the smoke that contains less CO2.

5. The CBO just a year ago supported a tax plan if any were required. Yet the Administration's proposal is a 100% Auction hard cap plan. This then allows the Administration to effectively take over the power companies, drive out the industrial base and destroy any creativity. Frankly this goes from Socialism to, well, I think we may have seen this before.

7 UNINTENDED CONSEQUENCES

The law of unintended consequences plays an ongoing role in all Government programs. Whenever the Government acts there are reactions to avoid the actions. The unintended consequences are critical to understand and hopefully anticipate and if necessary avoid. It is akin to flying an F-16 having had one lesson in a WW-I bi-plane. If you enter a dog fight you best have some skills.

7.1 Leakage from Mexico and Canada

Why not just set up coal power along the Mexican border. It would employ hundreds of thousands of Mexicans, and then send it across the border. Likewise Canada could use shale oil and do the same on the North. Then watch the trade deficit sky-rocket. The cap and trade proposal is a national first mover approach. Yet Canada and other nations have already moved. Thus what the US does is not followed by other countries.

7.2 Inherent Instabilities in Deployment of Alternatives by Environmentalists

As we have seen in so many prior cases, the environmental lobby, for reasons often known to only themselves, oppose anything. The use of wind has seen objection after objection. The deployment of large wind turbines across the mid country would be in the path of many migrating birds. Thus they cannot go there. Or the environmental impact statements would go on forever. Delay is often the deadliest form of denial. Delay can occur at the Federal, State, and local level, and the delay adds costs directly and derivatively.

7.3 Failure to Deploy Grid; Environmental and Other Delays

You cannot get wind and solar or even nuclear unless you have a national grid. This is in and of itself a major task. What is an intelligent grid? It is an evolving and learned process just as was the Internet. The Internet did not spring forth fully formed. It began in the late 1960s and slowly evolved assisted by thousands of highly intelligent and collaborative systems and development engineers. The power industry has been a backwater for the past fifty years. Thus the competence set is just not there. IBM had developed SNA, something that one may now find in history books. A handful of very smart people developed TCP/IP and its progeny. GE will not develop the smart grid. It will take the same group. However the problem is that they just do not exist. Thus the essential first step is at best problematic. Ironically many of those who could do this have H1B visas and are soon to be shipped out of the US! Who is forcing this? The

Unions. They want all Americans. The H1Bs want to become Americans and yet we throw them away. The system seems to devour itself in an endless fashion.

7.4 Stability Problems and Cycles

As I recalled about my involvement of the Black-Scholes model, my parting comment was beware of the instabilities. They seemed to have forgotten that admonition in Long Term Capital Management. This is not a static system, year upon year. It is a random dynamic process with nonlinearities. By definition they become unstable and they oscillate. However we can model and monitor them. They may be controllable and than can be observable. It just means that you fully understand this and have people looking at it as a system. Economists are poor at this since economists never have to design something that works. They are not engineers, scientists, or physicians. They are at best abstract conjurers. Thus we must beware that whatever we implement that there will be feed-back elements leading to both oscillations and instabilities.

7.5 Massive Job Loss and Displacement

Coal is the livelihood for hundreds of thousands in the United States. Wheeling, WV is a lynch pin in this world, and in the hollers of that region mining of coal has been centuries of existence. We will drive them totally into the stone age. The technological solution is a clean coal which seems to be dismissed out of hand by the Administration. Technologically ignorant people assume if it has not been done it cannot be accomplished. Roosevelt was not a luddite; the atomic bomb was a glimmer in the eye as late as 1943. It took really just over two years to deploy. The same effort could be applied to coal. But for some almost religious reason it has been defaulted.

Add to this the industrial collapse because of dislocations of Industries and we would expect massive unemployment. The recovery would take generations. It would be costly beyond any trillion dollar Stimulus we have yet to see.

7.6 Massive Industrial Movement from the US

The Industrial sector is a major user of energy in the United States. One approach of controlling the CO2 emissions at the source would be to have the Industrial sector be controlled like the electricity sector. If we look at the Table below the sector relies heavily on oil, gas and even coal. Coal is used for aluminum and concrete, it is a cheap energy source for creating these and also concrete as a chemical process also produces CO2. Thus is we were to apply the same restriction here we would inevitably drive these industries from the US totally. The IT industry is a heavy user of electricity and it too would find itself drive elsewhere.

Industrial	2006	2007	2008	2009	2010
Petroleum	420	406	420	410	385
Natural Gas	395	405	418	412	405
Coal	186	175	181	187	175
Electricity	652	653	641	621	618
Total	1,653	1,640	1,660	1,630	1,583

Thus one of the unintended and totally un-thought about consequences is this driving of industrial entities, the residual one at that, from the US to countries which have available and affordable power.

7.7 Dramatic Inflation and Inflationary Pressure

The problem of inflation is pandemic in this approach. Taxes will drive up demand which drive up costs of the energy sources which drive up energy which drives up costs and on and on. The cap and trade proposal may very well set in motion a whole cycle of such inflationary pressure. Also like Gresham's Law, it may drive out "good fuels" and leave bad. For example as coal becomes non-existent in electric power plants, there may be created a "Black market" for coal and wood may replace coal in certain markets. It will be akin to prohibition, the demand will be intensified because of the inflationary pressures. As one begins to know this Administration, the home still will be replaced by the home coal burning stove and a new massive Federal police force will likely be formed to strike down the down trodden pollution violators.

7.8 Destruction of Entrepreneurial Innovation

One of the things which seems to be coming out of this Administration is a total lack of understanding of the entrepreneur. As we have written before the entrepreneur I the engine of innovation and commerce in the US since the Dutch settled in Manhattan.

There is one term missing from the Administration's Budget and Stimulus package, the entrepreneur, the value creator. Just what is an entrepreneur? Well simply put, it is that person, who despite all odds, has an idea, works alone until they can convince a core group of fellow believers, and then endlessly pursues any and all resources necessary to achieve their goal. The entrepreneur eschews Government support, the entrepreneur is driven by the desire to get people to buy his creation. Frequently the drive of the entrepreneur is market acceptance not abject personal wealth accumulation.

The Bankers on Wall Street are wealth accumulators and not value creators. The management of large corporations falls likewise in a similar patch. Both are in many ways the antithesis of the entrepreneur. All too often the entrepreneur's objective is the continuing acceptance of their creation, and the expansion and extension of that creation. Jobs of Apple is an example of the entrepreneur who despite the displacement

of the classic corporate type in Scully, managed to expand Pixar, create Next, and then return and reinvent Apple. A similar person was Olsen at DEC, albeit there was an end to his run, failing in a reinvention as the PC came along.

The entrepreneur seeks to get to the other side of the mountain. The entrepreneur will go over the mountain, under the mountain, around the mountain, through the mountain or even turn around and walk all around the earth in the other direction to get to the other side. It is potentially and endless process of goal attainment. The entrepreneur does not demand Government money; there is not a single entrepreneur who has stepped up to the counter with their hand out because the culture, the ethos, of the entrepreneur is against such. Akin to the monks of old, who adhered to the vows of poverty, chastity and obedience, the entrepreneur can readily adhere to the first two, but the good entrepreneur is fundamentally disobedient, they seek what they have been told they cannot do, it is the trend towards disobedience that drives them.

There are few if any entrepreneurs in Russia, a small number in Europe, some in China, but the United States owes its very existence to that spirit. The current Administration takes not only little notice of them, but almost refuses to recognize their existence. Perhaps that is a good thing. Perhaps as this economy goes through its melt down there will be a reawakening of the entrepreneur, not the pseudo-Internet entrepreneur who create wealth by a tweaking of some incremental change, but the true American entrepreneur who strikes out on their own to create something fundamentally new. For American entrepreneurs are fundamentally individuals who flourish in adversity.

It will be the entrepreneurs and only the entrepreneurs who will create new value in this society, not the Government spending programs. I am continually drawn back to the 1960s and the Kennedy Space Program, a massive Government effort which sucked the best and brightest technical people into Government service and then in the early 1970s dropped them all on the street. The result of the 1960s effort was the rise of Japan in the 1980s, since the United States did Government non-value creating work for a decade, the result of the 1970s wilderness was the technological explosion of the 1980s and 1990s.

Regrettably the entrepreneurs in our Graduate schools are almost all foreign nationals, bright and creative, and the fear is that this time, this massive Government effort, will result in the 2010s and 2020s being the upsurge of China's and India's entrepreneurs, raised in the crucible of America and discharged as a result of the current Government Stimulus and Budget social restructurings. The result, if you think we have economic problems now, just wait!

8 CONCLUSIONS AND RECOMMENDATIONS

This White Paper presented a simple canonical model of a cap and trade system. Although the results are not fully representative of the complexities of a yet to be determined US system as being proposed by the current Administration it does allow for a simple method to assess the key problems areas and ascertain how if at all they can be eliminated and if not eliminated at least ameliorated.

In our opinion all the other proposal is static systems which grossly failed to account for full market dynamics. Further it is the market dynamics which yield wild cycles and gross instabilities. Again we suggest relooking at the stupidity of the California power grid and the Enron scam, which frankly was legal given what California mandated. The key to remember is that whenever the Government establishes barricades the entrepreneurs and finance and tax types will find ways around, through over or otherwise to get a better deal.

There have been dozens of proposals to cap and trade, each having a new variant (see references attached hereto). However the fundamentals are all the same. They are what we have developed in this simple model. We see the problem as one of lag or delay, of escalating prices of ever so rare a set of resources, of environmental counterattacks, and of massive unemployment due to collapse of existing industries, and a massive flow of manufacturing and other industrial entities to countries with lesser cost structures.

The people concocting these schemes assume that those whom they impose the tax will just sit idly by and pay whatever. Business does not work that way. Even if the US becomes the globes largest socialist state the movement may be to China which may ironically have the only free economic markets left. Every action has a reaction. Business is always the first to react.

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