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Series/Staff Member: Jeffrey Frankel

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OA/ID Number: 13724

FolderID:

Folder Title:
Defend GCC [Global Climate Change]

Stack:	Row:	Section:	Shelf:	Position:
S	20	4	11	2

Climate Change
January 29, 1998
11:00 - 11:45
Room 7250, Main State Department Building
Agenda

I. Quick Review of Last Week's Action Items

- Presidential Decision on Signing
- Economic Analysis
- Testimony Preparation
- Hill Info Packet
- Cabinet Q&As
- Cable/Letter to Umbrella Group
- Letter to Gilman

II. Diplomatic Issues -- Setting Priorities

A. Diplomatic Priorities for 1998

Status of Internal Discussions (What issues have been identified? What issues remain?)

- Clean Development Mechanism
- Emissions Trading Rules (including umbrella issues)
- Carbon Sinks
- Commitments of Advanced Developing Countries
- Others..

B. Timetable for Priority Setting and Principals' Action

C. Developing Country Programs

- Rollout of AID Initiative
- Power Plants Initiative (Atwood, Fuerth, Wirth/Eizenstat Initiative)

III. Next Steps and Next Meeting

Trading Scenario	Technology Assumption	Sinks Assumption	Permit Price	Resource Cost	Value of Transfers	% Reductions in U.S.
Annex I	1.0	100% reported	$11/ton	$5 billion	$4 billion	19%
Umbrella - EU, EE + 100% JI	1.0	no sinks	$14/ton	$8 billion	$7 billion	19%
Umbrella - EU, EE + key LDCs	1.0	no sinks	$16/ton	$9 billion	$7 billion	22%
Umbrella - EU, EE + Key LDC + 20% JI	1.0	no sinks	$15/ton	$8 billion	$7 billion	20%

Trading Scenario	Technology Assumption	Sinks Assumption	Permit Price	Resource Cost	Value of Transfers	% Reductions in U.S.
Annex I	1.0	50% reported	$26/ton	$12 billion	$9 billion	34%
Umbrella - EU	1.0	no sinks	$26/ton	$13 billion	$11 billion	31%
Annex I + 20% JI	1.0	no sinks	$36/ton	$17 billion	$13 billion	38%
Umbrella - EU, EE + 20% JI	1.0	no sinks	$30/ton	$15 billion	$12 billion	34%

Todds 1/27/92

$20 or less

Annex 2
+20%

1.0 or 1.1 AEI

5%, Silas $14/ton (31% reduction at 40%)
Elec p   + $1.002/kwh
offset by elec. resn.

No Savings

Econ. Analysis

G.S. Pres will think need paper that says ec. analysis not ~~credit~~ an option or bonus

S.E. lose all credibility otherwise

GS 3 part

1. Basic soundness of principles. ~~Acknowledge uncertainty~~
2. Get a no. we can live with a range, but not a huge range
3. ∃ uncertainty on upside sinks mdg technology

Electr. vers.

10% of elect. = $19_5 \xrightarrow{-4}$ 15_5 excl. states already doing

↓ ↘ Var 6.11

$-3\frac{1}{2}$ $-1\frac{1}{2}$ because ∃ some costs in sub 5.11

$= 14

G.S. 1. Packages mgkt. no. Describe could have been more optimistic on...

incl. everything. But don't push the limit

start from Annex 2 Mdg 648

For next mtg. what would be answers on specifics, without white paper yet, tho probably later

TS. Do a la Full Annex 2 but not below

take at 1st lvl of table

Pt in sinks

Dr 2 kinds of Q + A

Q: All nos. are crazy. 99/100 models will differ

Q: Someone who accepts nos. But find ways things in here.

- wait hit gas prices up by
- pay my Russia

Gruber → Gardiner

Al McCutcheon - Rawly

Call Gardiner
spoke to Jon.
We're prepay our principals
we may disagree
we've going to go with other
might make it

If that causes problem
May be better not engage

Now source clearance
As per your offer to
him
In reaction with
NAX reps.

We understand
agencies differ.
(→ Nox per Jon
Don't mean
specifically)

We reserve the right
not a sign off

To do
selling $65 I as base

PNS
Trans 1

Ben Jones main contact
622 4447 at Treas.

He has rights of appeal

3 many pieces. Overview

One sentence. Focus on major decisions.

Then Jon nos. Joe + Randy
costs + benefits

I Costs from SGM summ. Table 1

Low provided optimistic ass. Trndg B.A.

e.g. last nos $6-$13 b purchases from Russia

II Benefits Nonclimate

Reduced air polluth, congestn, accidents

≈ 1/5 to 1/3 of costs

Leaves • sinks
• other models
} mostly for staff

o How to close gap This group have to decide

– elect. restr. "Net benefits of package even before GCC benefits.."

– Don't close "Net cost is small...

Considered but recommend against

"Net ben. incl. GCC is X"

Assume will be

Many pieces
I will give overview of the big pieces
of the puzzle, how they fit together,
& the questions you all have to decide
- important elements of defense strategy I won't talk about, e.g. address jobloss.
Rather work toward what is the one sentence summary that we'd want to put out.
Focus on major decisions group has to make. (& "will there be a Report")
who writes
then
Jon will walk you thru the numbers on costs & benefits.
Joe & Randy are prepared to answer questions on costs & benefits respectively

I costs from Sch (as p2 says) Table 1
How low...? Very low, provided very optimistic assumption re trading. (Fortunately Buenos Aires has not yet happened.) e.g. last row of Table 1 down to $6-$13 b

(One drawback means • most reductns abroad enviros won't like
• transfers to Russia anti foreign aid people"

1/3

II Benefits non climate

Leaves sinks } mostly for us
other models }
How to close the gap This group
- electr. restr. One sentence "Net benefits of package
- Don't close "Net cost is small" even before

We considered but recommend against
"net benefit incl. GCC is X"
requiring a single monetary no.

Record Type: Record

To: See the distribution list at the bottom of this message

cc:

Subject: ROOM CHANGE- CLIMATE MEETING

FINAL ROOM CHANGE-

The meeting on Climate Change Economic Analysis will be held Friday from 9:00-10:00 am in GENE SPERLING'S OFFICE in the WEST WING.

Thanks.

Questions/Clearances- Pete Weissman 456-5804

Participants

Sperling
Stern
Eizenstat- State
Greenfield- State
Gruber- Treas
Yellen- CEA
Frankel- CEA
Aldy-CEA
Lutter-CEA
McGinty- CEQ
Sandalow- CEQ
Summers- Treasury
Mazur- Energy
Gardiner- EPA
Forrister- Task Force
Peter Orszag- NEC
Bill Antholis
Nick Lapham

Message Sent To:

(xTS

only 1 model. _ laity for G³...

Factors we varied

Benefits

Agend^ ~~models used~~

Costs: How low can they go with trading?

Benefits
sens. from other models
sinks
Techn AEEL

How to close the gap?
Electr. restr
CC mitigtn

% of reaction done in U.S
$ value of market

Effect on P prices

Jeffrey A. Frankel
01/21/98 08:09:10 PM

Record Type: Record

To: Janet L. Yellen/CEA/EOP

cc: Joseph E. Aldy/CEA/EOP, Randall W. Lutter/CEA/EOP, Adele C. Morris/CEA/EOP

Subject: report on Eizenstat mtg. re GCC

The 5:00 mtg. at State turned out to be chaired by Eizenstat, with a big agenda (which I will circulate). One interesting item was the question whether the President should sign the treaty now; the general consensus seemed to be to withhold signing (in addition to submission for ratification) until after Buenos Aires.

The most important item on the agenda from our viewpoint was the economic analysis. The view was that there had to be one, and that this meant eventually a report that would be released. He asked whether we could have the basic economic analysis (not the full report) ready in time for his testimony. The Senate Foreign Relations Committee has asked him for Feb. 5, but they thought they might possibly be able to postpone it another week. Jon and I told him that another week would help a lot -- that currently we are missing an authoritative interpretation of what to assume on sinks, as well as results from other models (in the latter case, to be honest, another week won't get us much more). He told his State people to try to get us some answers to our questions on sinks (Rafe...).

Stu was definite that someone from the economic team would have to testify. Half the time, the presumption among those present was that it would be Larry. But half the time other formulations were used (e.g., "someone from the economic team," "Larry or Janet," etc.).

Joe, et al: Regarding our work program, we'll know more after tomorrow's meeting. But after we fill in the holes in the basic analysis that we have done (e.g., other models), we also have to start thinking about "visuals," about quantifying (if not monetizing) climate effects, about things we can say about the impact on the energy bill of a typical family, and about other pieces of the argument, such as answering claims that there will be large numbers of unemployed. We will need to divide up these tasks among us, and with Treasury.

JF

1/21

S.E., Staff

AGENDA

I. Review of Last Week's Action Items

- Presidential Decision Memo on signing
- Economic Analysis
- Eizenstat - Byrd Conversation • Lieberman - Byrd Pos about Kyoto - Don't sign before B.A. opposite. Sign now. Save leverage for ratifictn.
- Hill Packet
- Testimony and Visuals

Daschell: 17 mos. Signing now would 2) endanger eventual success. Hold off to B.A. Time to educate, signing would lead to neg. resolutn.

II. Diplomatic Strategy Stock Taking

- Issues
    - Defining meaningful participation of developing countries.
    - Defining the rules for emissions trading.
    - Pursuing the emissions trading umbrella.
    - Strategy for advanced developing countries.
    - Power Plant Initiative in LDCs. SE should leverage IFIs: we will not support any initiative that does not ...
- Papers
- Key Venues and Principals Engagement (Rote → Hunter) Treas.: does not mind voting against. But doesn't want... Doug Hales Wilcox was there. But need ...

III. Next Steps and Next Meetings

GCC State Dept. 1/21/98

Stu E.

1. To sign or not to sign

S.E. lang.

JG JY — Hope & expect to be able to sign protocol within 1 yr period permitted. Will await developmt. B.A. & beyond for most appropriate time.

signing ceremony in Bonn with us Ann? S.E.: discourage that

Signing cost us leverage w/ EU + LDCs on trading rights

Defuses Election yr. Issue

LDCs would say our sig. doesn't mean much anyway. (Like Biodiversity treaty, etc.)

Sandalow: Katie inclined to sign now

what is downside? Just land-mine attack. Iff everybody else signs. Not really a worry.

consensus. To S.E.: Memo shall list 3 optns.

2. Econ. analysis

Got to have Report issued

Pres decisn? whether should be? Todd. no us

Honker: { • Realize Any analysis will be savaged by EC. • Misquote "failed" JY }

SE Testimony joined by Treas or CEA

Tahunny 1 model SGM sinks

SE back from Eur. Feb. 3 hearing 4.

Sen For. Relat (Feb. 5 Katie Feb. 4 — harder to delay

March Sensenbrenners comm. asked anytime 4 for SE, & Gov B can delay they say

SE not good to holt 1 person.
1st appearance SE + L.S. or other
before comm. over which has jurisdictn. with charts etc.

Msg consistent message S.E. + LS
should be the two
at first + throughout

Todds I agree

can defer Sensenbrenner

Canby Feb. 5
evey : Sinks

Belligerent all costs + benefits in
electr. restr. has to count

Damage from humans...

I wk. would help

Answer mearyl.

Hill Pocket Hunker : Repetn.

Rafe: Doing draft & testimony for S.E.

For testimony visuals absolutely critical

Scientific consensus. Insurance

Meaningful participation Byrd: what does it mean?

Stn Litt and subsidies...

member of OECD

Em. trading

3 papers { State
EC/A-Treas.
umbrella soup

Umbrella: Canadian Ministers supportive.

12/23

GGE steerg

TS They really want job loss nos. GS: no
SE need some analysis.

Add in electr. restructurg.

$25/ton => $.05/gal. offset in households' pocketbk by benefits of electr. restructurg.

TS work product documts.

Gene $20b

34 36
45 ME

Roy
Randy

IA
Cl. up
Austin

clear mandate.

comfort level

yr by yr.
effects tax cuts

Th. & Fri. 237-6552

Schwalensee
Wiesel

Office of Economic Policy

Department of the Treasury
Washington, D.C. 20220

FAX

Date: 12-30-97
Number of pages including cover sheet: 4

	Name	Fax Number	Phone Number
To:	Jeff Frankel	395-6958	
	Joe Aldy	395-6870	
	Randy Kritter	395-6870	
From:	Jon Gruber	202-622-2633	

REMARKS: ___ Urgent ___ For your review ___ Reply ASAP ___ Please comment

12/30/97

Memo To: Jeff Frankel
Joe Aldy
Randy Lutter
Ray Squitieri

From: Jon Gruber

Re: Cost and Benefit estimates for Kyoto agreement

Here is the latest version of the various permutations that we would like to see on costs and benefits. Joe is basically in charge of costs, with Randy & Ray working on benefits - although Joe will have to be involved with the last benefit, revenue recycling.

We are working towards a meeting with Larry and Janet on Monday, so we should probably plan to discuss results tomorrow or Friday.

Model Permutations to Consider for Cost Estimates:

1) Full Annex I trading

2) Umbrella - trading block that excludes EU and Eastern Europe. I'd like base case to be trading include E Eur. Only EU is excluded

3) AEEI of 1.25

4) AEEI of 1.71 (5 labs)

5) JI that gets us 20% of the gains of worldwide trading (beyond Annex I trading).

6) LDC participation that gets us "key" developing countries - the list of countries separately identified in SGM (Mexico, Korea, China, India).

7) JI/LDC participation that gets us key developing countries, and 20% of gains from remaining countries

8) Full Worldwide Trading

Question: Are interactions linear? Worth trying some combined and separate estimates to get a feel for this, although we don't want to get out of control. I would suggest the following set of runs:

Run	Annex I Trading	Umbrella excl. EE	AEEI 1.25	AEEI 1.71	JI 20%	Key LDC	LDC & JI 20%	Full World
0								
1	x							
2		x						
3			x					
4				x				
5					x			
6						x		
7							x	
8								x
9	x	x						
10	x		x					

11	x			x				
12	x				x			
13	x					x		
14	x						x	
15	x							x
16	x	x			x			
17	x	x				x		
18	x	x					x	
19	x	x						x
20	x	x	x		x			
21	x	x	x			x		
22	x	x	x				x	
23	x	x	x					x
24	x	x						

Once again, for each of these runs, we want to show:

- permit price
- share of reductions purchased abroad
- dollar costs
- dollar costs as share of GDP

Benefits Estimates

We are considering benefits along three dimensions:

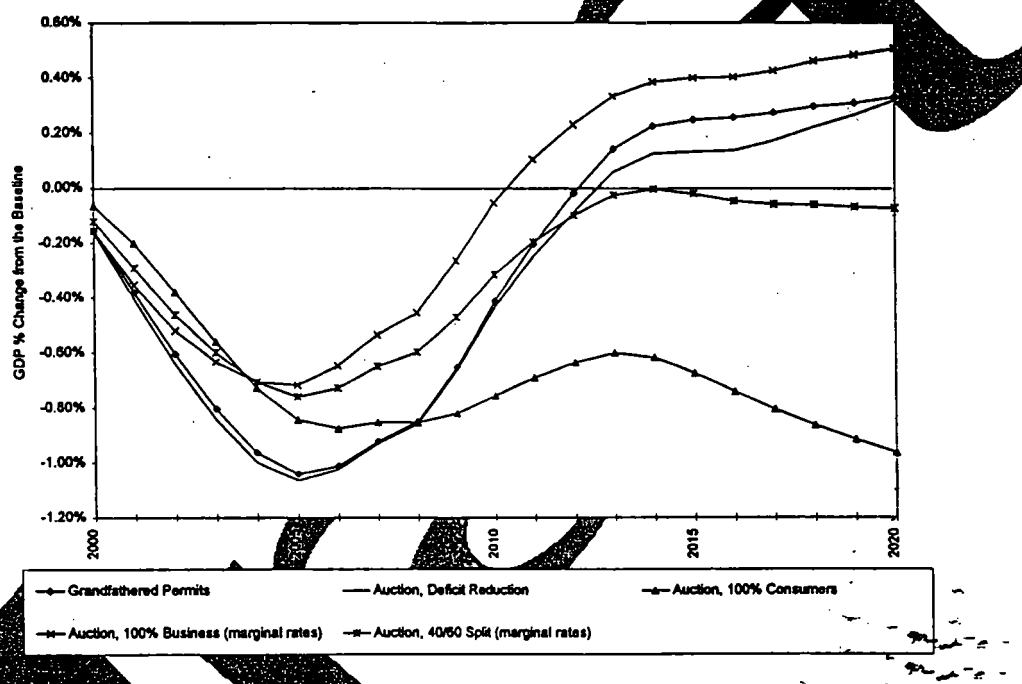
1) Electricity restructuring - here, we simply want the dollar figure for gains from a 10% reduction in electricity prices in 2010.

2) Reduced costs of NAAQS - we need to present a function which scales this by the share of reductions that are done domestically, so that we can apply the relevant figure to each of the cases above. That is, what are the cost savings from case 0 (where we do it all domestically), versus later cases where less than half of the reduction is done domestically?

3) Benefits of revenue recycling - Jeff thinks that this can be cobbled together from the IAT report. This is clearly a function of the domestic permit price, and how much reduction we do domestically. Ray and Randy, can you work on this, using model output from Joe?

- a 100 percent recycling of any revenues from permit auctions to consumers through a reduction in the personal income tax;
- a 100 percent return to business through a reduction in the marginal rates of the corporate income tax or through lump-sum rebates; or
- a 40/60 split to consumers and businesses, in proportion to their shares of energy use, either through tax rate reductions or a lump-sum return.

Figure 13: DRI 1990 Level Case, No International Trading
GDP Sensitivity to Revenue Recycling Options

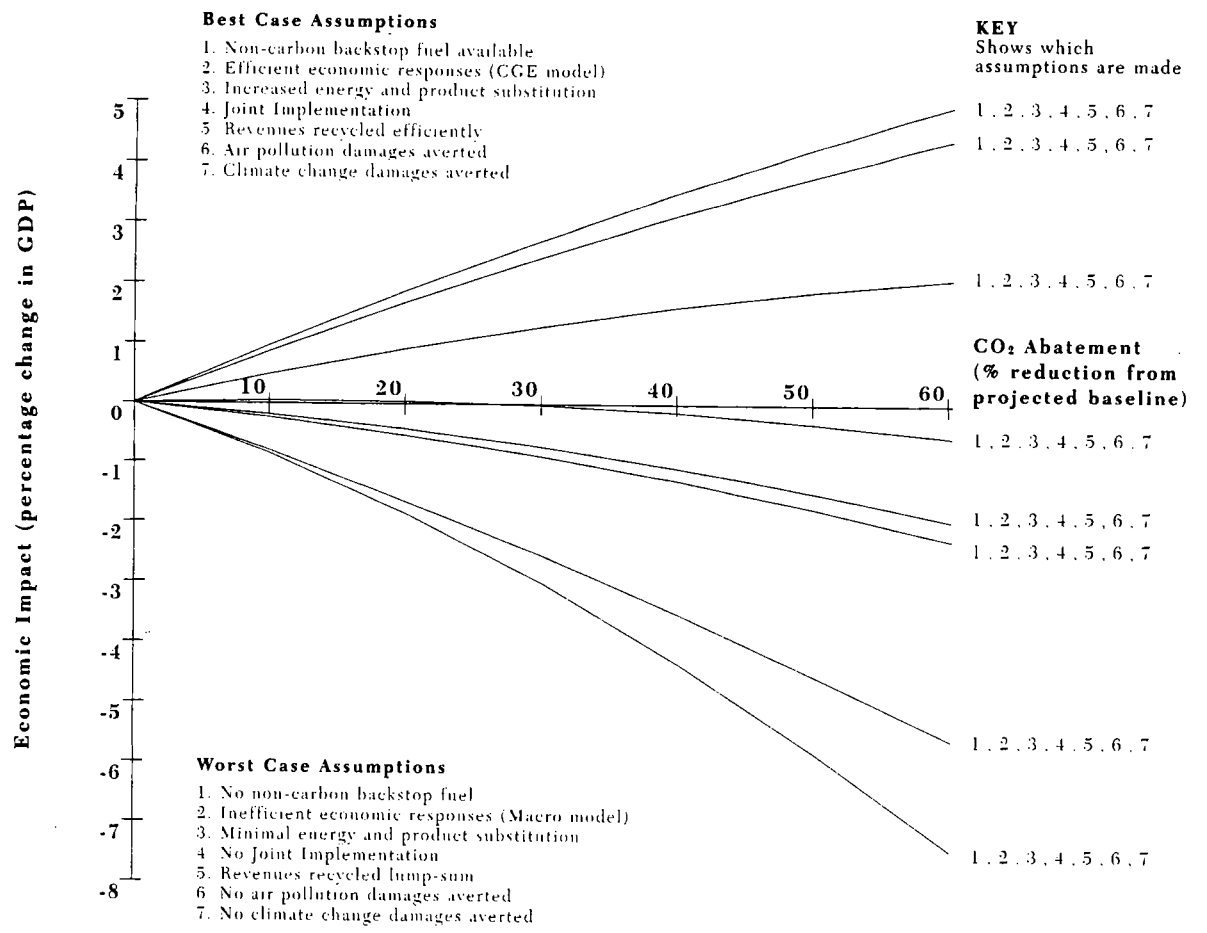


Note: Emissions stabilized at 1990 levels in 2010 with 10-year phase-in. Assuming a 1.25 percent annual decrease in E/GDP.

According to the IAT analysis, the revenues generated from the implementation of this policy have the most positive effect when returned through either the deficit reduction plan, grandfathered permits, or to business through lower taxes. Revenue recycled to consumers, in either case, result in a greater and longer-term reductions in GDP, when measured against the baseline.

The revenue recycling options that lead to better economic outcomes are all those associated with greater investment and capital formation. Deficit reduction leads to lower interest rates, which lowers the cost of capital and facilitates investment. Recycling revenues to companies has the effect of increasing savings through apparent profits and provides the wherewithal for greater investment spending. Similarly, grandfathering permits to producers allows them to "assetize" their right to produce emissions. This allows firms to realize gains on this "right" and again provides the wherewithal to invest.

FIG. 2 PREDICTED IMPACTS ON GDP FOR VARIOUS CO_2 ABATEMENT TARGETS IN 2020: THE EFFECTS OF CHANGING UNDERLYING ASSUMPTIONS ONE-BY-ONE



The salient policy assumptions that differentiate the model predictions are:

7. Does the model assume that carbon tax revenues are returned to the economy through the reduction of a distorting tax rate, or through lump-sum rebates?

8. Does the model assume that joint implementation options are available, or not?

To show how these assumptions affect the predicted economic impacts, we expressed these assumptions either as binary variables (yes = 1; no = 0) or numerical variables and used statistical techniques to relate the assumptions to the data points portrayed in Figure 1. Doing this shows how the assumptions affect the predicted impacts, not in any one model but across all 16 models in 162 different simulations. As suggested by these data points, we assumed that the economic impact of each additional one percent reduction in carbon emissions would be greater, the greater the percentage reduction.[2] We also assumed (consistent with the definition of the baseline projection) that imposing no carbon tax would not affect the economy's baseline trajectory, so that any statistical function would include the zero point in Figure 1.

Surprisingly, these eight assumptions (along with the size of the CO_2

[2] Specifically, we assumed that the percentage change in GDP was quadratically related to the percentage change in carbon emissions, both measured relative to the baseline projection.

December 31, 1997

Congestion Related Benefits From Carbon Control Policies

The Kyoto agreement will reduce emissions from carbon by about 27 percent (100/137=.73). To the extent that these emissions reductions are achieved through fuel price increases, there will be a reduction in the use of motor vehicles, and there may be resulting increases in traffic congestion.

One recent study suggests that fuel price increases would lead to significant reductions in traffic delays.[1] Several estimates for four metropolitan areas in California indicate that fuel taxes of $0.50 per gallon in 1991 would have led to reductions in delay of about 7 percent.

A recent report funded by the Department of Transportation put the costs of congestion, relative to free-flowing traffic, at nearly $60 billion in 1994, up from less than $40 billion in 1986.[2] These costs reflect both the dollar value of delays to motorists, and the additional fuel consumption from congestion, although only about a tenth of the total estimated costs are fuel-related.

Thus a $100/ton carbon tax would lead to a $0.25/gal fuel tax, and reductions in congestion related delays of about 3.5 percent in the four California cities. If extrapolated nation-wide, reductions in congestion related delays, including the fuel savings, would be worth about $2 billion per year.

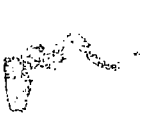
These estimates exclude the reductions in inconvenience that travelers would experience as a result of being able to begin trips closer to their preferred travel time. Such reduced inconvenience may be as valuable as the reductions in delay.

---

[1] See *Transportation Pricing Strategies for California: An Assessment of Congestion, Emissions, Energy and Equity Impacts*, California Environmental Protection Agency, November 1996

[2] *Urban Roadway Congestion --1982 to 1994* Texas Transportation Institute, Texas Department of Transportation, and the Federal Highway Administration, August 1997

Refers Kyoto Order



Mandate
Trdg
Techn

new china India
residual

20% JI
Imp.
big + nth ones
"Key Locs"

Clean Air

recyclg

Base case 1985 1.00

1.25

MC

S-Labc-Effct 1.75

Mon. Trgs mtg.

Office of Economic Policy

Department of the Treasury
Washington, D.C. 20220

FAX

Date: Dec. 30, 1997
Number of pages including cover sheet: 5

Name	Fax Number	Phone Number
To: Jeff Frankel	395-1058	395-5046
From: Jon Gruber	202-622-2633	

REMARKS: ___ Urgent ___ For your review ___ Reply ASAP ___ Please comment

Hold Close

Jeff -

Larry Summers suggested that I talk, on deep background, to a couple of outside experts to see what they would view as reasonable for our economic analysis. I attach (for your eyes only, obviously) some discussion of their views. I also attach a revised set of runs that I think Joe should do, reflecting these views. I haven't passed these on to Joe yet.

My only question is: have I been too conservative on the possibilities for JI/LDC participation? Maybe we should do some runs where JI/LDCs give us more benefits than the 20% that I assume? I don't know enough about the structure of the model to assess this.

Give me a call when you get in and lets discuss.

Jon

Expert Opinion on Economic Analysis

Contacts: Rob Stavins, Mike Toman, Dick Schmalansee

Starting Point: Roughly $100/ton from SGM model (this is with domestic only, and 1% AEEI)

All experts seem comfortable with this model and have great respect for Edmunds and Batelle. They seem to think that this is a sensible starting point. Stavins did note that this assumes that we equate marginal costs and pursue only least cost efficient paths to reduction. He points out that in reality this is unlikely. Schmalansee highlighted that timing is key - but the runs that CEA is using are calibrated for reductions to start in 2005, when our permit system kicks in.

Annex I Trading: Pure Annex I trading can roughly halve costs to $50; the umbrella might get the price down to $30

There was general comfort with the numbers, but all highlighted that this was conditional on perfect trading being in place, and there was also general skepticism that this could emerge. Stavins once again highlighted that this assumes we find global least cost reductions, which seems even more suspect since it requires other countries to be efficient as well. On the other hand, all recognize the huge value of the Russian tons. There was some skepticism that the EU would, at the end of the day, let themselves get shut out of the Russian tons.

Technology: The IAT used an AEEI of 1.25, and it was mildly criticized as a bit optomistic - but this was before the $6 billion in the budget, and without any price signal. 5 Labs implies an AEEI of 1.71. An AEEI of 1.25 would bring price down to roughly $80.

I think that there would be support for 1.25 AEEI, but not for much more - certainly nothing approaching 5 labs. Schmalansee pointed out that, even without an explicit price signal, Kyoto highlights that "the train is moving" and should promote the growth of the energy efficient technologies.

Joint Implementation and LDCs: Models tell us effect of Annex I trading, and worldwide trading. Question is: how much of the gap between these two is closed by JI?

Would be little support for claiming anything close to the majority of this gap. But there would, I think, be support for claiming a small share, say 10-20% of the gap. Schamalansee said <10%, Toman said up to 20%. There was no real view on the prospects of additional LDC participation, but pretty strong skepticism that it would amount to much.

Electriticity Restructuring: We can claim economic benefits from restructuring. Can we claim some enviro benefits as well?

Gruenspecht says that we can get electricity savings of 10% from restructuring. This is $20 billion now and ??? in 2010. Joskow says 8-10%, but will defer to Howard as well. By 2010, stranded costs are all paid, so that we get full benefits of lower prices.

There was generally strong skepticism among this group about claims of environmental benefits. Toman even pointed out that Howard Gruenspecht had actually changed his position on this over the past year. I think that the best we can do here is claim environmental neutrality, and maybe some qualitative statements about potential gains - putting numbers on this is going to get us in trouble.

Other Benefits: There may be gains from reducing costs of meeting NAAQS, or health benefits (but not both).

There was support for some benefits here. Toman thought that most of the action would be health benefits, since he didn't think that NAAQS would be effective by 2010. Ray notes that administration policy is that NAAQS will be effective by then, so that the benefits will be in dollars, not health.

Bottom Line: There seems to be professional support for claiming some technology gains, some small JI/LDC benefit, full Annex I trading gains, and perhaps for some gains from umbrella. But we have to recognize that this analysis will be criticized by some folks on the grounds that it is too idealistic on trading, and by others on the grounds that it implies that we buy our way out of the majority of our reductions. Both these criticisms will rise in proportion to the gains that we claim from umbrella.

It seems like an analysis with 1.25 AEEI, Annex I trading including EU (no umbrella), and JI/LDC that gets 20% of WW trading benefits would be pretty well received. Moving to the umbrella would bring some criticism, but not an avalanche. Going beyond that on trading or technology would be steeply criticized. I remain unclear on how much we can justify on JI/LDC

Given these comments, here is a revised set of runs that I think we should do:

Model Permutations to Consider:

1) Full Annex I trading

2) Umbrella - trading block that excludes EU and Eastern Europe

3) AEEI of 1.25

4) JI/LDC participation that gets us 20% of the gains of worldwide trading (beyond Annex I trading).

Question: Are interactions linear? Worth trying some combined and separate estimates to get a feel for this, although we don't want to get out of control. I would suggest the following set of runs:

1-3) Do the first three factors individually

4) Annex I trading with JI/LDC

5) Annex I trading, with umbrella, and JI/LDC

6) Higher AEEI, with Annex I trading

7) Higher AEEI, with Annex I trading and umbrella

8) Higher AEEI, with Annex I trading and JI/LDC

9) Higher AEEI, with Annex I trading, umbrella, and JI/LDC

For each of these cases, we should show what happens to permit price, and what share of our reductions are purchased abroad.

JOP

Trading

Anner 1
annex 1 excl. Europe (incl. E.E.)
annex 1 excl. EU
global excl. EU

Translate marginal p into total cost (incl. as % of GDP)

From Kyoto Agreement.
other gases,
What about sinks, etc. How far off are we
by treating the agreement as 1990 in 2010?
New model runs from SCM with new gas+sink formula

Look at full FAC participation, or participation
of just largest + richest countries

12/23/97

Estimates of the benefits of emissions abatement:
(1) averting global warming (2) other pollution benefits

Investigate references in Integrated Assessment lit (Nordhaus...Stanford EMF..., Cline)

Investigate research on (non-warming) pollution benefits: Schmalensee, Viscusi...

Investigate references in Duncan Austin's study, p.24.
Talk to Austin.

Talk to Rosina or others in OSTP.

Consider implications of the PM-Ozone Clean Air Act process.

Coordinate with Ray Squitieri (and Jon Gruber) at Treasury.
Pull in Sarah to help you at some point, if necessary.

Jeffrey A. Frankel
12/23/97 06:02:16 PM

Record Type: Record

To: Joseph E. Aldy/CEA/EOP

cc:
Subject: GCC marching orders

Joe
I hope you had a good break.

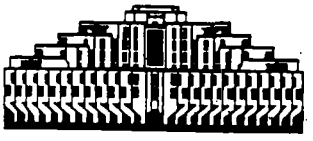
We now have a game plan. We want to see what it would take for benefits from GCC policy to outweigh costs. Randy is working on benefits. You are working on costs. We are coordinating with Gruber and Squitieri.

The first step for you is to finish writing up your memo summarizing what you did for Gruber under various international trading combinations (Annex I; Annex I excl. all Europe; Annex I excl EU).

But we also need:
- an entry in that memo for global trading (with and without the EU); and perhaps a version that includes only the largest and richest LDCs, not the others
- calculation of figures that add up the area under the curve to get total cost (do your "abatement costs" do that? or are they simply marginal cost times quantity), and also express them as % of GDP (Janet might like PDV of foregone consumptions; but (i) as I understand it, SGM can't do that, and (ii) Gene thinks that is not comprehensible to the public, and therefore irrelevant.)
- some accounting for the treatment of the 5 non-carbon gases and sinks, as specified in the Kyoto agreement

Please give me progress reports.
Thks
JF

Sinks



From the desk of ... Jeffrey Frankel

- High estimates of disasters + low discount rate
- " " other non-economic benefits
- Generate revenue from auction + recycle by cutting taxes on capital
- optimistic assumptions about response of technology + consumption patterns to prices
- optimistic assumption about Mchn. response to R+D
- [+ int. trading, esp. with FSU + without EU]

laromme jerusalem hotel מלון לרום ירושלים

Liberty Bell Park, 3 Jabotinsky St., Jerusalem 92145 Israel Tel. (02) 6756-666 Fax.(02) 6756-777
(02) 6756-777 פקס. (02) 6756-666 טל' 92145 ירושלים 3, דרך דבוז'ינסקי (ז'בוטינסקי) הפעמון

Paper

(1) A & L Today ... ... — ... / ... ...

(2) LDG full particip.n — Kimble ...

(3) Clean Dev. Mech. [illegible] — ... Bilsby ...

... MCC

(4) Sinks — ... Homegate ...

(5) R. Fuels — world ... [illegible]

- Benefits — ... Aust. / ...
- Full Trading EU ...
- what techn. ... do we need

Ray

cc -) fr
-) y

From Joe Cruber

To: RL
from: JF
12/29/97

Model Permutations to Consider:

1) Full Annex I trading

2) EU doesn't trade

3) Umbrella - trading block that excludes EU and Eastern Europe

4) Worldwide trading

5) AEEI that is consistent with 5 labs (find this by increasing AEEI in basic model such that it yields $50/ton permit price with domestic only reductions).

Question: Are interactions linear? Worth trying some combined and separate estimates to get a feel for this, although we don't want to get out of control. I would suggest the following set of runs:

1-5) Do the five factors individually

6) Umbrella, with 5 labs (I think that we should do permutations with umbrella case, rather than EU doesn't trade case, since I think that this is more realistic).

7) Worldwide trading, with umbrella

8) Worldwide trading, with 5 labs

9) Worldwide trading, with umbrella and 5 labs (most optomistic case)

For each of these cases, we should show what happens to permit price, and what share of our reductions are purchased abroad.

Questions/Other Things to Do:

1) What about recalibrating the model for the new international baselines? We should probably try to do a little of this before we produce the numbers. Joe will have to discuss how to do this with EPA and DoE folks.

2) Benefits of electricity restructuring. I have data on the economic benefits. Question is: do we want to score the environmental benefits? DoE says that could have as much as 5% reduction in carbon due to restructuring (80 mmt). Should we add this as one of our model permutations? I would argue no. We should instead have a set of "reasons why our numbers may be too high", including electricity restructuring benefits, as well as the industry consultation stuff that Dirk was talking about.

3) Other benefits of reducing use of carbon fuels. Jeff is going to talk to Austin about this, and Randy and Ray will work on it as well. I've spoken to Ray, and he is going to call Randy. The mandate that I gave him was twofold: first, figure out what the literature has to say on the benefits of reaching our target and timetable (in dollar terms); second, note how comfortable we are with the quality of this literature, and, if there are pieces with which we are more or less comfortable, separate those pieces out.

4) GDP/job effects. Do we want to think about this as well, or just focus on permit prices? Can we get some of this fairly costlessly from the same model runs that Joe will be doing? If so, we may want to add these to the table of results.

Possible Criteria:
Make best case possible
Best case possible that is consistent with approach in studies/memos written over 10/96-10/97.
Release studies/memos written over 10/96-10/97.
Release no numbers.

What kind of number is most useful bottom-line?
Cost-benefit estimate
Cost estimate in % of GDP
Cost estimate (e.g., in terms of price per ton of carbon)

Possible margins on which to work, in a cost-benefit type analysis (while emphasizing uncertainties in any case)
Reduce costs by international trading:
- With some limits
- Among all Annex I countries -- no limits
- Among Annex I countries excluding EU (umbrella)
- Among all countries including LDCs (could call it "ideal JI" or "full LDC participation")
- Among all countries including LDCs (excluding EU)

Generate revenues from auction of emission permits, and recycle revenues by cutting taxes on capital and other distorting taxes
Optimistic assumptions about response of technology and consumption patterns to prices
Optimistic assumption about response to R&D spending/tax cuts.
Estimates of probability and cost of future climate disasters, and rate at which they are discounted
Non-climate benefits: reduced air pollution, congestion, etc.

National Archives

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10-17

Jeff,

Roosevelt had many production goals for 1942, some of which were met and some of which were not. I've high-lighted the relevant sections where his goals are tracked and the outcomes are discussed.

-DJA

facsimile TRANSMITTAL

to: Daniel K. Chang
fax #: (202)395-6853
re: FDR & war production
date: October 17, 1997
pages: 5, including this cover sheet.

Dear Mr. Chang:

In response to your request:

1. We know of no meeting in which FDR called the leaders of industry to the White House and asked how much they could increase war production. Rather he obtained the data on war production targets from the civilian and military sources and then used those figures to set his goals. However, he employed various business leaders in government during the war in critical positions dealing with war production. We enclose a two page list and description of those individuals. (Enclosure A)

2. FDR set production goals in his state of the union address, January 6, 1942 We enclose the two pages from that speech outlining the goals. (Enclosure B)

3. FDR reviewed the accomplishments under those goals in his state of the union address, January 7, 1943. We enlcose the two pages from that speech containing FDR's remarks. (Enclosure C).

Sincerely,

Raymond Teichman

RAYMOND TEICHMAN
Supervisory Archivist

From the desk of...

Fax:

Enclosure A

1.

. Donald Nelson Chairman of the immensely powerful War Production Board was executive vice president and chairman of the executive committee, **Sears, Roebuck & Co.**

. William Knudsen left the presidency of **General Motors** to accept many wartime positions. He brought in John D. Biggers of **Libby-Owens-Ford**; W.H. Harrison, v.p. **A.T.&T.** Co.; E. F. Johnson of **GM**; Merrill C. Meigs, publisher of the **Chicago American**.

. Edward Stettinius had been vice president of **General Motors** and then chairman of **United States Steel** before becoming head of NDAC Materials Division. Joining him were W. L. "Bill" Batt, president **SKF Industries**; E.R. Weidlein, director of the **Mellon Institute** and Charles Francis of **General Foods**. In charge of NDAC was Charles E. Wilson, Knudson's predecessor as president of **GM**. Weidlein made great breakthroughs on the development of synthetic rubber. William Jeffers, president of the **Union Pacific Railroad** then became rubber Czar.

Also at NDAC was Robert T. Stevens of **J.P. Stevens & Co.**

A United STates-Canadian Committee was formed in May 1941 to exchange vital information.

. One of the first important organizations was the War Resources Board which had, among others, Dr. Karl T. Compton, **MIT** president who of course went on to the Manhattan Project as did **MIT's** Vannevar Bush.; Walter S. Gifford, president of **A.T. & T. Co.**; Dr. Harold Moulton of **Brookings**, John Lee Pratt, director, **General Motors Corp**; and General Robert E. Wood, Chairman of **Sears, Roebuck & Co.** Soon to join was Graham of **Goodrich Tire & Rubber Co.**

The Defense Purchases Committee was headed by Frank Folsom who had been in charge of merchandising with **Montgomery Ward & Co.**; Howard T. Lewis of the **Harvard B School**. Also playing key roles from the B School in areas of procurement were Dean Wallace B. Donham and Dean Donald K. David.

. Arthur Whiteside, president of **Dunn & Bradstreet** was made head of priorities. Nelson hired on Eddie George also from D & B.

When the War Production Board was finally established, it was divided like this:

1. Production Division, William Harrison, **AT&T**

2. Industry Opers. James S. Knowlson, president and Chairman of **Stewart-Warner Corp.** He was assisted by Philip Reed, Chairman of the Board of **General Electric**.

3. Labor. Sidney Hillman, president of **Amalgamated Clothing Workers**.

4. Statistics. Stacy May **Rockefeller Foundation** who worked closest with Jean Monnet.

5. Purchases. Douglas MacKeachie of **Great Atlantic & Pacific Tea Co.** Later Sidney Weinberg of **Goldman, Sachs & Co.**, who was also a director of **Sears**.

6. Planning Division. Robert R. Nathan.

Nelson also brought in to WPB Charley Wilson of GE who brought in Ralph Cordiner, once with GE and then president of **Schick Magazine Razor Co.**

Working with Hillman to set up Labor-Management groups around the country were Joseph D. Keenan of the AFL and John Owens of the CIO. AFL Building Trades head John P. Coyne provided craftsman to big construction projects around the country. Also leaders were William Green of AFL and Philip Murray of CIO, and of course the "Reuther Plan" for auto conversion. Management was lead by Frederick C. Crawford of NAM and Eric A. Johnston of C of C. Hillman took on J.W. Dietz of **Western Electric Co.**

A network of organizations was very active, including **Automotive and Aviation Parts Manufacturers; Society of Automotive Engineers; National Standard Parts ASsoc; and Automotive Tool and Die Manufacturers.**

Auto Conversion: The last passenger auto rolled off assembly one on February 10, 1942. But even before then, in 1940 the **Saginaw Steering Gear Division of GM** was making .30-caliber Browning tank-type machine guns in mass volume, and by March 1942 had made 28,728 at an average cost of $141.44.

A 2.

Aviation: is a whole story in itself, but the names are well known. Donald Douglas of Douglas took the lead in forming the eight-president west coast Aircraft War Production Council, the first president of whom was J. H. Kindelberger, head of the North American Company (included Boeing / Northrup). Ford made the Consolidated B-24 bombers; the Grumman TBF Avenger made with GM. Pratt and Whitney engines were also made by Kelvinator, Buick, Ford, Continental and Jacobs.

48,638 people were employed in industry in 1939; 2,102,000 in Nov. 1943, 36.9 or 486,000 of whom were women. In 1939 industry produced 5,865 planes; in 1944, 96,369. 34,500 aircraft were shipped to Allies between March 1941-Sept. 1944.

Knudsen got K.T. Keller, president of Chrysler to start thinking
about tank production. Company developed a new welding process and became chief tank producer, over 25,000 turned out for Army. Also produced 35 different types of war equipment including Bofors antiaircraft guns, 3.5 billion rounds of ammunition, and devices for A-bomb.

Pontiac took famous Swiss Oerlikon Gun, a 20-mm antiaircraft machine gun, redesigned it and then mass produced it.

Henry J. Kaiser introduced revolutionary techniques of prefabrication and assembly which would lead to the mass production of shipping without loss of quality. Turned out Libert Ships not in the average 200 days, but in forty days. Formed a partnerhp with Howard Hughes that made both men a legend.

Hard-driving executives, millions of workers including thousands of former housewives teamed up to create assembly lines that outperformed the factories of Krupp, Fiat and Mitsubishi, hitting a level of excellence the Emperor, Mussolini and Albert Speer could only dream.

When the Wehrmacht burst through the Ardennes in May 1940, its blitzkrieg was supported by 3,034 aircraft, 2,580 tanks, 10,000 artillery pieces and 4,000 trucks, the result of a rearmament program years in the making. During the next 5 years, America turned out over 296,000 warplanes, in excess of 100,000 tanks, 372,000 artillery pieces, and 2 and one-half million trucks.

At Teheran Stalin toasted "To American production, without which this war would have been lost."

In 1938 Marshall testified that if America were invaded, the armed forces were too weak to repel an invasion. 19th. Not enough ammunition.

Nelson hired Ernst Kanzler, one-time g.m. for Henry Ford.

. Ogor Sikorsky opened the world's first helicopter assembly line.

. Louis Renault was in Morganthau's office desperately negotiating supplies for France when it capitulated.

. John M Hertz and other transportation experts were recruited to see about moving supplies over the Burma Road

. Remember Jesse Jones (whose daughter gave $100,000 or more to Ollie North).

January 6, 1942

the war, but also to maintain the security of the peace that will follow.

But we know that modern methods of warfare make it a task, not only of shooting and fighting, but an even more urgent one of working and producing.

Victory requires the actual weapons of war and the means of transporting them to a dozen points of combat.

It will not be sufficient for us and the other United Nations to produce a slightly superior supply of munitions to that of Germany, Japan, Italy, and the stolen industries in the countries which they have overrun.

The superiority of the United Nations in munitions and ships must be overwhelming — so overwhelming that the Axis Nations can never hope to catch up with it. And so, in order to attain this overwhelming superiority the United States must build planes and tanks and guns and ships to the utmost limit of our national capacity. We have the ability and capacity to produce arms not only for our own forces, but also for the armies, navies, and air forces fighting on our side.

And our overwhelming superiority of armament must be adequate to put weapons of war at the proper time into the hands of those men in the conquered Nations who stand ready to seize the first opportunity to revolt against their German and Japanese oppressors, and against the traitors in their own ranks, known by the already infamous name of "Quislings." And I think that it is a fair prophecy to say that, as we get guns to the patriots in those lands, they too will fire shots heard 'round the world.

This production of ours in the United States must be raised far above present levels, even though it will mean the dislocation of the lives and occupations of millions of our own people. We must raise our sights all along the production line. Let no man say it cannot be done. It must be done — and we have undertaken to do it.

I have just sent a letter of directive to the appropriate departments and agencies of our Government, ordering that immediate steps be taken:

January 6, 1942

5. *Address on the State of the Union*

First, to increase our production rate of airplanes so rapidly that in this year, 1942, we shall produce 60,000 planes, 10,000 more than the goal that we set a year and a half ago. This includes 45,000 combat planes — bombers, dive bombers, pursuit planes. The rate of increase will be maintained and continued so that next year, 1943, we shall produce 125,000 airplanes, including 100,000 combat planes.

Second, to increase our production rate of tanks so rapidly that in this year, 1942, we shall produce 45,000 tanks; and to continue that increase so that next year, 1943, we shall produce 75,000 tanks.

Third, to increase our production rate of anti-aircraft guns so rapidly that in this year, 1942, we shall produce 20,000 of them; and to continue that increase so that next year, 1943, we shall produce 35,000 anti-aircraft guns.

And fourth, to increase our production rate of merchant ships so rapidly that in this year, 1942, we shall build 6,000,000 deadweight tons as compared with a 1941 completed production of 1,100,000. And finally, we shall continue that increase so that next year, 1943, we shall build 10,000,000 tons of shipping.

These figures and similar figures for a multitude of other implements of war will give the Japanese and the Nazis a little idea of just what they accomplished in the attack at Pearl Harbor.

And I rather hope that all these figures which I have given will become common knowledge in Germany and Japan.

Our task is hard — our task is unprecedented — and the time is short. We must strain every existing armament-producing facility to the utmost. We must convert every available plant and tool to war production. That goes all the way from the greatest plants to the smallest — from the huge automobile industry to the village machine shop.

Production for war is based on men and women — the human hands and brains which collectively we call Labor. Our workers stand ready to work long hours; to turn out more in a day's work; to keep the wheels turning and the fires burning twenty-four hours a day, and seven days a week. They realize well that on the

Enclosure B

Our forward progress in this war has depended upon our progress on the production front.

There has been criticism of the management and conduct of our war production. Much of this self-criticism has had a healthy effect. It has spurred us on. It has reflected a normal American impatience to get on with the job. We are the kind of people who are never quite satisfied with anything short of miracles.

But there has been some criticism based on guesswork and even on malicious falsification of fact. Such criticism creates doubts and creates fears, and weakens our total effort.

I do not wish to suggest that we should be completely satisfied with our production progress — today, or next month, or ever. But I can report to you with genuine pride on what has been accomplished in 1942.

A year ago we set certain production goals for 1942 and for 1943. Some people, including some experts, thought that we had pulled some big figures out of a hat just to frighten the Axis. But we had confidence in the ability of our people to establish new records. And that confidence has been justified.

Of course, we realized that some production objectives would have to be changed — some of them adjusted upward, and others downward; some items would be taken out of the program altogether, and others added. This was inevitable as we gained battle experience, and as technological improvements were made.

Our 1942 airplane production and tank production fell short, numerically — stress the word numerically — of the goals set a year ago. Nevertheless, we have plenty of reason to be proud of our record for 1942. We produced 48,000 military planes — more than the airplane production of Germany, Italy, and Japan put together. Last month, in December, we produced 5,500 military planes and the rate is rapidly rising. Furthermore, we must remember that as each month passes by, the averages of our types weigh more, take more man-hours to make, and have more striking power.

In tank production, we revised our schedule — and for good and sufficient reasons. As a result of hard experience in battle,

we have diverted a portion of our tank-producing capacity to a stepped-up production of new, deadly field weapons, especially self-propelled artillery.

Here are some other production figures:

In 1942, we produced 56,000 combat vehicles, such as tanks and self-propelled artillery.

In 1942, we produced 670,000 machine guns, six times greater than our production in 1941 and three times greater than our total production during the year and a half of our participation in the first World War.

We produced 21,000 anti-tank guns, six times greater than our 1941 production.

We produced ten and a quarter billion rounds of small-arms ammunition, five times greater than our 1941 production and three times greater than our total production in the first World War.

We produced 181 million rounds of artillery ammunition, twelve times greater than our 1941 production and ten times greater than our total production in the first World War.

I think the arsenal of democracy is making good.

These facts and figures that I have given will give no great aid and comfort to the enemy. On the contrary, I can imagine that they will give him considerable discomfort. I suspect that Hitler and Tojo will find it difficult to explain to the German and Japanese people just why it is that "decadent, inefficient democracy" can produce such phenomenal quantities of weapons and munitions — and fighting men.

We have given the lie to certain misconceptions — which is an extremely polite word — especially the one which holds that the various blocs or groups within a free country cannot forego their political and economic differences in time of crisis and work together toward a common goal.

While we have been achieving this miracle of production, during the past year our armed forces have grown from a little over 2,000,000 to 7,000,000. In other words, we have withdrawn from the labor force and the farms some 5,000,000 of our younger

Enclosure C

1/13/98

Kyoto costs & benefits

JY would have to rectify range of uncertainty

3 hard questns.

(1) How far toward worldwide idealized trdg

JY ∴ $48/ton ↓ ∴ (might have to say $171 if asked about no trdg case)

(2) willing to incl. electr. restr?

JY yes, but have to say that could do it independently, if asked

(3) Higher AEELs

As part of range. Controversy betw. engineers & econs.

Work in Progress, 1/12/98

Costs and benefits of U.S. participation in the Kyoto Agreement

Costs and Benefits Summary

Scenario (no sinks)	**Permit Price**	**Resource Cost**	**Possible Monetized Benefits**[1]
10/97 Administration Position (6 gases, net-net sinks, 1990 by 2010)	$148/ton	$41 billion	$25 billion
Kyoto Protocol: No International Trading[2]	$171/ton	$51 billion	$29 billion
Full Annex I Trading	$48/ton	$22 billion	$8 billion
Umbrella excluding EU and Eastern Europe	$43/ton	$20 billion	$7 billion
Umbrella excluding EU	$26/ton	$13 billion	$4 billion
Annex I Trading + JI (JI = 20% worldwide trading)	$36/ton	$17 billion	$6 billion
Annex I Trading + Participation by Key Developing Countries[3]	$20/ton	$10 billion	$3 billion
Annex I Trading + Full Worldwide Trading	$19/ton	$10 billion	$3 billion
Umbrella excluding EU + Full Worldwide Trading	$10/ton	$6 billion	$2 billion

[1] Preliminary and undergoing revision. Incl. air pollutn., congestn., accidents, roads. Excl. electricity restructuring

[2] All subsequent cases evaluate the Kyoto Protocol.

[3] Key developing countries include China, India, Mexico, and Korea.

With accounting for sinks
Full Annex I Trading

Sinks Assumption	**Permit Price**	**Resource Cost**	**Possible Monetized Benefits**
No Sinks (U.S.: 0 MMTCE)	$48/ton	$22 billion	$8 billion
Half of Land Use Change and Forestry Sinks (U.S.: 52 MMTCE)	$26/ton	$12 billion	$4 billion
All of Land Use Change and Forestry Sinks (U.S.: 104 MMTCE)	$11/ton	$5 billion	$2 billion

Two very large categories of potential benefits have been left out of the foregoing list of costs and benefits: revenue recycling and climate change mitigation.

Revenue recycling If the emission permits to be issued in the budget period, 2008-2012, were to be auctioned off, rather than allocated for free, the resulting revenue for the government could provide major benefits. If the revenue were used to reduce taxes that fall on capital (i.e., to reduce the capital gains tax or corporate income tax, or to add an investment tax credit), then the result would be an increase in investment, and therefore an increase in growth. According to the Repetto-Austin meta-analysis of 16 leading models, the assumption of such revenue recycling together with several other assumptions (non-carbon backstop fuel, CGE model, increased energy and product substitution, and an idealized form of JI equivalent to global trading) is enough to turn what would otherwise be a negative effect of GDP into a positive one [2020]. Similarly, the IAT report estimated that under a policy of recycling revenues to business, the GDP effect would turn from negative to positive around 2010.[1] Using the revenue for deficit reduction is almost as good, because it lowers interest rates and again stimulates investment. Jorgenson, Shackleton, and other economists have similar findings.

However, returning the revenue to the general public through reductions in income taxes or payroll taxes, or through lump-sum redistribution, does not produce positive effects on GDP in these models. We suppose that cutting corporate taxes would be undesirable on political and income-distribution grounds, and that the government may want to use the revenue to ease the burden on those (e.g., displaced coal miners) who might be disadvantaged. For this reason, we have not as yet pursued the revenue recycling idea (also known as the double-dividend) any further.

Climate Change mitigation The goal of the entire exercise, of course, is to begin to move to an emissions path that implies lower levels of atmospheric concentrations of GHGs in future centuries, and thereby mitigate the likely extent of global climate change. Estimates of the economic damages from climate change (e.g., in the Integrated Assessment models of Nordhaus, Cline, and other economists) fall into the following areas: agriculture, sea-level rise, air conditioning and heating, water supply, human life and health, air pollution, and other costs (hurricanes, migration costs, human amenity, construction, leisure activities, urban infrastructure, and ecological damages such as forest loss and species loss). One must sympathize with those who critique the economists on the grounds that these costs are extremely difficult to quantify, particularly when it comes to possible catastrophe scenarios to which the scientists cannot assign a reliable probability.

---

[1] (Figure 13 in IAT); this analysis assumes stabilization at 1990 levels by 2010, with 10-year phase-in; assuming a 1.25 % annual decrease in EEI.

It turns out that the subject of perhaps the greatest uncertainty and sensitivity is the discount rate that is applied to the benefits of averting future climate change. Such a discount rate is needed, because the economic costs of the policies under discussion occur over the next few decades, whereas the prime benefits of averting climate change occur in coming centuries. Yet there is little agreement, even among economists, on the appropriate discount rate. Cline, for example, explicitly considers a low discount rate (and a high aversion to possible catastrophe) in getting his conclusion that the benefits of early and strong action outweigh the costs.

We take it as self-evident that the benefits of averting climate change are potentially enormous. But we have, so far, chosen not to try to quantify them in monetary terms, in light of the quantitative uncertainty, their timing (far outside the 2008-2012 window), and the need to make difficult decisions regarding the post 2012 path of emissions cuts in order to produce meaningful reductions in future concentrations. We are inclined to favor an attempt to add up the various possible costs and benefits of emissions policy excluding climate change. Thus a conclusion might be phrased along lines such as "the net benefits of our policies to reduce emissions [under the following conditions...] are likely to be positive, even before taking into account the benefits of averting climate change itself."

Work in Progress, 1/12/98

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To do: higher AEEIs

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[1] (Figure 13 in IAT); this analysis assumes stabilization at 1990 levels by 2010, with 10-year phase-in; assuming a 1.25 % annual decrease in EEI.

It turns out that the subject of perhaps the greatest uncertainty and sensitivity is the discount rate that is applied to the benefits of averting future climate change. Such a discount rate is needed, because the economic costs of the policies under discussion occur over the next few decades, whereas the prime benefits of averting climate change occur in coming centuries. Yet there is little agreement, even among economists, on the appropriate discount rate. Cline, for example, explicitly considers a low discount rate (and a high aversion to possible catastrophe) in getting his conclusion that the benefits of early and strong action outweigh the costs.

We take it as self-evident that the benefits of averting climate change are potentially enormous. But we have, so far, chosen not to try to quantify them in monetary terms, in light of the quantitative uncertainty, their timing (far outside the 2008-2012 window), and the need to make difficult decisions regarding the post 2012 path of emissions cuts in order to produce meaningful reductions in future concentrations. We are inclined to favor an attempt to add up the various possible costs and benefits of emissions policy excluding climate change. Thus a conclusion might be phrased along lines such as "the net benefits of our policies to reduce emissions [under the following conditions...] are likely to be positive, even before taking into account the benefits of averting climate change itself."

Preliminary Draft

Ancillary Benefits of US participation in the Kyoto Agreement

I. Benefits Expressible in Monetary Terms (billions of dollars per year) given $50/ton carbon.

Emissions reductions	$3,000 ton for NoX rel in non-attainment area (lower in attainment areas) (conservative)	
Utilities	$1.1	
Vehicles	$0.3	
Other	$0.4	
Highway fatalities	$4.3	Higher cost ⇒ less driving; Also speed; potential offsets: Lower weight could mean fewer accidents
Highway accidents	$1.5	
Highway congestion	$1	
Highway maintenance expenses	NA	
Total	$8.5	comfortable with half

II. Unquantifiable benefits

Inconvenience from highway congestion
Mercury emissions reductions
Sulfur dioxide emissions control cost savings
Energy independence

III. Warning: This table is intended to show only that quantifiable monetary benefits could reach high billions of dollars per year. These numbers are exceptionally rough and greater precision is unwarranted. Key caveats include

1) reductions in highway fatalities ignore higher average speeds from reduced congestion, and lighter potentially less safe cars;
2) ~~potential double counting of some highway fatalities in highway accidents, and~~
3) uncertain, subjective, but conservative valuation of ancillary emissions reductions based on cost avoided.

January 8, 1998

Work in Progress, 1/12/98

Costs and benefits of U.S. participation in the Kyoto Agreement

Costs and Benefits Summary

Scenario (no sinks)	**Permit Price**	**Resource Cost**	**Possible Monetized Benefits**[1]
10/97 Administration Position (6 gases, net-net sinks, 1990 by 2010)	$148/ton	$41 billion	$25 billion
Kyoto Protocol: No International Trading[2]	$171/ton	$51 billion	$29 billion
Full Annex I Trading	$48/ton	$22 billion	$8 billion
Umbrella excluding EU and Eastern Europe	$43/ton	$20 billion	$7 billion
Umbrella excluding EU	$26/ton	$13 billion	$4 billion
Annex I Trading + JI (JI = 20% worldwide trading)	$36/ton	$17 billion	$6 billion
Annex I Trading + Participation by Key Developing Countries[3]	$20/ton	$10 billion	$3 billion
Annex I Trading + Full Worldwide Trading	$19/ton	$10 billion	$3 billion
Umbrella excluding EU + Full Worldwide Trading	$10/ton	$6 billion	$2 billion

[1] Preliminary and undergoing revision. Incl. air pollutn., congestn., accidents, roads. Excl. electricity restructuring

[2] All subsequent cases evaluate the Kyoto Protocol.

[3] Key developing countries include China, India, Mexico, and Korea.

With accounting for sinks
Full Annex I Trading

Sinks Assumption	**Permit Price**	**Resource Cost**	**Possible Monetized Benefits**
No Sinks (U.S.: 0 MMTCE)	$48/ton	$22 billion	$8 billion
Half of Land Use Change and Forestry Sinks (U.S.: 52 MMTCE)	$26/ton	$12 billion	$4 billion
All of Land Use Change and Forestry Sinks (U.S.: 104 MMTCE)	$11/ton	$5 billion	$2 billion

Two very large categories of potential benefits have been left out of the foregoing list of costs and benefits: revenue recycling and climate change mitigation.

Revenue recycling If the emission permits to be issued in the budget period, 2008-2012, were to be auctioned off, rather than allocated for free, the resulting revenue for the government could provide major benefits. If the revenue were used to reduce taxes that fall on capital (i.e., to reduce the capital gains tax or corporate income tax, or to add an investment tax credit), then the result would be an increase in investment, and therefore an increase in growth. According to the Repetto-Austin meta-analysis of 16 leading models, the assumption of such revenue recycling together with several other assumptions (non-carbon backstop fuel, CGE model, increased energy and product substitution, and an idealized form of JI equivalent to global trading) is enough to turn what would otherwise be a negative effect of GDP into a positive one [2020]. Similarly, the IAT report estimated that under a policy of recycling revenues to business, the GDP effect would turn from negative to positive around 2010.[1] Using the revenue for deficit reduction is almost as good, because it lowers interest rates and again stimulates investment. Jorgenson, Shackleton, and other economists have similar findings.

However, returning the revenue to the general public through reductions in income taxes or payroll taxes, or through lump-sum redistribution, does not produce positive effects on GDP in these models. We suppose that cutting corporate taxes would be undesirable on political and income-distribution grounds, and that the government may want to use the revenue to ease the burden on those (e.g., displaced coal miners) who might be disadvantaged. For this reason, we have not as yet pursued the revenue recycling idea (also known as the double-dividend) any further.

Climate Change mitigation The goal of the entire exercise, of course, is to begin to move to an emissions path that implies lower levels of atmospheric concentrations of GHGs in future centuries, and thereby mitigate the likely extent of global climate change. Estimates of the economic damages from climate change (e.g., in the Integrated Assessment models of Nordhaus, Cline, and other economists) fall into the following areas: agriculture, sea-level rise, air conditioning and heating, water supply, human life and health, air pollution, and other costs (hurricanes, migration costs, human amenity, construction, leisure activities, urban infrastructure, and ecological damages such as forest loss and species loss). One must sympathize with those who critique the economists on the grounds that these costs are extremely difficult to quantify, particularly when it comes to possible catastrophe scenarios to which the scientists cannot assign a reliable probability.

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Preliminary Draft

Improvements in Highway Safety From Fuel Price Increases

Higher fuel prices may improve highway safety. One effect on highway safety is through fewer vehicle miles traveled, although this may be offset somewhat by higher speeds associated with reduced congestion. Another effect is through lighter and potentially less safe vehicles. A third effect is through accelerated fleet turnover. The first effect is likely to be much larger than the other two effects, and forms the basis for our quantitative estimate. We consider each in turn and calculate illustrative magnitudes assuming a $100/ton carbon price.

I. Vehicle miles traveled.

As higher fuel prices induce people to drive less, the reduction in driving reduces the losses from traffic accidents. To calculate the reduction in driving recall that total vehicle miles traveled (VMT) is identical to gasoline consumption times average miles per gallon (mpg). Thus the elasticity of VMT with respect to price equals the elasticity of gasoline consumption with respect to price *plus* the elasticity of miles per gallon with respect to price. Estimates of these elasticities are presented below:

Estimates of the Elasticity of Vehicle Miles Traveled With Respect to Fuel Price
Table 1

Run	price elasticity of gasoline consumption	price elasticity of miles per gallon	implied price elasticity of VMT
Short Run	-.26	0[1] to .1 to .12	~-.14 to ~-.26
Long Run	-.9	.08 to .21	~-.8 to ~-.7

Source: Dahl and Sterner, "Analysing Gasoline Demand Elasticities: A Survey", Energy Economics, July 1991 for fuel price elasticities. For fuel-efficiency elasticities, see Dahl "Demand for Transportation Fuels: A Survey of Demand Elasticities and Their Components", Division of Economics and Business, Colorado School of Mines, (September), as cited in Khazzoom.

We develop estimates using elasticities of .2 and .7 for the short-run and the long-run.

Thus fuel price increases of $0.26 /gallon, given a base of $1.30 / gallon imply VMT declines of nearly 4 percent in the short run. Assuming that fatal accidents are proportional to VMTs, we estimate that such a fuel price increase might prevent about 1700 highway fatalities per year in the short run, or 6000 in the long-run. If these were valued at $5 million per statistical life, this would amount to savings of $8.5 billion per year in the short-run or $30 billion per year in the long-run, when the vehicle fleet has changed. Higher estimates result could result in different

[1]Price hikes should affect fleet efficiency only to the extent that people buy new cars. Thus in the very short run, the elasticity must be zero.

assumptions about the likelihood of two-car collisions. A physical model of vehicles as random particles would suggest that 2-vehicle accidents might fall in proportion to the square of the percentage reduction in VMT. In this case the number of fatalities avoided would more than double, to about 3800.

Total private passenger and commercial insurance claims equaled $83.67 billion dollars in 1996. Of that, $2.8 billion dollars equaled the liability insurance cost of auto fatalities. Thus the insurance cost of accidents apart from fatalities was $80.9 billion. If these fell by an amount proportional to VMT, savings in the short run would be about $3.1 billion per year; in the long run they could reach $10 billion.

Another estimate of the savings in insurance costs can be derived. A paper by the California Energy Commission estimated that the marginal insurance cost per mile driven, including the fatality cost is $0.04/mile, on the basis of a simple regression of five years of data for all California counties. The short-run declines in VMT of four percent that are expected to result from a fuel price increase of $0.26/gallon, correspond to about 88 billion vehicle miles traveled, given the baseline of the 2.3 trillion vehicles miles travelled in 1993. If the marginal cost of 4¢/mile is applied to these miles, the result is about $3.5 billion per year. This estimate corresponds fairly closely to the $3.1 billion estimate that assumes that insurance costs are proportional to VMT. (This estimate may be too high because it assumes insurance costs in the rest of the country are as high as in California.)

These estimates should use a baseline of 2010, which will be different because vehicle miles traveled are projected to grow at an annual rate of nearly 2 percent over the next decade. If this growth rate is applied to 15 years, e.g., from 1993 through 2008, then the incremental insurance related cost is $4.8 billion in the short-run.

One complication in the relationship between VMT and safety is that with less VMT, roads will be less congested and vehicle speeds greater. Higher speeds lead to more severe crashes, given that crashes occur, and since a large share of the economic losses from traffic accidents is fatalities, there may be an offset due to greater fatalities at higher speeds. A California study indicates that a $.50 /gallon tax lowers travel times (and hence raises average speeds) by about 5 percent, an increase slightly larger than the estimated decrease in VMT from the same tax. To control for these effects requires information about average speed on fatality risk holding road conditions constant. For simplicity we ignore these offsetting effects. (We are pursuing these estimates.)

II. Vehicle weight.

The claim that more efficient vehicles, e.g., those adopted as a result of fuel efficiency standards, tend to be lighter, less crash-worthy, and therefore less safe, is contentious. We develop alternative estimates that reflect this effect and sketch arguments to justify ignoring it.

An article by Crandall and Graham has quantified the effect of weight on safety; they estimate elasticities of fatalities to vehicle weight of 1 to 2. We can not apply this estimate without knowing the effect of higher fuel prices on weight. We have no direct estimates of this relationship, so we use instead an indirect approach based on the relationship between fuel efficiency and prices, and fuel efficiency and vehicle weight. As mentioned above, Dahl reports average estimated elasticities of fuel efficiency with respect to fuel prices of .1 to .12. Crandall *et. al.*, (Regulating the Automobile, 1986), report elasticities of miles per gallon with respect to weight of .7 to .8. We assume that the elasticity of weight with respect to fuel price is thus .13 [.13=.1/.75]. Thus an increase in fuel price of $0.26/gallon or 20 percent leads to a .026 percent reduction in weight, and an increase in fatalities of 2.6 percent to 5.2 percent. These amount to between 1100 and 2300 of the 44400 highway fatalities that occurred in 1993(?). Valuing these at $5 million each provides for an offset to the ancillary benefits of $5.5 billion to $12 billion annually.

More recent research, however, has drawn a different conclusion, which is also pursued here. For example, Dan Khazzoom of RFF[2] is quite critical of claims that lighter vehicles are less safe. He argues

- The underlying econometric models of fatalities as a function of vehicle weight neglect vehicle size. This neglect introduces omitted variable bias so that weight appears to have a beneficial effect, although it is size that in fact matters. Models that have included size and weight gave no support for the claim that weight enhances safety, at least in single vehicle crashes.

- The National Research Council, in a study of two car crashes, concluded that the total number of injuries when both cars are made lighter could rise, fall or remain unchanged.
  --Although the weight of loaded trucks would not decrease with higher energy prices, passenger cars and light trucks would generally become lighter as a result of higher fuel prices, so this result seems applicable.

- Down-weighting without down-sizing is a plausible response to higher fuel prices and according to Khazzoom, "the more recent evidence does not support the theory that reducing car weight is a detriment to safety." (p.115)

III. Fleet composition.

Higher fuel prices will accelerate the scrapping of older fuel-inefficient vehicles. Newer

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[2]J. Daniel Khazzoom, "Impact of Pay at the Pump on Safety through Enhanced Vehicle Fuel Safety", *The Energy Journal*, Vol. 18, No.3, 1997, pp.115-133.

cars are generally safer than older cars, however, due to air-bags, automatic braking systems, etc. Khazzoom finds that "given these additional characteristics contribute to safety, the inducement to advance replacement brought about by [higher fuel prices] leads to higher levels of fleet safety. This will always be the case, so long as these other characteristics contribute more to safety than the increase fuel efficiency detracts from it, which is very unlikely to be the case in light of our findings above", (p.123). Even if fuel-efficiency gains did come at the expense of safety, these would be offset by the greater safety of a newer vehicle fleet.

IV. Social cost of greater fuel efficiency.

Increases in fuel efficiency are typically costly, holding performance constant. Crandall and Graham estimate that the cost of each mile per gallon improvement is $1 billion. Given our price increase of $0.26 and our elasticity of efficiency with respect to price of .1, the projected improvement in miles per gallon is about two percent in the short run. Thus if 23 mpg were taken as the baseline efficiency, and a two percent gain were projected, then the absolute gain in mpg would be about .4 mpg. This gain would cost about $.4 billion, taking Crandall's estimate of $1 billion/mpg as given.