101

b(5) email re 2 CH. Lts 11 pgs

Williams, Ronald L

From: Kelliher, Joseph
Sent: Tuesday, February 20, 2001 7:33 PM
To: Anderson, Margot
Subject: RE: toycing base


sec7.doc


sec8.doc

Please give me your direct line.

-----Original Message-----
From: Anderson, Margot
Sent: Tuesday, February 20, 2001 7:18 PM
To: Kelliher, Joseph
Subject: toycing base

Joe,

Are you planning on submitting section 5 (both parts) tomorrow at 8 or 9 as well? If so, should I focus on that?

Margot

-----Original Message-----
From: Kelliher, Joseph
Sent: Tuesday, February 20, 2001 5:59 PM
To: Anderson, Margot
Subject: RE: almost

-----Original Message-----
From: Anderson, Margot

Sent: Tuesday, February 20, 2001 5:57 PM
To: Kelliher, Joseph
Subject: almost

Joe,

I want to read for typos (working too fast) but here is the section and the regional stuff. Will take about an hour.

Margot << File: sec1 3 jk.DOC >> << File: regional effects next 6 months. doc.doc >>

105

Williams, Ronald L 5(5)

From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 7:55 AM
To: Anderson, Margot
Subject: RE: Unocal patent, summertime gasoline prices

Jeez, end of the day would be great.

—Original Message—
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:53 AM
To: Kelliher, Joseph; Kripowicz, Robert; PETTIS, LARRY
Subject: RE: Unocal patent, summertime gasoline prices

Okay - I think we did something on this last year. Deadline?

—Original Message—
From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 7:23 AM
To: Kripowicz, Robert; PETTIS, LARRY
Cc: Anderson, Margot
Subject: FW: Unocal patent, summertime gasoline prices

—Original Message—
From: Robert_C._McNally@opd.eop.gov%internet
[mailto:Robert_C._McNally@opd.eop.gov]
Sent: Wednesday, February 21, 2001 7:12 AM
To: Kelliher, Joseph
Cc: McSlarrow, Kyle; Andrew_D._Lundquist@ovp.eop.gov%internet;
Karen_Y._Knutson@ovp.eop.gov%internet
Subject: Unocal patent, summertime gasoline prices

Joe,

Thanks,
Bob
Unocal: Gas patent won't boost prices
Tuesday, 20 February 2001 21:27 (ET)

Unocal: Gas patent won't boost prices
By HIL ANDERSON, UPI Chief Energy Correspondent

LOS ANGELES, Feb. 20 (UPI) – Unocal Corp. downplayed fears that Tuesday's U.S. Supreme Court decision not to hear the case against the patents on its reformulated gasoline formulas would lead to another summer of soaring prices at the pump.

The high court decided Tuesday it would not hear an appeal from five of Unocal's fellow oil companies and let stand a lower court ruling that upheld

Unocal's patents and the company's right to seek royalty payments of 5.75 cents per gallon from companies that use its formula.

The uncertainty over the Unocal case last summer was looked at by some analysts as playing a role in the hefty nationwide spike in pump prices that
sullied an otherwise banner year for summer vacation travel.

Unocal executives were elated at Tuesday's news from Washington. Officials said the back royalties could produce annual royalty revenues of $75-$150 million, however they insisted that consumers would not bear the brunt.

"We believe that our patented formulations provide refiners and blenders with a cost-effective way of meeting California and federal standards for cleaner-burning gasoline," said Charles R. Williamson, Unocal's chief executive officer. "We estimate that licenses for our patents would add less
than 1 cent per gallon to the cost of reformulated gasoline nationwide."

The patent challenge case primarily involved formulas for gasoline used only in California, however refiners nationwide were reluctant to produce fuel that might place them in a position to eventually be sued by Unocal. That reluctance was accompanied by warnings that an overall shortage of RFG could result if refiners could not find a way to blend RFG without stepping on Unocal's toes.

Pump prices nationwide jumped last summer with the increase largely the result of higher crude prices, although shortages of RFG drove retail prices
in the Chicago and Milwaukee areas to $2 per gallon.

Unocal, however, said that RFG can be made with formulas that differ from theirs, and that the gasoline covered by the five patents in question applied to "summer" RFG gasoline that has a lower so-called Reid Vapor Pressure -- which indicates a slower rate of evaporation -- and accounts for
less than half of all RFG varieties.

Nevertheless, Williamson said that the time had come for the nation's refiners to meet with Unocal to work out an accommodation.

"Lost in this long dispute is the simple fact that utilizing the formulations in our cleaner-burning gasoline patents can save refiners and consumers millions of dollars while improving air quality," he said. "We think it's time for all of the parties to sit down and negotiate fair and reasonable licensing agreements."

—

104

Williams, Ronald L Separate graphs 453

From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 12:32 PM
To: Anderson, Margot
Subject: RE: 97%

Get together the various charts, tables, and graphs we might want to include and we can go through them later today. If I get the submissions from the other agencies, I will send to you and you can circulate and get comments. Thanks.

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 12:18 PM
To: Kelliher, Joseph
Subject: RE: 97%

-----Original Message-----
From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 12:16 PM
To: Anderson, Margot
Subject: RE: 97%

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 12:13 PM
To: Kelliher, Joseph
Subject: RE: 97%

-----Original Message-----
From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 11:57 AM
To: Anderson, Margot
Subject: RE: 97%

Do you have any comments on the consumer piece? I want to send to the WH soon.

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 11:23 AM
To: Kelliher, Joseph
Subject: 97%

Sorry, I got called away to meeting with the chief of staff (on energy emergencies at DOE).

Margot

101

5(5)

Williams, Ronald L

From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 12:30 PM
To: Anderson, Margot
Subject: RE: 97%

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 11:23 AM
To: Kelliher, Joseph
Subject: 97%

Sorry. I got called away to meeting with the chief of staff (on energy emergencies at DOE).

Margot

14233

DOE015-1302

Williams, Ronald L

From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 12:16 PM
To: Anderson, Margot
Subject: RE: 97%

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 12:13 PM
To: Kelliher, Joseph
Subject: RE: 97%

-----Original Message-----
From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 11:57 AM
To: Anderson, Margot
Subject: RE: 97%

Do you have any comments on the consumer piece? I want to send to the WH soon.

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 11:23 AM
To: Kelliher, Joseph
Subject: 97%

Sorry, I got called away to meeting with the chief of staff (on energy emergencies at DOE).

Margot

107

Williams, Ronald L

From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 11:57 AM
To: Anderson, Margot
Subject: RE: 97%

Do you have any comments on the consumer piece? I want to send to the WH soon.

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 11:23 AM
To: Kelliher, Joseph
Subject: 97%

Sorry, I got called away to meeting with the chief of staff (on energy emergencies at DOE).

Margot

11c

5(5)

Williams, Ronald L

From: MaryBeth Zimmerman
Sent: Wednesday, February 21, 2001 10:45 AM
To: Anderson, Margot
Cc: Kelliher, Joseph; Michael York/EE/DOE@DOE%HQ-NOTES
Subject: A major typo in the renewables NEP submission to Margot

..... Forwarded by Lawrence Mansueti/EE/DOE on 02/21/2001 08:42 AM .....

111

b(5) [illegible] 36:55

Williams, Ronald L

From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 1:24 PM
To: Anderson, Margot
Subject: NEP pieces

sec2.2.DOC sec3.2.doc sec6.1.doc sec7.doc

sec8.doc secreg.doc

Williams, Ronald L

From: PETTIS, LARRY
Sent: Wednesday, February 21, 2001 6:39 PM
To: Anderson, Margot
Subject: RE: NEP pieces

Margo,
I'm getting two people to do a fact check on this so we have two set of eyes on this. Will let you know of any changes needed and highlight any data which we can't confirm.

Deadline???

-----Original Message-----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Wednesday, February 21, 2001 1:37 PM
To: Pettis, Larry
Subject: FW: NEP pieces

Larry,

Margot

-----Original Message-----
From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 1:24 PM
To: Anderson, Margot
Subject: NEP pieces

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b(5) attached 6 pgs

Williams, Ronald L

From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 5:47 PM
To: Anderson, Margot
Subject: FW: SECTION 10

02-15-2001 -- NEPG Outline St...

-----Original Message-----
From: Gallogly, Stephen J [mailto:GalloglySJ@state.gov]
Sent: Wednesday, February 21, 2001 4:19 PM
To: Kelliher, Joseph
Subject: SECTION 10

<<02-15-2001 -- NEPG Outline Study EXPANSION.doc>> Per today's discussion for wider circulation and comment within DOE. thanks steve

14275

DOE015-1344

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Williams, Ronald L 5(5)

From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 5:47 PM
To: Anderson, Margot
Subject: agency submissions

1.2 Sargent 6(5)

Williams, Ronald L

From: PETTIS, LARRY
Sent: Wednesday, February 21, 2001 8:12 PM
To: Anderson, Margot
Cc: KYDES, ANDY; SKINNER, BILL
Subject: RE: NEP pieces

We'll definitely get this to you by C.O.B tomorrow.

----Original Message----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Wednesday, February 21, 2001 4:03 PM
To: Pettis, Larry
Subject: RE: NEP pieces

Larry,

Thanks much. The final drop dead would be Friday (when the stuff goes to the Pres.) tomorrow COB woudl be nice. Any possibility?

Margot

----Original Message----
From: PETTIS, LARRY
Sent: Wednesday, February 21, 2001 6:39 PM
To: Anderson, Margot
Subject: RE: NEP pieces

Margo,
I'm getting two people to do a fact check on this so we have two set of eyes

on
this. Will let you know of any changes needed and highlight any data which
we
can't confirm.

Deadline???

----Original Message----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Wednesday, February 21, 2001 1:37 PM
To: Pettis, Larry
Subject: FW: NEP pieces

Larry,

Margot

----Original Message----
From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 1:24 PM

To: Anderson, Margot
Subject: NEP pieces

5/5)

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Williams, Ronald L

From: Braitsch, Jay
Sent: Thursday, February 22, 2001 9:43 AM
To: Anderson, Margot
Subject: RE: NEP news

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

124

Williams, Ronald L

From: Kelliher, Joseph
Sent: Thursday, February 22, 2001 8:39 AM
To: Anderson, Margot
Subject: RE: NEP news

Should work

-----Original Message-----
From: Anderson, Margot
Sent: Thursday, February 22, 2001 8:37 AM
To: Kelliher, Joseph
Subject: RE: NEP news

-----Original Message-----
From: Kelliher, Joseph
Sent: Thursday, February 22, 2001 8:34 AM
To: Anderson, Margot
Subject: RE: NEP news

Also, we have to footnote all our numbers in Ch 1 and 2. How have we done this in the past? I assume footnotes limited to numbers. Do we have to include pinpoints (page numbers) or can we say upfront the source for all numbers if AEO unless otherwise specified?

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All.

Margot

1?? 5(5-)

Williams, Ronald L

From: Kelliher, Joseph
Sent: Thursday, February 22, 2001 8:34 AM
To: Anderson, Margot
Subject: RE: NEP news

Also, we have to footnote all our numbers in Ch 1 and 2. How have we done this in the past? I assume footnotes limited to numbers. Do we have to include pinpoints (page numbers) or can we say upfront the source for all numbers if AEO unless otherwise specified?

—Original Message—
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

126 Synopsis 4:5)

Williams, Ronald L

From: PETTIS, LARRY
Sent: Thursday, February 22, 2001 12:35 PM
To: Anderson, Margot
Subject: RE: NEP pieces

-----Original Message-----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Thursday, February 22, 2001 8:40 AM
To: Pettis, Larry
Subject: RE: NEP pieces

Oh, Larry, don't kill me. We need sources for any info you are fact checking.

Just got the word.

Margot

-----Original Message-----
From: PETTIS, LARRY
Sent: Wednesday, February 21, 2001 8:12 PM
To: Anderson, Margot
Cc: KYDES, ANDY; SKINNER, BILL
Subject: RE: NEP pieces

We'll definitely get this to you by C.O.B tomorrow.

-----Original Message-----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Wednesday, February 21, 2001 4:03 PM
To: Pettis, Larry
Subject: RE: NEP pieces

Larry,

Thanks much. The final drop dead would be Friday (when the stuff goes to the Pres.) tomorrow COB woudl be nice. Any possibility?

Margot

-----Original Message-----
From: PETTIS, LARRY
Sent: Wednesday, February 21, 2001 6:39 PM
To: Anderson, Margot
Subject: RE: NEP pieces

Margo,
I'm getting two people to do a fact check on this so we have two set of eyes

on

this. Will let you know of any changes needed and highlight any data which we
can't confirm.

Deadline???

-----Original Message-----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Wednesday, February 21, 2001 1:37 PM
To: Pettis, Larry
Subject: FW: NEP pieces

Larry,

Margot

-----Original Message-----
From: Kelliher, Joseph
Sent: Wednesday, February 21, 2001 1:24 PM
To: Anderson, Margot
Subject: NEP pieces

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b(5) attachment 1 pg

Williams, Ronald L

From: Carter, Douglas
Sent: Thursday, February 22, 2001 1:06 PM
To: Anderson, Margot
Cc: Rudins, George; Kripowicz, Robert; Braitsch, Jay
Subject: RE: NEP news- Comments

Margot -

Attached are comments on Chapter 4 (Environment), for your consideration.

Doug Carter

Cmts on ch4.doc

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

12-1

Williams, Ronald L

b(5)

From: KONDIS, PAUL
Sent: Thursday, February 22, 2001 6:14 PM
To: Anderson, Margot
Subject: The first three changes

NEP2.PPT

i.e., the quick ones:

(I am assuming that what we sent earlier was a Powerpoint file.)

31

5 (5)

Williams, Ronald L

From: Cook, Trevor
Sent: Thursday, February 22, 2001 3:06 PM
To: Anderson, Margot
Subject: NE Comments on chapters 4, 5, 10

that's all folks.

Trev.

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

132 Surrogate 4:5) in bracket

Williams, Ronald L

From: Braitsch, Jay
Sent: Thursday, February 22, 2001 3:33 PM
To: Anderson, Margot
Subject: RE: NEP news

-----Original Message-----
From: Anderson, Margot
Sent: Thursday, February 22, 2001 3:15 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: RE: NEP news

Can I get a sense of who is going to provide comments by the end of the day on these three chapters? I have NE's (thanks, Trevor) and know EE will comment. Anyone else?

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

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b(5)

Williams, Ronald L

From: Carter, Douglas
Sent: Thursday, February 22, 2001 4:04 PM
To: Anderson, Margot
Subject: NEP, re "anyone else"

Margot -

I saw no acknowledgement on this so I'm resending.

-----Original Message-----
From: Carter, Douglas
Sent: Thursday, February 22, 2001 1:06 PM
To: Anderson, Margot
Cc: Rudins, George; Kripowicz, Robert; Braitsch, Jay
Subject: NEP, re "anyone else"

Margot -

Attached are comments on Chapter 4 (Environment), for your consideration.

Doug Carter

Cmts on ch4.doc

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

14301

DOE015-1370

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Williams, Ronald L

From: Kelliher, Joseph
Sent: Thursday, February 22, 2001 6:05 PM
To: Anderson, Margot
Subject: USDA Comments

Sensitivity: Personal

ogcomments.wpd

Attached are USDA comments. I got a fax from Treasury, and I will make a copy for you.

——Original Message——
From: Joseph Glauber [mailto:Joseph.Glauber@usda.gov]
Sent: Thursday, February 22, 2001 5:45 PM
To: Kelliher, Joseph; andrew_D._Lundquist@ovp.eop.gov%internet; Karen_Y._Knutson@ovp.eop.gov%internet
Cc: Keith.Collins@usda.gov%internet
Subject: Comments attached on interim report.
Sensitivity: Personal

Comments attached on interim report.

Joe Glauber
Office of the Chief Economist
U.S. Department of Agriculture
Room 112A Whitten Building
1400 Independence Ave., SW
Washington, DC 20250-3810
tel 202 720-6185
fax 202 690-4915

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Williams, Ronald L b(5)

From: Kelliher, Joseph
Sent: Thursday, February 22, 2001 5:52 PM
To: Anderson, Margot
Subject: propane

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6(5)

Williams, Ronald L

From: Carter, Douglas
Sent: Thursday, February 22, 2001 10:46 AM
To: Anderson, Margot
Subject: RE: NEP news

Margot -

Doug

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

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b(5) 6 pgs chart

Williams, Ronald L

From: Darrell Beschen
Sent: Thursday, February 22, 2001 5:46 PM
To: Anderson, Margot
Cc: Zimmerman, MaryBeth; York, Michael; Joel Rubin@DOE%HQ-NOTES; darrell.beschen@ee.doe.gov@DOE%HQ-NOTES
Subject: comments on the non EERE chapters

Comments on chapter 10 nationa...

Chapter (New 5) Comments_Econo...

Chapter (new 4) health and env...

these have not been vetted in our office but have the benefit of at least one of the cc persons insights.....

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b(5)

Williams, Ronald L

From: Carter, Douglas
Sent: Thursday, February 22, 2001 5:03 PM
To: Anderson, Margot
Cc: Braitsch, Jay; Kripowicz, Robert
Subject: RE: NEP news

Margot -

One more from FE (sorry).

Doug

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

144

b(5)

Williams, Ronald L

From:	Braitsch, Jay
Sent:	Thursday, February 22, 2001 4:26 PM
To:	Anderson, Margot
Cc:	Carter, Douglas
Subject:	RE: NEP news

—Original Message—
From: Anderson, Margot
Sent: Thursday, February 22, 2001 3:33 PM
To: Braitsch, Jay
Subject: RE: NEP news

Yes, got Doug's stuff. Sorry for not checking. I think you are right.

—Original Message—
From: Braitsch, Jay
Sent: Thursday, February 22, 2001 3:33 PM
To: Anderson, Margot
Subject: RE: NEP news

—Original Message—
From: Anderson, Margot
Sent: Thursday, February 22, 2001 3:15 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Kripowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: RE: NEP news

—Original Message—
From: Anderson, Margot
Sent: Wednesday, February 21, 2001 7:35 PM
To: Cook, Trevor; Scalingi, Paula; PETTIS, LARRY; KENDELL, JAMES; Zimmerman, MaryBeth; Sullivan, John; 'jkstier@bpa.gov'; Knpowicz, Robert; Haspel, Abe; Magwood, William; 'jkstier@bpa.gov'; Whatley, Michael; Braitsch, Jay; Conti, John; Carter, Douglas; KYDES, ANDY; Pumphrey, David; Hart, James
Cc: Kelliher, Joseph
Subject: NEP news

All,

Margot

14

b(5)

Williams, Ronald L

From: Vernet, Jean
Sent: Thursday, February 22, 2001 4:17 PM
To: Anderson, Margot
Cc: Conti, John
Subject: Comments on Chapter 4

Importance: High

Margot,

Directly to you per John's request.

Jean

14319

DOE015-1388

14 u

Williams, Ronald L

From: Kelliher, Joseph
Sent: Thursday, February 22, 2001 6:23 PM
To: Anderson, Margot
Subject: meetings

I want to make sure you know about the two meetings I hope you can attend. First, tomorrow from 10 to whenever to go through chapters 1, 2, and regional. Second, Monday from 11 to 12:30. Originally, I told you Monday, then it was moved to Tuesday, then moved back. I don't think I told you about the last change. I am assuming you will attend both.

141

Williams, Ronald L

From: KONDIS, PAUL
Sent: Thursday, February 22, 2001 10:01 PM
To: Anderson, Margot
Subject: RE: The first three changes

NFP2.PPT

Sure!

I apologize again, and I hope that I haven't set your schedule back very much.

----Original Message----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Thursday, February 22, 2001 5:25 PM
To: Kondis, Paul
Subject: RE: The first three changes

Paul,

Any chance for tomorrow?

Margot

----Original Message----
From: KONDIS, PAUL
Sent: Thursday, February 22, 2001 7:26 PM
To: Anderson, Margot
Subject: RE: The first three changes

I must apologize at this point, because I haven't been able to start on the other three graphs at this point, and I'm not sure when I will be able to.

----Original Message----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Thursday, February 22, 2001 4:09 PM
To: Kondis, Paul
Subject: RE: The first three changes

Thanks, they look good.

----Original Message----
From: KONDIS, PAUL
Sent: Thursday, February 22, 2001 6:14 PM
To: Anderson, Margot
Subject: The first three changes

i.e., the quick ones:

(I am assuming that what we sent earlier was a Powerpoint file.)

147

Williams, Ronald L

From: Stier, Jeffrey K - KN-DC [jkstier@bpa.gov]
Sent: Friday, February 23, 2001 9:21 AM
To: Anderson, Margot
Subject: RE: Revised regional

Margot - I've been out west and just got back. Is this done or is there still time to add comments?

-----Original Message-----
From: Anderson, Margot [mailto:Margot.Anderson@hq.doe.gov]
Sent: Monday, February 19, 2001 12:44 PM
To: Scalingi, Paula; Cook, Trevor; Kripowicz, Robert; Zimmerman, MaryBeth; Sullivan, John; PETTIS, LARRY; KENDELL. JAMES; 'jkstier@bpa.gov'
Cc: Kelliher, Joseph
Subject: Revised regional

All,

I took another stab at the regional piece. Comments and additions, please.

150

Williams, Ronald L

From: Terry, Tracy
Sent: Friday, February 23, 2001 10:20 AM
To: Anderson, Margot
Cc: Conti, John
Subject:

-----Original Message-----
From: Grahame, Thomas
Sent: Wednesday, January 31, 2001 11:11 AM
To: HUTZLER, MARY; BEAMON, JOSEPH; Conti, John; Terry, Tracy; KYDES, ANDY
Cc: Carter, Douglas
Subject: CERA data for CA kwh growth -- some progress made

Tom G

14332

151

Williams, Ronald L

From:	Terry, Tracy
Sent:	Friday, February 23, 2001 10:39 AM
To:	Anderson, Margot
Cc:	Conti, John
Subject:	CERA data on CA - more info

Tracy

152

Williams, Ronald L

From: Cook, Trevor
Sent: Friday, February 23, 2001 11:28 AM
To: Anderson, Margot
Subject: Any news on NEP for today?

Hiya Margo,

Just wondering if you've heard anything.

FYI, all next week I have Mr. Mom duty and will not be able to make it to Forestal until 11:30 am... I would appreciate it if you could schedule any meetings to 11:30 am or later.

My aupair girl is on vacation so my job is to get the kids to school and my wife's job is to leave work early to pick them up. So I can stay late, but I just cant get here until 11:30.

Trev.

Williams, Ronald L

From:	Cook, Trevor
Sent:	Friday, February 23, 2001 3:04 PM
To:	Anderson, Margot
Cc:	Magwood, William
Subject:	comments on chapter 9 "Infrastructure Investment, Integrity, and Safety"

Williams, Ronald L

From: Stier, Jeffrey K - KN-DC [jkstier@bpa.gov]
Sent: Friday, February 23, 2001 3:43 PM
To: Anderson, Margot
Subject: FW: Revised regional

-----Original Message-----
From: Anderson, Margot [mailto:Margot.Anderson@hq.doe.gov]
Sent: Monday, February 19, 2001 12:44 PM
To: Scalingi, Paula; Cook, Trevor; Kripowicz, Robert; Zimmerman, MaryBeth; Sullivan, John; PETTIS, LARRY; KENDELL, JAMES; 'jkstier@bpa.gov'
Cc: Kelliher, Joseph
Subject: Revised regional

All,

Williams, Ronald L

From:	Terry, Tracy
Sent:	Friday, February 23, 2001 4:02 PM
To:	Anderson, Margot
Cc:	Conti, John
Subject:	CERA Electricity data

Williams, Ronald L

From: McManus, Matthew T [McManusMT@state.gov]
Sent: Friday, February 23, 2001 5:28 PM
To: Kelliher, Joseph; Anderson, Margot; 'Dina Ellis Treasury'
Cc: 'Karen Knutson at OVP'; 'Andrew Lundquist, OVP'
Subject: State Comments

State Comments_.doc

<<State Comments_.doc>>

Williams, Ronald L

From: Terry, Tracy
Sent: Friday, February 23, 2001 5:26 PM
To: Anderson, Margot
Cc: Conti, John
Subject: NEP graphs - elec

elec graphs.ppt

14343

Margot, Jeremy asked me to get you our comments with our numbers footnoted. It is attached, however, this is not complete because some of the key folks were not available this afternoon. Therefore, I'll have to get you the rest (there aren't many more) on Monday morning. Ellen

Williams, Ronald L

From: Symons.Jeremy@epamail.epa.gov%internet [Symons.Jeremy@epamail.epa.gov]
Sent: Monday, March 05, 2001 11:18 AM
To: Anderson, Margot
Subject: RE: EPA footnoted

Hi Margot –

Do you have an electronic copy of Chapter 8. It would help us provide more specific redline/strikeout like you requested for the interim report chapters.

Thanks.

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

"Anderson, Margot" <Margot.Anderson@hq.doe.gov>
02/23/2001 05:54 PM

To: Ellen Brown/DC/USEPA/US@EPA
cc: Jeremy Symons/DC/USEPA/US@EPA
Subject: RE: EPA footnoted

Thanks.

-----Original Message-----
From: Brown.Ellen@epamail.epa.gov%internet
[mailto:Brown.Ellen@epamail.epa.gov]
Sent: Friday, February 23, 2001 5:41 PM
To: Anderson, Margot
Cc: Symons.Jeremy@epamail.epa.gov%internet
Subject: EPA footnoted

tmp.htm

Hi Margot --

Do you have an electronic copy of Chapter 8. It would help us provide more specific redline/strikeout like you requested for the interim report chapters.

Thanks.

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

"Anderson, Margot" <Margot.Anderson@hq.doe.gov>

02/23/2001 05:54 PM

To: Ellen Brown/DC/USEPA/US@EPA
cc: Jeremy Symons/DC/USEPA/US@EPA
Subject: RE: EPA footnoted

-----Original Message-----
From: Brown.Ellen@epamail.epa.gov%internet
[mailto:Brown.Ellen@epamail.epa.gov]
Sent: Friday, February 23, 2001 5:41 PM
To: Anderson, Margot
Cc: Symons.Jeremy@epamail.epa.gov%internet
Subject: EPA footnoted

Williams, Ronald L

From: MaryBeth Zimmerman
Sent: Friday, February 23, 2001 6:16 PM
To: Kelliher, Joseph
Cc: Anderson, Margot; Haspel, Abe; Sullivan, John
Subject: Draft renewables

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 10:53 AM
To: Anderson, Margot
Subject: RE: comments on regional

Thanks. I am working on the reorganization Andrew suggested, building on the version you emailed me Friday night. I will let you know when I am done, which may be less than 2 hours. Then we have to figure out how to proceed from there.

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 10:18 AM
To: Kelliher, Joseph
Subject: comments on regional

167

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 10:59 AM
To: Anderson, Margot
Subject: regional information


tmp.htm


Sum 2001 preliminary assessmen...

(b)(5)

——Original Message——
From: Dave Nevius [mailto:dave.nevius@nerc.com]
Sent: Thursday, February 22, 2001 2:11 PM
To: Kelliher, Joseph
Cc: Conti, John; lstuntz@sdsatty.com%internet; lou.leffler@nerc.com%internet; mike.gent@nerc.com%internet; dcook@nerc.com%internet; timg@nerc.com%internet
Subject: Fwd: FW: White House National Energy Policy Development Group(NEPDG)

Joe
One of our folks (Lou Leffler - another PSE&G alumni) got the inquiry below from a Jerry Swiggett of GIS Enterprises. (I think Jerry knows Lou from when Jerry consulted for SAIC -- they were doing some work together on Critical Infrastructure Protection stuff.)

e kind of info Jerry is asking for, on behalf of Andrew and the NEPDG, is xactly what we want to come talk with you about. In fact, we've already put together a preliminary assessment of Summer 2001 (attached), which we made available to Kyle McSlarrow. We will not have final projections of summer conditions until late March, but this is our best (not for attribution) assessment of expected conditions.

Of course, we are already underway with our 10-year assessment as well, which gets into more detail about key issues affecting reliability. Last year's 2000-2009 Reliability Assessment is on our web site. John Conti of DOE staff has been working with our Reliability Assessment Subcommittee for the past several years and is well versed on the issues and the projections. I think he was invited up to brief the Secretary the other day. Not sure if you were involved.

Bottom line is we would really like to come down and visit as soon as you are clear of your budget work. Let me know when you think that will be and what kinds of things you'd like to hear about from us. I see from Mr. Swiggett's letter that you may be looking for information about technology solutions, line losses (not sure why) and generally things that could be done quickly, by Executive Order. (Too bad the President can't make reliability standards enforceable by Executive Order.) Let me know what you need and we will do our very best to provide it.

Also, do you recommend we funnel information through Mr. Swiggett or deal directly with you?

w you're busy. Hope you're having fun. Hope to talk with you soon.

e
(609) 452-8060 work

(609) 915-3062 cell
home](b)(6)

>From: "Michehl R. Gent" <mgent@nerc.com>
>To: "David R. Nevius" <dave.nevius@nerc.com>
>Subject: FW: White House National Energy Policy Development Group(NEPDG)
>Date: Thu, 22 Feb 2001 13:11:42 -0500
>X-Mailer: Microsoft Outlook IMO, Build 9.0.2416 (9.0.2911.0)
>Importance: Normal
>
>
>
>——Original Message——
>From: Lou Leffler [mailto:lou.leffler@nerc.com]
>Sent: Thursday, February 22, 2001 10:59 AM
>To: Gene; Lou; Mike G
>Subject: FW: White House National Energy Policy Development Group(NEPDG)
>
>
>22 Feb 01
>Mike and Gene,
>
>Jerry Swiggett was a contact from SAIC about a year ago. I don't know what
>NEPDG is, other that the name: White House National Energy Policy
>Development Group. Do we want to know any more about this?
>
>lou.
>++++++++++++++++++++++
>
>
>——Original Message——
>From: Jerry Swiggett [mailto:gisent@ix.netcom.com]
>Sent: Wednesday, February 21, 2001 14:54
>To: Leffler, Lou
>Subject: White House National Energy Policy Development Group(NEPDG)
>
>
>Lou,
>
>I have gotten involved with Vice President Dick Cheney's NEPDG from the
>perspective of assisting Andrew Lundquist (NEPDG Director) secure some
>factual information and data on critical power issues. One of the most
>pressing issues, as you are well aware, is the capacity and reliability of
>the domestic elctric power transmission grid. The NEPDG will be developing
>both a "snapshot" of the current energy situation and a longer term report
>on things that can make a positive difference.
>
>I have taken the liberty of bringing you to Lundquist's attention as a
>nationally recognized expert in the power grid area. Lundquist is open to
>receiving a brief white paper (2-4 pages) from you on current grid
>limitations and weaknessess but more importantly, on what steps can be
>taken over the next year or two to improve the grid performance. He is
>very interested in factual data on power loss over distances, technologies
>like superconducting transmission systems or other more realistic
>enhancements or regulatory mods that the President can enact through
>Executive Orders.
>
>If you are possibly interested in responding to this invitation please let
>me know and I will work with you to get your ideas and data properly
>mitted.

pe all is well with you and NERC.
>

>Jerry
>
>
>Gerald E. Swiggett
>President
>GIS Enterprises, Inc.
>8403 Arlington Blvd., Ste. 100
>Fairfax, VA 22031
>(703)876-6800/0515 fax

] (b)(6)

Joe
One of our folks (Lou Leffler - another PSE&G alumni) got the inquiry below from a Jerry Swiggett of GIS Enterprises. (I think Jerry knows Lou from when Jerry consulted for SAIC -- they were doing some work together on Critical Infrastructure Protection stuff.)

The kind of info Jerry is asking for, on behalf of Andrew and the NEPDG, is exactly what we want to come talk with you about. In fact, we've already put together a preliminary assessment of Summer 2001 (attached), which we made available to Kyle McSlarrow. We will not have final projections of summer conditions until late March, but this is our best (not for attribution) assessment of expected conditions.

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Also, do you recommend we funnel information through Mr. Swiggett or deal directly with you?

I know you're busy. Hope you're having fun. Hope to talk with you soon.

Dave
(609) 452-8060 work

(b)(6)

From: "Michehl R. Gent" <mgent@nerc.com>
To: "David R. Nevius" <dave.nevius@nerc.com>
Subject: FW: White House National Energy Policy Development Group(NEPDG)
Date: Thu, 22 Feb 2001 13:11:42 -0500
X-Mailer: Microsoft Outlook IMO, Build 9.0.2416 (9.0.2911.0)
Importance: Normal

-----Original Message-----
From: Lou Leffler [mailto:lou.leffler@nerc.com]
Sent: Thursday, February 22, 2001 10:59 AM
To: Gene; Lou; Mike G
Subject: FW: White House National Energy Policy Development Group(NEPDG)

22 Feb 01
Mike and Gene,

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lou.
++++++++++++++++++++++

-----Original Message-----

From: Jerry Swiggett
Sent: Wednesday, February 21, 2001 14:54
To: Leffler, Lou
Subject: White House National Energy Policy Development Group(NEPDG)

Lou,

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I have taken the liberty of bringing you to Lundquist's attention as a nationally recognized expert in the power grid area. Lundquist is open to receiving a brief white paper (2-4 pages) from you on current grid limitations and weaknessess but more importantly, on what steps can be taken over the next year or two to improve the grid performance. He is very interested in factual data on power loss over distances, technologies like superconducting transmission systems or other more realistic enhancements or regulatory mods that the President can enact through Executive Orders.

If you are possibly interested in responding to this invitation please let me know and I will work with you to get your ideas and data properly submitted.

Hope all is well with you and NERC.

Jerry

Gerald E. Swiggett
President
GIS Enterprises, Inc.
8403 Arlington Blvd., Ste. 100
Fairfax, VA 22031
(703)876-6800/0515 fax

(b)(6)

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Sent: Wednesday, February 21, 2001 14:54
To: Leffler, Lou
Subject: White House National Energy Policy Development Group(NEPDG)

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Jerry

Gerald E. Swiggett
President
GIS Enterprises, Inc.
8403 Arlington Blvd., Ste. 100
Fairfax, VA 22031
(703)876-6800/0515 fax
(703)244-0125 cell

Preliminary Assessment of Summer 2001 Electricity Supply Conditions February 5, 2001

NERC publishes (May and November) seasonal assessments of the reliability of bulk electricity supply in North America. The Summer 2001 assessment will be published May 15. It will be based on updated supply and demand projections.

The information in this preliminary assessment relies on preliminary information and judgment, and is subject to change when the updated projections come in. As a result, nothing in this report should be publicly attributed to NERC. Also, as a general caveat on any assessment like this, even those areas that are expected to have adequate generation and transmission for the coming summer could experience problems if extraordinary weather or equipment outages occur.

The primary areas of concern for Summer 2001, as we see them now, are:

California and the Pacific Northwest

The California Independent System Operator (CAL-ISO) indicated in November 2000 that 2001 Summer demands could exceed available resources at the time of peak by 253 MW (mild temps) to 4,152 MW (hot temps). These projections include imports of 4,500 MW from outside the ISO, 1,421 MW of new generation, continued operation of CAL-ISO's 44,050 MW of existing generation (except for any generator maintenance outages and deratings due to low water conditions at hydro facilities), and a provision for required operating reserves. (Interruptible demands have not be subtracted from the demand forecast, but that may be academic since all of the hours of interruption allowed under these contracts were used up during the month of January.)

In the northern part of the state, hydro-powered electric generators will be limited by low water levels, as will imports from the Pacific Northwest.

California has an internal transmission constraint that limits how much power can be moved from the southern to northern portions of the state. Therefore, most of the reliability problems are expected to occur in northern California.

The Pacific Northwest is also heavily dependent upon hydro-powered electric generation. Stream flows and reservoir levels are at critically low levels. The key hydro indicator in the Northwest is runoff at the Dalles dam on the Columbia River. Current flow is about 65% of normal, and this will be the 4th worst year on record unless they get heavy spring rains. The Pacific Northwest should be able to meet its own customer demand unless weather is extremely hot, but will not be able to supply California with energy as they typically do.

Southeastern United States

Conditions in the Southeast are expected to be much the same as the last two summers – extremely tight. A number of new generators are planned to be added by the summer. However, there may be problems delivering the energy from some of these generators to the demand centers because the transmission system additions needed to connect these generators into the transmission system are lagging the construction of generators. Some existing generators are scheduled to be out of service this spring for maintenance to add emissions related equipment. This has the potential to reduce available resources at a critical time of the year.

Texas

Texas projects adequate capacity margins, but there are still some causes for concern in the state. Texas forecasts about 8,000 MW of new generation being added for the summer, but about 2,500 MW of this new generation is in an area of West Texas that prevents it from being delivered widely throughout Texas due to limitations in the transmission system. Some of the new generation is on the border between Texas and the southeastern United States and may not be used to serve the customers of Texas.

Texas experienced prolonged, extreme temperatures last summer, which required some generators to run many more hours than normal. This could lead to increased generator breakdowns this summer (like California experienced this winter).

A retail access pilot program is scheduled to commence on June 1, 2001 in Texas, and the ten power system operating centers (Control Areas) will be consolidated into a single center. Because June is a time of heavy electrical demand in Texas, this situation bears careful watching.

The Northeast

The northeastern United States experienced a very cool summer last year. If temperatures had been normal, it is very likely that New York and New England would have experienced serious electricity supply problems. While conditions have improved in this region since last summer, it is still susceptible to shortages if customer demand exceeds expectations due to abnormally hot weather, or if a significant number of generators are unexpectedly out of service.

Last summer, New York City experienced some minor supply shortages due to a lack of sufficient transmission into the city. About 440 MW of new generation will be added in distributed locations around New York City by Summer 2001, which should help alleviate this condition and contribute resources to serving total demand in the state.

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 12:43 PM
To: Anderson, Margot
Subject: RE: regional reality check

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 12:25 PM
To: Kelliher, Joseph
Subject: regional reality check

Joe,

Margot << File: secreg.doc >>

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 1:05 PM
To: Anderson, Margot
Subject: ch 2 rewrite

Here is my version of ch 2. If you send me yours, I will work try to figure out how to meld them as you read the attached.

sec1.4.doc

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 2:44 PM
To: Anderson, Margot
Subject: RE: regional reality check

secreg3.doc

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 12:25 PM
To: Kelliher, Joseph
Subject: regional reality check

Joe,

Margot << File: secreg.doc >>

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 2:44 PM
To: Anderson, Margot
Subject: RE: regional reality check

Some questions relating to the regional piece:

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 12:25 PM
To: Kelliher, Joseph
Subject: regional reality check

Joe,

Margot << File: secreg.doc >>

14397

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 2:57 PM
To: Anderson, Margot
Subject: RE: regional reality check

Does EPA have anything more recent than their 2/22 email? Did they hand something out on Friday? I can't recall.

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 2:49 PM
To: Kelliher, Joseph
Subject: RE: regional reality check

-----Original Message-----
From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 2:44 PM
To: Anderson, Margot
Subject: RE: regional reality check

<< File: secreg3.doc >>

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 12:25 PM
To: Kelliher, Joseph
Subject: regional reality check

Joe,

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 3:02 PM
To: Anderson, Margot
Subject: RE: regional reality check

Let me know when you want to sit down and go over your edits. I will come down there.

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 2:49 PM
To: Kelliher, Joseph
Subject: RE: regional reality check

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From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 2:44 PM
To: Anderson, Margot
Subject: RE: regional reality check

<< File: secreg3.doc >>

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From: Anderson, Margot
Sent: Sunday, February 25, 2001 12:25 PM
To: Kelliher, Joseph
Subject: regional reality check

Joe,

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 3:13 PM
To: Anderson, Margot
Subject: RE: regional reality check

Where should I go? Which room?

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 3:06 PM
To: Kelliher, Joseph
Subject: RE: regional reality check

10 minutes

-----Original Message-----
From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 3:02 PM
To: Anderson, Margot
Subject: RE: regional reality check

Let me know when you want to sit down and go over your edits. I will come down there.

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 2:49 PM
To: Kelliher, Joseph
Subject: RE: regional reality check

-----Original Message-----
From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 2:44 PM
To: Anderson, Margot
Subject: RE: regional reality check

What do you think about this for the regional piece? Rewrite of your last version.

<< File: secreg3.doc >>

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 12:25 PM
To: Kelliher, Joseph
Subject: regional reality check

Joe,

Williams, Ronald L

From: KYDES, ANDY
Sent: Sunday, February 25, 2001 6:31 PM
To: Anderson, Margot
Cc: PETTIS, LARRY; HUTZLER, MARY; SITZER, SCOTT; KENDELL, JAMES
Subject: RE: NEP news

NEPP-C~1.WPD

Andy

-----Original Message-----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Friday, February 23, 2001 1:02 PM
To: Pettis, Larry; Kendell, James; Kydes, Andy; TREVOR COOK_at_HQ-EXCH at X400PO; Paula Scalingi_at_HQ-EXCH at X400PO; jkstier@bpa.gov_at_internet at X400PO; Robert Kripowicz_at_HQ-EXCH at X400PO; WILLIAM MAGWOOD_at_HQ-EXCH at X400PO; Michael Whatley_at_HQ-EXCH at X400PO; Jay Braitsch_at_HQ-EXCH at X400PO; John Conti_at_HQ-EXCH at X400PO; Douglas Carter_at_HQ-EXCH at X400PO; David Pumphrey_at_HQ-EXCH at X400PO; James HART_at_HQ-EXCH at X400PO; MaryBeth Zimmerman_at_HQ-NOTES at X400PO; John Sullivan_at_HQ-NOTES at X400PO; Abe Haspel_at_HQ-NOTES at X400PO
Cc: Joseph Kelliher_at_HQ-EXCH at X400PO
Subject: RE: NEP news

All,

Margot

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 5:52 PM
To: Anderson, Margot
Subject: FW: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

This was the schedule for Monday. Was it changed on Friday? I thought we may have pulled the morning meetings so everyone could react to our new 1/2. I will call over there.

----Original Message----
From: John_Fenzel@ovp.eop.gov%internet [mailto:John_Fenzel@ovp.eop.gov]
Sent: Thursday, February 22, 2001 5:16 PM
To: Kelliher, Joseph; Juleanna_R._Glover@ovp.eop.gov%internet;
Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet;
Sue_Ellen_Wooldridge@IOS.DOI.gov%internet;
Tom_Fulton@iosiscns1.ios.doi.gov%internet;
Keith Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet;
Gallogiysj@State.gov%internet; McManusmt@State.gov%internet;
Michelle.Poche@OST.DOT.Gov%internet;
Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet;
Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet;
MPeacock@omb.eop.gov%internet; Mark_A._Weatherly@omb.eop.gov%internet;
Robert_C._McNally@opd.eop.gov%internet;
John_W._Howard@who.eop.gov%internet
Cc: Andrew_D._Lundquist@ovp.eop.gov%internet;
Karen_Y._Knutson@ovp.eop.gov%internet.
Charles_M._Smith@ovp.eop.gov%internet.
Charles_D._McGrath_Jr@ovp.eop.gov%internet;
John_W._Howard@who.eop.gov%internet; jhowardj@ceq.eop.gov%internet;
Robert_C._McNally@opd.eop.gov%internet
Subject: Lead Agency Meetings with the NEPD Executive Director/Deputy
Director

The following agencies are scheduled to meet with Andrew Lundquist and
Karen Knutson at the date/times indicated:

Monday, February 26th:

9:00 am: State Department (Gallogly/McManus)

10:00 am: Department of Interior and CEQ (Symons/Howard)

11:00 am: Department of Energy (Kelliher/Anderson)

Tuesday, February 27th:

9:00 am: Department of Transportation (Poche)

10:00 am: Department of Treasury (Ellis)

Please confirm any additional attendees so they are in the WAVES system and
can be granted access.

Many Thanks,

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 6:12 PM
To: Anderson, Margot
Subject: RE: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 6:06 PM
To: Kelliher, Joseph
Subject: RE: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

Wow, I don't remember this level of detail being discussed.

-----Original Message-----
From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 5:52 PM
To: Anderson, Margot
Subject: FW: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

This was the schedule for Monday. Was it changed on Friday? I thought we may have pulled the morning meetings so everyone could react to our new 1/2. I will call over there.

-----Original Message-----
From: John_Fenzel@ovp.eop.gov%internet [mailto:John_Fenzel@ovp.eop.gov]
Sent: Thursday, February 22, 2001 5:16 PM
To: Kelliher, Joseph; Juleanna_R._Glover@ovp.eop.gov%internet;
Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet;
Sue_Ellen_Wooldridge@IOS.DOI.gov%internet;
Tom_Fulton@iosiscns1.ios.doi.gov%internet;
Keith.Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet;
Galloglysj@State.gov%internet; McManusmt@State.gov%internet;
Michelle.Poche@OST.DOT.Gov%internet;
Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet;
Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet;
MPeacock@omb.eop.gov%internet; Mark_A._Weatherly@omb.eop.gov%internet;
Robert_C._McNally@opd.eop.gov%internet;
John_W._Howard@who.eop.gov%internet

Cc: Andrew_D._Lundquist@ovp.eop.gov%internet;
Karen_Y._Knutson@ovp.eop.gov%internet;
Charles_M._Smith@ovp.eop.gov%internet;
Charles_D._McGrath_Jr@ovp.eop.gov%internet;
John_W._Howard@who.eop.gov%internet; jhowardj@ceq.eop.gov%internet;
Robert_C._McNally@opd.eop.gov%internet
Subject: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

The following agencies are scheduled to meet with Andrew Lundquist and Karen Knutson at the date/times indicated:

Monday, February 26th:

9:00 am: State Department (Gallogly/McManus)

10:00 am: Department of Interior and CEQ (Symons/Howard)

11:00 am: Department of Energy (Kelliher/Anderson)

Tuesday, February 27th:

9:00 am: Department of Transportation (Poche)

10:00 am: Department of Treasury (Ellis)

Please confirm any additional attendees so they are in the WAVES system and can be granted access.

Many Thanks,

John Fenzel

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 7:57 PM
To: Anderson, Margot
Subject: elec generation

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 8:23 PM
To: Anderson, Margot
Subject: RE: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 6:16 PM
To: Kelliher, Joseph
Subject: RE: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

I can go to the 9 and 10 o'clock as long as I can protect 11:30-12:30. If I don't have a staff meeting, my senior staff will kill me. Too much going that we have to coordinate.

-----Original Message-----
From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 6:12 PM
To: Anderson, Margot
Subject: RE: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

-----Original Message-----
From: Anderson, Margot
Sent: Sunday, February 25, 2001 6:06 PM
To: Kelliher, Joseph
Subject: RE: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

Wow. I don't remember this level of detail being discussed.

——Original Message——
From: Kelliher, Joseph
Sent: Sunday, February 25, 2001 5:52 PM
To: Anderson, Margot
Subject: FW: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

This was the schedule for Monday. Was it changed on Friday? I thought we may have pulled the morning meetings so everyone could react to our new 1/2. I will call over there.

——Original Message——
From: John_Fenzel@ovp.eop.gov%internet [mailto:John_Fenzel@ovp.eop.gov]
Sent: Thursday, February 22, 2001 5:16 PM
To: Kelliher, Joseph; Juleanna_R._Glover@ovp.eop.gov%internet;
Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet;
Sue_Ellen_Wooldridge@IOS.DOI.gov%internet;
Tom_Fulton@iosiscns1.ios.doi.gov%internet;
Keith.Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet;
Galloglysj@State.gov%internet; McManusmt@State.gov%internet;
Michelle.Poche@OST.DOT.Gov%internet;
Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet;
Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet;
MPeacock@omb.eop.gov%internet; Mark_A._Weatherly@omb.eop.gov%internet;
Robert_C._McNally@opd.eop.gov%internet.
John_W._Howard@who.eop.gov%internet
Cc: Andrew_D._Lundquist@ovp.eop.gov%internet;
Karen_Y._Knutson@ovp.eop.gov%internet.
Charles_M._Smith@ovp.eop.gov%internet;
Charles_D._McGrath_Jr@ovp.eop.gov%internet;
John_W._Howard@who.eop.gov%internet; jhowardj@ceq.eop.gov%internet;
Robert_C._McNally@opd.eop.gov%internet
Subject: Lead Agency Meetings with the NEPD Executive Director/Deputy Director

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9:00 am: State Department (Gallogly/McManus)

10:00 am: Department of Interior and CEQ (Symons/Howard)

11:00 am: Department of Energy (Kelliher/Anderson)

Tuesday, February 27th:

9:00 am: Department of Transportation (Poche)

10:00 am: Department of Treasury (Ellis)

Please confirm any additional attendees so they are in the WAVES system and can be granted access.

Many Thanks,

John Fenzel

Williams, Ronald L

From: Kelliher, Joseph
Sent: Monday, February 26, 2001 11:51 AM
To: Anderson, Margot
Subject: FW: Cancellation of NEPD Working Group Meeting


sec1.4.doc


secreg3.doc

Task Force meeting this afternoon cancelled. Consider it found time.

-----Original Message-----
From: Charles_M._Smith@ovp.eop.gov%internet
[mailto:Charles_M._Smith@ovp.eop.gov]
Sent: Monday, February 26, 2001 10:41 AM
To: Kelliher, Joseph; Juleanna_R._Glover@ovp.eop.gov%internet;
Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet;
Sue_Ellen_Wooldridge@IOS.DOI.gov%internet;
Tom_Fulton@iosiscns1.ios.doi.gov%internet;
Keith.Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet;
Galloglysj@State.gov%internet; McManusmt@State.gov%internet;
Michelle.Poche@OST.DOT.Gov%internet;
Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet;
Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet;
MPeacock@omb.eop.gov%internet; Mark_A._Weatherly@omb.eop.gov%internet;
Robert_C._McNally@opd.eop.gov%internet;
William__Bettenberg@IOS.DOI.gov%internet;
Tom_Fulton@IOS.DOI.GOVMargot.Anderson%internet;
mleblanc@ceq.eop.gov%internet; jhowardj@ceq.eop.gov%internet
Cc: Andrew_D._Lundquist@ovp.eop.gov%internet;
Karen_Y._Knutson@ovp.eop.gov%internet;
Charles_D._McGrath_Jr@ovp.eop.gov%internet;
Robert_C._McNally@opd.eop.gov%internet
Subject: Cancellation of NEPD Working Group Meeting

Due to a conflict in Andrew Lundquist's schedule, the working group meeting scheduled for Monday, February 26, 2001, at 3:30 PM has been canceled. We'll do it on Wednesday, February 28, 2001, at 4:00 PM in the VP's Ceremonial Office.

The schedule for individual chapter meetings is as follows:

Transportation - Tuesday, February 27 - 9:00 AM
Treasury Tuesday, February 27 -10:00 AM

We'll provide you with the schedule for other review meetings as they are finalized.

I have also attached, for your information, the latest drafts prepared by DOE of the Regional Issues and Chapters 1 and 2.

(See attached file: sec1.4.doc)

(See attached file: secreg3.doc)

Any questions, give either John Fenzel or me a call. John is on 456-7953.
I am on 456-7874.

Charlie Smith

Williams, Ronald L

From: Kelliher, Joseph
Sent: Monday, February 26, 2001 11:53 AM
To: Anderson, Margot
Subject: California graphics

Importance: High

Williams, Ronald L

From: Terry, Tracy
Sent: Monday, February 26, 2001 12:18 PM
To: Conti, John; Anderson, Margot
Subject: NEP graphs - more on elec

Tracy

elec graphs.ppt

-----Original Message-----
From: Conti, John
Sent: Monday, February 26, 2001 8:18 AM
To: Anderson, Margot
Cc: Terry, Tracy
Subject: RE: NEP graphs - elec

-----Original Message-----
From: Anderson, Margot
Sent: Monday, February 26, 2001 8:04 AM
To: Conti, John; Terry, Tracy
Subject: RE: NEP graphs - elec

Can you be more specific? What should I fix?

-----Original Message-----
From: Conti, John
Sent: Monday, February 26, 2001 8:02 AM
To: Terry, Tracy; Anderson, Margot
Subject: RE: NEP graphs - elec

-----Original Message-----
From: Terry, Tracy
Sent: Friday, February 23, 2001 5:26 PM
To: Anderson, Margot
Cc: Conti, John

Williams, Ronald L

From: Charles_M._Smith@ovp.eop.gov%internet [Charles_M._Smith@ovp.eop.gov]
Sent: Monday, February 26, 2001 12:54 PM
To: Anderson, Margot; Tom_Fulton@IOS.DOI.GOV%internet
Subject: Cancellation of NEPD Working Group Meeting


sec1.4.doc


secreg3.doc

Due to a conflict in Andrew Lundquist's schedule, the working group meeting scheduled for Monday, February 26, 2001, at 3:30 PM has been canceled. We'll do it on Wednesday, February 28, 2001, at 4:00 PM in the VP's Ceremonial Office.

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We'll provide you with the schedule for other review meetings as they are finalized.

I have also attached, for your information, the latest drafts prepared by DOE of the Regional Issues and Chapters 1 and 2.

(See attached file: sec1.4.doc)

(See attached file: secreg3.doc)

Any questions, give either John Fenzel or me a call. John is on 456-7953. I am on 456-7874.

Charlie Smith

Williams, Ronald L

From:	Charles_M._Smith@ovp.eop.gov%internet [Charles_M._Smith@ovp.eop.gov]
Sent:	Monday, February 26, 2001 1:03 PM
To:	Kelliher, Joseph; Anderson, Margot; Julieanna_R._Glover@ovp.eop.gov%internet; Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet; Sue_Ellen_Wooldridge@IOS.DOI.gov%internet; Tom_Fulton@iosiscns1.ios.doi.gov% internet; Keith.Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet; Galloglysj@State.gov%internet; McManusmt@State.gov%internet; Michelle.Poche@OST.DOT.Gov%internet; Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet; Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet; MPeacock@omb.eop.gov%internet; Mark_A. _Weatherly@omb.eop.gov%internet; Robert_C._McNally@opd.eop.gov%internet; William__Bettenberg@IOS.DOI.gov%internet; Tom_Fulton@IOS.DOI.gov%internet; mleblanc@ceq.eop.gov%internet; jhowardj@ceq.eop.gov%internet
Cc:	Andrew_D._Lundquist@ovp.eop.gov%internet; Karen_Y._Knutson@ovp.eop.gov%internet; Charles_D._McGrath_Jr@ovp.eop.gov%internet; Robert_C._McNally@opd.eop.gov% internet; John_Fenzel@oa.eop.gov%internet
Subject:	Cancellatin of the Principals' Meeting

FYI: The principals' meeting scheduled for Wednesday, February 28, 2001, has also been cancelled due to the budget roll-out. The next meeting is Tuesday, March 6 at 10:00.

Williams, Ronald L R-5

From: Kelliher, Joseph
Sent: Saturday, March 24, 2001 10:29 AM
To: Anderson, Margot
Subject: refinery action

14459

DOE017-1555

(b)5

Williams, Ronald L

From: Wheeler, Evelyn [WheelerE@state.gov]
Sent: Thursday, March 22, 2001 3:02 PM
To: Anderson, Margot
Cc: McManus, Matthew T
Subject: RE: NEPD Deadline

Thanks, Margot.

Evelyn Wheeler
EB/ESC/IEC/EPC - Room 3535
Phone: (202) 647-4557
Fax: (202) 647-4037
This message is unclassified under precepts of EO 12958.

----Original Message----
From: Anderson, Margot [mailto:Margot.Anderson@hq.doe.gov]
Sent: Wednesday, March 21, 2001 6:39 PM
To: 'Wheeler, Evelyn'
Cc: 'McManus, Matthew T'; 'Gallogly, Stephen J'; Kelliher, Joseph; Hudome, Randa; 'Andrew Lundquist, OVP'; 'Karen Knutson at OVP'; 'Charlie Smith, OVP'; 'John Fenzel, OVP'; 'Kjersten Drager, OVP'; 'Kevin Murphy, DOC'
Subject: RE: NEPD Deadline

Evelyn,

Here are some comments on a previous version of chapter 10. They might still be useful.

Margot

----Original Message----
From: Wheeler, Evelyn [mailto:WheelerE@state.gov]
Sent: Wednesday, March 21, 2001 5:02 PM
To: Kelliher, Joseph; Anderson, Margot; Hudome, Randa; 'Andrew Lundquist, OVP'; 'Karen Knutson at OVP'; 'Charlie Smith, OVP'; 'John Fenzel, OVP'; 'Kjersten Drager, OVP'; 'Kevin Murphy, DOC'
Cc: McManus, Matthew T; Gallogly, Stephen J
Subject: NEPD Deadline

We made a mistake in telling you in our prior e-mail that the Friday meeting is at 1:00 in the afternoon. It's at 10:00 in the a.m. So, the earlier you can get us your comments, the better. Thank you for all your help!

14460

DOE017-1556

Evelyn Wheeler
EB/ESC/IEC/EPC - Room 3535
Phone: (202) 647-4557
Fax: (202) 647-4037
This message is unclassified under precepts of EO 12958.

(675

Williams, Ronald L

From:	Freitas, Christopher
Sent:	Thursday, March 22, 2001 4:01 PM
To:	Anderson, Margot
Cc:	DeHoratiis, Guido
Subject:	NEP Chapter 9 - Infrastructure Investment, Integrity and Reliability
Importance:	High

I'm still working on graphics. They will be sent later.

Sincerely,

Christopher J. Freitas
Program Manager, Natural Gas Infrastructure
(202) 586-1657

energyinfrastructure2.doc

14462

DOE017-1558

Williams, Ronald L

From: Kelliher, Joseph
Sent: Saturday, March 24, 2001 10:36 AM
To: Anderson, Margot
Subject: RE: refinery action

How do I edit this? If I want to add an action do I insert a cell or a row?

—Original Message—
From: Anderson, Margot
Sent: Saturday, March 24, 2001 10:34 AM
To: Kelliher, Joseph
Subject: RE: refinery action

No, just finished editing 8 and inserting graphics (no guidance from program offices on placement). I edited with a view toward what are options are going to be - but this consistency check will take more work after we have the options list.

—Original Message—
From: Kelliher, Joseph
Sent: Saturday, March 24, 2001 10:29 AM
To: Anderson, Margot
Subject: refinery action

I split one action "Preserving U.S. Refining Viability" into two actions, but don't know how to edit -- here is the second part:

R-5

Maybe you can insert this when I am done working with the document, which will be awhile yet.

I am editing some of the policy options as I work on policy goals for action clusters. I hope that does not throw off what you are doing.

Stamos, John

B - 5

From: Cook, Trevor
Sent: Friday, March 30, 2001 9:53 AM
To: Connell, Elizabeth; Stamos, John; Herczeg, John; Johnson, Shane; Magwood, William; Knipp, Robert; Marcus, Gail
Subject: National Energy Policy Task Force Papers

Importance: High

format for 2 papers.doc

Title HERE

Stamos, John

From: Cook, Trevor
Sent: Monday, March 26, 2001 10:54 AM
To: Stamos, John
Subject: FW: These are the remaining placeholders for the nuclear policy initiatives

Importance: High

-----Original Message-----
From: Cook, Trevor
Sent: Friday, March 23, 2001 12:54 PM
To: Anderson, Margot
Subject: These are the remaining placeholders for the nuclear policy initiatives
Importance: High

Thanks for getting these in, we will have full papers on Tuesday, possibly Wednesday, but these convey the gist of our ideas.

Trevor.

United States Government Department of Energy

memorandum

DATE: March 28, 2001

REPLY TO ATTN OF: William D. Magwood, IV

SUBJECT: Nuclear Energy Policy Initiatives

TO: Theodore J. Garrish
Kevin M. Kolevar
Joseph T. Kelliher

William D. Magwood, IV, Director
Office of Nuclear Energy, Science
and Technology

Attachment

cc: Kyle McSlarrow, S-1
Margot Anderson, PA-1

14490

DOE017-1586

Stamos, John

From: Savage, Buzz
Sent: Tuesday, March 27, 2001 7:59 AM
To: Johnson, Shane
Cc: Stamos, John; Cook, Trevor; Bartell, Joseph
Subject: Policy papers

CONSTRUCTABILITY POLICY v2 doc...

NUKE RASTRUCTURE SUPPORT v2

Stamos, John

From: Cook, Trevor
Sent: Monday, March 26, 2001 9:24 AM
To: Magwood, William
Cc: Stamos, John
Subject: FW: Chapter 8 (Increased production of U.S. Energy Resources).

Trev.

-----Original Message-----

From: Anderson, Margot
Sent: Saturday, March 24, 2001 10:41 AM
To: Conti, John; Haspel, Abe; Zimmerman, MaryBeth; Lockwood, Andrea; Breed, William; KYDES, ANDY; Whatley, Michael; Carter, Douglas; Braitsch, Jay; Melchert, Elena; Cook, Trevor; Breed, William; 'jksber@bpa.gov'; York, Michael; Freitas, Christopher; Friedrichs, Mark; Pumphrey, David; Kolevar, Kevin
Cc: Kelliher, Joseph
Subject: Chapter 8 (Increased production of U.S. Energy Resources).

Stamos, John

From: Cook, Trevor
Sent: Wednesday, March 21, 2001 12:12 PM
To: Magwood, William
Cc: Stamos, John
Subject: Heads up on the National Energy Policy Development for Nuclear

Importance: High

-----Original Message-----
From: Anderson, Margot
Sent: Wednesday, March 21, 2001 11:57 AM
To: Cook, Trevor
Subject: as we discussed


sec8.doc

Helpful to use redline method if you can/

Stamos, John

From: Cook, Trevor
Sent: Wednesday, February 14, 2001 9:40 AM
To: Stamos, John; Wade, Kenneth
Subject: FW: Electricity outline for the WhiteHouse

-----Original Message-----
From: Carter, Douglas
Sent: Tuesday, February 13, 2001 5:23 PM
To: Cook, Trevor
Subject: FW: Electricity outline for the WhiteHouse

-----Original Message-----
From: Carter, Douglas
Sent: Tuesday, February 13, 2001 5:16 PM
To: Hoffman, Patricia
Subject: Electricity outline for the WhiteHouse

-35

Doug Carter (FE-26)
US DOE
Washington, DC 20585
202-586-9684

[This email uses 100% recycled electrons.]

(b)5

Williams, Ronald

From: Cook, Trevor
Sent: Thursday, March 22, 2001 4:16 PM
To: Anderson, Margot
Cc: Magwood, William
Subject: Another Policy Paper for Nuclear

B5

B5

(b)5

Williams, Ronald L

From:	Freitas, Christopher
Sent:	Thursday, March 22, 2001 4:49 PM
To:	Anderson, Margot
Cc:	DeHoratiis, Guido; Braitsch, Jay
Subject:	Chapter 9 Infrastructure- Summary Closing
Importance:	High

Sincerely,

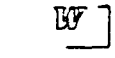
Christopher J. Freitas
Program Manager, Natural Gas Infrastructure
(202) 586-1657

14546

Stamos, John

From: Savage, Buzz
Sent: Tuesday, March 27, 2001 7:59 AM
To: Johnson, Shane
Cc: Stamos, John; Cook, Trevor; Bartell, Joseph
Subject: Policy papers

D-5


CONSTRUCTABILITY POLICY v2.doc...


NUKE RASTRUCTURE SUPPORT v2

(b) 5

Williams, Ronald L

From:	Freitas, Christopher
Sent:	Thursday, March 22, 2001 4:49 PM
To:	Anderson, Margot
Cc:	DeHoratiis, Guido; Braitsch, Jay
Subject:	Chapter 9 Infrastructure- Summary Closing
Importance:	High

Sincerely,

Christopher J. Freitas
Program Manager, Natural Gas Infrastructure
(202) 586-1657

14552

(b) 5

Williams, Ronald L

From: KYDES, ANDY
Sent: Thursday, March 22, 2001 7:49 PM
To: Anderson, Margot
Subject: RE: Any luck on my natural gas para?

B5

-----Original Message-----
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Thursday, March 22, 2001 4:34 PM
To: Kydes, Andy
Subject: Any luck on my natural gas para?

Williams, Ronald L

(b) 5

From: Kelliher, Joseph
Sent: Thursday, March 22, 2001 5:03 PM
To: Anderson, Margot
Subject: additions

Importance: High

subtractions will be coming later

-----Original Message-----
From: Stevenson, Beverley
Sent: Thursday, March 22, 2001 5:02 PM
To: Kelliher, Joseph
Subject: REVISED FILE ATTACHED
Importance: High

policyele1revised.doc

Beverley D. Stevenson
Office of the Secretary
Phone: (202)586-3500
Fax: (202) 586-7210

14578

Department of Energy
Washington, DC 20585

March 16, 2001

NOTE FOR: JOE KELLIHER

FROM: LARRY PETTIS
ACTING ADMINISTRATOR
ENERGY INFORMATION ADMINISTRATION

Attached are two charts sent to Vice President's Task Force following Monday's briefing.

Attachments

14583

DOE017-1679

Williams, Ronald L

From:	KYDES, ANDY
Sent:	Saturday, March 24, 2001 6:17 PM
To:	Anderson, Margot
Cc:	KENDELL, JAMES; HUTZLER, MARY; PETTIS, LARRY
Subject:	RE: Chapter 8 (Increased production of U.S. Energy Resources

B-5

B-5

B-5

B-5

B-5

B-5

B-5

——Original Message——
From: Margot Anderson_at_HQ-EXCH at X400PO
Sent: Saturday, March 24, 2001 10:40 AM
To: Kydes, Andy; John Conti_at_HQ-EXCH at X400PO; Andrea Lockwood_at_HQ-EXCH at X400PO; William Breed_at_HQ-EXCH at X400PO; Michael Whatley_at_HQ-EXCH at X400PO; Douglas Carter_at_HQ-EXCH at X400PO; Jay Braitsch_at_HQ-EXCH at X400PO; Elena Melchert_at_HQ-EXCH at X400PO; TREVOR COOK_at_HQ-EXCH at X400PO; 'jkstier@bpa.gov'_at_internet at X400PO; Christopher Freitas_at_HQ-EXCH at X400PO; Mark FRIEDRICHS_at_HQ-EXCH at X400PO; David Pumphrey_at_HQ-EXCH at X400PO; Kevin Kolevar_at_HQ-EXCH at X400PO; Abe Haspel_at_HQ-NOTES at X400PO; MaryBeth Zimmerman_at_HQ-NOTES at X400PO; Michael York_at_HQ-NOTES at X400PO
Cc: Joseph Kelliher_at_HQ-EXCH at X400PO
Subject: Chapter 8 (Increased production of U.S. Energy Resources).

B-5

B-5

SR/OIAF/2001-01

The Transition to Ultra-Low-Sulfur Diesel Fuel: Effects on Prices and Supply

May 2001

Energy Information Administration
Office of Integrated Analysis and Forecasting
U.S. Department of Energy
Washington, DC 20585

Preface

In December 2000 the U.S. Environmental Protection Agency (EPA) issued a final rulemaking on Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements. The purpose of the rulemaking is to reduce emissions of nitrogen oxides and particulate matter from heavy-duty highway engines and vehicles that use diesel fuel. The rulemaking requires new emissions standards for heavy-duty highway vehicles that will take effect in model year 2007. "The pollution emitted by diesel engines contributes greatly to our nation's continuing air quality problems," the EPA noted in its regulatory announcement. "Even with more stringent heavy-duty highway engine standards set to take effect in 2004, these engines will continue to emit large amounts of oxides of nitrogen (NO_x) and particulate matter (PM), both of which contribute to serious public health problems in the United States."

While the review of this rule was underway, the Committee on Science of the U.S. House of Representatives asked the Energy Information Administration (EIA) to provide an analysis of the proposal (Appendix A). The Committee noted that the proposed rule would reduce the level of sulfur in highway diesel by 97 percent. "These deep sulfur reductions will require significant investment s that not all refiners may choose to make. As a result, diesel fuel supplies could be affected," the Committee's letter stated.

In response to the Committee's request, EIA undertook an analysis incorporating two different analytical approaches. Mid-term issues and trends are addressed through scenario analysis using EIA's National Energy Modeling System. In addition, refinery cost analysis addresses the uncertainty of supply in the short term. Discussion of the key issues and uncertainties related to the distribution of ultra-low-sulfur diesel is based on interviews with a number of pipeline carriers. As suggested by the Committee, most of the major assumptions in this report are consistent with those used by the EPA in its Regulatory Impact Analysis (RIA) of the Rule.

Within its Independent Expert Review Program, EIA arranged for leading experts in the fields of energy and economic analysis to review earlier versions of this analysis and provide comment. The reviewers provided comments on two draft versions of the report and discussed their comments in a joint meeting. All comments from the reviewers either have been incorporated or were thoroughly considered for incorporation. As is always the case when peer reviews are undertaken, not all the reviewers may be in agreement with all the methodology, inputs, and conclusions of the final report. The contents of the report are solely the responsibility of EIA. The assistance of the following reviewers in preparing the report is gratefully acknowledged:

Raymond E. Ory
Baker and O'Brien, Inc.

Norman Duncan
Energy Institute, University of Houston

Kevin Waguespack
PricewaterhouseCoopers

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Executive Summary

This study was undertaken at the request of the Committee on Science, U.S. House of Representatives. The Committee asked the Energy Information Administration (EIA) to provide an analysis of the Final Rulemaking on Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, which was signed by President Clinton in December 2000.[1]

The purpose of the rulemaking is to reduce emissions of nitrogen oxides (NO_x) and particulate matter (PM) from heavy-duty highway engines and vehicles that use diesel fuel. The new rule requires refiners and importers to produce highway diesel meeting a 15 parts per million (ppm) maximum requirement, starting June 1, 2006; however, pipelines are expected to require refiners to provide diesel fuel with an even lower sulfur content, somewhat below 10 ppm, in order to compensate for contamination from higher sulfur products in the system, and to provide a tolerance for testing. Diesel meeting the new specification will be required at terminals by July 15, 2006, and at retail stations and wholesalers by September 1, 2006. Under a "temporary compliance option" (phase-in), up to 20 percent of highway diesel fuel produced may continue to meet the current 500 ppm sulfur limit through May 2010; the remaining 80 percent of the highway diesel fuel produced must meet the new 15 ppm maximum.

The purpose of this study is to assess the possible impact of the new sulfur requirement on the diesel fuel market. The study discusses the implications of the new regulations for vehicle fuel efficiency and examines the technology, production, distribution, and cost implications of supplying diesel fuel to meet the new standards. In order to address both the short-term and mid-term supply issues identified by the Committee on Science, this analysis incorporates two different analytical approaches. Refinery cost analysis addresses the uncertainty of supply in the short term, during the transition to ultra-low-sulfur diesel fuel (ULSD) in 2006. Mid-term issues and trends (2007 through 2015) are addressed through scenario analysis using EIA's National Energy Modeling System (NEMS). The Committee on Science requested that these analyses use assumptions consistent with the Regulatory Impact Analysis published by the U.S. Environmental Protection Agency (EPA). Discussion of the key issues and uncertainties related to the distribution of ULSD is based on interviews with a number of pipeline carriers.

Although highway-grade diesel is the second most consumed petroleum product, gasoline is the most important product by far. In 1999 highway diesel accounted for 12 percent of total petroleum consumption and gasoline 43 percent.[2] Consumption of highway-grade diesel (500 ppm) accounted for 68 percent of the distillate fuel market in 1999, although 9 percent went to non-road (rail, farming, industry) and home heating uses.[3] Higher sulfur distillate (more than 500 ppm sulfur), used exclusively for nor-road and home heating needs, accounted for the other 2 percent of the distillate market.

Assessment of Short-Term Effects of the Rule

Whether there will be adequate supply of diesel fuel as the new standard becomes effective in June 2006 is one of the key questions raised by the House Committee on Science in the request for analysis. To assess this possibility, cost increases for individual refineries to produce ULSD were estimated, the cost increases were arrayed from smallest to largest, and the resulting cost curves were matched against projected demand and imports. The cost curves reflect investment requirements and operating costs for refineries in Petroleum Administration for Defense Districts (PADDs) I through IV.[4] ULSD production costs were estimated for different groups of refineries based on size, sulfur content of feeds, fraction of cracked stocks in the feed,[5] boiling range of the feed, and fraction of highway diesel produced. Unlike ULSD analyses conducted by the EPA and others, the cost curves relied on proprietary stream data collected by

[1] U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements: Final Rule," *Federal Register*, 40 CFR Parts 69, 80, and 86 (January 18, 2001)

[2] Energy Information Administration, *Petroleum Supply Annual 1999*, DOE/EIA-0340(99)/1 (Washington, DC, June 2000), Table 3.

[3] Energy Information Administration, *Fuel Oil and Kerosene Sales 1999*, DOE/EIA-0525(99) (Washington, DC, September 2000), Tables 19-23

[4] PADD V was not included in this analysis, because supply concerns are less of an issue in the transition period, and the requirement for California Air Resources Board diesel makes the PADD V market different from those in PADDs I-IV.

[5] Cracked stocks are previously processed streams that are more difficult to treat.

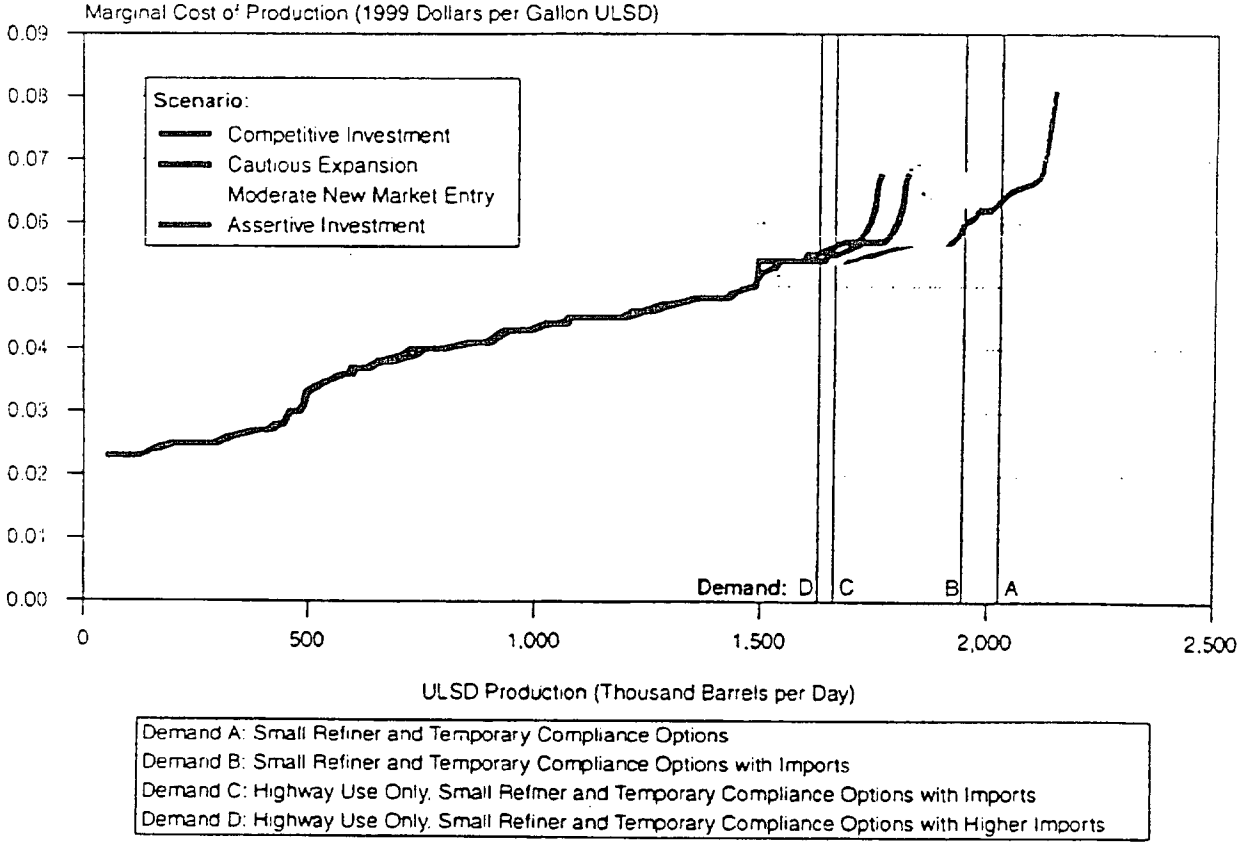
estimate assumes that imports from Canada and the Virgin Islands will continue at historical levels (Demand B, which matches the demand projection in the mid-term analysis described in Chapter 6). The Highway Use Only, Small Refiner and Temporary Compliance Options with Imports estimate (Demand C) assumes that ULSD will be used only to meet highway transportation demand, that the temporary compliance option will further reduce this demand by 20 percent, and that imports will remain at historical levels. Finally, the Highway Use Only, Small Refiner and Temporary Compliance Options with Higher Imports estimate (Demand D) assumes a higher level of ULSD imports.[8]

Table ES2. Short-Term Demand Estimates, 2006

Estimate	Demand Level (Thousand Barrels per Day)	Characteristics
Demand A: Small Refiner and Temporary Compliance Options	2,026	76 percent of transportation demand.
Demand B: Small Refiner and Temporary Compliance Options with Imports	1,946	Demand estimate A, less projected imports from Canada and the U.S. Virgin Islands.
Demand C: Highway Use Only, Small Refiner and Temporary Compliance Options with Imports	1,662	65 percent of transportation demand, less projected imports from Canada and the U.S. Virgin Islands.
Demand D: Highway Use Only, Small Refiner and Temporary Compliance Options with Higher Imports	1,626	Demand estimate C, less higher projected imports.

Source: National Energy Modeling System, run DSU7INV.D043001A.

Figure ES1. ULSD Cost Curve Scenarios with 2006 Demand Estimates



Sources: Cost curve scenarios: Appendix D Demand estimates: National Energy Modeling System, run DSU7INV.D043001A.

[8] Additional demand estimates are analyzed in Chapter 5

PADDs II (Midwest), III (Gulf Coast), and IV (Rocky Mountains) are aggregated into one region. Each region is considered as a single firm, for which more than 80 distinct refinery processes are modeled. Refining capacity is allowed to expand in each region.

Unlike previous ULSD analyses, the PMM provides multi-year scenarios. These scenarios reflect market prices rather than average costs and implicitly include investment and import decisions. In contrast to the cost curves used in the short-term analysis, the NEMS projections reflect equilibrium market prices. That is, the results of the PMM scenarios assume that, in the long run, refiners will increase supply to meet demand. As a result, the NEMS analysis reflects more aggressive investment behavior than that portrayed for individual refiners in the short-term analysis.

The PMM was used to develop a ULSD Regulation case based on the provisions of the EPA's final ULSD Rule. A Severe case was developed to combine five sensitivity cases associated with greater uncertainty in industry operations and costs.[9] Finally, a No Imports case and a 10% Return on Investment case were developed.

In the **Regulation case**, highway diesel at the refinery gate is assumed to contain a maximum of 7 ppm sulfur. Although sulfur content is limited to 15 ppm at the pump, there is a general consensus that refineries will need to produce diesel somewhat below 10 ppm in order to allow for contamination during the distribution process. Revamping existing units to produce ULSD is assumed to be undertaken by 80 percent of refineries, while 20 percent build new units. The amount of ULSD that is to be downgraded to a lower value product because of sulfur contamination in the distribution system is assumed to total 4 4 percent. The energy content of the ULSD is assumed to decline by 0.5 percent, because undercutting and severe desulfurization will result in a lighter stream composition than 500 ppm diesel. The Rule is assumed to result in no loss in vehicle fuel efficiency. The actual after-tax return on investment is assumed to be 5.2 percent, which is equivalent to a 7-percent before-tax return on investment. As suggested by the Committee, the major assumptions in this case are consistent with those used by the EPA in its Regulatory Impact Analysis (RIA) of the Rule.[10]

The **Severe case** combines five sensitivities at variance with the above assumptions. In the "2/3 Revamp" sensitivity case, two-thirds of upgrades at refineries are assumed to be accomplished by retrofitting existing equipment and one-third by construction of all new units, consistent with the results of the individual refinery analysis. In the "10% Downgrade" case, 10 percent of the 15 ppm diesel produced is assumed to be downgraded to a lower value product because of contamination with higher sulfur products in the distribution system. In the "4% Efficiency Loss" case it is assumed that manufacturers will meet the emissions requirements of the ULSD Rule by installing after-treatment technology on new vehicles beginning in 2010, which would result in a 4-percent loss of fuel efficiency that is phased out as new technology emerges. In the "1.8% Energy Loss" case, a greater loss of energy content is assumed than in the Regulation case. In the "Higher Capital Cost" case, the capital costs of the hydrotreaters are 24 percent higher and 33 percent higher than in the Regulation case, based on a review of the most recent industry cost data.

The **No Imports case** assumes that foreign imports of ULSD will not be available. This assumption was not included in the Severe case because it was deemed to be less likely. Foreign supplies should be available from Canadian refiners, who likely will move to the U.S. standard at the same time as the United States, and from a large refinery in the U.S. Virgin Islands that is jointly owned by Armada Hess and Venezuela's national oil company, PdVSA. Both owners of the Virgin Islands plant see the United States as a strategic market. The greatest uncertainty for import availability is likely to occur in the early years of the program, because foreign refiners may delay investment until the market outlook for ULSD is more certain.

The **10% Return on Investment case** uses the after-tax rate of return assumed in most other studies, which is higher than the 5.2-percent after-tax rate used in the Regulation case and in the other sensitivity cases in this study, consistent with the EPA's assumption. At a rate of return less than 10 percent, investors may hesitate to put money into the refinery industry, especially for equipment designed for a new product.

In the Regulation case, the marginal annual pump price for ULSD is projected to range from 6.5 to 7.2 cents per gallon between 2007 and 2011 (Table ES3 and Figure ES2).[11] The peak differential is projected to occur in 2011, when oil refiners must produce 100 percent ULSD. In absolute terms, real marginal prices range from $1.29 to $1.35 per gallon in the Regulation and Severe cases from 2007 to 2011.[12] Refiners are projected to invest $6.3 to $9.3 billion to meet full compliance with the ULSD Rule through 2011.

[9] Results for the five sensitivity cases are provided in Chapter 6 and Appendix E.

[10] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements*, EPA420-R-00-026 (Washington, DC, December 2000).

[11] Analysis of 2006 is discussed above. As a partial year, 2006 is not included in the equilibrium analysis.

[12] These cases are based on variations from a reference case similar to that in EIA's *Annual Energy Outlook 2001*.

by up to 10,000 barrels per day, which can be attributed to the assumption of 0.5-percent loss in energy content. In 2011 the differential in consumption increases to 83,000 barrels per day, because ULSD contaminated in the distribution system can no longer be downgraded to 500 ppm highway diesel, and refiners must therefore make more ULSD.

In the Severe case, up to 57,000 barrels per day of additional highway diesel is projected to be consumed between 2007 and 2010, and an average of 366,000 barrels per day of additional consumption is projected between 2011 and 2015. The ULSD Rule by itself accounts for an average of 9,000 barrels per day of the additional consumption through 2010 and an average of 83,000 barrels per day after 2010. The combined effects of the 2/3 Revamp, 10% Downgrade, 4% Efficiency Loss, 1.8% Energy Loss, and Higher Capital Cost cases raise consumption beyond that in the Regulation case by at least 30,000 barrels per day through 2010, primarily because of energy losses and higher capital cost, and by an average of 283,000 barrels per day after 2010 because of energy losses, downgrading, and efficiency losses. The higher downgrade assumption accounts for about 210,000 barrels of the additional demand after 2010. ULSD-related investments in the Severe case are projected to total $9.3 billion through 2011, $3 billion more than in the Regulation case. Higher demand in the Severe case generally results in marginal prices 1.7 to 1.9 cents per gallon above those in the Regulation case, although costs range up to 3.5 cents per gallon higher in 2011.

The No Imports case explores the impact of the ULSD Rule by assuming that foreign imports will not be available to meet the new sulfur standard. In the Regulation case, projected imports of highway diesel are lower than in the reference case in the first few years, because foreign refiners are expected to be more hesitant to invest to meet a U.S. regulation. The No Imports case assumes that no imports of ULSD are available, and that imports of highway diesel are reduced by 120,000 to 125,000 barrels per day between 2007 and 2015, relative to the reference case. The lack of imports means that domestic refineries must produce more ULSD. The requirement for more production results in marginal prices 1.1 to 1.6 cents per gallon higher than in the Regulation case. The higher prices in the No Imports case result in a slight dampening of demand compared with the Regulation case.

Because the Regulation case assumes a 5.2-percent after-tax return on investment, the 10% Return on Investment case must be compared with an alternative base case that assumes the same return on investment. The resulting price differentials range from 7.5 to 8.0 cents per gallon between 2007 and 2011 and are 0.9 cents per gallon higher on average than when the 5.2-percent after-tax rate is assumed.

Differences between regional end-use prices in the analysis cases relative to those in the reference case reflect variations in the marginal costs of producing ULSD between regions. The cost curve analysis described in Chapter 5 indicates that PADD IV, which is made up of relatively small refineries, can be expected to be the highest cost region. The relatively high cost in PADD IV is obscured in the mid-term analysis (Chapter 6), because PADD IV is aggregated with both PADD II and the largest and lowest cost refining region, PADD III. In the transition years of the Regulation case, regional refining costs range from an average of 4.8 to 5.3 cents per gallon. PADD I is the highest cost region, PADD V is the lowest cost region, and PADDs II-IV (and average U.S.) costs fall in between. Average marginal refining costs generally narrow by about 0.5 cents per gallon in the post-2010 period, as refineries make incremental improvements that allow them to produce ULSD more efficiently.

Additional Uncertainties

Uncertainties about the pace of engine, refinery, and pipeline testing technology development; the availability of personnel, thick-walled reactors, and reciprocating compressors; the behavior of ULSD in the oil pipeline system; and cost recovery by oil pipelines further cloud the outlook for the transition to very low levels of sulfur in diesel fuel. The new ULSD Rule requires not only that the sulfur content of transportation diesel fuel oil produced by domestic refineries be drastically reduced by 2007, but also that emission controls on heavy-duty diesel engines be imposed to reduce emissions of NO_x, PM, and hydrocarbons (HC).

Historically, engine manufactures have met new emissions standards through modifications to engine design. To meet the 2007 standard, manufacturers will have to rely heavily on component and system development by emission control equipment manufacturers. In particular, engine manufacturers must implement an exhaust after-treatment catalyst technology to control NO_x emissions. Currently, the EPA expects NO_x adsorbers to be the most likely emission control technology applied by the industry. Using current catalyst technology, the fuel-rich cycle could reduce fuel efficiency by 4 percent. To date, no NO_x adsorber system has proven feasible. Although NO_x adsorbers have demonstrated compliance using ULSD (7 ppm), the systems show losses in conversion efficiency after 2,000 miles of operation. In order to meet the 2007 emission standards for heavy-duty diesel engines, conversion efficiencies must be improved, and exhaust gas recirculation equipment must be optimized. The considerable time available for research and development, however, may provide government and industry ample time to resolve the fuel efficiency loss issues associated with advanced emission control technologies.

different assumptions about the cost of technologies; unit size; contingency factors; the extent to which refiners will modify existing equipment or build entirely new hydrotreaters; the cost and quantity of additional hydrogen required; the extent to which some refineries may reduce highway diesel production; and the amount of highway diesel downgraded due to fuel contamination during distribution. Nevertheless, the studies using LP models reported cost increases ranging from 4.0 to 10.7 cents per gallon, excluding distribution costs and taxes. The marginal refinery gate prices reported in this study for the post-2006 period, which exclude distribution costs and taxes, range from 4.7 to 9.2 cents per gallon.

Likewise, the costs derived from refinery-by-refinery analysis included average costs for the industry and average costs for the marginal firm, different estimates of the penetration of ULSD, different consumption estimates, different assumptions about the cost of technologies, different assumptions about the extent to which refiners will modify existing equipment or build entirely new hydrotreaters, different assumptions about the cost and quantity of additional hydrogen required, and different regions. The range of estimated cost increases reported in the studies using refinery-by-refinery analysis was 4.1 to 6.8 cents per gallon. This study's range for the 2006 analysis is at the higher end, because it leaves out the lower cost PADD V, is based on marginal industry costs rather than average refinery costs, and has 63 percent of refineries revamping their hydrotreaters, as compared with 80 percent in the studies with lower cost estimates.

1. Background and Methodology

Introduction

This study was undertaken at the request of the Committee on Science, U.S. House of Representatives. The Committee asked the Energy Information Administration (EIA) to provide an analysis of the Final Rulemaking on Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, which was signed by President Clinton in December 2000.[1] Along with all other regulations finalized at the end of the Clinton Administration, the Rule underwent a 60-day review by the Bush Administration. On February 28, 2001, the Administrator of the U.S. Environmental Protection Agency (EPA), Christine Todd Whitman, gave her approval to move forward with the new rule, citing the great benefits to public health and the environment.[2]

The purpose of the rulemaking is to reduce emissions of nitrogen oxides (NO_x) and particulate matter (PM) from heavy-duty highway engines and vehicles that use diesel fuel. The rulemaking requires new emissions standards for heavy-duty highway vehicles that will take effect in model year 2007. Because the advanced emission control devices that will be required to meet the 2007 emissions standards are damaged by sulfur, and because the 2007 model year begins September 1, 2006, the rulemaking also requires the sulfur content of highway diesel to be substantially reduced by mid-2006.

The purpose of this study is to assess the possible impact of the new sulfur requirement on the diesel fuel market. The study does not address the impact of the rulemaking on vehicle emissions or public health.[3] This study discusses the implications of the new regulations for vehicle fuel efficiency and examines the technology, production, distribution, and cost implications of supplying diesel fuel to meet the new standards.

A summary of the new sulfur requirement, the analysis issues identified by the Committee on Science, and the methodology of the report are provided in the remainder of this chapter. Chapter 2 describes emission control technologies for heavy-duty diesel engines, their effects on fuel efficiency, and expected costs. Chapter 3 discusses technologies for producing ultra-low-sulfur diesel fuel (ULSD) and the analysis approaches used in this study to assess their future costs. Chapter 4 discusses the impact of the ULSD Rule on oil pipeline operations. Chapter 5 addresses the issue of future supply of ULSD, particularly during the transition period in 2006, and the potential responses of refinery operators. Chapter 6 summarizes mid-term projections (2007 through 2015) for diesel fuel prices, based on a range of assumptions in cases analyzed using EIA's National Energy Modeling System (NEMS). A comparison of the assumptions and estimates from this study with those from other analyses is provided in Chapter 7.

Summary of the Final ULSD Rule

The new ULSD Rule requires refiners and importers to produce highway diesel meeting a 15 parts per million (ppm) maximum requirement starting June 1, 2006.[4] Pipeline operators are expected to require refiners to provide diesel fuel with even lower sulfur content (somewhat below 10 ppm) in order to compensate for possible contamination from higher sulfur products in the system and to provide a tolerance for testing. Diesel meeting the new specification will be required at terminals by July 15, 2006, and at retail stations and wholesalers by September 1, 2006. This time schedule is driven by the need to provide fuel for the 2007 model year diesel vehicles that will become available in September 2006. Under a "temporary compliance option" (phase-in), up to 20 percent of highway diesel fuel produced may continue to meet the current 500 ppm sulfur limit through May 2010. The remaining 80 percent of the highway diesel fuel produced must meet the new 15 ppm maximum.

The ULSD Rule provides for an averaging, banking, and trading (ABT) program. Refineries that produce more than 80 percent of their highway diesel to meet the 15 ppm limit can receive credits, which may be traded with other refineries within the same Petroleum Administration Defense District (PADD) that do not meet the 80-percent production requirement. Starting June 1, 2005, refineries can accrue credits for producing any

[1] U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements. Final Rule," *Federal Register*, 40 CFR Parts 69, 80, and 86 (January 18, 2001).

[2] U.S. Environmental Protection Agency, "EPA Gives the Green Light on Diesel-Sulfur Rule," Press Release (February 28, 2001).

[3] Sources addressing the impact of the ULSD Rule on vehicle emissions and public health are included in the bibliography.

[4] The State of Alaska and the U.S. Territories have been exempted from the program.

Background

The ULSD Rule represents a unique financial and logistical challenge to refiners and distributors, because it places an unprecedented low sulfur limit on a secondary product. Although highway-grade diesel, which is currently limited to 500 ppm sulfur, is the second most consumed petroleum product, gasoline is the most important product by far. In 1999, 500 ppm diesel accounted for 12 percent of total petroleum consumption while gasoline accounted for 43 percent.[7] The ULSD Rule comes less than a year after a new nationwide sulfur standard for gasoline was finalized by the EPA at an average 30 ppm.[8] Some concerns have been raised that resources may be both financially and physically challenged to meet both the gasoline and diesel sulfur standards.[9]

In February 2000, the EPA finalized a rule on Tier 2 vehicle emissions and gasoline sulfur standards. The sulfur content of gasoline across the country is to be phased down to 30 ppm on average between 2004 and 2007. Like the diesel sulfur standard, reduced sulfur gasoline is required in order to accommodate new emissions control technologies required for meeting tighter vehicle emissions standards. Gasoline produced by most refiners will be required to meet a corporate average sulfur content of 120 ppm in 2004 and 90 ppm in 2005, compared with a national average of around 340 ppm in 1998.[10] By 2006, most refiners must meet a refinery level annual average of 30 ppm with a maximum of 80 ppm in any gallon.

Refiners producing most of their gasoline for the Geographical Phase-In Area (GPA), generally encompassing the Rocky Mountain region, will also be allowed a more gradual phase-in because of less severe ozone pollution in the area. These refiners will be required to meet a refinery average of 150 ppm in 2006 and must meet the 30 ppm requirement in 2007. Small refiners will not be required to meet the 30 ppm standard until 2007. The date for GPA and small refiner gasoline sulfur compliance has been extended an additional 2 years for those refineries that produce 15 ppm diesel at 85 percent of baseline highway diesel production levels.[11]

Consumption of highway-grade diesel (500 ppm sulfur) accounted for 68 percent of the distillate fuel market in 1999,[12] although 9 percent of that fuel went to non-road (rail, farming, and industry) and home heating uses.[13] Higher sulfur distillate (more than 500 ppm) used exclusively for non-road and home heating needs accounted for the other 32 percent of the distillate market. These other distillate markets will also be affected by the new highway diesel standard and may play a role in how some refineries respond to the rule. For instance, instead of investing in ULSD production, some refineries may opt to switch production to non-road or heating markets.

The EPA is in the process of promulgating "Tier 3" non-road engine emission limits around 2005 or 2006, which are expected to be linked to sulfur reduction for non-road diesel fuel.[14] The level of sulfur reduction required for Tier 3 vehicles is highly uncertain because of the diversity of the non-road market. Diesel engines used for farming, construction, rail, and other industrial markets have different performance requirements that need to be reconciled.[15] Both the American Petroleum Institute (API) and National Petrochemical and Refiners Association (NPRA) have expressed concerns about complying with potential non-road standards before full implementation of the 15 ppm highway diesel standards.[16]

In addition to refinery issues, there are concerns about the ability of the distribution system to handle the requirements of the ULSD Rule. Between June 2006 and June 2010, the 80/20 rule will allow up to 20 percent of highway diesel production to continue at the current 500

[7] Energy Information Administration, *Petroleum Supply Annual 1999*, DOE/EIA-0340(99)/1 (Washington, DC, June 2000), Table 3.

[8] U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Control Requirements," *Federal Register*, 40 CFR Parts 80, 85, and 86 (February 10, 2000).

[9] National Petroleum Council, *U.S. Petroleum Refining: Assuring the Adequacy and Affordability of Cleaner Fuels* (June 2000), Chapter 3, U.S.A.

[10] U.S. Environmental Protection Agency, *EPA Staff Paper on Gasoline Sulfur Issues*, EPA420-R-98-005 (Washington, DC, May 1998). The average sulfur content has declined since the sulfur content of reformulated gasoline was reduced substantially to meet Phase 2 reformulated gasoline emissions requirements, which became effective in 2000.

[11] The EPA announced on May 4, 2001, that National Cooperative Refining Association and Wyoming Refining would be given additional time to meet the sulfur standard for gasoline. Both refiners are planning to comply with the 2006 highway diesel requirements on time.

[12] Energy Information Administration, *Petroleum Supply Annual 1999*, DOE/EIA-0340(99)/1 (Washington, DC, June 2000), Table 3.

[13] Energy Information Administration, *Fuel Oil and Kerosene Sales 1999*, DOE/EIA-0525(99) (Washington, DC, September 2000), Tables 19-23.

[14] U.S. Environmental Protection Agency, *Reducing Air Pollution from Non-road Engines*, EPA420-F-00-048 (Washington, DC, November 2000), p. 3.

[15] Nonroad Workgroup, Minutes of the Workgroup's Meeting (Alexandria, VA, January 16, 2000).

[16] *Diesel Fuel News*, Vol. 5, No. 3 (February 5, 2001).

constructed, based on refinery-specific analysis of investment requirements and operating costs.[24] Unlike the NEMS projections discussed below, the cost curves do not reflect an equilibrium market price.

The cost curves developed for this study are the result of a refinery-by-refinery analysis. Because of the proprietary nature of the data, this analysis does not disclose information about individual refineries. The ULSD production costs were estimated for different groups of refineries based on their size, the sulfur content of the feeds, the fraction of cracked stocks in the feed, the boiling range of the feed, and the fraction of highway diesel produced. The capital and operating costs for the different groups were developed for EIA by the staff of the National Energy Technology Laboratory (NETL).[25]

The technology cost representations were used to develop four sets of cost curves based on four different investment rationales. Within a given supply curve, the relative costs of different groups of refineries provide an indicator of possible supply problems. A large range of compliance costs in which investment costs are much higher for some refiners than for others may be an indication that some refiners may forgo investment. The behavior of refiners will be influenced by their expectation of what others will do and is therefore subject to great uncertainty. In order to explore the uncertainty of refinery behavior and the possible implications for supply, cost curves were developed based on the four different scenarios of investment behavior discussed below:

- **Competitive Investment Scenario.** This scenario assumes that some refineries will produce ULSD in 2006, while others may find it more economical to abandon the market. Refiners that have competitive costs of production are assumed to maintain market shares similar to current highway diesel market shares. Refineries currently producing a relatively low fraction of diesel fuel may abandon the market unless their cost per unit is competitive at current highway diesel production levels.
- **Cautious Expansion Scenario.** Current producers with competitive cost structures for ULSD production and a high yield of diesel production (greater than 70 percent of middle distillates) are assumed to increase production if the unit cost of the increased production is not substantial. Other refineries may also increase their fraction of highway production if economical and if the non-road market will allow. For instance, the Northeast has a strong heating oil market, potentially limiting a shift toward highway diesel production.
- **Moderate New Market Entry Scenario.** This cost curve assumes that a selective number of refineries that are currently producing little or no highway diesel will enter the ULSD market. The underlying premise is that there would be a limited number of companies that think they will be able to gain market share without depressing margins to the extent of undercutting profits. Only a few will make this move, while the rest wait for a clear indication of ULSD margins.
- **Assertive Investment Scenario.** Refineries were assumed to make the requisite investments to either maintain or gain highway diesel market share.

The scenarios discussed above are based on capital cost and return on investment assumptions that are consistent with EPA's analysis. Due to the uncertainty of these assumptions, two sets of sensitivity analysis are also provided. To address the uncertainty associated with the cost of installing or modifying distillate hydrotreaters for producing ULSD, a set of scenarios was developed assuming capital costs for hydrotreater units that are about 40 percent higher than the initial set. An additional set of scenarios explores the impact of assuming a 10-percent after-tax rate of return on investment, used in most of the studies compared in Chapter 7, instead of the 5.2-percent after-tax rate (equivalent to 7 percent before tax) assumed in the initial set.

Assessment of Mid-Term Effects of the Rule

The mid-term analysis for this study was performed using the NEMS Petroleum Market Module (PMM). The PMM represents domestic refinery operations and the marketing of petroleum products to consumption regions. PMM solves for petroleum product prices, crude oil and product import activity (in conjunction with the NEMS International Energy Module and Industrial Demand Module), and domestic refinery capacity expansion and fuel consumption. PMM is a regional, linear programming representation of the U.S. petroleum market. Refining operations are represented by a three-region linear programming formulation of the five Petroleum Administration for Defense Districts (PADDs). PADDs I (East Coast) and V (West Coast) are treated as single regions, and PADDs II (Midwest), III (Gulf Coast), and IV (Rocky Mountains) are aggregated into one region. Each region is considered as a single firm where more than 80 distinct refinery processes are modeled. Refining capacity is allowed to expand in each region over each 3-year period. As a result, cumulative

[24] The EPA and Baker and O'Brien also developed refinery-specific cost analyses, but their estimates did not reflect data related to the quality of crude oil inputs and the quality of diesel fuel components input to downstream units, collected by EIA.

[25] The technology costs were developed in consultation with Mr. John Hackworth and were reviewed by Mr. Ray Ory, one of EIA's independent expert reviewers, and by members of API.

downgrade assumption of 4.4 percent and the price differential between ULSD and other diesel.[27] Estimates for the percent of downgraded product range between EPA's 4.4 percent estimate to 17.5 percent by Turner Mason and Associates.[28] Due to the uncertainty about the extent of downgrade that will occur in the pipeline system, EIA has also projected the costs associated with larger downgrade assumptions (see Chapter 6).

[27]U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, web site www.epa.gov/otaq/regs/hd2007/frm/ria-v.pdf.

[28]Turner, Mason & Company, *Revised Supplement to Report: Costs/Impacts of Distributing Potential Ultra Low Sulfur Diesel* (Dallas, TX, August 8, 2000).

2. Efficiency and Cost Impacts of Emission Control Technologies

Background

The new ultra-low-sulfur diesel (ULSD) Rule issued by the U.S. Environmental Protection Agency (EPA) requires not only that the sulfur content of transportation diesel fuel oil produced by domestic refineries be drastically reduced by 2007, but also that emission controls on heavy-duty diesel engines be imposed to dramatically reduce emissions of nitrogen oxides (NO_x), particulate matter (PM), and hydrocarbons (HC). This chapter summarizes the new heavy-duty engine emission standards, discusses the feasibility of meeting the standards based on a review of the EPA-identified emission control technology options that might be available, and assesses cost implications of the technology options.

The new ULSD standards finalized by the EPA are crucial to the successful development of emission control equipment for heavy-duty diesel engines. The catalysts to be used in meeting the emission standards can be severely damaged by sulfur contamination. For example, catalyst-based particulate filters for diesel engines have shown significant losses of conversion efficiency with fuel containing 30 ppm sulfur, particularly in colder climates. With respect to NO_x adsorbers, researchers have found that at fuel sulfur levels above 10 ppm, the heavy truck emission standard may not be attainable.

The EPA's final emission standards will affect new heavy-duty vehicles in model years 2004, 2007, and 2010. Although this study focuses on the impact of the 2007 standard, discussion of the 2004 standards and the associated impacts on technology, cost, and efficiency are relevant to the analysis. In 1997, the EPA proposed new emission standards for 2004 and later model year heavy-duty diesel engines that required a combined standard for NO_x and HC of 2.4 grams per brake horsepower-hour (g/bhp-hr).[29] The current standard for NO_x is 4 g/bhp-hr, and the standard for HC is 1.3 g/bhp-hr. The proposed standard was reviewed by industry, and in 1998 the EPA signed consent decrees with several heavy-duty engine manufacturers, stating that the 2004 emission standards would be met by October 2002.[30] The standards for new heavy-duty highway vehicles in model years 2004 and later were finalized July 2000.

In December 2000, EPA published additional standards for on-road heavy-duty diesel engines that would take effect beginning in 2007. These standards will require stricter control of PM (0.01 g/bhp-hr), NO_x (0.20 g/bhp-hr), and HC (0.14 g/bhp-hr) emissions. The new standards apply to diesel-powered vehicles with gross vehicle weight (GVW) of 14,000 pounds or more. The PM standard applies to all on-road heavy- and medium-duty diesel engines. The NO_x and HC standards are to be phased in at 50 percent of new vehicle sales in model years 2007 through 2009. In 2010, all new on-road vehicles will be required to meet the NO_x and HC standards.

For years 2007 through 2009, the EPA allows diesel engine manufacturers flexibility in meeting the NO_x and HC standards.[31] Engine manufacturers are provided the option of producing all diesel engines to meet an average of 2004 and 2007 NO_x and HC emission standards (1.1 g/bhp-hr). Engine manufacturers and EPA have confirmed that the industry intends to design and produce engines that meet the average NO_x/HC emission standard, providing engine manufacturers the ability to comply with the standards by using less stringent emission control systems.[32] If manufacturers produce low-emission engines in 2006, the number produced can be deducted from 2007 production requirements.

Emission Control Technologies

Historically, engine manufactures have met new emissions standards through modifications to engine design. The continuation of this trend is seen in the projection of technologies used to meet the EPA's 2004 emission standards for heavy-duty diesel engines. An EPA-commissioned technology study that addressed

[29] The brake horsepower of an engine is the effective power output, sometimes measured as the resistance the engine provides to a brake attached to the output shaft. A bhp-hr is that unit of work or energy equal to the work done at the rate of 1 horsepower for 1 hour.

[30] U.S. Environmental Protection Agency, *Final Emission Standards for 2004 and Later Model Year Highway Heavy-Duty Vehicles and Engines*, EPA420-F-00-026 (Washington, DC, July 2000), p. 4.

[31] U.S. Environmental Protection Agency, *Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements*, EPA420-F-00-057 (Washington, DC, December 2000), p. 2.

[32] Based on telephone interviews with engine manufacturers and the U.S. Environmental Protection Agency.

the reduction of sulfur in the exhaust stream. The sulfur accumulates on the NO_x adsorber catalyst, and eventually adsorber storage capability is completely lost. Even at ultra-low-sulfur levels, further desulfurization must occur to ensure that the NO_x adsorber is not "poisoned."

To date, no NO_x adsorber system has proven feasible. Although NO_x adsorbers have demonstrated compliance using ULSD (7 ppm), the systems show losses in conversion efficiency after 2,000 miles of operation.[42] Concerns have also been raised about the ability of the technology to perform over a range of operating temperatures and loads. Industry and government research efforts are seeking ways to overcome the obstacles facing the NO_x adsorber technology.

In order to meet the 2007 emission standards for heavy-duty diesel engines, the EPA makes the following assumptions regarding the performance of NO_x adsorber emission control technology:

- Conversion efficiencies will improve so that the overall loss of fuel economy will be only 2 percent: 1 percent for the fuel-rich cycle and 1 percent for pumping losses.
- EGR equipment will be optimized as a result of the improved efficiency of NO_x adsorber emission control equipment. The optimized EGR air-to-fuel mixture will provide a 1-percent increase in fuel efficiency, which will offset the 1-percent loss in efficiency from the fuel-rich exhaust cycle.
- The application of the new emission control technology will provide a 3-percent or greater increase in efficiency by offsetting the fuel efficiency reductions that were incurred to meet the 2004 standard when diesel engine manufacturers manipulated fuel injection timing to optimize for low NO_x emissions.

Based on these assumptions, EPA predicts that there will be no loss in fuel efficiency associated with the NO_x adsorber catalyst designed to meet the 2007 emission standard.[43] Although experts agree that this is possible, it has yet to be proven.[44] Current field tests reveal a 4- to 5-percent fuel efficiency loss with current state-of-the-art technology, which still requires EGR and timing control. Experts agree, however, that NO_x adsorber catalysts are expected to improve and that the associated optimization of EGR and timing control will eventually be achieved.

Technology Costs

The EPA's cost analysis of the technologies required to meet the 2004 standard assumed that fuel injection and turbocharger improvements would occur without the new emission standards. Therefore, when estimating increases in engine costs, the EPA excluded 50 percent of the technology costs in the total cost estimation. The incremental costs for medium-duty engines were estimated to be $657 in 2004, decreasing to $275 in 2009. Heavy-duty engine costs were estimated at $803 in 2004, decreasing to $368 in 2009.[45]

The EPA also estimated increases in annual operating costs of $49 for medium-duty engines and $104 for heavy-duty engines for the maintenance of the EGR system. The cost of the NO_x adsorber emission control system for medium-duty engines was estimated at $2,564 in 2007, decreasing to $1,412 in 2012. For heavy-duty trucks, the cost of control technology was estimated at $3,227 in 2007, decreasing to $1,866 in 2012.[46] Although engine manufacturers state that these costs are optimistic, no studies have been completed to dispute the EPA estimates.

Efficiency Losses

EPA assumptions for the impacts of the ULSD Rule on diesel engine fuel efficiency are used for the Regulation case in this analysis. Because the emission control technology development needed to meet the 2007 standards remains to be developed, however, a sensitivity case was analyzed to evaluate the possible impacts of fuel efficiency reductions.[47] In the 4% Efficiency Loss case for this study, it is assumed that meeting the emission standards in 2010 will reduce the average fuel efficiency of highway heavy-duty diesel engines by 4 percent, improving to no efficiency loss in 2015. It is assumed in this scenario that engine manufacturers will not be able to overcome fuel efficiency losses in order to meet the standards in 2010, but with continued improvements in NO_x adsorber efficiency and desulfurization catalysts, they will be overcome by 2015.

[42] Manufacturers of Emission Controls Association, *Catalyst-Based Diesel Particulate Filters and NO_x Adsorbers: A Summary of the Technologies and the Effects of Fuel Sulfur* (August 14, 2000), p. 19.

[43] U.S. Environmental Protection Agency, *Technical Support Document for the Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements. Air Quality Modeling Analyses*, EPA420-R-00-028 (Washington, DC, December 2000), p. V-34.

[44] Based on phone interviews with emission control equipment manufacturers.

[45] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Control of Emissions of Air Pollution From Highway Heavy-Duty Engines*, EPA420-R-00-010 (Washington, DC, July 2000), p. 88.

[46] U.S. Environmental Protection Agency, *Technical Support Document for the Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements. Air Quality Modeling Analyses*, EPA420-R-00-028 (Washington, DC, December 2000), p. V-38.

[47] Although this case reflects a scenario in which losses in efficiency from emission contol are not overcome by new technology, the considerable time available for research and development may provide government and industry ample time to resolve the fuel efficiency loss issues associated with advanced emission control technologies.

3. Desulfurization Technology

Introduction

The availability of technologies for producing ultra-low-sulfur diesel fuel (ULSD) was one of the issues raised by the House Committee on Science. First, do adequate and cost-effective technologies exist to meet the ULSD standard? Second, are technologies being developed that could reduce the costs in the future? Last, is it likely that the needed technologies can be deployed into the market in time to meet the ULSD requirements of the rule?

A review of the technologies reveals that current technologies can be modified to produce diesel with less than 10 parts per million (ppm) sulfur. A small number of refineries currently produce diesel with sulfur in the 10 ppm range on a limited basis. The existence of the requisite technology does not ensure, however, that all refineries will have that technology in place in time to meet the new ULSD standards. Widespread production of ULSD will require many refineries to invest in major revamps or construction of new units. In addition to the status of desulfurization technologies, this chapter discusses possible impediments to their deployment.

Refineries in the United States are characterized by a wide range of size, complexity, and quality of crude oil inputs. Upgrades at a given refinery depend on individual circumstances, including the refinery's existing configuration, its inputs, its access to capital, and its perception of the market. The sulfur in petroleum products comes from the crude oil processed by the refinery. Refiners can reduce the sulfur content of their diesel fuel to a limited extent by switching to crude oil containing less sulfur; however, sulfur reduction from a switch in crude oil would fall well short of the new ULSD standard. Refineries will require substantial equipment upgrades to produce diesel with such limited sulfur.

In order to allow for some margin of error and product contamination in the distribution system, refineries will be required to produce highway diesel with sulfur somewhat below 15 ppm. Due to limited experience with such low-sulfur products, the exact sulfur level that will be required by refineries is not certain. In the Regulatory Impact Analysis for the ULSD Rule, the EPA assumed highway diesel production with an average of 7 ppm. Whether production is at 10 ppm or 7 ppm, the same technology would be used. In general, a relatively lower sulfur content would be achieved with more severe operating conditions at a higher cost.

Considerable development in reactor design and catalyst improvement has already been made to achieve ULSD levels near or below 10 ppm. In some cases low sulfur levels are the consequence of refiners' efforts to meet other specifications, such as low aromatic levels required in Sweden and California. In other cases refiners have decided to produce a "premium" low-sulfur diesel product, as in the United Kingdom, Germany, and California. These experiences, though limited, provide evidence for both the feasibility of and potential difficulties in producing ULSD on a widespread basis.

Refineries currently producing ULSD in limited quantities rely on enhanced hydrotreating technology. Technology vendors expect that this will also be the case for widespread production of ULSD. The following section focuses on hydrotreating as the primary means to achieve ULSD levels. A few emerging and unconventional desulfurization technologies are also discussed, which if proven cost-effective eventually may expand refiners' options for producing ULSD.

ULSD Production Technologies

Very-low-sulfur diesel products have been available commercially in some European countries and in California on a limited basis. Sweden was the first to impose very strict quality specifications for diesel fuel, requiring a minimum 50 cetane, a maximum of 10 ppm on sulfur content, and a maximum 5 percent on aromatics content. To meet these specifications the refinery at Scanraff, Sweden, installed a hydrotreating facility based on SynTechnology.[48] The Scanraff hydrotreating unit consists of an integrated two-stage reactor system with an interstage high-pressure gas stripper. The unit processes a light gas oil (LGO) to produce a diesel product with less than 1 ppm sulfur and 2.4 percent aromatics by volume. It is important to note that the Scanraff plant is highly selective of its feedstock to achieve the ultra-low sulfur content which may not be generalized to most U.S. refineries.

[48] B. van der Linde (Shell), R. Menon (ABB Lummus), D. Dave & S. Gustas (Criterion), "SynTechnology: An Attractive Solution for Meeting Future Diesel Specifications," presentation to the 1999 Asian Refining Technology Conference, ARTC-99.

Refineries with hydrotreaters are likely to achieve production of ULSD on straight runs by modifying catalysts and operating conditions. Desulfurizing the remainder of the distillate streams is expected to pose the greatest challenge, requiring either substantial revamps to equipment or construction of new units. In some refineries the heavier and less valuable streams, such as LCOs, are run through a hydrocracker. The distillates from the cracked stocks contain a larger concentration of compounds with aromatic rings, making sulfur removal more difficult. The need for some refineries to desulfurize the cracked stocks in addition to the straight-run streams may play a key role in the choice of technology.

When the 15 ppm ULSD specification takes effect in June 2006, refiners will have to desulfurize essentially all diesel blending components, especially cracked stocks, to provide for highway uses. It is generally believed that a two-stage deep desulfurization process will be required by most, if not all refiners, to achieve a diesel product with less than 10 ppm sulfur. The following discussion reviews a composite of the technological approaches of UOP, Criterion Catalyst, Haldor Topsoe, and MAKFining (a consortium effort of Mobil, Akzo Nobel, Kellogg Brown & Root, and TotalFinaElf Research).

A design consistent with recent technology papers would include a first stage that reduces the sulfur content to around 250 ppm or lower and a second stage that completes the reduction to less than 10 ppm. In some cases the first stage could be a conventional hydrotreating unit with moderate adjustments to the operation parameters. Recent advances in higher activity catalysts also help in achieving a higher sulfur removal rate.[55] The second stage would require substantial modification of the desulfurization process, primarily through using higher pressure, increasing hydrogen rate and purity, reducing space velocity, and choice of catalyst. To deep desulfurize cracked stocks, a higher reactor pressure is necessary. Pressure requirements would depend on the quality of the crude oil and the setup of the individual refinery.

The level of pressure required for deep desulfurization is a key uncertainty in assessing the cost and availability of the technology. In its 2000 study, *U.S. Petroleum Refining: Assuring the Adequacy and Affordability of Cleaner Fuels*, the National Petroleum Council (NPC) suggested that in order to produce diesel at less than 30 ppm sulfur, new high-pressure hydrotreaters would be required, operating at pressures between 1,100 and 1,200 psig.[56] Pressures over 1,000 psig are expected to require thick-walled reactors, which are produced by only a few suppliers (see discussion later in this chapter) and take longer to produce than reactors with thinner walls. In contrast to NPC's expectations, EPA's cost analysis reflected vendor information for revamps of 650 psig and 900 psig units that would not require thick-walled reactors. The vendors indicated that an existing hydrotreating unit could be retrofitted with a number of different vessels, including: a reactor, a hydrogen compressor, a recycle scrubber, an interstage stripper, and other associated process hardware.[57]

The amount of hydrogen required for desulfurization is also uncertain, because the industry has no experience with widespread desulfurization at ultra-low levels. One of the primary determinants of cost is hydrogen consumption and the related investment in hydrogen-producing equipment. Hydrogen consumption is the largest operating cost in hydrotreating diesel, and minimizing hydrogen use is a key objective in hydrotreating for sulfur removal. In general, 10 ppm sulfur diesel would require 25 to 45 percent more hydrogen consumption than would 500 ppm diesel, in addition to improved catalysts.[58] Hydrogen requirements at lower sulfur levels rise in a nonlinear fashion.

In addition to improvements in design and catalysts, other modifications to refinery operations can contribute to the production of ULSD. For example, high-sulfur compounds in both straight runs and cracked stocks lie predominantly in the higher boiling range of the materials. Thus, reducing the final boiling point for the streams and cutting off the heaviest boiling segment can reduce the difficulty of the desulfurization task. If a refiner has hydrocracking capability, the hydrocracker would be an ideal disposition for these streams. Some refiners making both high- and low-sulfur distillate products may be able to allocate the more difficult distillate blend streams to the high-sulfur product; however, the EPA is in the process of promulgating "Tier 3" non-road engine

[55] The type of improvement in catalyst activity is illustrated by Akzo Nobel new KF757 cobalt-molybdenum (CoMo) catalyst. Comparing KF757 with its predecessor catalyst Akzo states, "A diesel unit designed to achieve 500 wppm product sulfur with KF752 can easily achieve less than 250 ppm product sulfur with KF757 while maintaining the same operating cycle." Source: C.P. Smit, "MAKFining Premium Distillates Technology. The Future of Distillate Upgrading," presentation to Petrobras (Rio de Janeiro, Brazil, August 24, 2000), p. 4.

[56] National Petroleum Council, *U.S. Petroleum Refining: Assuring the Adequacy and Affordability of Cleaner Fuels* (June 2000), Chapter 7, pp. 132-133.

[57] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, p. V-69

[58] Charles River Associates, Inc., and Baker and O'Brien, Inc., *An assessment of the Potential Impacts of Proposed Environmental Regulations on U.S. Refinery Supply of Diesel Fuel*, CRA No. D02316-00 (August 2000), p. 26.

Developing Technologies and Ultra-Low-Sulfur Alternatives (Continued)

A second way to avoid desulfurization is with biodiesel made from vegetable oil or animal fats. Although other processes are available, most biodiesel is made with a base-catalyzed reaction. A fat or oil is reacted with an alcohol, such as methanol, in the presence of a catalyst to produce glycerine and methyl esters or biodiesel. The methanol is charged in excess to assist in quick conversion and recovered for reuse. The catalyst, usually sodium or potassium hydroxide, is mixed with the methanol. Increased production of biodiesel could create more surfactants than the market would be able to absorb. Biodiesel is a strong solvent and can dissolve paint as well as deposits left in fuel lines by petroleum-based diesel, sometimes leading to engine problems. Biodiesel also freezes at a higher temperature than petroleum-based diesel. Biodiesel advocates claim that a 1-percent blend of biodiesel can improve lubricity by as much as 65 percent. At least eight companies are marketing biodiesel in all parts of the United States, according to the National Biodiesel Board.[f]

[f]Web site www.biodiesel.org/marketers.htm.

emission limits around 2005 or 2006, which are expected to be linked to sulfur reduction for non-road diesel fuel.[59]

A processing scheme that has been promoted primarily in Asia and Europe employs a combination of partial hydrocracking and FCC to produce very-low-sulfur fuels. In this scheme a partial conversion hydrocracking unit is placed in front of the FCC unit to convert the vacuum gas oil to light products (distillate, kerosene, naphtha, and lighter) and FCC feed. The distillate product is low in sulfur (less than 200 ppm) and has a cetane number of about 50. The cracked stocks produced in the FCC unit are also lower in sulfur and higher in cetane. The relatively greater demand for distillate relative to gasoline demand in Europe and Asia and the higher diesel cetane requirement are more in keeping with the strengths of this process option than is the case for most U.S. refineries.

A few new technologies that may reduce the cost of diesel desulfurization—sulfur adsorption, biodesulfurization, and sulfur oxidation—are in the experimental stages of development (see box above). Although they are being spurred by the EPA rule, they are unlikely to have significant effects on ULSD production in 2006, however, they may affect the market by 2010. In addition, methods have been developed to produce diesel fuel from natural gas and organic fats, but they still are costly.

NEMS Approach to Diesel Desulfurization Technology

The Petroleum Market Module (PMM) in the National Energy Modeling System (NEMS)[60] projects petroleum product prices, refining activities, and movements of petroleum into the United States and among domestic regions. In addition, the PMM estimates capacity expansion and fuel consumption in the refining industry. The PMM is also revised on a regular basis to incorporate current regulations that may affect the domestic petroleum market.

The PMM optimizes the operation of petroleum refineries in the United States, including the supply and transportation of crude oil to refineries, the regional processing of these raw materials into petroleum products, and the distribution of petroleum products to meet regional demands. The production of natural gas liquids from gas processing plants is also represented. The essential outputs of the model are product prices, a petroleum supply/demand balance, demands for refinery fuel use, and capacity expansion.

The PMM employs a modified two-stage distillate deep desulfurization process based on proven technologies.[61] The first stage consists of a choice of two distinct units, which accept feedstocks of various sulfur contents and desulfurize to a range of 20 to 30 ppm (Table 2). The

[59]U.S. Environmental Protection Agency, *Reducing Air Pollution from Non-road Engines*, EPA420-F-00-048 (Washington, DC, November 2000), p. 3.

[60]NEMS was developed by EIA for mid-term forecasts of U.S. energy markets (currently through 2020). NEMS documentation can be found at web site www.eia.doe.gov/bookshelf/docs.html. PMM documentation can be found at web site www.eia.doe.gov/pub/pdf/model docs/m059(2001).pdf

[61]The PMM incorporates the technology database from EnSys Energy & Systems, Inc., a consultant to EIA, for refinery processing modeling.

Expected Developments and Cost Improvements

Recent experience indicates that consistent, high-volume production of ULSD is a technologically feasible goal, although many refineries could face major retrofits or new unit construction. The variation in feedstock concerning both sulfur content and the amount of cracked stock may be influential in the choice of process option and the cost of desulfurization, which may also entail a different allocation of streams to products. Although unconventional desulfurization technologies have been promoted recently by various vendors, none has made sufficient progress toward the commercial stage to warrant consideration by most refiners who must start producing ULSD by June 2006.[63]

The two-stage desulfurization process can be accomplished through revamping existing units, building new units, or a combination of both. Several aspects of unit design are important. Properly designed distribution trays can greatly improve desulfurization efficiency, in that catalyst bypassing can make it virtually impossible to produce ULSD. Because hydrogen sulfide (H_2S) inhibits hydrodesulfurization reactions, scrubbing of recycle gas to remove H_2S will improve desulfurization. New design or revamps will also include gas quench to help control temperature through the reactor. In the design of a two-stage system, there will be a hot stripper between the two reactors where ammonia and H_2S are stripped from the first-stage product.

As more commercial evidence and cost information become available for diesel desulfurization in the next few years, it will be possible to better assess the technology choices—including equipment requirements, operating conditions, and production logistics—that most refiners will have to make in order to meet the new ULSD standards. However, the EPA's tight compliance timetable for producing ULSD might short-circuit the learning process for refiners to acquire necessary experience to make cost-effective decisions.[64] The many caveats within current vendors' statements must be carefully scrutinized, to avoid overestimating the capability or underestimating the costs for new or revamped distillate hydrotreating facilities. Most vendors state that their goal is to use or revamp a client refiner's current process units whenever possible. In trying to reach a 10 ppm or lower sulfur target, however, many units may be unsuitable or require major capital outlays. Uncertainty about the level of revamp is a major source of uncertainty in estimating the cost of the ULSD Rule.

Further consolidation of the refinery industry may achieve better economies of scale, although some industry analysts have expressed concern that a shortage of diesel supply could materialize in the short term if some economically challenged refineries exit the diesel market. Catalyst improvements are expected to be one of the main factors in reducing operating costs, both in terms of recycle rate and efficient use of hydrogen. Other factors, such as the dependence of the refinery on distillates, access to lower-sulfur crude, level of competition, and ability to upgrade infrastructure, must also be taken into account. The European experience could also provide valuable insights for U.S. refineries.

Deployment of Desulfurization Technologies

The deployment of diesel desulfurization technologies will hinge on several factors, such as the ability and willingness of refiners to invest, the timing of investment and permitting, the ability of manufacturers to provide units for all U.S. refineries at once, and the availability of engineering and construction resources.

One impediment to acquiring desulfurization upgrades may be the willingness and ability of individual refiners to obtain capital. The EPA estimates that average investment for diesel desulfurization will cost $50 million per refinery, slightly more than the estimated $44 million per refinery required to meet the Tier 2 gasoline sulfur requirement. Most refiners will invest in the gasoline sulfur upgrade because gasoline is their major product. Because U.S. refineries typically produce three to four times as much gasoline as highway diesel fuel, the per gallon investment cost of ULSD will be three to four times as high.[65]

In its Regulatory Impact Analysis, the EPA provided an analysis of capital requirements indicating that the combined annual capital investment for gasoline and diesel desulfurization would be $2.15 billion in 2004 and $2.49 billion in 2005.[66] The EPA analysis spread the diesel investments over a 2-year period (to reflect "a somewhat more sophisticated schedule for the expenditure of capital throughout a project") and assumed that the gasoline

[63] It is believed that, to comply with the new ULSD cap of 15 ppm, a refiner would require about 4 years lead time to secure a permit and to design, build, and optimize a new desulfurization process before commercial production is ready.

[64] Small refiners, which may delay ULSD production under special provisions of the Rule, could adopt emerging technologies later in the decade when any of those technologies becomes cost-competitive.

[65] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV.

[66] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, pp. IV-63–IV-64.

Tier 2 gasoline program alone and for the gasoline and ULSD programs together, both with and without a temporary compliance option. The estimates of the two programs taken together without the temporary compliance option were about double the employment estimates for the Tier 2 gasoline program only, in all three job categories. When the temporary compliance option is taken into account, personnel requirements for the two programs are only about 30 percent higher than for the Tier 2 gasoline program alone.

Because the largest impact is expected to occur in front-end design, where 30 percent of available U.S. personnel are required, the EPA believes that the engineering and construction workforce can provide the equipment necessary for compliance. It appears that the EPA's criterion for the adequacy of engineering and construction personnel lies somewhere between 30 percent and 50 percent over the personnel requirements of the Tier 2 requirements alone.

The EPA's estimates without a temporary compliance option are most consistent with the timing assumptions of NPC's Scenario A. EPA's analysis indicates that engineering and construction requirements will be lower given the temporary compliance option of the ULSD Rule; however, NPC Scenarios D and E demonstrate that different assumptions about project timing lead to very different estimates for personnel. The range of personnel estimates shown in Table 4 highlights the uncertainty of the estimates.

The EPA's analysis assumed that a total of 97 units would be added to make Tier 2 gasoline and that 121 diesel desulfurization units would be added for ULSD (Table 5). The expected startup dates for the gasoline and diesel desulfurization units indicate an overlap of 26 gasoline units and 63 diesel units in 2006. The 2006 overlap in gasoline and diesel startups is noteworthy because it is significantly greater than it would have been with ULSD implementation in any other year except 2004.

Another possible hurdle to implementing technology for the ULSD Rule raised by the NPC is the ability of manufacturers to provide critical equipment. As mentioned earlier, the NPC analysis assumed that a sulfur requirement below 30 ppm would require new deep hydrotreaters with reactor pressures in the range of 1,100 to 1,200 psig, requiring thick-walled reactors. As compared with other reactors, the delivery time for thick-walled reactors is longer and the number of suppliers is more limited. Only one or two U.S. companies produce thick-walled reactors, whereas four to six can supply reactors with more typical wall widths. Outside the United States, 10 to 12 companies are able to supply

Table 4. Estimated Peak Engineering and Construction Labor Requirements for Gasoline and Diesel Desulfurization Projects
(Percent of Current Workforce)

Analysis Case	Front-End Design Workforce	Detailed Engineering Workforce	Construction Workforce
NPC Scenario A	42	32	—
NPC Scenario B	59	45	—
NPC Scenario C	62	56	—
NPC Scenario D	82	49	—
NPC Scenario E	82	49	—
EPA With No Temporary Compliance Option	46	27	10
EPA With Temporary Compliance Option	30	17	7

Sources: NPC: National Petroleum Council, *U.S. Petroleum Refining: Assuring the Adequacy and Affordability of Cleaner Fuels* (June 2000), Table 7-6. EPA: U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, Table IV.B-5.

Table 5. EPA Estimates of Desulfurization Unit Startups, 2001-2010

Unit Type	2001-2003	2004	2005	2006	2007	2008	2009	2010
Gasoline Units								
After Promulgation of the Tier 2 Gasoline Sulfur Program	10	37	6	26	9	9	—	—
After Promulgation of the ULSD Program	10	37	6	26	5	3	4	6
Diesel Units	—	—	—	63	—	—	—	58

Source: U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, Table IV.B-2.

4. Impact of the ULSD Rule on Oil Pipelines

Introduction

The petroleum products pipeline distribution system is the primary means of transporting diesel fuel and other liquid petroleum products within the United States. The Nation's refined petroleum products pipeline system is not monolithic. Pipelines are distinguished by the region they serve, the type of service they offer, their mode of operation, their size, the size of the interfaces between batches, and how they dispose of them. In preparing this report, several pipeline companies were contacted.[68] These companies represent a cross-section of size, capacity, location, markets, corporate structures, and operating modes. The assessment of the impact of the ultra-low-sulfur diesel (ULSD) Rule is complex, both because the pipeline system is complex and because there are uncertainties that cannot be resolved without operating experience with ULSD.

The first question appears to be: "Can the Nation's oil pipeline system successfully distribute ULSD without degrading its sulfur concentration?" While the answer seems to be yes, lingering uncertainties that come with the unique specifications of this new and untested product prevent a clear assertion. Among the uncertainties are the following:

- Protecting the product integrity of 15 parts per million (ppm) product will be more difficult than protecting the product integrity of the current 500 ppm highway diesel. Not only is the sulfur specification lower, with less room for error, but also the relative "potency" of the sulfur in products further upstream is higher.
- The behavior of sulfur molecules in ULSD has not been field-tested to allow conclusions about whether pipeline wall contamination is a real problem or simply a fear, and whether the migration of sulfur will require a significant increase in the volume downgraded at the interface.
- There are few pieces of the approved test equipment now in use, but its reliability and accuracy are unproven.

Although the overall costs of the program may be lower if the rule is phased in, the incremental costs associated with temporarily transporting ULSD, in addition to low-sulfur diesel and heating oil fall on pipelines and other players in downstream distribution. During the transition phase, some 20 percent of the highway diesel volume will be 500 ppm. The increased cost of tankage for handling this small volume of 500 ppm material is borne solely by the affected regions. On a cost-per-gallon basis for the small volume in the limited region, the increased cost more than doubles the current pipeline tariff for the largest carriers. Whether such an increase can be passed through in tariff rates is a matter of significant concern for pipeline operators.

Finally, there is a concern that further limitations on distribution flexibility will contribute to price spikes or spot outages. The distribution of ULSD will reduce the system's flexibility by imposing testing requirements that will increase transit times by increasing the product lost to downgrade and by "freezing" storage capacity in the event of product contamination. These adverse impacts inject new supply risks into the system, making an already burdened oil distribution system more vulnerable to product supply imbalances in local and regional markets. Supply imbalances, if they occur, could cause increased product price volatility, price spikes, and product outages. This concern is not just theoretical. During 2000, logistics problems contributed to large and sudden price spikes in the Midwest gasoline market.[69] To the extent that the system is overburdened, stresses and unforeseen circumstances will cause imbalances more often, and with greater impact.

The Role of Refined Petroleum Product Pipelines

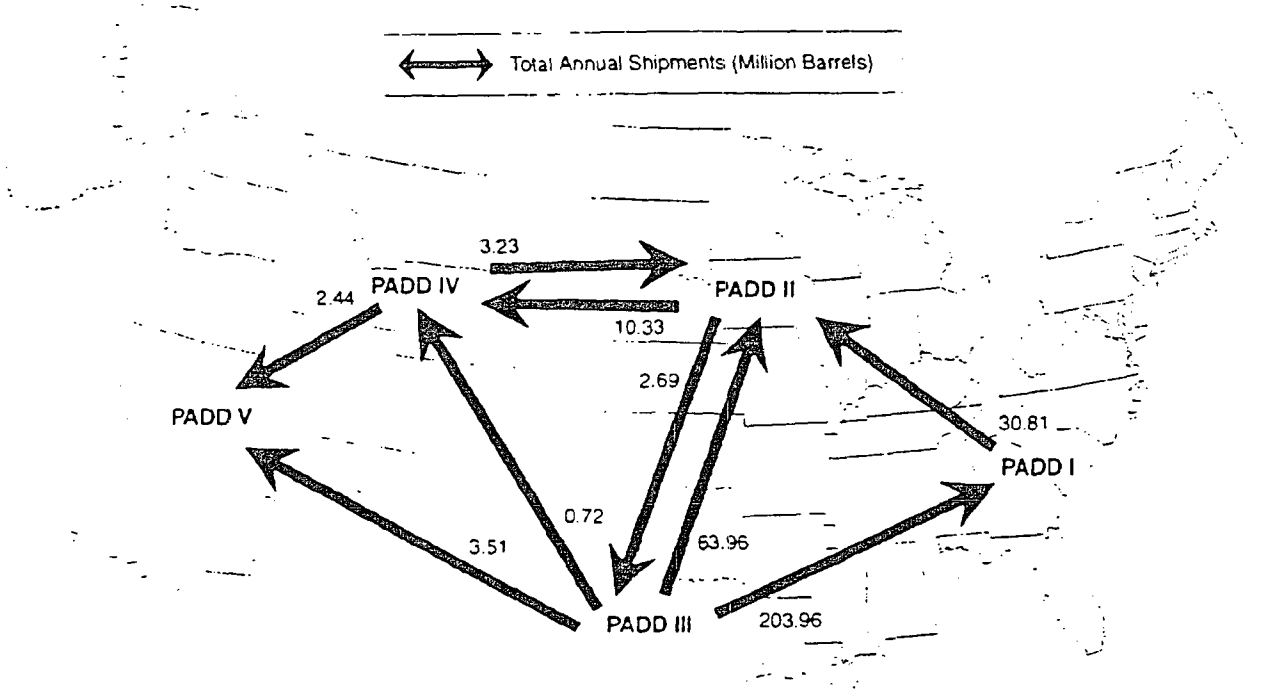
Oil pipelines transport more crude oil and refined petroleum products in the United States than any other means of transportation.[70] Typically, as common carriers (which transport for any shipper on a nondiscriminatory basis), oil pipelines are subject to State authority if

[68] Buckeye Pipe Line Company, Colonial Pipeline, Conoco Pipe Line Company, Kaneb Pipeline Partners, L.P., Kinder Morgan Energy Partners L.P., Marathon Ashland Petroleum LLC, TE Products Pipeline Company, L.P., and Williams Energy Services

[69] Joanne Shore, Energy Information Administration, "Supply of Chicago/Milwaukee Gasoline Spring 2000," web site www.eia.doe.gov/pub/oil_gas/petroleum/presentations/2000/supply_of_chicago_milwaukee_gasoline_spring_2000/cmsupply2000.htm (August 9, 2000)

[70] According to the Association of Oil Pipe Lines, *Shifts in Petroleum Transportation: 1999* (2001), pipelines account for 75 percent of the ton-miles of oil transported in the United States. (One ton of oil transported one mile equals one ton-mile.)

Figure 1. Pipeline Shipments of Distillate Fuels Between PADDs, 1999



Note: Includes low-sulfur (highway) diesel fuel and high-sulfur distillate fuel oil (non-road diesel fuel and heating oil).
Source: Energy Information Administration, *Petroleum Supply Annual 1999*, DOE/EIA-0304(99)/1 (Washington, DC, June 2000), Table 33.

aboveground storage tanks at an origin location accumulate and hold a given petroleum product pending its entry into the pipeline for transport. Petroleum products are also stored temporarily in aboveground storage tanks at destination terminals. Such tanks usually are dedicated to holding a single petroleum product or grade. Most storage tanks used in pipeline operation are filled and drained up to four or more times per month.

In addition to the minor creation of interface material that occurs in pipeline transit, creation of interface material also occurs in the local piping facilities (station piping) that direct petroleum products from and to respective origin and destination storage tanks and in the tanks themselves. Essentially, station piping represents the connection between a main pipeline segment and its requisite operating tanks. The concept is simple in theory, but in practice the configuration of station piping is not. Station piping layouts become more complex as the tanks at a pipeline terminal facility become more numerous.

The interface generation in station piping and breakout tanks may be even more important than during pipeline transit. The volume of interface material thus generated is due to the physical attributes of the system. It has fewer variables but approaches a fixed value on a barrel-per-batch, not a percentage, basis. For instance, one pipeline operator creates 25,000 barrels of high-sulfur/ low-sulfur distillate interface per batch whether the batch is 250,000 barrels or 1,000,000 barrels. In addition, a given batch of product might be transported in multiple pipelines between its origin and its final destination and even within the same system might require a stop in breakout tanks, as noted above. Each segment of the journey generates additional interface.

Challenges of the ULSD Rule

Because pipeline operators do not have experience with 15 ppm product, there are significant uncertainties related to its transport. This section discusses some of the issues:

- The volume of downgraded product likely to be produced from deep pipeline cuts necessary to preserve the integrity of ULSD
- Likely strategies for protecting the product integrity of 15 ppm diesel and their impact on the generation of interfaces and transmix
- Limitations on downgrading from 15 ppm to 500 ppm product within the diesel pool

The EPA assumed the level ULSD downgrade volumes at 4.4 percent of ULSD supplied, double their current estimate of 2.2 percent of highway diesel supplied. The EPA based this assumption in part on comments made by respondents to the AOPL survey. In its Regulatory Impact Analysis, the EPA stated a desire to ". . . yield a conservatively high estimate of our program's impact . . ." and noted ". . . an appropriate level of confidence that we are not underestimating the impact of our sulfur program . . . will help account for various unknowns that may cause downgrade volumes to increase."[75]

Pipeline operators have several concerns about the downgrade volume of ULSD. One concern is that the simple use of specific gravity—the current method—may not be a sufficiently sensitive indicator to make the interface cut. One of the AOPL/API survey respondents noted, for instance: "Our initial studies of trailback from [heating oil] to [low-sulfur diesel] indicates that trailback in interfaces to ULSD diesel may be as much as 4 times that of the gravity change between products."[76] However, the EPA viewed increased trailback from heating oil to ULSD as less of a concern.[77]

The EPA assumed that pipeline operators would not have to substantially change their current methods to detect the interface between ULSD and adjacent products in the pipeline. In the EPA's view it was highly unlikely that there would be any difference in the physical properties of ULSD versus the current 500 ppm highway diesel that would cause a substantial change in the trailback of sulfur from preceding batches into batches of ULSD.[78]

Another concern is that a protective cut, when it can be calibrated using real-world experience, may require a large volume downgrade. The conventional approach is to buffer distillate products against other distillate products to facilitate blending, as noted in the previous discussion. A batch of 500 ppm diesel might be wrapped between a batch of 2,000 ppm jet fuel and a batch of dye non-road distillate fuel oil (heating oil) at 3,000 to 5,000 ppm. Thus, the product with the sulfur restriction (500 ppm diesel) is wrapped by a product with four times the sulfur (2,000 ppm jet fuel), and by a product with six to eight times the sulfur (3,000 to 5,000 ppm heating oil). In practice, the current highway diesel is usually considerably less than the 500 ppm limitation (300 ppm would not be uncommon). Under these circumstances, it is relatively unlikely that chance contamination could move the diesel from 300 ppm to nonconforming status at more than 500 ppm.

The current situation, however, contrasts significantly to the ULSD situation. ULSD (15 ppm) may be adjacent to jet fuel at 2,000 ppm, 133 times the ULSD sulfur concentration, or to heating oil at 3,000 to 5,000 ppm, 200 to 300 times the ULSD concentration. In this case, a tiny contamination will move the ULSD batch to nonconforming status. According to one of the AOPL/API respondents, ". . . a 0.15 percent contamination (15 bbls in 10,000 bbls) of [heating oil] in ULSD will raise the sulfur level by 3 ppm . . . ." According to another, ". . . the [heating oil] at 2000 ppm can contaminate the ULSD at levels as low as 0.22 percent."[79] In combination with the concerns raised about the sulfur trailback, the issue of the volume necessary for the protective cut is another significant uncertainty in the handling of ULSD.

The assumption made about the size of the increase in interface generated after a switch from the current standard for highway diesel (500 ppm) to ULSD becomes important when calculating the cost of the regulation. EPA's estimate of additional costs of the ULSD rule that can be attributed to increased product downgrades was 0.3 cents per gallon of ULSD supplied once the ULSD rule was fully implemented and all highway diesel must meet the 15 ppm standard. This 0.3 cents per gallon cost was with the 4.4 percent downgrade assumption.[80] Turner Mason and Company conducted a study of distribution costs for the API and came up with a cost increase of 0.9 cents per gallon for product downgrade. Turner Mason assumed that 17.5 percent of ULSD shipped would be downgraded.

Strategies for Buffering ULSD in a Pipeline

Because there is no experience with distributing ULSD in a non-dedicated or common transportation system, pipeline operators are unsure how they will sequence the new product in the pipeline. Those that now ship highway diesel adjacent to jet fuel are unlikely to be able to continue the practice unless the sulfur content of the jet fuel is also lowered. At the current jet fuel sulfur content, ULSD cannot tolerate the contamination from the protective cut necessary to protect the other properties

[75] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, pp. IV-93–IV-94.

[76] AOPL Comments, Attachment, p. 2

[77] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, p. IV-96.

[78] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, p. IV-94.

[79] AOPL Comments, Attachment, p. 2 and p. 5.

[80] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, p. V-124.

Residual Sulfur in a Pipeline

In comments on the proposed ULSD Rule, pipeline operators raised a concern over whether residual sulfur from high-sulfur material could contaminate subsequent pipeline material beyond the interface. The concern was based on limited experience. Recently, in light of the prospect of transporting ULSD, Buckeye Pipe Line conducted a test of possible sulfur contamination from one product batch to another. In the test on one segment of its pipeline system, Buckeye made a careful measurement of sulfur content in batches of highway diesel fuel following a batch of high-sulfur diesel fuel. Buckeye found that the sulfur content of the second batch of highway diesel fuel increased.[83] However, the EPA stated: "We believe there is no reason to surmise that contamination from surface accumulation will represent a significant concern under our sulfur program."[84] This issue cannot be resolved without further testing. Until it is, it will remain an uncertainty about the impact of the ULSD Rule.

Product Testing

Product testing is another area of considerable concern for those involved in the transport of highway diesel fuel, for two reasons: (1) The designated test method was developed for testing sulfur in aromatics and has not yet been adapted or evaluated by industry as a test for sulfur in diesel fuel. (2) There is no readily available and appropriate test for sulfur that will permit the precise interface cuts between batches that will be required in handling ULSD. The first of these issues is important for all players in ULSD markets, and the second is specific to the oil pipelines that will transport ULSD.

Currently, oil pipeline operators test the petroleum products they transport in a variety of ways, for a variety of parameters. Each product has its own relevant test parameters, and grades of a particular product are tested to confirm their defining characteristics within a product group. In many pipelines, product batches are tested four times at various stages of their entry to or transit through the pipeline:

- Rigorous testing is performed *before products enter a* pipeline to assure that relevant specifications are within the normal range.
- Many pipelines monitor materials *at strategic pipeline locations en route* for contamination.
- *At or near a product's delivery point*, pipelines perform oversight testing covering a limited number of key product parameters (but not sulfur content).
- Most pipelines test *random pipeline batches* using a full battery of tests.

All tests except in-line testing, the second testing regime outlined above, are performed on a batch basis. All but the fourth testing regime outlined above are performed on each batch of products. Pipeline operators are equipped at their own pumping and delivery stations to perform oversight testing on an expedient, on-site basis. Other batch testing is typically performed at an off-site laboratory. Some operators use test laboratories owned and operated internally and some use third-party laboratories. The large laboratories, whether operated by a pipeline operator or by a third party, will be able to meet any testing requirements. However, the designated test method presents uncertainties even to the most sophisticated laboratories, as discussed more fully below. ULSD regulations on testing apply directly only to refiners and importers, leaving additional leeway for parties downstream to choose a test method. Thus, the concerns with respect to test method apply even more strongly to refiners and importers than to pipelines and other downstream parties.

The designated testing method will be ASTM 6428-99,[85] not the widely-used ASTM 5453-99, which has been approved by the State of California and has been demonstrated to be reliable in testing very low sulfur content. The designated method, ASTM 6428-99, was developed for testing sulfur in aromatics. There is no currently available test methodology to apply the test to sulfur in diesel fuel. Because the diesel methodology has not yet been developed for the designated method, it has not yet been tested by multiple laboratories. By industry convention, new test methods are subjected to "round robin" testing under the oversight of the American Society of Testing and Materials (ASTM), in which multiple laboratories apply the test method to multiple batches to develop an objective evaluation of the method's reliability and accuracy. The correlation of the round robin's results becomes the industry standard and is used to calibrate other test methods against the designated method. The correlation is critical to the choice of test method and equipment for downstream players.

While ASTM 5453-99 has been designated as an alternative test method, its results must be correlated with the

[83] Operators at Explorer Pipeline, which formerly carried crude oil and refined products as batches in the same pipeline, also observed that refined products following high sulfur crude oil in the pipeline experienced a material increase in sulfur content. (The physical characteristics of crude oil are distinct from refined products, and its sulfur content can be considerably higher than the sulfur content of refined petroleum products shipped in a pipeline.)

[84] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, p. IV-99

[85] U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements: Final Rule," *Federal Register*, 40 CFR Part 80.580(a)(2) (January 18, 2001)

leave room for test reproducibility and unavoidable contamination.

Currently, most oil pipeline operators use X-ray fluorescent sulfur analyzers such as those manufactured by Oxford Instruments, Asoma Instruments, or Horiba, Ltd., for oversight sulfur content testing of highway diesel fuel. These analyzers, however, will be unable to monitor ULSD. Some oil pipelines use Antek Instruments, administering ASTM 5453-99 in a laboratory to monitor sulfur content on a batch basis. However, this equipment and test will help with the interface cut only in some situations, because its application for in-line testing presents a number of challenges (see below).

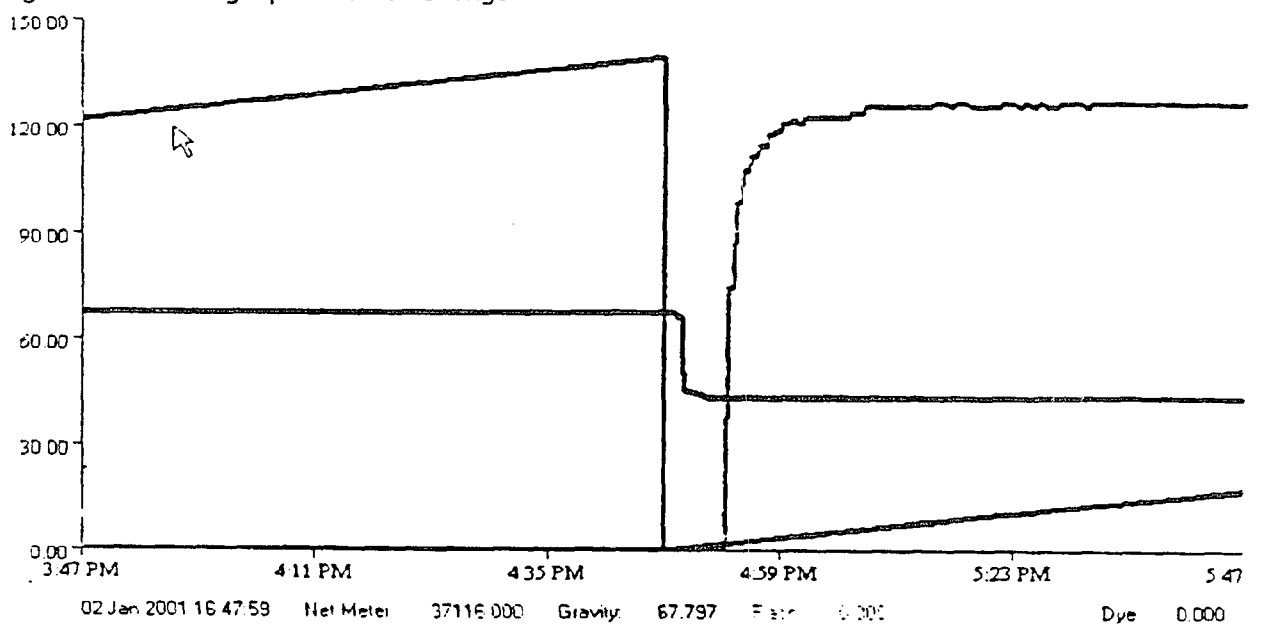
Some oil pipelines use in-line testing equipment to detect contamination close to and downstream from potential source locations where foreign or off-specification material might be inadvertently introduced into pure material (Figure 2). Early detection of contamination gives operators flexibility in correcting problems before they become intractable. However, there is no in-line test for sulfur content.

Product testing is different from instrumented detection of specific gravity, which is used to identify and track product batches in a pipeline system. Batch tracking and identification are accomplished by in-line monitoring of the pipeline stream's specific gravity at strategic pipeline locations. Such locations are typically station entry points or other locations where batches need to be "cut" and separately directed to subsequent pipeline segments in a system or to storage tanks for segregation (Figure 3). The cut, as noted previously, does not depend on sulfur content.

Most oil pipeline operators will probably want or need to perform in-line monitoring of sulfur content, because degradation of ULSD will easily and, possibly, frequently occur. The entry, for example, of only 35 barrels of heating oil (3,000 ppm) into a 10,000-barrel batch of ULSD will contaminate the batch.[87] A 10-inch diameter pipeline flowing at 4 miles per hour (a representative rate for a delivering carrier) is flowing at some 34 barrels per minute. Other carriers may be flowing faster, and on larger diameter pipelines, are moving more product. Hence, flow rates can exceed 300 barrels per minute. The 35-barrel contamination, then, is quick to occur. A normal cut, illustrated above, might take some minutes.

In-line testing for sulfur will represent a difficult challenge for the oil pipeline industry and for test instrument manufacturers. Current in-line instruments such as flash point or dye/haze analyzers cost $40,000 each to acquire, but there is no similar instrument available to meet ULSD test requirements. Current instruments for testing sulfur do not have adequate sensitivity, accuracy, or speed.

Figure 3. Monitoring Pipeline Batch Change



Note: This screen capture, originating from the pipeline's SCADA system, illustrates a normal batch change from gasoline (67 API gravity) to kerosene (47 API gravity and 123 minimum flashpoint).

[87] [(9,965 x 7) + 935 x (35 x 3,000)] / 10,000 = 17.5 ppm.

diesel fuel. The EPA cited a survey on the expected cost of handling a second grade of diesel fuel by the National Association of Truck Stop Operators of its members. Based on this survey, the EPA estimated an average cost of $100,000 per truck stop to handle the two diesel grades, giving a total of $240 million. A Petroleum Marketers Association of America estimate gave costs of $50,000 per truck stop.[90] The total costs of new tanks and equipment to handle both 500 ppm and 15 ppm diesel fuel were estimated by the EPA at $1.05 billion.[91]

The EPA estimated the total cost per gallon of highway diesel of additional storage tanks at 0.7 cents. This 0.7 cents per gallon additional cost was for the 2006 to 2010 phase-in period. The EPA assumed that the additional storage tanks would be fully amortized during the phase-in period, and that service stations supplying light-duty vehicles with diesel fuel, centrally fueled fleet facilities, and card locks (unattended filling stations) would not install additional storage tanks to handle both 500 ppm diesel and ULSD. Therefore, no cost was estimated for additional storage tanks during the phase-in at service stations, centrally fueled fleet facilities, or card locks.[92]

Where an operator cannot add a tank, it may choose to drop a grade of product. (Such a strategy is not a clear winner, however, because a dropped grade of gasoline, for instance, requires the shipment and storage of greater volumes of another grade of gasoline to compensate.) A carrier might be able to drop a grade of distillate fuel oil, but not without requiring an additional, compensating volume of low-sulfur product or ULSD to meet the market need, exacerbating the draw on refiner capabilities.

The question of whether pipeline companies will be able to recover the increased costs associated either with moving ULSD or moving ULSD plus another temporary grade is a matter of conjecture. The only process for recovery will be tariff rates, and the path to structuring rates to allow that recovery is uncharted.

Overview of Tariff Rate Issues

The majority of transportation for refined petroleum products by volume or by barrel-miles is provided by common-carrier oil pipelines operating in interstate service, under rates regulated by the Federal Energy Regulatory Commission (FERC). Most oil pipeline carriers have approved tariff rates on file with the FERC covering the transportation of diesel fuel. If no other application or action were taken by an oil pipeline company, the existing tariff rates covering diesel fuel would apply to ULSD when that material is distributed to markets. As noted in other sections of this report, however, oil pipelines will incur large, incremental capital and operating costs in distributing the new diesel fuel.

For most regulated oil pipelines, the FERC uses an economic index as the basis for approving tariff rate increases. The index provides that tariff rates may increase without challenge by a percentage amount no more than the Producer Price Increase for Finished Goods, less 1 percent over an approved base rate. If an oil pipeline carrier is operating under the FERC's index method and applies its existing tariff rate to ULSD, there will be no basis for the carrier to recover its extraordinary incremental costs in the approved rate.

Some oil pipeline companies operate under alternative programs with the FERC. The second most prominent method is to administer some or all of a carrier's tariff rates under a market-based system.[93] Under this method, if various markets served by an oil pipeline are first found by the FERC to be workably competitive, the FERC then stipulates the basis by which the pipeline carrier may raise rates more flexibly, without application of the index. Many oil pipeline operators believe that market conditions under which they operate are far more competitive than their status as regulated utilities suggests. If they are correct (and the FERC's own findings of workable competition in many oil transportation markets suggests that they are), pipelines will be competitively constrained from simply passing through their higher ULSD costs to shippers.

A carrier might file a new tariff rate expressly covering ULSD. If that rate is greater than the previous rate (or the remaining tariff rate for other grades of diesel fuel), the FERC or a shipper might protest the new rate, a common occurrence. In such an event, it is possible that the new tariff rate would not be permitted to take effect or that it would be accepted subject to refund if it were later found to be excessive. Furthermore, such administrative proceedings to adjudicate tariff rates before the FERC are costly and time-consuming.

As an alternative to attempting to recover incremental costs through increasing an existing approved rate or filing new tariff rates, carriers could try to impose special charges to recover incremental capital or operating costs

[90] John Huber, Petroleum Marketers Association of America, "Letter to U.S. EPA, Re: AMS-FRL-6705-2." Submitted to the public docket on August 11, 2000.

[91] John Huber, Petroleum Marketers Association of America, "Letter to U.S. EPA, Re: AMS-FRL-6705-2." Submitted to the public docket on August 11, 2000.

[92] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, p. V-133.

[93] Other rate administration methods are available from the Commission, but they are even less frequently used.

- Installing product quality testing equipment (which does not yet exist)
- Recovering operating costs that are not transparently recoverable under FERC regulations or market conditions
- Collecting, transporting, reprocessing, and selling up to twice the volume of existing pipeline transmix
- Reconfiguring an undetermined number of existing stations with new piping, tanks, manifolds, or valves
- Installing new loading facilities at distribution terminals.

Protecting the integrity of 15 ppm product will be more difficult than protecting the product integrity of the current 500 ppm product. The sulfur concentration of the neighboring product will more easily lead to contamination of the ULSD. Not only is the specification lower, with less room for error, but also the "potency" of the sulfur in the nearby product is higher.

It appears that the overall proposition of transporting ULSD is feasible. More problems can be expected to arise in handling ULSD among delivering pipeline carriers than among trunk carriers. In particular, those delivering carriers that cannot support fungible operations, are already short of working tankage, have complex routing and schedules, or have small markets at their end points will have the greatest difficulty in transporting ULSD.

The market impact of a contaminated batch will be stronger, however. With such a tight specification, there is little opportunity for blending lower sulfur material into an off-specification batch or tank. With the regulation applied as a cap with no averaging aspect, an off-specification tank in a terminal with only two tanks will quickly lead to a localized shortage of highway diesel, especially in areas where the market is thin and the infrastructure sparse.

Finally, there are uncertainties about transporting ULSD that cannot be resolved without hands-on experience with this unique product.

5. Short-Term Impacts on ULSD Supply

Background

This chapter addresses the transition to ultra-low sulfur diesel fuel (ULSD) when the ULSD Rule takes effect in 2006. Whether there will be adequate supply was one of the key questions raised by the House Committee on Science in its request for analysis. The Charles Rivers Associates/Baker and O'Brien (CRA/BOB) study done for the American Petroleum Institute (API) estimated a shortfall of 320,000 barrels per day when the regulation is introduced in 2006. The issue of future supply of highway diesel fuel "received considerable attention during the comment period" on the Notice of Proposed Rulemaking (NPRM) published by the U.S. Environmental Protection Agency (EPA).[96] The EPA noted that "numerous commenters to the proposed rule indicated that they believed that the 15 ppm sulfur cap would cause shortages in highway diesel fuel supply" but that "a number of commenters also thought otherwise (i.e., that future supplies would be adequate)."[97]

While it is possible that some refiners may decide to shut down altogether because of this regulation, others might just abandon the highway diesel market. Few refineries can operate without producing gasoline because gasoline is a high-margin, high-volume product that provides significant revenue to refiners. On the other hand, it may be possible for some refineries to operate without producing ULSD. Some refineries could sell higher sulfur distillate products into the non-road, rail, ship, or heating oil markets. Some refiners could also decide to export distillate products if they are in the right location.

Because there are other markets for distillate products, some refiners may opt to delay upgrading their facilities to produce ULSD. Refiners' recent experiences with investing to meet new fuel standards have not been encouraging. As the EPA pointed out in the Regulatory Impact Analysis for this regulation, both the 500 ppm diesel fuel and reformulated gasoline standards resulted in overinvestment and oversupply of the fuels, and "of late, relatively poor refining margins have not allowed refiners to recoup the full cost of environmental standards."[98] Overly aggressive expansion to produce ULSD could result in similar oversupply of product and reduced margins, and some refiners may therefore wait to see whether adequate margins develop.

Another uncertainty is possible regulation of non-road diesel fuel. In addition, some States are proposing their own regulations for highway diesel fuel, which may add to the EPA requirements. Some refiners may wait to see whether additional requirements are established for highway or non-road diesel before investing to upgrade their refineries to produce ULSD.

The EPA has taken steps to monitor the ULSD supply situation. Its Final Rulemaking requires refiners and importers to submit a variety of information to ensure a smooth transition, and to evaluate compliance once the program begins. Refiners and importers expecting to produce highway diesel in 2006 are required to register with the EPA by December 31, 2001. Annual precompliance reports are required from 2003 through 2005, containing estimates of ULSD and 500 ppm sulfur fuel that will be produced at each refinery and projections of the numbers of credits that will be generated or needed by each refinery. A time line for compliance is also required, as well as other information.

The EPA will produce an annual report summarizing information from the precompliance reports without disclosing individual company plans. This information will give refiners a better indication of the potential market for credits and the availability of credits in each region. The EPA will also require annual reports after the program takes effect, in order to monitor production of ULSD and 500 ppm sulfur diesel fuel.[99] In addition, an independent advisory panel will be set up to look at issues of diesel supplies and related technologies, and to report to the EPA annually on the progress being made by industry to comply with the ULSD Rule.[100]

[96] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, p. IV-33.

[97] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, p. IV-33.

[98] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter IV, p. IV-34.

[99] U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements: Final Rule," Pre-publication Final Rulemaking (December 21, 2000), pp. 158-160

[100] *Diesel Fuel News* (March 5, 2001), p. 3.

investment, which is estimated to be equivalent to the 7-percent before-tax return on investment assumed in the EPA's analysis.

The cases in Table 6 were designed to represent the types of individual refinery situations that lie behind the cost curve results. Cases A and B represent refiners producing highway diesel fuel as a high fraction of their distillate pool. These refineries run a higher sulfur crude oil, do not have hydrocracking facilities, and have relatively large-scale highway diesel production. Thirty-two percent of the highway diesel they produce comes from cracked stock, which is about the average for Petroleum Administration for Defense District II (PADD II) (see Appendix D, Table D1). The cost of producing highway diesel at current production levels in the refineries of Cases A and B is 6.0 cents per gallon if a new hydrotreater is required and 5.0 cents per gallon if the current hydrotreater can be revamped. The cost of the incremental hydrogen to produce ULSD represents 28 percent of the added cost for Case A and 35 percent for Case B.

Cases C and D have the same volumes as A and B but use a lower sulfur crude oil. The cost of the added hydrogen is similar to the result for Cases A and B, because this analysis is estimating the cost to produce ULSD with 7 ppm sulfur rather than the current 500 ppm. Total costs, however, are just 0.1 cents per gallon lower for a revamped unit (Case D compared to Case B) and 0.6 cents per gallon lower for a new unit (Case C compared to Case A).

Case E shows a refinery producing ULSD only from straight-run distillate derived from a high-sulfur crude. The cost of production from a hydrotreater that has been revamped is only 2.7 cents per gallon. This is slightly more than half the cost of Case B, which has to handle 32 percent cracked stocks.

Cases G and H represent the same mix of hydrotreater feed as in Cases A and B, but the total feedstock volume is only 10,000 barrels per day, compared to 50,000 barrels per day in Cases A and B. This is the type of situation represented by comparing ULSD production in PADD IV with that in PADD II and PADD III. For a new hydrotreater unit, the ULSD cost would be 8.3 cents per gallon (2.3 cents per gallon higher than in Case A). If the unit can be revamped, the cost is 6.1 cents per gallon (1.1 cents per gallon higher than in Case B).

Some refineries currently produce high volumes of distillate product but no highway diesel. These refineries might consider entering the highway diesel market when the ULSD Rule takes effect if they anticipate that the price differential between ULSD and their other distillate products can more than offset the added investment and operating costs they would incur. Case I illustrates a non-road diesel producer converting to the production of highway diesel. The refinery runs a moderately high-sulfur crude oil and has substantial volumes of cracked distillates from the fluid catalytic cracker (FCC) and coker units. Because of quality requirements for non-road diesel products, cracked stocks still make up 45 percent of the feed to the hydrotreater for highway diesel production. The large percent of cracked stocks means a moderately high per-barrel investment and operating cost for the hydrotreater. Additionally, the per-barrel cost for hydrogen is quite high. Most of the refineries with high-volume distillate production and no highway diesel production had costs of highway diesel production in the higher portion of the cost range.

Cases J, K, and L provide an illustration of refineries achieving improved economics by reducing the volume of ULSD diesel below current highway production levels. As shown in Table 6, the cost of added hydrogen is generally a large component of the cost of producing ULSD. The cost for hydrogen grows as the fraction of cracked stocks increases, eventually requiring the construction of new hydrogen production capacity. However, if there is only a modest percent of cracked stock in the hydrotreater feed and the refiner reduces the input to the hydrotreater, then the incremental hydrogen requirement for ULSD production can be provided by existing refinery production sources.

Cases J and K show the costs for a new and revamped hydrotreater for a refinery running a medium-sulfur crude and with 22 percent cracked stock in the highway diesel production pool. Case L shows that if the input level is reduced from 32,400 barrels per day to 20,700 barrels per day when the unit is revamped, then the cost of ULSD production is reduced from 4.5 cents per gallon to 3.1 cents per gallon. Given the costs for Cases K and L, the preferred option for the refiner would be Case K if the price differential between highway and non-road diesel exceeds 6.9 cents per gallon and Case L if the differential is less than 6.9 cents per gallon.[101]

These sample cases highlight several situations that can cause refineries to have potentially high ULSD production costs and discourage them from investing to produce ULSD. Small refineries with less than 10,000 barrels per day of highway diesel production will have very high relative costs unless they can revamp an existing unit. The fraction of cracked stocks in the ULSD hydrotreater feed is extremely important. The need for hydrogen increases with the fraction of cracked stocks and may require new hydrogen production capability. If a refinery's other distillate products are primarily

[101] Calculated by taking the difference in total cost (1.88 x 32.4 – 1.31 x 20.7) divided by the change in volume (32.4 – 20.7), expressed in cents per gallon.

Table 7. Estimate of Revamps and New Hydrotreaters for ULSD Production

Region	Number of Refineries			Percent Revamp	ULSD Production Volume (Thousand Barrels per Day)			Percent Revamp
	Revamp	New	Total		Revamp	New	Total	
PADD I	4	7	11	36	139	77	216	64
PADD II	14	13	27	52	442	158	599	74
PADD III	22	23	45	49	603	423	1,026	59
PADD IV	5	10	15	33	46	72	117	39
Total	45	53	98	46	1,229	729	1,957	63

PADD = Petroleum Administration for Defense District.

Note: Although 98 refineries are considered in this analysis, 87 are current producers of low-sulfur diesel. Not all of these refineries are expected to produce ULSD economically.

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

lowest proportion of revamps because of the larger amount of cracked stocks that refineries in that region must process. PADD II has the highest percentage of revamps because of the extensive upgrading that took place in the early 1990s and the moderate levels of cracked stocks in the feed. The EPA assumed that 80 percent of ULSD production capacity would be revamped units.

Supply Scenarios

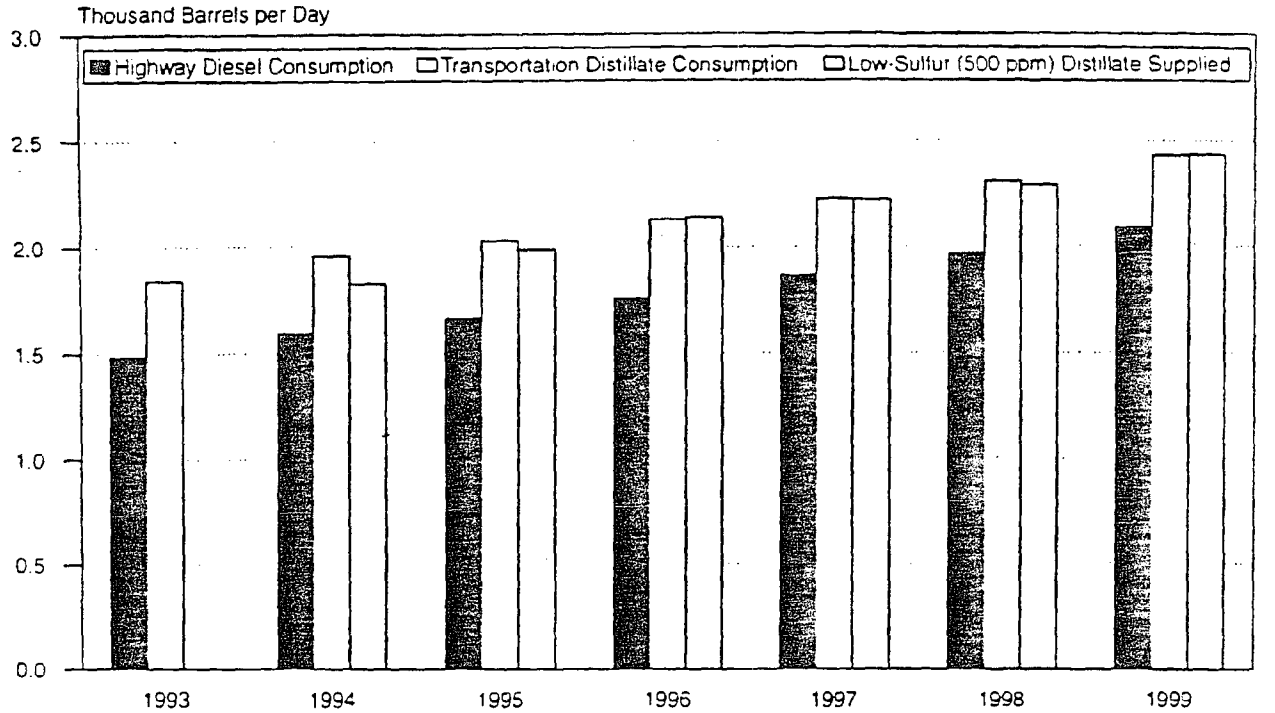
The first of the four supply scenarios was developed based on the rationale that there is a high probability that refiners will produce at least a moderate level of ULSD. In the other three scenarios there is decreasing probability that the additional volumes would be produced. The description of the specific scenarios follows:

- Scenario 1—**Competitive Investment.** The first scenario includes only those refiners who are likely to prepare to produce ULSD in 2006. They currently hold market share and are estimated to be able to produce ULSD at a competitive cost. Refiners with highway diesel as a relatively low fraction of their distillate production are assumed to abandon the market unless their cost per unit of production is competitive at current highway diesel production levels. Some refiners are assumed to reduce highway diesel production below current levels when they have a more competitive ULSD production at a reduced production rate.
- Scenario 2—**Cautious Expansion by Competitive Producers.** In this scenario, refiners base ULSD production decisions on the assumption that the price differential between ULSD and non-road distillate products will remain wide. Current producers with competitive cost structures for ULSD production and high fractions of highway diesel production (greater than 70 percent of total distillate production) are assumed to maintain current production levels and may even push production of ULSD toward 100 percent of distillate production if only minor increases in per unit production costs occur at increased volume. Other refiners are also assumed to increase their fraction of highway production if the economics are only slightly poorer at higher volumes. Those whose current production is focused primarily on non-road markets are assumed to stay with those markets.
- Scenario 3—**Moderate New Market Entry.** While refineries that are currently producing little or no highway diesel may be hesitant to jump into the ULSD market, this scenario assumes that a select few will decide to take the risk. This is based on the belief that a limited number of refineries think they can gain market share without depressing the price differential between ULSD and non-road diesel to the extent of ruining margins and return on investment. These refiners are assumed to have favorable cost structures for ULSD production (probably in the lower third).
- Scenario 4—**Assertive Investment.** The fourth scenario assumes that a larger number of refiners will compete to increase their shares of the ULSD market. In this scenario, refiners believe that most of their competitors are overly cautious, and that they can succeed by taking a contrary strategy (which in reality is adopted by far more refiners than anticipated).

Imports

Historically, imports have been a small part of low-sulfur diesel supply. The only significant volumes of low-sulfur diesel fuel have been imported into PADD I, which totaled 123,000 barrels per day in 1999 then declined slightly in 2000 to 106,000 barrels per day (Figure 4). Imports made up 5 percent of low-sulfur diesel product supplied for the United States as a whole in 2000 and 14 percent of product supplied in PADD I. The PADD I imports come from three main sources—Canada, the Virgin Islands, and Venezuela. Low-sulfur diesel imports from the Virgin Islands reached 62,000 barrels per day in 1996 and have fallen to 47,000 barrels per day in 2000. Imports from Canada, which have been fairly constant for the past few years, totaled 35,000 barrels per day in 2000. Imports from Venezuela grew sharply in 1998 and 1999, to 22,000 barrels per day in 1999, before falling to 8,000 barrels per day in 2000.

Figure 5. Low-Sulfur Diesel Consumption and Product Supplied, 1993-1999



Sources: Energy Information Administration, *Petroleum Supply Annual*, DOE/EIA-0340, and *Fuel Oil and Kerosene Sales*, DOE/EIA-0525 (Washington, DC, 1993-1999).

diesel fuel currently being consumed in the market is more than 15 percent higher than that required for highway vehicles. There are several reasons for this. The logistics of the distribution system dictate in some areas that only one type of fuel can be distributed. Because the price differential between low-sulfur diesel and other distillate products has been only 2 to 3 cents per gallon or less in recent years, the incentive to maintain separate product infrastructure has not been great. An important question is the extent to which the demand for ULSD will remain above that required for highway vehicles after the ULSD regulation takes effect in 2006. A larger price differential between ULSD and higher sulfur distillate products may provide some incentive to avoid consuming ULSD in markets where it is not required, but in some areas it may continue to be impractical to distribute more than one product.

It is also unclear how much 500 ppm sulfur diesel fuel will be in the market after the regulation takes effect. Refiners will be investing for the long term and not just to produce 80 percent ULSD in the transition period, and many refiners (if they invest to produce ULSD at all) may be producing 100 percent ULSD in the transition period. Some refiners could continue to supply 500 ppm diesel fuel by purchasing credits, and some small refiners could continue to produce 500 ppm sulfur fuel until 2010 (see box on page 45).

For the above reasons, the amount of ULSD actually needed to balance demand in 2006 is highly uncertain. A range of demand estimates has been developed to account for some of the uncertainty. In the mid-term analysis for this study, transportation distillate demand in PADDs I-IV[106] in the 2/3 Revamp case (see Chapter 6) amounts to about 2.7 million barrels per day. At the U.S. level, transportation distillate demand is projected to be 3.0 million barrels per day in 2006, increasing by 3.2 percent per year from the 1999 level of 2.4 million barrels per day. This compares to an average rate of increase of 3.5 percent per year from 1982 to 1999. Transportation distillate demand rose sharply from 1982 to 1989 and again from 1991 to 1999, at annual average growth rates of 4.7 and 4.0 percent, respectively, but fell in 1990 and 1991, at the time of the Iraqi invasion of Kuwait.

The probable downgrading of some ULSD to 500 ppm sulfur diesel in the distribution system was not taken into account in this part of the analysis. The requirement to produce 80 percent ULSD is at the refinery gate, and

[106] PADD V was not included in this analysis because supply concerns are less of an issue in the transition period and the requirement for CARB diesel makes the PADD V market different from PADDs I-IV.

have much higher costs and could have concerns that margins in the marketplace would not be high enough to provide a satisfactory rate of return.

The cost curves in Figure 6 were developed using capital cost and return on investment assumptions consistent with those used in the EPA's analysis. Those assumptions were used in order to provide a comparison with the EPA's analysis results and should not be viewed as the assumptions that EIA considers the most likely. However, concerns about the adequacy of ULSD supply are based on the possible reluctance of higher cost producers to invest to produce ULSD in 2006. Because of the uncertainty of these assumptions, two additional sets of supply scenarios are provided, using higher capital cost assumptions and a higher required return on investment, as discussed later in this chapter.

Total ULSD production on the Scenario 1 (Competitive Investment) and Scenario 2 (Cautious Expansion) cost curves extends beyond the lower demand estimates (C and D) and would meet the highway demand estimates even if no ULSD imports were available. In Scenario 3 (Moderate New Market Entry), production just reaches the mid-term analysis demand estimate that includes imports (Demand B). In Scenario 4 (Assertive Investment), ULSD production surpasses the mid-term analysis demand estimate that does not include imports. None of the supply curves, however, provides enough supply to reach the demand estimate that does not include the temporary compliance option (see Table 8 below). Some refiners may be able to produce ULSD with a cost of about 2.5 cents per gallon; however, at the volumes needed to meet demand, costs are estimated at 5.4 to 6.8 cents per gallon.[109] ULSD prices could show an even higher differential if supply falls short of demand.

The four factors that have the strongest influence on the cost of producing ULSD are the production volume of 500 ppm diesel, the fraction of cracked stocks in the feedstock, the scale of the hydrotreater unit, and whether a new or revamped unit is required.

500 ppm Diesel Supply Issues in 2006

In 2006, 500 ppm highway diesel could come from two sources: either from refiners who produce both 500 ppm and 15 ppm highway diesel or from refiners who are now producing highway diesel but who choose not to make investments to produce ULSD and purchase credits to sell 500 ppm diesel. Few refineries are assumed to fall into the first group. Possible candidates would be refiners with large current production of highway diesel who have multiple distillate hydrotreating units and decide to revamp or replace a large unit to produce ULSD and maintain a second unit to produce 500 ppm highway diesel. This would also mean that the refiner would anticipate selling the 500 ppm diesel as non-road diesel in 2011, because building one large hydrotreater in 2006 would be more economical than building a second hydrotreater for ULSD in 2010. If the decision is made to invest to produce ULSD, a refiner is likely to invest to produce the full volume of highway diesel as ULSD. Some product that fails to meet the ULSD specifications could be downgraded to 500 ppm diesel fuel and sold as highway diesel during the transition period, but few refiners are assumed to produce both 15 ppm and 500 ppm diesel.

Production of 500 ppm highway diesel can clearly come from refiners who are now producing low-sulfur highway diesel and decide not to convert their refinery facilities in 2006. In Scenario 2, the number of non-producers of ULSD in PADDs I-IV totals 21. The characteristics of the 21 refineries that are the potential sources of 500 ppm highway diesel production in 2006 in Scenario 2 differ across the various PADDs. PADD I has 5 refineries and PADD II has 5 refineries that are assumed not to invest to produce ULSD. Nine of these ten refineries currently produce less than 10,000 barrels per day of highway diesel, and the other is under 20,000 barrels per day.

The profile of the PADD III refiners is quite different from those in the other PADDs. While PADD III has some small refineries in this group, several moderately large refineries are also included, which accounts for the fact that PADD III represents 56 percent of the total volume of PADD I-IV production that is estimated not to convert from low-sulfur diesel to ULSD in 2006. Most of these refineries are on the high end of the cost range and would have to build new units and/or deal with relatively high fractions of cracked stocks to produce ULSD.

Six refineries in PADD IV are estimated to have relatively high costs of ULSD production and are assumed not to invest to produce ULSD. The PADD IV refiners are relatively small. Most have some cracked stocks in the highway diesel feed stream and would need to build new units. The refiners not producing ULSD would need to obtain waivers or purchase credits to continue to sell 500 ppm diesel fuel into the highway market.

[109] These are marginal costs on the industry supply curve, based on average refinery costs for producing ULSD. These cost estimates do not include additional costs for distribution, estimated at 1.1 cents per gallon in the mid-term analysis. Costs were not adjusted to take sulfur credit trading into account, because of the uncertainty about whether trading would occur and the value of the credits. If credit trading occurred, costs could be reduced.

higher. Second, five of the refineries entering the market were viewed in Scenario 3 as having too high a cost. The third and largest portion of additional volume comes from two refineries that currently are not producers of highway diesel. All of the additional volume in Scenario 4 comes from refiners with costs of ULSD production higher than 5 cents per gallon.

Table 8 shows the differences between the demand and supply estimates. The largest shortfall, which occurs between Scenario 1 (assuming the most cautious investment strategy) and the highest demand estimate, is estimated at 770,000 barrels per day. The widest surplus, 517,000 barrels per day, is under Scenario 4 (the most aggressive investment strategy) and the lowest demand estimate that also accounts for import availability. Assuming the mid-term analysis demand estimate, which is similar to the *AEO2001* projection, Scenarios 3 and 4 project sufficient supply.

Some analysts contend that demand could exceed the estimates in this analysis that assume the temporary compliance option of 80 percent ULSD production. Most refiners that invest to produce ULSD will plan to produce 100 percent ULSD unless they have a market for the higher sulfur product after 2010. Those producing 100 percent ULSD will generate credits which can then be sold to those who decide to delay investing to produce ULSD. Credit trading programs have been successful in the utility industry, but how well credit trading will work in a less-regulated industry remains unclear. Refiners may be less than enthusiastic about selling credits to their competitors that would allow them to sell product produced at a lower cost in the same market as ULSD, possibly at a price similar to the price of ULSD.[111] Refiners who wait to invest can also take advantage of improvements in technology that could help them compete more effectively with those who invested early. Credits could increase sharply in value if markets were tight, but they would have less value if supplies were ample.

To provide a further range of demand estimates, Tables 9 and 10 show the projections for high and low macroeconomic growth cases along with the supply estimates from the cost curves. Transportation distillate demand is projected to increase by 4.0 percent per year from 1999 to 2006 in the high macroeconomic growth case and by 2.7 percent per year in the low macroeconomic growth case.

Table 9. Supply and Demand Estimates in the High Economic Growth Case, 2006
(Thousand Barrels per Day)

	Demand	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total Supply		1,763	1,823	1,952	2,143
Number of Refineries Producing ULSD		66	66	67	74
Differences Between Supply and Demand					
Small Refiner Option	2,669	-906	-845	-716	-525
Small Refiner and Temporary Compliance Options	2,135	-372	-311	-183	8
Small Refiner and Temporary Compliance Options with Imports	2,055	-292	-231	-103	88
Highway Use Only, Small Refiner and Temporary Compliance Options with Imports	1,756	7	68	196	387
Highway Use Only, Small Refiner and Temporary Compliance Options with Higher Imports	1,720	43	104	232	423

Sources: Cost curve scenarios: Appendix D. Demand estimates: National Energy Modeling Sytem, run HM2001.D101600A.

Table 10. Supply and Demand Estimates in the Low Economic Growth Case, 2006
(Thousand Barrels per Day)

	Demand	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total Supply		1,763	1,823	1,952	2,143
Number of Refineries Producing ULSD		66	66	67	74
Differences Between Supply and Demand					
Small Refiner Option	2,447	-685	-624	-495	-304
Small Refiner and Temporary Compliance Options	1,958	-195	-134	-6	186
Small Refiner and Temporary Compliance Options with Imports	1,878	-115	-54	74	266
Highway Use Only, Small Refiner and Temporary Compliance Options with Imports	1,604	159	220	349	540
Highway Use Only, Small Refiner and Temporary Compliance Options with Higher Imports	1,568	195	256	385	576

Sources: Cost curve scenarios: Appendix D. Demand estimates: National Energy Modeling Sytem, run LM2001.D101600A.

[111] Many analysts contend that the prices of ULSD and 500 ppm diesel will converge in the phase-in period, because most trucks can use 500 ppm fuel but only 20 to 25 percent of production will be 500 ppm fuel. The higher demand than supply will tend to push the price to the same level as ULSD. The need to purchase credits to sell 500 ppm product will also tend to push up its price.

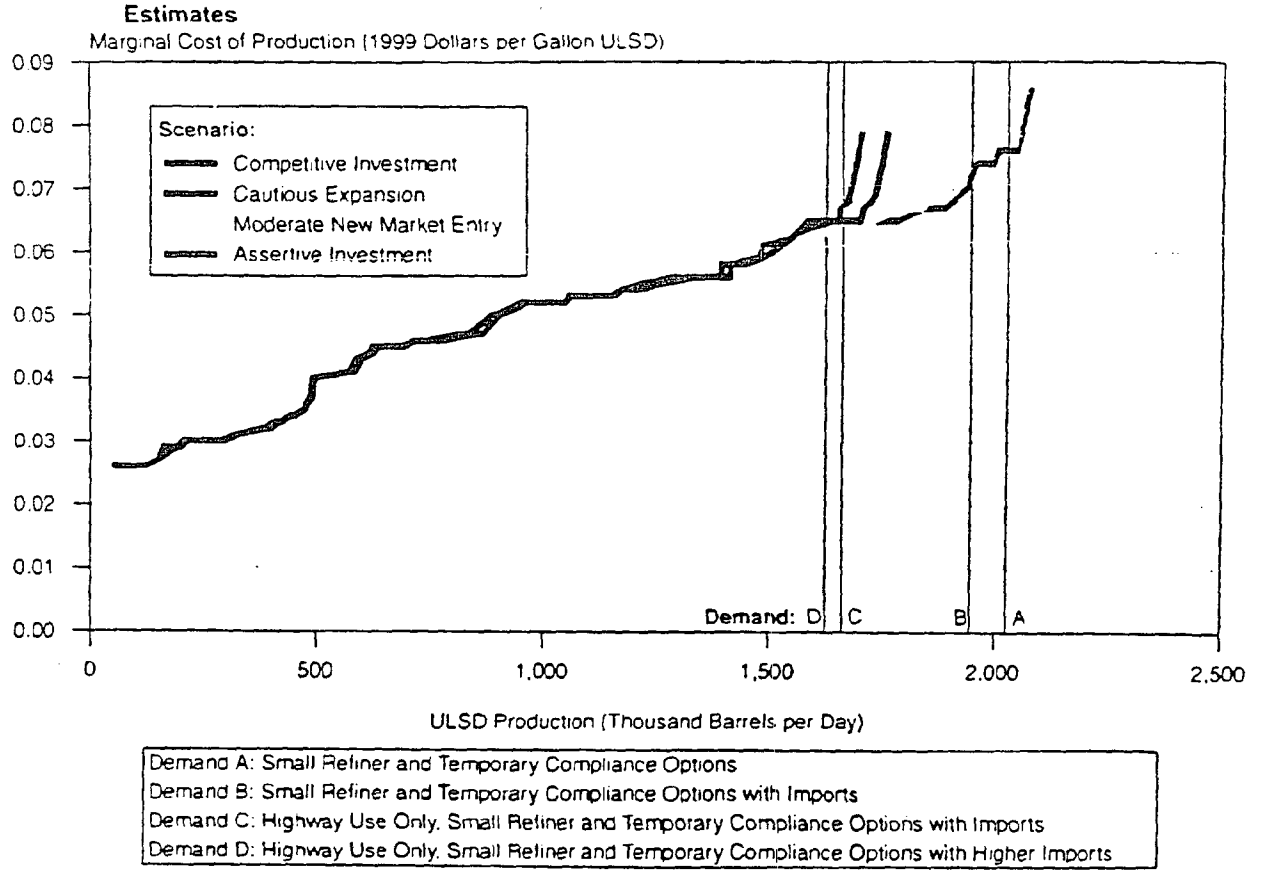
this analysis, and/or if more imports were available. On the demand side, slower growth in the highway diesel market than these demand estimates and/or curtailing of ULSD consumption for non-road uses would also improve the situation.

If supplies fall short of demand, sharp price increases could occur to balance supply and demand. That type of situation could result in a number of responses, some of which could begin to occur as soon as the price differential between ULSD and other products started to widen—possibly even before it became clear that a market supply problem existed. Refiners would attempt to maximize ULSD production. Some additional production may be possible by, for example, shifting some non-road distillate or jet fuel streams into ULSD. This would be limited, however, because only the lower sulfur streams could be used and additional hydrotreating may be necessary. Imports of jet fuel or other products could then replace the lost production of those fuels. Additional imports of ULSD could be forthcoming if there were large price differentials between markets. Such responses would require higher costs, however, because lower cost options would be exercised first.

Sharply higher prices would also curtail demand for diesel fuel. Truckers would reduce consumption to the extent possible and try to pass higher fuel costs to customers, who would then look for alternative means to transport goods.

In 2006, the quantity of fuel actually needed for vehicles requiring ULSD will be much less than the required 80 percent of diesel production. If it becomes apparent that the supply is inadequate, or that markets are becoming tight, additional low-sulfur diesel supplies could become available if the required proportion of ULSD production were reduced. Allowing more 500 ppm diesel into the highway market could alleviate some of the stress on the market. If the requirement were 70 percent instead of 80 percent, for example, the demand estimates shown in Table 8 would be reduced by 217,000 to 253,000 barrels per day, enough to eliminate the shortfalls indicated except for Demand A in Scenario 1 and the highest

Figure 8. ULSD 10% Return on Investment Sensitivity Case Cost Curve Scenarios with 2006 Demand Estimates



Sources: Cost curve scenarios: Appendix D. Demand estimates: National Energy Modeling Sytem, run DSU7INV.D043001A.

6. Mid-Term Analysis of ULSD Regulations

Assumptions

The National Energy Modeling System (NEMS) was used to perform petroleum market analysis of the impact of new requirements for ultra-low-sulfur diesel fuel (ULSD) from 2007 through 2015. The Petroleum Market Module (PMM) of NEMS were modified to produce a ULSD Regulation case. Analysis of the Regulation case focuses on changes relative to a reference case using the oil price and macroeconomic assumptions of the *Annual Energy Outlook 2001* (*AEO2001*) reference case but including some adjustments to provide a more accurate reflection of the diesel fuel market. The differences between the reference case for this study and the *AEO2001* reference case are discussed in Appendix B.

The projected investment costs and average marginal prices resulting from the NEMS analysis represent the investment and price levels necessary to meet all demand requirements under the new ULSD Rule. As discussed in Chapter 5, some refiners may choose to drop out of the highway diesel market or even close down instead of investing for compliance with the Rule. ULSD supply could be inadequate in the short term if enough refineries chose to forgo investment. The NEMS analysis does not capture this uncertainty of supply, because NEMS is a long-run equilibrium model. By definition, the NEMS analysis projects the level of domestic production and imports necessary to meet all demand requirements. As a result, the NEMS analysis reflects more aggressive investment behavior than that portrayed for individual refiners in the short-term analysis.

The NEMS analysis reflects the "80/20" rule, which requires the production of 80 percent ULSD and 20 percent 500 ppm highway diesel between June 2006 and June 2010, and a 100 percent requirement for ULSD after June 2010. Because each model region acts as a single unit, the provision of the ULSD Rule allowing small refiners, which account for about 5 percent of current highway diesel production, to delay investment until June 2010 is not modeled explicitly. However, the production requirements are adjusted downward by 4 percent to reflect an assumption that most small refiners will choose to delay investment.[113]

The requirement for 80 percent ULSD is not phased in and begins on June 1, 2006. Therefore, the full market impact of the requirement can be expected to occur at that time. Because NEMS is an annual average model, the full economic impact of the 80/20 rule cannot be seen until 2007. In the same manner, projections for 2011 represent the first full year of 100 percent ULSD compliance. The results for 2010 reflect a partial year at the 80 percent requirement and a partial year at the 100 percent requirement. For the purpose of assessing the market impacts of the new ULSD requirements, 2007 will be discussed as the first full year of the 80/20 requirement, and 2011 will be discussed as the 100 percent requirement.

The House Committee on Science requested that, if practical, the EIA analysis use the same assumptions as those used by the U.S. Environmental Protection Agency (EPA) in its Regulatory Impact Analysis (RIA). The assumptions are compared in Table 13. The Regulation case for this study is based on the following assumptions:

- Highway diesel at the refinery gate will contain a maximum of 7 parts per million (ppm) sulfur. Although sulfur content is limited to 15 ppm at the pump, there is a general consensus that refineries will need to produce diesel somewhat below 10 ppm in order to allow for contamination during the distribution process. The EPA assumed in its RIA that refineries would produce highway diesel at 7 ppm.
- The capital costs for the distillate hydrotreaters reflected in NEMS are $1,331 per barrel per day for a notional 25,000 barrel per day unit that processes low-sulfur feed streams with incidental dearomatization, and $1,849 per barrel per day for a second, 10,000 barrel per day unit that processes higher sulfur feed streams with greater aromatics improvement. A range of capital costs from a number of other studies is provided in Chapter 7. Because of differences in methodology, the sets of capital costs are not directly comparable. For instance, the EPA estimated the capital cost for a new distillate hydrotreater to range from $1,240 per barrel per day to $1,680 per barrel per day, but those estimates

[113] In its Regulatory Impact Analysis, the U.S. EnvironmentalProtection Agency included investment by small refineries in cost estimates for full compliance but not for the transition period. See U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000)

analysis, the revenue loss estimate is based on NEMS model results, at 0.3 cents per gallon of ULSD during the transition period and 0.2 cents per gallon after 2010.

- A cost of 0.2 cents per gallon is assumed for the addition of lubricity additives, consistent with estimates by the EPA and with industry analyses. Lubricity additives are needed to compensate for the reduction of aromatics and high-molecular-weight hydrocarbons stripped away by the severe hydrotreating used in the desulfurization process.
- The energy content of ULSD is assumed to decline by 0.5 percent, because undercutting and severe desulfurization will result in a lighter stream composition than that for 500 ppm diesel. The EPA's analysis made no explicit adjustment to the energy content of diesel fuel but estimated a cost associated with a 1.3-percent (by weight) loss of yield. In the NEMS analysis, the yield loss is a variable model result (generally around 1.5 percent by volume). The National Petrochemical and Refining Association (NPRA) quoted a range of 1 to 4 percent energy loss in comments to the rulemaking docket. NPRA also estimated a yield loss of 1 to 5 percent.
- In accordance with the EPA's RIA, changes to engine after-treatment devices are assumed to result in no loss of fuel efficiency. Discussions with some engine and emission control technology manufacturers indicated considerable uncertainty about this assumption.
- No change in the sulfur level of non-road diesel is assumed. The EPA analysis of ULSD reflects no change in non-road standards, although the EPA is in the process of promulgating "Tier 3" non-road engine emission limits around 2005 or 2006, which are expected to be linked to sulfur reduction for non-road diesel fuel.[115] The level of sulfur reduction required for Tier 3 vehicles is highly uncertain because of the diversity of the non-road market.
- No changes to other highway diesel specifications, such as aromatics or cetane, are assumed. Some refiners anticipate changes to these parameters in the future because of their relationship to emissions of particulate matter (PM). The State of California already limits aromatics to 10 percent by volume, which is reflected in this analysis. Proposals for similar requirements in other States are not included.
- Imports of diesel meeting the new ULSD standard are assumed to be available to U.S. markets, but the level of imports relative to the level of product supplied by refineries in the United States is a model result. Refineries in Canada, Northern Europe, and the Caribbean Basin (including Venezuela) are assumed to make upgrades to produce diesel fuel meeting the 15 ppm sulfur cap for 2006. Canada is moving forward with plans to harmonize with diesel regulations in the United States. European refiners will reduce diesel sulfur to 50 ppm for a new European standard in 2005. Some isolated European production of diesel meeting the ULSD standard is assumed, due to tax incentives for 10 ppm diesel in some markets.[116] In order to divert ULSD from European markets, prices in the United States would have to exceed the tax incentives plus shipping costs. In 2000 less than 5 percent of U.S. imports of highway diesel came from Europe.
- In accordance with the EPA's RIA, the before-tax rate of return on investment is assumed to be 7 percent. Between 1977 and 1999 the combined before-tax return on investment for refiners and marketers averaged 7 percent, which is equivalent to a 5.2-percent after-tax rate.[117] Because NEMS operates on an after-tax basis, the 5.2-percent rate is used in the model. Most of the studies compared in Chapter 7 assumed a 10-percent after-tax return on investment.

The Committee indicated that this analysis was to be as consistent as possible with the assumptions underlying the EPA's RIA, and that sensitivity analysis should be provided for assumptions that diverge significantly from those in other studies or from expectations of industry experts.[118] In addition to the Regulation case, this report provides sensitivity analyses for five assumptions associated with a greater uncertainty, for a Severe case that combines the assumptions of the five individual sensitivities, for a No Imports case, and for a 10% Return on Investment case:

- In the Higher Capital Cost case, the capital cost of the first notional hydrotreater is 24 percent higher than in the Regulation case, and the capital cost of the second notional unit is 33 percent higher.[119]
- In the 2/3 Revamp case, two-thirds of upgrades at refineries are assumed to be accomplished by retrofitting existing equipment and one-third by construction of new units. With the exception of the

[115] U.S. Environmental Protection Agency, *Reducing Air Pollution from Non-road Engines*, EPA420-F-00-048 (Washington, DC, November 2000), p. 3.

[116] Germany and the United Kingdom have proposed tax incentives for sales of 10 ppm diesel.

[117] Based on financial information from Form EIA-28 (Financial Reporting System).

[118] EIA did not assess the validity of these asumptions.

[119] The capital costs used in this case are based on recent work by EnSys, with revisions based on correspondence with Mr. Martin Tallett, April 23, 2001.

system. In other words, the additional downgrades must be offset by more ULSD production after 2010. The effect of downgrades is more pronounced in the 10% Downgrade case and the Severe case, where highway diesel demand is projected to increase by 2.9 percent and 3.1 percent per year, respectively, from 1999 to 2015.

Regulation Case

In the Regulation case, cumulative investment in distillate hydrotreating and hydrogen units is projected to be $4.2 billion higher than projected in the reference case in 2007 and $6.3 billion higher in 2011, when upgrades for meeting full compliance with the ULSD Rule will be complete (Table 14). In the early part of the transition period, upgrades for making ULSD may be constrained by specialized workforce and manufacturing limitations and access to capital, all of which will be in competition with projects for meeting the requirements for low-sulfur gasoline (see Chapter 3). The projected $2.1 billion in investment between 2007 and 2011 reflects expenditures for meeting expectations of growing demand for highway diesel, in addition to full compliance with the Rule. After 2011, incremental upgrades to meet future distillate demand are projected to continue, resulting in another $0.5 billion of investment in desulfurization equipment by 2015.

The Regulation case results in an increase in the marginal annual pump price for ULSD of 6.5 to 7.2 cents per gallon between 2007 and 2011 (Table 15). The peak differential is projected to occur in 2011, when all refiners must produce 100 percent ULSD. The projected differential declines after 2011, reaching 5.1 cents per gallon in 2015. About 0.7 cents of this decline is the result of no longer needing to include EPA's estimate of additional capital investments for distribution and storage of a second highway diesel fuel during the transition period. A drop in capital expenses for distribution systems occurs after 2010 as a reflection of the EPA's assumption that these investments will be fully amortized during the transition period. The remainder of the drop in the post-2011 differential occurs because refineries are expected to have completed the upgrades necessary for full compliance, and to be making incremental improvements that will make ULSD production less challenging. A similar decline in the price differential also occurs in all the sensitivity cases.

Through 2010, the Regulation case projections for highway diesel consumption exceed the reference case levels by up to 10,000 barrels per day, which can be attributed to the assumption of 0.5 percent loss in energy content. In 2011, the differential in consumption increases to 83,000 barrels per day, due mostly to the downgrade of 2.2 percent of ULSD to lower value non-road markets.

In a refinery, the impact of a change in the makeup or production level of a product can filter through to other products, because it changes the mix of total refinery production. The ULSD Rule is projected to result in slightly lower yields of higher sulfur distillate used for non-road and heating purposes, because its production is replaced by ULSD that is produced by refineries but is downgraded to higher sulfur products in the distribution system. The availability of the downgraded ULSD reduces the projected prices for high-sulfur distillate by about 1 cent per gallon relative to the reference case. The analysis revealed no clear trends for other distillate products as a result of the ULSD Rule.

Table 14. Variation from Reference Case Projections of Cumulative Capital Expenditures for Hydrogen and Distillate Hydrotreating Units in EIA Sensitivity Cases, 2007, 2010, and 2015
(Billion 1999 Dollars)

Analysis Case	2007	2010	2015
Regulation	4.2	6.3	6.8
Higher Capital Cost	5.4	7.8	8.8
2/3 Revamp	4.6	6.9	7.6
10% Downgrade	4.2	6.7	7.3
4% Efficiency Loss	4.2	6.3	6.9
1.8% Energy Loss	4.2	6.3	6.9
Severe	5.9	9.3	10.5
No Imports	4.4	6.5	7.0

Source: National Energy Modeling System, runs DSUREF.D043001B, DSU7PPM.D043001A, DSU7HC.D043001A, DSU7INV.D043001A, DSU7DG10.D043001A, DSU7TRN.D043001A, DSU7BTU.D043001A, DSU7ALL.D050101A, and DSU7IMP0.D043001A.

Higher Capital Cost Case

Because of limited experience in producing diesel containing less than 10 ppm sulfur, the capital costs for hydrotreaters able to mass produce ULSD are uncertain. The Higher Capital Cost case results in refinery investment for hydrogen and distillate hydrotreating units totaling $5.4 billion in 2007, which is $1.2 billion above the Regulation case level. By 2011 the Higher Capital Cost case is projected to require $7.8 billion of investment, $1.5 billion more than in the Regulation case. The higher investment costs translate to a higher projected price path for ULSD. Relative to the reference case, price differentials are projected to range from 7.5 to 7.8 cents per gallon between 2007 to 2010, peaking at 8.1 cents per gallon in 2011, the first full year of full compliance. These prices are 0.8 cents per gallon higher on average than those in the Regulation case.

2/3 Revamp Case

The 2/3 Revamp case results in a higher projected price path for ULSD, with price differentials ranging from 6.9 to 7.6 cents per gallon higher than in the reference case from 2007 to 2011. Prices are generally higher than in the Regulation case, with the differential between the two cases at its widest in 2011 at 0.4 cents per gallon. The 2/3

4% Efficiency Loss Case

The 4% Efficiency Loss case reflects an expectation, by some engine and emission technology manufacturers, that emission requirements for new heavy-duty vehicles in 2010 will be met by installing after-treatment technology, which could result in a 4-percent loss of fuel efficiency. Technological improvements are assumed to fully offset the loss in fuel efficiency of new vehicles by 2015.[124] The combined impact of the ULSD requirement and less efficient new vehicles results in 19,000 barrels per day of additional highway diesel consumption in 2010 and 107,000 barrels per day in 2011 through 2015. The introduction of less fuel-efficient vehicles accounts for 11,000 barrels per day of the additional demand in 2010 and 24,000 barrels per day of demand after 2010. Refiners are projected to invest an additional $100 million dollars through 2015 relative to the Regulation case to provide for the slightly higher diesel demand.

The additional demand for highway diesel results in prices that are 5.7 cents per gallon above reference case prices on average between 2011 and 2015. This differential is 0.3 cents higher than when no fuel efficiency loss is assumed. Owners of vehicles purchased between 2010 and 2015 would see the greatest impact under this case, because diesel vehicles of that vintage would consume relatively more diesel fuel.

1.8% Energy Loss Case

Due to changes in refinery processing, ULSD is expected to have slightly less energy content than 500 ppm diesel. The 1.8% Energy Loss case reflects a greater loss of energy content than the Regulation case, which assumes a 0.5-percent loss per barrel. This case results in an average increase in ULSD consumption of 42,000 barrels per day between 2007 and 2010. Due to the 100 percent ULSD requirement, the impact of the lower energy content is greatest after 2010 when it widens to 128,000 barrels per day. Relative to the Regulation case, the 1.8% Energy Loss case results in an average of 33,000 barrels per day of additional demand through 2010 and 45,000 barrels per day after full compliance. This additional demand does not change refinery investment patterns relative to the Regulation case, because it can be provided through higher utilization rates.

The price differentials from the reference case average 7.0 cents per gallon between 2007 and 2010 and 5.5 cents per gallon between 2011 and 2015. In anticipation of higher demand, refineries are expected to build slightly more capacity in the transition period than they would in the Regulation case. Because of the slightly different investment pattern, prices in the 1.8% Energy Loss case are 0.2 cents per gallon higher than in the Regulation case on average through 2010 and comparable to Regulation case prices after 2010.

Severe Case

In the Severe case, the ULSD requirement in combination with the five sensitivity assumptions results in an average of 44,000 barrels per day of additional highway diesel consumption between 2007 and 2010 and an average of 366,000 barrels per day of additional demand between 2011 and 2015. The ULSD regulation by itself accounts for about 9,000 barrels per day of the additional consumption through 2010 and about 83,000 barrels per day after 2010. The combined effect of the five

Table 16. Variations from Reference Case Projections of Fuel Distribution Costs in the Regulation and 10% Downgrade Cases
(1999 Cents per Gallon)

Analysis Case and Cost Component	Average Annual Cost, June 2006 - June 2010	Average Annual Cost After June 1, 2010
Regulation		
Total	1.2[a]	0.4[a]
Capital Costs	0.7	0.0
Operating Costs	0.2	0.2
Downgrade Revenue Loss	0.3	0.2
10% Downgrade		
Total	1.6	0.9
Capital Costs	0.7	0.0
Operating Costs	0.2	0.2
Downgrade Revenue Loss	0.7	0.7

[a]The additional annual diesel fuel distribution costs in the Regulation case differ slightly from the EPA estimates (see Table 26 in Chapter 7), because different revenue losses associated with product downgrade are assumed.

Sources: **Capital Costs and Operating Costs:** U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, web site www.epa.gov/otaq/regs/hd2007/frm/ria-v.pdf. Operating Costs include operating, existing mix, transmix, and testing cost estimates. **Downgrade Revenue Loss:** Energy Information Administration, Office of Integrated Analysis and Forecasting, based on projected price differentials for ULSD versus 500 ppm diesel.

[124]This assumption is based on interviews with engine and technology manufacturers.

cents per gallon between 2007 and 2011. Because this analysis is based on results from a long-run equilibrium model, it does not capture the uncertainty of supply discussed in Chapter 5. The NEMS analysis reflects more aggressive investment than is portrayed for individual refiners in the short-term analysis. In the Regulation case, which uses many of the EPA's assumptions, prices are projected to increase by 6.5 to 7.2 cents per gallon between 2007 and 2011. The widest price differential—10.7 cents per gallon in 2011—is projected in the Severe case, which is based on assumptions more consistent with industry views. This peak price differential is associated with a requirement for additional ULSD supplies of 272,000 barrels per day above demand levels in the Regulation case, of which 206,000 barrels per day results from the 10-percent downgrade assumption.

Because NEMS is a long-run equilibrium model, it cannot address short-term supply issues; however, the No Imports case does provide some implications for short-term supply. When no availability of ULSD grade imports is assumed, the marginal price of ULSD is projected to exceed prices reflecting access to imports by about 1.2 to 1.6 cents per gallon between 2007 and 2011.

Table 18. Variations from Reference Case Projections of ULSD Marginal Refinery Gate Prices by Region in the Regulation and Sensitivity Analysis Cases, 2007-2015
(1999 Cents per Gallon)

Analysis Case and Producing Region	2007-2010 Average	2011-2015 Average	Analysis Case and Producing Region	2007-2010 Average	2011-2015 Average
Regulation			4% Efficiency Loss		
U.S. Average	5.2	4.7	U.S. Average	5.2	5.1
PADD I	5.3	4.8	PADD I	5.3	5.3
PADDs II-IV	5.3	4.8	PADDs II-IV	5.3	5.2
PADD V	4.8	4.3	PADD V	4.8	4.5
Higher Capital Cost			1.8% Energy Loss		
U.S. Average	6.4	5.2	U.S. Average	5.5	4.8
PADD I	6.6	5.5	PADD I	5.6	5.3
PADDs II-IV	6.6	5.3	PADDs II-IV	5.6	4.9
PADD V	5.4	4.9	PADD V	5.2	4.4
2/3 Revamp			Severe		
U.S. Average	5.7	4.9	U.S. Average	7.0	6.4
PADD I	6.0	5.0	PADD I	7.4	6.8
PADDs II-IV	6.0	5.0	PADDs II-IV	7.4	6.3
PADD V	5.0	4.5	PADD V	5.9	5.2
10% Downgrade			No Imports		
U.S. Average	5.2	5.2	U.S. Average	6.6	6.1
PADD I	5.3	5.4	PADD I	6.9	6.8
PADDs II-IV	5.3	5.3	PADDs II-IV	6.9	6.3
PADD V	4.8	4.7	PADD V	4.8	4.3

Source: NEMS runs DSUREF.D043001B, DSU7PPM.D043001A, DSU7HC.D043001A, DSU7INV.D043001A, DSU7DG10.D043001A, DSU7TRN.D043001A, DSU7BTU.D043001A, DSU7ALL.D050101A, and DSU7IMP0.D043001A.

7. Comparison of Studies on ULSD Production and Distribution

This chapter compares the methodology and results of the Energy Information Administration's (EIA's) analysis with those from a number of other studies related to ultra-low-sulfur diesel fuel (ULSD) supply and costs. Refinery costs and investments are compared with other estimates from studies by the U.S. Environmental Protection Agency (EPA), Mathpro, the National Petroleum Council (NPC), Charles River and Associates and Baker and O'Brien (CRA/BOB), EnSys Energy & Systems, Inc. (EnSys), and Argonne National Laboratory (ANL). EIA's estimates of distribution costs are compared with estimates from the EPA, ANL, and Turner, Mason and Company (TMC). A review of an analysis of alternative markets for diesel fuel components by Muse, Stancil and Company (MSC) is also provided. All cost estimates in this chapter have been converted to 1999 dollars.

Analyses of Refining Costs

The refining cost studies reviewed here represent a range of methodologies and assumptions. An understanding of some key terms is important to differentiating between the methodologies of the various studies. The studies were based on two general types of methodologies: a linear programming (LP) approach used by Mathpro, NPC, EnSys, DOE, and EIA; and a refinery-by-refinery approach used by CRA, EPA, and EIA. Within either approach, the studies used different methodologies and made different assumptions that make them difficult to compare. For instance, two different types of LP refinery models were used. The Mathpro analysis used an LP model of a "notional refinery" that represented an average refinery in a given region. In contrast, EnSys and EIA used refinery LP models that represented an aggregate refinery, or all the refineries in a region acting as one (Tables 19 and 20).

Costs estimated by the different studies are not easy to compare, because differences in estimation methodologies make them conceptually different. Both "average" and "marginal" costs can be based on LP models that operate as a single firm, or estimated from analysis of individual refineries. In general, marginal cost estimates that represent the cost of the last barrel of required supply can be seen as estimates of market prices. Much of the variation in investment and cost estimates reflects different assumptions about the cost of technologies; return on investment; the extent to which refiners will modify existing equipment or build entirely new hydrotreaters; the cost and quantity of additional hydrogen required; the extent to which some refineries may reduce highway diesel production; and the amount of highway diesel downgraded due to fuel contamination during distribution.

In EIA's refinery-by-refinery analysis (cost curves), the increased cost of producing ULSD in 2006 is estimated to be between 5.4 and 6.8 cents per gallon. Using the National Energy Modeling System (NEMS) Petroleum Market Module (PMM), the increased cost of producing ULSD is estimated to be between 4.7 and 7.3 cents per gallon from 2007 to 2010 and between 6.5 and 9.2 cents per gallon in 2011.[125] The estimated additional production costs are associated with expected increases in average marginal price increases at the pump ranging from 6.5 to 8.8 cents per gallon in the transition period and 7.2 to 10.7 cents per gallon in 2011. In the Regulation case, which uses many of the EPA's assumptions, prices are projected to increase by 6.5 to 7.2 cents per gallon between 2007 and 2011. The widest price differential—10.7 cents per gallon in 2011—is projected in the Severe case, which is based on assumptions more consistent with industry views.

For consistency with the EPA's analysis, EIA estimates are based on a 7-percent before-tax return on investment, which is estimated to equate to a 5.2-percent after-tax rate of return.[126] When a 10-percent after-tax rate of return, which was used in all the other analyses, is assumed; the refinery-by-refinery costs are about 0.8 to 1.2 cents per gallon higher than in the Regulation case, and the NEMS costs are about 0.8 to 1.1 cents per gallon higher than in the Regulation case.

[125] In the NEMS PMM projections, the U.S. price is the average of the marginal prices in the three model regions.

[126] According to financial information from Form EIA-28 (Financial Reporting System) refiners and marketers averaged a 7-percent before-tax return on investment between 1977 and 1999.

EPA Analysis

The EPA analysis was conducted in support of the final rulemaking published in December 2000.[127] The EPA analysis used a refining cost spreadsheet that included refinery-specific estimates for meeting the new highway diesel standards and aggregated them to estimate fuel cost increases at the Petroleum Administration for Defense District (PADD) and national levels. The costs of meeting the final ULSD Rule were analyzed without including possible reductions in non-road diesel sulfur. The EPA estimated that the ULSD Rule would increase average national production and distribution costs by 5.4 cents per gallon of 15 ppm diesel (4.5 cents per gallon for all highway diesel) during the temporary compliance period (2006 to 2010).[128] The total cost after full compliance in June 2010 was estimated at 5.0 cents per gallon (Table 21).

The largest component of the costs estimated by the EPA was increased refining costs (4.1 cents per gallon for 15 ppm diesel and 3.3 cents per gallon for all highway diesel between 2006 and 2010; 4.3 cents per gallon after June 1, 2010). The cost estimate for the compliance period was adjusted downward to reflect credit trading, assuming that low-cost refineries trade with high-cost refineries at the cost of production. Cost estimates for PADD IV were 30 to 40 percent higher than costs in other PADDs. The refining costs discussed above were based on a 7-percent before-tax return on investment, but the EPA also provided costs based on a 6-percent and 10-percent after-tax rate of return. The cost estimates for a 6-percent after-tax rate of return were 0.1 cents per gallon higher than the full compliance cost calculated with the 7-percent before-tax rate, and the estimates for a 10-percent after-tax rate were 0.4 cents per gallon higher.[129]

In addition to increased refining costs, the EPA estimated that the addition of lubricity additives would cost approximately 0.2 cents per gallon, and distribution costs were estimated to add another 1.1 cents per gallon during the temporary compliance period and 0.5 cents per gallon after full compliance.[130] The analysis behind the distribution cost estimates is discussed below.

Increased refining costs were expected to result from capital investment of $3.9 billion to meet the 2006 requirements and another $1.4 billion to reach full compliance in 2010, for a total investment of $5.3 billion.[131] The EPA estimated that the average refinery would spend $43 million dollars in capital expenditures and an additional $7 million per year in operating costs.

The EPA assumed that, in order to meet the 15 ppm highway diesel requirement, refiners would need to produce 7 ppm diesel fuel on average. It was assumed that 80 percent of diesel refining capacity would meet the new standards by modifications to existing hydrotreaters and the other 20 percent by building new hydrotreaters. The analysis included cost estimates under two scenarios. The first scenario assumed that all refiners currently producing highway diesel fuel would continue to do so. The second scenario assumed that some refiners would increase their production of highway diesel while making up for lost production from refiners that would drop out of the market. The EPA did not provide analysis assuming a net loss of production, but indicated that, with the inclusion of the 80/20 and small refiner provisions, no supply problems were anticipated. The EPA also performed an analysis of engineering and construction requirements and concluded that these factors should not be a problem due to the temporary compliance provisions (see Chapter 3 for more discussion).

Table 21. EPA Estimates of Increased Costs To Meet the 15 ppm Highway Diesel Standard
(1999 Cents per Gallon)

Period	Additional Refining	Lubricity Additive	Distribution[a]	Additional Distribution Tanks	Total Increase
Phase-in, 2006-2010	4.1	0.2	0.4	0.7	5.4
Fully Implemented Program, 2010	4.3	0.2	0.5	0.0	5.0

[a]Not including additional distribution tanks.
Source: U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), p. V-103.

[127]U.S. Environmental Protection Agency, "Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements: Final Rule," *Federal Register*, 40 CFR Parts 69, 80, and 86 (January 18, 2001).

[128]Total cost per gallon of 15 ppm diesel is the sum of 4.1 cents per gallon refining cost and 1.1 cent per gallon distribution cost.

[129]U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, p. V-106.

[130]Distribution costs include the capital cost of additional storage tanks, additional operating costs, yield losses, product downgrades, and testing costs.

[131]U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, p. V-103, web site www.epa.gov/otaq/regs/hd2007/frm/ria-v.pdf.

3,500 ppm non-road diesel. The lower average costs were the result of spreading the investments over a larger volume of product. The scenarios with non-road diesel sulfur capped at 15 ppm required the most investment and led to the highest costs. Relative to the 3,500 ppm non-road scenarios, the 15 ppm non-road scenarios required at least $1 billion more investment and resulted in average costs between 0.1 and 0.8 cents per gallon higher.

NPC Analysis

In its report, *U.S. Petroleum Refining: Assuring the Adequacy and Affordability of Cleaner Fuels*, the NPC included estimates of meeting a 30 ppm sulfur standard.[134] The estimates were based on the 30 ppm scenarios included in Mathpro's original report for the Engine Manufacturers Association in October 1999. The NPC combined the cost estimates from the "no retrofitting-inflexibility" and the "retrofitting-series" cases assuming that at 30 ppm, most refiners would retrofit. The NPC also made adjustments to the Mathpro estimates to reflect alternative assumptions of refinery economics. NPC adjusted the vendor-supplied estimates used in the Mathpro model upward by a factor of 1.2 for investments and a factor of 1.15 for hydrogen consumption and other operating expenses. The vendor data were adjusted to account for a perceived tendency of vendors to quote overly optimistic cost and performance information. The NPC analysis estimated industry investment costs at $4 1 billion at a cost of 5.9 cents per gallon (1999 dollars) and assumed 50 percent revamped and 50 percent new units. The study indicated that a sulfur standard below 30 ppm would require greater reliance on new units, as opposed to retrofits, resulting in considerably higher investments.

The NPC analysis included a discussion of limitations on engineering and construction resources and, in contrast with the EPA analysis, concluded that the overlap with gasoline sulfur projects would result in delays in meeting the diesel standards. The study suggested that highway diesel supply shortfalls might occur if the standard were required before 2007 and that even more time would be required to meet a standard below 30 ppm. (See Chapter 3 of this report for more detail on engineering and construction.)

CRA/BOB Analysis

In a study for the American Petroleum Institute, CRA/BOB developed refinery-specific cost estimates for every U.S. refinery, using the Prism refinery model.[135] The estimates and a survey of refiners intentions were used to construct a marginal cost curve that was used in an equilibrium supply and demand analysis. The initial supply and demand assumptions were from EIA's *Annual Energy Outlook 2000*. The supply curve was shifted according to the marginal cost analysis, and the demand curve was shifted based on an elasticity assumption. In contrast to all but the EIA offline analysis, the CRA/BOB study provided an analysis of a short-term supply and cost outlook.

The analysis projected a reduction in highway diesel production of 320,000 barrels per day, resulting in a supply shortfall. The EPA has estimated that 75 percent of the shortfall estimated by CRA/BOB resulted from the underlying assumption that an additional 10 percent of the highway diesel produced would be downgraded because of product degradation from distribution and storage.[136] In contrast, EIA and the EPA assumed an additional 2.2 percent of downgraded product, and TMC estimated that a total of 17.5 percent of ULSD would be downgraded.[137] The estimated increase in average refining cost was 6.7 cents per gallon to produce ULSD from 500 ppm diesel. The estimated increase in the marginal price of ULSD needed to balance supply and demand was between 14.7 and 48.9 cents per gallon, depending on the availability of imports.

The CRA/BOB analysis assumed that, in order to meet the 15 ppm standard, refiners would produce highway diesel at an average of 7 ppm.[138] The analysis also assumed that non-road diesel would be reduced to 350 ppm and jet fuel and heating oil sulfur would remain at 1999 levels. The cost estimates reflected an assumption that 40 percent of ULSD would be produced from new desulfurization units and 60 percent from revamped units, and that the return on investment would be 10 percent.

[134] National Petroleum Council, *U.S. Petroleum Refining: Assuring the Adequacy and Affordability of Cleaner Fuels* (June 2000), Chapter 3. Investment and cost estimates have been converted to 1999 dollars from 1998 dollars reported by NPC.

[135] Charles River Associates, Inc. and Baker and O'Brien, Inc., *An assessment of the Potential Impacts of Proposed Environmental Regulations on U.S. Refinery Supply of Diesel Fuel*, CRA No. D02316-00 (August 2000).

[136] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, web site www.epa.gov/otaq/regs/hd2007/frm/ria-v.pdf.

[137] Turner, Mason & Company, *Costs/Impacts of Distributing Potential Ultra Low Sulfur Diesel* (Dallas, TX, February 2000); *Revised Supplement* (August 2000).

[138] Telephone conversation with Ray Ory of Baker and O'Brien, January 25, 2001.

Each of the phase-in cost series provided by ANL was associated with a set of distribution costs, which varied slightly in the seven scenarios. The distribution cost analysis for 15 ppm highway diesel fuel was extrapolated from TMC (early) estimates for distributing 5 ppm and 50 ppm diesel.[143] The costs included capital investment for the distribution and refueling system and for product downgrade. Distribution costs were provided for various levels of phase-in between 5 and 100 percent of the highway diesel market. The level of phase-in most consistent with the 80 percent required by the ULSD Rule for the initial years of the program was a supply of 83 percent of highway diesel, which was associated with undiscounted distribution costs between 1.5 and 2.2 cents per gallon. The costs associated with 100 percent of highway diesel at 15 ppm ranged between 1.2 and 2.1 cents per gallon.[144]

The ANL analysis concluded that, depending on the case and the stage of phase-in, the total incremental costs of a phase-in would range from 6.1 to 11.2 cents per gallon, compared to a range of 7.1 to 12.7 cents per gallon for an all-at-once strategy. Estimates of total (undiscounted) costs to consumers for the various phase-in scenarios ranged from $15.2 to $25.4 billion ($10.1 to $17.3 billion net present value). Higher expenditures were estimated for an all-at-once strategy, with expected costs totaling $30.4 to $52.8 billion ($22.3 to $38.6 billion net present value). The relatively lower distribution costs under a phase-in approach were translated into an estimated savings of $14.2 to $27.4 billion.

Summary of Investment Estimates

EPA estimated that, in order to meet the requirements of the ULSD Rule, the industry would invest a total of $5.3 billion. In comparison, DOE (by ANL) estimated between $8.1 and $13.2 billion of investment for ULSD, Mathpro estimated a range of $3.0 to $6.0 billion, CRA estimated $7.7 billion, and NPC estimated $4.1 billion to meet a 30 ppm standard and substantially higher but undefined amount to provide 15 ppm diesel (Tables 23 and 24). Because production of diesel in the appropriate sulfur range has been very limited, analysis of costs of the ULSD Rule depend heavily on vendor estimates and several critical assumptions, including refinery configuration, size, and crude oil inputs; the ratio of retrofitted units to new units; and the relative cost of retrofits versus new units.

The studies discussed above used different methodologies, economic approaches, levels of regional and annual detail, and assumptions (see Table 20). Many were completed before the Final Rule was issued and do not reflect the provisions for small refineries or the 80/20 rule. In addition, the studies were based on different assumptions about investment behavior and costs and the level of diesel demand. The capital investment estimates are difficult to compare not only because of their different methodologies and assumptions but also because their investment estimates reflect slightly different things. For instance, the EPA estimated the capital cost for a new distillate hydrotreater to range

Table 23. Comparison of ULSD Production Cost Estimates: Individual Refinery Representation

Study	Sulfur Level (ppm)	Percentage of Highway Diesel That Is ULSD	Cost Change (1999 Cents per Gallon of ULSD)	Cost Basis	Refinery Capital Investment (Billion 1999 Dollars)
EPA (temporary compliance, 2006-2010)	7	75[a]	4.1[b]	Average, U.S.	3.9
EPA (full compliance, June 2010 forward)	7	100	4.3	Average, U.S.	5.3 total
CRA/BOB (August 2000 for 2006)	7[c]	100	6.7[d]	Average, U.S.[e]	7.7
EIA (cost curves, 2006)	7	76-100	5.4-5.8	Marginal, PADDs I-IV[f]	

[a]Small refiners accounting for 5 percent of production are eligible to delay, but only 2 percent are assumed to delay.
[b]Cost adjusted for credit trading at cost to low cost refiners.
[c]Correspondence with Ray Ory of Baker and O'Brien. Also reflects assumption of 350 ppm non-road diesel.
[d]Average cost to produce 7 ppm diesel from 500 ppm diesel. The marginal price to balance supply and demand was estimated to be between 14.7 and 48.9 cents per gallon, depending on the availability of imports.
[e]Average based on marginal cost methodology.
[f]Marginal based on average refinery costs.
Sources: EPA: U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, web site www.epa.gov/otaq/regs/hd2007/frm/ria-v.pdf. CRA/BOB: Charles River Associates, Inc., and Baker and O'Brien, Inc., *An assessment of the Potential Impacts of Proposed Environmental Regulations on U.S. Refinery Supply of Diesel Fuel*, CRA No. D02316-00 (August 2000). EIA: Energy Information Administration, Office of Integrated Analysis and Forecasting (Chapter 5 of this report).

[143]Turner, Mason & Company, *Costs/Impacts of Distributing Potential Ultra Low Sulfur Diesel* (Dallas, TX, February 2000).

[144]M.K. Singh, *Analysis of the Cost of a Phase-in of 15 ppm Sulfur Cap on Diesel Fuel*, Revised (Argonne, IL: Center for Transportation Research, Argonne National Laboratory, November 2000), Appendix C.

The lower end cost in EIA's NEMS analysis reflects a notional unit that processes low-sulfur feed with incidental dearomatization, while the higher end cost reflects a different notional unit that processes higher sulfur feed with greater aromatics improvement. EIA also provided sensitivity analysis using higher capital cost assumptions for both the refinery-by-refinery and NEMS analyses. The Higher Capital Cost sensitivity case for EIA's refinery-by-refinery analysis is based on capital costs that are about 40 percent higher than those in the initial analysis. Both sets of capital costs were developed by the National Energy Technology Laboratory, in conjunction with Mr. John Hackworth, energy consultant. The capital costs used in the NEMS Higher Capital Cost case were provided by recent work from EnSys and are 24 percent higher for the first notional unit and 33 percent higher for the second notional unit, relative to the Regulation case.

The EPA analysis was based on estimates from two technology vendors, providing costs based on retrofits and new units.[145] EPA assumed that 80 percent of ULSD will be produced from diesel hydrotreaters that are revamped at a cost of $40 million each. These estimates reflected an assumption that new units would cost twice as much as revamps. The net result was an estimated average cost of $50 million per refinery, which equates to a little more than 4 cents per gallon of highway diesel on average.

The NPC analysis did not estimate costs for producing diesel with less than 10 ppm sulfur but indicated that even a 30 ppm sulfur standard would require reactor pressures in the range of 1,100 to 1,200 psi, which is well above the vendor estimates used by the EPA.[146] The NPC characterized vendor estimates as inherently over-optimistic;[147] however, several new technologies are under development that may reduce costs (see Chapter 3).

The ANL estimates blended the EnSys 100 percent new and 100 percent revamp refinery analysis, based on the assumption that 60 percent of ULSD would be produced from revamped units that cost an average of $40 million per unit, and the other 40 percent would come from new units at an average cost of $80 million per unit. Instead of making an assumption about the split between revamped and new units, Mathpro developed scenarios for different types of choices. Assuming no change in the non-road diesel standards, Mathpro estimated that the total investment cost would range from $6.0 billion if refineries required all new units with minimum operating flexibility to $3.0 billion if all refineries were retrofitted and economies of scale from trading were realized.

Table 25. Comparison of Key Hydrotreator Investment Assumptions for Various Refinery Models

Model	Capital Cost of New Hydrotreater (1999 Dollars per Barrel per Day, ISBL)	Revamp Cost as a Percentage of New Unit Cost	Unit Size (Barrels per Day)	Percent of ULSD Production from Revamped Units Versus New Units
Refinery-by-Refinery Models				
CRA/BOB	1,622[a]	55	25,000	60/40
EPA	1,240-1,680[b]	50	25,000	80/20
EIA Cost Curve	1,043-1,807[c]	Variable	50,000-10,000	Not an assumption
EIA Cost Curve, High Capital Cost Scenario	1,465-2,548c	Variable	50,000-10,000	Not an assumption
LP Models				
EnSys (August 2000)	2,350-3,296[d]	60	25,000	NA
EIA NEMS Regulation Case	1,331-1,849[d]	50	25,000-10,000	80/20
EIA NEMS 2/3 Revamp Case	1,331-1,849[c]	50	25,000-10,000	66.7/33.3
EIA NEMS Higher Capital Cost Case	1,655-2,493[c]	50	25,000-10,000	80/20

[a]Feedstock composed of 65 percent straight-run distillate, 10 percent cracked stock, and 25 percent light cycle oil.
[b]Low end of range is for straight-run distillate and high end is for light cycle oil.
[c]Costs varied depending on unit size and feedstock.
[d]Low end of range is for units processing low-sulfur feed streams with incidental dearomatization. High end is for higher sulfur feed streams with greater aromatics improvement.

Sources: **CRA/BOB:** Correspondence with Mr. Ray Ory, April 19, 2001. **EPA:** U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, Table V.C-9, web site www.epa.gov/otaq/regs/hd2007/frm/ria-v.pdf. **EIA Cost Curve and Cost Curve High Capital Cost Scenario:** National Energy Technology Laboratory, in conjunction with Mr. John Hackworth, energy consultant. **EnSys:** EnSys Energy & Systems, Inc, *Modeling Impacts of Reformulated Diesel Fuel* (Flemington, NJ, August 2000). **EIA/NEMS Regulation and 2/3 Revamp Cases:** Office of Integrated Analysis and Forecasting. **EIA/NEMS High Capital Cost Case:** Revised EnSys costs based on correspondence with Mr. Martin Tallett, April 23, 2001.

[145] EPA corroborated the vendors' cost estimates in discussions with two other vendors. E-mail from Lester Wyborny, U.S. Environmental Protection Agency, March 30, 2001.

[146] M.K. Singh, *Analysis of the Cost of a Phase-in of 15 ppm Sulfur Cap on Diesel Fuel*, Revised (Argonne, IL: Center for Transportation Research, Argonne National Laboratory, November 2000), p. 132.

[147] National Petroleum Council, *U.S. Petroleum Refining: Assuring the Adequacy and Affordability of Cleaner Fuels* (June 2000), p. 77.

produced was projected to be downgraded to a lower value product.

The ANL estimates, which were extrapolated from previous TMC estimates for delivering 5 ppm and 50 ppm diesel,[148] ranged from 6.2 cents to 1.2 cents per gallon for delivery of 5 percent and 100 percent, respectively.[149] In August 2000, TMC provided supplemental estimates reflecting downgrade costs associated with distributing 15 ppm diesel fuel.[150] Presumably, the capital costs would remain the same as for the 5 ppm case in the previous TMC analysis. When the original TMC 5 ppm estimates are adjusted to reflect 15 ppm diesel, the total distribution cost estimates are 6.9 cents per gallon to supply 5 percent of the market; 4.1 cents per gallon to supply 20 percent of the market; and 1.4 cents per gallon to supply the entire highway diesel market.[151]

The extent to which product contamination will occur in the distribution system (and how much product must be downgraded as a result) is very uncertain. The analyses included strikingly different estimates of how much of the 15 ppm product would be downgraded in the distribution system. EIA's NEMS analysis assumed 4.4 percent downgrade for consistency with the EPA assumptions but also provided a sensitivity case assuming 10 percent downgrade. Downgrade estimates ranged from 4.4 percent of production (EPA) to 17.5 percent (TMC). Part of the uncertainty stems from not knowing the present level of downgrade occurring in the distribution system, because there is no current reporting requirement. The EPA assumed a doubling of product downgrade from current downgrade levels, which were estimated at 2.2 percent. The methodology used by the EPA to estimate current downgrade levels was highly speculative and was not based on a scientific survey. The EPA's estimation methodology was loosely based on a survey of the Association of Oil Pipelines, in which six respondents provided estimates of the current diesel fuel downgrade ranging from 0.2 percent to 10.2 percent (see Chapter 4). In the same survey some respondents expressed an expectation that the downgrade amount might be expected to double under the ULSD Rule.

The TMC analysis was based on a survey of 14 refiners (representing 38 percent of U.S. petroleum refining capacity), 3 pipeline operators (representing approximately 40 percent of U.S. highway diesel shipping capacity), and 11 terminal operators (representing 25 percent of U.S. petroleum product storage capacity). A wide range of responses was noted in the responses of pipeline operators. In the survey, some terminal operators indicated that they would not handle ULSD. Terminal operators generally anticipated a higher rate of downgrade than did pipeline operators. Terminal operators indicated that, to handle ULSD, dedicated transport trucks or compartments in transport trucks would be required to avoid sulfur contamination.[152]

The TMC analysis projected 17.5 percent downgrade when 100 percent of the highway diesel market was assumed to require the 15 ppm diesel, and slightly lower levels of downgrade were expected when smaller segments of the market were required. Although the ANL analysis did not provide the downgrade assumptions used, it was based on the TMC assumptions for downgrade of 5 ppm and 50 ppm diesel and tracked closely with the TMC assumptions. Different downgrade assumptions resulted in different cost estimates associated with downgrade. The EPA estimated a total downgrade cost of 0.2 cents per gallon for all highway diesel in the initial years and 0.3 cents per gallon after full implementation.[153] In contrast, the ANL analysis (based on the TMC assumptions of higher downgrade volumes) estimated a total downgrade cost of about 1 cent per gallon when more than half of the market was required to meet the 15 ppm standard.

The TMC, EPA, and ANL analyses also used different sets of assumptions about capital investment requirements. During the initial years of the program, when the distribution system must handle two highway diesel fuels, the EPA estimated tankage costs at refineries, terminals, pipelines, and bulk plants at $0.81 billion. In addition, investments at truck stops to handle the extra product were estimated at $0.24 billion. These costs were amortized over total highway diesel volumes (both 500 ppm and 15 ppm) during the initial 4 years at 7 percent per year, resulting in a cost of 0.7 cents per gallon. EIA used EPA's capital cost estimate of 0.7 cents per gallon in all NEMS analysis scenarios.

The ANL analysis assumed that, given a phase-in, 50 percent of terminals would add tanks or reconfigure. Of those terminals that were modified, it was assumed that

[148] Turner, Mason & Company, *Costs/Impacts of Distributing Potential Ultra Low Sulfur Diesel* (Dallas, TX, February 2000).

[149] M.K. Singh, *Analysis of the Cost of a Phase-in of 15 ppm Sulfur Cap in Diesel Fuel*, Revised (Argonne, IL: Center for Transportation Research, Argonne National Laboratory, November 2000), Appendix C.

[150] Turner, Mason & Company, *Costs/Impacts of Distributing Potential Ultra Low Sulfur Diesel* (Dallas, TX, February 2000); *Revised Supplement* (August 2000).

[151] Total distribution and retail cost estimates for 5 ppm from *Costs/Impacts of Distributing Potential Ultra Low Sulfur Diesel* were adjusted based on update of downgrade costs for 15 ppm diesel provided in the *Revised Supplement*.

[152] Telephone conversation with Bob Cunningham of Turner Mason, March 21, 2001.

[153] U.S. Environmental Protection Agency, *Regulatory Impact Analysis: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Requirements*, EPA420-R-00-026 (Washington, DC, December 2000), Chapter V, p. V-124.

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Appendix A

Letters from the Committee on Science, U.S. House of Representatives

U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON SCIENCE

SUITE 2320 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6301
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TTY: (202) 226-4410

July 26, 2000

Mr. Lawrence A. Pettis
Acting Administrator
Energy Information Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr. Pettis:

The U.S. Environmental Protection Agency (EPA) has proposed a 15 parts per million (PPM) highway diesel sulfur cap effective at the refinery or import level beginning April 1, 2006. The same standard would be effective at the terminal level on May 1, 2006 and at the retail level on June 1, 2006. These deep sulfur reductions will require significant investments that not all refiners may choose to make. As a result, diesel fuel supplies could be affected. In addition, these extremely low sulfur levels raise serious questions about the ability of the industry to adequately distribute the fuel in a fungible pipeline system that supports an array of different fuels and sulfur levels.

We believe that the EPA has not adequately studied the potential impacts of its proposed sulfur level on diesel fuel supply or the distribution system. EPA has also not fully assessed the availability of cost-effective desulfurization technologies that would be available in time to allow compliance with the new standard. As a result, an independent and objective study is needed that addresses, at a minimum, the following questions:

- Assuming that the rule is finalized as proposed (without a phase-in of the low sulfur fuel), what are the potential impacts on highway diesel fuel supply that could result? What impacts are possible on other middle distillate products such as jet fuel, home heating oil and off-road diesel? If highway diesel fuel supply is adversely impacted, what are the potential impacts on the cost of diesel fuel to the end-users? To what extent would imports be able to fill any shortfall in supply and at what cost? How significant an effect would the 5% fuel efficiency loss associated with engine after-treatment devices have in the context of expected diesel demand under EPA's 15 PPM standard?

- EPA has proposed implementing the new diesel standard in April 2006. How would potential supply change if the effective date was later (i.e., refinery changes for diesel did not have to overlap those for gasoline sulfur)?

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January 24, 2001

Mr. Lawrence A. Perris
Energy Information Administration
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Mr Perris:

The Energy Information Administration is about to begin a study requested by the Committee on Science on July 26, 2000 regarding the effect of the Environmental Protection Agency's (EPA) 15 parts per million diesel fuel standard. I am enclosing a copy of the July 26, 2000 letter for your information.

The EPA issued the final rule on December 21, 2000, which differs in several ways from the request the Committee made in July. As such, please modify the request to take the assumptions underlying EPA's final rule into account. Where EPA's assumptions diverge meaningfully from industry assumptions please perform a sensitivity analysis as appropriate. There are some significant differences between EPA and industry assumptions in several areas including:

- the Btu content of ultra-low-sulfur diesel (ULSD),
- efficiency loss from engine after-treatment devices; and
- additional distribution costs

Thank you for your attention to this matter. Please contact Tom Vanek of my staff at (202) 225-4778 if you have any questions.

Sincerely,

Harlan Watson
Staff Director
Energy & Environment Subcommittee

HW:tjv

Enclosure

Appendix B

Differences From the *AEO2001* Reference Case

Appendix B

Differences From the *AEO2001* Reference Case

The reference case for this study was established to provide a baseline scenario representing the nominal forecast for petroleum refining and marketing without the new requirement for ultra-low-sulfur diesel fuel (ULSD). The reference case reflects the mid-term reference case forecast published by the Energy Information Administration (EIA) in its *Annual Energy Outlook 2001 (AEO2001)*.[160] Both the reference case for this study and the *AEO2001* reference case were prepared using EIA's National Energy Modeling System (NEMS).[161] Both cases reflect the "Tier 2" Motor Vehicle Emission Standards and Gasoline Sulfur Control Requirements finalized by the U.S. Environmental Protection Agency (EPA) in February 2000. Both cases also incorporate bans or reductions for the gasoline additive methyl tertiary butyl ether (MTBE) in the States where such legislation has been passed. They do not include a waiver of the Federal oxygen requirement for reformulated gasoline.

Updates in databases and assumptions that were incorporated into NEMS after the publication of *AEO2001*, however, resulted in minor differences in the reference case forecasts. Differences between the two forecasts relevant to the ULSD study are discussed in this appendix.

Return on Investment

The *AEO2001* forecast assumed a 15-percent hurdle rate in the decision to invest and a 15-percent return on investment (ROI) over the 15-year life of a refinery processing unit. To be consistent with the EPA analysis, the reference case for this study used a 10-percent hurdle rate and a 5.2-percent ROI over a 15-year financial lifespan. The revised rates do not have a significant impact on the marginal costs for producing current 500 ppm highway diesel fuel in the reference case forecast.

Diesel Fuel Consumption

The *AEO2001* reference case assumed that 85 percent of the demand for diesel fuel in the transportation sector was for highway use. More recently, however, EIA has determined that refinery production of highway diesel approximates the total demand for diesel fuel in the transportation sector. Therefore, the reference case for this study assumes that the production of 500 ppm highway diesel fuel is equal to the total demand in the transportation sector.

Two major factors account for the revised assumption. First, some of the highway diesel produced at refineries is downgraded in the distribution system. The EPA estimates that currently about 2.2 percent of highway diesel is downgraded. Second, some highway-grade diesel has been used for non-road or other uses, because the price differential between low-sulfur and high-sulfur diesel has not been large enough to make separate distribution infrastructures economical. As a result, it has been noted that some customers purchase low-sulfur diesel for non-road uses. In California, the State requires the same low sulfur standard for both highway and non-road diesel (except for railroad and maritime uses).

Import Supply Curves

The NEMS Petroleum Market Module (PMM) uses import supply curves developed from an international refinery model external to NEMS to represent the supply of available imports. In preparation for this study, new sets of crude and product import supply curves were estimated, adding supply curves for ULSD. The new import curves were used in the reference case for this study, but ULSD imports were not allowed.

Refining Technology Database

The PMM represents petroleum refining and marketing. The refining portion is a linear programming representation incorporating a detailed refining technology database that includes process options, product blending to specification, and investment costs. This database is updated annually to produce the *AEO* forecasts. There have been some minor changes since *AEO2001*, mostly associated with product blending. Although four new distillate desulfurization units were added as part of the refining technology database update, those four units were not allowed in the reference case. Therefore, the updates had minimal impact on the reference case for this study as compared with the *AEO2001* reference case.

NEMS Operation Mode

For the *AEO2001* reference case, all modules of the NEMS were executed to solve for supply and demand balance in the U.S. domestic energy market through 2020. For this study only the relevant modules were executed, including the International Energy Module, Transportation Demand Module, Industrial Demand Module, and the Petroleum Market Module. This mode of NEMS operation greatly reduced the model run time without significantly affecting the results.

[160] Energy Information Administration, *Annual Energy Outlook 2001*, DOE/EIA-0383(2001) (Washington, DC, December 2000), web site www.eia.doe.gov/oiaf/aeo/. See also web sites www.eia.doe.gov/oiaf/assumption/pdf/0554(2001).pdf and www.eia.doe.gov/oiaf/supplement/index.html.

[161] Model documentation reports for NEMS and its modules as well as a summary report, *NEMS: An Overview*, are available at web site www.eia.doe.gov/bookshelf/docs.html.

Appendix C

Pipeline Regions and Operations

Appendix C

Pipeline Regions and Operations

U.S. Regions for Distribution of Petroleum and Their Key Pipelines

The supply and demand characteristics for refined petroleum products across the United States vary across regions (Petroleum Administration for Defense Districts, or PADDs). The reasons are historical, demographic, geological, and topographical.

The *East Coast* (PADD I), the most heavily populated PADD, has the highest petroleum consumption. It has virtually no indigenous crude oil production and only limited refining capacity. The Northeast is unique in its dependence on heating oil: 70 percent of all single-family homes in the Northeast are heated with oil. Hence, the Northeast has the largest market for the transportation of high-sulfur distillate, as opposed to low-sulfur diesel oil. The region covers its deficit in refined product supply with shipments from the Gulf Coast by pipeline and with imports of refined products by tanker. Colonial Pipeline (Gulf Coast to the New York area) and Plantation Pipe Line (Gulf Coast to the Washington, DC, area) are trunk lines that transport a wide product slate to the area, including distillate fuel oils. Delivering lines, such as Buckeye Pipe Line Company, distribute products within the New York Harbor and from the New York Harbor area to Pennsylvania and upstate New York. Buckeye also serves Connecticut and Massachusetts from an origin in New Haven. ExxonMobil and Sun also operate delivering product pipelines in the region.

The *Midwest* (PADD II) is less heavily populated than PADD I and has a greater balance of supply and demand for both crude oil and refined products. It receives pipeline supplies of distillate fuel oil from both the Gulf Coast and the East Coast. The main trunk carriers of refined petroleum products in the Midwest are TE Product Pipeline and Explorer Pipeline. The role of delivering carriers in the Midwest is a key to product distribution. The region's refining hubs depend on pipelines to deliver their output. As logistics hubs, as well as refining hubs, areas such as Chicago ship product output from refineries and also re-ship product received from refineries on the Gulf Coast or in Oklahoma. Pipelines serving the Chicago hub include Williams, Equilon, and Phillips (in addition to Explorer and TE Products), Citgo, Marathon Ashland, Buckeye, and Wolverine. Other refining centers or single refineries also depend on pipeline transport of their products. Kaneb and Conoco are two of the pipelines serving the western part of PADD II, the plains States, where distances are long and consumption volumes low.

The *Gulf Coast* (PADD III) is the Nation's main oil supply region. It is the largest refining area, with facility design and sophistication unrivaled in the world. It is a major crude oil producing area, with output greater than all but two members of the Organization of Petroleum Exporting Countries. It also has a low regional demand for finished petroleum products. Thus, its shipments of products to other regions are a central facet of supply east of the Rocky Mountains. The Gulf Coast is the origin of trunk carriers such as Explorer, TEPPCO (to the Midwest), Colonial, and Plantation (to the Southeast and East Coast). These pipelines also deliver to points within PADD III.

The *Rocky Mountain States* (PADD IV) are thinly populated, with a low volume of oil shipped across long transport distances. Its consumption of diesel fuel for transportation on a per capita basis is about 60 percent greater than the average in the lower 48 States, but its consumption per square mile is less than 30 percent of the lower 48 average. The region's highway consumption of diesel—a proxy for the low-sulfur diesel required—is about 60 percent of its total distillate market, but low-sulfur diesel accounts for more than 80 percent of the total distillate supplied in the region. The market is so thin that many companies have opted to market (and hence require transport and storage for) only low-sulfur diesel fuel instead of both low- and high-sulfur fuel. The pipelines serving the region distribute products from refineries in the Denver area and from refineries in Billings, MT; and Casper, WY, as well as product received from terminals in PADD II. Pipelines such as Yellowstone and Cenex distribute across the Northern Tier States. Chevron moves products out of Salt Lake City through Idaho and to western Washington, and a variety of pipelines go into and out of the Denver area (Phillips from PADD III; Chase from PADD II; and Conoco, WYCO, Sinclair, and others within the Rockies).

The *West Coast* (PADD V) is a singular oil market, separated from the rest of the country. From the earliest days, the Rockies prevented the easy transfer of oil in and out of the region. More recently, California's adoption of uniquely stringent oil product specifications has exacerbated the region's supply isolation. The region is populous as a whole because California is populous; consumption is high, but not on a per capita basis. In California, the Kinder Morgan pipeline system (formerly Santa Fe Pacific Pipeline) is the most important. It redistributes product from area refineries and, in southern California, receives product from its system in Arizona. The system in Arizona, in turn, connects with

and destined for Points B and C can be delivered at both distant points simultaneously; part of the stream can continue on to Point C while delivery is still underway at Point B. In a batch mode, a delivery operation to Point B means that all pipeline movements beyond Point B cease while the delivery to Point B is completed.

Fungible operations also support more efficient utilization of storage tanks. In fungible operations, large storage tanks are used to accumulate or deliver multiple consignments of identical refined products. In batch operations, only one consignment of material is typically held in each tank. Accordingly, storage tanks used in batch pipeline operations tend to be smaller (and, possibly, more numerous) and are not utilized as intensively as storage tanks used in fungible service.

Among the pipeline characteristics that determine whether a refined petroleum products pipeline operates in a batch or fungible mode, customer requirements for segregation are an important factor. (Many pipelines operating on a fungible product basis can make provision to accept a distinct batch from a shipper. In doing so the carrier might impose a higher minimum volume requirement or charge a higher tariff rate to cover the higher operating cost of providing the special service.) Nonetheless, many pipelines or pipeline segments serve areas where the structure of the market does not support the "one size fits all" character of fungible service.

Another important factor in determining a pipeline's type of service offering is the possible availability of multiple pipelines in the same service corridor. If existing practice and customer service arrangements initially mandate batch pipeline service, it is difficult for a refined petroleum products pipeline carrier to change to fungible service subsequently. On the other hand, if a pipeline carrier serves a transportation corridor using multiple pipelines, it has more flexibility to adopt fungible service.

Thus, while an oil pipeline is likely to prefer fungible service, batch service is often the only feasible choice. Like the difference between trunk and delivering carriers, the difference between fungible and batch service is one of scale for many operating parameters. An oil pipeline in batch service has considerably less flexibility to offset operating "hiccups" (such as product contamination at a shipper's terminal tank) than does an oil pipeline operating in fungible service.

Sequencing Product Flow

Refined products pipelines carry more than 60 percent of all petroleum products transported in the United States.[162] Products pipelines are routinely capable of transporting various types of products or grades of the same petroleum products in the same pipeline. For example, it is common for a single refined products pipeline to transport various grades of motor gasoline, diesel fuel, and aircraft turbine fuel in the same physical pipeline. (For the most part, oil pipelines do not transport both crude oil and refined petroleum products in the same pipeline.)

To carry multiple products or grades in the same pipeline, different petroleum products or grades are held in separate storage facilities at the origin of a pipeline and are delivered into separate storage facilities at the destination. The different types or grades of petroleum products are transported sequentially through the pipeline. While traversing the pipeline, a given refined product occupies the pipeline as a single batch of material. At the end of a given batch, another batch of material, a different petroleum product, follows. A 25,000-barrel batch of products occupies nearly 50 miles of a 10-inch-diameter pipeline.

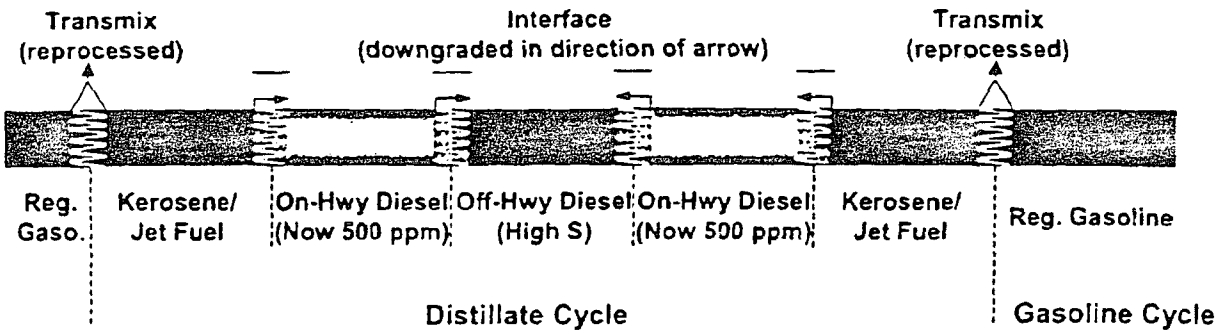
Generally, product batches are butted directly against each other, without any means or devices to separate them. At the interface of two batches in a pipeline, some, but relatively little, mixing occurs. The actual volume of mixed material generated depends on a number of physical parameters, including pipeline diameter, distance, topography, and type of material. As a guide to understanding the volume of interface generated, it would be typical for 150 barrels of mixed material to be generated in a 10-inch pipeline over a shipment distance of 100 miles. The hydraulic flow in a pipeline is also a crucial determinant of the amount of mixing that occurs. "Turbulent flow," as occurs in most pipelines, minimizes the generation of interface, while operations that require the flow to stop and start will generate the most interface material.

Monthly Batch Scheduling

As a part of their strategy to minimize the generation of interface material, pipeline operators sequence batches on the basis of the total number of products routinely shipped and the number and capacity of storage tanks available at the origin, destination, and intermediate breakout locations. Most often, pipeline operators use a recurring monthly schedule of "cycles," shipping all the available petroleum products of the same type in sequence. For example, only gasoline grades would be shipped during the days that constitute the gasoline cycle, and only distillates would be shipped during the days that constitute the distillate cycle. The actual duration of the cycles might vary from 6 to 10 days, depending on the volume of each material to be shipped during a particular month. Operators accommodate increased seasonal demand and stock builds, for instance, by adjusting the cycle schedule. The schedule is published

[162] Based on ton-miles. See Association of Oil Pipe Lines, *Shifts in Petroleum Transportation—1999* (2001).

Figure C1. Typical Product Sequence and Interfaces in a Refined Products Pipeline



Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

the tanks themselves. Essentially, station piping represents the connection between a main pipeline segment and its requisite operating tanks. The concept is simple in theory, but in practice the configuration of station piping is not. Station piping layouts become more complex as the tanks at a pipeline terminal facility become more numerous.

Configurations of station piping necessary to accommodate a given number of tanks and to provide flexibility in routing multiple products in and out of those tanks provide many possibilities for the creation of pipeline interface material. Each pipeline facility is different, not only among pipeline companies but within pipeline companies. There is no way to predict how easy or hard it will be to minimize possible sulfur contamination of ULSD in station piping, except to examine the risks on a case-by-case basis.

In fact, the interface generation in station piping and breakout tanks may be even more important than during pipeline transit. The volume of interface material thus generated is due to the physical attributes of the system. It has fewer variables but approaches being a fixed value on a barrel-per-batch, not a percentage, basis. For instance, one pipeline operator may create 25,000 barrels of high-sulfur/low-sulfur distillate interface per batch whether the batch is 250,000 barrels or 1,000,000 barrels. In addition, a given batch of product might be transported in multiple pipelines between its origin and its final destination and even within the same system might require a stop in breakout tanks, as noted above. Each segment of the journey generates additional interface.

Appendix D

Short-Term Analysis of Refinery Costs and Supply

Appendix D

Short-Term Analysis of Refinery Costs and Supply

As a result of the new regulations issued by the U.S. Environmental Protection Agency (EPA) for ultra-low-sulfur diesel fuel (ULSD) the U.S. refining industry faces two major challenges: to meet the more stringent specifications for diesel product, and to keep up with demand by producing more diesel product from feedstocks of lower quality. Some refineries in the United States and Europe currently have the capability to produce some diesel product containing less than 10 ppm sulfur, and there is no question that diesel fuel with less than 10 ppm sulfur can be produced with current technology.

U.S. refiners have demonstrated that meeting the EPA target specification of 500 ppm sulfur (1993 reduction from 5,000 ppm to 500 ppm) was easier than anticipated. The primary methods used were upgrading existing hydrotreater units by adding extra reactor volume and building new units. In contrast, the proposed change from 500 to 15 ppm represents a new and far more challenging task for the industry, because the remaining sulfur (less than 500 ppm) is likely to be contained in compounds that are difficult to desulfurize, such as 4,6–dimethyldibenzothiophene (often described as sterically hindered sulfurcontaining molecules). Furthermore, to meet growing demand for diesel fuel, some refineries will have to increase capacity, which may involve treating lower quality feedstocks (cracked distillates) that require more severe and costly process conditions.

The implications of producing ULSD are complex, not only from a unit-specific standpoint but also from a refinery standpoint. Each refinery has unique circumstances, such as existing hydrodesulfurization units, source of crude, diesel blend components, and hydrogen availability. Producing ULSD is a significant decision for most refiners, and the incremental cost per barrel could vary dramatically across the range of individual refiners. In addition, it is uncertain whether further restrictions on diesel quality will be imposed in the future. Some refiners may decide to discontinue producing highway diesel and produce only non-road diesel and heating oil as distillate products. Such decisions, coupled with increasing demand for diesel fuel, could heighten the potential for a diesel shortage in 2006.

This appendix provides details of the methods used to estimate the short-term cost per gallon to manufacture ULSD meeting the EPA sulfur specifications for 2006 and examines the variations in cost for different U.S. refineries. The analysis results in a cost curve indicative of the cost that may be incurred by U.S. refiners to produce the new fuel at various supply levels.

Estimating Components of the Distillate Blend Pool

The initial step of the analysis was to analyze the potential economics of producing ULSD for each refinery. Using input and output data submitted to the Energy Information Administration (EIA) by refiners, the current components of the distillate blend pool were estimated and allocated to the current production of highway diesel, non-road diesel, and heating oil. Volumes and sulfur content of straight-run distillate, fluid catalytic cracker (FCC) light cycle oil (LCO), coker distillate, and hydrocracker distillate were estimated on the basis of the gravity and sulfur content of crude feeds, input volumes to the FCC, coker, and hydrocracker units, and the fraction of the FCC feed that is hydrotreated.

The estimates for volumes of full-range straight-run distillate, LCO from the FCC, and coker distillate were adjusted according to reported refinery data. Because kerosene and jet fuel are made from the straight-run distillate and hydrocracked material, those distillate pool components were reduced accordingly. If a hydrocracker was available at a refinery, volumes of LCO and coker distillate were allocated to the hydrocracker by comparing available distillate boiling range components to distillate product volumes. A final adjustment was made, based on the relative production of gasoline and distillate products.

The initial estimate of straight-run distillate volume for a given refinery was based on a typical cut point range for a crude oil with the gravity of the crude oil charged to that refinery. If the available distillate pool volumes exceeded the distillate product produced, the volume of the straight-run distillate component was reduced, based on the typical variation in distillation cut points. (The light end of the kerosene boiling range material may be included in the reformer feed for gasoline production, and the heavy end (high end) of the boiling range may be included in the FCC feedstock. Either or both of these adjustments will reduce the straight-run distillate volume.) The adjustments resulted in estimated distillate pool volumes approximately equal to the reported volumes of distillate production. The distillate pool components were then allocated to the production of highway diesel, non-road diesel, and heating oil.

components to reduce aromatics and improve cetane in order to produce acceptable products.

In the longer term, increased movement of cracked distillates between refineries could occur, with more undercutting of cracked stock to remove the high-aromatic, high-sulfur material at the high end of the boiling range. Such industry optimization avenues would take time to establish, however, because they are based on component price differentials that may grow over time to provide incentives for such activities. During the transition period starting in 2006, based on past experience, it is assumed that most refiners would base their strategies on analyses of specific refinery situations. Possible exceptions are multiple refineries within a single company system having logistical connections that permit practical and economical movement of refinery streams.

Identifying Refinery Options for Producing ULSD

The objective of this step of the analysis was to generate estimates of the incremental cost for each refinery to produce ULSD. The incremental cost will vary for each refinery, depending on the volume of ULSD produced; the type of blend components from which it is produced; the sulfur, aromatics, and boiling range content of those blend components; whether the refinery can revamp an existing hydrotreater or must build a new one; and the cost for catalyst, hydrogen, and other requirements to produce the ULSD. Moreover, each refinery must decide how much ULSD it will produce in 2006. Because the volume of ULSD produced will affect the incremental cost of production, the incremental cost of ULSD production for each refinery was first estimated at current production levels, assuming both the revamp of a current hydrotreating unit and the addition of a new unit. Then, additional options for reducing or expanding the refinery's ULSD production were estimated.

Several factors may cause a refiner to maintain, contract, or expand highway diesel production when the ULSD regulation takes effect in 2006. Maintaining current production of highway diesel has the appeal of keeping the refinery production in balance with current distillate markets sales for the company. Either increasing or decreasing the highway diesel production will mean finding markets for more highway diesel, more heating oil, or more non-road diesel products. Reducing ULSD production may result in a lower per barrel incremental cost for ULSD production.

ULSD production requires added hydrogen usage in the distillate hydrotreater, thereby increasing hydrogen consumption per unit of distillate feed. Some refiners may choose to reduce feed input in order to continue to operate within existing hydrogen supply constraints and avoid building new hydrogen production capacity. Reducing hydrotreater throughput may also enhance the practicality of revamping a current hydrotreater to avoid building a new unit. The 1996 API/NPRA survey showed that at the 500 ppm sulfur limit level, about 15 percent of untreated material was placed in highway diesel in PADDs I-IV. Producing ULSD will require that all the diesel product must be hydrotreated. This means that some refiners who seek to revamp will be working with a unit that has less capacity than indicated by current highway production. Some additional capacity may be made available by increasing the utilization rates of existing units that are currently operating at lower utilization rates.

If a refiner has to build a new hydrotreater, expansion of highway diesel production is an obvious consideration.

Table D2. Cetane Number of Light Cycle Oil From Some World Crude Oils

Crude Oil	Source	Gravity (Degrees API)	Sulfur Content (Percent by Weight)	Cetane Number		
				Straight-Run Diesel	Light Cycle Oil at 60 Percent Conversion	Light Cycle Oil at 80 Percent Conversion
Murban	Abu Dhabi	39	0.9	56	40	22
Saudi Arabia Light	Saudi Arabia	34	1.7	58	32	18
Forcados	Nigeria	31	0.2	39	25	<15
Forties	North Sea	37	0.3	52	37	20
Maya	Mexico	22	3.3	47	25	15
Boscan	Venezuela	10	5.5	39	21	<15
North Slope	Alaska	27	1.0	45	30	17
Gibson Mix	Louisiana	36	0.3	55	40	22
West Texas Sour	Texas	32	2.4	47	32	18

Note: It was assumed that 650-1050F vacuum gas oil was cracked at 60 percent or 80 percent volume conversion. Properties of the vacuum gas oil and cetane number of straight-run diesel are from the Ethyl Corporation crude oil database.

Source: G.H. Unzelman, "Diesel Fuel Demand: A Challenge to Quality," Presentation to the Energy Economics Group, Institute of Petroleum (London, UK, October 10, 1983).

produce ULSD. The volume of ULSD a refiner decides to produce will affect the cost. For each refinery, the cost for ULSD production is estimated at current production levels, both assuming the addition of a new hydrotreating unit and assuming the revamping of an existing hydrotreating unit (options 1 and 2 below). Three additional options are considered (reductions from current highway diesel production assuming new and revamped hydrotreater units and increases from current production assuming new units) to find the most economical production levels for individual refineries.

Option 1 (Baseline New Hydrotreater): This "business-as-usual" option is modeled using the current refinery production capacities for highway and non-road diesel. The model estimates the cost to produce highway and non-road diesel at the proposed sulfur limits (7 ppm and 5,000 ppm, respectively) while maintaining the same hydrotreater throughput. A new hydrotreater plant is estimated.

Option 2 (Baseline Revamped Hydrotreater): This option is identical to Option 1 except that the existing hydrotreater plant is assumed to be revamped. The revamp option considers the cost of installing an additional hydrotreater reactor (not an entire plant) and interstage amine scrubber. The additional reactor is sized to decrease the existing diesel sulfur content from 500 ppm to 7 ppm.

Options 3 and 4 (Reduced ULSD New and Revamp Hydrotreater): These options consider the cost impacts of decreasing highway diesel production and increasing non-road diesel production. Because ULSD production will require more hydrogen consumption (especially for refineries with lower quality feedstocks), reducing ULSD production may permit the refinery to operate within existing hydrogen capacity and avoid the necessity of building a costly new hydrogen plant. Furthermore, reducing hydrotreater throughput may also enhance the practicality of revamping the current hydrotreater and avoiding the need to invest in a new unit.

Option 5: Increased ULSD New Hydrotreater: This option considers expanding highway diesel production while decreasing non-road diesel production, thus increasing throughput to the hydrotreater and creating the need for a new hydrotreater. A particular refiner might consider this option for several reasons: (1) the refinery has a high volume of cracked stocks, and a new hydrotreater plant is needed anyway; (2) a new unit may provide economies of scale and lower per-unit production cost; (3) there may be a perceived opportunity to expand highway diesel production as demand increases and "challenged" refineries discontinue diesel production. A corresponding revamp case was not considered, because it was assumed that current refineries were at maximum production rate with existing equipment, and both new hydrotreater and hydrogen plants would be needed.

Worksheet Environment

Economic Factors: The capital charge factor is assumed to be 12.0 percent (corresponding to a 5.2-percent after-tax rate of return on investment), contingency 20.0 percent, on-site maintenance 4.0 percent, off-site maintenance 2.0 percent, taxes and insurance 1.5 percent (included in the capital charge factor), and miscellaneous 0.6 percent, all as a percentage of capital investment. Sensitivity cases using a 17.2-percent capital charge were also analyzed.

Refinery Input Data: The cost model requires two input data sets for each scenario. The first set of input data is the baseline data, consisting of the current refinery diesel capacities from which all scenarios are developed. The baseline data consist of the API gravity, highway and non-road diesel blend component flow rates, and sulfur content of each stream to the hydrotreater. The second set of input data contains the blend component flow rates for the optional expanded or reduced hydrotreater.

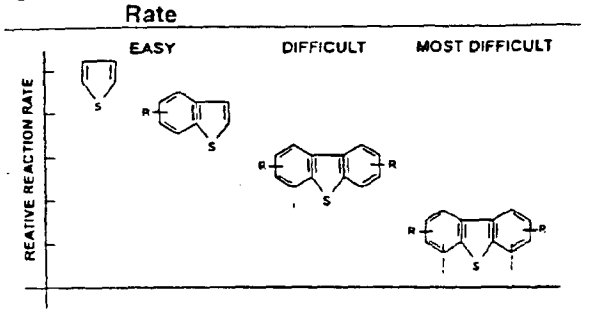
Manual Variables: Some variables are not available in the original refinery-by-refinery specific database and require some engineering judgment and estimation. Whether or not the FCC feed is hydrotreated affects the hydrogen consumption for desulfurizing the LCO stream. Pretreatment of the FCC feed results in products (LCO in this case) with higher API gravities (lower sulfur and aromatic content), which will in turn require less hydrogen to remove the remaining sulfur during hydrotreating. The geographic location factor is utilized in the cost estimates for each refinery process; the location basis used in the model is the U.S. Midwest. The pressure input (in pounds per square inch absolute [psi]) affects both the kinetic and hydrotreater portions of the model. It is assumed that the maximum pressure for the revamp options is 650 psi, and the average length-of-run pressure for the new hydrotreater options is 900 psi. The estimated process temperature has a direct impact on the kinetic performance.

Hydrotreater Kinetics: The kinetic model used in this study has the general form:

$$-dS/dt = kS^n P_{H_2}/(1 + K_s S_o) .$$

An Arrhenius form is used for the temperature dependence of k. For the Langmuir-Henshelwood factor, it is assumed that sulfur species in the feed and H_2S are equally strongly absorbed on catalyst sites. The constants in the equation were fit using the best available data from the literature. The best fit was obtained with n equal to 1.5. The equation was integrated to give space

Figure D3. Impact of Sulfur Species on Reaction Rate



Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

Hydrotreater Utilities: The main utilities for the hydrotreater plant included in the model are power, steam, cooling water, and fuel. All utility requirements were estimated from published correlations or actual data. The revamp option utility requirements are the incremental utilities to remove the remaining sulfur present in the diesel. The incremental additional power was estimated to be 40 percent of the existing power usage due to additional hydrogen consumption and potentially higher system pressure drops.

Hydrotreater Yields and Energy Content: The volume and weight percent yields of ULSD produced by the distillate hydrotreater can vary considerably, depending on the fraction of cracked stocks in the feed and the level of aromatics saturation. An average yield and energy content were estimated for this study, based on the Criterion data in a June 2000 study by the National Petroleum Council.[167] The yield of hydrotreater product in the distillate boiling range was assumed to be 98 percent by weight, and the API gravity was assumed to increase by 2 numbers, which means that the volume yield was 99.2 percent. There was also a small increase in the Btu content of the product on a weight basis (98.2 percent of the feed energy content in 98.0 weight percent of the feed). The energy content declines on a volume basis, because the heat content of the product is 0.989 times the heat content of the feed on a volume basis.

Hydrogen Plant: The same hydrogen consumption and hydrogen plant cost estimation methodologies are used for both the new and revamp cases. The goal of the hydrogen plant portion of the model is to determine the hydrogen consumption and associated costs to reduce the current sulfur level (500 ppm) down to 7 ppm, whether it is a new or revamp situation (see Table 6 in Chapter 6). The incremental H_2 is calculated as the difference between the baseline H_2 consumption (for highway diesel at 500 ppm sulfur and non-road diesel at 5,000 ppm) and the predicted required H_2 consumption (highway diesel at 7 ppm, non-road at 5,000 ppm). If the incremental H_2 consumption value is greater than 25 percent of the baseline H_2 capacity, then the model calculates the H_2 costs based on a new plant.

Simple nonlinear correlations based on the flow rate and sulfur concentration of each cut, including the non-road streams to the hydrotreater, were developed using data compiled from multiple sources. The H_2 consumption correlations are as follows:

Straight-run highway baseline:

$$SCF\ H_2 = SR\ Flowrate * (((120 * SRSulPercent) + 40) + 50)$$

Straight-run highway required:

$$SCF\ H_2 = SR\ Flowrate * (((120 * SRSulPercent) + 40) + 50 + 50)$$

Straight-run non-road baseline and required:

$$SCF\ H_2 = SR\ NonHighway\ Flowrate * ((120 * SRSulPercent) + 40)$$

LCO highway baseline:

$$SCF\ H_2 = LCO\ Flowrate * (((150 * LCOSulPercent) + 40) + 150)$$

LCO and coker distillate highway required:

$$SCF\ H_2 = LCO\ Flowrate * (((150 * LCOSulPercent) + 40) + 150 + 650)$$

LCO and coker distillate non-road baseline and required:

$$SCF\ H_2 = LCO\ NonHighway\ Flowrate * ((150 * LCOSulPercent) + 40).$$

After the total baseline, required, and incremental hydrogen capacities are calculated, the model then decides whether to build a new hydrogen plant. If the existing H_2 plants capacity is determined to be sufficient (no build), only the variable cost associated with the required capacity is calculated. If a new H_2 plant is necessary, the on-site capital cost is estimated (scaled) using published data (60 million standard cubic feet per day plant at $50 million). The off-site capital cost is assumed to be 40 percent of the on-site capital cost. The total hydrogen cost per barrel of distillate treated includes the cost of the natural gas feed to the hydrogen plant.

Sulfur Plant: The new sulfur plant estimates are based on the amount of sulfur removed from the diesel pool and are a function of whether the FCC feed was pre-treated, the flow rate and percent sulfur of each stream, and the API gravity of the crude. The estimate

[167] National Petroleum Council, *U.S. Petroleum Refining: Assuring the Adequacy and Affordability of Cleaner Fuels* (June 2000).

Appendix E

Model Results

Appendix E

Model Results

This appendix provides mid-term projections for end-use prices and total supplies of ultra-low-sulfur diesel fuel (ULSD), based on the Energy Information Administration's (EIA's) National Energy Modeling System (NEMS) Petroleum Market Module (PMM). Historical data for 1999 prices and supplies of highway diesel (500 ppm sulfur) are also provided for comparison (Tables E1 and E2).

The projected end-use (pump) prices are lower than the current prevailing prices for highway diesel fuel for several reasons. The end-user prices include crude oil costs, processing costs, taxes, and marketing costs.[168] Therefore, variations in the costs and taxes affect the projected end-user prices. The reference case, the Regulation case, and all sensitivity cases were based on mid-term projections for world crude oil prices used in *Annual Energy Outlook 2001 (AEO2001)*. After the steep increase in world crude oil prices in 1999 and 2000, EIA projected that crude oil prices would decline initially (through 2003), then slowly increase through 2020.[169] EIA's *Weekly Petroleum Status Report* for March 23, 2001, estimated the February 2001 price at $24.60 per barrel ($0.577 per gallon) in 1999 dollars for U.S. imported crude oil. In comparison, NEMS projects a world crude oil price of $21.37 per barrel ($0.509 per gallon) in 2010 (in 1999 dollars). The lower 2010 oil price projections from *AEO2001* thus account for a difference of 6.8 cents per gallon in the projected end-use prices for ULSD.

In addition, the end-use diesel prices include a nominal Federal tax of $0.24 per gallon in 1999, which decreases in value (in real terms) in the forecast years. The differential in Federal taxes between 1999 and 2010 is about 4 cents per gallon. The PMM reference case projects an end-use price of $1.238 per gallon in 2010. After upward adjustment to account for the differentials in world crude oil price and Federal taxes (a total of 10.8 cents), the end-use price would be $1.346 per gallon at the current world crude oil price level.

The U.S. prices of most petroleum fuel products fluctuate between seasons and in response to world crude oil prices. The higher-than-normal diesel prices in 2000 and in the early part of 2001 reflect the low distillate inventory and high world crude oil prices. Since February 2001, the average price of U.S. highway diesel has been dropping steadily, to a level around $1.40 per gallon. According to the *Weekly Petroleum Status Report* for March 23, 2001, the average U.S. price of highway diesel was $1.338 per gallon (in 1999 dollars), comparable to the price projection of $1.346 per gallon from the PMM.

[168] Energy Information Administration, *Annual Energy Outlook 2001*, DOE/EIA-0383(2001) (Washington, DC, December 2000), Figure 112.

[169] Energy Information Administration, *Annual Energy Outlook 2001*, DOE/EIA-0383(2001) (Washington, DC, December 2000), Figure 88.

Table E2. End-Use Prices and Total Supplies of Highway Diesel, 1999 and 2007-2015, Assuming 10-Percent Return on Investment

Analysis Case	1999	2007	2008	2009	2010	2011	2015	2007-2010 Average	2011-2015 Average
End-Use Prices of Highway Diesel (1999 Cents per Gallon)[a]									
Reference with 10% Return on Investment (500 ppm)	114.0	121.9	122.5	123.3	123.8	124.4	125.4	122.9	124.8
Regulation with 10% Return on Investment (ULSD)	NA	129.8	130.0	130.9	131.5	132.4	131.1	130.6	130.8
Total Highway Diesel Supplied (Million Barrels per Day)									
Reference with 10% Return on Investment									
Total (500 ppm)	**2.43**	**3.10**	**3.16**	**3.22**	**3.27**	**3.33**	**3.56**	**3.19**	**3.44**
Regulation with 10% Return on Investment									
500 ppm	2.43	0.70	0.71	0.73	0.26	0.00	0.00	0.60	0.00
ULSD	0.00	2.41	2.46	2.50	3.02	3.41	3.64	2.60	3.52
Total	**2.43**	**3.11**	**3.17**	**3.23**	**3.28**	**3.41**	**3.64**	**3.20**	**3.52**

[a]Highway diesel prices (both 500 ppm and ULSD) include Federal and State taxes but exclude county and local taxes.
NA = not available.
Sources: **1999:** Energy Information Administration, *Petroleum Supply Annual 1999*, Vol. 1, DOE/EIA-0340(99)/1 (Washington, DC, June 2000).
Projections: National Energy Modeling System, runs DSUREF10.D043001A and DSU7PPM10.D043001A.

Williams, Ronald L

From: Poche, Michelle [Michelle.Poche@ost.dot.gov]
Sent: Saturday, March 24, 2001 4:18 PM
To: Kelliher, Joseph
Cc: Anderson, Margot; 'Symons.Jeremy(a)EPA.gov'

B-5

Thanks,
Michelle

B-5

14664

B-5

Department of Energy
Washington, DC 20585

Office of Policy

Facsimile

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Williams, Ronald L

From: Breed, William
Sent: Thursday, March 22, 2001 5:33 PM
To: Anderson, Margot
Subject: FW: NEP Chapter 9 - Infrastructure Investment, Integrity and Reliability

Importance: High

latest version of refinery section included in Chris' text -- much thanx to Barry --

William Breed
Acting Director, Office of Energy Efficiency,
Alternative Fuels, and Oil Analysis (PO-22)
202-586-4763

-----Original Message-----
From: McNutt, Barry
Sent: Thursday, March 22, 2001 5:16 PM
To: Breed, William
Subject: FW: NEP Chapter 9 - Infrastructure Investment, Integrity and Reliability
Importance: High

revised.

-----Original Message-----
From: Breed, William
Sent: Thursday, March 22, 2001 4:38 PM
To: McNutt, Barry
Subject: FW: NEP Chapter 9 - Infrastructure Investment, Integrity and Reliability
Importance: High

William Breed
Acting Director, Office of Energy Efficiency,
Alternative Fuels, and Oil Analysis (PO-22)
202-586-4763

-----Original Message-----
From: Freitas, Christopher
Sent: Thursday, March 22, 2001 4:30 PM
To: Breed, William
Subject: FW: NEP Chapter 9 - Infrastructure Investment, Integrity and Reliability
Importance: High

Bill, FYI thanks for the return call.
Sincerely,

Christopher J. Freitas
Program Manager, Natural Gas Infrastructure
(202) 586-1657

-----Original Message-----
From: Freitas, Christopher
Sent: Thursday, March 22, 2001 4:01 PM
To: Anderson, Margot
Cc: DeHoratiis, Guido
Subject: NEP Chapter 9 - Infrastructure Investment, Integrity and Reliability
Importance: High

5 (5)

Margot, FYI see attached file. All edits are in red font and I have also used the strikethrough feature.

I'm still working on graphics. They will be sent later.

Sincerely,

Christopher J. Freitas
Program Manager, Natural Gas Infrastructure
(202) 586-1657

energyinfrastructure2.doc

Williams, Ronald L

From: Poche, Michelle [Michelle.Poche@ost.dot.gov]
Sent: Saturday, March 24, 2001 7:18 PM
To: Kelliher, Joseph; Anderson, Margot

NAFTA.)

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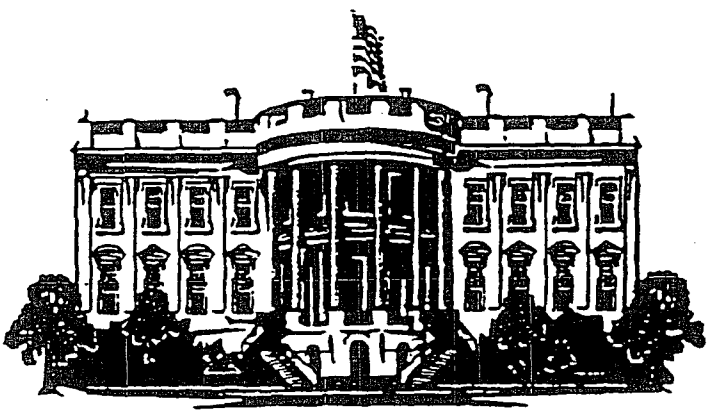
an
2/21/01
draft



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BOB MCNALLY
NATIONAL ECONOMIC COUNCIL
THE WHITE HOUSE
WASHINGTON, DC 20502
PHONE: 202/456-5~~65~~ 96 FAX: 202/456-2223

DATE: 2-22-01
TO: Joe Kelliher
FAX: 586-7644

NUMBER OF PAGES (INCL. COVER):

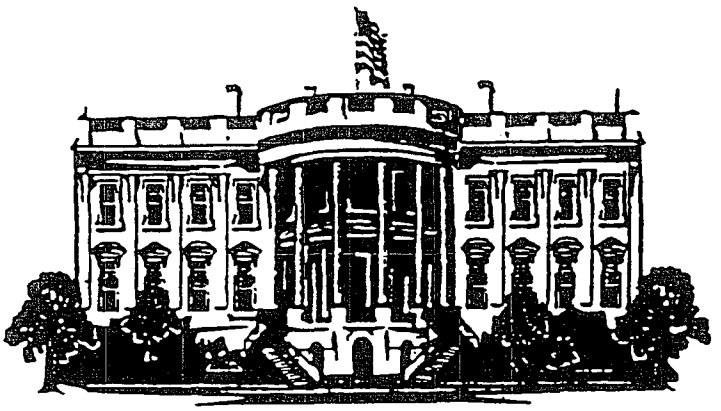
COMMENTS: Just some thoughts on the draft.

Comments on
2/21/draft

To: Joe Kelliher, DOE
586-7210

From: Ray Squitieri, Treasury
622-1301 phone
-1294 fax

a
2/21/01
draft



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TO: Joe Kelliher
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622-1301 phone
-1294 fax

Comments on
2/21/draft

To: Joe Kelliher, DOE
586-7210

From: Ray Squitieri, Treasury
622-1301 phone
-1294 fax

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, March 25, 2001 12:49 PM
To: Anderson, Margot
Subject: policy options

Importance: High

b5

DOE Policy Proposals w-Joe's E...

Williams, Ronald L

From: Kelliher, Joseph
Sent: Sunday, March 25, 2001 4:05 PM
To: Anderson, Margot
Subject: goals/actions

fedactlst1.doc

B - 5

Rasmussen, Erik

From:	Halwick, Kay
Sent:	Friday, March 16, 2001 3:13 PM
To:	Whatley, Michael; Vargas, Meagan; Mcgee, Alexander; Maierhofer, Justin; Kindrick, Alan; Ivahnenko, Michael; Disch, Ellis; Threlkeld, Jim; Oliver, Martha; Rasmussen, Erik; Brady, Joyce; Lerner, Steve; Wisniewski, Mike; Rabb, John; Peery, Kathy; Tuttle, Robert; Hutchinson, Joshua
Cc:	Chumbris, Nick; Ayton, Jan
Subject:	House and Senate bills of interest to DOE introduced on 3/15/01

B-5

Rasmussen, Erik

From: Halwick, Kay
Sent: Thursday, March 15, 2001 4:30 PM
To: Whatley, Michael; Hutchinson, Joshua; Ivahnenko, Michael; Kindrick, Alan; Maierhofer, Justin; Mcgee, Alexander; Disch, Ellis; Vargas, Meagan; Rasmussen, Erik; Mandel, Philip; Threlkeld, Jim; Oliver, Martha; Brady, Joyce
Cc: Chumbris, Nick; Ayton, Jan
Subject: House and Senate bills on interest to DOE introduced on 3/14/01

B-5

Rasmussen, Erik

From: Halwick, Kay
Sent: Wednesday, March 14, 2001 2:55 PM
To: Whatley, Michael; Ivahnenko, Michael; Maierhofer, Justin; Mcgee, Alexander; Peery, Kathy; Tuttle, Robert; Disch, Ellis; Vargas, Meagan; Rasmussen, Erik; Lemer, Steve; Brady, Joyce; Mandel, Philip; Threlkeld, Jim; Oliver, Martha
Cc: Chumbris, Nick; Ayton, Jan
Subject: House bills of interest to DOE introduced on 3/13/01

B5

Rasmussen, Erik

From: Halwick, Kay
Sent: Tuesday, March 13, 2001 3:33 PM
To: Whalley, Michael; Vargas, Meagan; Peery, Kathy; Tuttle, Robert; Mcgee, Alexander; Maierhofer, Justin; Ivahnenko, Michael; Disch, Ellis; Tathwell, Fred; Rasmussen, Erik; Brady, Joyce
Cc: Chumbris, Nick; Ayton, Jan
Subject: Senate bills of interest to DOE introduced on 3/12/01

B-5

B-5

Rasmussen, Erik

From: Halwick, Kay
Sent: Thursday, March 08, 2001 4:56 PM
To: Whatley, Michael; Disch, Ellis; Vargas, Meagan; Ivahnenko, Michael; Maierhofer, Justin; Mcgee, Alexander; Tathwell, Fred; Peery, Kathy; Lerner, Steve; Brady, Joyce; Threlkeld, Jim; Rasmussen, Erik; Oliver, Martha
Cc: Chumbris, Nick; Ayton, Jan
Subject: House and Senate bills of interest to DOE introduced on 3/7/01

35

B-5

Rasmussen, Erik

From: Halwick, Kay
Sent: Friday, March 09, 2001 3:45 PM
To: Whatley, Michael; Vargas, Meagan; Disch, Ellis; Ivahnenko, Michael; Maierhofer, Justin; Mcgee, Alexander; Rasmussen, Erik; Mandel, Philip; Oliver, Martha; Threlkeld, Jim; Brady, Joyce; Wisniewski, Mike; Rabb, John
Cc: Chumbris, Nick; Ayton, Jan
Subject: House and Senate bills introduced on 3/8/01

B5

B5

Rasmussen, Erik

From: Halwick, Kay
Sent: Thursday, March 08, 2001 8:39 AM
To: Whatley, Michael; Vargas, Meagan; Disch, Ellis; Ivahnenko, Michael; Maierhofer, Justin; Mcgee, Alexander; Oliver, Martha; Threlkeld, Jim; Wisniewski, Mike; Rabb, John; Tathwell, Fred; Mandel, Philip; Brady, Joyce; Rasmussen, Erik
Cc: Chumbris, Nick; Ayton, Jan
Subject: House and Senate bills introduced on 3/6/01

Bills introduced on 3/6/01

Rasmussen, Erik

From: Halwick, Kay
Sent: Tuesday, February 27, 2001 4:19 PM
To: Whatley, Michael; Disch, Ellis; Vargas, Meagan; Brady, Joyce; Lerner, Steve; Mandel, Philip; Oliver, Martha; Peery, Kathy; Rabb, John; Rasmussen, Erik; Tathwell, Fred; Threlkeld, Jim; Wisniewski, Mike; Ivahnenko, Michael; Maierhofer, Justin; Mcgee, Alexander; Crapa, Barbara; Knight, Al
Cc: Chumbris, Nick; Ayton, Jan
Subject: House & Senate bills of interest to DOE introduced on 2/26/01

13-5

15366

Rasmussen, Erik

From: Halwick, Kay
Sent: Thursday, March 01, 2001 3:39 PM
To: Whatley, Michael; Peery, Kathy; Tathwell, Fred; Rasmussen, Erik; Threlkeld, Jim; Oliver, Martha; Disch, Ellis; Vargas, Meagan; Ivahnenko, Michael; Maierhofer, Justin; Mcgee, Alexander; Brady, Joyce; Lerner, Steve; Mandel, Philip
Cc: Chumbris, Nick; Ayton, Jan
Subject: Bills of interest to DOE introduced on 2/28/01

B-5

Rasmussen, Erik

From: Halwick, Kay
Sent: Wednesday, February 28, 2001 3:47 PM
To: Whatley, Michael; Vargas, Meagan; Disch, Ellis; Peery, Kathy; Brady, Joyce; Rasmussen, Erik; Ivahnenko, Michael; Maierhofer, Justin; Mcgee, Alexander
Cc: Chumbris, Nick; Ayton, Jan
Subject: House and Senate bills of interest to DOE introduced on 2/27/01

B-5

Rasmussen, Erik

From: Ayton, Jan
Sent: Friday, February 16, 2001 3:35 PM
To: Whatley, Michael; Vargas, Meagan; Disch, Ellis; Rasmussen, Erik; Thornton, Vicki; Oliver, Martha; Threlkeld, Jim; Brady, Joyce; Lerner, Steve; Mandel, Philip
Cc: Chumbris, Nick; Halwick, Kay
Subject: Bills of interest to DOE introduced on 2/15/01

B-5

B-5

Rasmussen, Erik

From: Halwick, Kay
Sent: Thursday, February 15, 2001 4:26 PM
To: Whatley, Michael; Vargas, Meagan; Disch, Ellis; Rasmussen, Erik; Peery, Kathy; Mandel, Philip; Oliver, Martha; Threlkeld, Jim; Tathwell, Fred
Cc: Chumbris, Nick; Ayton, Jan
Subject: House & Senate bills of interest to DOE introduced on 2/14/01

B-5

Rasmussen, Erik

From: Halwick, Kay
Sent: Friday, February 09, 2001 2:19 PM
To: Whatley, Michael; Disch, Ellis; Vargas, Meagan; Rasmussen, Erik; Peery, Kathy; Oliver, Martha; Threlkeld, Jim; Mandel, Philip; Lemer, Steve; Brady, Joyce
Cc: Chumbris, Nick; Ayton, Jan
Subject: House and Senate bills of interest introduced on 2/8/01

B5

2 of 7

Williams, Ronald L

From: Charles_M._Smith@ovp.eop.gov%internet [Charles_M._Smith@ovp.eop.gov]
Sent: Wednesday, March 28, 2001 6:38 PM
To: Anderson, Margot
Subject: Chapter 9 from DOT

Ch9.03.26.doc

Margot:

I sent Chapter 9 out on 3/26/01 at 10:00 am. But, here's another copy.

-76

Williams, Ronald L

From:	Charles_M._Smith@ovp.eop.gov%internet [Charles_M._Smith@ovp.eop.gov]
Sent:	Wednesday, March 28, 2001 6:47 PM
To:	Kelliher, Joseph; Kolevar, Kevin; Anderson, Margot; Julieanna_R._Glover@ovp.eop.gov%internet; Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet; Sue_Ellen_Wooldridge@IOS.DOI.gov%internet; Joel_D._Kaplan@who.eop.gov%internet; Keith.Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet; Galloglysj@State.gov%internet; McManusmt@State.gov%internet; Michelle.Poche@OST.DOT.Gov%internet; Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet; Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet; MPeacock@omb.eop.gov%internet; Mark_A._Weatherly@omb.eop.gov%internet; Robert_C._McNally@opd.eop.gov%internet; Jhowardj@ceq.eop.gov%internet; William_bettenberg@IOS.DOI.gov%internet; Tom_fulton@IOS.DOI.gov%internet; Kjersten_drager@ovp.eop.gov%internet; Mleblanc@ceq.eop.gov%internet; Bruce.Baughman@FEMA.gov%internet; Charles.m.Hess@USACE.army.mil%internet; akeeler@cea.eop.gov%internet; commcoll@aol.com%internet; Carol_J._Thompson@who.eop.gov%internet; Sandra_L._Via@omb.eop.gov%internet; Megan_D._Moran@ovp.eop.gov%internet; Ronald_L._Silberman@omb.eop.gov%internet; Lori_A._Krauss@omb.eop.gov%internet; WheelerE@State.gov%internet
Cc:	Andrew_D._Lundquist@ovp.eop.gov%internet; Karen_Y._Knutson@ovp.eop.gov%internet; John_fenzel@ovp.eop.gov%internet; Margaret_Bradley@IOS.DOI.gov%internet; Jean_M._Russell@opd.eop.gov%internet
Subject:	NEPDG - Treasury Recommendations

recommendations to NEP.doc

Attached, for your information, are the Department of the Treasury's recommendations.

15387

2 of 7

Williams, Ronald L

From: Charles_M._Smith@ovp.eop.gov%internet [Charles_M._Smith@ovp.eop.gov]
Sent: Wednesday, March 28, 2001 7:07 PM
To: Anderson, Margot
Subject: RE: Chapter 9 from DOT

I just had Michelle over here from 5 to past 6 dealing with important stuff like graphics and photographs and she didn't mention anything about another draft - but who knows.

B-5

Williams, Ronald L

From: Kelliher, Joseph
Sent: Wednesday, March 28, 2001 7:49 PM
To: Anderson, Margot
Subject: DOE recommendations

Can we prepare one- to two-pagers on each of the DOE recommendations? Is that doable? I am running out the door right after I send it so you can't yell at me.

Williams, Ronald L

From: Poche, Michelle [Michelle.Poche@ost.dot.gov]
Sent: Wednesday, March 28, 2001 11:31 PM
To: Kelliher, Joseph; Anderson, Margot; Kolevar, Kevin; 'Charles(u)M.(u)Smith(a)ovp.eop.gov'; Julieanna_R._Glover@ovp.eop.gov%internet; Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet; Sue_Ellen_Wooldridge@ios.doi.gov%internet; Joel_D._Kaplan@who.eop.gov%internet; Keith.Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet; Galloglysj@state.gov%internet; McManusmt@state.gov%internet; Poche, Michelle; Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet; Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet; MPeacock@omb.eop.gov%internet; Mark_A._Weatherly@omb.eop.gov%internet; Robert_C._McNally@opd.eop.gov%internet; Jhowardj@ceq.eop.gov%internet; William_bettenberg@ios.doi.gov%internet; Tom_fulton@ios.doi.gov%internet; Kjersten_drager@ovp.eop.gov%internet; Mleblanc@ceq.eop.gov%internet; Bruce.Baughman@FEMA.gov%internet; Charles.m.Hess@USACE.army.mil%internet; akeeler@cea.eop.gov%internet; commcoll@aol.com%internet; Karen_E._Keller@omb.eop.gov%internet; Carol_J._Thompson@who.eop.gov%internet; Sandra_L._Via@omb.eop.gov%internet; Megan_D._Moran@ovp.eop.gov%internet; Ronald_L._Silberman@omb.eop.gov%internet; Lori_A._Krauss@omb.eop.gov%internet; WheelerE@state.gov%internet
Cc: Andrew_D._Lundquist@ovp.eop.gov%internet; Karen_Y._Knutson@ovp.eop.gov%internet; John_fenzel@ovp.eop.gov%internet; Margaret_Bradley@ios.doi.gov%internet; Jean_M._Russell@opd.eop.gov%internet
Subject: Latest Draft of Chapter 9

Ch9.03.28.doc transmissionprobmap.doc Silicon Valley.doc

15393

27

b-5

Williams, Ronald L

From: Braitsch, Jay
Sent: Thursday, March 29, 2001 8:23 AM
To: Anderson, Margot
Subject: Marginal NEP Option

15410

295

b-5

Williams, Ronald L

From: Braitsch, Jay
Sent: Thursday, March 29, 2001 8:23 AM
To: Anderson, Margot
Subject: Marginal NEP Option

2 pb

b-5

Williams, Ronald L

From: Charles_M._Smith@ovp.eop.gov%internet [Charles_M._Smith@ovp.eop.gov]
Sent: Thursday, March 29, 2001 8:49 AM
To: Anderson, Margot
Subject: RE: Chapter 9 from DOT

Margot:

Charlie

15412

297

Williams, Ronald L

EF (6)5

From: MaryBeth Zimmerman
Sent: Thursday, March 22, 2001 7:26 PM
To: Anderson, Margot
Cc: Garland, Buddy; Sullivan, John; Haspel, Abe; Baldwin, Sam
Subject: Ch. 6 -efficiency


Ch 6 (efficiency) graphics.ppt...


ch 6 march 22 EE datachecks.do...

here are your responses to comments on Chapter 6, plus the power point graphics to accompany. We might be able to update the transportation graphic for you. I'm afraid the renewables chapter will have to come tomorrow -- our folks were tied up on budget text today.

15413

240

Williams, Ronald L

From: Charles_M._Smith@ovp.eop.gov%internet [Charles_M._Smith@ovp.eop.gov]
Sent: Thursday, March 29, 2001 8:52 AM
To: Kelliher, Joseph; Kolevar, Kevin; Anderson, Margot; Julieanna_R._Glover@ovp.eop.gov%internet; Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet; Sue_Ellen_Wooldridge@IOS.DOI.gov%internet; Joel_D._Kaplan@who.eop.gov%internet; Keith.Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet; Galloglysj@State.gov%internet; McManusmt@State.gov%internet; Michelle.Poche@OST.DOT.Gov%internet; Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet; Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet; MPeacock@omb.eop.gov%internet; Mark_A._Weatherly@omb.eop.gov%internet; Robert_C._McNally@opd.eop.gov%internet; Jhowardj@ceq.eop.gov%internet; William_bettenberg@IOS.DOI.gov%internet; Tom_fulton@IOS.DOI.gov%internet; Kjersten_drager@ovp.eop.gov%internet; Mleblanc@ceq.eop.gov%internet; Bruce.Baughman@FEMA.gov%internet; Charles.m.Hess@USACE.army.mil%internet; commcoll@aol.com%internet; Karen_E._Keller@omb.eop.gov%internet; Carol_J._Thompson@who.eop.gov%internet; Sandra_L._Via@omb.eop.gov%internet; Megan_D._Moran@ovp.eop.gov%internet; Ronald_L._Silberman@omb.eop.gov%internet; Lori_A._Krauss@omb.eop.gov%internet; WheelerE@State.gov%internet
Cc: Andrew_D._Lundquist@ovp.eop.gov%internet; Karen_Y._Knutson@ovp.eop.gov%internet; John_fenzel@ovp.eop.gov%internet; Margaret_Bradley@IOS.DOI.gov%internet
Subject: Latest Draft of Chapter 9 from DOT

Ch9.03.28.doc transmissionprobmap.doc Silicon Valley.doc

fyi

15424

B - 5

Williams, Ronald L

From: Braitsch, Jay
Sent: Thursday, March 29, 2001 12:47 PM
To: Anderson, Margot
Cc: Juckett, Donald
Subject: RE: chapter 10 (international)

Importance: High

ch10 march 27 FE Comments.doc

-----Original Message-----
From: Anderson, Margot
Sent: Thursday, March 29, 2001 10:20 AM
To: Conti, John; Haspel, Abe; Zimmerman, MaryBeth; Lockwood, Andrea; Breed, William; KYDES, ANDY; Whatley, Michael; Carter, Douglas; Braitsch, Jay; Melchert, Elena; Cook, Trevor; Breed, William; 'jkstier@bpa.gov'; York, Michael; Freitas, Christopher; Friedrichs, Mark; Pumphrey, David; Kolevar, Kevin
Cc: Kelliher, Joseph
Subject: chapter 10 (international)

All,

Attached is the latest version of Chapter 10 (just received).

Margot

<< File: 03_29_01_NEPG Study_R4.doc >>

B-5

Williams, Ronald L

From: Breed, William
Sent: Thursday, March 29, 2001 12:51 PM
To: Anderson, Margot
Subject: NEP chap 9 - refinery section

Margot:

attached is our version of the refinery section of the infrastructure paper – just bolt this in place of the existing text

2-96

B-5

Williams, Ronald L

From: Freitas, Christopher
Sent: Thursday, March 29, 2001 1:13 PM
To: Anderson, Margot
Cc: DeHoratiis, Guido; Juckett, Donald
Subject: RE: chapter 10 (international)

Importance: High

Margot, FYI Final edits (I promise) see attached file and my two edits in red font.

03_29_01_NEPG Study_R4.doc

Sincerely,

Christopher J. Freitas
Program Manager, Natural Gas Infrastructure
(202) 586-1657

-----Original Message-----
From: Anderson, Margot
Sent: Thursday, March 29, 2001 10:20 AM
To: Conti, John; Haspel, Abe; Zimmerman, MaryBeth; Lockwood, Andrea; Breed, William; KYDES, ANDY; Whatley, Michael; Carter, Douglas; Bradtsch, Jay; Melchert, Elena; Cook, Trevor; Breed, William; 'jkstier@bpa.gov'; York, Michael; Freitas, Christopher; Friedrichs, Mark; Pumphrey, David; Kolevar, Kevin
Cc: Kelliher, Joseph
Subject: chapter 10 (international)

All,

Attached is the latest version of Chapter 10 (just received).

Margot

<< File: 03 *[Freitas, Christopher]* _29_01_NEPG Study_R4.doc >>

15457

B-5
B-6

Williams, Ronald L

From: Symons.Jeremy@epamail.epa.gov%internet [Symons.Jeremy@epamail.epa.gov]
Sent: Thursday, March 29, 2001 1:54 PM
To: Anderson, Margot
Cc: Wynn.Lynda@epamail.epa.gov%internet
Subject: URGENT: 1-pagers for NEPD

tmp.htm

Margot,

Lynda Wynn of EPA's water office is our lead contact for now. Please cc her in your response (I copied her on this email) B-6

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

15471

B-5
B-6

Margot,

[redacted] Lynda Wynn of EPA's water office is our lead contact for now. Please cc her in your response (I copied her on this email)..

B-6

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

3rC

B - 5

Williams, Ronald L

From: Ball, Crystal A - KN-DC [caball@bpa.gov]
Sent: Thursday, March 29, 2001 1:56 PM
To: Anderson, Margot; Carrier, Paul; Conti, John
Subject: RE: More NEP assignments

Margot,

Crystal

-----Original Message-----
From: Anderson, Margot [mailto:Margot.Anderson@hq.doe.gov]
Sent: Thursday, March 29, 2001 1:46 PM
To: Breed, William; Conti, John; Kripowicz, Robert; Braitsch, Jay; Haspel, Abe; Zimmerman, MaryBeth; 'caball@bpa.gov'; Friedrichs, Mark; Carrier, Paul; Moses, David; Vernet, Jean; Baer, Mitchell
Cc: Kolevar, Kevin; Kelliher, Joseph
Subject: More NEP assignments

All,

Principals meeting groups (Friday, noon deadline):

OCS: (DOI lead, FE (who?), and PO (Mitch Baer) should assist.
Safe Drinking Water: EPA lead, PO (Moses and Vernet should assist). Who else?
3-Pollutant and NSR: EPA lead, PO (Conti), FE (who?) should assist
Nuclear: Kelliher has lead.
CAFE: Kolevar has lead.

Margot

15473

301

Williams, Ronald L

From:	Symons.Jeremy@epamail.epa.gov%internet [Symons.Jeremy@epamail.epa.gov]
Sent:	Thursday, March 29, 2001 3:12 PM
To:	Anderson, Margot
Cc:	Wynn.Lynda@epamail.epa.gov%internet
Subject:	RE: URGENT: 1-pagers for NEPD

I believe the issue is safe drinking water act as it applies to hydraulic fracturing. I have no idea who might work on it at DOE. Do you, Lynda?

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

"Anderson, Margot" <Margot.Anderson@hq.doe.gov>
03/29/2001 02:04 PM

To: Jeremy Symons/DC/USEPA/US@EPA
cc: Lynda Wynn/DC/USEPA/US@EPA
Subject: RE: URGENT: 1-pagers for NEPD

Working on it. Not sure who. I thought the broader issue was Safe Drinking Water. Do you have someone in mind?

----Original Message----
From: Symons.Jeremy@epamail.epa.gov%internet
[mailto:Symons.Jeremy@epamail.epa.gov]
Sent: Thursday, March 29, 2001 1:54 PM
To: Anderson, Margot
Cc: Wynn.Lynda@epamail.epa.gov%internet
Subject: URGENT: 1-pagers for NEPD

Margot,

15474

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

tmp.htm

307

B - 5

I believe the issue is safe drinking water act as it applies to hydraulic fracturing. I have no idea who might work on it at DOE. Do you, Lynda?

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

"Anderson, Margot" <Margot.Anderson@hq.doe.gov>

03/29/2001 02:04 PM

To: Jeremy Symons/DC/USEPA/US@EPA
cc: Lynda Wynn/DC/USEPA/US@EPA
Subject: RE: URGENT: 1-pagers for NEPD

Working on it. Not sure who. I thought the broader issue was Safe Drinking Water. Do you have someone in mind?

-----Original Message-----
From: Symons.Jeremy@epamail.epa.gov%internet
[mailto:Symons.Jeremy@epamail.epa.gov]
Sent: Thursday, March 29, 2001 1:54 PM
To: Anderson, Margot
Cc: Wynn.Lynda@epamail.epa.gov%internet
Subject: URGENT: 1-pagers for NEPD

Margot,

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

B - 3

Williams, Ronald L

From: Symons.Jeremy@epamail.epa.gov%internet [Symons.Jeremy@epamail.epa.gov]
Sent: Thursday, March 29, 2001 1:54 PM
To: Anderson, Margot
Cc: Wynn.Lynda@epamail.epa.gov%internet
Subject: URGENT: 1-pagers for NEPD

tmp.htm

Margot,

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

15478

304

Margot,

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

215

Williams, Ronald L

D -5

From: Ball, Crystal A - KN-DC [caball@bpa.gov]
Sent: Thursday, March 29, 2001 1:56 PM
To: Anderson, Margot; Carrier, Paul; Conti, John
Subject: RE: More NEP assignments

Margot, I see you've asked BPA for help on hydro licensing.

Crystal

-----Original Message-----
From: Anderson, Margot [mailto:Margot.Anderson@hq.doe.gov]
Sent: Thursday, March 29, 2001 1:46 PM
To: Breed, William; Conti, John; Kripowicz, Robert; Braitsch, Jay; Haspel, Abe; Zimmerman, MaryBeth; 'caball@bpa.gov'; Friedrichs, Mark; Carrier, Paul; Moses, David; Vernet, Jean; Baer, Mitchell
Cc: Kolevar, Kevin; Kelliher, Joseph
Subject: More NEP assignments

All,

15480

206

Williams, Ronald L

F - 5

From: Symons.Jeremy@epamail.epa.gov%internet [Symons.Jeremy@epamail.epa.gov]
Sent: Thursday, March 29, 2001 3:12 PM
To: Anderson, Margot
Cc: Wynn.Lynda@epamail.epa.gov%internet
Subject: RE: URGENT: 1-pagers for NEPD

I believe the issue is safe drinking water act as it applies to hydraulic fracturing. I have no idea who might work on it at DOE. Do you, Lynda?

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

"Anderson, Margot" <Margot.Anderson@hq.doe.gov>
03/29/2001 02:04 PM

To: Jeremy Symons/DC/USEPA/US@EPA
cc: Lynda Wynn/DC/USEPA/US@EPA
Subject: RE: URGENT: 1-pagers for NEPD

Working on it. Not sure who. I thought the broader issue was Safe Drinking Water. Do you have someone in mind?

----Original Message----
From: Symons.Jeremy@epamail.epa.gov%internet
[mailto:Symons.Jeremy@epamail.epa.gov]
Sent: Thursday, March 29, 2001 1:54 PM
To: Anderson, Margot
Cc: Wynn.Lynda@epamail.epa.gov%internet
Subject: URGENT: 1-pagers for NEPD

Margot,

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

tmp.htm

I believe the issue is safe drinking water act as it applies to hydraulic fracturing. I have no idea who might work on it at DOE. Do you, Lynda?

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

"Anderson, Margot" <Margot.Anderson@hq.doe.gov>

03/29/2001 02:04 PM

To: Jeremy Symons/DC/USEPA/US@EPA
cc: Lynda Wynn/DC/USEPA/US@EPA
Subject: RE: URGENT: 1-pagers for NEPD

Working on it. Not sure who. I thought the broader issue was Safe Drinking Water. Do you have someone in mind?

-----Original Message-----
From: Symons.Jeremy@epamail.epa.gov%internet
[mailto:Symons.Jeremy@epamail.epa.gov]
Sent: Thursday, March 29, 2001 1:54 PM
To: Anderson, Margot
Cc: Wynn.Lynda@epamail.epa.gov%internet
Subject: URGENT: 1-pagers for NEPD

Margot,

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

3c8

(b)5

Williams, Ronald L

From: Kelliher, Joseph
Sent: Friday, March 23, 2001 8:39 AM
To: Anderson, Margot
Subject: policy options

Importance: High

neplist1.doc

Williams, Ronald L

From:	Charles_M._Smith@ovp.eop.gov%internet [Charles_M._Smith@ovp.eop.gov]
Sent:	Thursday, March 29, 2001 2:19 PM
To:	Kelliher, Joseph; Kolevar, Kevin; Anderson, Margot; Juleanna_R._Glover@ovp.eop.gov% internet; Kmurphy@osec.doc.gov%internet; Dina.Ellis@do.treas.gov%internet; Sue_Ellen_Wooldridge@IOS.DOI.gov%internet; Joel_D._Kaplan@who.eop.gov%internet; Keith.Collins@USDA.gov%internet; Joseph.Glauber@USDA.gov%internet; Galloglysj@State.gov%internet; McManusmt@State.gov%internet; Michelle.Poche@OST.DOT.Gov%internet; Patricia.Stahlschmidt@FEMA.gov%internet; Brenner.Rob@EPA.gov%internet; Symons.Jeremy@EPA.gov%internet; Beale.John@EPA.gov%internet; MPeacock@omb.eop.gov%internet; Mark_A. _Weatherly@omb.eop.gov%internet; Robert_C._McNally@opd.eop.gov%internet; Jhowardj@ceq.eop.gov%internet; William_bettenberg@IOS.DOI.gov%internet; Tom_fulton@IOS.DOI.gov%internet; Kjersten_drager@ovp.eop.gov%internet; Mleblanc@ceq.eop.gov%internet; Bruce.Baughman@FEMA.gov%internet; Charles.m.Hess@USACE.army.mil%internet; commcoll@aol.com%internet; Carol_J. _Thompson@who.eop.gov%internet; Sandra_L._Via@omb.eop.gov%internet; Megan_D. _Moran@ovp.eop.gov%internet; Ronald_L._Silberman@omb.eop.gov%internet; Lori_A. _Krauss@omb.eop.gov%internet; WheelerE@State.gov%internet
Cc:	Andrew_D._Lundquist@ovp.eop.gov%internet; Karen_Y._Knutson@ovp.eop.gov%internet; John_fenzel@ovp.eop.gov%internet
Subject:	Draft DOT Recommendations

dotrec1.doc

Attached is a draft of DOT's recommendations.

(b)5

Williams, Ronald L

From:	Cook, Trevor
Sent:	Thursday, March 22, 2001 1:00 PM
To:	Anderson, Margot
Cc:	Magwood, William
Subject:	figure for Nuclear Chapter 8

Margot,

thanks, Trev.

line chart.ppt

314

B - 5

Williams, Ronald L

From: Braitsch, Jay
Sent: Thursday, March 29, 2001 3:13 PM
To: Anderson, Margot
Subject: RE: More NEP assignments

Importance: High

I have not been able to make contact with the people who cover these issues and hydraulic fracturing.

-----Original Message-----
From: Anderson, Margot
Sent: Thursday, March 29, 2001 1:46 PM
To: Breed, William; Conti, John; Kripowicz, Robert; Braitsch, Jay; Haspel, Abe; Zimmerman, MaryBeth; 'caball@bpa.gov'; Friedrichs, Mark; Carrier, Paul; Moses, David; Vernet, Jean; Baer, Mitchell
Cc: Kolevar, Kevin; Kelliher, Joseph
Subject: More NEP assignments

All,

Principals meeting groups (Friday, noon deadline):

If this is unclear, give me a call.

Margot

15505

B-5

Williams, Ronald L

From: Conti, John
Sent: Thursday, March 29, 2001 3:14 PM
To: Anderson, Margot
Subject: RE: More NEP assignments

Margot,

As we discussed in staff on Monday, I will be in Chicago tomorrow. I think;

We also need to talk about what needs to get done and the current version of the "policies" to work from. Please call me ASAP.

-----Original Message-----
From: Anderson, Margot
Sent: Thursday, March 29, 2001 1:46 PM
To: Breed, William; Conti, John; Kripowicz, Robert; Braitsch, Jay; Haspel, Abe; Zimmerman, MaryBeth; 'caball@bpa.gov'; Friedrichs, Mark; Carrier, Paul; Moses, David; Vernet, Jean; Baer, Mitchell
Cc: Kolevar, Kevin; Kelliher, Joseph
Subject: More NEP assignments

All,

Principals meeting groups (Friday, noon deadline):

If this is unclear, give me a call.

Margot

"Anderson, Margot" <Margot.Anderson@hq.doe.gov>
03/29/2001 02:04 PM

To: Jeremy Symons/DC/USEPA/US@EPA
cc: Lynda Wynn/DC/USEPA/US@EPA
Subject: RE: URGENT: 1-pagers for NEPD

Working on it. Not sure who. I thought the broader issue was Safe Drinking Water. Do you have someone in mind?

----Original Message----
From: Symons.Jeremy@epamail.epa.gov%internet
[mailto:Symons.Jeremy@epamail.epa.gov]
Sent: Thursday, March 29, 2001 1:54 PM
To: Anderson, Margot
Cc: Wynn.Lynda@epamail.epa.gov%internet
Subject: URGENT: 1-pagers for NEPD

Margot,

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

<< File: tmp.htm >>

tmp.htm

2.16

B - 5

Williams, Ronald L

From: Breed, William
Sent: Thursday, March 29, 2001 3:56 PM
To: Anderson, Margot
Subject: RE: chapter 10 (international)

Comments on NEP Chap 10 - International

William Breed
Acting Director, Office of Energy Efficiency,
Alternative Fuels, and Oil Analysis (PO-22)
202-586-4763

-----Original Message-----
From: Anderson, Margot
Sent: Thursday, March 29, 2001 10:20 AM
To: Conti, John; Haspel, Abe; Zimmerman, MaryBeth; Lockwood, Andrea; Breed, William; KYDES, ANDY; Whatley, Michael; Carter, Douglas; Braitsch, Jay; Melchert, Elena; Cook, Trevor; Breed, William; 'jkstier@bpa.gov'; York, Michael; Freitas, Christopher; Friedrichs, Mark; Pumphrey, David; Kolevar, Kevin
Cc: Kelliher, Joseph
Subject: chapter 10 (international)

15508

All,

Margot

<< File: 03_29_01_NEPG Study_R4.doc >>

3/17

(6)5

Williams, Ronald L

From: Michael York
Sent: Friday, March 23, 2001 3:24 PM
To: Anderson, Margot
Cc: Zimmerman, MaryBeth
Subject: What States are doing on energy efficiency

State Energy Efficiency Progra...

Margot, here's the second request -:

15510

Williams, Ronald L

From: Symons.Jeremy@epamail.epa.gov%internet [Symons.Jeremy@epamail.epa.gov]
Sent: Monday, March 26, 2001 11:16 AM
To: Anderson, Margot
Subject: Energy star box


tmp.htm


energystarbox.wpd

Here it is... sorry for the delay. We can send you an electronic file with the label if you don't have it readily available.

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

15513

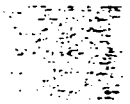
321

Here it is... sorry for the delay. We can send you an electronic file with the label if you don't have it readily available.

Jeremy Symons
EPA, Office of Air and Radiation
(202) 564-9301
Fax: (202) 501-0394

323

b(5)



Michael McCabe

04/26/2001 02:48:32 PM

To: Michael York/EE/DOE@DOE
cc: Robert Kripowicz@HQMAIL@HQDOE, MaryBeth Zimmerman/EE/DOE@DOE, Mark Ginsberg/EE/DOE@DOE, Robert Dixon/EE/DOE@DOE, Tom Gross/EE/DOE@DOE, Denise Swink/EE/DOE@DOE, Elizabeth Shearer/EE/DOE@DOE, Barbara Sisson/EE/DOE@DOE, Richard Moorer/EE/DOE@DOE, William Parks/EE/DOE@DOE, Robert Brewer/EE/DOE@DOE, Joan Glickman/EE/DOE@DOE, Abe Haspel/EE/DOE@DOE, Darrell Beschen/EE/DOE@DOE

Subject: Secretary meeting with American Gas Association

Mike, as I mentioned, the Secretary is meeting with AGA next Friday, May 4. Doug Faulkner has requested we put together a briefing package for the meeting.

Michael

---------- Forwarded by Michael McCabe/EE/DOE on 04/26/2001 02:34 PM ----------

Doug Faulkner@HQMAIL on 04/26/2001 12:38:52 PM

To: Michael McCabe/EE/DOE@DOE@HQMAIL
cc:

Subject: secy mtg with rick shelby american gas assoc on may 4th: need backgrounder

also attending are gary neale, CEo, NlSource; dave parker, CEO, american gas assoc

15516

324

Williams, Ronald L

From: KYDES, ANDY
Sent: Monday, March 26, 2001 3:53 PM
To: Anderson, Margot
Cc: Maples, John
Subject: FW: March 25 version of Chapter 6


CH6EFF~1.PPT


LIGHTV~1.PPT

Margot:

Is this something like what you want (Light duty vehicle effiency)? The graph
may be more presentable if shown as groups of 3 bar graphs for years 1980, 1985,
1990, 1995, latest year.

John Maples: Lets see if that is what Margot wants before we do it.

Andy

----Original Message----
From: Maples, John
Sent: Monday, March 26, 2001 12:01 PM
To: Kydes, Andy
Subject: RE: March 25 version of Chapter 6

Andy,

The attached file is original PowerPoint slides plus the new slide showing new
vehicle mpg for both cars and light trucks and the stock average fuel efficiency
for all light duty vehicles.

John

----Original Message----
From: Kydes, Andy
Sent: Monday, March 26, 2001 11:29 AM
To: Maples, John
Subject: RE: March 25 version of Chapter 6

John,

15517

525

1625

[redacted]
02/14/2001 04:31 PM

To: Joel Rubin
cc:

Subject: Re: FW: NEP Draft outline

---------- Forwarded by Darrell Beschen/EE/DOE on 02/14/2001 04:31 PM ----------

Peggy Podolak
02/14/2001 03:40 PM

To: Darrell Beschen/EE/DOE@DOE
cc:

Subject: Re: FW: NEP Draft outline

http://washingtonpost.com/wp-dyn/articles/A33072-2000Dec20.html
DARRELL BESCHEN

[redacted]
02/14/2001 03:04 PM

To: Kenneth Friedman/EE/DOE@DOE, Peggy Podolak/EE/DOE@DOE, Linda Silverman/EE/DOE@DOE, Ed Wall/EE/DOE@DOE, David Rodgers/EE/DOE@DOE, Jerry Dion/EE/DOE@DOE, Gail McKinley/EE/DOE@DOE, Lawrence Mansueti/EE/DOE@DOE, John Sullivan/EE/DOE@DOE, Michael York/EE/DOE@DOE, Buddy Garland/EE/DOE@DOE, Nancy Jeffery/EE/DOE@DOE, Joel Rubin/EE/DOE@DOE, Sam Baldwin/EE/DOE@DOE, #EE-ADAS
cc:

Subject: Re: FW: NEP Draft outline

Mary beth sent you the directions on the nep assessment paper this morning, this is the follow-up. I have been asked to act as the principal point of contact.

(6)5

[redacted]
02/14/2001 03:43 PM

To: Joel Rubin, "Nicholls, Andrew K" <ak.nicholls@pnl.gov>
cc:

Subject: Re: FW: NEP Draft outline

---------- Forwarded by Darrell Beschen/EE/DOE on 02/14/2001 03:43 PM ----------

[redacted]
02/14/2001 03:04 PM

To: Kenneth Friedman/EE/DOE@DOE, Peggy Podolak/EE/DOE@DOE, Linda Silverman/EE/DOE@DOE, Ed Wall/EE/DOE@DOE, David Rodgers/EE/DOE@DOE, Jerry Dion/EE/DOE@DOE, Gail McKinley/EE/DOE@DOE, Lawrence Mansueti/EE/DOE@DOE, John Sullivan/EE/DOE@DOE, Michael York/EE/DOE@DOE, Buddy Garland/EE/DOE@DOE, Nancy Jeffery/EE/DOE@DOE, Joel Rubin/EE/DOE@DOE, Sam Baldwin/EE/DOE@DOE, #EE-ADAS
cc:

Subject: Re: FW: NEP Draft outline

Mary beth sent you the directions on the nep assessment paper this morning, this is the follow-up. I have been asked to act as the principal point of contact.

327

(6) 5-

[redacted]
02/14/2001 03:04 PM

To: Kenneth Friedman/EE/DOE@DOE, Peggy Podolak/EE/DOE@DOE, Linda Silverman/EE/DOE@DOE, Ed Wall/EE/DOE@DOE, David Rodgers/EE/DOE@DOE, Jerry Dion/EE/DOE@DOE, Gail McKinley/EE/DOE@DOE, Lawrence Mansueti/EE/DOE@DOE, John Sullivan/EE/DOE@DOE, Michael York/EE/DOE@DOE, Buddy Garland/EE/DOE@DOE, Nancy Jeffery/EE/DOE@DOE, Joel Rubin/EE/DOE@DOE, Sam Baldwin/EE/DOE@DOE, #EE-ADAS

cc:

Subject: Re: FW: NEP Draft outline

Mary beth sent you the directions on the nep assessment paper this morning, this is the follow-up. I have been asked to act as the principal point of contact.

320

Williams, Ronald L

(b 5

From: Breed, William
Sent: Monday, March 26, 2001 1:29 PM
To: Anderson, Margot
Subject: quick comments on list of policies

Margot: here are some notes!
-- Bill

15524