Cc: Moran, Robin[moran.robin@epa.gov]
To: Bolon, Kevin[Bolon.Kevin@epa.gov]
From: John German
Sent: Fri 9/16/2016 6:41:47 PM
Subject: Re: 9/22 Hearing

Thanks, Kevin.
What about some of the technologies that are just now starting to enter production? Specifically, did the TAR include or evaluate any of the following technologies:

- Miller cycle (for turbos)
- E-boost (48v)
- Variable Compression Ratio
- VGT (variable geometry turbo) for gasoline engines
- Dynamic cylinder deactivation (i.e. deactivating individual cylinders every other stroke)

John

On Sep 16, 2016, at 10:46 AM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

Yes, there were multiple updates to cost and efficiency.

Focusing on EPA's analysis here, in addition to the newly added and very important ATK2 and 48V MHEV technologies mentioned below, here are some of the other highlights:
- Updated mass reduction costs, based on 4 independent teardown studies (Venza, Accord, 2011 and 2014 Silverado's), which at lower levels of mass reduction produced lower costs than the FRM estimates. Some of these cost savings were not available in our analysis with an updated baseline fleet, which we estimated had on average 2%MR relative to our 0% point on the cost curve.
- Increased effectiveness of future 8-speed transmissions (referred to as TRX22 in the TAR), as informed by benchmarking of multiple transmissions, published reports of future planned improvements by ZF, and results from our physics-based Alpha model.
- A significant reduction in battery cost estimates for the TAR for EVs and PHEVs as a result of updated battery and motor sizing estimates, and the application of DOE's latest version of the BatPaC model.
- Improved on-cycle effectiveness estimates for stop-start, based on more recent implementations of the technology

Not all of the changes from the FRM were in the direction of lower costs and higher effectiveness. Specifically:
- lowered effectiveness estimate for cylinder deactivation, based on our benchmarking of the Silverado V6 Ecotec engine
- costs for TDS24 are higher due to the additional costs of a variable geometry turbocharger with was not accounted for in the FRM.

I may have left out a few of the differences from the FRM, but those are the main

ones. And for all the technologies, costs have been updated using 2013$, and an updated learning rate.

You asked a question in your other email about why we saw lower MR rates in the TAR than the FRM. First, I would point out that they are only slightly lower (6% vs 7%). But it's still a reasonable question, especially given our updated cost curves. I think there are a few factors at play here. First, that's the fleet average. There are specific vehicles, trucks especially, that have higher levels applied. Second, the fact that more MR wasn't applied really speaks to the range of other technologies that manufacturers have available for a cost-effective compliance pathway. In all of our sensitivity analyses, the consistent theme was that our results were not dependent on any one single technology. Restricting the application of a single technology (e.g. ATK2, or even MR) resulted in an increase in the penetration of other technologies, but did not really have a major impact on the $/vehicle compliance costs. That might be a point that's worth mentioning in your testimony: The MY2022-2025 standards are not dependent on any single technology; There are multiple promising technology pathways, and there are already several examples where different strategies employed by manufactures have produced competition in innovation (AT vs CVT, TDS vs ATK2, HSS vs Aluminum, etc.)

-Kevin

From: John German [mailto:john@theicct.org]
Sent: Thursday, September 15, 2016 5:35 PM
To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

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Were there any significant changes to the cost or efficiency improvement estimates from the rulemaking to the TAR?

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On Sep 15, 2016, at 5:18 PM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

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I do have a specific question. Why is weight reduction lower in the TAR than in the rulemaking? There have been all kinds of reports since the rulemaking showing that weight reduction will be much lower cost than estimated in the rulemaking.
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I will focus primarily on technology innovations over the last 5 years, based primarily on the series of technology papers ICCT is publishing in cooperation with suppliers. I will also discuss the problem with using (a) older estimates and (b) assuming technology innovation stops today. Technology is developing so fast that either of these will yield higher cost estimates, not because there is anything wrong with the methods, simply because the latest developments are not included. I might use the best-in-class analysis done by Novation Analytics as an example - for example, their report stated, ""Novation's approach means that the best-in-class technology today would be the average performance of that same technology in 2025." They present this as though current best-in-class technology is the best we can do by 2025. The reality is that the average vehicle in 2025 will be much more efficient that best-in-class technology today.

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Hi John,

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Ex. 6 - Personal Privacy

Take care,

Robin

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Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

Cc: Bolon, Kevin[Bolon.Kevin@epa.gov]
To: Moran, Robin[moran.robin@epa.gov]
From: John German
Sent: Thur 9/15/2016 3:27:13 PM
Subject: Re: 9/22 Hearing

Yes, excellent point on the tear-down cost studies. I will certainly include.
I have read the executive summary of the TAR. It is very helpful, but a side-by-side comparison of the technology projections would be amazing. Especially if it included the different assessments in the TAR from EPA and NHTSA (the assessments in the rulemaking were close enough that I don't need separate EPA/NHTSA estimates for the rulemaking).

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From: John German [mailto:john@theicct.org]
Sent: Wednesday, September 14, 2016 4:58 PM
To: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

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To: John German[john@theicct.org]
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To: John German[john@theicct.org]
Cc: Moran, Robin[moran.robin@epa.gov]
From: Bolon, Kevin
Sent: Mon 9/19/2016 9:57:33 PM
Subject: RE: 9/22 Hearing

Because the fundamental mechanisms for improving transmissions are not specific to the particular architecture (broader ratio spreads, improved matching between load and engine operation point, improved transmission efficiency) for the TAR we defined effectiveness improvements by generic transmission categories: TRX11 is used to characterize CVTs and 6spd ATs, and associated improvements over current 4 and 5 speed transmissions. TRX21 is used to characterize wider ratios of 7+ speed AT transmissions available today. Future transmission efficiency gains in CVTs are represented by the incremental improvements from TRX11 to TRX21.

To answer your question directly, yes, we did reassess CVT's for the TAR based on data from actual CVT implementations and ALPHA modeling that accounted for CVT-specific losses, and ratio change strategy. Based on that assessment, we estimated effectiveness improvement to go from a current 4 speed (i.e. null tech package) to a current CVT to be about 7%, which is the same improvement we assumed to go from a 4 speed to a 6 speed AT. For future CVT transmissions, we assumed it would provide 13% emissions reduction form the current 4 speed, which is the same improved assumed for a current 7+ speed AT related to a 4 speed. The penetration of TRX21 in our analysis in MY2025 was 51.5%, but we did not attempt to draw a distinction between how much of that 51.5% was improved CVT's, and how much was 7+ speed ATs.

- Kevin

From: John German [mailto:john@theicct.org]
Sent: Monday, September 19, 2016 4:45 PM
To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

Also, what about CVTs? Their market penetration doubled from 2012 (9%) to 2015 (18%), yet you still have these as zero in 2025. Did you reassess CVTs for the TAR?

John

On Sep 19, 2016, at 2:01 PM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

Full hybrids in our analysis do use an Atkinson cycle, but a low compression ratio type such as the one used in the current Prius (thus the distinction between ATK1 for low CR, and ATK2 for high CR). The summary I provided does include MHEVs in the tech pens for IC engine technologies, but since ATK1 is not shown, HEVs are not included in tech pens for IC engines technologies (although the more detailed breakdown of tech pens that I attached in that earlier Excel file does show ATK1 tech pens).

Acronyms were defined as they were discussed in the text of the TAR, but there is no consolidated list of technology acronyms. For the most part, they should be self-explanatory, but obviously there are cases (like above) where it's not. If you have a few specific acronym that you would like some further explanation, please let me know.

-Kevin

From: John German [mailto:john@theicct.org]
Sent: Monday, September 19, 2016 1:30 PM
To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

Thanks, Kevin. Answer on Miler cycle makes sense - but less so on the balance of vehicles. Full and mild HEVs are still primarily dependent on ICE for propulsion. Your summary should include the engines used in hybrid applications.

Also, could you point me towards a list of definitions for all the of acronyms in your 4 worksheets?

John

On Sep 19, 2016, at 12:28 PM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

About 8% of the balance of vehicles have strong electrification (3%HEV, 2%PHEV, 3%EV). The remaining 10% or so of vehicles have some mild hybridization, although I don't have the exact proportion readily available since that MHEV technology is also present on some of the ATK2 and TDS vehicles. Between ATK2, TDS, MHEV, PHEV, and EV, it's going to be close to or equal to 100% of the fleet.

You had another question about the 4% penetration of Miller cycle, and why it was so low. The short answer is that, unlike TDS24, there is no engine downsizing assumed with the addition of Miller cycle. So although there is a substantial effectiveness benefit, the costs are higher than TDS24 because there's no potential to drop cylinders from I4→I3/V6→I4/V6→V8.

I hope that helps,

Kevin

From: John German [mailto:john@theicct.org]
Sent: Saturday, September 17, 2016 5:32 PM
To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

Sorry, I do have another question.

When I add up the various turbo and Atkinson percentages, I don't get anywhere close to 100%, i.e. 37% turbo, 44% Atkinson, or 81% total. What are the rest?

John

On Sep 16, 2016, at 7:10 PM, John German <john@theicct.org> wrote:

Hopefully I will have no more questions, Kevin. Thanks again for all your help.

John

On Sep 16, 2016, at 6:01 PM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

We didn't apply any additional restrictions to Miller cycle, beyond the relatively high (75%) penetration caps that are applied to TDS24, so your question about the relatively low penetration is a good one. My initial thought is that, like mass reduction penetrations, it really just illustrates how manufacturers have a number of cost effective options for compliance, but let me do a little more investigating to see if there were any other factors.

I'm headed home for the day, but if you send along any other questions over the weekend, I should be able to respond on Monday.

-Kevin

From: John German [mailto:john@theicct.org]
Sent: Friday, September 16, 2016 4:17 PM
To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

Exactly. :)

You only applied Miller cycle to 4% of the 2025 fleet? Why so conservative? The first applications are already in production and the turbo suppliers tell us that everyone is headed this way.

John

On Sep 16, 2016, at 3:56 PM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

We did include Miller cycle, which is represented in the tech pen table that I provided as 'TURBM'. We referenced the engine map published by VW on their 2016 2.0L EA888 engine in the TAR, and technology was applied to 4% of the 2025 fleet in our OMEGA analysis.

We also included variable geometry turbo; our estimates for TDS24 cost and effectiveness are based on the assumption that this technology is employed.

We did not explicitly model e-boost, VCR, or dynamic cylinder deactivation. Nor did we model HCCI, water injected turbos, or 48V MHEVs with a P2 configuration, although we do discuss the state of all of these technologies in the TAR write up. I think that remember hearing you mention before that EPA's analyses tend to be inherently conservative because we model only those technologies that we have a high degree of certainty in. It's obviously critical that we have a robust, defensible analysis, while at the same time, in response to criticism that we are overly optimistic, it seems fair for you to note in your testimony that we have not included these potentially promising future technologies, and of course there may be other technology innovations that are unforeseen.

- Kevin

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Sent: Friday, September 16, 2016 2:42 PM

To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

Thanks, Kevin.

What about some of the technologies that are just now starting to enter production? Specifically, did the TAR include or evaluate any of the following technologies:

- Miller cycle (for turbos)
- E-boost (48v)
- Variable Compression Ratio
- VGT (variable geometry turbo) for gasoline engines
- Dynamic cylinder deactivation (i.e. deactivating individual cylinders every other stroke)

John

On Sep 16, 2016, at 10:46 AM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

Yes, there were multiple updates to cost and efficiency.

Focusing on EPA's analysis here, in addition to the newly added and very important ATK2 and 48V MHEV technologies mentioned below, here are some of the other highlights:

- Updated mass reduction costs, based on 4 independent teardown studies (Venza, Accord, 2011 and 2014 Silverado's), which at lower levels of mass reduction produced lower costs than the FRM estimates. Some of these cost savings were not available in our analysis with an updated baseline fleet, which we estimated had on average 2%MR relative to our 0% point on the cost curve.

- Increased effectiveness of future 8-speed transmissions (referred to as TRX22 in the TAR), as informed by benchmarking of multiple transmissions, published reports of future planned improvements by ZF, and results from our physics-based Alpha model.

- A significant reduction in battery cost estimates for the TAR for EVs and PHEVs as a result of updated battery and motor sizing estimates, and the application of DOE's latest version of the BatPaC model.

- Improved on-cycle effectiveness estimates for stop-start, based on more recent implementations of the technology

Not all of the changes from the FRM were in the direction of lower costs and higher effectiveness. Specifically:

- lowered effectiveness estimate for cylinder deactivation, based on our benchmarking of the Silverado V6 Ecotec engine

- costs for TDS24 are higher due to the additional costs of a variable geometry turbocharger with was not accounted for in the FRM.

I may have left out a few of the differences from the FRM, but those are the main ones. And for all the technologies, costs have been updated using 2013$, and an updated learning rate.

You asked a question in your other email about why we saw lower MR rates in the TAR than the FRM. First, I would point out that they are only slightly lower (6% vs 7%). But it's still a reasonable question, especially given our updated cost curves. I think there are a few factors at play here. First, that's the fleet average. There are specific vehicles, trucks especially, that have higher levels applied. Second, the fact that more MR wasn't applied really speaks to the range of other technologies that manufacturers have available for a cost-effective compliance pathway. In all of our sensitivity analyses, the consistent theme was that our results were not dependent on any one single technology. Restricting the application of a single technology (e.g. ATK2, or even MR) resulted in an increase in the penetration of other technologies, but did not really have a major impact on the $/vehicle compliance costs. That might be a point that's worth mentioning in your testimony: The MY2022-2025 standards are not dependent on any single technology; There are multiple promising technology

pathways, and there are already several examples where different strategies employed by manufactures have produced competition in innovation (AT vs CVT, TDS vs ATK2, HSS vs Aluminum, etc.)

-Kevin

From: John German [mailto:john@theicct.org]
Sent: Thursday, September 15, 2016 5:35 PM
To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

Thanks, Kevin. Very helpful.

Were there any significant changes to the cost or efficiency improvement estimates from the rulemaking to the TAR?

John

On Sep 15, 2016, at 5:18 PM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

Hi John,

As Robin, mentioned, we didn't include a side-by-side comparison of tech pens in the TAR, but it was relatively easy

for me to pull together from the FRM and TAR text, and materials posted to the docket. The table below (also in the attached file) shows tech pens for EPA's MY2025 control case analyses. The trends are as one would expect; highly cost-effective technologies like low rolling resistance tires, advanced transmissions, improved accessories, and engine friction reduction all have very high penetration rates in both the FRM and TAR. Aero2 and electric power steering were also almost universally applied in the TAR, but aren't shown here because those numbers weren't presented in the FRM (I'm sure that the FRM did have high penetration of those techs).

<image003.png>

The most significant change in the TAR tech penetrations was due to the addition of the cost-effective ATK2 technology (i.e. high compression Atkinson engines, like Mazda's SkyActiv), which resulted in a reduction in the penetrations of turbo downsizing and hybridization. We also implemented a more cost effective Mild Hybrid, based on a 48V system, but since there are a variety of other cost-effective technologies available, penetration was less than 20% of the fleet in the TAR.

I have not included NHTSA's tech penetrations, which show much lower penetrations of high compression Atkinson engines due to restrictions in the CAFE analysis that limit application of the technology to three manufacturers.

I'll be available tomorrow afternoon, so please feel free to call or email with any follow-up questions you have. Good luck with your testimony!

-Kevin

Kevin Bolon, Ph.D.
Light Duty Center, Assessment and Standards Division
National Vehicle and Fuel Emissions Laboratory

U.S. EPA, Office of Transportation and Air Quality
734-214-4331 bolon.kevin@epa.gov

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Thanks, Kevin.

I won't have a chance to start working on my testimony until tomorrow, so if I could get this by about 2:00 pm tomorrow (Friday), that would be great.

John

On Sep 15, 2016, at 3:11 PM, Moran, Robin <moran.robin@epa.gov> wrote:

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<EPA tech penetrations - FRM vs TAR_20160915.xlsx>

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Cc: Moran, Robin[moran.robin@epa.gov]
From: Bolon, Kevin
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Focusing on EPA's analysis here, in addition to the newly added and very important ATK2 and 48V MHEV technologies mentioned below, here are some of the other highlights:

- Updated mass reduction costs, based on 4 independent teardown studies (Venza, Accord, 2011 and 2014 Silverado's), which at lower levels of mass reduction produced lower costs than the FRM estimates. Some of these cost savings were not available in our analysis with an updated baseline fleet, which we estimated had on average 2%MR relative to our 0% point on the cost curve.

- Increased effectiveness of future 8-speed transmissions (referred to as TRX22 in the TAR), as informed by benchmarking of multiple transmissions, published reports of future planned improvements by ZF, and results from our physics-based Alpha model.

- A significant reduction in battery cost estimates for the TAR for EVs and PHEVs as a result of updated battery and motor sizing estimates, and the application of DOE's latest version of the BatPaC model.

- Improved on-cycle effectiveness estimates for stop-start, based on more recent implementations of the technology

Not all of the changes from the FRM were in the direction of lower costs and higher effectiveness. Specifically:

- lowered effectiveness estimate for cylinder deactivation, based on our benchmarking of the Silverado V6 Ecotec engine

- costs for TDS24 are higher due to the additional costs of a variable geometry turbocharger with was not accounted for in the FRM.

I may have left out a few of the differences from the FRM, but those are the main ones. And for all the technologies, costs have been updated using 2013$, and an updated learning rate.

You asked a question in your other email about why we saw lower MR rates in the TAR than the FRM. First, I would point out that they are only slightly lower (6% vs 7%). But it's still a reasonable question, especially given our updated cost curves. I think there are a few factors at play here. First, that's the fleet average. There are specific vehicles, trucks especially, that have higher levels applied. Second, the fact that more MR wasn't applied really speaks to the range of other technologies that manufacturers have available for a cost-effective compliance pathway. In all of our sensitivity analyses, the consistent theme was that our results were not dependent on any one single technology. Restricting the application of a single technology (e.g. ATK2, or even MR) resulted in an increase in the penetration of other technologies, but did not really have a major impact on the $/vehicle compliance costs. That might be a point that's worth mentioning in your testimony: The MY2022-2025 standards are not dependent on any single technology; There are multiple promising technology pathways, and there are already several examples where different strategies employed by manufactures have produced competition in innovation (AT vs CVT, TDS vs ATK2, HSS vs Aluminum, etc.)

-Kevin

From: John German [mailto:john@theicct.org]
Sent: Thursday, September 15, 2016 5:35 PM
To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

Thanks, Kevin. Very helpful.

Were there any significant changes to the cost or efficiency improvement estimates from the rulemaking to the TAR?

John

On Sep 15, 2016, at 5:18 PM, Bolon, Kevin <Bolon.Kevin@epa.gov> wrote:

Hi John,

As Robin, mentioned, we didn't include a side-by-side comparison of tech pens in the TAR, but it was relatively easy for me to pull together from the FRM and TAR text, and materials posted to the docket. The table below (also in the attached file) shows tech pens for EPA's MY2025 control case analyses. The trends are as one would expect; highly cost-effective technologies like low rolling resistance tires, advanced transmissions, improved accessories, and engine friction reduction all have very high penetration rates in both the FRM and TAR. Aero2 and electric power steering were also almost universally applied in the TAR, but aren't shown here because those numbers weren't presented in the FRM (I'm sure that the FRM did have high penetration of those techs).

<image003.png>

The most significant change in the TAR tech penetrations was due to the addition of the cost-effective ATK2 technology (i.e. high compression Atkinson engines, like Mazda's SkyActiv), which resulted in a reduction in the penetrations of turbo downsizing and hybridization. We also implemented a more cost effective Mild Hybrid, based on a 48V system, but since there are a variety of other cost-effective technologies available, penetration was less than 20% of the fleet in the TAR.

I have not included NHTSA's tech penetrations, which show much lower penetrations of high compression Atkinson engines due to restrictions in the CAFE analysis that limit application of the technology to three manufacturers.

I'll be available tomorrow afternoon, so please feel free to call or email with any follow-up questions you have. Good luck with your testimony!

-Kevin

Kevin Bolon, Ph.D.
Light Duty Center, Assessment and Standards Division
National Vehicle and Fuel Emissions Laboratory
U.S. EPA, Office of Transportation and Air Quality
734-214-4331 bolon.kevin@epa.gov

From: John German [mailto:john@theicct.org]
Sent: Thursday, September 15, 2016 3:34 PM
To: Moran, Robin <moran.robin@epa.gov>
Cc: Bolon, Kevin <Bolon.Kevin@epa.gov>
Subject: Re: 9/22 Hearing

Thanks, Kevin.

I won't have a chance to start working on my testimony until tomorrow, so if I could get this by about 2:00 pm tomorrow (Friday), that would be great.

John

On Sep 15, 2016, at 3:11 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi John, Kevin's working on it for you.

From: John German [mailto:john@theicct.org]
Sent: Thursday, September 15, 2016 11:27 AM
To: Moran, Robin <moran.robin@epa.gov>
Cc: Bolon, Kevin <Bolon.Kevin@epa.gov>
Subject: Re: 9/22 Hearing

Yes, excellent point on the tear-down cost studies. I will certainly include.

I have read the executive summary of the TAR. It is very helpful, but a side-by-side comparison of the technology projections would be amazing. Especially if it included the different assessments in the TAR from EPA and NHTSA (the assessments in the rulemaking were close enough that I don't need separate EPA/NHTSA estimates for the rulemaking).

John

On Sep 15, 2016, at 11:23 AM, Moran, Robin <moran.robin@epa.gov> wrote:

John,

Thanks, this all sounds great. Glad to help on anything you need regarding

the TAR. There's a 12-page Executive Summary that might be best to read first https://www3.epa.gov/otaq/climate/documents/mte/420d16901.pdf

Though we didn't publish in the TAR a handy side-by-side tech pen table, Kevin Bolon will put that together and send you directly later today.

Would also be great if you mentioned the rigorous peer-reviewed state-of-the-art cost studies we've done to support rules, including pointing to the NAS's endorsement of such approaches as the most appropriate way to get at costs. This to counter what we may see from others as "surveys" of automakers purporting higher costs.

Just heard Mark Cooper of CFA is testifying too, so maybe you and he can compare notes.

Glad you got away in August!

Robin

From: John German [mailto:john@theicct.org]
Sent: Wednesday, September 14, 2016 4:58 PM
To: Moran, Robin <moran.robin@epa.gov>
Subject: Re: 9/22 Hearing

I will focus primarily on technology innovations over the last 5 years, based primarily on the series of technology papers ICCT is publishing in cooperation with suppliers. I will also discuss the problem with using (a) older estimates and (b) assuming technology innovation stops today. Technology is developing so fast that either of these will yield higher cost estimates, not because there is anything wrong with the methods, simply because the latest developments are not included. I might use the best-in-class analysis done by Novation Analytics as an

example - for example, their report stated, ""Novation's approach means that the best-in-class technology today would be the average performance of that same technology in 2025." They present this as though current best-in-class technology is the best we can do by 2025. The reality is that the average vehicle in 2025 will be much more efficient that best-in-class technology today.

I will also discuss consumer issues. Two main points. First, there isn't a consumer backlash if the fuel savings more than pay for the increase in the monthly car payment. Second, and more important, most of these technologies have other attributes that are desired by consumers, so much of the explosion in 7+ speed transmissions, GDI, turbocharging, and lightweighting is because consumers want the performance provided by these technologies.

I might touch on safety - haven't decided yet.

One thing that would help me is if you have a summary of the TAR, in particular comparing the technology projections in the TAR to those in the 2017-25 rule. I just have not had time to read the TAR myself, as we are struggling to get our technology papers out in time to meet the Sept. 26 deadline for comments on the TAR, Ex. 6 - Personal Privacy

Ex. 6 - Personal Privacy

John

On Sep 14, 2016, at 2:28 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi John,

I hear you have the honor of being a testifier at the Congressional hearing on the midterm review next week. Could you let me know what your key messages will be, or even maybe share a draft testimony? I'm helping with all the prep for Janet's testimony.

Ex. 6 - Personal Privacy

Take care,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

<EPA tech penetrations - FRM vs TAR_20160915.xlsx>

To: Alson, Jeff[alson.jeff@epa.gov]; Moran, Robin[moran.robin@epa.gov]; Sherwood, Todd[sherwood.todd@epa.gov]; Lieske, Christopher[lieske.christopher@epa.gov]
Cc: Olechiw, Michael[olechiw.michael@epa.gov]; Charmley, William[charmley.william@epa.gov]; Birgfeld, Erin[Birgfeld.Erin@epa.gov]
From: Hula, Aaron
Sent: Wed 1/4/2017 3:25:49 PM
Subject: RE: Flagging one error in UCS comment

FYI – Dave has spent quite a bit of time on his own GHG savings calculations, and took a rather deep dive into my methodology – which I shared with him. Generally our approaches are similar, although he makes a few assumptions that differ a little from my (and the MTE) methodology. For example we use a little different starting time for when we assume vehicles of a specific model year begin to hit the road, so there's a bit of an offset.

This is mostly fine tuning not order of magnitude, but if you see some different GHG numbers from UCS there is a reason why. I'll continue to evaluate some of these things as we update the ticker.

If you're interested, a more detail explanation from Dave is below.

Aaron

From: Alson, Jeff
Sent: Saturday, December 31, 2016 3:13 PM
To: Moran, Robin <moran.robin@epa.gov>; Sherwood, Todd <sherwood.todd@epa.gov>; Hula, Aaron <Hula.Aaron@epa.gov>; Lieske, Christopher <lieske.christopher@epa.gov>
Cc: Olechiw, Michael <olechiw.michael@epa.gov>; Charmley, William <charmley.william@epa.gov>; Birgfeld, Erin <Birgfeld.Erin@epa.gov>
Subject: Flagging one error in UCS comment

In multiple places in its public comments, UCS states that the LD GHG standards have already saved 129 MMT GHG and $34 million in fuel costs.

The $34 million is a typo, it should presumably be $34 billion. I have sent a note flagging this to Dave Cooke.

Assuming that $34 billion is correct, the GHG and fuel savings values are similar, though not exactly the same, to the projections that we provide in the "ticker" that Aaron developed for our Green Vehicle Guide web page.

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Friday, October 28, 2016 3:07 PM
To: Hula, Aaron <Hula.Aaron@epa.gov>
Cc: Alson, Jeff <alson.jeff@epa.gov>
Subject: RE: GHG savings ticker

Thank you, this is very helpful. I was able to track down the major differences...some matter more than others. A couple may be things you want to think about.

The biggest difference is actually that we used the car/truck fuel economies from Trends for each fleet instead of the average value. I would have thought this would result in our analysis overestimating the net benefits relative to yours because trucks travel more miles and have seen a greater change in fuel per mile than cars, but for some reason this turns out not to be the case. I even made this edit to your spreadsheet and confirmed the same effect (see attached). I feel like an idiot for not being able to understand why this results in such a large negative effect on the benefits, so I welcome any insight you may have. That's really the biggest factor.

The other major discrepancy is one we already talked about - the way you handle the model year to calendar mileage means that your fleet has a 3 month head start.

There is a small difference in the VMT assumption, but I don't think they're that different since I also started from MOVES (although it might've been MOVES2010b) - the difference is that I grew the VMT at a rate of 1.15%/year, so it ends up increasing over time relative to yours (and it starts slightly higher because I increased it from 2006>2010). But that difference isn't really that big, and I think your assumption makes sense.

There are two differences between how we consider off-cycle credits, however -- the first is that I consider off-cycle credits separately from MPG. Because I assume that off-cycle credits are direct "real world" benefits, my off-cycle credit benefits are merely added in at the end. Because you incorporate them into an "effective MPG", yours get double-counted by the upstream factor. In thinking about this, I am thinking we are both wrong - the off-cycle and A/C efficiency credits should be counted as you suggest (part of the fuel usage), but the A/C leakage credits should be counted outside of the "fuel usage" because they are non-gasoline GHG and have no upstream (or a different upstream value).

The other issue with the off-cycle credits is that you did not assume any off-cycle credits in MY2011, but I went back to the "MY2009-2011 early credits" and have assumed that those would have been in the fleet regardless of the regs. I think this is potentially open for debate, but it does change the baseline value and the level of additional impact from the regs.

There is also the major difference of our use of the MY2010 baseline, which helps buffer against some of the other differences in our two models, but that use of the separate car/truck values is really a major (and surprising) culprit in the differences between the ticker and my analysis. Thanks for sharing your spreadsheet - I never would have figured that out otherwise. I don't know what I'll do about it, but at least I can explain it.

- Dave

To: Alson, Jeff[alson.jeff@epa.gov]; Olechiw, Michael[olechiw.michael@epa.gov]; Simon, Karl[Simon.Karl@epa.gov]; Moran, Robin[moran.robin@epa.gov]
Cc: Snapp, Lisa[snapp.lisa@epa.gov]; French, Roberts[french.roberts@epa.gov]
From: Charmley, William
Sent: Thur 8/18/2016 4:37:18 PM
Subject: Fwd: For Immediate Attention: ICCT Publication on Growing Gap between 2-cycle Test and Real World Fuel Economy in US

Sent from my iPhone

Begin forwarded message:

From: "Charmley, William" <charmley.william@epa.gov>
Date: August 18, 2016 at 12:22:22 PM EDT
To: Drew Kodjak <drew@theicct.org>
Cc: "French, Roberts" <french.roberts@epa.gov>, "Snapp, Lisa" <snapp.lisa@epa.gov>, Uwe Tietge <uwe.tietge@theicct.org>, Peter Mock <peter@theicct.org>, Anup Bandivadekar <anup@theicct.org>
Subject: Re: For Immediate Attention: ICCT Publication on Growing Gap between 2-cycle Test and Real World Fuel Economy in US

Dear Drew, Peter, Anup and others,

Thank you for reaching out to us again.

I would like to suggest that we arrange a time ASAP to discuss this report. The EPA technical staff have a number of technical issues with this report and the conclusions.

I have no doubt that ICCT reached out to me and others this past spring, and I apologize if we provided no input at that time. Most of us have had to put our lives on hold for the last 6 months I order to deliver a whole range of actions for Administrator McCarthy this spring and summer, including an RFS annual rule proposal, an aircraft GHG endangerment finding, the light duty GHG Draft TAR, and earlier this week the heavy-duty GHG Phase 2 program. Unfortunately that means a few things slipped through the cracks, including our feedback on this ICCT report.

We have a significant respect in OTAQ for the technical expertise and independence of ICCT, but I think you all would benefit from our more thoughtful feedback on this report.

Let me know if we can set something up for next week.

Best regards,

Bill

Sent from my iPhone

On Aug 17, 2016, at 12:02 AM, Drew Kodjak <drew@theicct.org> wrote:

Bill, Rob, Lisa,
In early April, I presented information at the EPA's International Compliance Summit showing ICCT research demonstrating a growing gap between real world fuel economy and type approval values in Europe and in other countries including the US.

In Europe, our research has demonstrated a growing gap from 8% in 2002 to over 40% in 2015. As a result, half of the expected benefits from EU's CO2 standards for passenger cars have not been realized - a major cause of concern and much needed regulatory attention.

In the United States, we have examined real world emissions against the two cycle and the five cycle tests. The good news is that real world emissions are very close to the values produced by the 5 cycle test. The bad news is that real world emissions compared with the 2-cycle test have grown by 11 percentage points from 2001 to 2015. Specifically, we found a gap of 14% in 2001 and 25% in 2015. While this increase is far less than in Europe, it is still substantial enough to cause concern.

In April - June, Uwe Tietge, our lead researcher on this topic, reached out to several of your staff as you suggested to seek review and engagement from EPA to ensure that our results are sound. These results also underwent extensive internal review at ICCT. At this point, we are comfortable with these results and the paper is on track for publication.

All that said, I wanted to make sure that you were aware of the latest developments well in advance of any ICCT publication. I asked Uwe to draft a short memo, which is attached, giving you the key graphics and messages.

Please let us know if you would like to follow up, recognizing that we have already reached out to you several times for review and comment, and we have a publication schedule that we would like to adhere to.

Finally, congratulations on a successful publication of the final HDV GHG regulation - a major accomplishment that will have ripple effects in major markets around the world.

<ICCT_memo_fuel_economy_gap_US.pdf>

Drew Kodjak
Executive Director
International Council on Clean Transportation
202-534-1608 (desk)
drew@theicct.org

On Apr 8, 2016, at 8:48 PM, Charmley, William <charmley.william@epa.gov> wrote:

Dear Drew,

It was good to see you yesterday.

One topic you raised to me yesterday was some new technical work that ICCT technical staff have undertaken to look at the relationship world wide between the regulatory test cycles for standard setting for GHG/CO2 and fuel economy and the comparison to the real world or fuel economy labeling test cycles. As you know, in the U.S. we us the 2-cycle FTP/highway fuel economy tests for GHG and CAFE standards, and we use the 5-cycle test cycles for criteria pollutants and for the fuel economy label.

I suspect that for the U.S., EPA has the most complete data set of 2-cycle/5-cycle test data from the same vehicle. When EPA finalized the 2008 Fuel Economy Labeling rule, we provided ourselves with the discretion via guidance to update in the formula which under certain conditions an auto company can utilize 2-cycle data for the fuel economy label (a 2-cycle to 5-cycle translation).

In June of 2015 the OTAQ Compliance Division (Byron's group) issued a Guidance letter, where, based on a detailed analysis by the Compliance Division staff, we updated this formula, as the most recent data indicated that the "gap" between 2-cycle and 5-cycle had grown a little since compared to what we estimated in the 2008 rulemaking. This change for the fuel economy label became mandatory for the 2017 model year. It directionally will bring the label values down for companies using the 2-cycle methodology. I have attached a copy of this Guidance Document, which includes the analysis by EPA justifying this new requirement. Rob French on Byron's staff lead this assessment.

We would be interested in learning about any new assessment that ICCT is doing in this area, so please keep us informed. In particular, if ICCT is going to issue a report on this topic we would appreciate any opportunity to review and comment on the draft report. If that is not possible, we would appreciate any opportunity to know what the report will say and when it may be released.

Best regards,
Bill

Bill Charmley
Director
Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

National Vehicle and Fuel Emissions Laboratory
2000 Traverwood Drive
Ann Arbor, MI 48105

desk ph. 734-214-4466
cell ph. 734-545-0333
e-mail: charmley.william@epa.gov

<EPA Guidance Document, CD-15-15, June 22, 2015, Derived 5-cycle Coefficients.pdf>

To: Alson, Jeff[alson.jeff@epa.gov]
Cc: Simon, Karl[Simon.Karl@epa.gov]; Snapp, Lisa[snapp.lisa@epa.gov]; French, Roberts[french.roberts@epa.gov]; Olechiw, Michael[olechiw.michael@epa.gov]; Moran, Robin[moran.robin@epa.gov]
From: Charmley, William
Sent: Thur 8/18/2016 4:21:44 PM
Subject: Re: Ex. 5 - Deliberative Process ICCT memo of August 16 on the fuel economy gap and impact on National Program

I will email drew right now.

Sent from my iPhone

On Aug 18, 2016, at 10:56 AM, Alson, Jeff <alson.jeff@epa.gov> wrote:

Bill,

Rob forwarded the attached ICCT memo to me that was sent to you, Rob, and Lisa earlier this week (Lisa is on leave). Rob and I worked together on this joint response.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Let Rob or I know if you want to discuss this in more detail.

Jeff

From: French, Roberts
Sent: Wednesday, August 17, 2016 7:44 AM
To: Alson, Jeff <alson.jeff@epa.gov>
Subject: FW: For Immediate Attention: ICCT Publication on Growing Gap between 2-cycle Test and Real World Fuel Economy in US

Jeff,

You probably got – or will get – this via other channels. But I'm not assuming that you will, so forwarding along anyway.

Rob

Roberts W. French, Jr.

U.S. Environmental Protection Agency

National Vehicle and Fuel Emissions Laboratory

2000 Traverwood Drive

Ann Arbor, Michigan 48105

(734) 214-4380

From: Drew Kodjak [mailto:drew@theicct.org]
Sent: Wednesday, August 17, 2016 12:02 AM
To: Charmley, William <charmley.william@epa.gov>; French, Roberts <french.roberts@epa.gov>; Snapp, Lisa <snapp.lisa@epa.gov>
Cc: Uwe Tietge <uwe.tietge@theicct.org>; Peter Mock <peter@theicct.org>; Anup Bandivadekar <anup@theicct.org>
Subject: For Immediate Attention: ICCT Publication on Growing Gap between 2-cycle Test and Real World Fuel Economy in US

Bill, Rob, Lisa,

In early April, I presented information at the EPA's International Compliance Summit showing ICCT research demonstrating a growing gap between real world fuel economy and type approval values in Europe and in other countries including the US.

In Europe, our research has demonstrated a growing gap from 8% in 2002 to over 40% in 2015. As a result, half of the expected benefits from EU's CO2 standards for passenger cars have not been realized - a major cause of concern and much needed regulatory attention.

In the United States, we have examined real world emissions against the two cycle and the five cycle tests. The good news is that real world emissions are very close to the values produced by the 5 cycle test. The bad news is that real world emissions compared with the 2-cycle test have grown by 11 percentage points from 2001 to 2015. Specifically, we found a gap of 14% in 2001 and 25% in 2015. While this increase is far less than in Europe, it is still substantial enough to cause concern.

In April - June, Uwe Tietge, our lead researcher on this topic, reached out to several of your staff as you suggested to seek review and engagement from EPA to ensure that our results are sound. These results also underwent extensive internal review at ICCT. At this point, we are comfortable with these results and the paper is on track for publication.

All that said, I wanted to make sure that you were aware of the latest developments well in advance of any ICCT publication. I asked Uwe to draft a short memo, which is attached, giving you the key graphics and messages.

Please let us know if you would like to follow up, recognizing that we have already reached out to you several times for review and comment, and we have a publication schedule that we would like to adhere to.

Finally, congratulations on a successful publication of the final HDV GHG regulation - a major accomplishment that will have ripple effects in major markets around the world.

<ICCT_memo_fuel_economy_gap_US.pdf>

To: Olechiw, Michael[olechiw.michael@epa.gov]; Bolon, Kevin[Bolon.Kevin@epa.gov]; McDonald, Joseph[McDonald.Joseph@epa.gov]; Barba, Daniel[Barba.Daniel@epa.gov]; Moskalik, Andrew[Moskalik.Andrew@epa.gov]; Kargul, John[kargul.john@epa.gov]; Cherry, Jeff[Cherry.Jeff@epa.gov]; Neam, Anthony[Neam.Anthony@epa.gov]; Caffrey, Cheryl[caffrey.cheryl@epa.gov]; Alson, Jeff[alson.jeff@epa.gov]; Hula, Aaron[Hula.Aaron@epa.gov]
Cc: Charmley, William[charmley.william@epa.gov]
From: Moran, Robin
Sent: Thur 5/26/2016 12:48:32 PM
Subject: ICCT's Technology briefing series
Naturally Aspirated working paper v7a.docx
ATT00001.htm

FYI, below is a note from John German with the game plan and schedule for the Technology papers.

Ex. 5 - Deliberative Process

From: John German [mailto:john@theicct.org]
Sent: Wednesday, May 25, 2016 9:03 PM
To: Moran, Robin <moran.robin@epa.gov>
Cc: Olechiw, Michael <olechiw.michael@epa.gov>; Aaron Isenstadt <aaron.isenstadt@theicct.org>; Joe Schultz <joe@theicct.org>; Drew Kodjak <drew@theicct.org>
Subject: Re: Technology briefing series

Here is the schedule (although we are already behind). The goal is to get all of the papers done, except the diesel paper, before the end of the TAR comment period.

I have attached the latest draft of the naturally aspirated paper, although it will change as we are still negotiating with BorgWarner on the writeup. You are welcome to comment on it, but we will not acknowledge this, as we want to keep the technology papers independent of EPA, and I may not be able to incorporate all of your comments as everything has to be agreed with the participating suppliers.

1) Naturally aspirated gasoline paper.

- Initial draft has been distributed for review on April 1.
- Comments requested by May 2.

2) Transmission paper. ICCT is currently working on a complete draft for this paper. This was selected to go second because we have received most of the data, while we are still waiting for significant data and writeups on the other papers.

- Complete draft for review finished by ICCT - May 2 (Still not done.)
- Comments requested by June 1.

3) and 4) Lightweighting and gasoline downsized turbo papers. These will likely be our most important - and longest - papers, thus we want to get started on them after the transmission paper. We would like to work on them simultaneously, although this will be affected by when we receive data, information, and writeups.

- **Submit data, information, and initial writeups to ICCT by May 2.** (Still waiting for some inputs.)
- Complete drafts for review finished by ICCT by July 5.
- Comments requested by August 1.

4) Thermal Management. This was not one of the papers were originally planned. However, ITB volunteered to write the first draft, so we added it. Should be done before 3) and 4).

5) Diesel paper. While important, it is a lower priority than the other papers simply because of the relatively small share of the market.

- **Submit data, information, and initial writeups to ICCT by July 15.**
- Complete drafts for review finished by ICCT by September 1.
- Comments requested by October 1.

John

On May 25, 2016, at 8:52 AM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi John,

Hope you're doing well. I'm glad you were able to join the NGOs' MTE meeting with EPA, NHTSA and CARB earlier this week, and appreciate all the good points you made on technology development.

Mike and I were hoping you could give us an update on the status of your technology briefing paper series, as we didn't catch everything you said on Monday's call. I know the hybrid paper is on your web. Are there others ready in draft form? We'd be glad to take a look at any drafts, if that's something you'd find useful. We thought we heard you say the papers were targeted for completion in Sept – is that right?

Thanks John.

Take care,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: Alson, Jeff[alson.jeff@epa.gov]; Barba, Daniel[Barba.Daniel@epa.gov]; Bolon, Kevin[Bolon.Kevin@epa.gov]; Brown, Jarrod[Brown.Jarrod@epa.gov]; Caffrey, Cheryl[caffrey.cheryl@epa.gov]; Cherry, Jeff[Cherry.Jeff@epa.gov]; Hula, Aaron[Hula.Aaron@epa.gov]; Kargul, John[kargul.john@epa.gov]; McDonald, Joseph[McDonald.Joseph@epa.gov]; Moran, Robin[moran.robin@epa.gov]; Moskalik, Andrew[Moskalik.Andrew@epa.gov]; Nam, Ed[nam.ed@epa.gov]; Olechiw, Michael[olechiw.michael@epa.gov]; Sherwood, Todd[sherwood.todd@epa.gov]
From: Helfand, Gloria
Sent: Wed 3/2/2016 1:45:08 PM
Subject: FW: UCS Whitepaper: Fuel Economy / Performance trade-off
Fuel Economy v. Performance - Whitepaper.pdf

I've taken a quick look at the attached paper from Dave Cooke of UCS. The key point is that we should use the 2010 baseline for performance levels, not grow it: "Because it is ultimately the manufacturers who make the choice to improve performance at the expense of fuel economy, costs incurred as a result should not be attributed to the standards—the regulation was predicated on preserving performance, and therefore the costs for any improvements to performance should be considered opportunity costs borne by the manufacturer" (p. 3).

It explicitly points out the tradeoff between performance and fuel economy. He estimates that allowing performance to increase greatly increases the costs of achieving the standards. He then goes on to discuss ways of removing performance from the cost estimates of technology packages. I didn't follow the details (that part is not as clearly written as I'd like); it involves estimating the proportion of tech improvement that's gone to performance, and pro-rating the costs based on that proportion.

On the spectrum of dealing with the power-fuel economy tradeoff issue, this seeks to anchor one end of the spectrum, with others (perhaps Don Pickrell's SBCA presentation?) anchoring the other end. I think our discussion falls in between, and may be more sophisticated than Cooke's argument.

Next steps are thinking about how/whether to include this in the TAR writeup, as well as the additional text I stuck in, and what other revisions we may want to consider.

Gloria Helfand, Ph.D.

Assessment and Standards Division

Office of Transportation and Air Quality

U.S. Environmental Protection Agency

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Ann Arbor, MI 48105

(734) 214-4688

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Friday, February 26, 2016 11:29 AM
To: Alson, Jeff <alson.jeff@epa.gov>; Moran, Robin <moran.robin@epa.gov>; Helfand, Gloria <helfand.gloria@epa.gov>; Nam, Ed <nam.ed@epa.gov>; Bolon, Kevin <Bolon.Kevin@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Moskalik, Andrew <Moskalik.Andrew@epa.gov>
Cc: Charmley, William <charmley.william@epa.gov>
Subject: UCS Whitepaper: Fuel Economy / Performance trade-off

EPA LDV team,

Attached is a whitepaper that looks at manufacturers' trade-off between applying technology improvements in light-duty vehicles towards either improved performance/acceleration or reducing fuel consumption. We at the Union of Concerned Scientists know that this is an issue that may play a critical role in the efficacy of light-duty efficiency regulations, and we've targeted this analysis specifically towards the effect the continued performance trend could have on the mid-term evaluation.

As author of the paper, I'm happy to discuss any relevant details of our modeling and answer any questions that you may have. We will obviously also formally submit this through the Draft TAR public comment, but I wanted to make sure that the agencies had time to consider our findings as you look at this critical climate regulation. We are also sharing it with colleagues at the other agencies involved in the mid-term evaluation (NHTSA, CARB), but feel free to pass it on to any relevant parties. Thanks,

- Dave

David W. Cooke, Ph.D.

Senior Vehicles Analyst

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The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with citizens across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

Join our citizen action network or expert network. | Support our work. | Join the conversation on our blog or follow us on Twitter and Facebook.

To: Alson, Jeff[alson.jeff@epa.gov]
From: Dave Cooke
Sent: Sat 12/19/2015 6:20:05 PM
Subject: RE: Trends?

I think that makes sense regarding curve neutrality in light of some of the papers like Whitefoot showing an incentive to increase footprint and the fact that it seems like manufacturers are doing this already in redesigns (E.g., F-150), although you may be able to argue that on safety requirements.

I just started analysis on the effect of small SUVs, car/truck distinction, and how that could be affecting the benefits of regulation, so I'm glad to hear that this is an ongoing conversation at the agencies that we could be contributing to.

I hope you're taking some time to enjoy the holidays, and I am sure we will connect back up in the new year. Take care,

- Dave
On Dec 18, 2015 5:49 AM, "Alson, Jeff" <alson.jeff@epa.gov> wrote:

All good points. Makes me proud to be a UCS member!

One thing we are already thinking about is whether we can incorporate the fuel economy effects of A/C efficiency and off-cycle credits into our Trends fuel economy values (we did not try this year, I estimate that these impacts could have increased adjusted FE by about 0.2 mpg, and this will surely grow in 2015). If you have an opinion on that, let me know.

Regarding policy, I personally think that, in the long run, we have to move away from a principle of "curve neutrality" to "trying to tilt the market from trucks-to-cars and from higher-to-lower footprint." I take every opportunity to make this point internally. I suspect it will be extremely difficult to convince management to consider this in the MTE (they will want to open as few issues as possible to maximize the chance of keeping the status quo), but effective jawboning on this during the MTE can lay the groundwork for a more effective regulatory structure in 2026+. I intend to do some thinking about this topic next year, and again any input would be helpful.

If we don't talk again, have a great holiday season.

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Thursday, December 17, 2015 6:07 PM
To: Alson, Jeff <alson.jeff@epa.gov>

Subject: RE: Trends?

Yeah, the contrast between Dan's and ours/NRDC's/ICCT's releases on the reports is pretty stark. Calling sales mix a loophole just doesn't make sense, although I think there are issues around some of the credits that I'm sure the rest of the NGO community will start to raise more in the MTE process, particularly given that OEMs are looking to expand the credit program.

I think the mix shift trend v. fuel economy trend is going to be close for MY2015, but I'm still hopeful that it should at least to one digit still be no worse than flat, since MY2014 was somewhat artificially low and MY2013 a little high already from the Hyundai/Kia weirdness. If it does go backwards, it'll make telling the story of the regulatory success harder, but it will go back up over time regardless because of the program's design so I think it's unfair to look at this as anything but temporary.

It would be helpful to get a heads-up on that major finding in advance, but I think for us we'll continue to focus on a bigger picture view instead of just that one number. It's a good reality check for thinking about overall climate impact, but I definitely prefer to view the success of a policy in a counterfactual way. But I'm sure we'll be thinking about whether there are opportunities through the MTE process to address market shifts and its effect on the efficacy of the current footprint curves as a driver for total reductions.

- Dave

From: Alson, Jeff [mailto:alson.jeff@epa.gov]
Sent: Thursday, December 17, 2015 2:23 PM
To: Dave Cooke
Subject: RE: Trends?

Yes, for the most part we were pretty happy with the press coverage. I think our management thinks that the decision to release the two reports jointly was a good one, so I think that will be the default from now on.

Dan was Dan, and his use of the "loophole" argument is most frustrating to us. He called me late yesterday and I told him that that was our biggest problem with his statement and quotes, since the "loopholes" were all known from the beginning and reflected in our

technology feasibility demonstration. Without the "loopholes" we would never have gotten 54.5. He know this, but refuses to admit it publicly.

I am worried even more about the 2015 data, that mpg might be a decrease from 2014. While I will be stepping back and no longer leading the Trends team next year (it is time for Aaron to be seen as leading the effort, I am going to focus on policy development for the transition team), I will make sure that we give you guys more notice next year, especially if 2015 is lower than 2014.

Jeff

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Thursday, December 17, 2015 5:08 PM
To: Alson, Jeff <alson.jeff@epa.gov>
Subject: RE: Trends?

Thanks, Jeff. I appreciate the feedback and the extra time you took with us to make sure we had the data right. While Dave Shepardson's piece released in advance of the report seemed aimed at convoluting a 54.5 mpg end target and the fleet mix shift, generally it does look to me based on the press pick-up so far that releasing both reports at the same time helped tell a balanced story consistent with what the rules are designed to do.

- Dave

From: Alson, Jeff [mailto:alson.jeff@epa.gov]
Sent: Wednesday, December 16, 2015 10:57 AM
To: Dave Cooke
Cc: Seth Michaels
Subject: RE: Trends?

Dave, that is a great blog, and everyone up to Chris Grundler has seen it and is thrilled.

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Wednesday, December 16, 2015 12:09 PM
To: Alson, Jeff <alson.jeff@epa.gov>
Cc: Seth Michaels <SMichaels@ucsusa.org>

Subject: Trends?

Jeff,

Is the Trends report still being released today? I'm about to hop on a flight, so can you CC Seth Michaels (ccd here) the update? Thanks. We don't want to scoop you.

Seth, please coordinate the blog release with Chris.

- Dave

To: Hula, Aaron[Hula.Aaron@epa.gov]
Cc: Alson, Jeff[alson.jeff@epa.gov]
From: Dave Cooke
Sent: Tue 12/15/2015 5:58:02 PM
Subject: RE: Getting back with you

There were a few issues, so I decided to revisit my calculation in light of both the credits question and the fact that the cars are getting older changing how we think about VMT in the years after sale. We use a 2010 baseline that includes off-cycle A/C credits, so that means our credit totals are slightly lower than yours (by 4.4 g/mi); it also obviously means we have a year's worth of cars that while only marginally different continue to save fuel. Through calendar year 2014, I calculate the benefits with our analysis to be 69 MMT CO2e, and it looks to me like at least half that difference is related to the 2010 v. 2011 baseline. We will be focusing on the to-date estimate (through November 2015) of 105 MMT, though, and the 2014 numbers will only be in a chart. So if asked, those two factors (different baseline, different end date) should essentially be the difference.

We also are using Wards data for sales and considering the model year to be October through September so that we can estimate per month numbers. I'm sure that causes some disparity, too, but this makes it easier to estimate savings on-the-fly.

From: Hula, Aaron [mailto:Hula.Aaron@epa.gov]
Sent: Tuesday, December 15, 2015 12:43 PM
To: Dave Cooke
Cc: Alson, Jeff
Subject: RE: Getting back with you

Dave,

I know we talked about calculating the MMT of co2 avoided previously. At that point I think you were using a 54 MMT number that did not include upstream or credits. Are the credits and upstream the difference? As I understand it you're using a 2010 baseline, including sales through the last month (source?), and including credits and upstream. Does that sound correct?

In our press release, we will be saying 60 MMT, through 2014 since that is the last year we have data for. We're trying to make sure we can explain any differences if someone asks.

Thanks,

Aaron

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Monday, December 14, 2015 5:47 PM
To: Alson, Jeff <alson.jeff@epa.gov>
Subject: RE: Getting back with you

Thanks for this info—it looks like trucks are doing even better than I thought, which is interesting although could just be a result of an increase in the fraction of Small 4WD SUVs.

From UCS' perspective, we'll be rolling with these main themes in a press statement and more in-depth in a blog:

1) Summary of the positive benefits of the rule (which hopefully are reasonably close to yours, though we use a 2010 baseline): $27B in fuel savings to-date; just over 200 M bbls of oil saved; over 100 MMT CO2e avoided, equivalent to shutting down more than 27 coal-fired power plants over the course of the rule.

2) Consumers rate fuel economy at the top regardless of gas price and are continuing to get more efficient offerings in all classes of vehicle, thanks to the standards.

3) Low gas prices are affecting the market and possibly leading to an increase in sales for SUVs and trucks, which is hampering overall improvement in fleet fuel economy, but this effect will be short-lived because all vehicles are continuing to get more efficient.

A corollary to the last point which we will be reiterating in my blog is that without regulations, we would have seen the same type of backsliding that we did in the 90s-2000s given market trends, which I know you've thought about.

- Dave

From: Alson, Jeff [mailto:alson.jeff@epa.gov]
Sent: Monday, December 14, 2015 5:17 PM
To: Dave Cooke
Subject: Getting back with you

Dave, sorry for late reply. Crazy here, now that we have the attention of our high level press folks.

2014 car = 27.9 mpg

2015 car = 28.4 mpg (preliminary)

2014 truck = 20.4 mpg

2015 truck = 20.7 mpg (preliminary)

Yes, FFV credits are 3.6 g/mi higher than we projected for MY 2014. I do not know why we projected FFV credits to go down in 2013 and 2014 since that is before the "cap" phase-out begins. If asked, we plan to point out that the 3.6 g/mi higher-than-expected FFV credits are still only a small part of the 13 g/mi industry-wide over-compliance. A/C are 0.8 g/mi more than we projected and O-C are 2.3 g/mi more than we showed in tables, but those increases are not as newsworthy since they represent meaningful GHG reductions.

The fact that we are still on pace with our rulemaking projections through MY 2014 is a very positive sign, given the low gasoline prices. I am almost certain that we will fall behind in 2015 though.

Chris is asking us what you guys plan to say on Wednesday, so when you know, let us know!

The current plan is Wednesday noon, with Chris doing an interview or two on Wednesday morning. Not sure the reporter(s) yet.

From: Dave Cooke [mailto:DCooke@ucsusa.org]

Sent: Friday, December 11, 2015 5:32 PM
To: Alson, Jeff <alson.jeff@epa.gov>
Subject: RE: Confidential--just to the four of you

Thanks, Jeff. I definitely agree with your assessment of the market and am planning on reinforcing some of those points where possible.

Would it be possible to get the 2014/15 car/truck FE numbers in advance? All I saw in the presentation you presented were the fleet aggregate numbers, but I think given the uncertainty around the 2015 vehicle mix, being able to talk individually about how much more efficient those classes of vehicles got would be a better approach.

Also, I did for my own satisfaction estimate what the projected two-cycle regulations would have been with the actual 2014 car/truck mix, and it does appear to confirm that EPA is still on target with its projections even if you only believe tailpipe emissions. However, in looking into this it did drive home just how much EPA underestimated the use of FFV credits in the 2012-2016 FRM, which will eat into real GHG reductions, and it reinforces just how much of the current overcompliance is related to an underestimate of credits, which isn't great for the MTE.

From: Alson, Jeff [mailto:alson.jeff@epa.gov]
Sent: Friday, December 11, 2015 3:46 PM
To: Therese Langer; Nic Lutsey
Cc: Dave Cooke; Luke Tonachel (NRDC)
Subject: RE: Confidential--just to the four of you

Looks like Wednesday release is now very solid, although there is always the risk of something else interfering.

In case any of you are interested in reading and/or commenting and/or incorporating into your own messaging, here is a draft Q/A that I intend to provide to Chris Grundler, qualitatively dealing with the issue that Dan raised at our briefing (and which I am sure he will pitch to reporters) and which I raised again in my separate email last week. Again, I think it is futile to try to quantitatively show this. This may be too much for public messaging, that will be Chris' call.

Question: EPA says that the increased truck share and larger cars/truck footprints led to no change in fuel economy in MY 2014. How do you respond to those suggesting that the footprint-

based standards inherently provide loopholes that are reducing the effectiveness of the GHG standards?

Answer:

•□□□□□□□□ Yes, fuel economy was flat in 2014 due to higher truck sales and slightly larger footprints.

•□□□□□□□□ The flat overall fuel economy masks some good news: trucks had their second biggest improvement in 30 years, and truck SUVs and pickups showed the best improvements overall.

•□□□□□□□□ The footprint-based standards were adopted specifically to permit consumers to buy the types of vehicles that they want, but also to ensure that all vehicles, whether small car or large SUV, improve over time, and we are seeing this play out in the Trends data.

•□□□□□□□□ I believe that the changes in consumer behavior are being driven by broader forces that go well beyond the standards—gasoline prices, automaker marketing, cultural changes.

•□□□□□□□□ If these changes in consumer behavior would have occurred in the absence of standards, then we would be going backwards without standards, and therefore the standards are likely saving even more GHG tons than we projected during our rulemaking.

From: Alson, Jeff
Sent: Tuesday, December 08, 2015 4:52 PM
To: 'Therese Langer' <TLanger@aceee.org>; Nic Lutsey <nic@theicct.org>
Cc: Dave Cooke <DCooke@ucsusa.org>; Luke Tonachel (NRDC) <Ltonachel@nrdc.org>
Subject: Confidential--just to the four of you

Just sending to the four of you because I know you better than the others, and deleting Dan because, well, he is Dan (all of you know I have worked with, and enabled (!), Dan, for many years).

Please keep this confidential.

Thanks for coming to the briefing today. Sorry I missed part of it, but I had a very important family matter that came up at the last minute.

I want to mention one interesting perspective that has come out of our thinking over the past few weeks as we think about communicating the GHG and Trends reports.

We all know that, because of both truck share and average car and truck footprint values, we did not achieve the absolute g/mi improvement in the MY 2014 standards that we projected in the rule. It is not clear to me at this point whether the multi-year improvement from a MY 2011 baseline is greater or less than what we projected. My own calculations a few weeks ago initially projected that we were about where we projected we would be in MY 2014 (with the industry over-compliance approximately offsetting the issues with truck share and footprint), but as I looked into this in the last few weeks, I found some discrepancies in our rulemaking documents and underlying spreadsheets with respect to our assumed regulatory baseline, and I now think it is probably futile to try to make any firm conclusions along this line. Dan would think I am wimping out, but there are too many inconsistencies in our rulemaking analyses and spreadsheets to do a meaningful comparison.

But, here is the more important perspective I gained—a critical factor in whether you think we are achieving more or less than we projected from the standards is whether you think the recent market shifts (truck share, footprint) are being driven primarily by the standards themselves (i.e., the standards tilt toward trucks and higher footprint and are the primary reason for the market shifts) or primarily due to non-standards forces. If you believe, as I do, that our standards curves are not the main factor (I am sure they are not neutral, the most obvious failure is with respect to small SUV 2WD car vs 4 WD truck, but I think that impact on the market is relatively small) and the primary reasons for the market shifts are gasoline prices and other market forces, then the more relevant baseline for a MY 2014 standards evaluation is not what we assumed in the rule, but a truck share and footprint level more like what we actually see in the market today. And if that is a better baseline, then because it is a lower mpg baseline, our standards are probably achieving more GHG reduction than we projected in the rule.

Bottom line, if you agree that today's market shifts would have happened in the absence of the standards, the footprint based standards will achieve less total g/mi improvement from the older assumed baseline, but likely greater g/mi improvement relative to a more realistic based-on-today's-market-forces baseline. All of this is way too nuanced to try to explain to the public, and we won't try, but I did want to raise this and maybe spark some more thinking. I spun my own wheels for weeks trying to quantify this, so I don't recommend that, but it could be a qualitative talking point in some situations.

If nothing else, this kind of thinking may help prepare us for the MY 2015 data, about which I am extremely worried since the biggest drop in gasoline prices came about a year ago, at the start of MY 2015.

To: Olechiw, Michael[olechiw.michael@epa.gov]; Fernandez, Antonio[fernandez.antonio@epa.gov]; Safoutin, Mike[safoutin.mike@epa.gov]; McDonald, Joseph[McDonald.Joseph@epa.gov]; Bolon, Kevin[Bolon.Kevin@epa.gov]; Barba, Daniel[Barba.Daniel@epa.gov]; Kargul, John[kargul.john@epa.gov]; Moskalik, Andrew[Moskalik.Andrew@epa.gov]; Neam, Anthony[Neam.Anthony@epa.gov]; Cherry, Jeff[Cherry.Jeff@epa.gov]
Cc: Moran, Robin[moran.robin@epa.gov]
From: Caffrey, Cheryl
Sent: Tue 12/20/2016 2:37:05 PM
Subject: RE: Technology papers - Publication of Transmission Working Paper

Mike,

Ex. 5 - Deliberative Process

Cheryl

From: Olechiw, Michael
Sent: Tuesday, December 20, 2016 6:50 AM
To: Caffrey, Cheryl <caffrey.cheryl@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Safoutin, Mike <safoutin.mike@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Bolon, Kevin <Bolon.Kevin@epa.gov>; Barba, Daniel <Barba.Daniel@epa.gov>; Kargul, John <kargul.john@epa.gov>; Moskalik, Andrew <Moskalik.Andrew@epa.gov>; Neam, Anthony <Neam.Anthony@epa.gov>; Cherry, Jeff <Cherry.Jeff@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: FW: Technology papers - Publication of Transmission Working Paper

ICCT Tech papers for your review.

Mike

From: John German [mailto:john@theicct.org]
Sent: Monday, December 19, 2016 3:38 PM
To: Charmley, William <charmley.william@epa.gov>; Olechiw, Michael

<olechiw.michael@epa.gov>; Alson, Jeff <alson.jeff@epa.gov>; Alberto@ARB Ayala <Alberto.Ayala@arb.ca.gov>; Mike McCarthy <michael.mccarthy@arb.ca.gov>
Cc: Anup Bandivadekar <anup@theicct.org>; NIc Lutsey <nic@theicct.org>; Joe Schultz <joe@theicct.org>; Aaron Isenstadt <aaron.isenstadt@theicct.org>
Subject: Re: Technology papers - Publication of Transmission Working Paper

FYI, we just published our detailed working paper on lightweighting, written in cooperation with suppliers:

http://www.theicct.org/lightweighting-technology-development-and-trends-us-passenger-vehicles

Except for the diesel working paper, which we hope to publish in February, this is the last of our working papers. You can find the home page for all of the pages at:

http://www.theicct.org/series/us-passenger-vehicle-technology-trends

Note that the page includes both the detailed working papers we wrote with suppliers and the shorter ICCT technology briefs, so most of the subjects are listed twice.

Specific web links for the other detailed technology working papers are as follows:

http://www.theicct.org/downsized-boosted-gasoline-engines

http://www.theicct.org/automotive-thermal-management-technology

http://www.theicct.org/PV-technology-transmissions-201608

http://www.theicct.org/naturally-aspirated-gas-engines-201606

http://www.theicct.org/hybrid-vehicles-trends-technology-development-and-cost-reduction

Please let me know if you have any questions or would like additional information.

John

On Aug 29, 2016, at 2:29 PM, John German <john@theicct.org> wrote:

FYI, we just published our second detailed technology working paper, this one on transmissions. Dana, BorgWarner, ITB, and FEV contributed to this paper:

http://www.theicct.org/PV-technology-transmissions-201608

Unfortunately, we have not yet finished ICCT's technology "brief" on transmissions, summarizing the results and adding a bit about implications on the mid-term review. I will let you know when this has been completed.

The papers on gasoline turbocharged engines and thermal management have finished supplier review and are now undergoing a final internal review by our communications team. The lightweighting paper was sent out for supplier review on Aug. 10, with their comments due by August 31. We are still hopeful that these can be finished by the end of September, with the paper on diesels following by the end of the year.

John

On Jun 21, 2016, at 10:51 AM, John German <john@theicct.org> wrote:

FYI, we just published two papers on naturally aspirated gasoline engines. These are the first in a series of technology reports in support of the 2017-25 mid-term review. Reports on transmissions, gasoline turbocharged engines, lightweighting, and thermal management will (hopefully) be finished by September, with a report on diesels following by the end of the year.

The first paper is the detailed working paper that we did in collaboration with Eaton, BorgWarner, and ITB.

Working paper: <http://theicct.org/naturally-aspirated-gas-engines-201606>

The second is ICCT's technology "brief", which summarizes the results of the working paper and adds a bit about implications on the mid-term review.
Tech brief: <http://theicct.org/naturally-aspirated-engines-techbrief-jun2016>

Let me know if you have any questions or want additional information.

John

To: DCooke@ucsusa.org[DCooke@ucsusa.org]
From: Bolon, Kevin
Sent: Thur 8/25/2016 7:07:03 PM
Subject: RE: Two quick questions re: EPA/NHTSA engine assessments

Hi Dave,

Ex. 6 - Personal Privacy

I think that I should be able to help answer your questions. Do you still have time this afternoon for a call? Any time before 5pm should be ok. If that doesn't work, I'm free tomorrow afternoon as well.

Best regards,

Kevin Bolon

Kevin Bolon, Ph.D.
Light Duty Center, Assessment and Standards Division
National Vehicle and Fuel Emissions Laboratory
U.S. EPA, Office of Transportation and Air Quality
734-214-4331 bolon.kevin@epa.gov

From: Olechiw, Michael
Sent: Wednesday, August 24, 2016 10:57 AM
To: Bolon, Kevin <Bolon.Kevin@epa.gov>
Subject: FW: Two quick questions re: EPA/NHTSA engine assessments

Kevin,

Please follow-up with Dave.

Mike

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Friday, August 12, 2016 1:01 PM
To: Olechiw, Michael <olechiw.michael@epa.gov>
Subject: Two quick questions re: EPA/NHTSA engine assessments

Mike,

I continue to pour over the TAR and the volumes of research and analysis that the agencies have put together, and there were three pieces of information related to the engine that differed between the agencies that surprised me, and I wanted to see if I had that right and if there might be any further info that would bring them closer together.

1) **HCR:** In comparing the Volpe work to OMEGA, it appears that there is a huge discrepancy on HCR between the agencies (EPA is ~3% higher). I know that HCR was not included in the initial ANL work for Volpe, and purportedly NHTSA used EPA's engine maps for that tech, so this feels like something that will eventually move towards EPA's analysis.

2) **Cylinder Deactivation:** On the other hand, with cylinder deactivation, it seems like NHTSA is using much higher levels of improvement, especially for SUVs/trucks. Is there a clear reason for this discrepancy of which you are aware? I realize this might change as you look more at rolling deactivation or other technologies, but the differences (especially for SUVs) was pretty strong for these two, and it significantly affects how Volpe deals with HCR because of the (false) choice it places on HCR v. DEAC in the vehicle pathway.

3) **TDS:** In my examination of the two agencies' assessments, I was surprised to find that NHTSA's turbocharged, downsized engine effectiveness packages appear to be much more effective than EPA's, particularly since NHTSA relied on older engine maps. Is this a finding

consistent with your analysis of the differences between the two agencies?

If there are not short answers to these questions, feel free to give me a call—I was mainly looking to truth-test some initial findings before I dig further at some of these issues. I thought maybe that since you all may have already worked out some of these differences in drafting the TAR you might have a quick synopsis explaining the larger discrepancies. While obviously the modeling tools used by the agencies for compliance are very different, which means that any fleet pathways for CAFE and GHG compliance in 2025 will have differences, in the FRM the inputs at least appear to be much more generally aligned than in the TAR, so I was trying to assess ways in which we might be able to provide clarity around these figures to help that process.

Thanks,

- Dave

David W. Cooke, Ph.D.

Senior Vehicles Analyst

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The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with citizens across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

Join our citizen action network or expert network. | Support our work. | Join the conversation on our blog or follow us on Twitter and Facebook.

To: Caffrey, Cheryl[caffrey.cheryl@epa.gov]
From: John German
Sent: Tue 12/20/2016 7:01:19 PM
Subject: Re: Technology papers - Lightweighting paper

Thanks for reading it, Cheryl. Not many people go through the whole thing.
All of the technology working papers were always targeted at advancements since the rulemaking. It was quite an undertaking to obtain agreement from all of the participating suppliers on the contents, which was quite time consuming. And the process did not allow for revisions after the TAR was issued.

ICCT is preparing comments in response to the Proposed Determination. In this, we are updating the technology assessments from the working papers to compare with the ones in the Proposed Determination. So, this will likely be more in line with what you are looking for (although it will only be ICCT's position, not a joint position with suppliers).

The California reference was from CARB's technology assessment in support of their 2017-25 GHG standards. CARB disagreed with NHTSA and EPA on lightweighting cost and estimated it would only be $2.30/lb/%. I can dig this out if you want.

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Thus, I think the cost estimate in our lightweighting technology working paper better reflects how lightweighting design and material development will actually take place in the fleet.

But, again, this is my opinion, not that of ICCT.

John

On Dec 20, 2016, at 1:14 PM, Caffrey, Cheryl <caffrey.cheryl@epa.gov> wrote:

Hi John!

Mike Olechiw forwarded me the paper on lightweighting (see below) that you sent to him yesterday. It is a very interesting read with all of the perspectives and information shared.

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I am interested in your feedback on these Midterm Evaluation/Proposed Determination curves as well. I am also interested in your reference which says "California Air Resources Board (CARB) estimated lightweighting cost was only about half of this, $2.30/pound/% reduction" – what was this reference?

Thank you!
Cheryl Caffrey

Cost Curve for Pass Cars in Draft TAR:
(red curve) For vehicles with no decrease in curb weight between 2015 and 2008
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<image001.jpg>

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<image003.jpg>

From: Olechiw, Michael
Sent: Tuesday, December 20, 2016 6:50 AM
To: Caffrey, Cheryl <caffrey.cheryl@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Safoutin, Mike <safoutin.mike@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Bolon, Kevin <Bolon.Kevin@epa.gov>; Barba, Daniel <Barba.Daniel@epa.gov>; Kargul, John <kargul.john@epa.gov>; Moskalik, Andrew <Moskalik.Andrew@epa.gov>; Neam, Anthony <Neam.Anthony@epa.gov>; Cherry, Jeff <Cherry.Jeff@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: FW: Technology papers - Publication of Transmission Working Paper

ICCT Tech papers for your review.

Mike

From: John German [mailto:john@theicct.org]
Sent: Monday, December 19, 2016 3:38 PM
To: Charmley, William <charmley.william@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Alson, Jeff <alson.jeff@epa.gov>; Alberto@ARB Ayala <Alberto.Ayala@arb.ca.gov>; Mike McCarthy <michael.mccarthy@arb.ca.gov>
Cc: Anup Bandivadekar <anup@theicct.org>; NIc Lutsey <nic@theicct.org>; Joe Schultz <joe@theicct.org>; Aaron Isenstadt <aaron.isenstadt@theicct.org>
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http://www.theicct.org/downsized-boosted-gasoline-engines
http://www.theicct.org/automotive-thermal-management-technology
http://www.theicct.org/PV-technology-transmissions-201608
http://www.theicct.org/naturally-aspirated-gas-engines-201606
http://www.theicct.org/hybrid-vehicles-trends-technology-development-and-cost-reduction

Please let me know if you have any questions or would like additional information.

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Working paper: <http://theicct.org/naturally-aspirated-gas-engines-201606>

The second is ICCT's technology "brief", which summarizes the results of the working paper and adds a bit about implications on the mid-term review.
Tech brief: <http://theicct.org/naturally-aspirated-engines-techbrief-jun2016>

Let me know if you have any questions or want additional information.

John

Cc: Caffrey, Cheryl[caffrey.cheryl@epa.gov]
To: Olechiw, Michael[olechiw.michael@epa.gov]
From: John German
Sent: Mon 8/10/2015 4:11:28 PM
Subject: Fwd: EPA Baseline

Michael,
Cheryl told me that she is deferring to you on my questions - and that you took a two week vacation. So, I am hoping that you have had a chance to dig out from your backlog and can respond to my questions, below.

Can you let me know if EPA has any interest in "work to inform out mass reduction baseline analysis"?

John

Begin forwarded message:

From: John German <john@theicct.org>
Subject: Re: EPA Baseline
Date: July 21, 2015 4:09:25 PM EDT
To: "Caffrey, Cheryl" <caffrey.cheryl@epa.gov>
Cc: "Bolon, Kevin" <Bolon.Kevin@epa.gov>, "Olechiw, Michael" <olechiw.michael@epa.gov>

Cheryl,
If I understand correctly, EPA's direction on lightweighting is to develop cost curves from the detailed lightweight studies done recently by FEV, Lotus, and EDAG, then use these to try to elicit OEM responses and data.

This sounds like a fine strategy to assess lightweighting potential, cost, and leadtime. But I am having trouble understanding what it has to do with the US/EU/China lightweighting comparison project we have been working on.

Michael Olechiw's email to me on January 29, 2015 stated:

> Having discussed the proposed program to evaluate the state of mass reduction on light-duty vehicles on a global scale with Bill Charmley, I am happy to report that we are interested in supporting this program. Our goals in supporting the work are as follows:
>
> 1. We expect the work to inform our mass reduction baseline analysis. The mass reduction baseline is meant to provide the agencies with an assessment of the mass reduction solutions that are already in production.
> 2. We hope to gain insight into impacts that global platform sharing has on the opportunity to reduce mass.

I don't see how developing cost curves from the four studies will help inform EPA's mass reduction baseline analysis.

Am I missing something here?

John

On Jul 2, 2015, at 11:23 AM, "Caffrey, Cheryl" <caffrey.cheryl@epa.gov> wrote:

Hi John,

Please see responses below.

Cheryl

From: John German [mailto:john@theicct.org]
Sent: Thursday, July 02, 2015 10:54 AM
To: Caffrey, Cheryl
Cc: Bolon, Kevin; Olechiw, Michael
Subject: Re: EPA Baseline

Thanks for the update and the additional information, Cheryl.

However, I'm not clear what this means for the US/EU/China lightweighting project. Are you saying that you need to wait until completion of the analyses and writeup for lightweighting? You have decided to focus on the four vehicles and will not participate? Something else?

- At this time it is my understanding that your question was whether the group needed to purchase the Ducker database and the A2Mac1 database to assist in the lightweighting vehicle characterization for the TAR. If I am not focused correctly then please provide additional information – it is very possible that I overlooked a focus of the group.

One question. You said, "The cost curves will likely be developed through detailed work with four specific vehicles". Given the wide difference from vehicle to vehicle in material use and lightweight design, how accurate it is to extrapolate from these four vehicles to the fleet?

- We have detailed cost curve information on four vehicles and I agree that the materials, designs and lightweight approaches amongst OEM's will differ and it will be impossible to characterize them all without their assistance in understanding their approaches. Our attempts at gathering specific information from the OEM's on their plans has shown to date to not be a fruitful exercise and hence I have taken the approach that we will go forward with a proposal and will wait for OEM comment on our analyses. The OEM's already know about the cost curves through the public Midsize CUV, Accord and light duty truck reports (through the SAE paper) and so can give us preliminary feedback on these curves (with data) if they desire at this time.

Related to this, you said, "The ability to understand the specific lightweight technologies on each vehicle would be a daunting task given the 1400 models and the information isn't readily available." This is accurate. However, A2Mac1 has detailed teardown data on about 150 NA vehicles. Wouldn't this be a lot better than four vehicles?

- The point on this topic is that we don't have the time or resources to work with the data. We currently have access to the A2Mac1 database (although it will be ending soon) and will be using it to determine some vehicle changes from our curb weight analyses. However the A2Mac1 database doesn't give detailed information on the different steel strengths used in the BIW (I think they have 10 BIW with analyses) and I understand Ducker gives an overview of how much of each steel is used by OEM, but not by vehicle.

I appreciate your view of the group to support EPA's baseline database development, and it is possible that we will come up with tasks for which we could use assistance – we just don't know yet at this time what that will be until we work with our database more – just a little shorthanded at the moment wrt timing of responding to you in a time efficient manner. As I mentioned above, please forward along your full vision for the group for it is likely I have not kept the full focus in mind as I was working to answer your question about the need for the A2Mac1 and Ducker databases.

John

On Jul 2, 2015, at 10:41 AM, "Caffrey, Cheryl" <caffrey.cheryl@epa.gov> wrote:

Hi John,

I wanted to give you an update on where we are with developing the baseline for mass reduction.

Currently the students have completed a near-final version of the database comparing curb weights of 2008 and 2014 MY vehicles. We have also noted the footprint for each vehicle and the overall vehicle dimensions with which we will use to analyze differences in curb weight along with noted vehicle changes (ex: body on frame to unibody, severe decontenting, etc.) in the two model years.

We have settled on this approach to date for several reasons.

1. The effective mass reduction is what is in the vehicle that is on the road (ie: curb weight). OEM's are in the habit of utilizing mass reduction to offset added mass from content or additional safety features and so even if one OEM added on a specific technology, it may have been offset by one of these factors.
2. The cost curves will likely be developed through detailed work with four specific vehicles (two pass cars and two trucks) and it is an approximation when applying these cost curves to other vehicles. OEM's have their own detailed plans for using mass reduction and overall costs will vary for each manufacturer

– if the cost curves are clearly unrealistic then I believe the OEM's will let us know. However given comments from the MMLV project with Ford, Magna and DOE at the 2015 SAE World Congress this year it is apparent that even our cost estimates for some advanced technologies to date may be slightly overestimated – which we would expect as time marches on and more advancements are made.

3. The ability to understand the specific lightweight technologies on each vehicle would be a daunting task given the 1400 models and the information isn't readily available (A2Mac1 has limited teardowns and Ducker Worldwide has some good information but not everything (from what I can tell – I haven't yet inquired with Ducker about the presentation they gave to the group).
4. The time to do this indepth analyses for each vehicle isn't available. We have three summer students working on gathering baseline information for the cub weight database and they are all leaving end of July/early August. The timeline for modeling inputs and draft write-ups are upon us with completion by December so we don't have unlimited time or resources.
5. We can review the methodology upon completion of the writeup and analyses for lightweighting and could adopt something for the Draft Determination in 2017.

I will keep you informed as we further work with our database and develop the baseline %MR for 2014. I will be out of the office Monday July 6 but will be in the rest of the week.

Thank you!
Cheryl Caffrey
734-214-4849

To: John German[john@theicct.org]
From: Caffrey, Cheryl
Sent: Wed 12/21/2016 1:48:32 PM
Subject: RE: Technology papers - Lightweighting paper

Thank you!

Cheryl

PS: Say hi to Nic! **Ex. 6 - Personal Privacy**

From: John German [mailto:john@theicct.org]
Sent: Tuesday, December 20, 2016 3:46 PM
To: Caffrey, Cheryl <caffrey.cheryl@epa.gov>
Cc: Nic Lutsey <nic@theicct.org>
Subject: Re: Technology papers - Lightweighting paper

Nic found the CA reference for me, Cheryl:

Appendix Q of CARB's 2012 ISOR:

https://www.arb.ca.gov/regact/2012/leviiighg2012/levappq.pdf

John

On Dec 20, 2016, at 2:32 PM, Caffrey, Cheryl <caffrey.cheryl@epa.gov> wrote:

Hi John!

Thank you for your input! Always good to have other points of view – especially since there are so many ways to view mass reduction. Whether an OEM does all optimization without changing material is one strategy, but based on presentations at Great Designs in Steel, it likely isn't the way they would approach this (again, my point of view). NHTSA's cost curves are all positive no matter

where one is on the cost curve so we are an improvement on that viewpoint.

If you have a document for the CARB statement on costs of MR then that would be good and I can look it up online.

Thank you!

Cheryl

From: John German [mailto:john@theicct.org]
Sent: Tuesday, December 20, 2016 2:01 PM
To: Caffrey, Cheryl <caffrey.cheryl@epa.gov>
Subject: Re: Technology papers - Lightweighting paper

Thanks for reading it, Cheryl. Not many people go through the whole thing.

All of the technology working papers were always targeted at advancements since the rulemaking. It was quite an undertaking to obtain agreement from all of the participating suppliers on the contents, which was quite time consuming. And the process did not allow for revisions after the TAR was issued.

ICCT is preparing comments in response to the Proposed Determination. In this, we are updating the technology assessments from the working papers to compare with the ones in the Proposed Determination. So, this will likely be more in line with what you are looking for (although it will only be ICCT's position, not a joint position with suppliers).

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Thank you!

Cheryl Caffrey

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(red curve) For vehicles with no decrease in curb weight between 2015 and 2008

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<image001.jpg>

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<image003.jpg>

From: Olechiw, Michael

Sent: Tuesday, December 20, 2016 6:50 AM
To: Caffrey, Cheryl <caffrey.cheryl@epa.gov>; Fernandez, Antonio <fernandez.antonio@epa.gov>; Safoutin, Mike <safoutin.mike@epa.gov>; McDonald, Joseph <McDonald.Joseph@epa.gov>; Bolon, Kevin <Bolon.Kevin@epa.gov>; Barba, Daniel <Barba.Daniel@epa.gov>; Kargul, John <kargul.john@epa.gov>; Moskalik, Andrew <Moskalik.Andrew@epa.gov>; Neam, Anthony <Neam.Anthony@epa.gov>; Cherry, Jeff <Cherry.Jeff@epa.gov>
Cc: Moran, Robin <moran.robin@epa.gov>
Subject: FW: Technology papers - Publication of Transmission Working Paper

ICCT Tech papers for your review.

Mike

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Sent: Monday, December 19, 2016 3:38 PM
To: Charmley, William <charmley.william@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Alson, Jeff <alson.jeff@epa.gov>; Alberto@ARB Ayala <Alberto.Ayala@arb.ca.gov>; Mike McCarthy <michael.mccarthy@arb.ca.gov>
Cc: Anup Bandivadekar <anup@theicct.org>; Nic Lutsey <nic@theicct.org>; Joe Schultz <joe@theicct.org>; Aaron Isenstadt <aaron.isenstadt@theicct.org>
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Working paper: <http://theicct.org/naturally-aspirated-gas-engines-201606>

The second is ICCT's technology "brief", which summarizes the results of the working paper and adds a bit about implications on the mid-term review. Tech brief: <http://theicct.org/naturally-aspirated-engines-techbrief-jun2016>

Let me know if you have any questions or want additional information.

John

To: John German[john@theicct.org]
From: Caffrey, Cheryl
Sent: Mon 5/11/2015 1:00:28 PM
Subject: RE: Lightweighting Examples...

Thank you! I was able to see the webinar they had a few weeks ago – it'll be good to have this as a reference.

Cheryl

From: John German [mailto:john@theicct.org]
Sent: Thursday, May 07, 2015 5:28 PM
To: Caffrey, Cheryl; Bolon, Kevin
Cc: Anup Bandivadekar
Subject: Fwd: Lightweighting Examples...

Cheryl/Kevin,

In case you haven't seen this yet.

John

Begin forwarded message:

From: Anup Bandivadekar <anup@theicct.org>

Subject: Re: Lightweighting Examples...

Date: May 7, 2015 2:55:44 PM EDT

To: Zifei Yang <zifei.yang@theicct.org>

Cc: Nic Lutsey <nic@theicct.org>, John German <john@theicct.org>, Vicente

Franco <vicente@theicct.org>, Peter Mock <peter@theicct.org>

Some videos from Munro about the BMW i3 teardown --http://www.hybridcars.com/teardown-reveals-bmw-i3-is-most-advanced-vehicle-on-the-planet/

Impressive work.

On Apr 9, 2015, at 1:07 PM, Zifei Yang <zifei.yang@theicct.org> wrote:

Hi all,

Thanks again for keeping contributing to the lightweighting example collection. I'm a little behind in tracking the examples, but will catch up soon.

A cool presentation about Munro tear down BMW i3 into pieces is attached. Some features they highlighted:

The structural adhesives are really tough to join the body-in-white (carbon fiber) and chassis (aluminum)

Recycled carbon fiber used on roof panel

Individual battery modules that can be replaced seperately

Best,

Zifei

[The attachment munro-and-associates-BMW-i3-tear-down-Uncovering-the-secrets.pdf has been manually removed]

On Mar 4, 2015, at 9:43 PM, Nic Lutsey <nic@theicct.org> wrote:

Hi all,

Another lightweighting example: 2016 Chevrolet Malibu to get 300 lb (~9%) lighter:

http://www.autonews.com/article/20150304/OEM04/150309922?template=printart

Nic

<an_logo.gif>

Next Malibu tackles weight, space challenges

Mike Colias **<rsslogo.jpg>**
Automotive News | March 4, 2015 - 9:49 am EST

DETROIT -- The next-generation Chevrolet Malibu will have more interior space and weigh 300 pounds less than the current car, General Motors said today.

Chevrolet will unveil the redesigned 2016 Malibu midsize sedan at the New York auto show next month, along with the next-gen Chevy Spark minicar. The Malibu is expected to go on sale by year end.

Chevy released a teaser shot of the Malibu today that shows a sleeker silhouette with fastback styling.

“The roofline has been stretched rearward, giving a more sleek profile, while the front wheels have moved forward and front and rear overhangs have been reduced," GM global design chief Ed Welburn said in a statement. "Along with the sculpted body side, these cues help Malibu appear more dynamic and sophisticated.”

General Motors divulged few other details of the car, but made clear that engineers addressed two of the biggest problems with the current Malibu: The cramped rear seat and its bloated weight relative to competing sedans.

GM said the Malibu will be built on a new vehicle architecture, with a wheelbase nearly 4 inches longer than the '15 model, creating more rear legroom and interior space.

A lighter high-strength steel structure helped reduce the vehicle's weight, "which benefits the sedan's fuel economy and handling," GM said.

The Malibu was quickly re-engineered following the spring 2011 introduction of the current-generation model, which was panned for its stale front-end styling and tight rear seat. Despite improvements for the 2014 model year, sales have struggled.

Malibu sales fell 6 percent last year, the only one of the top seven midsize sedans to post a decline.

<AR-150309922.jpg&MaxWb2&cci_ts 150304115815>

On Feb 18, 2015, at 4:55 PM, Nic Lutsey <nic@theicct.org> wrote:

Hi all,

For the lightweighting file, two examples:

- Chevrolet Volt PHEV will get 243 lbs (~6%) lighter
- Mazda2 to get 7% lighter (stating high-strength steels), while also getting bigger

Nic

http://www.autonews.com/article/20150216/OEM06/150219927/fewer-pounds-and-better-chemistry-boost-16-volt-range

ELECTRO-LIGHT

Fewer pounds and better chemistry boost '16 Volt range

<article_tool_icon_letter.gif> Respond

<email.png>

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<LinkedinSquare30.jpg>

<TwitterSquare30.jpg>

General Motors engineers put the 2016 Chevrolet Volt on a diet to increase its performance and boost its range on a single battery charge to 50 miles from 38. The plug-in hybrid, which goes on sale in the second half of 2015, shed 243 pounds from the 2015 model. A significant share of that weight was cut from the gasoline-electric powertrain. Here's how GM made the Volt's powertrain lighter, along with some other notable engineering changes.

http://europe.autonews.com/article/20150217/ANE/150219876

AUTOMOTIVE NEWS EUROPE E-MAGAZINE

Mazda2 gets bigger, lighter and bolder

Michael Specht
Automotive News Europe | February 17, 2015 06:01 CET

Mazda expects its latest Mazda2 hatchback to make a bigger impact in Europe's highly competitive subcompact segment than the current model because of its more aggressive design, improved interior and a wide range of safety equipment. The company's product program manager Ayumu Doi, said the five-door hatchback's dynamic design will attract new buyers to the brand.

At 4060mm, the fourth-generation Mazda2 is 140mm longer than the current model, but Mazda says it reduced the car's weight by 7 percent through greater use of lightweight steels.

Fast facts

Technology?
First car in its segment to offer a head-up display. First Mazda to offer optional LED headlamps and daytime running lights.
What's good?
Many optional safety features, including automatic braking to prevent low-speed collisions, an audible alert when a vehicle crosses the car's path while reversing and lane-departure warning.
What's bad?
Rear seats do not fold down completely flat, reducing load space. Safety equipment only available on top-end versions.
Engines?
1.5-liter diesel and gasoline engines
Target buyers?
Singles and young couples seeking a small car with a sporty look.

The car's interior has been significantly enhanced with more passenger room and higher-quality materials. Mazda also improved the car's torsional rigidity, giving it a smoother ride and quieter interior.

The basics

Launch date: February (Germany)
Base price: 12,790 euros (Germany)
Platform: Skyactive B modular platform
Where built: Japan, Thailand, Mexico
Annual sales forecast: Global sales target is 200,000
Lowest CO2 emissions: 89g/km
Main rivals: Seat Ibiza, VW Polo, Ford Fiesta, Opel Corsa

The hatchback is Mazda's No. 3 seller in Europe after the C-X5 crossover and Mazda3 compact. European sales of the Mazda2 were up slightly in the first 11 months of 2014, to 22,748 from 22,265, according to market researchers at UK-based JATO Dynamics.

AUTOMOTIVE NEWS EUROPE E-MAGAZINE

This story is from the current issue of the *Automotive News Europe* monthly e-magazine, which is also available to read on our iPhone and iPad apps.**You can download the new issue as well as past issues by clicking here.**

<AR-150219876.jpg&MaxWb2&cci_ts 150217032042>

The Mazda2 has the long hood and sportier stance characteristic of the brand's new Kodo design language.

PRINTED FROM: http://europe.autonews.com/apps/pbcs.dll/article?AID=/20150217/ANE/150219876&template=printartANE

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On Feb 13, 2015, at 2:39 PM, Nic Lutsey <nic@theicct.org> wrote:

Hi all,

Here's a report for the lightweighting files (though I couldn't download as ClimateWorks' sciencedirect subscription appears to have lapsed):

http://www.sciencedirect.com/science/article/pii/S0306261914002530

It appears to be based on this dissertation:

http://deepblue.lib.umich.edu/bitstream/handle/2027.42/102298/amle_1.pdf

Nic

<Lewis 2013 UMich lightweight EV.pdf>

On Feb 11, 2015, at 9:48 AM, John German <john@theicct.org> wrote:

Full speed ahead for aluminum

Prospects for the metal undimmed by F-150's modest mpg gain

http://www.autonews.com/article/20150202/OEM01/302029958/full-speed-ahead-for-aluminum

Some nice quotes here that I thought I would pass along, such as:

- "During a recent presentation to investors in Detroit, Ford product development chief, Raj Nair, said Ford is working on new grades of aluminum that will be more formable and that are expected to reduce weight by about 30 percent over high-strength steel."
- "Lightweighting improves capability," Nair said. "Reducing weight offers faster acceleration, better dynamics and shorter stopping distances," he told investors.
- Mike Murphy, vice president of global automotive for Alcoa, said, "They (Ford) said to us from the beginning it's not about CAFE. That's a tiny piece of the equation. It's about all of the performance attributes of the truck they are now promoting, added towing, improved handling, acceleration and braking. It's a total package,"

John

On Jan 28, 2015, at 1:38 PM, John German <john@theicct.org> wrote:

Really nice article, Nic. Even has some projections in it. Thanks for sending this along.

I am cc'ing Peter on this as well, as the article originated in London.

JOhn

On Jan 28, 2015, at 7:57 AM, Nic Lutsey <nic@theicct.org> wrote:

Hi all,

Here's a more general note on lightweighting. See the AutoNews story link (and below), suggesting ~4% aluminum increase use in cars per year in the US through 2025.

http://www.autonews.com/article/20150128/OEM10/150129811/auto-industry-drives-comeback-in-aluminum-prices

Also on the older question some of us have wondered about on US vs EU aluminum use, the article says 309 lb per vehicle in Europe. The TEDB data (see Table 4.15 at http://cta.ornl.gov/data/chapter4.shtml) source indicates 360 lb per US vehicle in 2012 (~9% of curb mass). So maybe the fleets are similar in percent curb mass that is aluminum.

Nic

Auto industry drives comeback in aluminum prices

Analyst: Usage in cars will have "explosive period of growth from 2015 to 2025'

Firat Kayakiran
Automotive News | January 28, 2015 - 6:44 am EST
LONDON (Bloomberg) -- At a time when other commodities are slumping, aluminum is making a comeback as automakers under pressure to build more fuel-efficient cars increase their use of the lightweight metal.

While copper prices are down 13 percent this year and iron ore has slipped 11 percent, aluminum has gained 1 percent. The rise is small but significant, marking an improvement from a year in which the price of aluminum fell to its lowest level since 2009. Meanwhile, producers including Alcoa Inc. and Rio Tinto Group predict demand will continue to rise over the next few years as the metal grows in importance to automakers.

"Aluminum looks very different from other commodities," Oleg Deripaska, president of the world's largest producer, United Co. Rusal, said in an interview last week. "If we look at the developments which we made to develop new alloys, new applications in cars, construction, packaging and manufacturing, I think this is a reward which we must have for the last seven years of suffering."

Rusal expects automaker consumption to rise 65 percent to 23 million metric tons by 2020, Steve Hodgson, director of sales and marketing, said by email.

Aluminum has long been used in car doors and roofs, but unlike steel, it's difficult to weld, limiting its use in other automobile parts. Breakthroughs in welding technology, though, helped Ford Motor Co. produce its top-selling vehicle, the F-150 pickup, with an aluminum body, and is opening up its use elsewhere.

That's particularly important when the U.S. government target for fuel efficiency is set to rise to 54.5 mpg by 2025, almost double the figure for 2011. The lighter the car, the more fuel-efficient it can be made.

'Stamping processes'

"Technological advancements have made alloys of the metal stronger than steel," Steve Man, an analyst at Bloomberg Intelligence, wrote in a report last week. "New stamping processes have enabled automakers to produce aluminum body parts that meet tight specifications. They can also make them in intricate shapes."

Demand for aluminum auto sheets in North America will almost quadruple to 1.78 million tons in the decade through 2025, according to Alcoa, the largest U.S. producer. Increasing orders for airplanes are also boosting consumption.

"Aluminum being used more and more in vehicles is an inevitable trend," Vanessa Lau, an analyst at Sanford C. Bernstein & Co. in Hong Kong, said by phone. "The significance of the Ford F-150 is that finally and for the first time aluminum is being deployed at mass production. This shows that it can become a substitute for steel."

Weight strategy

Ford declined to discuss its use of the metal. Daimler AG uses a variety of materials including aluminum and carbon-fiber plastics as part of its weight strategy, according to Koert Groeneveld, a company spokesman.

Aluminum prices last year fell to their lowest since 2009, and are now about 33 percent lower than their 2011 peak of $2,800 a metric ton. Looking forward, Alf Barrios, Rio's head of aluminum, said in December he expects demand for the metal to grow 4 percent annually through 2025 on increasing use of the lightweight metal in the transport industry, including both cars and airplanes.

"If you want to survive and improve your margins, you have to focus on high-value products and eliminate the commoditized ones from the portfolio," said Bernstein's Lau, who was previously chief financial officer at Alcoa's global rolled products group, which supplies Ford.

European cars

In Europe, new cars already contain an average of 309 pounds of aluminum each and transport accounts for 40 percent of the use of the metal, according to the European Aluminum Association.

The region's third-largest producer, Norsk Hydro ASA, working with customers including Daimler's Mercedes-Benz unit, has succeeded in manufacturing a large side panel in one piece, reducing the welding requirements and cutting assembly costs.

"Producing side panels in one-piece aluminum was a dream for the auto industry, and now we are increasing production to meet rising demand," Hydro's CEO Svein Richard Brandtzaeg said in an interview.

Hydro is investing 130 million euros ($147 million) to increase output fourfold for car makers from its plant in Germany, and Alcoa shipped a record volume of automotive aluminum sheet last quarter.

Steelmakers, meanwhile, are trying to counter the rise of aluminum with their own new products. ArcelorMittal, the world's biggest steelmaker, in September said a new range of products for automakers can save as much as 384 pounds, or 23 percent of the weight of a pickup's cab, box, frame and closures, allowing vehicles to meet emission standards in Europe and the U.S.

It may be too late. Ducker Worldwide LLC, a suburban Detroit consultant, says it sees aluminum use in cars reaching a "critical mass for an explosive period of growth from 2015 to 2025."
<AR-150129811.jpg&q
€&MaxW"8&cci_ts
150128065238>
Breakthroughs in welding
technology helped Ford produce the
aluminum-bodied F-150 and is
opening up its use elsewhere

On Dec 13, 2014, at 10:45 AM, Nic Lutsey <nic@theicct.org> wrote:

Hi all,

Another example for the lightweighting highlights library:

The 2015 Audi Q7 drops 716 lb (~14% from 5192 lb curb weight).

http://www.autonews.com/article/20141212/OEM04/141219941?template=printart

http://www.edmunds.com/audi/q7/2014/features-specs/

Nic

<an_logo.gif>

Audi Q7 slims down for 2015

Richard Truett <rsslogo.jpg>
Automotive News | December 12, 2014 - 1:48 pm EST

Audi is shrinking the Q7 SUV.

By reducing the size slightly and constructing the body with a mixture of high-strength steel and aluminum, the three-row SUV drops 716 pounds.

Audi plans a world debut for the vehicle Jan. 12 at the North American International Auto Show in Detroit.

The Q7 has an ultra-high-strength steel backbone in what Audi calls the “occupant cell,” and aluminum castings, extruded sections and panels are used in the front and rear of the body.

Audi plans to offer a plug-in diesel hybrid version of the Q7 after the gasoline and diesel models are launched.

Two engines will be available -- a 3.0-liter supercharged gasoline V-6 and a 3.0-liter turbocharged diesel V-6. Audi says the Q7’s fuel economy will improve as much as 26 percent. All versions will be equipped with an eight-speed automatic transmission.

<V2-141219941.jpg&MaxWb2&cci_ts 141212170334>

To reduce weight, Audi used aluminum for the doors, fenders, hood and rear hatch -- saving more than 150 pounds. The doors alone shave 52 pounds off the curb weight.

<V3-141219941.jpg&MaxWb2&cci_ts 141212170334>

The Q7 has an ultra-high-strength steel backbone in what Audi calls the “occupant cell,” and aluminum castings, extruded sections and panels are used in the front and rear of the body.

Audi plans to offer a plug-in diesel hybrid version of the Q7 after the gasoline and diesel models are launched.

<AR-141219941.jpg&MaxWb2&cci_ts 141212170334>

PRINTED FROM: http://www.autonews.com/apps/pbcs.dll/article?AID=/20141212/OEM04/141219941&template=printart

On Nov 26, 2014, at 8:12 AM, Nic Lutsey <nic@theicct.org> wrote:

Hi Zifei et al,

For the folder on good news on the lightweighting front, here's another story related to automakers' planned lightweighting efforts, this one related to Toyota adding aluminum body parts to luxury models (in addition to Prius):

http://asia.nikkei.com/Business/Companies/Toyota-embracing-aluminum-auto-bodies-to-boost-mileage

It talks about aluminum bodies (hoods, bumpers, doors and fenders) for 100 kg savings on luxury models for 0.5-0.7 km/L reduced fuel consumption. Also note that Toyota is rolling out of their Toyota New Global Architecture as well and has targeted mass reduction of "up to 20%" (attached).

Nic

<Toyota 20percent mass 2015 TNGA.pdf>

On Oct 23, 2014, at 10:59 AM, John German <john@theicct.org> wrote:

Article suggests it is 900 pounds with the battery. In any case, if the 99 mile driving range is real world, then your guess of 250-300 pounds for the battery pack is probably OK. If the 99 mile driving range is on the NEDC, then the battery pack might be somewhat lighter.

Although with a 20 kW motor and a top speed of 75 mph, I doubt they will find many customers. Even the Smart Fortwo EV uses a 55 kW motor.tesla $35k

There does seem to be a growing consensus that lightweighting can reduce the overall cost of BEVs. The outlier seems to be Tesla, which has said they plan to switch to less expensive materials (e.g. steel) for their $35k midsize car in a few years to reduce cost.

John

On Oct 23, 2014, at 10:28 AM, Zifei Yang <zifei.yang@theicct.org> wrote:

More lightweighting on electric vehicles.

BMW and Daimler model Visio. M is **900 lbs** (without battery) with carbon fiber, aluminum for passenger compartment, and polycarbonate windows. With battery, probably 250-300 lbs more? (Smart Fortwo is around 1900 lbs)

20 hp electric motor, top speed 75 mph, driving range 99 miles.

They claim to make it affordable, so the saving from smaller battery could balance out increased material cost?

http://inhabitat.com/lightweight-visio-m-electric-car-weighs-in-at-only-900-pounds/visiom_tum_0001/

Best,

Zifei

On Sep 9, 2014, at 9:54 AM, Zifei Yang <zifei.yang@theicct.org> wrote:

FYI.

Top-selling two-seaters: 2016 Mazda MX-5 Miata/Roadster (Japan) shaved 220 lbs (9%) of its new model compare to its current 2005 model. Also shrink the size--3 inches in overall length and 1/2 inch in width.

http://www.detroitnews.com/article/20140904/AUTO0104/309040121

DuPont survey: Lightweighting leads fuel efficiency technologies to meet 2025 CAFE targets

http://www.compositesworld.com/news/lightweighting-goals-top-automotive-design-and-manufacturing-survey

Best,

Zifei

On Aug 14, 2014, at 10:43 AM, Zifei Yang <zifei.yang@theicct.org> wrote:

Jaguar Lightweight E-type. ONLY 6 in production. Aluminum bodyshell cut 250 lb (114kg) weight. Digital design of 230 individual body components.

http://www.greencarcongress.com/2014/08/20140812-jag.html

Best,

Zifei

On Jul 16, 2014, at 4:12 AM, Vicente Franco <vicente@theicct.org> wrote:

Just FYI

http://automotivemegatrends.com/articles/lightweighting-drives-materials-innovation-inside/

Vicente Franco
International Council on Clean Transportation
Neue Promenade 6 - Berlin 10178
+49.30.847.129.109 | vicente@theicct.org
ICCT - International Council on Clean Transportation Europe gemeinnuetzige GmbH
Managing Director: Dr. Peter Mock, Amtsgericht Charlottenburg HRB 143557, VAT-IdNr. DE284186076

On 16 Jun 2014, at 15:41, John German <john@theicct.org> wrote:

A lot of interesting materials in the M3/M4. Unfortunately, these are BMW's high-performance versions of the 3-series and their sales are relatively low. It looks like BMW considered a lot of the materials to be too expensive for the higher volume 3-seriese vehicles.

On the other hand, this is how costs come down over time. OEMs test out new ideas on low volume vehicles, then later spread the ones that work to higher volume vehicles.

John

On Jun 15, 2014, at 10:09 AM, Nic Lutsey <nic@theicct.org> wrote:

Hi all,

Another lightweighting example: 180 lb (5% of curb weight) reduction from BMW 3-series M3/M4 for MY2015. This is notable in that the BMW 3-series (and M versions especially) do a lot of other lightweighting already. A/the major reason they could accomplish this (I'm guessing…) is that they dropped the V8 and therefore could see direct plus indirect mass reduction benefits in engine supports, suspension, etc. The article mentions a handful of new carbon fiber parts (this might be made more cost-effective from the "scraps" from i3 carbon fiber processes?).

Nic

<BMW M3 M4 180 lb.pdf>

On Jun 11, 2014, at 1:09 PM, John German <john@theicct.org> wrote:

I don't suppose Ducker has done anything similar for Europe? Could be useful in our ongoing arguments over size versus weight standards in Europe.

John

On Jun 10, 2014, at 11:42 PM, Nic Lutsey <nic@theicct.org> wrote:

Hi all,

On the lightweighting front, see the latest on N American aluminum projections through 2025 from Ducker:

http://www.greencarcongress.com/2014/06/20140610-ducker.html

http://www.drivealuminum.org/research-resources/PDF/Research/2014/2014-ducker-report

Any by the way attached are the lightweighting slides that I presented in China last week. Mostly these are a synthesis of materials that a few of us have used before, but with a few tweaks, additions, and translation.

Nic

<Lutsey.day2_ENCN_v2.pptx>

On Jun 4, 2014, at 2:59 PM, Anup Bandivadekar <anup@theicct.org> wrote:

Ford introduces Lightweight Concept vehicle to showcase ongoing light-weighting and advanced materials work; nearly 25% weight reduction

http://www.greencarcongress.com/2014/06/20140604-ford2.html

and

https://media.ford.com/content/fordmedia/fna/us/en/news/2014/06/03/ford-builds-on-advanced-materials-use-with-lightweight-concept.html

On May 6, 2014, at 11:15 AM, Zifei Yang wrote:

Attached is slides from a webcast host by SAE today on "Lightweighting with Multi-Material Vehicles".

Ford talked about its lightweight strategy, challenges for multi materials, and a little bit about 2015 F-150

-- Strategy to meet CAFE standards: engine and chassis technologies are expensive, if apply weight reduction at high level, combine with secondary weight reduction, better fuel economy could be realized at lower cost

-- Three steps for mass use of mass reduction technologies: Lightweight materials--> LW vehicle system--> carbon fiber

-- When aluminum come into high volume production, recycling provide big cash advantages

-- The 2015 F-150 is the most profitable alternative to meet CAFE target

-- Q&A. Will the customers bear all the raising cost of F-150, what the price will be like? A: It will be priced competitively. Meanwhile, the customer will notice the improvement made by the aluminum (improved performance and fuel economy…)

-- Q&A. Since aluminum warm forming is not available for mass production, how to increase the strengthens of the material? A: It's simple. 6000 series aluminum, use a special heat treatment to increase the strength.

Nanosteel talked about their business model, 3rd generation AHSS materials (1200 MPa, 20% elongation), EDAG study, and have a poll question for audience (not sure how many and who are the audience), though they are all important.

<PastedGraphic-9.pdf>

Dow talked about adhesive technology, and their technologies used on Tesla Model S, GM Corvette Stingray, 2015 F-150, BMW i3 etc. and another pool question for audience (question is: what do you see as the main barrier for not using structure adhesive). The presenter said the results is similar to the feedback they collected from OEMs.

<PastedGraphic-11.pdf>

Best,

Zifei

<SAE lightweigh May6 Webcastslides.pdf>

On Mar 26, 2014, at 5:08 PM, John German <john@theicct.org> wrote:

I thought BMW was going to produce the carbon fiber panels for the i3 and i8 itself, but I could well be wrong.

John

On Mar 26, 2014, at 1:17 PM, Anup Bandivadekar <anup@theicct.org> wrote:

I wonder if the two MY 2016 vehicles using carbon fiber body panels are actually BMW i-series or someone else...

http://www.magna.com/media/press-releases-news/news-page/2014/03/11/news-release---magna-to-produce-carbon-fiber-composite-body-panels

All,

Here's another example of lightweighting from the Geneva auto show

http://www.magnasteyr.com/capabilities/vehicle-engineering-contract-manufacturing/news-events/events/geneva-motor-show-2014

Best,

Vicente Franco

International Council on Clean Transportation
Neue Promenade 6 - Berlin 10178

+49.30.847.129.109 | vicente@theicct.org

From: John German John German
Reply: John German john@theicct.org
Date: 25 Feb 2014 at 21:59:41
To: Anup Bandivadekar anup@theicct.org
Subject: Re: Lightweighting Examples...

Well, they are just using production waste to keep the costs down. Doesn't sound like it would be cost-effective on its own.

John

On Feb 25, 2014, at 3:56 PM, Anup Bandivadekar <anup@theicct.org> wrote:

Hi Zifei,

For now, I will keep this as an ongoing thread, and will request others to keep replying as we discover more lightweighting applications:

Today, I learned that BMW is planning to use carbon fiber in wheels. This would be a first, if I'm not wrong:

http://www.autoexpress.co.uk/bmw/85858/bmw-carbon-fibre-wheels-close-producion

Interesting that they talk about making not just steering wheels, but also the entire dashboard. I have no idea of the economics of all of this, but seems like BMW is leveraging it's i3 carbon fiber effort well.

Anup

On Feb 18, 2014, at 12:52 PM, Zifei Yang wrote:

Hi Anup,

These are all good sources. Thanks for sending to me and feel free to send more when you come across any. I will look into them.

Below is some more info on Peugeot 308 SW:

CO2 emission 85 g/km (Blue HDi version). 21% reduction. Good aerodynamic performance 0.73 m2

For an equivalent engine and equipment, the PEUGEOT 308 SW is the lightest vehicle in the segment. The new EMP2 platform makes possible a drastic weight reduction of 70 kg and the innovative technical design and the choice of innovative technical solution allow a further reduction of 70 kg. The weight of each part has been optimized while still maintaining the full capacity of the part (the bonnet and front wings are made of aluminum, some HSS, innovative materials, redefinition of parts). Around 9% mass reduction.

http://www.peugeot.com/en/news/the-new-peugeot-308-sw-presented-for-the-1st-time-at-geneva-motor-

show

Best,

Zifei

On Feb 18, 2014, at 2:36 PM, Anup Bandivadekar <anup@theicct.org> wrote:

hi Zifei,

Sorry for the multiple emails, but here is an example of an investment announcement by company in lightweight manufacturing capacity. The amount here is small, but 150 jobs is very neat. Please be sure to capture both $$ as well as jobs added as you accumulate these examples.

http://shiloh.com/wp-content/uploads/2014/02/Shiloh_Indiana-Expansion_FINAL.pdf

Best,

Anup

On Feb 18, 2014, at 11:23 AM, Anup Bandivadekar wrote:

Also, some really good presentations
here: http://www.cargroup.org/?module=Schedule&confID=5&event=Session&sessionID)

JLR: Aluminum usage, see nice slides on manufacturing processes

http://vimeo.com/61276480

https://www.raeng.org.uk/events/pdf/InnovationAuto_Mark_White_JLR.pdf

On Feb 17, 2014, at 10:48 PM, Anup Bandivadekar wrote:

The new model from Peugeot is supposed to have 140 kg weight reduction compared to the older version. Could you please try to find out more?

Thanks,

Anup

Anup Bandivadekar

Passenger Vehicles Program Director

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http://www.theicct.org/ Twitter: @TheICCT

To: John German[john@theicct.org]
From: Caffrey, Cheryl
Sent: Thur 4/23/2015 8:09:29 PM
Subject: RE: US/EU/China lightweight vehicle technology study - Next call April 28

That's what I am saying we can't do for we are really in the middle of doing the analyses to figure that out. We had

SAE this week so it took time and the student only worked M-W and we haven't had a chance to catchup with him to look at what he uncovered. I think the student has finals next week, but if he is in on Monday then we can discuss his work from this week… no promises.

I can cover the first week in May since Mike can't make it – if that works for you.

Cheryl

From: John German [mailto:john@theicct.org]
Sent: Thursday, April 23, 2015 3:20 PM
To: Caffrey, Cheryl
Cc: Ken White; Olechiw, Michael
Subject: Fwd: US/EU/China lightweight vehicle technology study - Next call April 28

Unfortunately, Doug just shot down my idea of inviting Ducker and A2mac1 to give presentations (see below).

Can EPA at least talk in general terms about the kind of data they are likely to need, including baseline years desired (e.g. would you like 2010 to match the rulemaking and are you going to use an updated year for the MTE)? I would late to postpone the meeting, given that most of the main players have already committed and it will be 3 more weeks before I could reschedule.

John

Begin forwarded message:

From: "Richman, Doug" <Doug.Richman@kaiseral.com>

Subject: RE: US/EU/China lightweight vehicle technology study - Next call April 28

Date: April 23, 2015 3:14:19 PM EDT

To: "John German" <john@theicct.org>

John,

I recommend developing an initial consensus description of what we think we want before we start discussions with Ducker or A2mac1. This exercise will help us focus on clearly defined articulated project goals, objectives and scope. Contractors will then be in a position to propose the services they can provide to support those objectives. Contractors will, by the nature of their business, offer suggested revisions to the draft project description.

Doug

From: John German [mailto:john@theicct.org]
Sent: Thursday, April 23, 2015 1:53 PM
To: Richman, Doug
Cc: george.coates@thephxway.com Coates
Subject: Re: US/EU/China lightweight vehicle technology study - Next call April 28

Thanks, Doug.

A quick question about the agenda for April 28. Do you think it would be worthwhile to have Ducker and A2mac1 give brief presentations on April 28 and answer a few questions? Or should we try to hash out what we want first?

John

On Apr 23, 2015, at 1:35 PM, "Richman, Doug" <Doug.Richman@kaiseral.com> wrote:

John,

I am available April 28 at 11 ET.

Doug Richman

From: John German [mailto:john@theicct.org]
Sent: Wednesday, April 22, 2015 3:25 PM
To: Michael Olechiw; Kevin Bolon; Cheryl Caffrey; Richman, Doug; Patrik Ragnarsson; Ed Opbroek; Russ Balzer; Jody R Shaw;george.coates@thephxway.com Coates; Ken White; Jan Guy; Amanda Kasik; Gina-Marie Oliver; Ingo.Sartorius@Plasticseurope.org; Patricia Vangheluwe; Pat Davis; Gong Huiming; Zhang Xiuli; 赵冬昶; 杨洁; 郭千里; lvwang@catarc.ac.cn; Ian Hodgson; Drew Kodjak; Hui He; Zifei Yang; Anup Bandivadekar; Peter Mock; Keri Browning
Subject: Re: US/EU/China lightweight vehicle technology study - Next call April 28

Although I have not heard back from most people and I have had two people say they cannot make April 28, I have decided to **schedule the next meeting for April 28 (8am PT/11am ET/5pm ECT)** for two reasons. First, the proposed date is only 6 days away and we need to get moving. Second, both EPA and Ian Hodgson (EC) are available on April 28 and **I would like to focus the next call on the data requirements,** which will be largely determined by the regulators from EPA, EU, and China.

ICCT will once again set up a GoToMeeting for April 28. We will distribute this before the end of the week.

I talked to Scott Ulnick at Ducker this morning. He gave me some background information on the type of data that they can supply and how the data can be stratified:

- **Region**: North America, EU-27, other EU, Japan, China, S. Korea, South America, India.
- **Vehicle Components,** such as body-in-white, closures, bumpers, powertrain
- **Materials**: Type of materials (e.g. metals, plastics) and grades
- **Forming process**, such as stamping, cast materials, etc.
- **Geographic:** Their data is stored by the location of the final assembly plant. They also

have sales, so they can link to where the vehicles are sold, but this would cost more.
- **Vehicle models:** Typically sort their data by vehicle class, such as A, B, C. They can dive deeper into models and manufacturers, but would cost more.

Please come to the April 28 call prepared to **discuss the level of detail needed for the data collection**. This is an important step before we can proceed with discussions with Ducker and A2mac1 on supplying data and cost.

Following is a tentative agenda for the April 28 meeting. Let me know if you have comments or suggestions on agenda items:

Tentative Agenda for April 28:

1) Discuss level of detail needed for the data collection, for the parameters laid out by Ducker.

- Regions should be clear and I think we want the most detailed data possible on materials.
- Do we want data by component or forming process, or is an overall vehicle assessment adequate?
- Do we want data by vehicle model or manufacturer, or is market segment adequate?
- Do we want data by both both location of final assembly plant and by market location?
- EPA has requested an analysis of global platforms, so we need data on whether platform is local or global.

2) How does the data from A2mac1 overlap with that from Ducker? What unique data does each offer?

3) Who would like to be part of a group to discuss costs and contract proposals with Ducker and A2mac1?

4) How does data from the SAE-China Lightweight Alliance compare with these parameters? (Assuming SAE-China can make the call.)

John

734-355-1055

On Apr 20, 2015, at 5:59 PM, John German <john@theicct.org> wrote:

Existing studies: Two additional links:

- The European Aluminum Association has a public version of their latest Ducker report: http://www.alueurope.eu/wp-content/uploads/2012/04/EAA-Aluminium-Penetration-in-cars_Final-Report-Public-version.pdf
- A September 2014 report by the American Chemistry Council on "Plastics and Polymer Composites in Light Vehicles" is attached.

Next meeting. So far, I have only had feedback on the proposed April 28 meeting from EPA (yes), Ed Opbroek (yes), and Patrick Ragnarsson (no). **Please let me know if April 28 works for you**, so that we can get this scheduled or try to find a different time.

John

On Apr 17, 2015, at 2:42 PM, John German <john@theicct.org> wrote:

Thanks to everyone for participation in the kickoff meeting yesterday. We had a good discussion and helped lay out some parameters and next steps.

Notes from the meeting are attached. Note that I have reorganized this a bit, plus we have some additions and corrections from CATARC and SAE-China. **Please let me know if you have any corrections or comments.**

Next meeting. During the call, we tentatively discussed April 30. Unfortunately, EPA is not available on April 30 or the following week. They suggested that Tuesday, April 28 would be best for them. **Please let me know your availability for April 28.** Time would be the same - 8 PT/11ET/5 CET.

Existing studies:

- SAE Paper 2015-01-0574 on A2mac1 data and statistical methods by Malen & Hughes.

The authors are presenting this paper at next weeks SAE Congress in Detroit Thursday morning, Paper is available on the SAE website. Abstract is b

elow.

- Plastics report is at: http://www.plastics-car.com/Tomorrows-Automobiles/Plastics-and-Polymer-Composites-Technology-Roadmap/Plastics-and-Polymer-Composites-Technology-Roadmap-for-Automotive-Markets-Full-Report.pdf
- **Please send me links to any additional materials.**

Next Steps:

- WorldAutoSteel will organize a briefing on the statistical methods used for the A2mac1 SAE paper.
- ICCT will follow up with EPA (and EU and CATARC?) to define the level of segregation they need for the data.
- ICCT will follow up with organizations that are interested but have not yet committed to participating.
- By next meeting hope to be able to define a scope of work, so we can request proposals.
- **Any other suggestions?**

John

On Apr 13, 2015, at 4:09 PM, John German <john@theicct.org> wrote:

Following is the GoToMeeting information for our meeting this Thursday. Please let me know if you need additional information - or if you have suggestions for the agenda (attached again).

1. Please join my meeting, Apr 16, 2015 at 8:00 AM PDT.
https://global.gotomeeting.com/join/616257053

2. Use your microphone and speakers (VoIP) - a headset is recommended. Or, call in using your telephone.

United States: +1 (224) 501-3316
Germany: +49 (0) 692 5736 7207

Access Code: 616-257-053
Audio PIN: Shown after joining the meeting

Meeting ID: 616-257-053

John

734-355-1055

Begin forwarded message:

From: John German <john@theicct.org>

Subject: Re: US/EU/China lightweight vehicle technology study - kickoff meeting April 16

Date: March 31, 2015 10:16:04 AM EDT

Sorry to take so long to pick a date for our kickoff meeting. This is a group of busy people and it was hard to come up with a day everyone could participate.

The best compromise is **Thursday, April 16, 8am PT, 11am ET, 5pm CET** (thanks to the steel folks for being flexible). I will sent up a GoToMeeting and send this with the call-in information in a followup email. We have a lot to cover so please plan on **two hours for the meeting**.

Attached is a draft agenda, along with a preliminary list of project goals. This includes ICCT's original ideas (below) and some input from EPA and WorldAutoSteel. **I would appreciate any additional suggestions on the agenda and items that you would like to discuss - including the specific tasks that your organization would like to support.**

While the meeting is focused on the participants, I am also sending this email to a number of potential participants and other interested observers. We encourage you to join the meeting and participate as appropriate.

John

<Plastics in LD vehicles - Sep2014.pdf>

To: Viera, John (J.J.)[jviera@ford.com]; rhwang@nrdc.org[rhwang@nrdc.org]; JBECKER@autoalliance.org[JBECKER@autoalliance.org]; wrwade1@gmail.com[wrwade1@gmail.com]; Larson, Robert[larson.robert@epa.gov]; Moran, Robin[moran.robin@epa.gov]; John@theicct.org[John@theicct.org]
From: Katie Rustad
Sent: Fri 6/26/2015 2:40:35 PM
Subject: RE: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Hello all, just thought you would like to see the current version of your session from the agenda below. I'll be happy to make any updates.

Thank you!

Katie Rustad

Thursday, August 20

Session IV – 2 to 6 p.m.

Part A: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Aggressive national energy and GHG performance standards for cars and light trucks were adopted in 2012. They require nearly a halving of fuel consumption and GHGs from 2010 to 2025. China, Japan, and the EU are also adopting very aggressive standards. Is the technology and market on track to meet these standards? Should they be modified? And what role is, or might, the Zero Emission Vehicle mandate, adopted by 10 states, having on the achievement of the targets?

Moderator:

John Viera, *Global Director of Sustainability, Ford Motor Company*

Speakers:

Robin Moran, *Senior Policy Advisor, Office of Transportation and Air Quality, U.S. EPA*

"Midterm Evaluation of the 2022-2025 Light-duty Vehicle Greenhouse Gas Standards"

Wally Wade, *Technical Fellow, Ford Motor Company* (retired)

"What the National Academies Report Says about Technology"

Discussants:

Julie Becker, *Vice President, Environmental Affairs, Alliance of Automobile Manufacturers*

John German, *Senior Fellow/U.S. Co-Lead, International Council on Clean Transportation*

Roland Hwang, *Director, Energy & Transportation Program, Natural Resources Defense Council*

From: Viera, John (J.J.) [mailto:jviera@ford.com]
Sent: Friday, June 26, 2015 2:33 AM
To: rhwang@nrdc.org; JBECKER@autoalliance.org; wrwade1@gmail.com; larson.robert@epa.gov; moran.robin@epa.gov; John@theicct.org
Cc: Katie Rustad; Viera, John (J.J.)
Subject: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Hello all (Robin, I hope I have the right email for you – just a guess after seeing Bob Larson's email approach at EPA. I will need your official title for the session description below) –

It is time that we begin pulling together our material before the Asilomar event in August. I know this was a crazy busy month for all of us with the NAS report out, the HD NPRM, etc. I would like to get together sometime the week of July 13th and then possibly hold 1-2 more meetings to final all of our material and logistics leading up to Asilomar the 3rd week in August.

Does anyone have access to Doodle scheduling that we can set up to understand available days and times that week?

Thanks and really looking forward to an incredibly rich session!

John J. Viera
Director, Sustainability & Vehicle Environmental Matters
Ford Motor Company
Phone: 313-32-36976 Cell: 313-805-3219
jviera@ford.com

From: Katie Rustad [mailto:klrustad@ucdavis.edu]
Sent: Friday, May 01, 2015 6:00 PM
To: Viera, John (J.J.)

Subject: Asilomar Conference 2015 agenda update

Dear Mr. Viera,

Dan Sperling has asked me to update the conference agenda. Your session information is below. Could you please let me know about any changes needed in your title and affiliation, or in the description of your session?

Thank you!

Best regards,

Katie Rustad

Senior Writer & Publications Archive Manager

Institute of Transportation Studies

University of California, Davis

klrustad@ucdavis.edu

Thursday, August 20

Session IV – 2 to 6 p.m.

Part A: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Aggressive national energy and GHG performance standards for cars and light trucks were adopted in 2012. They require nearly a halving of fuel consumption and GHGs from 2010 to 2025. China, Japan, and the EU are also adopting very aggressive standards. Is the technology and market on track to meet these standards? Should they be modified? And what role is, or might, the Zero Emission Vehicle mandate, adopted by 10 states, having on the achievement of the targets?

Moderator:

John Viera, *Global Director of Sustainability, Ford Motor Company*

Speakers:

Robin Moran for Bill Charmley, *Director, Assessments and Standards Division, U.S. EPA*

"Proposed Vehicle Regulations"

Wally Wade, *Technical Fellow, Ford Motor Company* (retired)

"What Do the National Academies Say about Technology Progress?"

Discussants:

Julie Becker, *Vice President, Environmental Affairs, Alliance of Automobile Manufacturers*

John German, *Senior Fellow/U.S. Co-Lead, International Council on Clean Transportation*

Roland Hwang, *Director, Transportation Program, Energy & Transportation Program, Natural Resources Defense Council*

To: 'Hilary Sinnamon'[hilary@redmtngroup.com]; Nic Lutsey[nic@theicct.org]; 'Tonachel, Luke'[Ltonachel@nrdc.org]; Chester J France[cjfrance@sbcglobal.net]; skhan@aceee.org[skhan@aceee.org]; Jesse Prentice-Dunn - Sierra Club (jesse.prentice-dunn@sierraclub.org)[jesse.prentice-dunn@sierraclub.org]; 'Therese Langer'[TLanger@aceee.org]; Moran, Robin[moran.robin@epa.gov]; Dave Cooke[DCooke@ucsusa.org]; 'Shannon Baker-Branstetter'[sbaker-branstetter@consumer.org]
From: Jonna Hamilton
Sent: Wed 6/17/2015 4:16:14 PM
Subject: LDV technical meetings

Hi All,

Sorry for the late agenda on this. We will follow Dave's suggestion for the topics to be covered on this call. EPA is also interested in hearing our thoughts on these issues. We have only 45 minutes today, so the call will be from 1-1:45.

Call in info –

1-888-346-3659; 648047#

Agenda

Question 2 from our original list:

What assumptions are in the mid-term evaluation that are having adverse impacts on the effectiveness of the rule, and is EPA reconsidering?

a. Continued trade-offs between increased effectiveness and performance and manufacturers choosing performance

b. Turbo downsizing – not clear how effective it is in reality –how will it figure into the next round?

c. Car vs truck definition — is this a loophole and/or something the agencies will be looking at?

Thanks and I look forward to talking with all of you soon.

Jonna

Jonna Hamilton

Senior Washington Representative

Clean Vehicles Program

Union of Concerned Scientists

1825 K Street NW, Suite 800

Washington, DC 20001

202-331-5451

JHamilton@ucsusa.org

To: Moran, Robin[moran.robin@epa.gov]
From: Carol Lee Rawn
Sent: Fri 5/8/2015 11:10:28 PM
Subject: Re: costs

Thank you Robin!
Best, Carol Lee
On May 7, 2015, at 9:44 AM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi Carol Lee,

I ran this by one of our cost experts, Todd Sherwood, and am pasting his feedback below, hoping this will be useful to your contractor:

- Many of the costs in Figure 18 seem a bit low. We have updated our trans costs per revisions from FEV, available on our website (link below, and copy of report attached). The changes resulted in higher trans costs. That said, they show AMT costs rather than DCT costs (which we show). Perhaps they mean DCT which suggests that their costs are lower than our costs.

http://www.epa.gov/otaq/climate/strategies-vehicle.htm

Light-Duty Technology Cost Analysis, Report on Additional Case Studies (Revised Final Report) (PDF) (39 pp, 281K, EPA-420-R-13-008, April 2013)

o Supporting Excel spreadsheets can be found in the Electronic Docket at regulations.gov; search for "EPA-HQ-OAR-2009-0472-11604," and see the documents with IDs EPA-HQ-OAR-2009-0472-11604.1 through EPA-HQ-OAR-2009-0472-11604.77

- Figure 18's electrification costs seem a bit lower too. I assumed their costs were direct+indirect and meant for 2020, but that's not clear. They show costs for CVTs which are probably based on Phase 1 or even 2002 NAS. That's probably the best public value to use (short of estimates they may get directly from industry). We have been told that CVT costs should be on par with 6 sp auto trans costs, but we have no public estimate at this time that's better than 2002 NAS. They also show costs for 2mode HEVs, which we included in the phase 1 rule but didn't include in phase 2.

- We did not attempt to compare the package costs in Figure 19 to ours.

As I mentioned earlier this week, except for the updated transmission costs noted above, we won't have any new publicly available technology teardown cost estimates until at best this fall (mild hybrids, diesels), after peer review. Our teams are reviewing all the cost estimates from the 2017-2025 rule as part of the draft Technical Assessment Report for release in June 2016.

I hope this feedback is useful, and of course please let me know if there are any follow-up questions.

Best,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Tuesday, May 05, 2015 10:39 AM
To: Moran, Robin
Subject: costs

Hi Robin - good talking with you. Attached is the Citi report; the cost section is on p.26-35.

many thanks Robin!

Carol Lee Rawn

Director, Transportation Program

Ceres

99 Chauncy Street

Boston, MA 02111-1703

(T) 617-247-0700 ext. 112

(M) 617-388-7879

www.ceres.org

<EPA_FEV_transmission cost update_April 2013.pdf>

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(M) 617-388-7879
rawn@ceres.org
www.ceres.org

To: Moran, Robin[moran.robin@epa.gov]
From: Jonna Hamilton
Sent: Wed 5/6/2015 5:21:13 PM
Subject: RE: Meeting time

Hi Robin,

Folks were talking about whether EPA is considering how OEMs are using credits and are likely to use credits to comply in the out years. How will the credit banking affect each manufacturers compliance in the future? Is EPA incorporating this kind of thinking in the mid-term evaluation? Will it affect how EPA looks at the stringency?

It might make sense to talk about this at a higher level in the first meeting and maybe then do a deeper dive on it on a future call.

Thanks,

Jonna

From: Moran, Robin [mailto:moran.robin@epa.gov]
Sent: Wednesday, May 06, 2015 1:03 PM
To: Jonna Hamilton
Subject: RE: Meeting time

Hi Jonna, that sounds great. On the credits topic, what exactly are the questions you'd want to discuss? I know a lot about the GHG credits programs, but if there's something deeper you want to get into (e.g., credit calculations in the MY2013 manufacturer performance report) I could pull in other folks -- or that might be better for a different call?

Thanks

Robin

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]

Sent: Wednesday, May 06, 2015 12:57 PM
To: Moran, Robin
Subject: Meeting time

Hi Robin,

Thanks for your patience in scheduling this meeting – there was some shifting that needed to happen to get this to come together. We can do May 21 from 11-12. I am happy to provide a call in number. Right now it looks like folks from UCS, NRDC, and EDF will be joining.

We are discussing some of the topics we want to bring up and will send you a better list closer to the meeting time, but one thing that has come up is a conversation about credits – I'm not sure who the expert in credits is at EPA, but is it possible to get whoever knows this best to join the call?

Thanks,

Jonna

Jonna Hamilton

Senior Washington Representative

Clean Vehicles Program

Union of Concerned Scientists

1825 K Street NW, Suite 800

Washington, DC 20001

202-331-5451

JHamilton@ucsusa.org

To: Moran, Robin[moran.robin@epa.gov]
From: Don Anair
Sent: Wed 1/28/2015 7:43:46 PM
Subject: RE: New UCS blog: Why low gas prices are no reason to roll back fuel economy and emission standards
removed.txt

Thanks Robin.

From: Moran, Robin [mailto:moran.robin@epa.gov]
Sent: Wednesday, January 28, 2015 10:56 AM
To: Don Anair
Subject: RE: New UCS blog: Why low gas prices are no reason to roll back fuel economy and emission standards

Don,

This is fantastic, we couldn't have said it better ourselves!

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

From: Don Anair [mailto:DAnair@ucsusa.org]
Sent: Tuesday, January 27, 2015 1:59 PM
To: danair@ucsusa.org
Subject: New UCS blog: Why low gas prices are no reason to roll back fuel economy and emission standards

Hi,

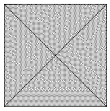
I wanted to share a recent blog post that might be of interest. I address some of the recent media coverage and automaker statements, particularly Chrysler, encouraging a change in fuel economy standards.

Thanks,

-Don

http://blog.ucsusa.org/dear-chrysler-5-reasons-oil-prices-shouldnt-affect-fuel-economy-standards-800

Dear Chrysler: 5 Reasons Oil Prices Shouldn't Affect Fuel Economy Standards



Don Anair, research and deputy director, Clean Vehicles

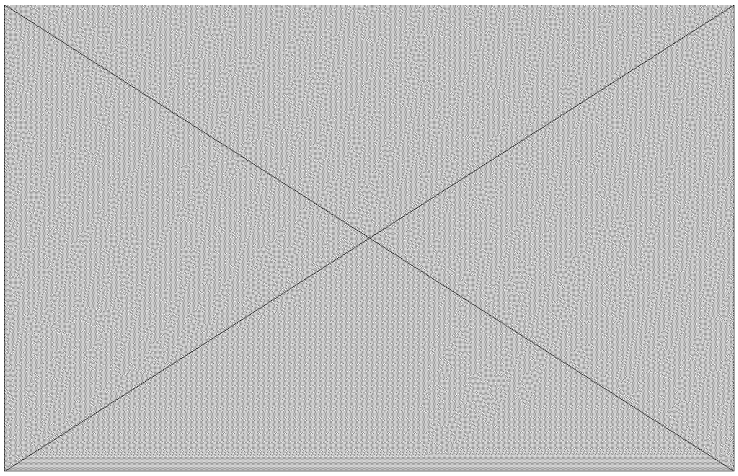
January 27, 2015

Lately, low gas prices have been making headlines across the country. Having dropped by more than $1.50/gallon over the last 6 months, there is certainly reason to be talking about them. So it

was no surprise when the topic came up at the North American International Auto Show earlier this month in Detroit. The CEO of Chrysler, Sergio Marchionne, used the opportunity to call for rolling back vehicle fuel economy standards. This is perhaps not surprising from a CEO who also tells people not to buy his company's electric cars and who's company has scored last in 6 out of 7 UCS Automaker Rankings. But his statements on fuel economy appear to be as volatile as oil prices. Just a couple of years ago he stood up with the President and supported the new standards.

Low gas prices do not mean it's time to roll back clean vehicle standards – and here are 5 good reasons why:

1. We need cleaner cars AND trucks. Much has been made of recent vehicle sales showing a market shift toward larger vehicles, with last week's WSJ article "Clash Looms Over Fuel Economy Standard" highlighting the pushback expected from automakers on fuel economy standards. Regardless of what's causing the shift (and I dare say it is more than just low gas prices – since the increasing market share for trucks started in 2013 and was projected to grow in 2014 well before anyone knew gas prices were going to plummet), it's important to understand what impact that will have on automakers ability to comply with federal fuel economy and greenhouse standards.



A vehicle manufacturer's fuel economy requirements are based on the size of vehicles sold, as defined by the vehicle footprint (track width multiplied by the wheelbase). A larger wheel base means a lower fuel economy target.

In a word – none.

Increased market share of larger vehicles will lead to more oil consumption and emissions, but it's no reason to rollback standards. In fact, the standards were designed to accommodate shifts in the vehicle mix. Instead of setting a single fuel economy or greenhouse gas emission number and making every manufacturer meet it, the standards are set based on the size (or footprint) of the vehicles that are sold by each manufacturer.

The fuel economy and greenhouse gas standards are often described as requiring automakers to meet a 54.5 mpg standard in 2025. In reality, this figure is just an estimate based on an assumption about the size of vehicles that are expected to be sold in 2025 across the entire US market. If the size of vehicles sold in 2025 differs from the assumptions, then so will the average fuel economy target for each manufacturer.

Can automakers meet fuel economy standards if they sell more trucks? Absolutely. If Ford stopped selling cars, and only sold F150's with it's new 2.7 liter V6 EcoBoost engine, Ford would not only be compliance with today's standards, but would already be complying with standards as far out as 2021. (Photo: Courtesy of Ford Motor Company.)

Consider this. What if Ford only sold F150's equipped with their new 2.7-liter EcoBoost engine and no other vehicles?

You might think they wouldn't have a chance at meeting the fuel economy standards. In fact, not only would they be in compliance with this year's fuel economy target, but Ford would be years ahead of the standard.

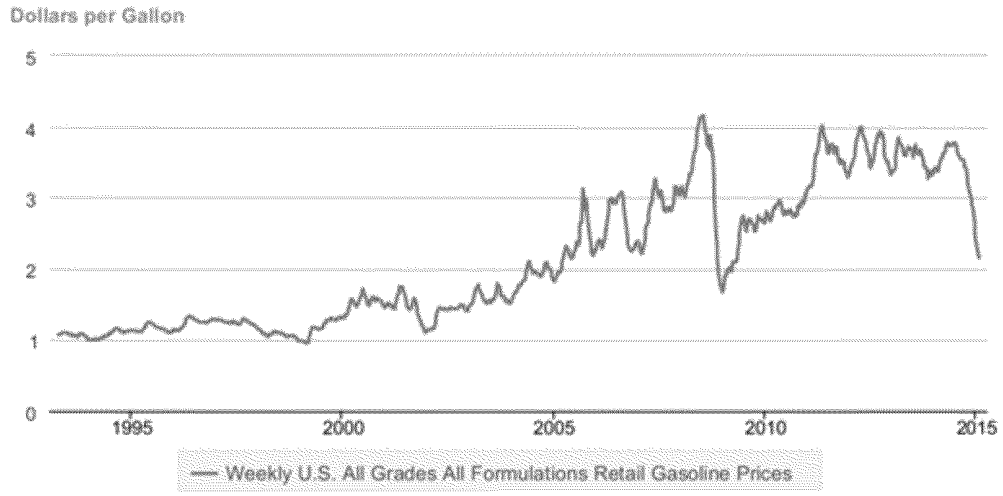
The two-wheel drive 2015 F150 2.7L is rated on government fuel economy tests at a combined highway/city fuel economy of 28.5 mpg (the actual consumer label value is 22 mpg – see more about the difference in this factsheet). The average footprint of the F150 is 65.67 sq ft assuming the shortest truck bed length option and the current market share of standard, crew and extended cab versions of the F150. The fuel economy target in 2015 for a truck with this size footprint is 24.83 mpg and doesn't reach 28 mpg until 2021. Even the four-wheel drive version of the F150 with slightly worse fuel economy already meets the standard set for 2019.

So a shifting market share to trucks is not an excuse for a change in the standards, but certainly highlights the importance of implementing other policies to reduce fuel use and greenhouse gas emissions from transportation. Complementary policies include putting a price on carbon, consumer rebates to reduce the cost of cleaner cars or fees on higher emission vehicles, and low carbon fuel standards, among others.

2. Learn from history or be doomed to repeat it. Remember the sky-rocketing gas prices and subsequent economic crash of 2008? Fuel economy standards stalled in the 90's and early 2000's in large part due to automaker's intransigence. As gas prices rose, U.S. automakers were particularly vulnerable given their inefficient product offerings and better positioning by their global rivals with more efficient vehicle choices. This ultimately led to bankruptcy for GM and Chrysler. Consumers were complicit as well, shifting their purchases to larger, inefficient SUVs and trucks when gas prices were low.

Making policy and purchasing decisions based on the assumption that current gas prices will stay low has been tried before with devastating effect. Calling for a change in in standards because of plunging oil prices is a classic example of short-term thinking that totally ignores that prices will rise and fall again, probably many times before

Weekly U.S. All Grades All Formulations Retail Gasoline Prices



2025. eia Source: U.S. Energy Information Administration

3. What goes down must go up. Gas prices are volatile and dependent on global supply and demand. The current oil market is being influenced by both (according to EIA analysis). Fuel economy standards are partly responsible as improving efficiency of U.S. vehicles has slowed demand for oil in the U.S. while a boom in U.S. oil production has led to increasing global supply.

However, oil companies are already responding to lower oil prices. Stories of oil field layoffs and reductions in oil company investments in oil exploration and development should be a warning sign. At oil prices below $50 a barrel, fracking for hard-to-get oil in the U.S. is likely an economically losing proposition. As investments wane in production, so will supply to the oil markets. There's plenty of debate about how and when oil prices might change, but if history is any lesson volatile oil prices are here to stay.

Fuel economy standards remain an effective insurance policy against volatile oil prices. By 2025 new car fuel consumption will be about half compared to model year 2010. No matter if fuel prices are $3.00 or $6.00, keeping the standards in place means a vehicle owner's fuel bill will be cut in half for the life of the vehicle, not just when oil prices happen to be low.

4. Fuel economy remains a top consideration for consumers. Fuel economy is by no means the only consideration when buying a vehicle. Passenger seating, cargo capacity, and others are key factors in car buying decisions. But most people want their vehicle to also use the least amount of fuel possible, as well as do everything else that's important to them. This is true despite low gas prices, as seen by the results of the recent J.D. Power's study which found fuel economy remains the most influential factor for new vehicle buyers for the fourth year in a row.

5. Electric cars are key to cutting oil use and climate emissions – now's no time to slow down. Low gas prices are not helpful to boosting electric vehicle sales, but it doesn't mean the sky is falling either. A quick look at the Department of Energy's eGallon calculator shows the average fuel costs for an EV are about half that of a comparable conventional gasoline vehicle. In many states, charging on off-peak hours (when your car is parked overnight) means even lower fuel costs. Last year plug-in EV sales, both plug-in hybrid and battery-electric, grew by 23 percent.

California's Zero Emission Vehicle (ZEV) program, also being implemented in 9 other states, is helping to propel the EV market forward and compelling automakers to invest in these technologies. This is important to make sure EVs, a key strategy to cutting our projected oil use in half by 2035 and slashing our carbon emissions 80% by 2050, become more cost competitive and a viable option for more consumers. Many of the states, including CA, that have adopted the ZEV program are also committing resources to making the roll out of these vehicles a success with state incentives, carpool lane access, infrastructure development, and other support. In other words, the automakers are not alone in this endeavor.

In terms of meeting the federal fuel economy and greenhouse gas standards for 2025, the vast majority of compliance will come from "plain vanilla technology" as Chrysler CEO Marchionne put it – meaning improvements in engines, transmission, and other conventional technologies. EPA's estimates for compliance with the standards show only about 5% hybrids and 2% plug-in vehicles needed in 2025 to achieve a fleet average the equivalent of 54.5 mpg. Every EV a manufacturer sells in a ZEV state will help them meet the federal fuel economy and greenhouse gas standards, but there's no requirement for automakers to be selling millions of EVs outside of ZEV states to comply with fuel economy standards now or in 2025. Of course that doesn't mean there isn't a market for them, like in Atlanta for example.

When supporting the standards in 2011:

Marchionne said the three Detroit automakers ended a "bad habit of crying wolf" and opposing higher standards. That's largely because the companies' current chief executives came from outside the industry.

…

"We looked at this and said this can be done, as business people who did not grow up and did not become conditioned by traditions of Detroit," Marchionne said.

Perhaps Mr. Marchionne has spent a little too much time in Detroit.

Don Anair

Research and Deputy Director, Clean Vehicles Program
Union of Concerned Scientists

Please Note Our New Address!

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danair@ucsusa.org

The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with citizens across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future. Join our citizen action network or expert network. Support our work. Follow us on Twitter and Facebook.

To: Moran, Robin[moran.robin@epa.gov]
From: Carol Lee Rawn
Sent: Mon 1/5/2015 9:02:48 PM
Subject: Re: Meeting in January

no problem - thank you!
On Jan 5, 2015, at 3:24 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Let's do 10:30 on Wednesday then, thanks for being flexible!

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Monday, January 05, 2015 3:17 PM
To: Moran, Robin
Subject: Re: Meeting in January

I understand! I'm free from 10:30-12 and after 4 on Wed. - I don't think we need more than 15 minutes if that makes it easier. I'm also avail tomorrow between 10:30-12 and 12:30-4 if that works. Thanks!

Best, Carol Lee (I actually go by Carol Lee rather than Carol)

On Jan 5, 2015, at 2:30 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi Carol – I hate to do this, but is there any chance you could talk either at noon or 3pm Wednesday? I had another meeting in play that just tried to land on the 2pm spot as well!

Thanks,

Robin

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Monday, January 05, 2015 12:59 PM
To: Moran, Robin
Subject: Re: Meeting in January

Thanks Robin - look forward to talking to you at 2; shall I call you at (734) 214-4781 ?

On Jan 5, 2015, at 12:23 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi Carol Lee, **Ex. 6 - Personal Privacy**

I can't meet at 11 Wednesday, but could do noon or 2pm.

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Monday, January 05, 2015 12:05 PM
To: Moran, Robin
Subject: Re: Meeting in January

Hi Robin - hope you had a good break! Apologies- I now have a conflict Wed at 9:30 AM; can you talk at 11 instead? Thanks!

On Dec 18, 2014, at 8:42 AM, Moran, Robin <moran.robin@epa.gov> wrote:

Look forward to talking with you then, you enjoy the holidays as well!

Robin

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Wednesday, December 17, 2014 6:27 PM
To: Moran, Robin
Subject: Re: Meeting in January

Great - thanks for your time Robin! I just sent you an invite for 9:30 on 1/7. Hope you enjoy the holidays!

Best, Carol Lee

On Dec 17, 2014, at 1:14 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi Carol Lee,

Thanks for your call yesterday about setting up a time to talk in early January. My schedule is pretty open on Wednesday, Jan. 7 except for 1-2pm. So why don't you pick a time that works well for you.

It was nice to see you on video last week, and I thought it was a very productive discussion with Janet. Your group brings such an important and unique perspective to the fuel efficiency issues, and I'm looking forward to collaborating on the midterm review.

Have a wonderful time off over the holidays!

Best,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

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rawn@ceres.org
www.ceres.org

To: David Cooke (DCooke@ucsusa.org)[DCooke@ucsusa.org]
From: Moran, Robin
Sent: Thur 1/12/2017 7:09:13 PM
Subject: FW: TODAY at 4pm

Web link, so its handy at 4

From: Moran, Robin
Sent: Thursday, January 12, 2017 2:00 PM
To: Luke Tonachel <ltonachel@nrdc.org>; Jonna Hamilton (JHamilton@ucsusa.org) <JHamilton@ucsusa.org>
Subject: TODAY at 4pm

https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas-ghg

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: David Cooke (DCooke@ucsusa.org)[DCooke@ucsusa.org]
From: Moran, Robin
Sent: Thur 1/5/2017 8:12:05 PM
Subject: TRB panel next week
TRB 2017_MTE presentation_Moran.pptx

Hi Dave, I understand we're speaking on the same TRB panel on Tuesday. Wondering if you'd mind sharing your slides, and here's my draft (due tomorrow), so we can maybe help reinforce each other's points, and not be duplicative. I don't know the other two panelists, but interested to hear their studies.

Will be good to see you and catch up, though I'm only able to be in/out for it … other pressing business ☺

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: John German[john@theicct.org]
From: Moran, Robin
Sent: Tue 12/20/2016 12:12:34 PM
Subject: RE: Technology papers - Publication of Transmission Working Paper

Excellent, thanks John for all your continued work on these papers.

Have a wonderful holidays!

Robin

From: John German [mailto:john@theicct.org]
Sent: Monday, December 19, 2016 3:43 PM
To: Moran, Robin <moran.robin@epa.gov>
Subject: Fwd: Technology papers - Publication of Transmission Working Paper

Sorry, Robin. Forgot to include you on copy list.

John

Begin forwarded message:

From: John German <john@theicct.org>

Subject: Re: Technology papers - Publication of Transmission Working Paper

Date: December 19, 2016 at 3:37:34 PM EST

To: Bill Charmley <charmley.william@epa.gov>, Michael Olechiw <olechiw.michael@epa.gov>, "Alson, Jeff" <alson.jeff@epa.gov>, "Alberto@ARB Ayala" <Alberto.Ayala@arb.ca.gov>, Mike McCarthy <michael.mccarthy@arb.ca.gov>

Cc: Anup Bandivadekar <anup@theicct.org>, Nic Lutsey <nic@theicct.org>, Joe Schultz <joe@theicct.org>, Aaron Isenstadt <aaron.isenstadt@theicct.org>

FYI, we just published our detailed working paper on lightweighting, written in cooperation with suppliers:

http://www.theicct.org/lightweighting-technology-development-and-trends-us-passenger-vehicles

Except for the diesel working paper, which we hope to publish in February, this is the last of our working papers. You can find the home page for all of the pages at:

http://www.theicct.org/series/us-passenger-vehicle-technology-trends

Note that the page includes both the detailed working papers we wrote with suppliers and the shorter ICCT technology briefs, so most of the subjects are listed twice.

Specific web links for the other detailed technology working papers are as follows:

http://www.theicct.org/downsized-boosted-gasoline-engines

http://www.theicct.org/automotive-thermal-management-technology

http://www.theicct.org/PV-technology-transmissions-201608

http://www.theicct.org/naturally-aspirated-gas-engines-201606

http://www.theicct.org/hybrid-vehicles-trends-technology-development-and-cost-reduction

Please let me know if you have any questions or would like additional information.

John

On Aug 29, 2016, at 2:29 PM, John German <john@theicct.org> wrote:

FYI, we just published our second detailed technology working paper, this one on transmissions. Dana, BorgWarner, ITB, and FEV contributed to this paper:

http://www.theicct.org/PV-technology-transmissions-201608

Unfortunately, we have not yet finished ICCT's technology "brief" on transmissions, summarizing the results and adding a bit about implications on the mid-term review. I will let you know when this has been completed.

The papers on gasoline turbocharged engines and thermal management have finished supplier review and are now undergoing a final internal review by our communications team. The lightweighting paper was sent out for supplier review on Aug. 10, with their comments due by August 31. We are still hopeful that these can be finished by the end of September, with the paper on diesels following by the end of the year.

John

On Jun 21, 2016, at 10:51 AM, John German <john@theicct.org> wrote:

FYI, we just published two papers on naturally aspirated gasoline engines. These are the first in a series of technology reports in support of the 2017-25 mid-term review. Reports on transmissions, gasoline turbocharged engines, lightweighting, and thermal management will (hopefully) be finished by September, with a report on diesels following by the end of the year.

The first paper is the detailed working paper that we did in collaboration with Eaton, BorgWarner, and ITB.

Working paper: <http://theicct.org/naturally-aspirated-gas-engines-201606>

The second is ICCT's technology "brief", which summarizes the results of the working paper and adds a bit about implications on the mid-term review.
Tech brief: <http://theicct.org/naturally-aspirated-engines-techbrief-jun2016>

Let me know if you have any questions or want additional information.

John

EPA FOIA 2017-003707

Midterm Evaluation of Light-Duty Vehicle Greenhouse Gas Emissions Standards for Model Years 2022-2025

Transportation Research Board 96th Annual Meeting

January 10, 2017

Robin Moran

U.S. EPA, Office of Transportation and Air Quality

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EPA FOIA 2017-003707

Overview

- Light-duty vehicle GHG standards & trends
- Midterm Evaluation (MTE) of 2022-2025 standards
- EPA's Proposed Determination

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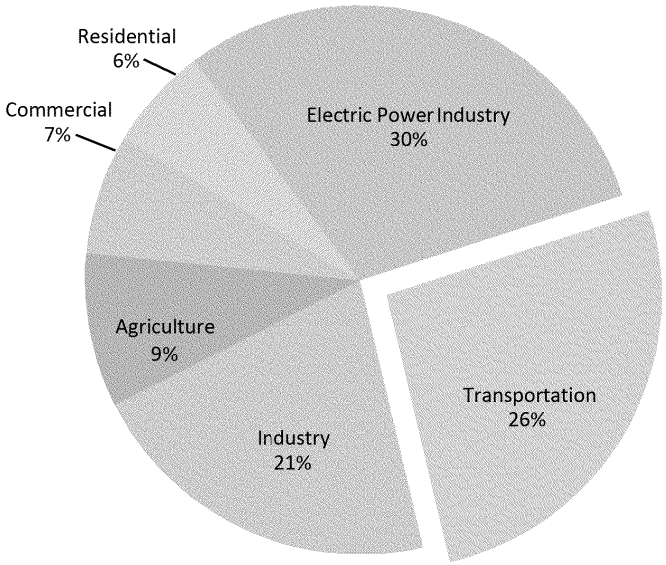
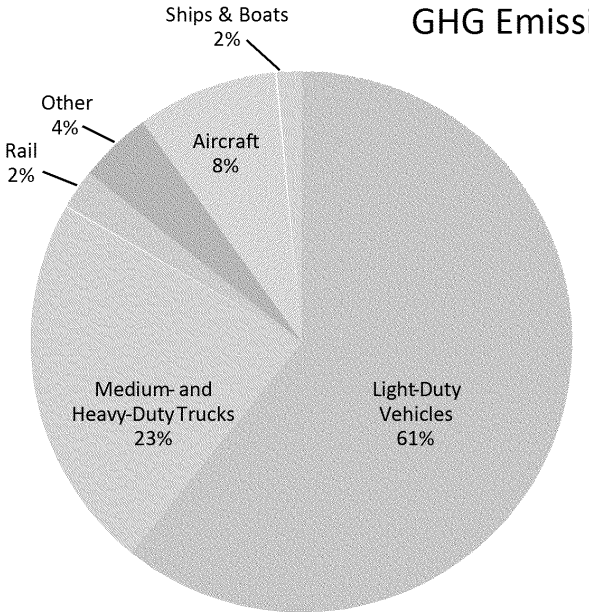
EPA FOIA 2017-003707

Light-duty vehicles are significant source of U.S. GHG emissions

2014 Share of U.S. GHG Emissions by Sector



2014 Share of Transportation GHG Emissions by Source



Source: *U.S. Greenhouse Gas Inventory Report: 1990-2014*, EPA (2014).

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EPA FOIA 2017-003707

Overview of National Program

- Significant U.S. actions to address climate change and energy independence (joint EPA/NHTSA)
  - 2012-2016 standards set in 2010
  - 2017-2025 standards set in 2012
- Reduces GHG emissions by half and doubles fuel economy by 2025
- Allows automakers to plan long-term and build a single, national fleet of vehicles satisfying federal and California GHG/fuel economy standards
  - CA allows manufacturer compliance with the EPA GHG standards to satisfy compliance with CA GHG standards
  - Size (footprint)-based standards ensure consumers continue to have a full range of vehicle choices

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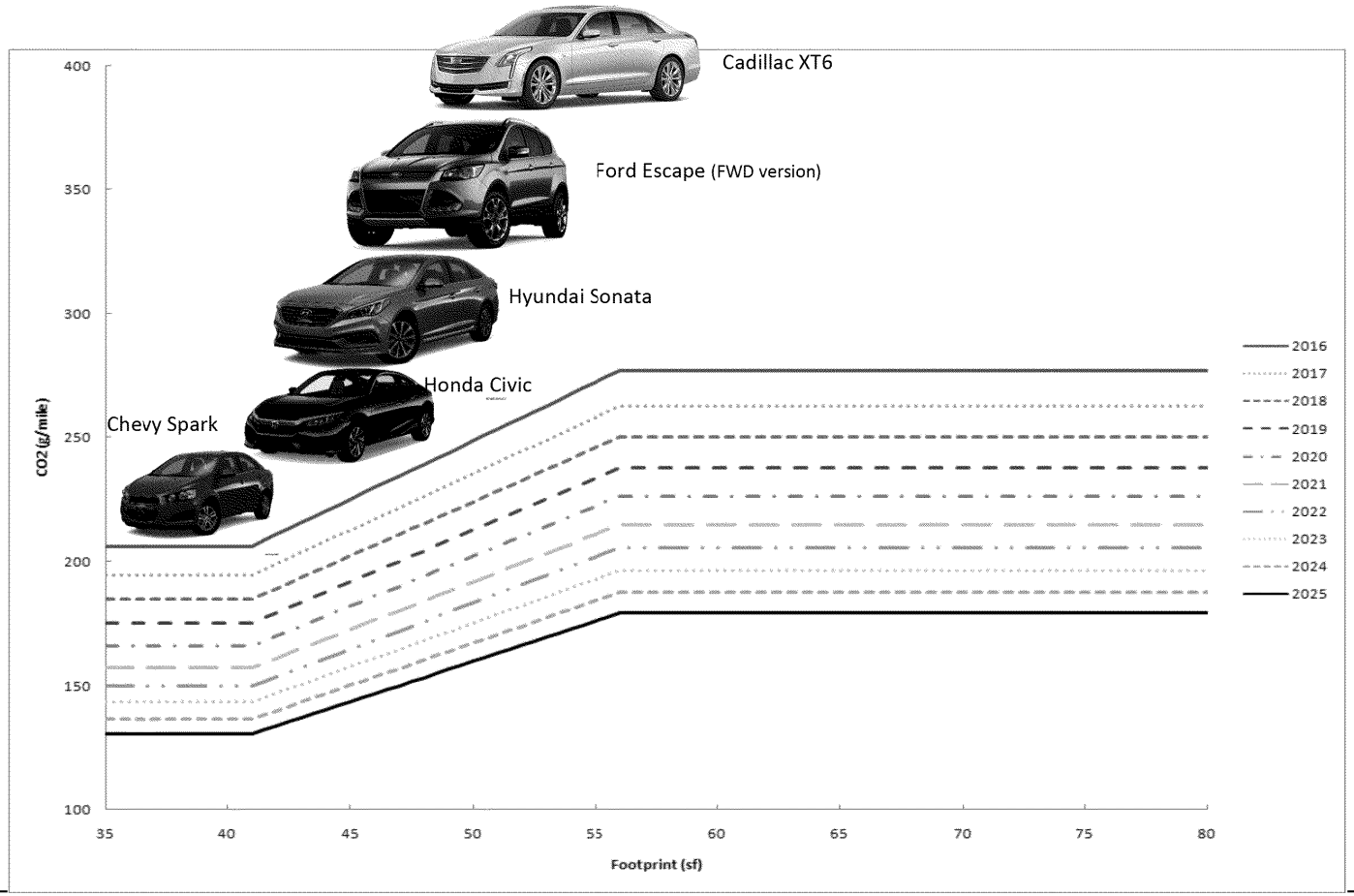
Footprint-based CO_2 Target Curves (Cars)

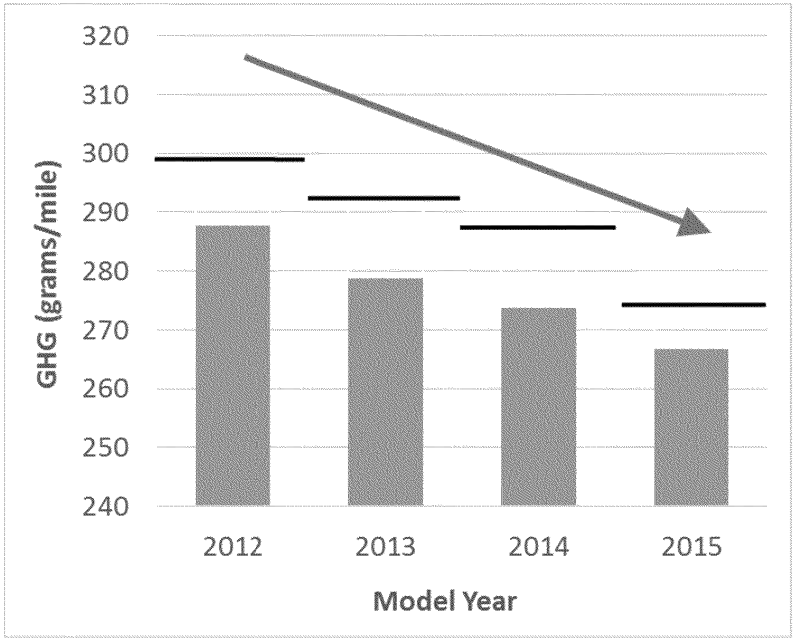
[separate footprint curve for Trucks]



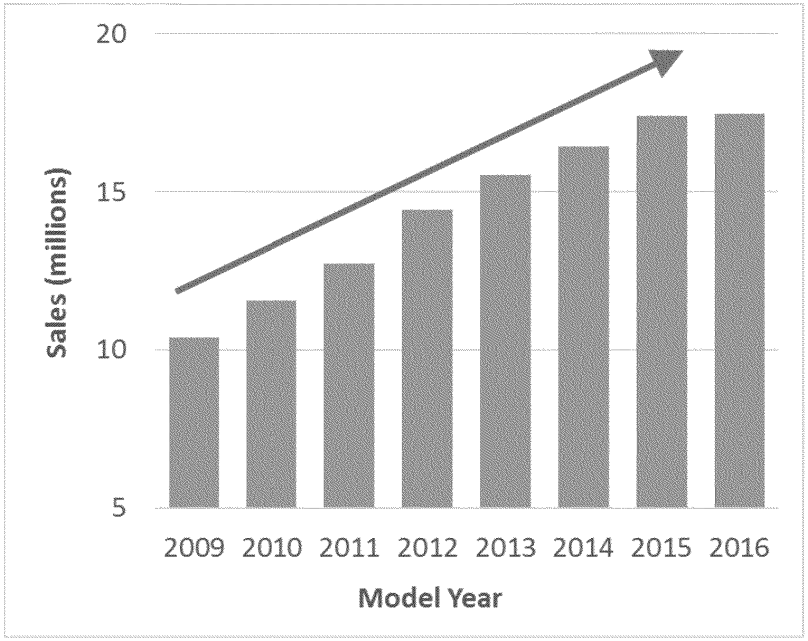
EPA FOIA 2017-003707

Standards are Working

Automakers Outperforming Standards



7 Years of Sales Increases Thru 2016
First Time in 100 Years



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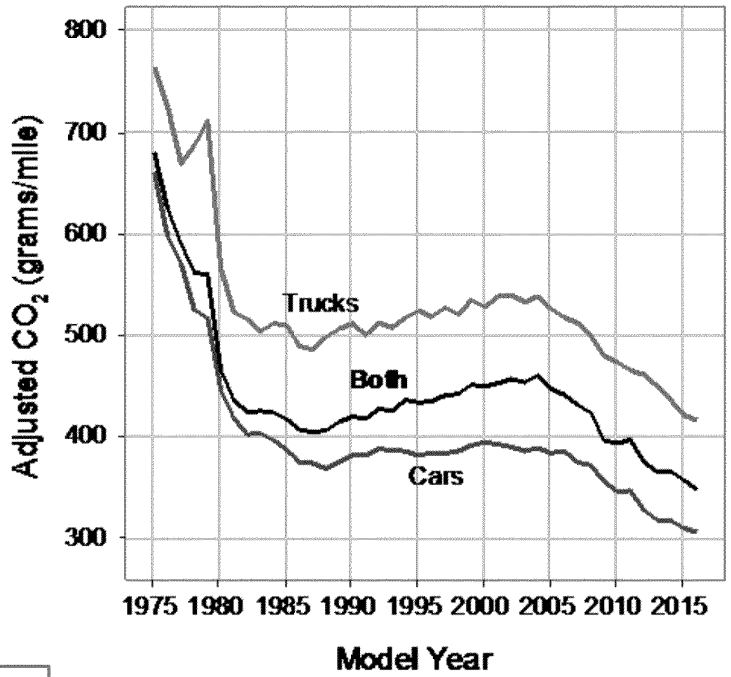
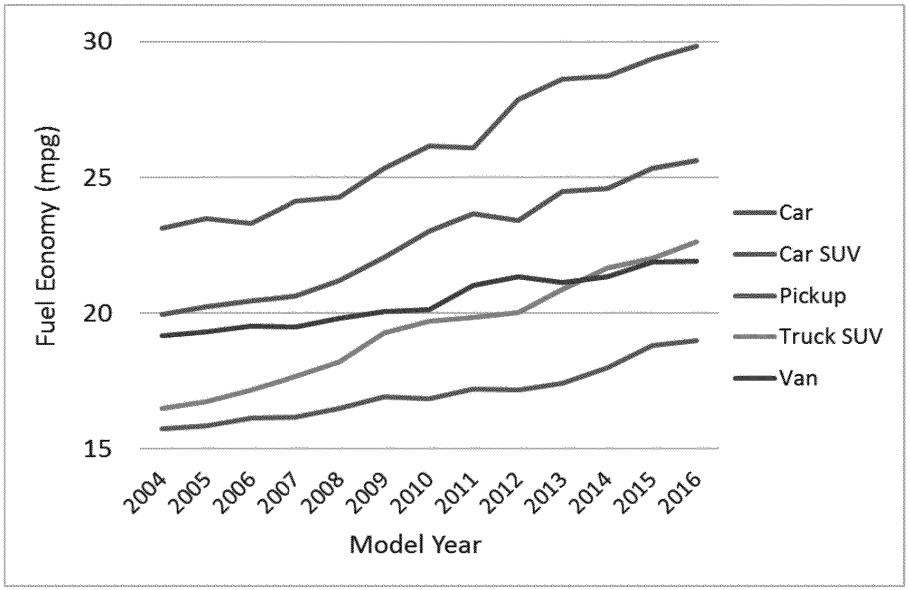
EPA FOIA 2017-003707

Vehicle CO_2 emissions at record low – SUVs/pickups improving the most





All values
Real world

MY2015: 358 g/mi CO_2 (24.8 mpg)
MY 2016 Projected : 25.6 mpg

Truck SUVs highest percentage improvement since 2004, up 33%
Pickups improved most in past year, up 0.8 mpg to 18.8 mpg

Source: Light-Duty Automotive Technology, Carbon Dioxide Emissions and Fuel Economy Trends: 1975 through 2015, EPA, November 2016

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EPA FOIA 2017-003707

Fuel Prices/Fleet Mix Affect Projected CO_2 Levels

Projections for 2025

Projections for 2025	2012 Final Rule	Proposed Determination		
	AEO 2011 Reference	AEO 2016 Reference	AEO 2016 Low	AEO 2016 High
Fuel price[1] ($/gallon)	$3.87	$2.97	$1.97	$4.94
Car/truck mix	67/33%	53/47%	44/56%	63/37%
CO_2 (grams/mile)	163	173	178	167
MPG-e[2] (2-cycle compliance)	54.5	51.4	49.9	53.3

Real world
36 MPG
(233 g/mi)

[1]AEO 2011 fuel price is 2010$ (equivalent to $4.21 in 2015$); AEO 2016 fuel prices are 2015$.
[2] Mile per gallon equivalent (MPG-e) is the corresponding fleet average fuel economy value if the entire fleet were to meet the CO_2 standard compliance level through tailpipe CO_2 improvements that also improve fuel economy.; provided for illustrative purposes only, as we do not expect the GHG standards to be met only with fuel efficiency technology.

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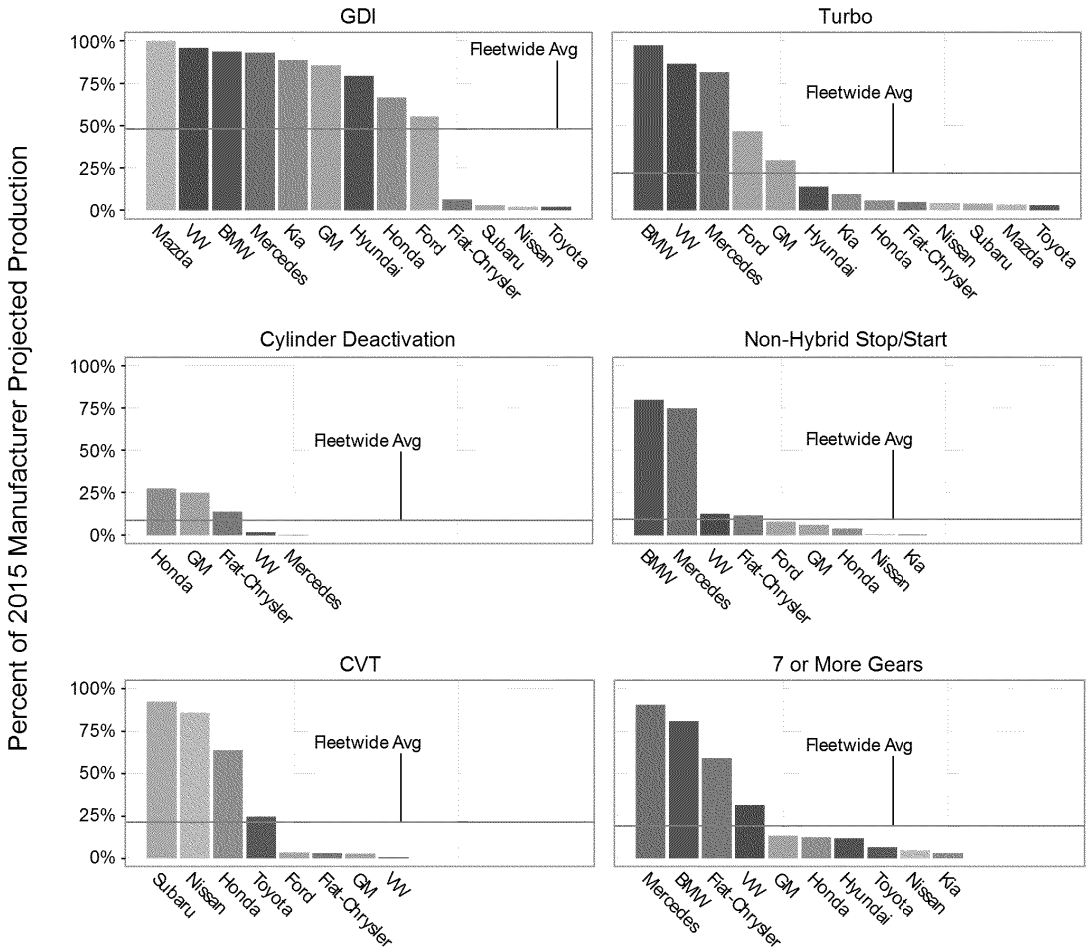
Automakers are adopting a wide array of technologies at rapid rates

Based on MY2016 Projected Data:

- GDI use on nearly half of all vehicles (up from 3% in MY2008), with Mazda at 100%, 6 more OEMs above 75%
- ~20% fleet use 7+ speed transmissions, led by Mercedes, BMW, and Fiat-Chrysler
- >20% fleet use continuously variable transmissions (CVT), led by Subaru, Nissan, and Honda



Source: Light-Duty Automotive Technology, Carbon Dioxide Emissions and Fuel Economy Trends: 1975 through 2015, EPA, November 2016

EPA FOIA 2017-003707

Midterm Evaluation & EPA's Proposed Determination

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EPA FOIA 2017-003707

The MTE Process

- In the 2017-2025 rulemaking, Agencies committed to a midterm evaluation of 2022-2025 standards
  - Coordinated review with EPA, NHTSA, and California ARB
  - Holistic assessment of all the factors considered in setting standards
- Through the MTE, the EPA Administrator must determine the appropriateness of the 2022-2025 standards
- EPA regulations set forth a 3 step process:
  1) Draft Technical Assessment Report (TAR) – issued jointly with EPA, NHTSA, CARB for public comment in July 2016
  2) Proposed Determination on whether the 2022-2025 standards are appropriate – issued by EPA Administrator for public comment in November 2016
  3) Final Determination

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EPA FOIA 2017-003707

Factors Considered in the Determination

- Availability and effectiveness of technology, and the appropriate lead time for introduction of technology
- Cost on the producers or purchasers of new motor vehicles or new motor vehicle engines
- Feasibility and practicability of the standards
- Impact of the standards on reduction of emissions, oil conservation, energy security, and fuel savings by consumers
- Impact of the standards on the automobile industry
- Impacts of the standards on automobile safety
- Impact of the greenhouse gas emission standards on the Corporate Average Fuel Economy standards and a national harmonized program
- Impact of the standards on other relevant factors

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EPA FOIA 2017-003707

EPA's MTE assessments informed by a wide range of information

- Technical research initiated by EPA
  - Benchmarking testing of 30 vehicles across wide range of powertrains & segments
  - Published more than 30 peer-reviewed papers and technical reports
  - Vehicle simulation modeling, cost teardown studies, mass reduction feasibility/cost studies, manufacturer "learning by doing" costs, research on consumer issues, economic inputs, others
- Extensive reviews of the literature
  - Including significant studies such as the 2015 National Academy of Sciences report
- Stakeholder outreach & collaboration
  - Hundreds of meetings with automakers, suppliers, NGOs, consumer groups, labor, states/local governments
  - Collaboration with NHTSA, CARB, DOE, Canada

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EPA FOIA 2017-003707

EPA's Proposed Determination on MY2022-2025 Standards

- On November 30, 2016, EPA Administrator made a Proposed Determination that the MY2022-2025 standards remain appropriate under the Clean Air Act
  - EPA extensively assessed public comments on the Draft TAR, and updated its assessment

- Key Findings:
  - Standards are feasible and cost-effective, with a wide range of technology pathways available
  - Standards will achieve significant GHG and oil reductions
  - Standards provide significant benefits to consumers and the public

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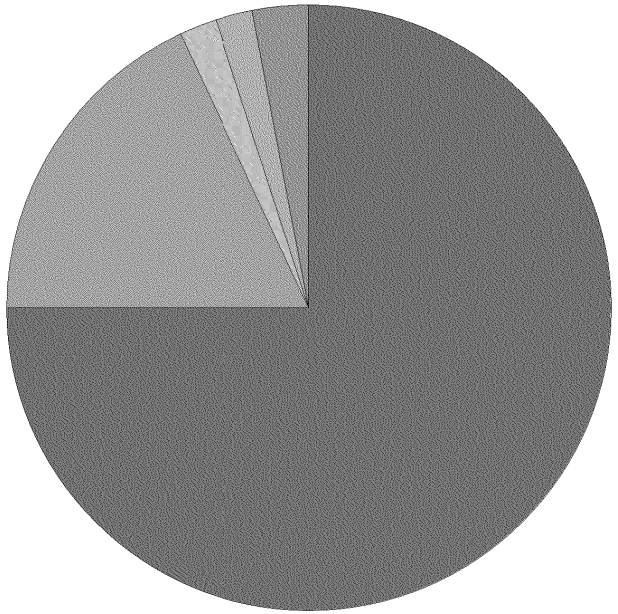
EPA FOIA 2017-003707

Standards can be met mostly with advanced gasoline vehicle technologies:

- Advanced engines and transmissions
- Vehicle light-weighting
- Improved aerodynamics
- More efficient accessories
- Low rolling resistance tires
- Stop-start technology
- Mild hybrid (e.g., 48 volt systems)



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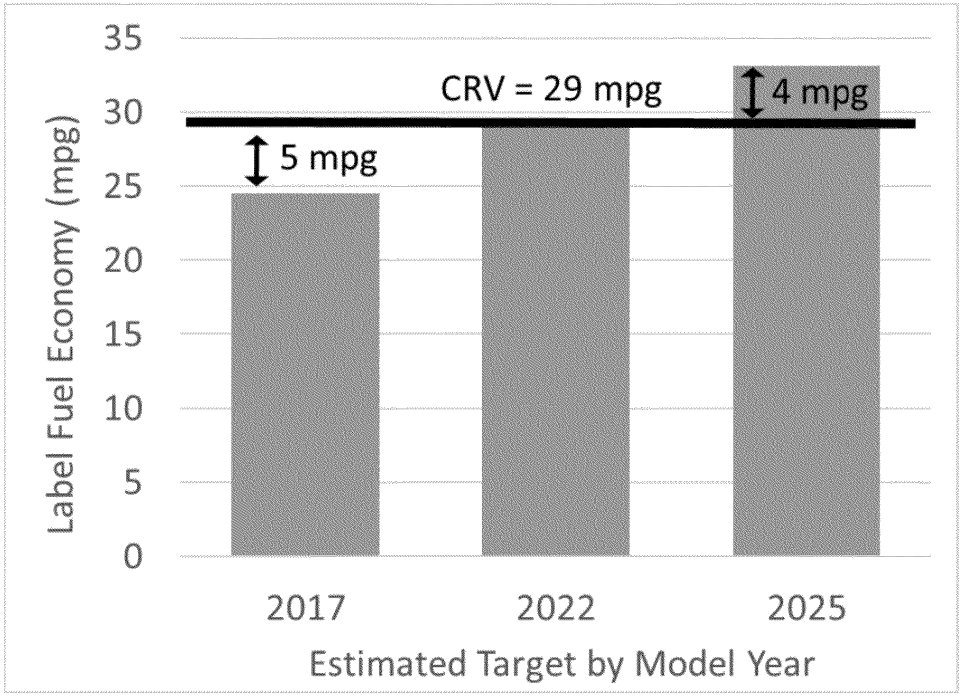
Success Story: 2017 Honda CRV 1.5 L AWD



- Best-selling SUV in U.S.
- AWD versions make up 2/3 of sales
- Advanced Gasoline Technology:
  - Turbocharged 1.5 liter I4 engine
  - Continuously variable transmission
  - No electrification
- Already meets* 2022 target -- 5 years ahead
- Within 4 mpg of 2025 target (22 g/mi, 2-cycle)

** EPA assumes A/C credits and 5 g/mi off-cycle credits*

EPA FOIA 2017-003707

Standards will achieve significant benefits

- **Standards will achieve significant GHG and oil reductions**
  - Reduce GHG emissions by 540 MMT and oil consumption by 1.2 billion barrels over lifetime of MY2022-2025 vehicles

- **Standards provide significant benefits to consumers and the public**
  - Net societal benefits of nearly $100 billion
  - Net lifetime consumer savings of $1,650
  - Payback for an average MY2025 vehicle (compared to MY2021):
    - Consumers who finance with 5-year loan will see payback within 1st year
    - Consumers who pay cash will see payback within 5 years

* All analyses compare the MY2022-2025 standards to a reference case of the MY2021 standard

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EPA FOIA 2017-003707

Next Steps

- 30-day public comment period on Proposed Determination closed on December 30, 2016
- EPA is carefully assessing the public comments received on the Proposed Determination
- The EPA Administrator will consider whether she has enough information to make a Final Determination

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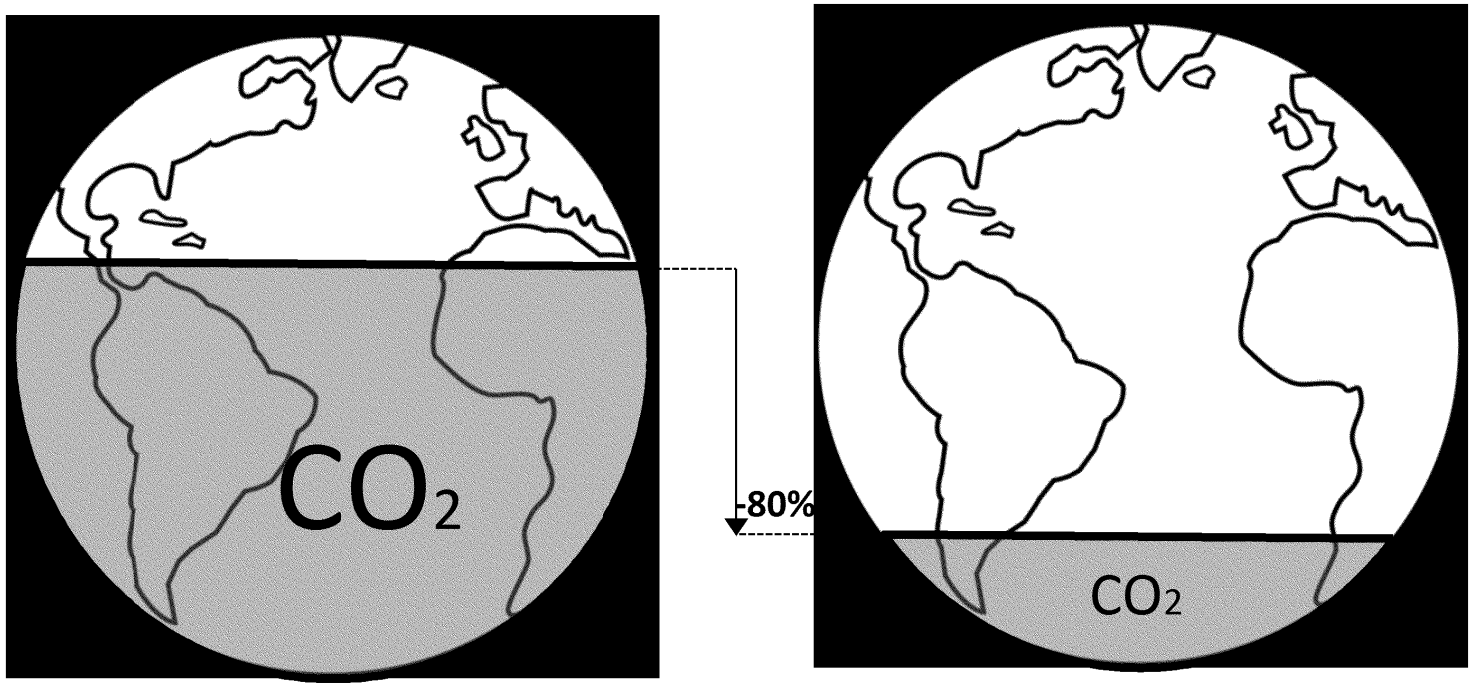
EPA FOIA 2017-003707

Beyond 2025…



We are headed here

But we need to go here

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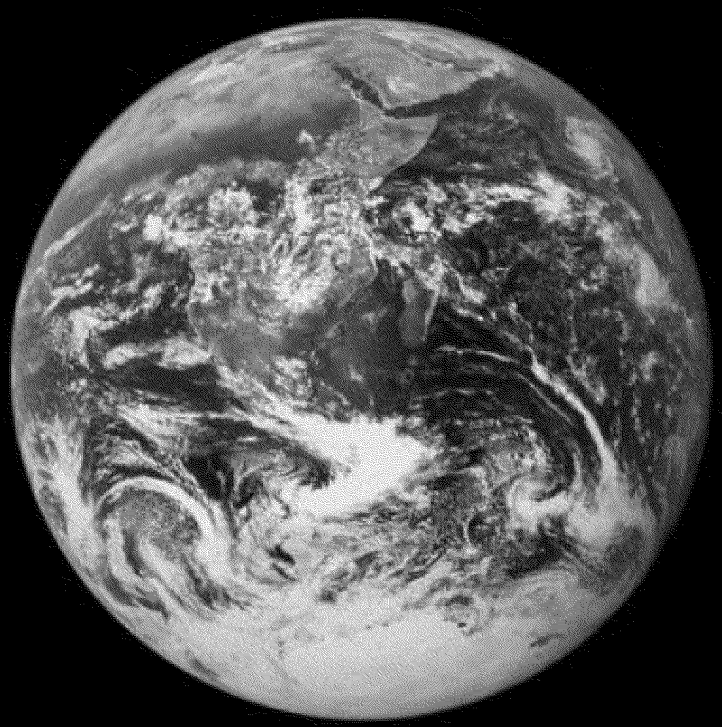
EPA FOIA 2017-003707



"We're the first generation to feel the impact of climate change.
We're the last generation that can do something about it."

"We only get one home.
We only get one planet.
There's no plan B."

President Barack Obama
August 3, 2015

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EPA FOIA 2017-003707

Thank You

Robin Moran, Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

moran.robin@epa.gov; (734) 214-4781

EPA's MTE web site:

https://www.epa.gov/regulations-emissions-vehicles-and-engines/midterm-evaluation-light-duty-vehicle-greenhouse-gas-ghg

ED_001162_00011829-00021

To: Dave Cooke[DCooke@ucsusa.org]
From: Moran, Robin
Sent: Thur 11/3/2016 9:19:26 AM
Subject: RE: UCS Blog on 2016 EPA Trends and Compliance Reports

Fantastic as always, thanks Dave!

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Wednesday, November 02, 2016 5:43 PM
To: French, Roberts <french.roberts@epa.gov>; Moran, Robin <moran.robin@epa.gov>; Alson, Jeff <alson.jeff@epa.gov>; Hula, Aaron <Hula.Aaron@epa.gov>
Subject: UCS Blog on 2016 EPA Trends and Compliance Reports

Thanks for the briefing on the two reports released today—it was very helpful. In case you didn't see it, here was the blog I put out today on the Trends and Compliance reports and their relationship to the MTE:

http://blog.ucsusa.org/dave-cooke/fuel-economy-reaches-highest-level-ever-as-automakers-continue-to-beat-epa-regulations

- Dave

To: John German (john@theicct.org)[john@theicct.org]
From: Moran, Robin
Sent: Wed 9/14/2016 6:28:42 PM
Subject: 9/22 Hearing

Hi John,

I hear you have the honor of being a testifier at the Congressional hearing on the midterm review next week. Could you let me know what your key messages will be, or even maybe share a draft testimony? I'm helping with all the prep for Janet's testimony.

Ex. 6 - Personal Privacy

Take care,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: Dave Cooke[DCooke@ucsusa.org]
From: Moran, Robin
Sent: Wed 6/22/2016 8:23:15 PM
Subject: RE: UCS Fact Sheet Series on the Midterm Review/2017-2025 regs

Hi Dave,

Thanks for sharing, this is good stuff. Sorry I haven't been able to return your call. Let me know if there's a good time tomorrow. Jeff may be calling you in meantime to talk about emissions reduction estimates.

Robin

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Wednesday, June 22, 2016 12:18 PM
To: Charmley, William <charmley.william@epa.gov>; Alson, Jeff <alson.jeff@epa.gov>; Moran, Robin <moran.robin@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>
Subject: UCS Fact Sheet Series on the Midterm Review/2017-2025 regs

EPA team,

I am sure you all are quite busy right now with your own MTE work, but I wanted to share some public-facing work that we at UCS have put together. Today we are kicking off a series of fact sheets discussing the 2017-2025 regulations and the mid-term review: http://ucsusa.org/midtermreview

The first in the series are 1) a summary of the 2017-2025 standards and their benefits; 2) an explanation of why these rules are important as the market shifts to more SUVs and how they continue to bring benefits, regardless of consumer behavior; and 3) the technology that manufacturers have developed, spurred by these rules, and why it means they can go farther.

We will continue to update the series with other relevant topics (consumer benefits despite low gas prices, the role of advanced technologies, etc.) throughout the next couple months, announcing new fact sheets via blog. The first blog kicking off the series is available here:

http://blog.ucsusa.org/dave-cooke/epa-nhtsa-vehicle-efficiency-standards-midterm-review.

If you have any questions/comments/concerns, I'd be happy to respond. Thanks,

- Dave

David W. Cooke, Ph.D.

Senior Vehicles Analyst

Union of Concerned Scientists

1825 K Street, NW 8th floor

Washington, DC 20006

p: 202-331-6948

f: 202-223-6162

e: dcooke@ucsusa.org

The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with citizens across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

Join our citizen action network or expert network. | Support our work. | Join the conversation on our blog or follow us on Twitter and Facebook.

To: John German[john@theicct.org]
Cc: Olechiw, Michael[olechiw.michael@epa.gov]
From: Moran, Robin
Sent: Thur 5/26/2016 2:18:17 PM
Subject: RE: Technology briefing series

Hi John,

Thanks so much for this update. These technology papers will be incredibly valuable to inform the MTE.

Appreciate the draft naturally aspirated paper. I agree with your strategy on our review of drafts – we'll let you know if anything jumps out at us.

Happy Memorial Day!

Robin

From: John German [mailto:john@theicct.org]
Sent: Wednesday, May 25, 2016 9:03 PM
To: Moran, Robin <moran.robin@epa.gov>
Cc: Olechiw, Michael <olechiw.michael@epa.gov>; Aaron Isenstadt <aaron.isenstadt@theicct.org>; Joe Schultz <joe@theicct.org>; Drew Kodjak <drew@theicct.org>
Subject: Re: Technology briefing series

Here is the schedule (although we are already behind). The goal is to get all of the papers done, except the diesel paper, before the end of the TAR comment period.

I have attached the latest draft of the naturally aspirated paper, although it will change as we are still negotiating with BorgWarner on the writeup. You are welcome to comment on it, but we will not acknowledge this, as we want to keep the technology papers independent of EPA, and I may not be able to incorporate all of your comments as everything has to be agreed with the participating suppliers.

1) Naturally aspirated gasoline paper.

- Initial draft has been distributed for review on April 1.
- Comments requested by May 2.

2) Transmission paper. ICCT is currently working on a complete draft for this paper. This was selected to go second because we have received most of the data, while we are still waiting for significant data and writeups on the other papers.

- Complete draft for review finished by ICCT - May 2 (Still not done.)
- Comments requested by June 1.

3) and 4) Lightweighting and gasoline downsized turbo papers. These will likely be our most important - and longest - papers, thus we want to get started on them after the transmission paper. We would like to work on them simultaneously, although this will be affected by when we receive data, information, and writeups.

- **Submit data, information, and initial writeups to ICCT by May 2.** (Still waiting for some inputs.)
- Complete drafts for review finished by ICCT by July 5.
- Comments requested by August 1.

4) Thermal Management. This was not one of the papers were originally planned. However, ITB volunteered to write the first draft, so we added it. Should be done before 3) and 4).

5) Diesel paper. While important, it is a lower priority than the other papers simply because of the relatively small share of the market.

- **Submit data, information, and initial writeups to ICCT by July 15.**
- Complete drafts for review finished by ICCT by September 1.
- Comments requested by October 1.

John

On May 25, 2016, at 8:52 AM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi John,

Hope you're doing well. I'm glad you were able to join the NGOs' MTE meeting with EPA, NHTSA and CARB earlier this week, and appreciate all the good points you made on technology development.

Mike and I were hoping you could give us an update on the status of your technology briefing paper series, as we didn't catch everything you said on Monday's call. I know the hybrid paper is on your web. Are there others ready in draft form? We'd be glad to take a look at any drafts, if that's something you'd find useful. We thought we heard you say the papers were targeted for completion in Sept – is that right?

Thanks John.

Take care,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: Jonna Hamilton[JHamilton@ucsusa.org]
From: Moran, Robin
Sent: Wed 3/16/2016 1:15:21 PM
Subject: RE: Meetings

Hi Jonna, sorry its taken me a while to get back to you. As you can imagine, things are pretty crazy here with getting the TAR ready for release by June. We should probably talk about what makes sense with the NGO discussions.

Do you have some time Friday morning?

Robin

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]
Sent: Friday, March 11, 2016 1:19 PM
To: Moran, Robin <moran.robin@epa.gov>
Subject: Meetings

Hey Robin,

I hope you are doing well. I am hoping that we can set up a regular technical check in with the coalition – maybe the first one could be about the workshop last week. I was thinking monthly might be useful, but I'm open to suggestions.

Thanks,

Jonna

EPA FOIA 2017-003707

Jonna Hamilton

Senior Washington Representative

Clean Vehicles Program

Union of Concerned Scientists

1825 K Street NW, Suite 800

Washington, DC 20001

202-331-5451

JHamilton@ucsusa.org

ED_001162_00012082-00002

To: Dave Cooke[DCooke@ucsusa.org]
From: Moran, Robin
Sent: Sun 2/28/2016 5:36:20 PM
Subject: RE: UCS Whitepaper: Fuel Economy / Performance trade-off

Hi Dave,

Thanks so much, this will be incredibly useful.

Looking forward to seeing you at the workshop Tuesday.

Robin

From: Dave Cooke [mailto:DCooke@ucsusa.org]
Sent: Friday, February 26, 2016 11:29 AM
To: Alson, Jeff <alson.jeff@epa.gov>; Moran, Robin <moran.robin@epa.gov>; Helfand, Gloria <helfand.gloria@epa.gov>; Nam, Ed <nam.ed@epa.gov>; Bolon, Kevin <Bolon.Kevin@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Moskalik, Andrew <Moskalik.Andrew@epa.gov>
Cc: Charmley, William <charmley.william@epa.gov>
Subject: UCS Whitepaper: Fuel Economy / Performance trade-off

EPA LDV team,

Attached is a whitepaper that looks at manufacturers' trade-off between applying technology improvements in light-duty vehicles towards either improved performance/acceleration or reducing fuel consumption. We at the Union of Concerned Scientists know that this is an issue that may play a critical role in the efficacy of light-duty efficiency regulations, and we've targeted this analysis specifically towards the effect the continued performance trend could have on the mid-term evaluation.

As author of the paper, I'm happy to discuss any relevant details of our modeling and answer any questions that you may have. We will obviously also formally submit this through the Draft TAR public comment, but I wanted to make sure that the agencies had time to consider our findings as you look at this critical climate regulation. We are also sharing it with colleagues at the other agencies involved in the mid-term evaluation (NHTSA, CARB), but feel free to pass it on to any relevant parties. Thanks,

- Dave

David W. Cooke, Ph.D.

Senior Vehicles Analyst

Union of Concerned Scientists

1825 K Street, NW 8th floor

Washington, DC 20006

p: 202-331-6948

f: 202-223-6162

e: dcooke@ucsusa.org

The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with citizens across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

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To: Jonna Hamilton[JHamilton@ucsusa.org]
From: Moran, Robin
Sent: Thur 12/17/2015 4:32:55 PM
Subject: RE: Meeting Thurs am

Hi Jonna,

Here's a link to the consumer choice modeling paper we mentioned:

http://www3.epa.gov/otaq/climate/documents/mte/420d15011.pdf

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]
Sent: Tuesday, December 15, 2015 3:49 PM
To: Moran, Robin
Subject: Re: Meeting Thurs am

Great. Thanks.

Sent from my iPhone

On Dec 15, 2015, at 3:45 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Yep, still good for us. Talk to you then.

Robin

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]
Sent: Tuesday, December 15, 2015 2:47 PM
To: Moran, Robin
Subject: Meeting Thurs am

Hi Robin,

I just realized that I'm not sure I confirmed the meeting with you and your team on Thursday at 10 am. We are able to do it, so if it still works for you, we're on.

We can use my call in info:

1-888-346-3659; 648047#

Thanks,

Jonna

Jonna Hamilton

Senior Washington Representative

Clean Vehicles Program

Union of Concerned Scientists

1825 K Street NW, Suite 800

Washington, DC 20001

202-331-5451

JHamilton@ucsusa.org

To: John German[john@theicct.org]
From: Moran, Robin
Sent: Tue 9/15/2015 12:30:04 PM
Subject: RE: ICCT Technology Briefs

Hi John, I think it would be nice to have you here in person if that's possible, always easier for frank discussions. We can always move the date to something that works better for you too, if that's easier. Just let me know what's best for you.

On the real-world gap issue, that's fine to add to the agenda. I may pull in Jeff Alson who's been our lead for this on the team.

Robin

-----Original Message-----
From: John German [mailto:john@theicct.org]
Sent: Monday, September 14, 2015 4:21 PM
To: Moran, Robin
Subject: Re: ICCT Technology Briefs

Robin,

How important is it for me to attend the meeting in person, instead of by phone? **Ex. 6 - Personal Privacy**

Ex. 6 - Personal Privacy

I also have a 3rd agenda item, which is the rapidly growing gap between fuel economy test results and in-use fuel consumption as reported on fueleconomy.gov. Our European office wants to include this in an upcoming report on the gap in 5 regions/countries and Nic expressed a concern about publishing this before the midterm review. I wanted to get an early reaction from Charmley about this.

John

On Sep 8, 2015, at 9:27 PM, "Moran, Robin" <moran.robin@epa.gov> wrote:

> John,
>
> I didn't realize that Bill had already scheduled something with you for 1-1:30pm on Sept 24 (?) on the mass reduction topic. If that's still good for you, can you extend it from 1-2pm to cover the tech briefing papers too? You can come on over to our office.
>
> Thanks,
> Robin
>
> -----Original Message-----
> From: John German [mailto:john@theicct.org]
> Sent: Friday, August 28, 2015 8:22 PM
> To: Moran, Robin
> Cc: Olechiw, Michael
> Subject: Re: ICCT Technology Briefs
>
> Robin,
>
> I'm pretty open the weeks of September 14 and 21. A few one to two hour conflicts each week, but nothing much. Thus, I'm sure it would be better if you started with Bill's calendar.
>

> Sent from Grand Marais on the north shore of Lake Superior.
>
> Sent from my iPhone
>
>> On Aug 27, 2015, at 1:06 PM, Moran, Robin <moran.robin@epa.gov> wrote:
>>
>> John,
>>

Ex. 6 - Personal Privacy

>>
>> We'd like to have you come over the EPA office sometime in later September to talk more about the briefing papers. As we told Nic when he first mentioned it, this is a great idea, and will be valuable sources we can reference in the draft TAR. I'm especially interested in your plans for rolling out (press interest, blogging, sharing with stakeholders - like NHTSA, etc), and what response you're getting back from suppliers.
>>
>> If you let me know a couple days that are good for you, I'll work with Bill's calendar. I know he had some ideas on the NAS mass reduction that he wanted to share too (which he hasn't even shared with us yet, so we'll be interested to hear what he has to say).
>>
>> Take care,
>> Robin
>>
>>
>> Robin Moran
>> Senior Policy Advisor
>> U.S. EPA, Office of Transportation and Air Quality
>> 2000 Traverwood Dr.
>> Ann Arbor, MI 48105
>> (734) 214-4781 (phone)
>> (734) 214-4821 (fax)
>>
>>
>> -----Original Message-----
>> From: John German [mailto:john@theicct.org]
>> Sent: Thursday, August 20, 2015 4:20 PM
>> To: Charmley, William
>> Cc: Moran, Robin
>> Subject: ICCT Technology Briefs
>>
>> Bill,
>>
>> I think you know about the Technology Briefs that ICCT is doing, but I thought you might be interested in the latest developments.
>>
>> The goal of the briefs is to explore and document technology development since the analyses in the 2017-25 rulemaking and compare this to the projections in the rulemaking. Each technology brief is designed to stand alone and to feed into the mid-term review. The secondary goal is to involve suppliers, both to help craft the briefs and to provide more credibility.
>>
>> Attached are two documents. The Word document is an outline of our proposed technology briefs, which I have sent out to about 20 different suppliers and organizations. The first page provides an overview of the project, followed by outlines for technology briefs on downsized, boosted gasoline engines, naturally aspirated engines, transmissions, lightweighting, and diesels. Each outline includes a suggested list of possible participants, mostly suppliers (although I doubt I will be able to contact every

organization on the lists, much less enlist participation).
>>
>> Also attached is the first technology brief, on hybrid vehicles. ICCT did this brief ourselves, in part to give suppliers an idea of what the technology briefs might look like and in part because we thought it would be more difficult to involve suppliers in the assessment, due to the complexity of the systems. Although, we certainly hope that the next technology briefs can be shorter.
>>
>> I would be happy to discuss this further with you. Let me know if you have questions.
>>
>> John
>> 734-355-155
>>

To: John German[john@theicct.org]
From: Moran, Robin
Sent: Mon 9/14/2015 11:57:01 AM
Subject: RE: ICCT Technology Briefs

Sounds good, thanks John.

-----Original Message-----
From: John German [mailto:john@theicct.org]
Sent: Friday, September 11, 2015 12:26 PM
To: Moran, Robin
Subject: Re: ICCT Technology Briefs

Yes, this would be fine. There is a chance I will be in DC that week and we will have to do this by phone, but otherwise I will plan on coming to EPA.

John

On Sep 8, 2015, at 9:27 PM, "Moran, Robin" <moran.robin@epa.gov> wrote:

> John,
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> I didn't realize that Bill had already scheduled something with you for 1-1:30pm on Sept 24 (?) on the mass reduction topic. If that's still good for you, can you extend it from 1-2pm to cover the tech briefing papers too? You can come on over to our office.
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> Sent from my iPhone
>
>> On Aug 27, 2015, at 1:06 PM, Moran, Robin <moran.robin@epa.gov> wrote:
>>
>> John,
>>
>> It was so nice to meet your family at Asilomar, I hope you're off enjoying a great vacation up far North! Hopefully you're not checking email, but I wanted this waiting for when you return.
>>
>> We'd like to have you come over the EPA office sometime in later September to talk more about the briefing papers. As we told Nic when he first mentioned it, this is a great idea, and will be valuable sources we can reference in the draft TAR. I'm especially interested in your plans for rolling out (press interest, blogging, sharing with stakeholders - like NHTSA, etc), and what response you're getting back

from suppliers.
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>> I would be happy to discuss this further with you. Let me know if you have questions.
>>
>> John
>> 734-355-155
>>

To: John German[john@theicct.org]
Cc: Olechiw, Michael[olechiw.michael@epa.gov]
From: Moran, Robin
Sent: Sun 9/6/2015 8:10:54 PM
Subject: RE: ICCT Technology Briefs

OK, will do. **Ex. 6 - Personal Privacy**

-----Original Message-----
From: John German [mailto:john@theicct.org]
Sent: Friday, August 28, 2015 8:22 PM
To: Moran, Robin
Cc: Olechiw, Michael
Subject: Re: ICCT Technology Briefs

Robin,

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Ex. 6 - Personal Privacy

Sent from my iPhone

> On Aug 27, 2015, at 1:06 PM, Moran, Robin <moran.robin@epa.gov> wrote:
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> John,
>

Ex. 6 - Personal Privacy

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> Robin Moran
> Senior Policy Advisor
> U.S. EPA, Office of Transportation and Air Quality
> 2000 Traverwood Dr.
> Ann Arbor, MI 48105
> (734) 214-4781 (phone)
> (734) 214-4821 (fax)
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> -----Original Message-----
> From: John German [mailto:john@theicct.org]

> Sent: Thursday, August 20, 2015 4:20 PM
> To: Charmley, William
> Cc: Moran, Robin
> Subject: ICCT Technology Briefs
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> I would be happy to discuss this further with you. Let me know if you have questions.
>
> John
> 734-355-155
>

To: John German[john@theicct.org]; Wallace Wade[wrwade1@gmail.com]; rhwang@nrdc.org[rhwang@nrdc.org]; Julie Becker[JBECKER@autoalliance.org]; Greene, David[dgreen32@utk.edu]; John Viera[jviera@ford.com]
From: Moran, Robin
Sent: Thur 8/6/2015 7:01:34 PM
Subject: Robin's latest Asilomar slides
Asilomar_Moran_8-20-15 ver 8-5.pptx

Here's the latest of version of my slide deck, reflecting everyone's comments (& other small tweaks).

Changes include:

- Slide 6 replaces previous pie graph with two bars, per Roland's comments that it wasn't clear that the pie represented only the fraction of vehicles meeting future standards early (~10% of the 2015 fleet meets 2020 already). Hopefully this makes the point clearer, and then looks at that same slice by both Powertrain type and Segment.

- Slide 7 – note we are continuing some QA/QC of some of these vehicles, so this slide may still be tweaked a bit. Per Julie's comment, I added a duplicate of this slide in Appendix that adds details on which variant, and more detail on the AC credits assumed.

- Slide 9, 2nd bullet adds in the "consistent with agencies analysis" per Roland's suggestion.

- Slide 13 – added, per John's suggestion for more details on the EPA testing

- Slide 14 – added, as a quick lead-in to the auto review analysis (since that's not the only thing we're doing on market).

- Slide 15 – tweaks to clarify this study was based on MY2014 vehicles (and I'll verbally note we're now redoing w/MY2015), and clarify that CVTs and stop/start are "least positives" (since "most negatives" was misconstrued by some as all negatives – not the case). More than half reviews were still positives for these techs.

Ex. 6 - Personal Privacy

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

From: John German [mailto:john@theicct.org]
Sent: Thursday, August 06, 2015 12:19 PM
To: Wallace Wade; rhwang@nrdc.org; Moran, Robin; Julie Becker; Greene, David; John Viera
Subject: Re: Comments and Suggestions on John German's Response Slides

Attached is version 2 of my presentation. Revisions since the first version:

- Slide 3: Changed table to graph
- Slide 4: Added new text box on the bottom, per my exchange with Wally on countermeasures versus clean sheet design
- Slide 8 - minor wording change for accuracy on the second bullet.
- Slide 13 - Revised 2nd to last bullet to clarify that the comparison is with the average 2025 weight reduction, per my exchange with Wally
- Slide 14 - Revised first bullet to avoid claiming more than was stated by the Committee, per my exchange with Wally
- Added Slide 17, on "other consumer benefits", per suggestion from Robin. I don't know if I will have time to cover this slide, which is why it is at the end - I'll skip it if necessary.

John

To: John German[John@theicct.org]
From: Moran, Robin
Sent: Thur 8/6/2015 12:05:35 AM
Subject: RE: Asilomar - draft presentation

I know… how about you hit Julie up for an extra minute (Ha!)

Thanks for ideas on adding more testing info, will think all that over tonight.

Steal away on the innovation slides, I had a lot of fun with those graphics.

On the F-150, funny you should ask, as John Viera sent Cynthia my way to press on details, as they're only getting out to 2023. We added the full 24.4 g/mi truck AC credit projected in the 17-25 rule, but nothing else (no off cycle, even though that system has stop/start). This was the 2WD, 2.7L ecoboost, 164 and 157 wheelbase versions. Aaron Hula (who works with Jeff Alson on Trends) is working the details on this.

From: John German [mailto:John@theicct.org]
Sent: Wednesday, August 05, 2015 7:38 PM
To: Moran, Robin
Subject: Fwd: Asilomar - draft presentation

Oh, so you want me to add slide 27 to my deck, so it counts against my time instead of yours? If I have 10 minutes, I could do it. Not sure with 9.

Understand on the Myths. We are both time limited in what we can say.

On the EPA testing front, I would keep this general, just a bit more information. You consider adding Grundler's slides 17 and/or 18, and/or Barba's slide 6. You could add the BSFC figures from Mike's presentation, below, to Grundler's slide 17 - they would provide specific examples of the benchmarking activities - and they look cool.

Thanks for Chris's CAR slides. CAR doesn't invite me to their conference anymore, after we trashed their 2025 cost assessments a few years ago. And I certainly appreciate all the innovation slides - if you don't mind, I might steal some of them for future presentations.

One question: We just ran the 2.7L F150 FE numbers against the standards (for the same WSJ article) and we only got compliance with 2022. Chris got 2024. Does he have access to credits (A/C, off-cycle, pickup truck tech credits) that we don't know about?

John

Begin forwarded message:

From: "Moran, Robin" <moran.robin@epa.gov>

Subject: RE: Asilomar - draft presentation

Date: August 5, 2015 12:45:15 PM EDT

To: John German <John@theicct.org>

Hi John, I hadn't forgotten about your earlier comments, my focus has been getting Chris Grundler ready for the CAR Traverse City talk yesterday, so now I can finally turn attention back to my own Asilomar presentation. Here's Chris's CAR slides, fyi (we'll be posting on our MTE web site too). I know you've done a great job touting the innovation theme – I really like your Asilomar messages on that (esp the Rumsfeld quote). You'll see we wove many innovation messages into Chris's talk. The idea was kind of shaming autos on their "nothing left on the shelf" bit. And also to plug suppliers as playing key role, which I know fits nicely with some of the supplier focused work Nic has told us ICCT is planning. The press coverage from Automotive News and Wards we've seen so far has been good, optimistic on 2025.

Back to your thoughts below:

- On the Myths slide, you're right, that would be another good one to add, but I'll probably opt to stick to the key "3" I have now, so that I can underscore points on those. Those are the biggest ones the press continually gets wrong. (In fact, Roland and I having a side bar on a Monday WSJ

article still perpetuating the "more trucks can't meet 2025" myth.). But I like your Appendix slide 27 on the "other consumer benefits of technology", and wonder if you want to pull that one into your main deck? We like to call these "win win" technologies. I think it builds upon the Innovation theme too – while OEM/suppliers are out working on FE, low and behold they've found ways to give consumers more than that. Think about adding LED lights to the list. I just bought a new car with LEDs and adaptive forward lighting, and can't believe the better night vision. There has to be some safety benefits there.

- On the EPA testing front, is the slide below what you had in mind (this was Mike's from Megatrends)? I also attached, in case you never saw it, Dan Barba's presentation to the CAR Powertrain Suppliers group who we hosted a month or so back. This has the most detail we've presented publicly on our ALPHA "best in class" plans. I could touch on this at a conceptual, high level on how we plan to use the benchmarking testing in the MTE analysis. And of course, appreciate your "amazing new work" comments!

-

To: John German[John@theicct.org]
From: Moran, Robin
Sent: Wed 8/5/2015 11:55:32 PM
Subject: RE: Asilomar - draft presentation

No problem on distributing slides, they're both public.

From: John German [mailto:John@theicct.org]
Sent: Wednesday, August 05, 2015 7:49 PM
To: Moran, Robin
Subject: Re: Asilomar - draft presentation

Also, thanks for the slides. Both presentations were very interesting.

I sent them along to the light-duty folks at ICCT. Let me know if this is a problem.

John

On Aug 5, 2015, at 12:45 PM, "Moran, Robin" <moran.robin@epa.gov> wrote:

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- <image001.png>

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Sent: Friday, July 24, 2015 1:39 PM
To: Moran, Robin
Cc: Viera, John (J.J.); rhwang@nrdc.org; JBECKER@autoalliance.org; wrwade1@gmail.com; Greene, David
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'Greene, David'
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From: Katie Rustad [mailto:klrustad@ucdavis.edu]
Sent: Friday, May 01, 2015 6:00 PM
To: Viera, John (J.J.)
Subject: Asilomar Conference 2015 agenda update

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Thank you!

Best regards,

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Senior Writer & Publications Archive Manager

Institute of Transportation Studies

University of California, Davis

klrustad@ucdavis.edu

Thursday, August 20

Session IV – 2 to 6 p.m.

Part A: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Aggressive national energy and GHG performance standards for cars and light trucks were adopted in 2012. They require nearly a halving of fuel consumption and GHGs from 2010 to 2025. China, Japan, and the EU are also adopting very aggressive standards. Is the technology and market on track to meet these standards? Should they be modified? And what role is, or might, the Zero Emission Vehicle mandate, adopted by 10 states, having on the achievement of the targets?

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<Asilomar_Moran_draft to Panel.pptx>

<Grundler_CAR_Management Seminar_final2.pptx><CAR Suppliers meeting at NVFEL_Barba.pptx>

To: John German[John@theicct.org]
From: Moran, Robin
Sent: Wed 8/5/2015 4:45:15 PM
Subject: RE: Asilomar - draft presentation
Grundler_CAR_Management Seminar_final2.pptx
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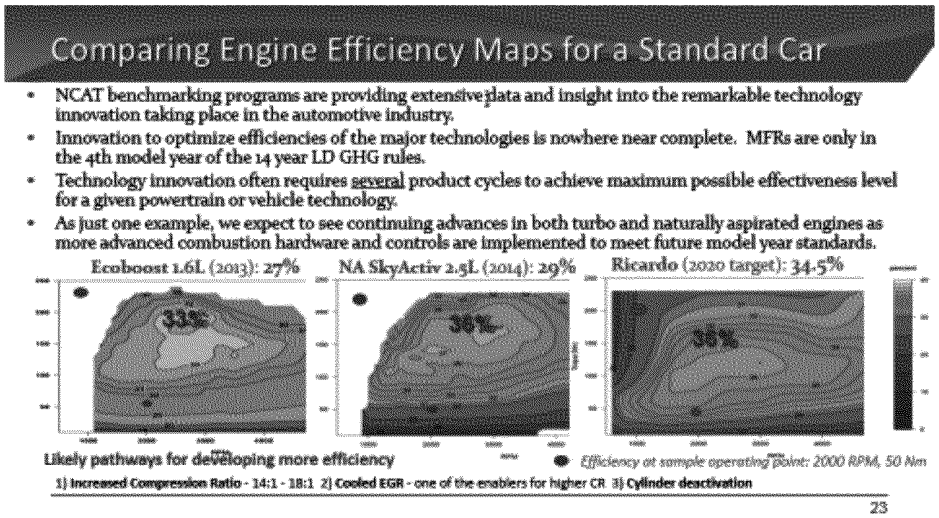

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Transportation

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<Asilomar_Moran_draft to Panel.pptx>

To: John German[John@theicct.org]
From: Moran, Robin
Sent: Tue 7/28/2015 12:03:30 AM
Subject: RE: Asilomar - draft presentation

Ha, lucky you. I started my widescreen for another presentation, so I have some formatting to do! ☺

From: John German [mailto:John@theicct.org]
Sent: Monday, July 27, 2015 3:42 PM
To: Moran, Robin
Subject: Re: Asilomar - draft presentation

Thanks, Robin. Almost all of my slides are 4:3, so this is good news for me.

John

On Jul 27, 2015, at 1:09 PM, "Moran, Robin" <moran.robin@epa.gov> wrote:

John – this just in from Asilomar organizers – Powerpoints should be in standard (not widescreen) format, so I'll change mine. Here's note I got from Ning Wan, the IT person.

HI Dan,

I just called Asilomar Conference Center. They told me that their standard setting is 4:3 format (VGA port). It will cost about $5000-$6000 more if we want to have 16:9 High Definition projection.

I will work with Natali and Katie to make sure the speakers know the conference PowerPoint standard.

Thanks,

Ning

Ning Wan

IT Manager

Institute of Transportation Studies

& Energy Cluster

1605 Tilia Street, Suite 100

Davis, CA 95616

(530)-752-3363

Send your IT request to: its-support@ucdavis.edu

Self IT service:http://goo.gl/XnrKmZ

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From: Moran, Robin
Sent: Mon 7/27/2015 11:30:22 PM
Subject: RE: Asilomar - draft presentation

Thanks Roland, I'll make edits to slide 8 along the lines you suggest, and plan to expand on the other two points verbally.

From: Hwang, Roland [mailto:rhwang@nrdc.org]
Sent: Monday, July 27, 2015 4:45 PM
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Cc: Viera, John (J.J.); wrwade1@gmail.com; Greene, David; John German
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Robin:
These slides look great to me as well. Some minor thoughts:

•□□□□□□□□ Slide 8. I would say something like "Consistent with agency assessment that 2025 standards …." That is, the NAS study did one illustrative calculation that supports that notion and is consistent with the agencies' findings.

•□□□□□□□□ Slide 10. Not absolutely critical, but some folks in the audience from CA may be interested to know what "In coordination with …CARB" means in terms of CA's involvement which you can expand on your verbal remarks as well.

•□□□□□□□□ Slide 11. The list of studies underway I suspect will be of interest to this conference, so I'd be prepared to expand on such.

Roland hwang **NATURAL RESOURCES DEFENSE COUNCIL**

DIRECTOR, ENERGY AND TRANSPORTATION PROGRAM

111 Sutter Street, 20th floor, San francisco, CA 94104 / T 415-875-6178 M 510-334-0804
RHwang@NRDC.ORG,@NRDCenergy, @Rolandhwang
NRDC.ORG,blog http://switchboard.nrdc.org/blogs/rhwang/

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Julie,

Thanks for your comments. Here are the answers to your Q's:

- Slide 1: Is the 2014 data actual data, projected or target? MY 2014 (and years beyond) are projections from the rulemaking.

- Slides 4 and 7: What is the source for the projections shown here? MY 2015 projected data (pre-Trends report data)

- Slide 5: Are these 2015 MY vehicles? Yes. Does this refer to GHG numbers only? Yes. What categories of credits are taken into account in deriving these conclusions? A/C credits based on our rule projections (Note we could have added some off-cycle credits, like UCS did in their recent report, which would make the forecast more optimistic. We haven't done that yet, but are considering for future analyses.)

- Slide 13: What is the anticipated comment period for the TAR? (I had to ask…) Good question! No decision yet, but I'm guessing about 60 days.

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803 7th Street, NW, Suite 300

Washington, DC 20001

From: Moran, Robin [mailto:moran.robin@epa.gov]
Sent: Monday, July 27, 2015 8:53 AM
To: John German
Cc: Viera, John (J.J.); rhwang@nrdc.org; Julie Becker; wrwade1@gmail.com; Greene, David

Subject: RE: Asilomar - draft presentation

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Thursday, August 20

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From: Moran, Robin
Sent: Mon 7/27/2015 7:05:24 PM
Subject: RE: Asilomar - draft presentation

Julie,

Thanks for your comments. Here are the answers to your Q's:

- Slide 1: Is the 2014 data actual data, projected or target? MY 2014 (and years beyond) are projections from the rulemaking.

- Slides 4 and 7: What is the source for the projections shown here? MY 2015 projected data (pre-Trends report data)

- Slide 5: Are these 2015 MY vehicles? Yes. Does this refer to GHG numbers only? Yes. What categories of credits are taken into account in deriving these conclusions? A/C credits based on our rule projections (Note we could have added some off-cycle credits, like UCS did in their recent report, which would make the forecast more optimistic. We haven't done that yet, but are considering for future analyses.)

- Slide 13: What is the anticipated comment period for the TAR? (I had to ask…) Good question! No decision yet, but I'm guessing about 60 days.

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Sent: Monday, July 27, 2015 11:24 AM
To: Moran, Robin
Cc: Viera, John (J.J.); rhwang@nrdc.org; wrwade1@gmail.com; Greene, David; John German
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Robin,

Thanks so much for sending your presentation last week. A couple of questions you might want to address before our call:

- Slide 1: Is the 2014 data actual data, projected or target?

- Slides 4 and 7: What is the source for the projections shown here?

- Slide 5: Are these 2015 MY vehicles? Does this refer to GHG numbers only? What categories of credits are taken into account in deriving these conclusions?

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From: Moran, Robin
Sent: Fri 7/24/2015 12:10:46 AM
Subject: RE: Asilomar - draft presentation
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To: Jonna Hamilton (JHamilton@ucsusa.org)[JHamilton@ucsusa.org]; David Cooke (DCooke@ucsusa.org)[DCooke@ucsusa.org]; Roland Hwang[rhwang@nrdc.org]; Luke Tonachel[ltonachel@nrdc.org]; Therese Langer (tlanger@aceee.org)[tlanger@aceee.org]; Jesse Prentice-Dunn (Jesse.Prentice-Dunn@sierraclub.org)[Jesse.Prentice-Dunn@sierraclub.org]; Nic Lutsey (nic@theicct.org)[nic@theicct.org]; John German (john@theicct.org)[john@theicct.org]; Zoe Lipman[zoel@bluegreenalliance.org]; Carol Lee Rawn (rawn@ceres.org)[rawn@ceres.org]; Shannon Baker-Branstetter - Consumers Union (sbaker-branstetter@consumer.org)[sbaker-branstetter@consumer.org]; Hilary Sinnamon[hilary@redmtngroup.com]; Chet - Home France[cjfrance@sbcglobal.net]
From: Moran, Robin
Sent: Mon 7/20/2015 2:51:00 PM
Subject: EPA Report on Mass Reduction and Cost Analysis - Light Duty Pickup Trucks Model Years 2020-2025

Dear NGO Colleagues:

EPA has released the Silverado mass reduction feasibility/cost study conducted with FEV. See note below for details and web link.

Robin

From: Caffrey, Cheryl
Sent: Wednesday, July 15, 2015 1:41 PM
Subject: Available online: Mass Reduction and Cost Analysis - Light Duty Pickup Trucks Model Years 2020-2025

Dear Colleague,

We are proud to inform you that the lightweighting study on the Light Duty Pickup Truck by FEV North America, EDAG and Munro & Associates is now on the EPA website at http://www.epa.gov/otaq/climate/mte.htm#epa-projects (direct link to report is at

http://www.epa.gov/otaq/climate/documents/mte/420r15006.pdf).

We greatly appreciate all of the information you all have shared with us in regards to the ideas on lightweighting whether it be related to this report or the lightweighting topic in general and ICCT for the financial sponsorship of the suspension section of this report.

In addition to the report, the online site contains the CAE baseline and lightweight models. We expect the Peer Review Response to Comment Report to be placed on the website by July 24.

A followup study from this work is underway and focuses on the change in mass needed for the lightweight design to meet the IIHS small overlap. This work is being done by Transport Canada and EDAG and is expected to be available in October of 2015. This work incorporates the lightweight ideas contained in the LDT study by FEV/EDAG/Munro and modifications to the model as needed.

Sincerely,

Cheryl Caffrey

US EPA NVFEL

Mechanical Engineer, MS

734-214-4849

To: Carol Lee Rawn (rawn@ceres.org)[rawn@ceres.org]
From: Moran, Robin
Sent: Thur 7/2/2015 6:10:03 PM
Subject: New EPA web page for the Midterm Evaluation

Hi Carol Lee,

I hope your summer is going well so far. I wanted to let you know about a new web page we've created for the light-duty midterm evaluation (MTE): http://www.epa.gov/otaq/climate/mte.htm

In the spirit of transparency throughout the MTE process, we wanted a place for the public to see the range of projects we have underway, and the products of our research (documents, publications, key presentations, etc.), as well as give more details on the timeline/process, and links to the work of our partners. As new MTE-related work is released, this is the place we'll post it.

Ex. 6 - Personal Privacy but maybe later in July we could catch up on how things are going with the auto profits study?

Take care,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: Viera, John (J.J.)[jviera@ford.com]; rhwang@nrdc.org[rhwang@nrdc.org]; Wallace Wade[wrwade1@gmail.com]; Katie Rustad[klrustad@ucdavis.edu]; JBECKER@autoalliance.org[JBECKER@autoalliance.org]; John@theicct.org[John@theicct.org]
From: Moran, Robin
Sent: Tue 6/30/2015 1:42:18 PM
Subject: RE: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Hi John,

On July 14th, I'm open until 3pm eastern.

Robin

From: Viera, John (J.J.) [mailto:jviera@ford.com]
Sent: Tuesday, June 30, 2015 9:28 AM
To: rhwang@nrdc.org; Wallace Wade; Katie Rustad; JBECKER@autoalliance.org; Moran, Robin; John@theicct.org
Subject: RE: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

All,

Thanks for the responses. With my informal poll, looks like best date to meet will be on Tuesday, July 14th. I think many are in Eastern time, but possibly not Roland.

Any preferred times for folks? If we can't do this by email, Julie has graciously volunteered to do a doodle scheduling, but let's see what you all would prefer for an hour meeting time slot via email.

Thanks!

John J. Viera
Director, Sustainability & Vehicle Environmental Matters
Ford Motor Company
Phone: 313-32-36976 Cell: 313-805-3219
jviera@ford.com

From: Hwang, Roland [mailto:rhwang@nrdc.org]
Sent: Monday, June 29, 2015 5:17 PM
To: Wallace Wade; Katie Rustad; Viera, John (J.J.); JBECKER@autoalliance.org; larson.robert@epa.gov; moran.robin@epa.gov; John@theicct.org
Subject: RE: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

My current title is "Director, Energy and Transportation Program"

Roland hwang **NATURAL RESOURCES DEFENSE COUNCIL**

DIRECTOR, ENERGY AND TRANSPORTATION PROGRAM

111 Sutter Street, 20th floor, San francisco, CA 94104 / T 415-875-6178 M 510-334-0804
RHwang@NRDC.ORG,@NRDCenergy, @Rolandhwang
NRDC.ORG,blog http://switchboard.nrdc.org/blogs/rhwang/

From: Wallace Wade [mailto:wrwade1@gmail.com]
Sent: Monday, June 29, 2015 11:40 AM
To: Katie Rustad; Viera, John (J.J.); Hwang, Roland; JBECKER@autoalliance.org; larson.robert@epa.gov; moran.robin@epa.gov; John@theicct.org
Subject: Re: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

John,

Thank you for your email. My title and the presentation title are correct as shown on the agenda below.

Regarding a meeting during the week of July 13th, I will not be available on July 15th and 16th,

since I will be out town. Otherwise, I should be available for a conference call during that week.

I will look forward to discussing the Asilomar Conference with you.

Regards,
Wally Wade
Phone: 248-449-4549
Email: wrwade1@gmail.com (wrwade followed by 1)

From: Katie Rustad

Sent: Friday, June 26, 2015 10:40 AM

To: Viera, John (J.J.) ; rhwang@nrdc.org ; JBECKER@autoalliance.org ; wrwade1@gmail.com ; larson.robert@epa.gov ; moran.robin@epa.gov ; John@theicct.org

Subject: RE: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Hello all, just thought you would like to see the current version of your session from the agenda below. I'll be happy to make any updates.

Thank you!

Katie Rustad

Thursday, August 20

Session IV – 2 to 6 p.m.

Part A: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Aggressive national energy and GHG performance standards for cars and light trucks were adopted in 2012. They require nearly a halving of fuel consumption and GHGs from 2010 to 2025. China, Japan, and the EU are also adopting very aggressive standards. Is the technology and market on track to meet these standards? Should they be modified? And what role is, or might, the Zero Emission Vehicle mandate, adopted by 10 states, having on the achievement of

the targets?

Moderator:

John Viera, *Global Director of Sustainability, Ford Motor Company*

Speakers:

Robin Moran, *Senior Policy Advisor, Office of Transportation and Air Quality, U.S. EPA*

"Midterm Evaluation of the 2022-2025 Light-duty Vehicle Greenhouse Gas Standards"

Wally Wade, *Technical Fellow, Ford Motor Company* (retired)

"What the National Academies Report Says about Technology"

Discussants:

Julie Becker, *Vice President, Environmental Affairs, Alliance of Automobile Manufacturers*

John German, *Senior Fellow/U.S. Co-Lead, International Council on Clean Transportation*

Roland Hwang, *Director, Energy & Transportation Program, Natural Resources Defense Council*

From: Viera, John (J.J.) [mailto:jviera@ford.com]
Sent: Friday, June 26, 2015 2:33 AM
To: rhwang@nrdc.org; JBECKER@autoalliance.org; wrwade1@gmail.com; larson.robert@epa.gov; moran.robin@epa.gov; John@theicct.org
Cc: Katie Rustad; Viera, John (J.J.)
Subject: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Hello all (Robin, I hope I have the right email for you – just a guess after seeing Bob Larson's email approach at EPA. I will need your official title for the session description below) –

It is time that we begin pulling together our material before the Asilomar event in August. I know this was a crazy busy month for all of us with the NAS report out, the HD NPRM, etc. I would like to get together sometime the week of July 13th and then possibly hold 1-2 more meetings to final all of our material and logistics leading up to Asilomar the 3rd week in August.

Does anyone have access to Doodle scheduling that we can set up to understand available days and times that week?

Thanks and really looking forward to an incredibly rich session!

John J. Viera
Director, Sustainability & Vehicle Environmental Matters
Ford Motor Company
Phone: 313-32-36976 Cell: 313-805-3219
jviera@ford.com

From: Katie Rustad [mailto:klrustad@ucdavis.edu]
Sent: Friday, May 01, 2015 6:00 PM
To: Viera, John (J.J.)
Subject: Asilomar Conference 2015 agenda update

Dear Mr. Viera,

Dan Sperling has asked me to update the conference agenda. Your session information is below. Could you please let me know about any changes needed in your title and affiliation, or in the description of your session?

Thank you!

Best regards,

Katie Rustad

Senior Writer & Publications Archive Manager

Institute of Transportation Studies

University of California, Davis

klrustad@ucdavis.edu

Thursday, August 20

Session IV – 2 to 6 p.m.

Part A: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Aggressive national energy and GHG performance standards for cars and light trucks were adopted in 2012. They require nearly a halving of fuel consumption and GHGs from 2010 to 2025. China, Japan, and the EU are also adopting very aggressive standards. Is the technology and market on track to meet these standards? Should they be modified? And what role is, or might, the Zero Emission Vehicle mandate, adopted by 10 states, having on the achievement of the targets?

Moderator:

John Viera, *Global Director of Sustainability, Ford Motor Company*

Speakers:

Robin Moran for Bill Charmley, *Director, Assessments and Standards Division, U.S. EPA*

"Proposed Vehicle Regulations"

Wally Wade, *Technical Fellow, Ford Motor Company* (retired)

"What Do the National Academies Say about Technology Progress?"

Discussants:

Julie Becker, *Vice President, Environmental Affairs, Alliance of Automobile Manufacturers*

John German, *Senior Fellow/U.S. Co-Lead, International Council on Clean Transportation*

Roland Hwang, *Director, Transportation Program, Energy & Transportation Program, Natural Resources Defense Council*

To: Viera, John (J.J.)[jviera@ford.com]; rhwang@nrdc.org[rhwang@nrdc.org]; JBECKER@autoalliance.org[JBECKER@autoalliance.org]; wrwade1@gmail.com[wrwade1@gmail.com]; Larson, Robert[larson.robert@epa.gov]; John@theicct.org[John@theicct.org]
Cc: klrustad@ucdavis.edu[klrustad@ucdavis.edu]
From: Moran, Robin
Sent: Mon 6/29/2015 12:31:52 PM
Subject: RE: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Hi John,

Thanks for your note. It looks like my title, presentation title, etc are all set on the latest conference agenda (pasted below).

A call the week of July 13 sounds great. Best times for me are 13th or 14th before 3pm, or 15th before noon, though I'll try to make myself available if other times work better for the group.

Looking forward to it.

Best,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

http://www.its.ucdavis.edu/files/ITS-Davis-Asilomar-2015-Agenda-June-18.pdf

Session IV – 2 to 6 p.m.

Part A: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

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Speakers:

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"Midterm Evaluation of the 2022-2025 Light-duty Vehicle Greenhouse Gas Standards"

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Discussants:

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Roland Hwang, *Director, Energy & Transportation Program, Natural Resources Defense Council*

From: Viera, John (J.J.) [mailto:jviera@ford.com]
Sent: Friday, June 26, 2015 5:33 AM
To: rhwang@nrdc.org; JBECKER@autoalliance.org; wrwade1@gmail.com; Larson, Robert;

Moran, Robin; John@theicct.org
Cc: klrustad@ucdavis.edu; Viera, John (J.J.)
Subject: Asilomar Conference: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Hello all (Robin, I hope I have the right email for you – just a guess after seeing Bob Larson's email approach at EPA. I will need your official title for the session description below) –

It is time that we begin pulling together our material before the Asilomar event in August. I know this was a crazy busy month for all of us with the NAS report out, the HD NPRM, etc. I would like to get together sometime the week of July 13th and then possibly hold 1-2 more meetings to final all of our material and logistics leading up to Asilomar the 3rd week in August.

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John J. Viera
Director, Sustainability & Vehicle Environmental Matters
Ford Motor Company
Phone: 313-32-36976 Cell: 313-805-3219
jviera@ford.com

From: Katie Rustad [mailto:klrustad@ucdavis.edu]
Sent: Friday, May 01, 2015 6:00 PM
To: Viera, John (J.J.)
Subject: Asilomar Conference 2015 agenda update

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in the description of your session?

Thank you!

Best regards,

Katie Rustad

Senior Writer & Publications Archive Manager

Institute of Transportation Studies

University of California, Davis

klrustad@ucdavis.edu

Thursday, August 20

Session IV – 2 to 6 p.m.

Part A: Toward Energy Efficient, Low-Carbon Cars and Light Trucks—to 2025

Aggressive national energy and GHG performance standards for cars and light trucks were adopted in 2012. They require nearly a halving of fuel consumption and GHGs from 2010 to 2025. China, Japan, and the EU are also adopting very aggressive standards. Is the technology and market on track to meet these standards? Should they be modified? And what role is, or might, the Zero Emission Vehicle mandate, adopted by 10 states, having on the achievement of the targets?

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"What Do the National Academies Say about Technology Progress?"

Discussants:

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John German, *Senior Fellow/U.S. Co-Lead, International Council on Clean Transportation*

Roland Hwang, *Director, Transportation Program, Energy & Transportation Program, Natural Resources Defense Council*

To: Jonna Hamilton (JHamilton@ucsusa.org)[JHamilton@ucsusa.org]; Nic Lutsey (nic@theicct.org)[nic@theicct.org]; David Cooke (DCooke@ucsusa.org)[DCooke@ucsusa.org]; Luke Tonachel[ltonachel@nrdc.org]; Jesse Prentice-Dunn (Jesse.Prentice-Dunn@sierraclub.org)[Jesse.Prentice-Dunn@sierraclub.org]; Shannon Baker-Branstetter - Consumers Union (sbaker-branstetter@consumer.org)[sbaker-branstetter@consumer.org]; Therese Langer (tlanger@aceee.org)[tlanger@aceee.org]
Cc: Olechiw, Michael[olechiw.michael@epa.gov]; Nam, Ed[nam.ed@epa.gov]
From: Moran, Robin
Sent: Thur 6/18/2015 8:28:45 PM
Subject: New EPA web site for Midterm Evaluation

Hello NGO colleagues –

Today we posted a new web page dedicated to the Midterm Evaluation.
http://www.epa.gov/otaq/climate/mte.htm

In the spirit of transparency throughout the process, we wanted a place for the public to see the range of projects we have underway, and the products of our research (documents, publications, key presentations, etc.), as well as give more details on the timeline/process, and links to the work of our partners (e.g, DOE, Canada). As new studies are finalized, this is where they'll go (for example, in the next week or so we'll release the new Silverado FEV study and VMT rebound work, and I'll give you heads-up once they're posted).

If you have ideas on other things you'd like to see on this site, please let me know.

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: Carol Lee Rawn[rawn@ceres.org]
From: Moran, Robin
Sent: Thur 5/7/2015 1:44:18 PM
Subject: RE: costs
EPA_FEV_transmission cost update_April 2013.pdf

Hi Carol Lee,

I ran this by one of our cost experts, Todd Sherwood, and am pasting his feedback below, hoping this will be useful to your contractor:

- Many of the costs in Figure 18 seem a bit low. We have updated our trans costs per revisions from FEV, available on our website (link below, and copy of report attached). The changes resulted in higher trans costs. That said, they show AMT costs rather than DCT costs (which we show). Perhaps they mean DCT which suggests that their costs are lower than our costs.

http://www.epa.gov/otaq/climate/strategies-vehicle.htm

Light-Duty Technology Cost Analysis, Report on Additional Case Studies (Revised Final Report) (PDF) (39 pp, 281K, EPA-420-R-13-008, April 2013)

o Supporting Excel spreadsheets can be found in the Electronic Docket at regulations.gov; search for "EPA-HQ-OAR-2009-0472-11604," and see the documents with IDs EPA-HQ-OAR-2009-0472-11604.1 through EPA-HQ-OAR-2009-0472-11604.77

- Figure 18's electrification costs seem a bit lower too. I assumed their costs were direct+indirect and meant for 2020, but that's not clear. They show costs for CVTs which are probably based on Phase 1 or even 2002 NAS. That's probably the best public value to use (short of estimates they may get directly from industry). We have been told that CVT costs should be on par with 6 sp auto trans costs, but we have no public estimate at this time that's better than 2002 NAS. They also show costs for 2mode HEVs, which we included in the phase 1 rule but didn't include in phase 2.

- We did not attempt to compare the package costs in Figure 19 to ours.

As I mentioned earlier this week, except for the updated transmission costs noted above, we won't have any new publicly available technology teardown cost estimates until at best this fall

(mild hybrids, diesels), after peer review. Our teams are reviewing all the cost estimates from the 2017-2025 rule as part of the draft Technical Assessment Report for release in June 2016.

I hope this feedback is useful, and of course please let me know if there are any follow-up questions.

Best,

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Tuesday, May 05, 2015 10:39 AM
To: Moran, Robin
Subject: costs

Hi Robin - good talking with you. Attached is the Citi report; the cost section is on p.26-35.
many thanks Robin!

Carol Lee Rawn

Director, Transportation Program

Ceres

99 Chauncy Street

Boston, MA 02111-1703

(T) 617-247-0700 ext. 112

(M) 617-388-7879

www.ceres.org

To: Jonna Hamilton[JHamilton@ucsusa.org]
From: Moran, Robin
Sent: Wed 5/6/2015 5:23:36 PM
Subject: RE: Meeting time

Yep, that sounds good, I can cover that topic for this call.

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]
Sent: Wednesday, May 06, 2015 1:21 PM
To: Moran, Robin
Subject: RE: Meeting time

Hi Robin,

Folks were talking about whether EPA is considering how OEMs are using credits and are likely to use credits to comply in the out years. How will the credit banking affect each manufacturers compliance in the future? Is EPA incorporating this kind of thinking in the mid-term evaluation? Will it affect how EPA looks at the stringency?

It might make sense to talk about this at a higher level in the first meeting and maybe then do a deeper dive on it on a future call.

Thanks,

Jonna

From: Moran, Robin [mailto:moran.robin@epa.gov]
Sent: Wednesday, May 06, 2015 1:03 PM
To: Jonna Hamilton
Subject: RE: Meeting time

Hi Jonna, that sounds great. On the credits topic, what exactly are the questions you'd want to discuss? I know a lot about the GHG credits programs, but if there's something deeper you want to get into (e.g.,

credit calculations in the MY2013 manufacturer performance report) I could pull in other folks – or that might be better for a different call?

Thanks

Robin

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]
Sent: Wednesday, May 06, 2015 12:57 PM
To: Moran, Robin
Subject: Meeting time

Hi Robin,

Thanks for your patience in scheduling this meeting – there was some shifting that needed to happen to get this to come together. We can do May 21 from 11-12. I am happy to provide a call in number. Right now it looks like folks from UCS, NRDC, and EDF will be joining.

We are discussing some of the topics we want to bring up and will send you a better list closer to the meeting time, but one thing that has come up is a conversation about credits – I'm not sure who the expert in credits is at EPA, but is it possible to get whoever knows this best to join the call?

Thanks,

Jonna

Jonna Hamilton

Senior Washington Representative

Clean Vehicles Program

Union of Concerned Scientists

1825 K Street NW, Suite 800

Washington, DC 20001

202-331-5451

JHamilton@ucsusa.org

EPA FOIA 2017-003707

Midterm Evaluation of the 2022-2025 Light-Duty Vehicle Greenhouse Gas Standards

Asilomar Transportation & Energy 2015

August 20, 2015

Robin Moran

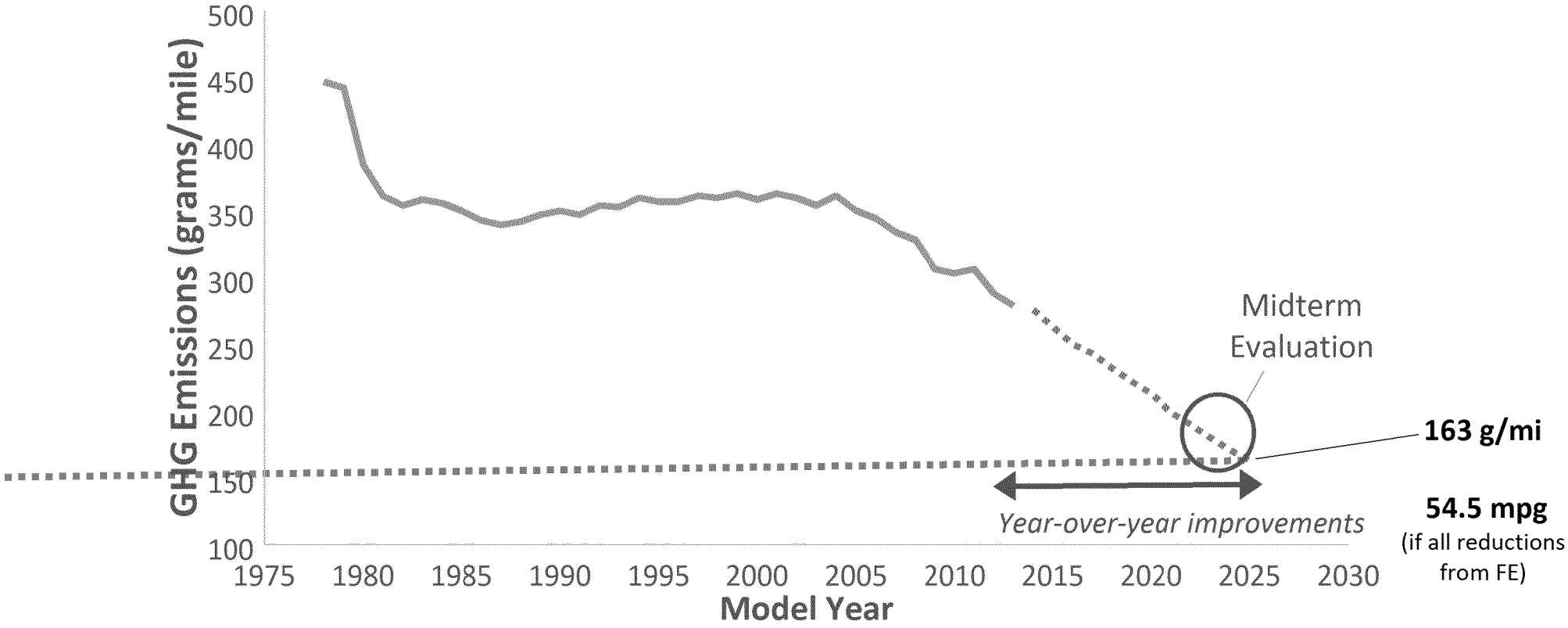
Office of Transportation and Air Quality

ED_001162_00012169-00001

Overview

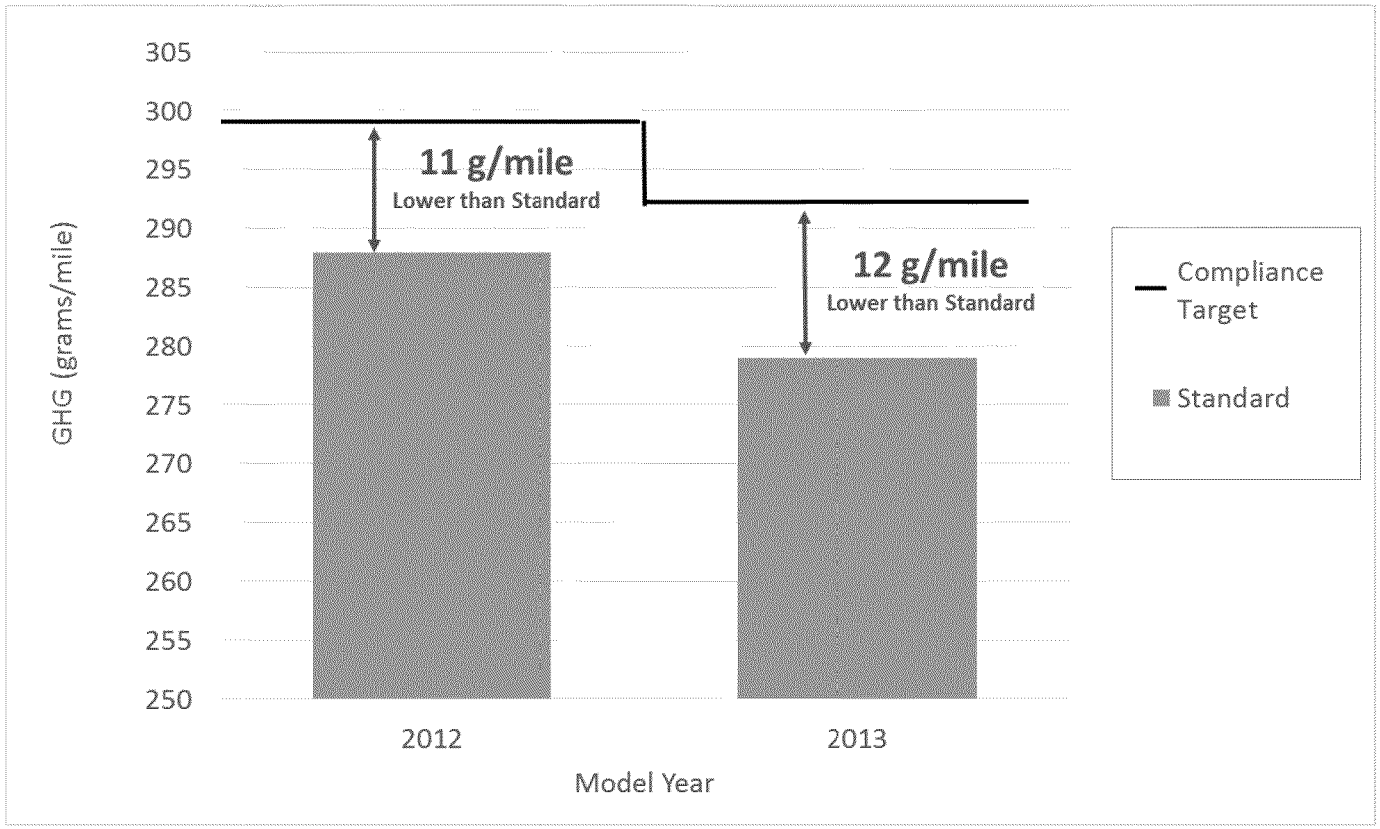
- Light-duty GHG progress thus far
  - Auto manufacturers, technologies, vehicles
- Midterm evaluation
  - Purpose, EPA research areas, process & timing

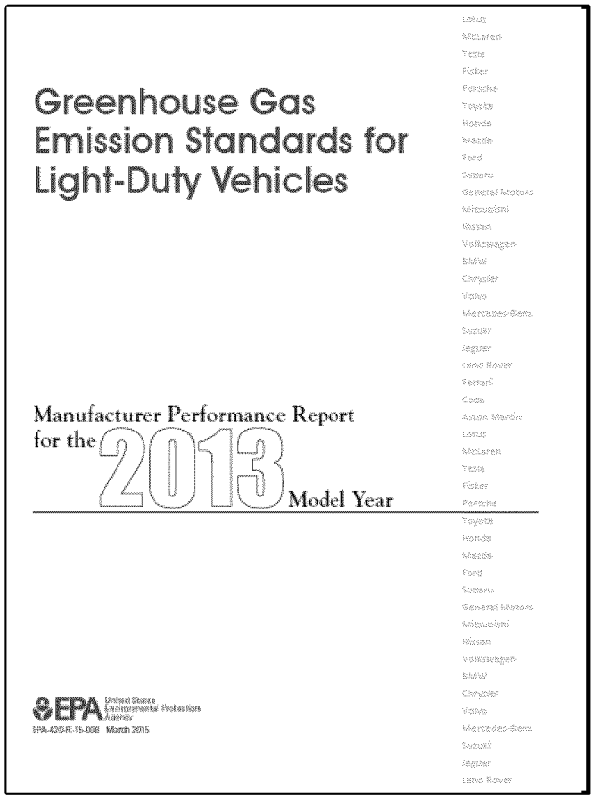
U.S. GHG/Fuel Economy standards provide significant benefits to climate, oil, consumers



GHG Compliance … Good News So Far

- Automakers beat standards first two years
- Widespread use of credit flexibilities



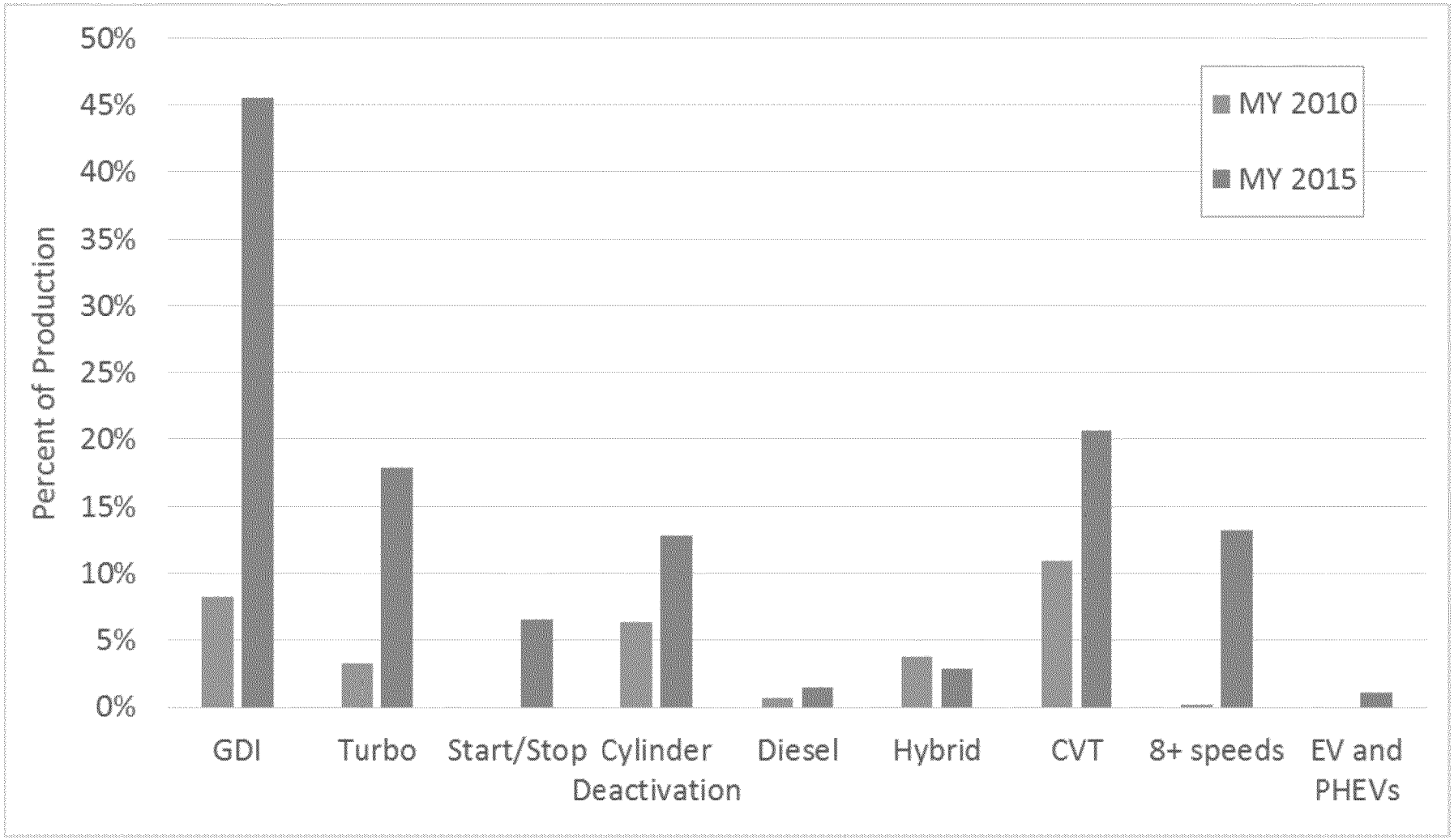

Greenhouse Gas Emission Standards for Light-Duty Vehicles

Manufacturer Performance Report for the 2013 Model Year

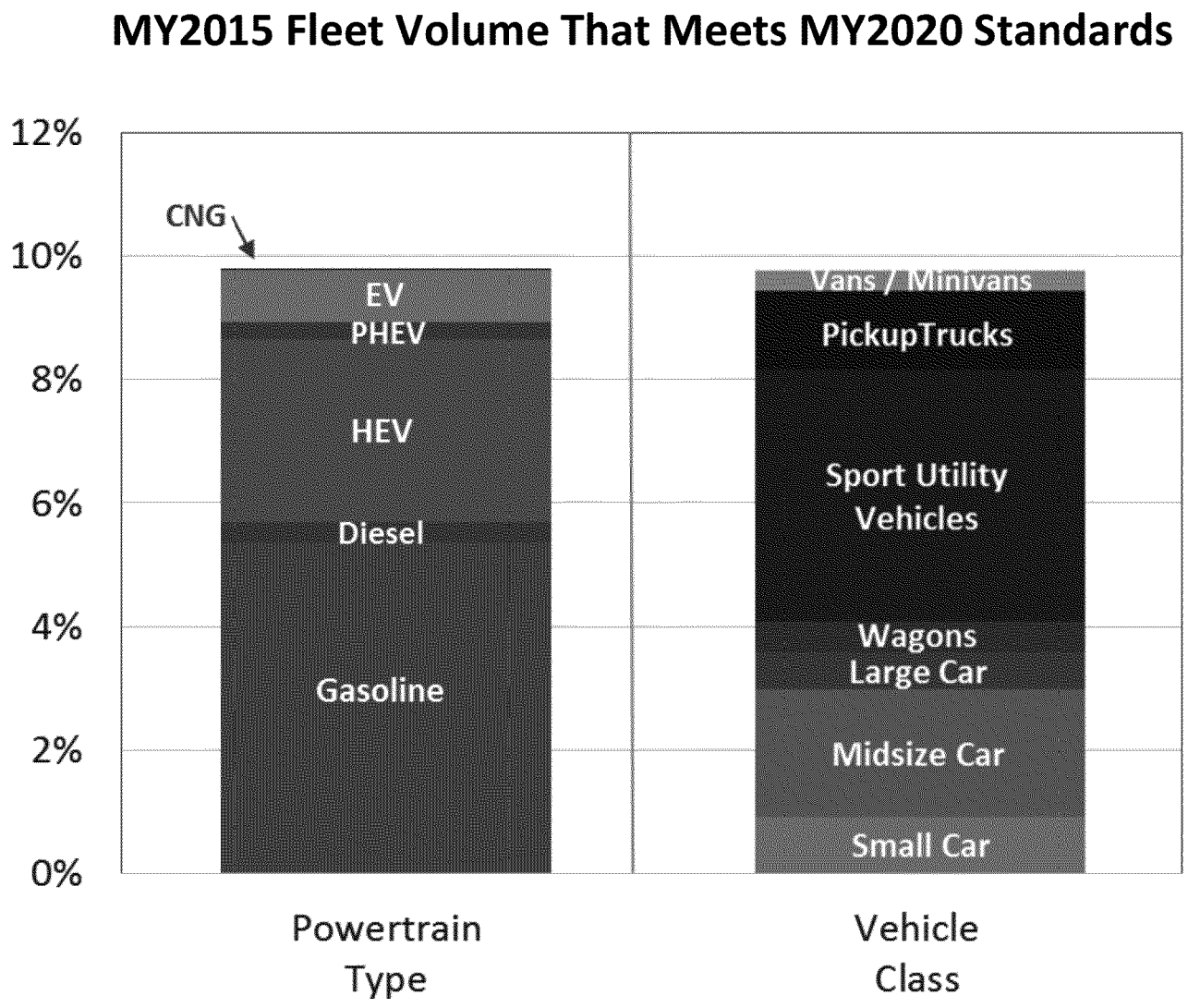
EPA Environmental Protection Agency

EPA-420-R-15-008 March 2015

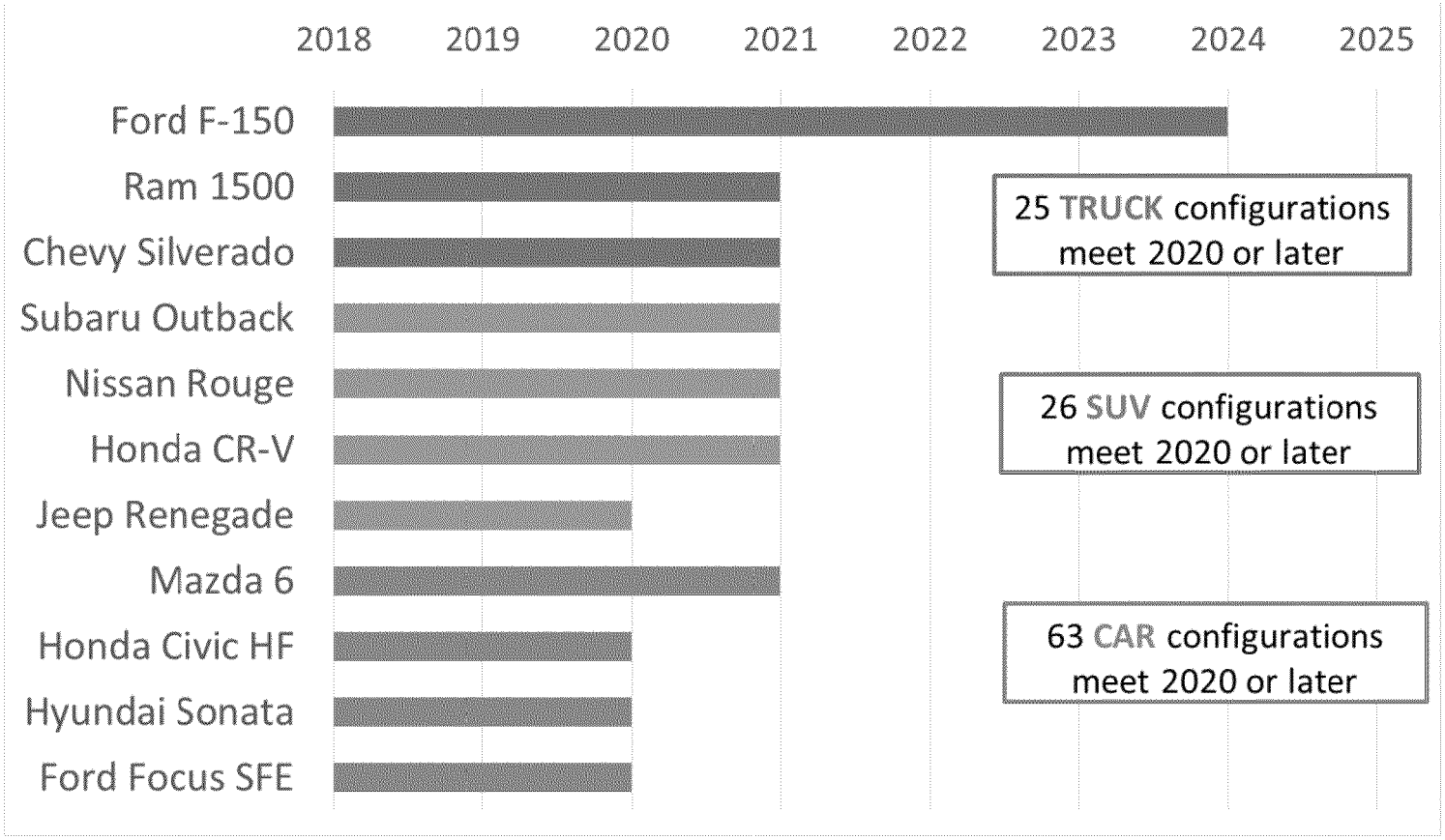
Manufacturers are aggressively adopting technology



Vehicles are meeting future standards -- with mostly gasoline powertrains, across segments



Many of today's top-selling vehicles* already meet** future GHG standards



At least one variant of MY 2015 vehicle model (see Appendix)

*** Assumes air conditioning credits*

Vehicles are meeting future standards with a variety of technologies

		Trucks			SUVs				Cars			
		Ford F-150	Ram 1500	Chevy Silverado	Subaru Outback	Nissan Rouge	Honda CR-V	Jeep Renegade	Mazda 6	Honda Civic HF	Hyundai Sonata	Ford Focus SFE
Engine	Diesel		X									
	Turbocharging	X						X			X	X
	High Compression Atkinson								X			
	GDI	X		X			X		X		X	X
	Cylinder Deactivation			X								
	Stop-start	X										
Transmission	8+ Speed Transmissions		X									
	CVT				X	X	X			X		
Road Loads	Mass Reduction*	X					X		X			
	Tires**		X			X	X		X	X	X	
	Aero**	X	X	X							X	X

**Compared to MY2008 model's sales-weighted curb weight*

*** Top 25% of class + other active/passive features*

NAS Report on Fuel Economy Technologies

The National Academies of SCIENCES · ENGINEERING · MEDICINE

- Comprehensive study – good early input to midterm evaluation process
- Consistent with Agencies' analysis, affirmed that 2025 standards can be met through advanced gasoline vehicle technologies
- Many recommendations in line with our research plan already underway, others help prioritize

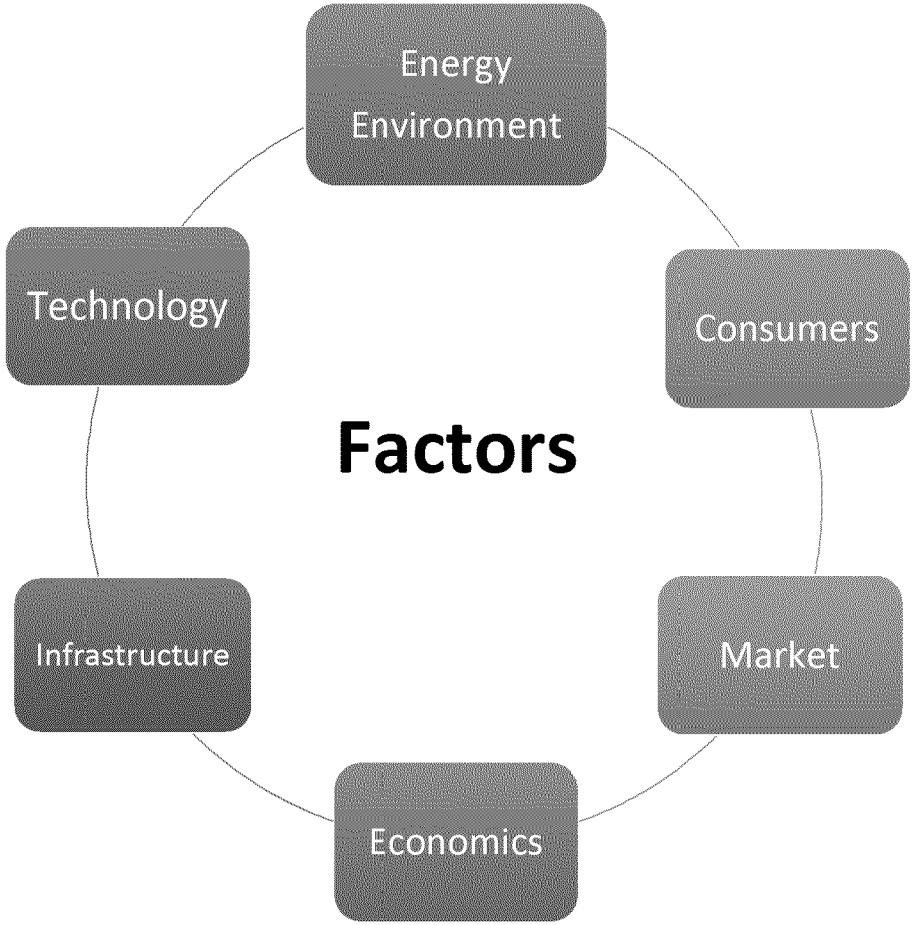
MYTHS

- Standards force small cars
- Low gasoline prices threaten compliance
- Low hybrid/electric vehicle sales mean 2025 standards can't be met

- Footprint-based standards designed to preserve consumer choice
- Industry is complying as sales are booming
- If fleet mix changes, standards adjust
- EPA standards are performance-based – no technology mandate
- EPA projected– and NAS reaffirmed – compliance largely from gasoline vehicles

Midterm Evaluation – Overview

- Technical review of longer term standards for 2022-2025
- In coordination with NHTSA and CARB
- EPA decision on whether standards are appropriate. Could go one of 3 ways:
  - Standards remain same
  - More stringent
  - Less stringent



Midterm Evaluation – EPA Research Areas

- Researching advanced engine and transmission technologies

- Mass reduction feasibility/cost study for a full-size pickup
- Cost teardowns on mild hybrid, diesel, turbo-downsized engine, others

- Manufacturer "learning by doing" costs assessment

- Research on consumers, market

EPA's Powertrain Assessment

- Testing 20+ vehicles/engines across a wide range of powertrains & segments
  - Cars, SUVs, pickups
  - Naturally aspirated and boosted engines
  - Gasoline and diesel
  - I4 and V6 engines
  - 6 and 8+ speed AT/DCT and CVT transmissions

		N/A Gasoline	Turbo Gasoline	Diesel
Cars	I3/I4	**SkyActiv 2.0L 14:1** [demo engine]	**Mahle DI3** [demo engine]	
		2013 Malibu 2.5L 6AT [eng mapped by FEV]	**2013 Escape 1.6L EcoBoost***	
		2013 Mazda 6 SkyActiv 2.5L* 8MT	**2013 Focus 1.6L EcoBoost*** [Euro]	
		2013 Mazda 3 SkyActiv 2.0L* 13:1 8MT	**2015 Volvo S60 2.0L Drive-E*** 8AT**	
		2013 Mazda 3 SkyActiv 2.0L* 14:1 [Euro]	**2013 Sonata 2.0L 6AT [tested by TC]**	
		2013 Mazda 3 SkyActiv 2.0L 13:1 6AT	**2015 Forester 2.0L*** *[tested by TC]*	
		2013 Altima SV 2.5L* Jatco CVT8**	**PSA 1.6L **** *[tested by SwRI]*	
	V6	**Chrysler 300 3.6L Pentastar 8AT**		**2013 Mercedes E350 3.0L 7AT**
		Dodge Charger 3.6L Pentastar 5AT		
		Dodge Charger 3.6L Pentastar 8AT		
SUVs Trucks	V6	**2014 RAM HFE 3.6L Pentastar*** 8AT**	**2015 Alum F150 2.7L EcoBoost***	**2014 RAM 1500 3.0L EcoDiesel VM 8AT**
		2014 Silverado 4.3L Deac* EcoTec3		**BMW X5 35d 3.0L* (I6)** *[tested by FEV]*

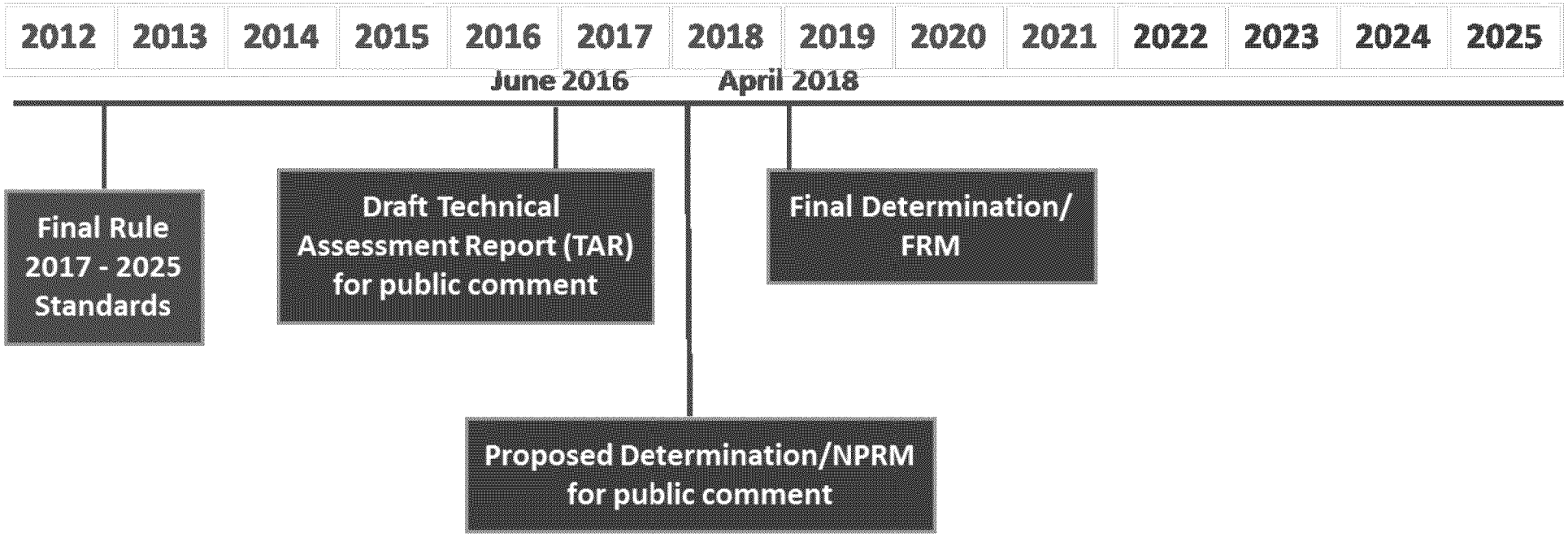
Midterm Evaluation – Market Research

- Vehicle sales
- Fleet mix changes (cars v. trucks)
- Technology penetration in fleet
- Consumer satisfaction surveys
- Automotive reviews

Automotive Reviewers Like Fuel Economy Technologies

- EPA study finds 4 out of 5 mentions of MY 2014 FE technologies in auto reviews have positive or neutral ratings
- Most positives (80-100%)
  - Active aero, mass reduction, cylinder deactivation, LEDs, GDI, turbocharging
- Least positives (but still >50%)
  - CVTs and stop-start
- But no universal issues with technologies -- some manufactures implementing better than others

Midterm Evaluation Process -- Timeline



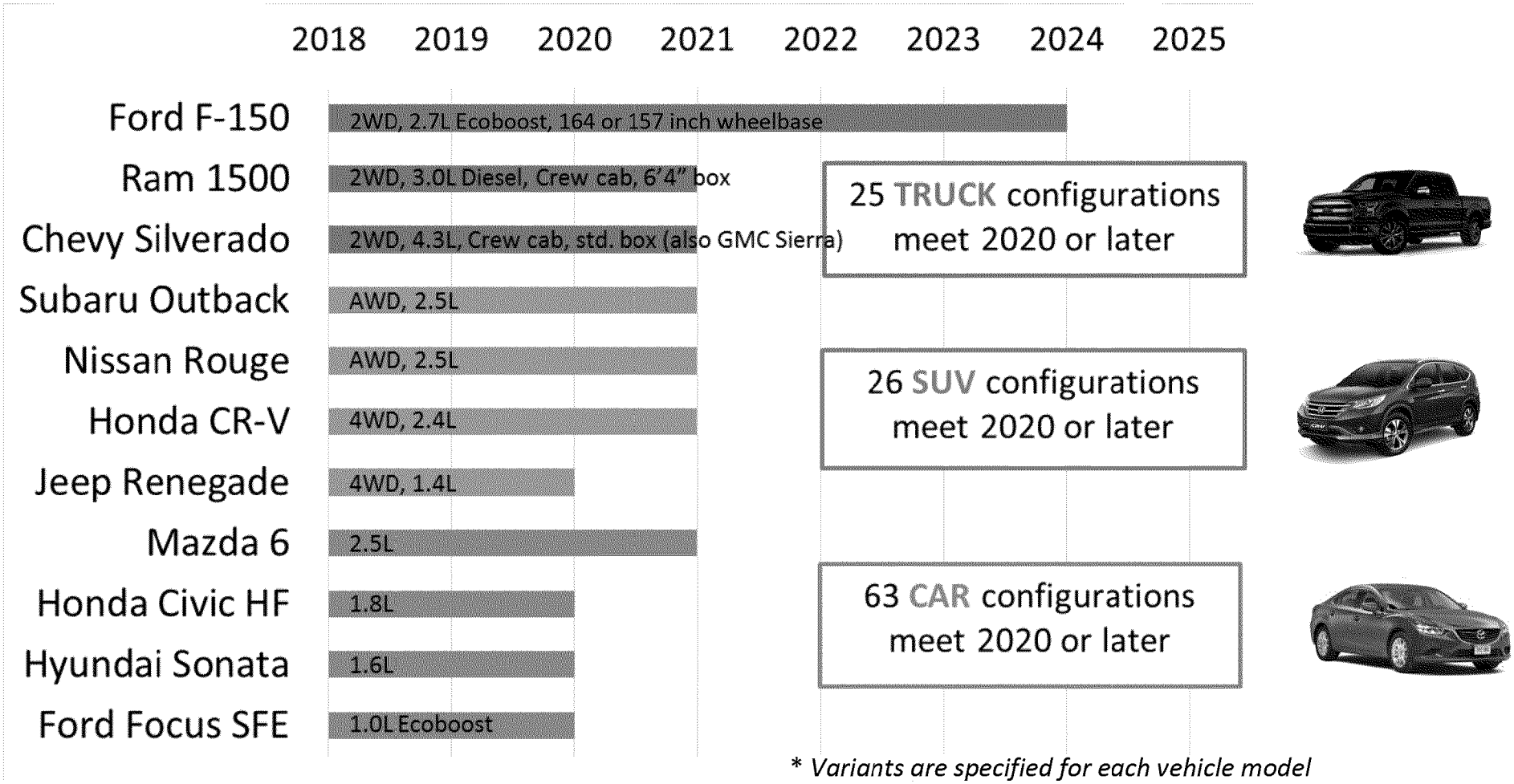
Going forward

- Extensive stakeholder outreach
- Data-driven
- Transparent: we'll share results of technical work along the way

www.epa.gov/otaq/climate/mte.htm

Appendix

Many of today's top-selling vehicles* already meet** future standards (with variant details)



** Variants are specified for each vehicle model*
***Assumes addition of air conditioning credits phasing in per EPA rule projections, up to 18.8 g/mi for cars and 24.4 g/mi for trucks in 2021-2025*

EPA FOIA 2017-003707

National Center for Advanced Technology Mid-Term Evaluation Projects

briefing for:

Center for Automotive Research

June 18, 2015

TATD/National Center for Advanced Technology
Office of Transportation and Air Quality

ED_001162_00012174-00001

Topics

1. **Overview of EPA Lab**
2. **Lab Activities Supporting Midterm Evaluation**
   a) **Modeling:** Initial ALPHA results of a "best-in-class composite simulation" for various vehicle classes
   b) **Engine Benchmarking:** Progress on downsized-boosted and naturally-aspirated engine benchmarking and demonstration programs
   c) **Vehicle Benchmarking:** Status of our assessment of 8-speed automatic and CVT transmissions
3. **Lab Tour**

EPA's Advanced Technology Testing

EPA's National Vehicle and Fuel Emissions Laboratory – Part of EPA's Office of Transportation and Air Quality in Ann Arbor, MI

NVFEL is a state of the art test facility that provides a wide array of dynamometer and analytical testing and engineering services for EPA's motor vehicle, heavy-duty engine, and nonroad engine programs which:

- Certify that vehicles and engines meet federal emissions and fuel economy standards
- Test in-use vehicles and engines to assure continued compliance and process required enforcement actions
- Analyze fuels, fuel additives, and exhaust compounds
- Develop future emission and fuel economy regulations
- Develop laboratory test procedures
- **Research future advanced engine and drivetrain technologies** (involving 20+ engineers – modeling, advanced technology testing and demonstrations)

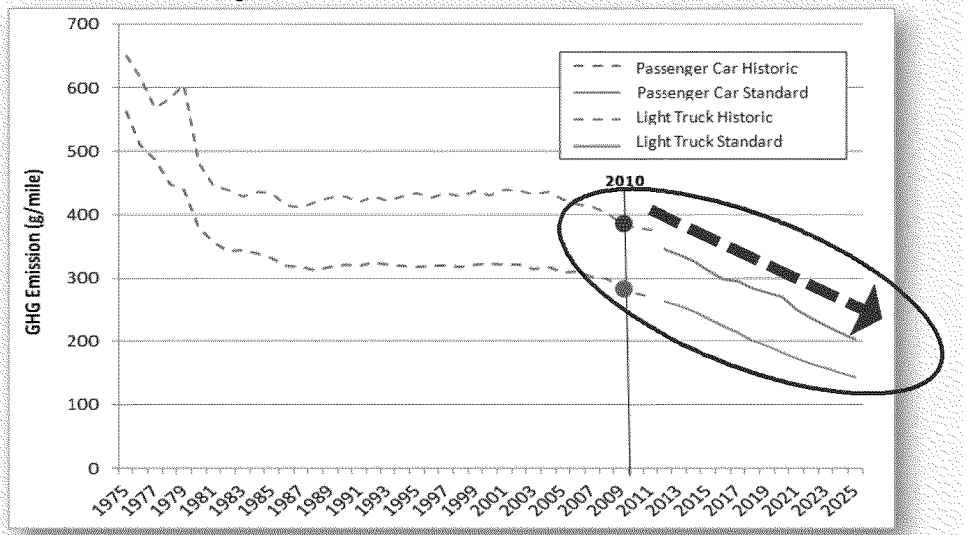
National Center for Advanced Technology (NCAT)

NVFEL is proud to be an ISO certified and ISO accredited lab -- ISO 14001:2004 and ISO 17025:2005.

Light-Duty Vehicle GHG Rule

- ✓ Joint EPA/NHTSA National Program
- ✓ Rules covers MY 2012-2016 and MY 2017-2025
- ✓ GHG standards projected to lead to a new fleet average of 143 g/mi CO_2 for cars, 203 g/mi CO_2 for trucks in 2025
- ✓ The 54.5 mpg target in the rule corresponds to a label value around 40 mpg
- ✓ Additional reductions come from other sources such as air conditioning technology
- ✓ Legally requires **mid-term evaluation** of 2022-2025 standards

Unadjusted GHG Emissions, 1975-2025



- *Historic values from 2012 EPA Trends Report*
- *Future projections from EPA GHG rules for MY 2012-2016 and MY 2017-2025*
- *No adjustments for emission credits*

Lab Work Needed for the Mid-Term Evaluation

What is needed for the MTE?

- EPA needs a rigorous and robust analysis of LD GHG technology.
- The Ricardo data used in the 2025 rulemaking was good, however, technologies are changing rapidly and new data is available to inform the MTE.
- EPA needs a testing and modeling capability to estimate effectiveness of current and future technology.

What is NCAT doing?

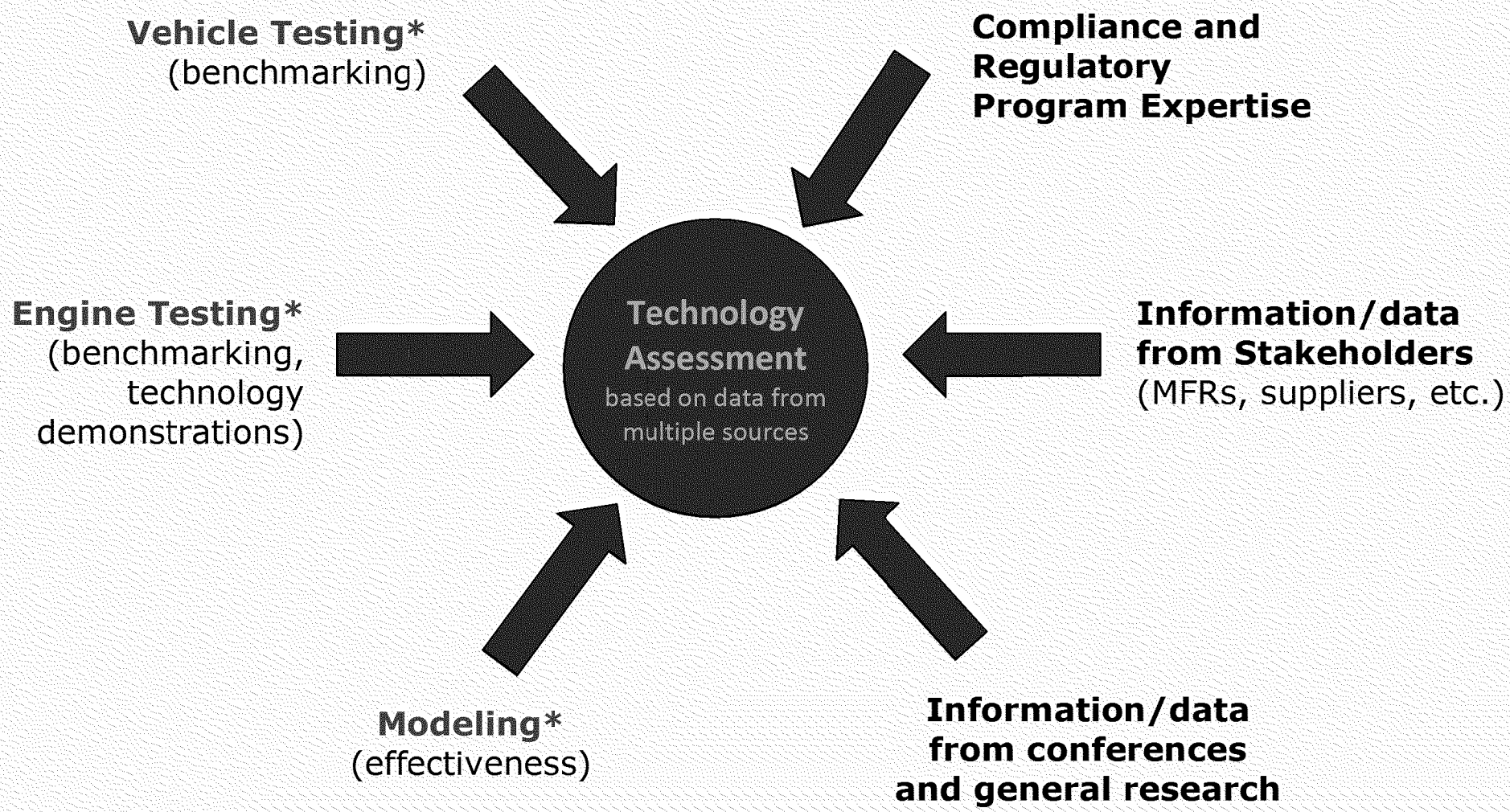
- Benchmarking new vehicle and engine technologies
- Demonstrating the potential of future engine technologies
- Providing a robust validated ALPHA model to setup the next version of LPM/Omega and to provide a stronger basis for future rulemakings
  - The heavy-duty vehicle GEM model is sibling of the ALPHA model.
- Relying on the Ricardo inputs and outputs where appropriate, and will revise it and add new data for new technologies not included in the original rulemaking analysis
- Gathering and using data from OEMs, suppliers, and national labs

ALPHA – **A**dvanced **L**ight-Duty **P**owertrain and **H**ybrid **A**nalysis Model

OMEGA – Optimization Model for reducing Emissions of Greenhouse gases from Automobiles

Unique Access to Important Sources of Information for Technology

Information Sources



**NCAT has lead*

Tools to Model Future Fleet

"**O**ptimization **M**odel for reducing **E**missions of **G**reenhouse gases from **A**utomobiles"

Lots of DATA!

Component Data
- ✓ engine
- ✓ transmission
- ✓ electrical components
- ✓ chassis, etc.

Vehicle Data
- ✓ steady-states
- ✓ transient cycles

OMEGA is used to evaluate a future fleet's potential compliance path with LD GHG standards

- ✓ Feasibility analysis of how a fleet might utilize these technologies to comply with LD standards, not a market prediction
  - Manufacturer's engineering, marketing, or other considerations may lead them to a different path
  - Model assumes that technology availability and cost is equivalent across manufacturers
- ✓ Detailed fleet baseline on relevant technologies for ~1300 current models in the light duty fleet (modeled as ~250 vehicle platforms)
- ✓ Future vehicle sales are based on Economic projections from DOE/EIA, and Industry forecasts from JD Powers and CSM (Now IHS)

ALPHA Model

Assesses Combinations of Light-Duty Technologies

- ✓ Quantifies effectiveness of a technology or groups of technologies
- ✓ Helps assess feasibility of light-duty standards

ALPHA – **A**dvanced **L**ight-Duty **P**owertrain and **H**ybrid **A**nalysis Model

OMEGA Model

Assesses Potential Compliance Path with New LD GHG Rules

- ✓ Determines cost efficient path(s) of adding technology to vehicles in order to achieve regulatory compliance
- ✓ Quantifies economic and environmental impacts of technology changes/improvements in vehicle fleets
- ✓ Requires many scenarios of future vehicle technologies and their effectiveness (among many other model inputs) on reducing GHG emissions

Where is Our ALPHA Modeling Now?

- NCAT has tested enough new engine and vehicle technologies to begin using ALPHA to generate effectiveness data for future vehicles to compare with other sources of effectiveness data for the June 2016 Technical Assessment Report (TAR).
- We are building an ALPHA vehicle simulation to combine the **best-in-class technologies** for **conventional** standard car and large truck classes – to estimate how far the industry has come so far, and to predict how far they should be able to go in the future.
- We will continue to gather more data on 2016 and 2017 engines and vehicles to strengthen EPA's analysis for the final MTE recommendation.
- Peer review of GEM/ALPHA has already begun
  - GEM been peer reviewed by 4 experts (paid for peer review), and by industry (Ford, Volvo, …)
  - A formal review of ALPHA will be completed before the draft TAR is released

What is a Best-in-Class Composite Analysis?

- Best-in-class (BIC) composite analysis is an ALPHA vehicle simulation that shows the FE improvement progression a by adding the best-in-class of each technology one-by-one.
- The analysis uses ALPHA to perform full vehicle simulations to determine the effectiveness of a technology progression to meet the 2025 LD GHG standard.
- This is similar to the process followed by OMEGA when it determines the most cost effective technologies packages to meet the standard.
- The starting point of the analysis combines BIC engines (like EcoBoost, SkyActive NA) with BIC transmissions (like ZF 8-spd, Jatco CVT?, DCT?), start-stop, and values for mass reduction and aero/rolling resistance assumed in the original federal rulemaking. Other technologies will be added as more complete benchmarking data becomes available.

Sample Composite Simulation – 5 Engines, 4 Transmissions

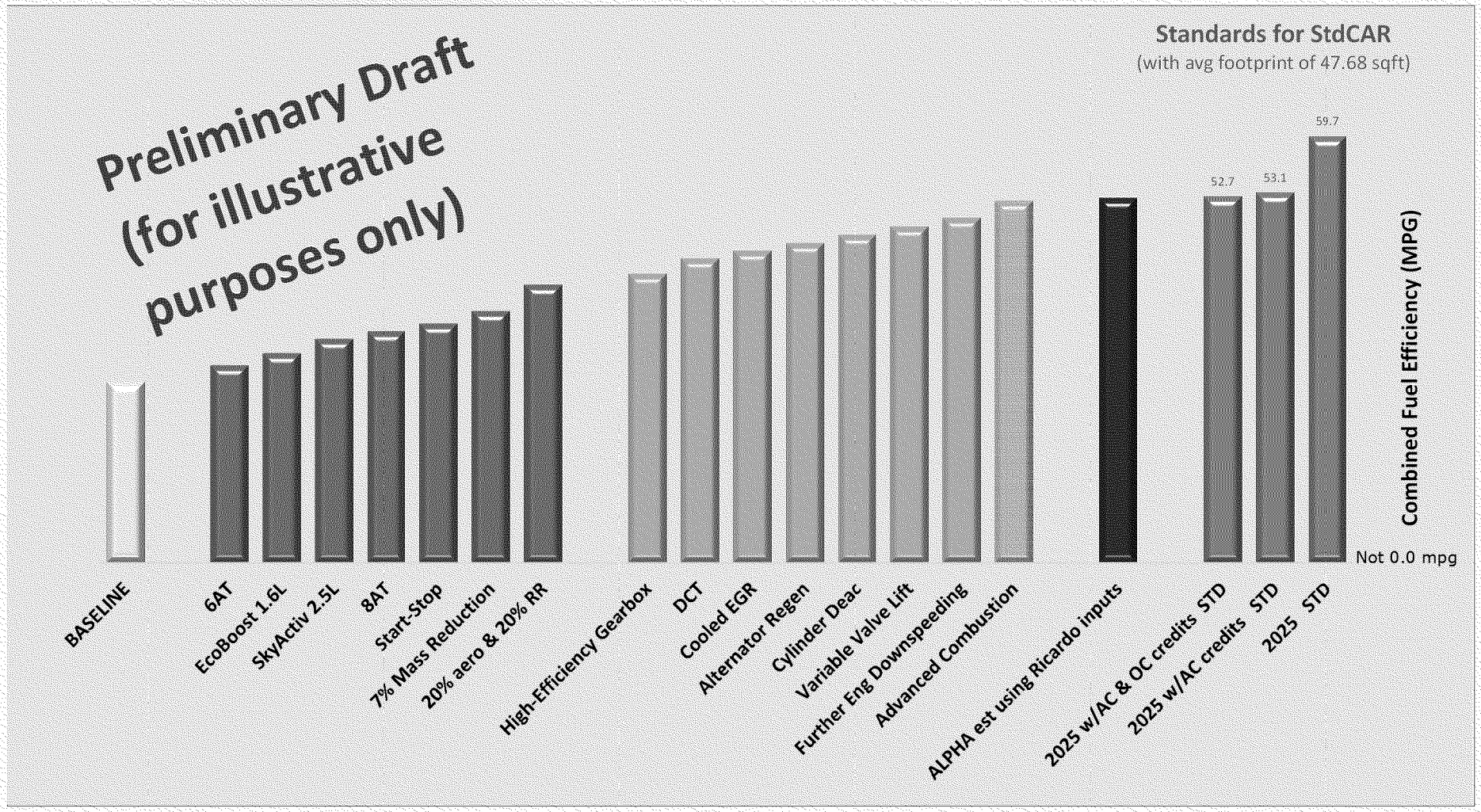
Engines:

- **2009 Toyota Camry 2.4L** – estimate from Ricardo model
  - No transient penalty – assuming it is included in Ricardo map
- **2013 Ford EcoBoost 1.6 L** – EPA map
  - No transient penalty (observed in model validation)
- **2013 GM Ecotec 2.5L** – FEV map
  - Added full transient penalty (observed in model validation)
- **2014 Mazda SkyActiv 2.5L** – EPA map
  - Added ½ transient penalty (pending validation)
- **2020 EGR Boost 27 Bar 1.04L** – estimate from Ricardo model
  - No transient penalty – assuming it is included in Ricardo map

Transmissions:

- **2008 GM4T45 4AT** (estimated efficiency data)
- **2013 GM6T40 6AT** (FEV efficiency map)
- **2013 ZF 8HP45 8AT** (EPA est. of efficiency data, soon will have new map from FEV)
- **2020 Ricardo 8AT -** estimate from Ricardo model

Development of an Analysis Method
"Composite of Technologies"



- The analysis will be used to show cost-effective technology pathways for conventional vehicles to meet the 2025 standard.
- The rulemaking assumed that some HEV/EV technologies would be used to meet standard.

Planned Vehicle Benchmarking

- Currently, there are ~20 vehicle test projects underway.
- The vehicles on the list were chosen based on our need to evaluate key technologies like:
  - advanced naturally aspirated, down-sized boosted and diesel engines
  - advanced automatic, dual-clutch and continuously variable transmissions
  - as well as hybrid technologies
- The vehicle list shown is constantly evolving and subject to change. It is provided here to give a sense of the scope of technology currently being evaluated in our testing program.
- We reassess the vehicle list every 3-6 months. We plan to continue testing even more vehicles and engines over the next 2 years building on the foundation of test data from these vehicles.

vehicle/engine
2013 Malibu Base (6AT, NA)
2013 Escape (1.6l ecoboost, 6AT)
2013 Mercedes E350 (ETEC 7AT)
2013 Malibu Base (6AT, NA)
2012 Focus (1.6l ecoboost, MT)
2014 Dodge Charger (3.6 L, 5AT)
2014 Dodge Charger (3.6 L, 8AT)
2013 Altima SV (2.5 S Jatco CVT8)
2013 Jetta Hybrid (1.4L T, P2, 7DCT)
2013 Chev Malibu Eco (2.4L, 6AT, BAS)
US Mazda 6 (SkyActiv 2.5l, 6MT)
US Mazda 3 (SkyActiv 2.0l, Auto)
Euro Mazda 3 (SkyActiv 2.0l, 14:1)
2014 RAM 1500 HFE
2014 Ram 1500 EcoDiesel (3.0L Dies, 8AT)
2015 Volvo S60 T5 (2.0L Turbo with 8AT)
2014 Chevrolet Silverado (4.3L V6 LV3)
2015 Ford F-150 (2.7L V6 Nano)
2013 Hyundai Sonata (2.0L Turbo, 6AT)
2015 Subaru Forester (2.0L Turbo)

Vehicle and Engine Selection

		N/A Gasoline	Turbo Gasoline	Diesel	Alt & hybrid		
Cars	I3/I4	SkyActiv 2.0L 14:1 [demo engine]	Mahle DI3 [demo engine]			I3/I4	Cars
		2013 Malibu 2.5L* 6AT [eng mapped by FEV]	2013 Escape 1.6L EcoBoost*	VW Jetta 2.0L EA288	2013 Chevy Malibu Eco 2.4L 6AT		
		2013 Mazda 6 SkyActiv 2.5L* 8MT	2013 Focus 1.6L EcoBoost* [Euro]	Chevy Cruze 2.0L	2013 Jetta P2 hybrid 1.4L EA211 7DCT		
		2013 Mazda 3 SkyActiv 2.0L* 13:1 8MT	2015 Volvo S60 2.0L Drive-E*** 8AT	BMW 2.0L B47 (non US)	Accord hyb 2.0L EarthDreams Atkinson		
		2013 Mazda 3 SkyActiv 2.0L* 14:1 [Euro]	2013 Sonata 2.0L 6AT [tested by TC]	Volvo 2.0L Drive-E (non US)	Honda 1.8L Natural Gas		
		2013 Mazda 3 SkyActiv 2.0L 13:1 6AT	2015 Forester 2.0L* *[tested by TC]*	Mazda 2.2L SkyActiv D (non US)			
		2013 Altima SV 2.5L*** Jatco CVT8	PSA 1.6L ** *[tested by SwRI]*				
		2015 Toyota Aygo 1.0L Atkinson (non US)	BMW 2.0L B48 (non US)				
		2015 honda Fit 1.5L EarthDreams new CVT	2015 Acura TLX 2.4L EarthDreams 8AT				
		2016 Mazda SkyActiv 1.5L	2015 Lexus NX 2.0L 8AR-FTS Atkinson 6AT				
			2015 BMW Mini 1.5L (i3) 6AT				
			2015 BMW Mini 2.0L (i4) 6AT				
			2015 Sonata Eco 1.6L (new) 7DCT				
			2015 Euro Golf/Seat 1.4L TSI ACT				
			2015 Ford ? 1.0L or 1.5L EcoBoost				
			2016 Buick Cascade 1.6L (strat chrg)				
			2016/7 Jaguar XE 2.0L (Ingenium)				
	V6	Chrysler 300 3.6L Pentastar 8AT	Mercedes c400 3.0L DELA30 (M276)	2013 Mercedes E350 3.0L*** 7AT		V6	
		Dodge Charger 3.6L Pentastar 5AT					
		Dodge Charger 3.6L Pentastar 8AT					
		2015 Acura 3.5L Earthdreams					
		2015 Porsch 911 GT3-R5 4.xL boxer 13:1					
	V8	2015 Mercedes CLS550 x.xL 9G-tronic	Jaguar XK 5.0L AJ133			V8	
Trucks / SUVs	I4/I5			Ford Transit 3.2L Power Stroke		I4/I5	Trucks / SUVs
				Chevy Colorado 2.8L Duramax			
	V6	2014 RAM HFE 3.6L Pentastar*** 8AT	2015 Alum F150 2.7L EcoBoost*	2014 RAM 1500 3.0L EcoDiesel*** VM 8AT	Highlander 3.5L 2GR-FXE Atkinson	V6	
		2014 Silverado 4.3L Deac* EcoTec3		BMW X5 35d 3.0L* (I6) *[tested by FEV]*			
		2016 Toyota Tacoma 3.5L D-4S Atkinson					
	V8	Chevy Silverado 5.3L EcoTec3		2016 Titan 5.0L Cummins TurboDiesel		V8	

RED some special testing performed on the engine { * tethered engine map; ** non-tethered eng map; ** CAN engine map }

GRAY new vehicles being considered for testing

YELLOW new vehicles not available yet

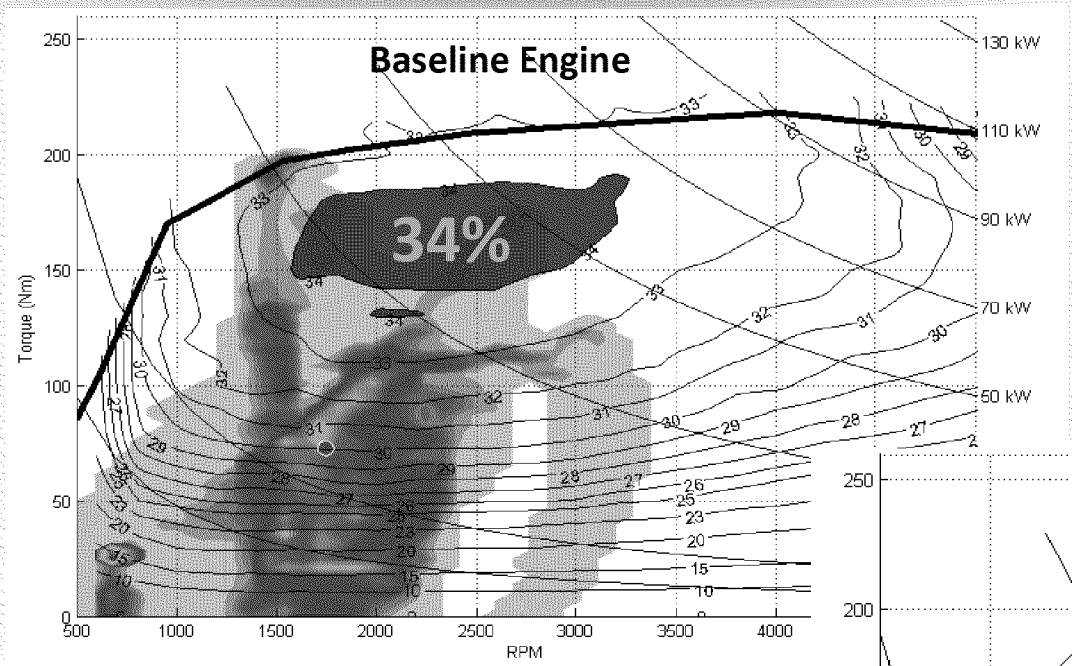
core testing is active
follow-on testing underway
all testing completed
demonstration engine

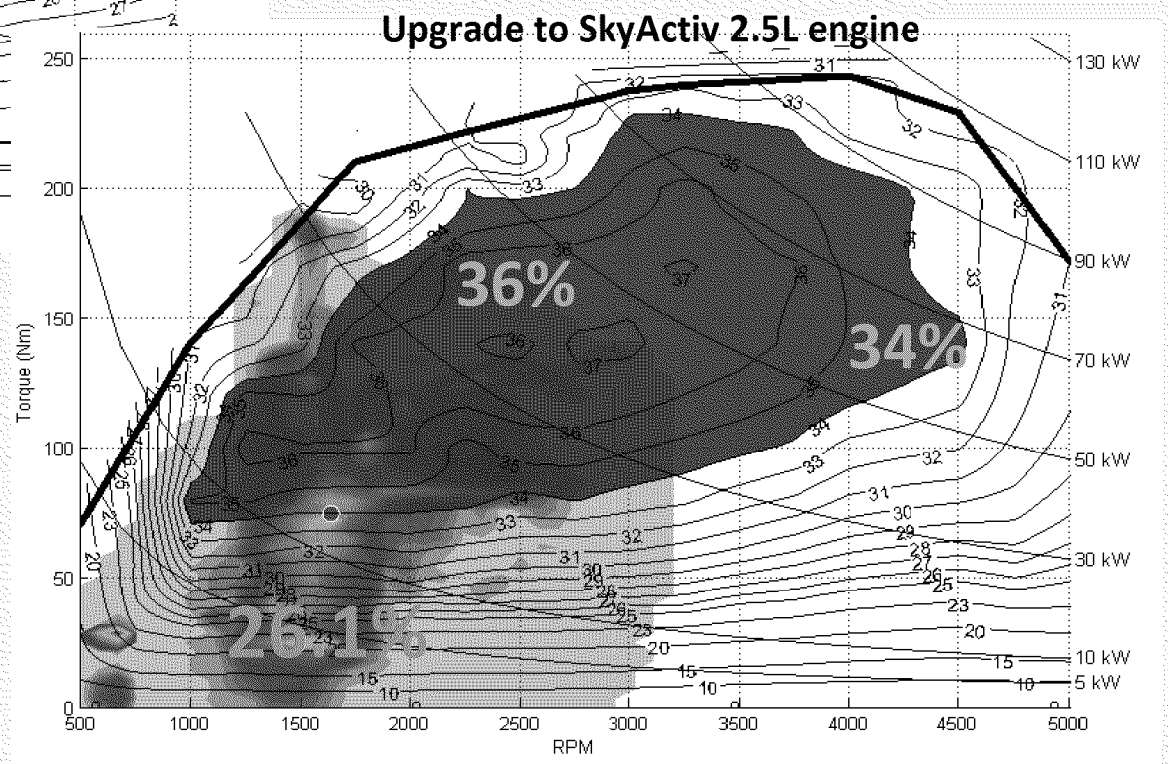
Engines

More Fuel Burned within the Efficiency "Sweet Spot"

ALPHA modeling – UDDS Cycle

37% -PEAK EFFICIENCY Island
26% -energy weighted AVG EFFICIENCY over UDDS





High efficiency islands are getting larger, allowing more operation at higher engine efficiency to obtain better UDDS fuel economy.

Shaded clouds shown on engine maps represent where the fuel would be burned on a **UDDS drive cycle**.
Please note that this case study is for illustrative purposes only.

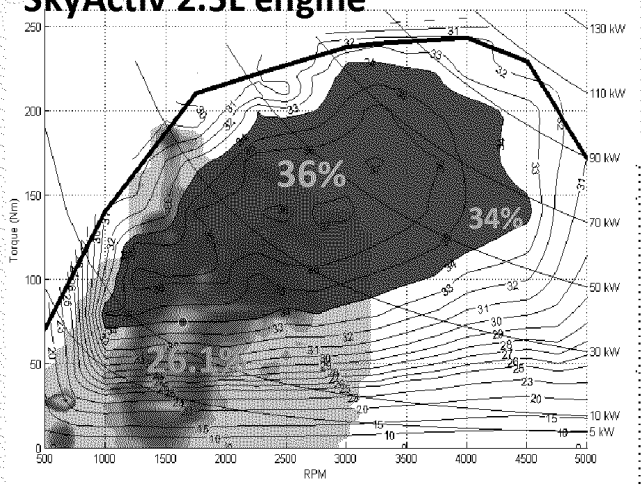
Engines

Upgrading to Future 2020 Ricardo with 8-speed Trans

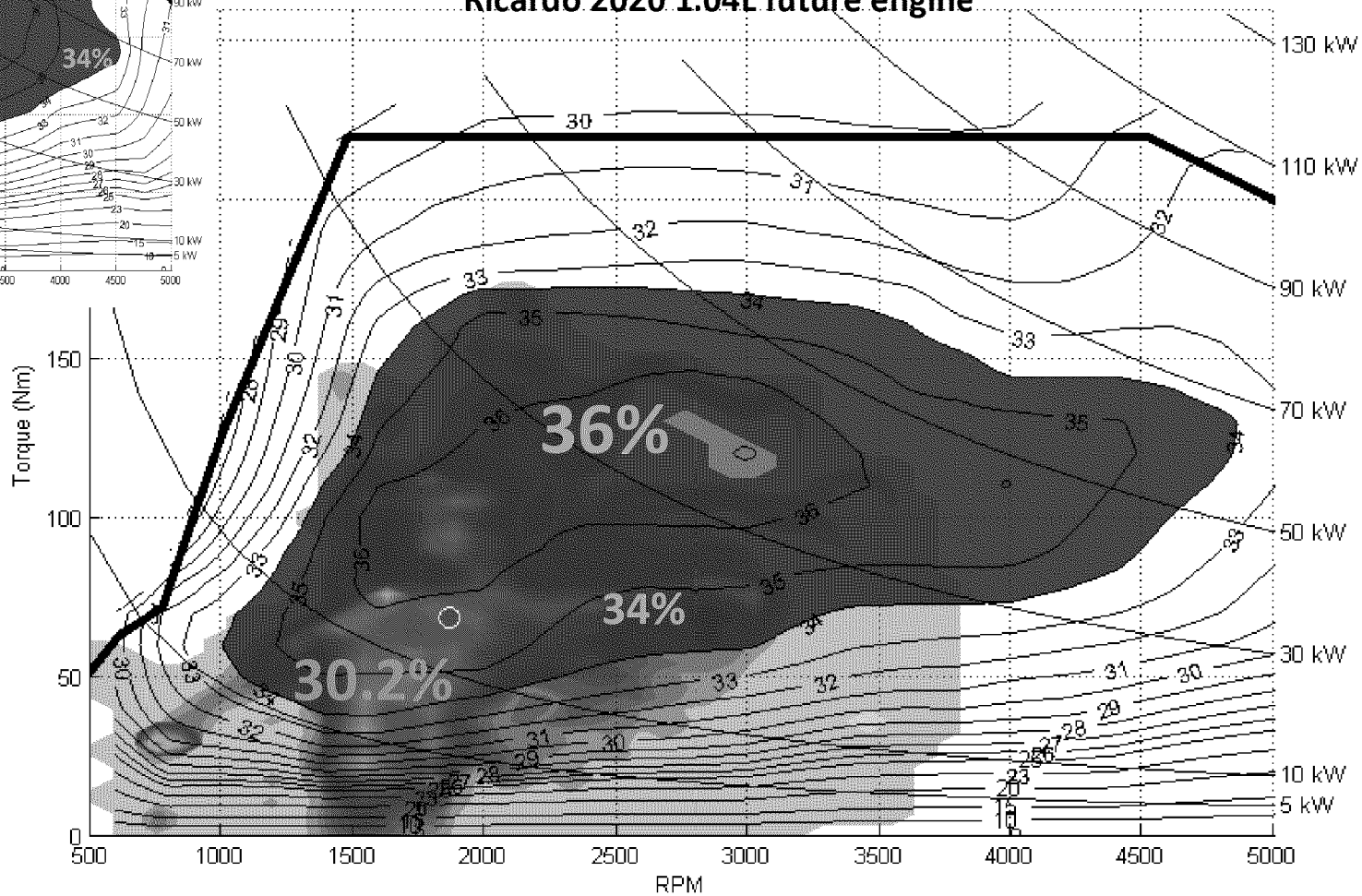
36% -PEAK EFFICIENCY Island
30% -energy weighted AVG EFFICIENCY over UDDS

ALPHA modeling – UDDS Cycle

SkyActiv 2.5L engine



Ricardo 2020 1.04L future engine

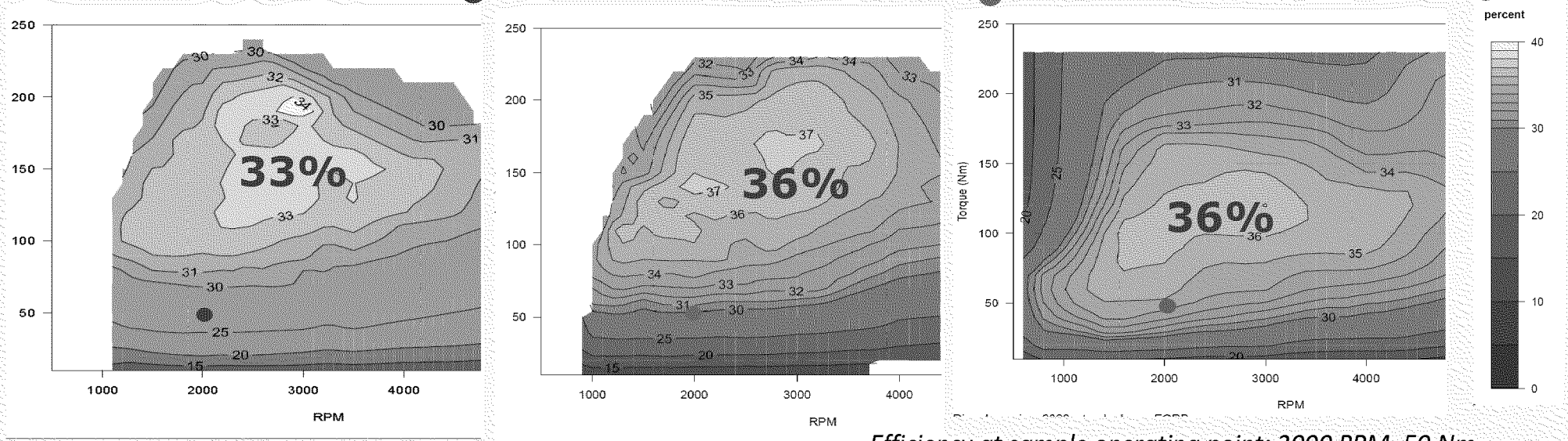


Engines

Comparing Engine Efficiency Maps for a "Standard Car"

- NCAT benchmarking programs are providing extensive data and insight into the remarkable technology innovation taking place in the automotive industry.
- Innovation to optimize efficiencies of the major technologies is nowhere near complete. MFRs are only in the 4th model year of the 14 year LD GHG rules.
- Technology innovation often requires several product cycles to achieve maximum possible effectiveness level for a given powertrain or vehicle technology.
- As just one example, we expect to see continuing advances in both turbo and naturally aspirated engines as more advanced combustion hardware and controls are implemented to meet future model year standards.

EcoBoost 1.6L (2013): **27%** **NA SkyActiv 2.5L** (2014): **29%** **Ricardo** (2020 target): **34.5%**



Efficiency at sample operating point: 2000 RPM, 50 Nm

Likely pathways for developing more efficiency

1) **Increased Compression Ratio** - 14:1 - 18:1 2) **Cooled EGR** - one of the enablers for higher CR 3) **Cylinder deactivation**

Engines

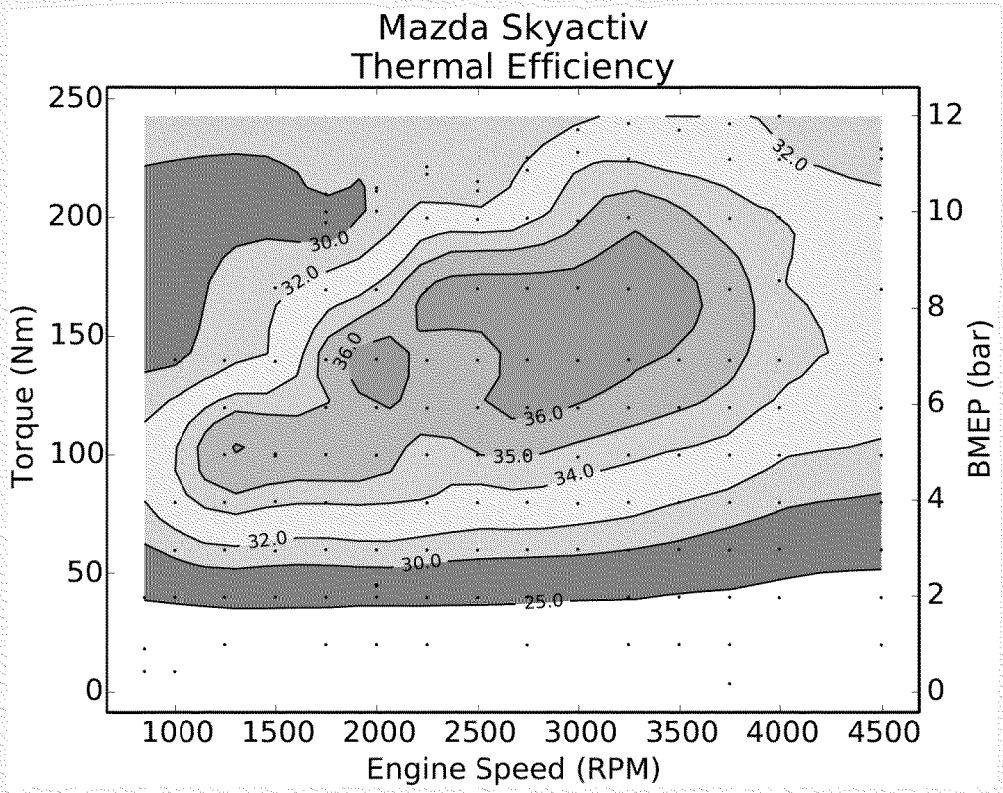
SkyActiv 2.0L versus 2.5L Thermal efficiency

Naturally Aspirated Engines

SkyActiv 2.0L 13:1

Figure deleted: final EPA internal peer review not complete at this time

SkyActiv 2.5L 13:1



Fuel: LEV III (E-10, 88 AKI)

- **We plan to demonstrate the effectiveness of <u>cooled EGR</u> and <u>cylinder deactivation</u> on a Euro SkyActiv 2.0L <u>14:1</u> engine.**
- **Testing is planned to begin in May 2015.**

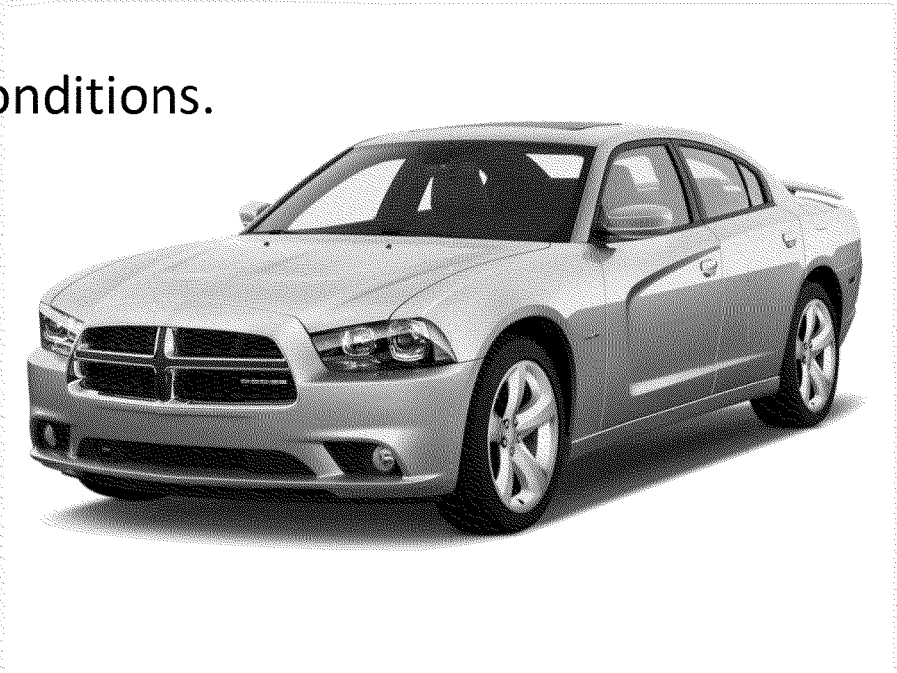
Trans

Test Program…

Test Purpose: To verify expected effectiveness of 8-speed transmissions

Dodge Charger was offered with 5-speed or 8-speed option, but otherwise identical.

Run back-to-back tests under same conditions.



Compare:

- Fuel economy
- Engine operation
- Transmission operation
- Torque converter operation
- Transmission efficiency

The 8-speed transmission is being tested as a stand-alone component at FEV to gather additional details of how the transmission operates.

We also plan to study the fuel economy impact of the increase in vehicle performance related to transmissions.

Trans

Initial CO_2 Difference Between Chargers

Figure deleted: final EPA internal peer review not complete at this time.

- To answer this question one must consider things like:
  - This Charger test data compares an 8AT to a 5AT, not to a 4AT
  - "Performance" of 8AT Charger versus 5AT Charger is NOT "neutral"
  - 8AT Charger has unknown & un-optimized gearbox efficiency

EPA FOIA 2017-003707

Light-Duty Vehicle Greenhouse Gas Standards

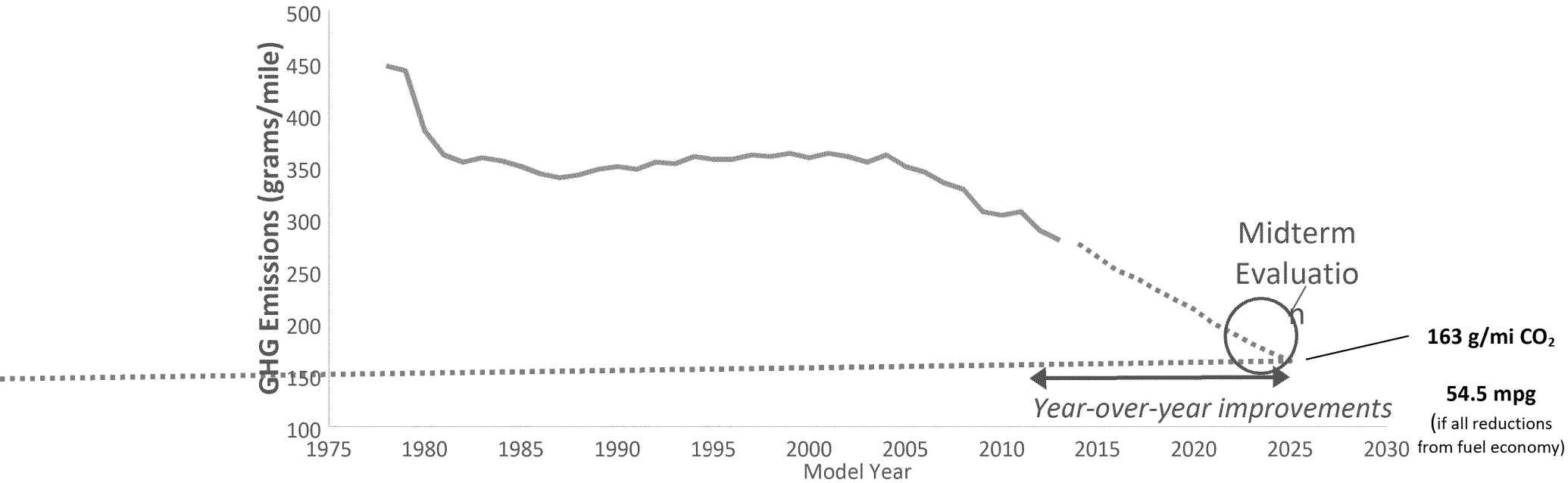
Center for Automotive Research Management Briefing Seminar

August 4, 2015

ED_001162_00012175-00001

EPA FOIA 2017-003707

U.S. GHG/Fuel Economy standards provide significant benefits to climate, oil, consumers



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EPA FOIA 2017-003707

What does the future hold … Empty Shelf or Smorgasbord?

OR

"Yet maintaining the current pace of emissions reductions will be challenging because automakers have exhausted available technologies to reduce emissions, leaving "nothing sitting on the shelf" Alliance of Automobile Manufacturers, Automotive News, March 26, 2015

"We've got a whole smorgasbord or buffet of technology that can be implemented"

Mark Reuss, GM President of North America, Automotive News, February 5, 2011

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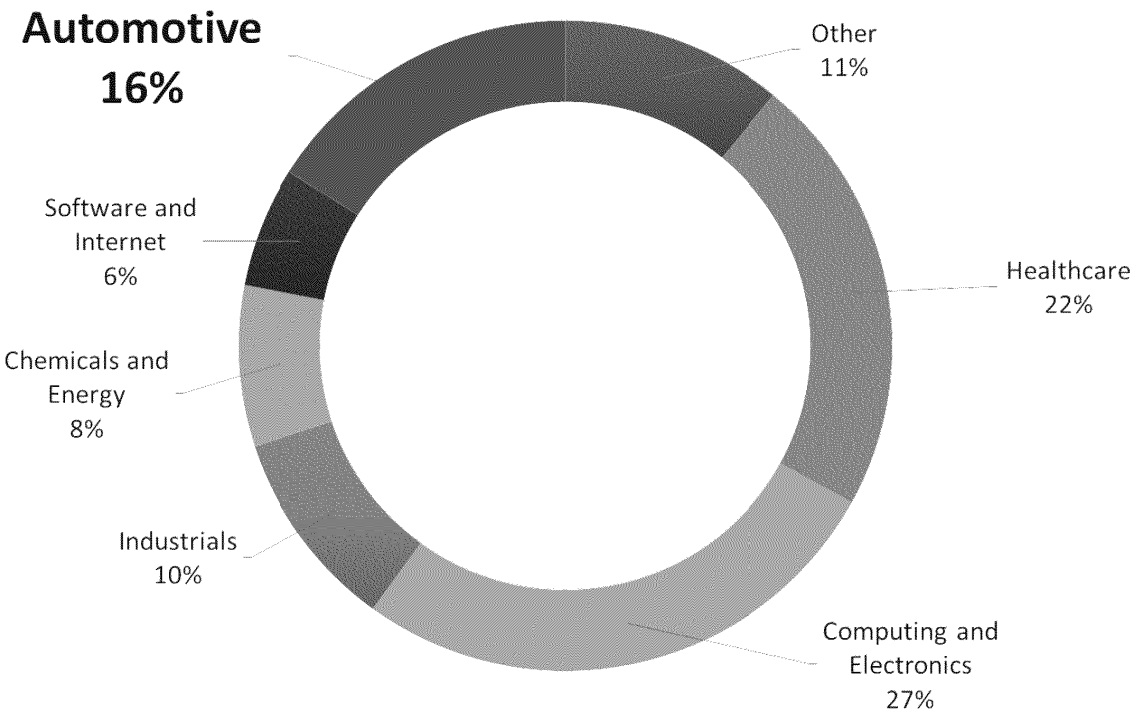
EPA FOIA 2017-003707

Auto industry ranks 3rd largest sector for global R&D investment

Auto R&D Budget
> $100 Billion/year
(>$270 Million/day)



Source: Booz & Co.

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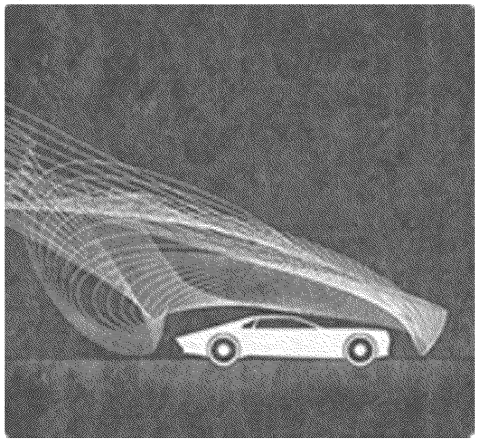
EPA FOIA 2017-003707

BCG report: Fuel economy standards are spurring auto innovation

"Regulatory and marketplace demands with respect to fuel efficiency, connectivity, and safety … may well herald a new golden age of automotive innovation."

"Consumers cite innovation – generally in key areas such as connectivity, safety, and fuel economy – as an important consideration in their purchase decision."

bcg.perspectives
by THE BOSTON CONSULTING GROUP



Accelerating Innovation: New Challenges for Automakers (January 2014)

ED_001162_00012175-00005

Thompson Reuters lists Fuel Economy among the 5 "hottest areas" of automotive innovation

TABLE 1: HOTTEST AREAS OF AUTOMOTIVE INNOVATION

TOPIC AREA	DEFINITION	CATEGORY
Fuel Economy	Also knows as fuel efficiency, or the maximization of the distance traveled on a unit of fuel	Propulsion
Telematics	Global Positioning System technology integrated with computers and mobile communications technology in automotive navigation systems	Navigation
Autonomous Driving	Automobiles that are capable of driving themselves without input from a human passenger	Handling
Driver Assistance	Various systems such as auto braking, lane departure warning, and traffic sign recognition that help the driver become aware of and avoid road hazards	Safety & Security
Heads-Up Displays (HUDs)	Systems for displaying data from a smartphone to the windshield of an automobile so a driver can keep his/her eyes on the road	Entertainment

Table 2—*List of Hot Topic Areas, Definitions, and Corresponding Categories*
Source: *Thomson Innovation & Thomson Reuters Derwent World Patents Index*

"Technology is most certainly playing a key role in developing next generation automobiles that will be more fuel efficient, safer, and fun to drive."

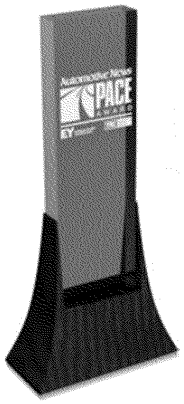
EPA FOIA 2017-003707

Powertrain suppliers have a key role – and opportunity – to lead innovation

Automotive News PACE AWARD

EY Building a better working world

TRC Transportation Research Center Inc.



7th Annual GLOBAL AUTOMOTIVE INNOVATION CHALLENGE

sponsored by SAE, MIT Alliance of MI, and NextEnergy

Half of the 2015 PACE awards (7 of 14) went to supplier innovations to improve fuel economy

> "*A new level of efficiency is being achieved with basic science -- new materials and electronics*"
> J. Ferron, Director of Judging, PACE Awards

Half of the Global Automotive Innovation Challenge awards (6 of 12) were also related to fuel economy technologies

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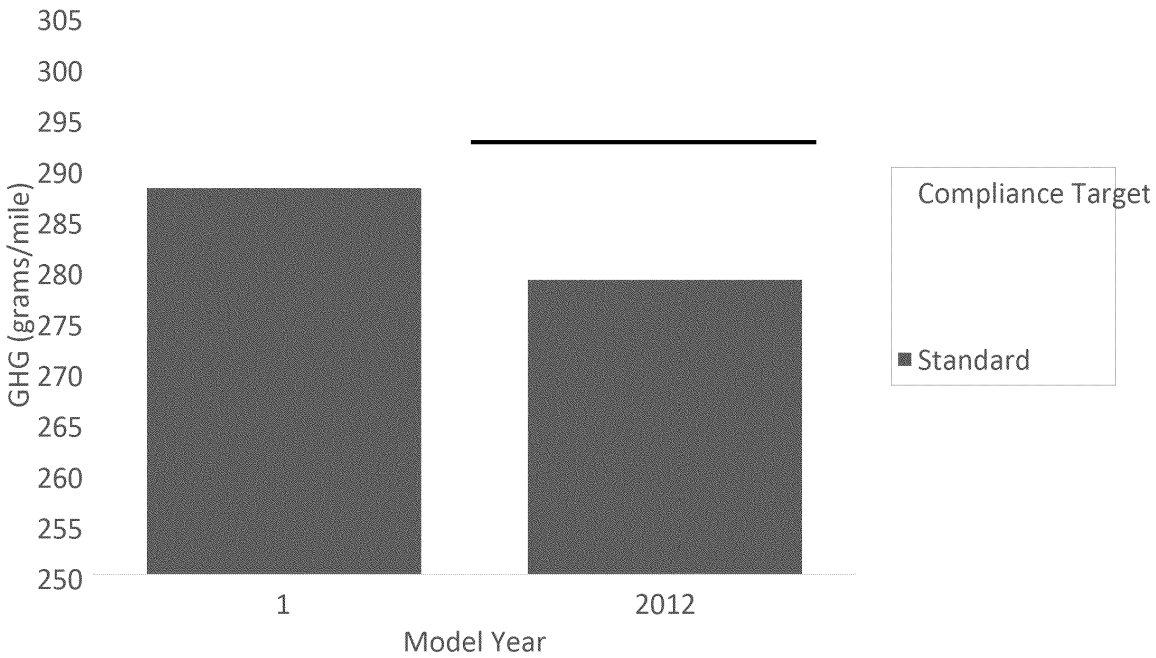
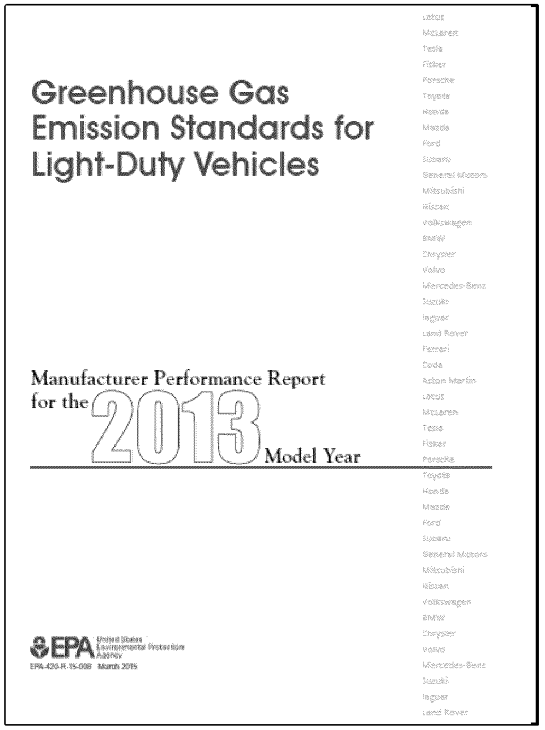
EPA FOIA 2017-003707

GHG Compliance … Good News So Far

Automakers beat standards first two years; widespread use of credit flexibilities




Greenhouse Gas Emission Standards for Light-Duty Vehicles

Manufacturer Performance Report for the 2013 Model Year

EPA United States Environmental Protection Agency

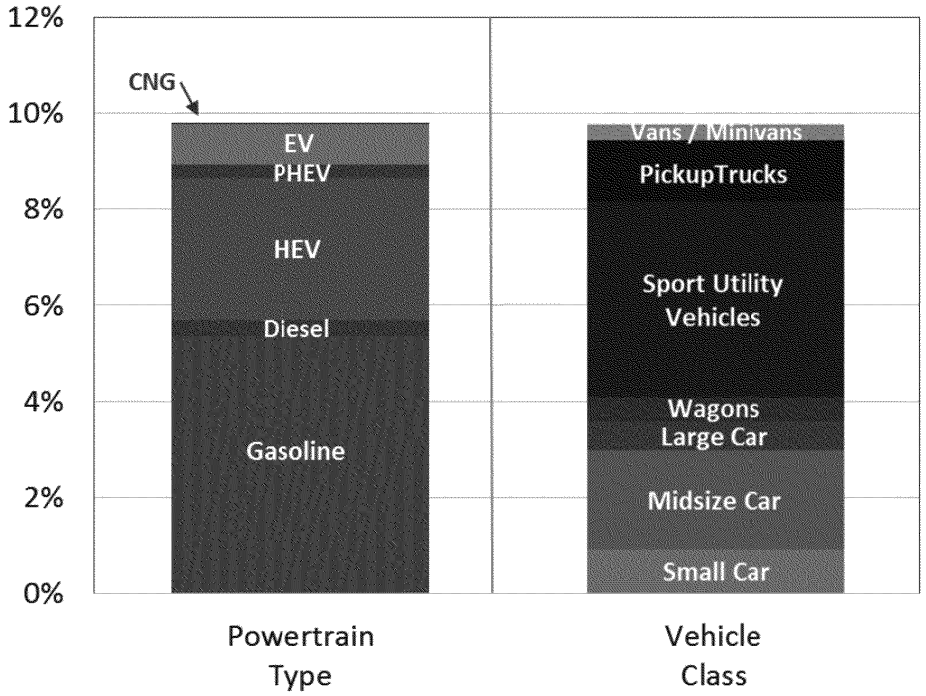
EPA-420-R-15-008 March 2015

ED_001162_00012175-00008

EPA FOIA 2017-003707

Vehicles are meeting future standards with a variety of powertrains – mostly gasoline

MY 2015 Fleet Volume That Meets MY 2020 Standards



More than 1.3 million MY 2015 vehicles are already meeting future standards for MY 2020 or beyond

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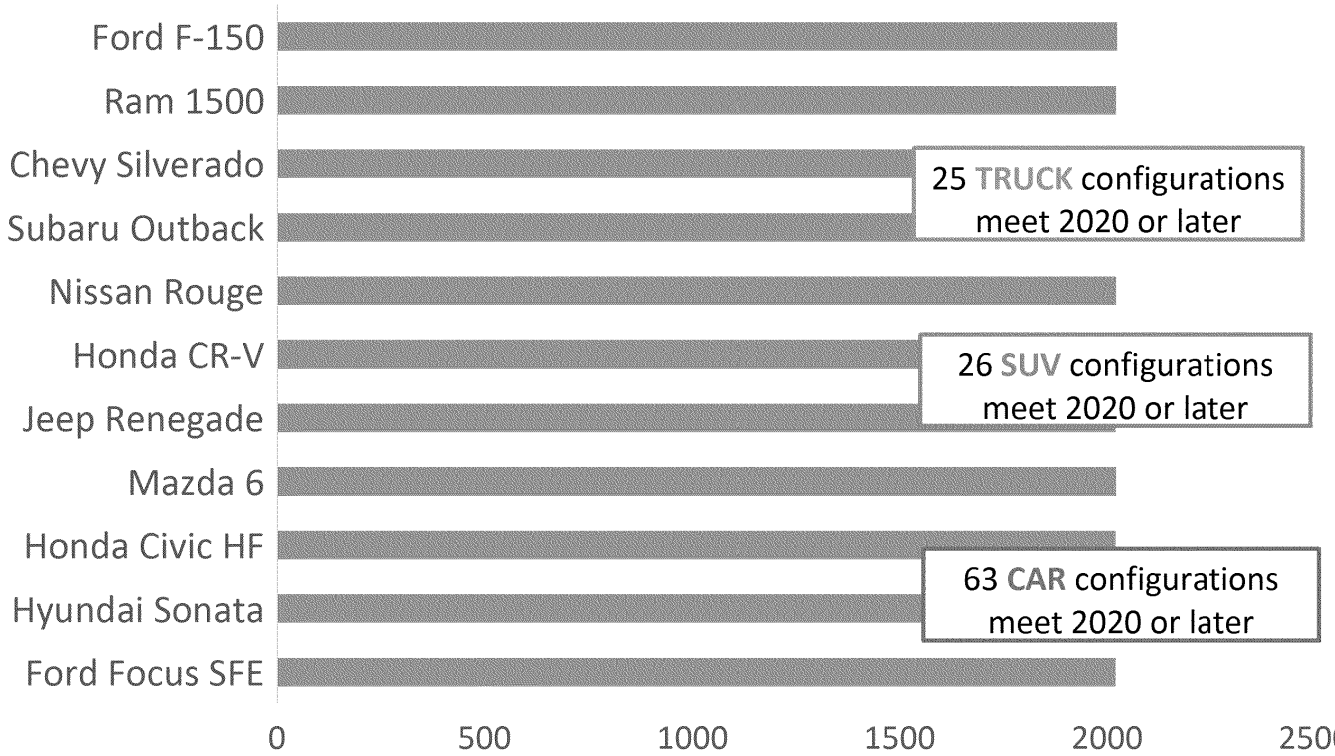
Many of today's top-selling vehicles* can already meet future standards



*At least one variant of vehicle model

Vehicles are meeting future standards with a variety of technologies

		Trucks			SUVs				Cars			
		Ford F-150	Ram 1500	Chevy Silverado	Subaru Outback	Nissan Rouge	Honda CR-V	Jeep Renegade	Mazda 6	Honda Civic HF	Hyundai Sonata	Ford Focus SFE
Engine	Diesel		X									
	Turbocharging	X						X			X	X
	High Compression Atkinson								X			
	GDI	X		X			X		X		X	X
	Cylinder Deactivation			X								
	Stop-start	X										
Transmission	8+ Speed Transmissions		X									
	CVT				X	X	X			X		
Road Loads	Mass Reduction*	X					X		X			
	Tires**		X			X	X		X	X	X	
	Aero**	X	X	X							X	X

*compared to MY2008 curb weight
** Top 25% of class + other active/passive features

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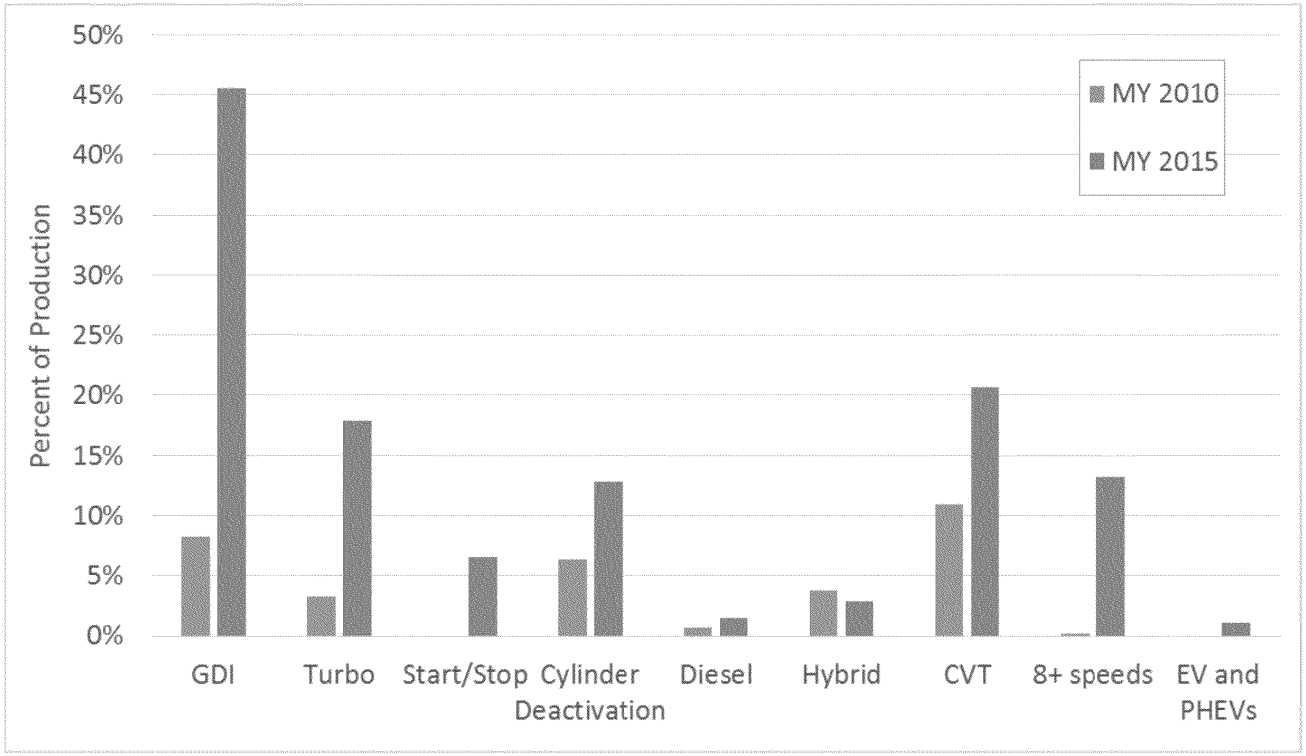
Manufacturers are aggressively adopting technology



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EPA FOIA 2017-003707

NAS Report on Fuel Economy Technologies

The National Academies of SCIENCES · ENGINEERING · MEDICINE

- Comprehensive study – good early input to MTE process
- Affirmed that 2025 standards can be met through advanced gasoline vehicle technologies
- Many recommendations in line with our research plan already underway, others help prioritize

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EPA FOIA 2017-003707

MYTHS

Standards ignore consumer choice	➢ Footprint-based standards designed to preserve consumer choice
Low gasoline prices threaten compliance	➢ Industry is complying as sales are booming ➢ If fleet mix changes, standards adjust
Low HEV/EV/PHEV sales mean 2025 standards can't be met	➢ EPA standards are performance-based – no technology mandate ➢ EPA projected – and NAS reaffirmed – compliance largely from gasoline vehicles

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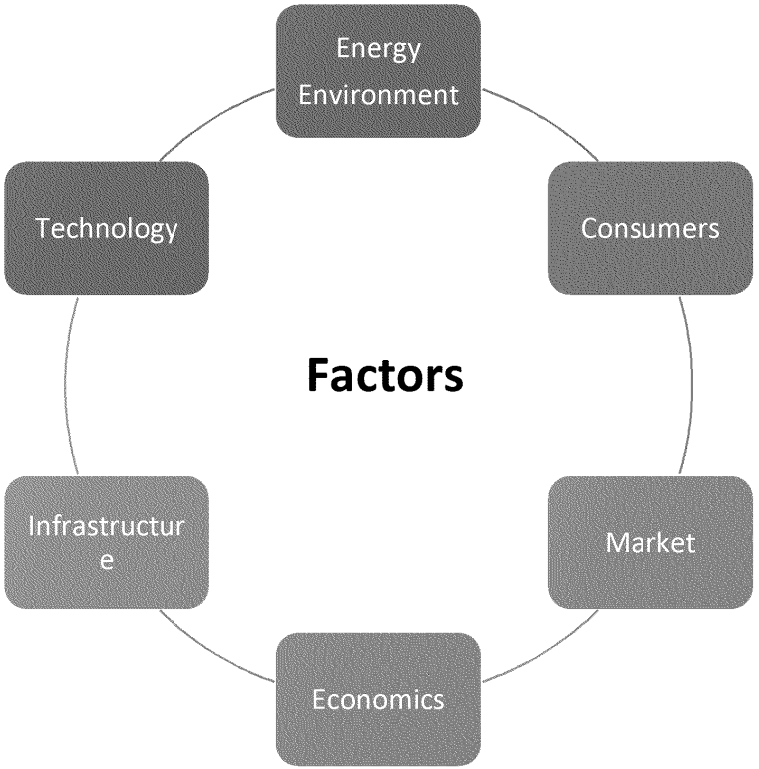
Midterm Evaluation – Overview

- Technical review of longer term standards for 2022-2025
- In coordination with NHTSA and CARB
- EPA's decision could go one of 3 ways:
  - Standards remain same; more stringent; less stringent



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EPA FOIA 2017-003707

Midterm Evaluation – Technology Assessment

- Advanced technology assessment
- Mass reduction feasibility/cost study
- Cost teardowns
- Modeling tools

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EPA FOIA 2017-003707

Midterm Evaluation – Powertrain Benchmarking

- Testing 23 vehicles/engines across a wide range of powertrains and segments
  - Cars, SUVs, pickups
  - Naturally aspirated and boosted engines
  - Gasoline and diesel
  - I4 and V6 engines
  - 6 and 8+ speed AT/DCT transmissions and CVTs

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EPA FOIA 2017-003707

Midterm Evaluation – Market Research

- Vehicle sales
- Fleet mix changes (cars v. trucks)
- Technology penetration in fleet
- Consumer satisfaction surveys
- Automotive reviews

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Automotive Reviewers Like Fuel Economy Technologies

- EPA study finds 4 out of 5 mentions of FE technologies in auto reviews have positive or neutral ratings
- Most positives (80-100%): active aero, mass reduction, cylinder deactivation, LEDs, GDI, turbocharging
- Most negatives (~30%): CVTs and stop-start
- But no universal issues with technologies -- some manufactures implementing better than others

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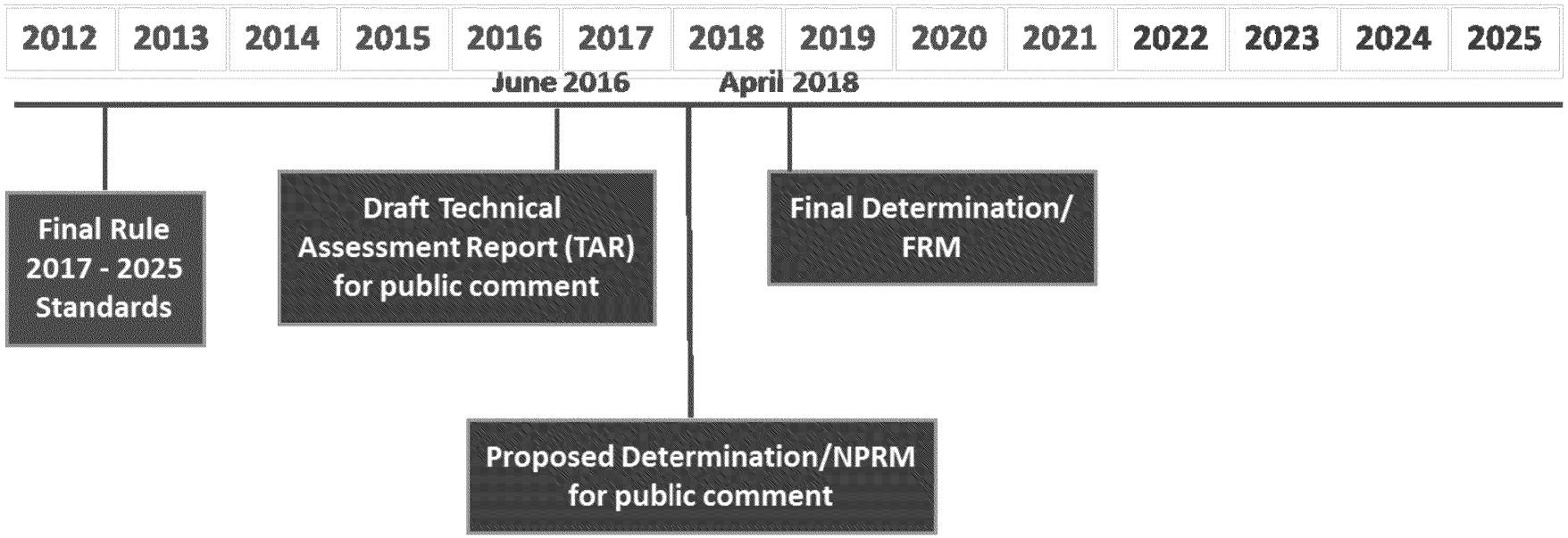
Midterm Evaluation Timeline



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Going forward

- Extensive stakeholder outreach
- Data-driven
- Transparent: we'll share results of technical work along the way

www.epa.gov/otaq/climate/mte.htm

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EPA FOIA 2017-003707

Midterm Evaluation of the 2022-2025 Light-Duty Vehicle Greenhouse Gas Standards

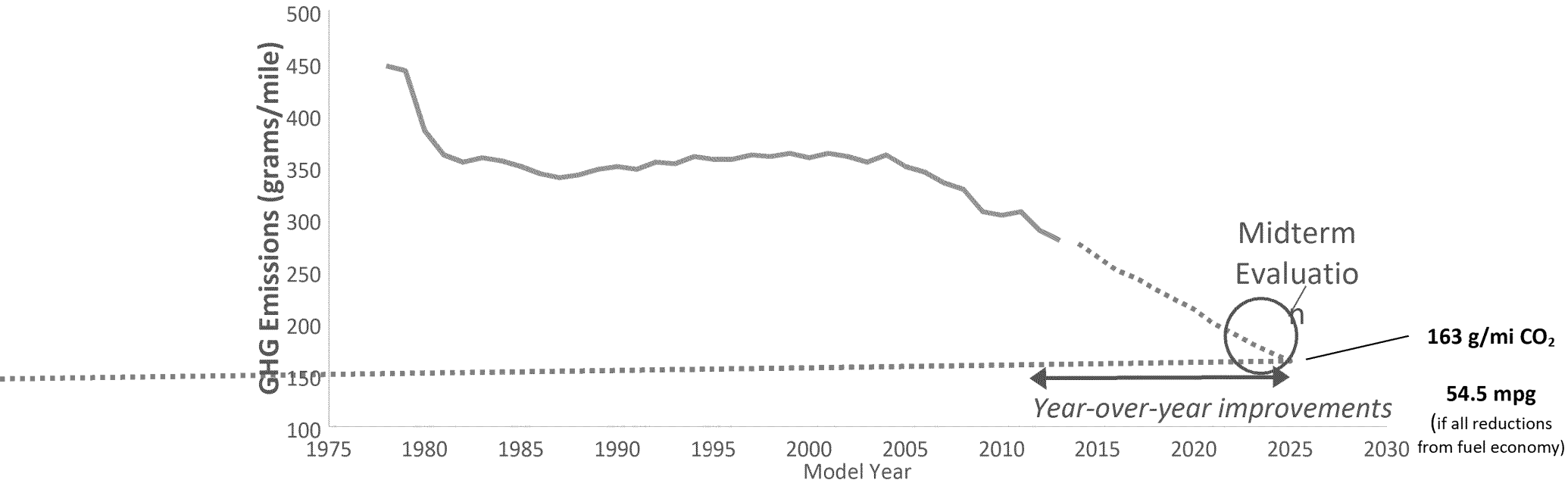
Asilomar Transportation & Energy 2015

August 20, 2015

ED_001162_00012187-00001

EPA FOIA 2017-003707

U.S. GHG/Fuel Economy standards provide significant benefits to climate, oil, consumers



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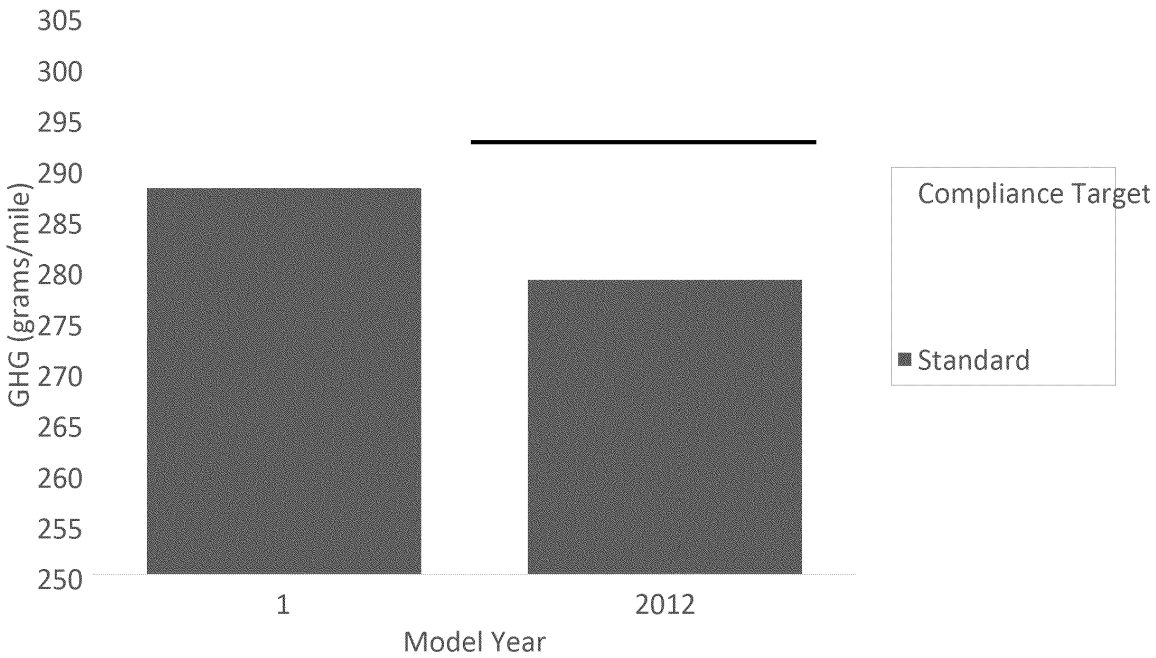

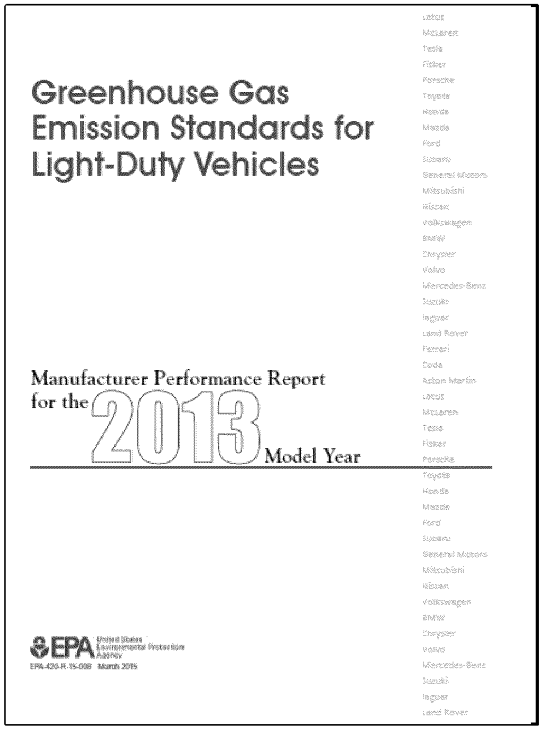
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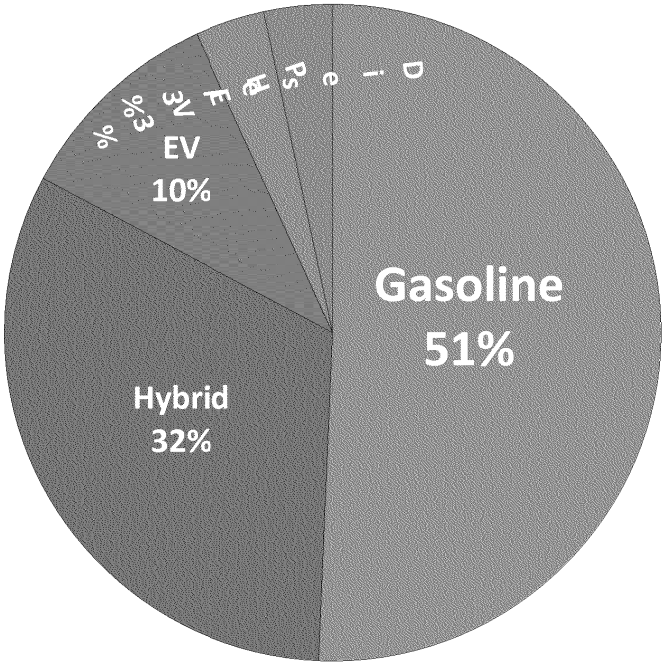
EPA United States Environmental Protection Agency

EPA-420-R-15-008 March 2015

EPA FOIA 2017-003707

Vehicles are meeting future standards with a variety of powertrains – mostly gasoline

Share of Projected Fleet Volume



More than 1.3 million MY 2015 vehicles are already meeting future standards for MY 2020 or beyond

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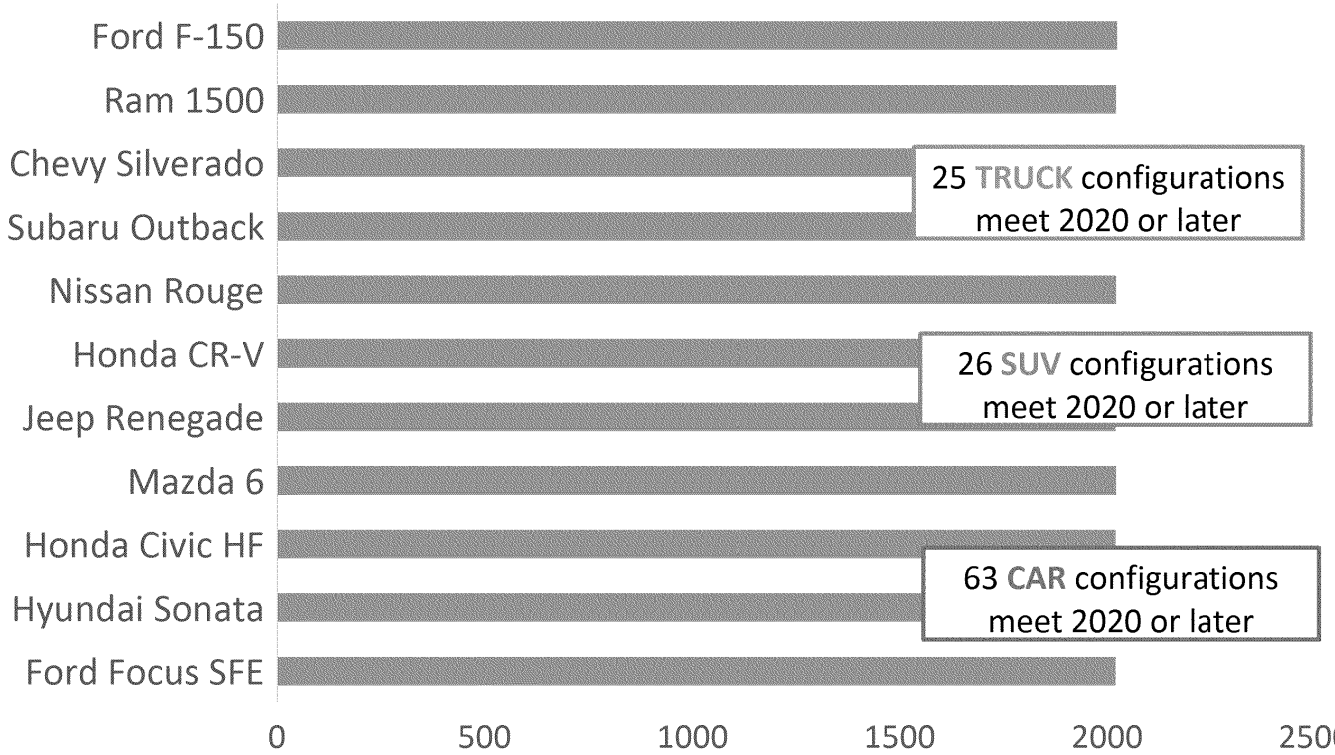
Many of today's top-selling vehicles* can already meet future standards



*At least one variant of vehicle model

EPA FOIA 2017-003707

Vehicles are meeting future standards with a variety of technologies

		Trucks			SUVs				Cars			
		Ford F-150	Ram 1500	Chevy Silverado	Subaru Outback	Nissan Rouge	Honda CR-V	Jeep Renegade	Mazda 6	Honda Civic HF	Hyundai Sonata	Ford Focus SFE
Engine	Diesel		X									
	Turbocharging	X						X			X	X
	High Compression Atkinson								X			
	GDI	X		X			X		X		X	X
	Cylinder Deactivation			X								
	Stop-start	X										
Transmission	8+ Speed Transmissions		X									
	CVT				X	X	X			X		
Road Loads	Mass Reduction*	X					X		X			
	Tires**		X			X	X		X	X	X	
	Aero**	X	X	X							X	X

*compared to MY2008 curb weight
** Top 25% of class + other active/passive features

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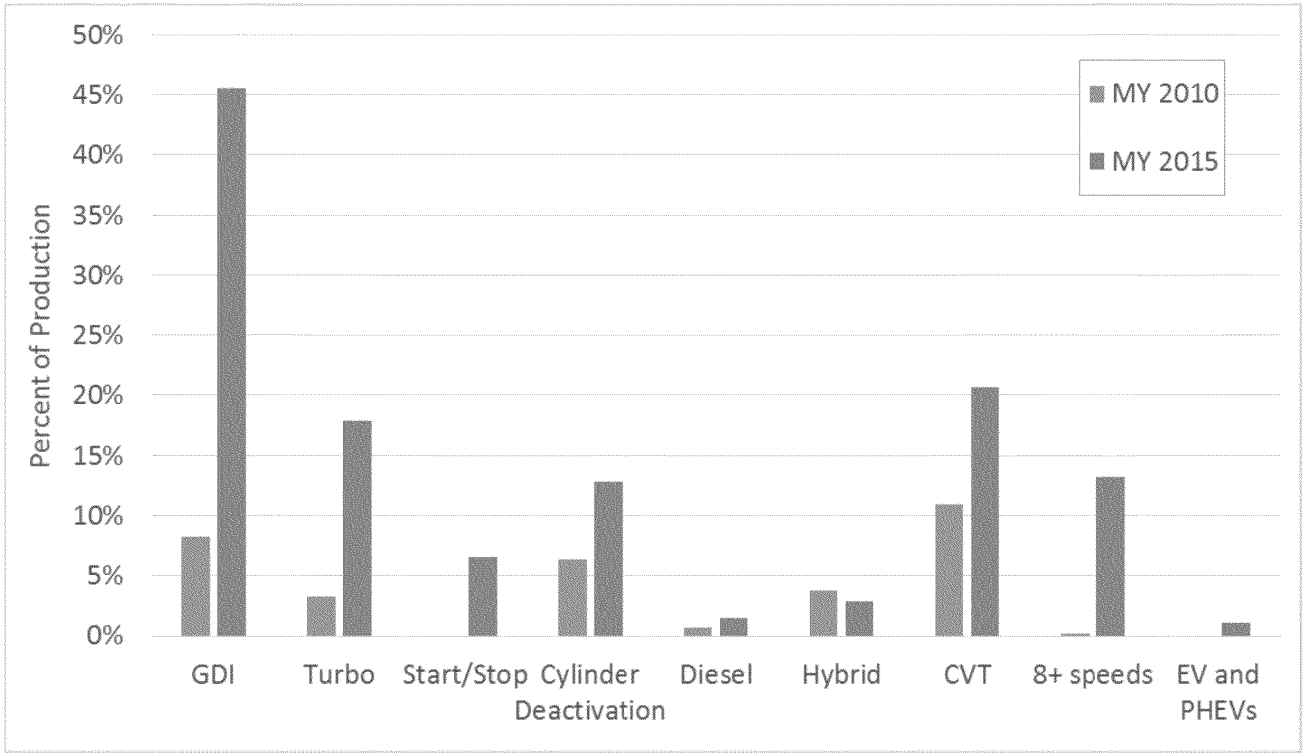
EPA FOIA 2017-003707

Manufacturers are aggressively adopting technology



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- Affirmed that 2025 standards can be met through advanced gasoline vehicle technologies
- Many recommendations in line with our research plan already underway, others help prioritize

ED_001162_00012187-00008

EPA FOIA 2017-003707

MYTHS

Standards ignore consumer choice

- Footprint-based standards designed to accommodate consumer choice
- Larger vehicles/more trucks allow higher GHG/lower FE

Low gasoline prices threaten compliance

- Industry is complying as sales are booming
- If low gas prices spur larger vehicle sales, mfrs' standards adjust accordingly

Low HEV/EV/PHEV sales mean 2025 standards can't be met

- EPA standards are performance-based -- do not mandate specific technologies
- EPA projected – and NAS reaffirmed -- that compliance would focus on gasoline vehicle innovation (we expect ~ 5% strong hybrids and 2% EV/PHEVs in MY 2025—decade from now)

ED_001162_00012187-00009

EPA FOIA 2017-003707

Midterm Evaluation – Overview

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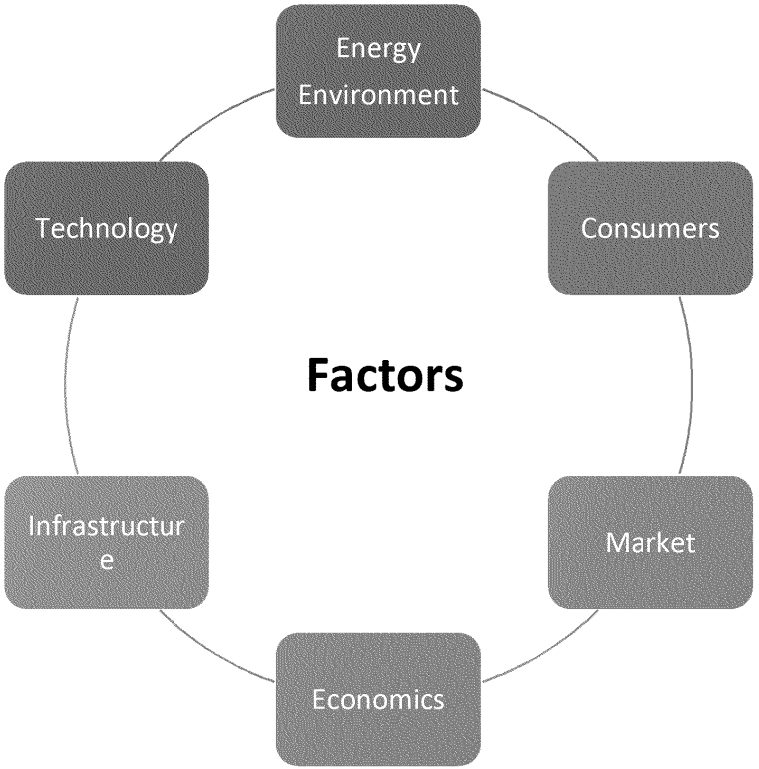

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EPA FOIA 2017-003707

EPA's National Vehicle and Fuel Emissions Laboratory Research Supporting Midterm Evaluation (MTE)

- Researching future advanced engine and transmission technologies to support modeling, advanced technology testing, and demonstrations
- Mass reduction study with FEV for a full-size pickup
- Cost teardowns with FEV on mild hybrid, diesel, turbo-downsized engine, others
- Research on consumer and economic issues

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EPA FOIA 2017-003707

Automotive Reviewers Like Fuel Economy Technologies

- EPA study finds 4 out of 5 mentions of FE technologies in auto reviews have positive or neutral ratings
- Most positives (80-100%): active aero, mass reduction, cylinder deactivation, LEDs, GDI, turbocharging
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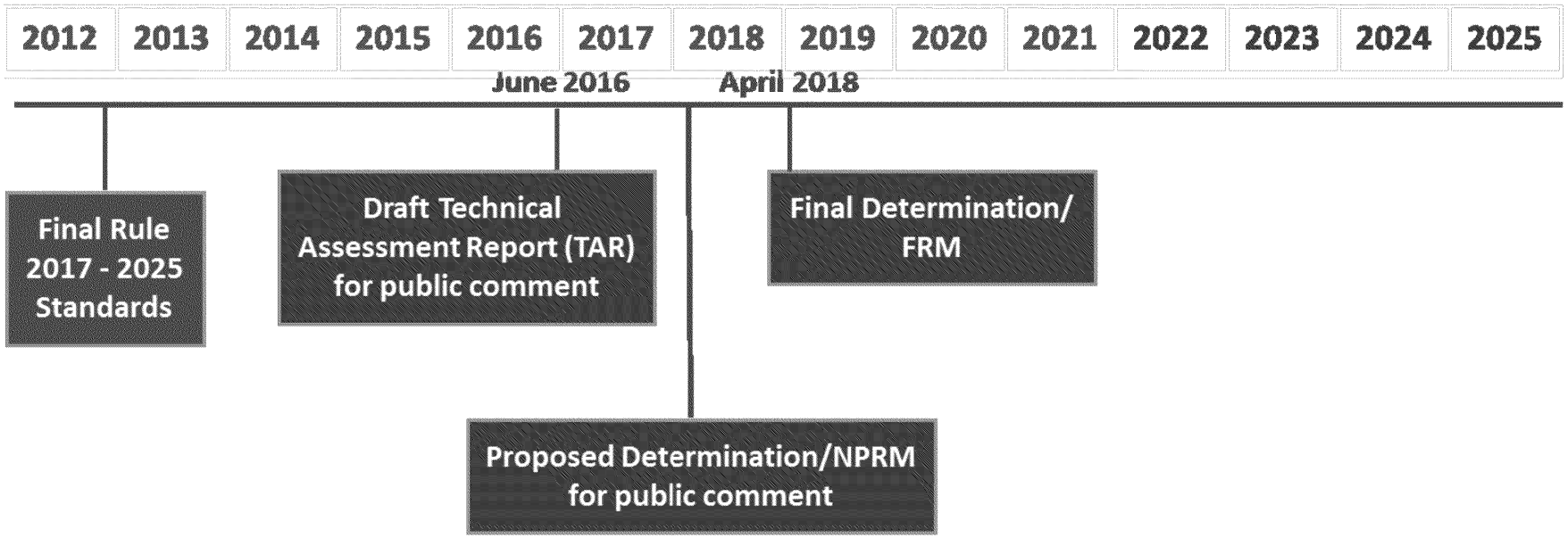
Midterm Evaluation Timeline



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EPA FOIA 2017-003707

Going forward

- Extensive stakeholder outreach
- Data-driven
- Transparent: we'll share results of technical work along the way

www.epa.gov/otaq/climate/mte.htm

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Light-Duty Technology Cost Analysis, Report on Additional Case Studies

Revised Final Report

United States
Environmental Protection
Agency

ED_001162_00012240-00001

EPA FOIA 2017-003707

Light-Duty Technology Cost Analysis, Report on Additional Case Studies

Revised Final Report

Assessment and Standards Division
Office of Transportation and Air Quality
U.S. Environmental Protection Agency

Prepared for EPA by
FEV, Inc.
EPA Contract No. EP-C-07-069
Work Assignment No. 2-3

NOTICE

This technical report does not necessarily represent final EPA decisions or positions. It is intended to present technical analysis of issues using data that are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments.

United States Environmental Protection Agency

EPA-420-R-13-008
April 2013

ED_001162_00012240-00002

EPA FOIA 2017-003707

Report FEV 07-069-203 Rev. D

Light-Duty Technology Cost Analysis - Report on Additional Case Studies

Contract No. EP-C-07-069

Work Assignment 2-3

Prepared for:

Brian Nelson
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Submitted by:

Greg Kolwich
FEV, Inc.
4554 Glenmeade Lane
Auburn Hills, MI 48326

April 12, 2013

ED_001162_00012240-00003

FEV
Engine Technology

Analysis Report FEV 07-069-203 Rev D
April 22, 2013

Updates to "Light-Dutry Vehicle Technology Cost Analysis, Report on Additional Case Studies"

The overall goal of this study was to provide accurate technology assessments through highly detailed and transparent cost analysis methodologies that compare and contrast differences and similarities between these transmission systems. Based on that goal, FEV is hereby issuing an update to the previously released report dated 3/26/10. Minor revisions have been made to some of the electronic hardware and controls to more accurately account for all components as well as including required communication and feedback loops between these components with both high-side and low-side electronic drivers. These updates are described below and are comprised of refinements in cost analysis results obtained as well as detailing the electronic control system differentials between the compared transmissions. This is done in an added table detailing the various solenoids, valves, sensors, wiring and various drivers that differentiate each unit.

- Revision to List of Figures on page iii due to inclusion of new Figure 2-4 in report body.

Electronic Hardware Comparison

- This is done with the addition of a detailed paragraph on page 2-16 and Figure 2-4 on page 2-17 that detail a direct side-by-side comparison of the two transmission variations being studied.

Updates to Previous Text Descriptions and Tables in the Report Body

- Update Table ES-0-1 on page 2 due to the revision of the 6-Speed DCT vs. AT cost differential.
- Revision to text at the top of page 2-16 describing the cost differential to the net incremental direct manufacturing cost.
- Update Figure 2-5 on page 2-18 due to the insertion of electronic controls costs.

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EPA FOIA 2017-003707

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B. System Cost Model Analysis Templates (CMATs)

C. Subsystem Cost Model Analysis Templates (CMATs)

ED_001162_00012240-00006

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Light-Duty Technology Cost Analysis – Report on Additional Case Studies

Executive Summary

The United States Environmental Protection Agency (EPA) contracted with FEV, Inc. to determine the incremental direct manufacturing costs for a set of advanced, light-duty vehicle technologies. The technologies selected are on the leading edge for reducing emissions of greenhouse gases in the future, primarily in the form of tailpipe carbon dioxide (CO_2).

This report, the second in a series of reports, addresses the direct incremental manufacturing cost of four (4) new powertrain configurations, relative to four (4) existing baseline configurations, with comparable driver performance metrics. The complete costing methodology used in the analysis of these configurations, as well as the pilot case study, is described in "Light-Duty Technology Cost Analysis Pilot Study (EPA-420-R-09-020)".

The four (4) new powertrain technology configurations analyzed are:

- 2.0L, I4, 4-valve, dual overhead cam (DOHC), dual variable valve timing (d-VVT), turbocharged, gasoline direct injection (GDI) engine, compared to an equivalent conventional 3.0L, V6, 4-valve, DOHC, d-VVT, naturally aspirated (NA), port fuel injected (PFI) engine.
- 3.5L, V6, 4-valve, dual overhead cam (DOHC), d-VVT, turbocharged, GDI engine, compared to an equivalent conventional 5.4L, V8, 3-valve, single overhead cam (SOHC), VVT, NA, PFI engine.
- A 6-speed automatic transmission, compared to an equivalent 5-speed automatic transmission
- A 6-speed wet dual clutch transmission (DCT), compared to an equivalent 6-speed automatic transmission

The results for the four (4) case studies are shown in Table ES-0-1 along the results previously published for case study #0101.

Table ES-0-1: Increment Unit Cost Impact – Five (5) New Technology Configurations

Case Study Reference	Technology Definition	Vehicle Class	Base Technology	New Technology	Incremental Unit Cost
0101	Downsized Turbocharged Gasoline Direct Injection (Engine)	Compact/ Budget/ Economy Car, Passenger. 2-4	CS# B0101 2.4L, I4, 4-V DOHC, d-VVT NA, PFI,	CS# N0101 1.6L, I4, 4-V DOHC, d-VVT, Turbo, GDI	$531.57
0102	Downsized Turbocharged Gasoline Direct Injection (Engine)	Mid to Large Size Car, Passenger 4-6	CS# B0102 3.0L, V6, 4-V, DOHC, d-VVT, NA, PFI	CS# N0102 2.0L, I4, 4-V, DOHC, d-VVT Turbo, GDI	$68.68
0104	Downsized Turbocharged Gasoline Direct Injection (Engine)	Passenger + Midsize Towing Capabilities Truck & SUV	CS# B0104 5.4L V8, 3-V, SOHC, VVT, NA, PFI	CS# N0104 3.5L V6, 4-V, DOHC, d-VVT Turbo, GDI	$846.26
0902	6-Speed Dual Clutch Transmission Replacing a 6-Speed Automatic Transmission	Mid to Large Size Car, Passenger 4-6	CS# B0801 6-Speed Automatic Transmission	CS# N0801 6-Speed Wet Dual Clutch Transmission	($97.34)
0802	6-Speed replacing a 5-Speed Automatic Transmission	Mid to Large Size Car, Passenger 4-6	CS# B0802 5-Speed Automatic Transmission	CS# N0802 6-Speed Automatic Transmission	($105.53)[1]

[1] The 6-speed automatic transmission evaluated incorporated a Ravigneaux gear set design, a major factor in the reduction of hardware and complexity in the 6-speed design over the 5-speed design. As such the 6-speed transmission was calculated to be less costly to manufacture than the 5-speed automatic transmission.

1 Introduction

1.1 Objectives

The objective of this work assignment was to determine the incremental direct manufacturing costs for four (4) new advanced light-duty vehicle technology configurations using the costing methodology, databases, and supporting worksheets developed in the previously concluded pilot study (Light-Duty Technology Cost Analysis Pilot Study [EPA-420-R-09-020]).

For the downsized, turbocharged, stoichiometric GDI engine case studies, careful consideration was given to the selection of vehicle classes analyzed to ensure that the developed costing models, at any analysis level (component, sub-subsystem, or subsystem) could be interpolated or extrapolated to other classes, configurations and/or content levels.
Table 1-1 exhibits the five (5) vehicle classes considered in this work assignment and identifies those vehicles classes with actual teardown-based cost studies.

Table 1-1: Vehicle Class and Corresponding Downsized, Turbocharged, Stoichiometric, GDI Engine Case Study Evaluated

Vehicle Class	Vehicle Class Description	Completed Analysis
Small Car	subcompact or compact car typically powered by an in-line 4 cylinder engine	Case Study #0101 (2.4L I4 » 1.6L I4) (ß175 hp) (Pilot Study)
Midsize Car	midsize or large passenger car typically powered by a V6 engine	Case Study #0102 (3.0 V6 » 2.0L I4) (ß225 hp)
Large Multipurpose Vehicle	minivan or large cross-over vehicle with a large frontal area, typically powered by a V6 engine, capable of carrying ~ 6 or more passengers	(Large V6»Small V6) Potential to scale costs from #0102 & #0104
Small Truck	small or mid-sized sports-utility or cross-over vehicle, or a small pickup truck, powered by a V6 or V8 engine	Case Study #0104 (5.4L V8 » 3.5L V6) (ß330 hp)
Large Truck	large sports-utility vehicles and large pickup trucks, typically powered by a V8 engine	(Large V8»Small V8) Potential to scale costs from #0104

1.2 Study Methodology

The first report published, "Light-Duty Technology Cost Analysis Pilot Study (EPA-420-R-09-020)", covers in great detail the overall costing methodology used to calculate an incremental cost delta between various technology configurations. In summary, the costing methodology is heavily based on teardowns of both new and baseline technology configurations having similar driver performance metrics. Only components identified as being different, within the selected new and baseline technology configurations, as a result of the new technology adaptation are evaluated for cost. Component costs are calculated using a ground-up costing methodology analogous to that employed in the automotive industry. All incremental costs for the new technology are calculated and presented using transparent cost models consisting of eight (8) core cost elements: material, labor, manufacturing overhead/burden, end item scrap, SG&A (selling general and administrative), profit, ED&T (engineering, design and testing) and packaging. Information on how additional associated manufacturing fixed and variable cost elements (e.g. shipping, tooling, OEM indirect costs) are accounted for within the cost analysis is also discussed in the initial report (EPA-420-R-09-020).

Listed below, with the aid of Figure 1-1, is a high level summary of the ten (10) major steps taken during the cost analysis process. For additional information concerning the terminology used within the ten (10) steps, please reference the glossary of terms found at the end of this report.

Step 1: Using the ***Powertrain-Vehicle Class Summary Matrix (P-VCSM)***, a technology is selected for cost analysis.

Step 2: Existing vehicle models are identified for teardown to provide the basis for detailed incremental cost calculations.

Step 3: Pre-teardown ***Comparison Bills of Materials (CBOM)*** are developed, covering hardware that exists in the new and base technology configurations. These high level CBOM's are informed by the team's understanding of the new and base technologies and serve to identify the major systems and components targeted for teardown.

Step 4: Phase 1 (high level) teardown is conducted for all subsystems identified in Step 3 and the assemblies that comprise them. Using ***Design Profit® software***, all high level processes (e.g. assembly process of the high pressure fuel pump onto the cylinder head assembly) are mapped during the disassembly.

Step 5: A ***cross functional team (CFT)*** reviews all the data generated from the high level teardown and identifies which components and assumptions should be carried forward into the cost analysis. The CBOMs are updated to reflect the CFT input.

Step 6: Phase 2 (component/assembly level) teardowns are initiated, based on the updated CBOM's. Components and assemblies are disassembled, and processes and operations are mapped in full detail. The process mapping generates key process information for the quote worksheets. Several ***databases*** containing critical costing information provide support to the mapping process.

Step 7: ***Manufacturing Assumption and Quote Summary (MAQS) worksheets*** are generated for all parts undergoing the cost analysis. The MAQS details all cost elements making up the final unit costs: material, labor, burden, end item scrap, SG&A, profit, ED&T, and packaging.

Step 8: Parts with high or unexpected cost results are subjected to a ***marketplace cross-check,*** such as comparison with supplier price quotes or wider consultation with company and industry resources (i.e. subject matter experts) beyond the CFT.

Step 9: All costs calculated in the MAQS worksheets are automatically inputted into the ***Subsystem Cost Model Analysis Templates (CMAT)***. The Subsystem CMAT is used to display and roll up all the differential costs associated with a subsystem. All parts in a subsystem that are identified for costing in the CBOM are entered into the Subsystem CMAT. Also both the base and new technology configurations are included in the same CMAT to facilitate differential cost analysis.

Step 10: The final step in the process is creating the ***System CMAT*** which rolls up all the subsystem differential costs to establish a final system unit cost. The System CMAT, similar in function to the subsystem CMAT, is the document used to display and roll-up all the subsystem costs associated within a system as defined by the CBOM. Within the scope of this cost analysis, the System CMAT provides the bottom line incremental unit cost between the base and new technology configurations under evaluation

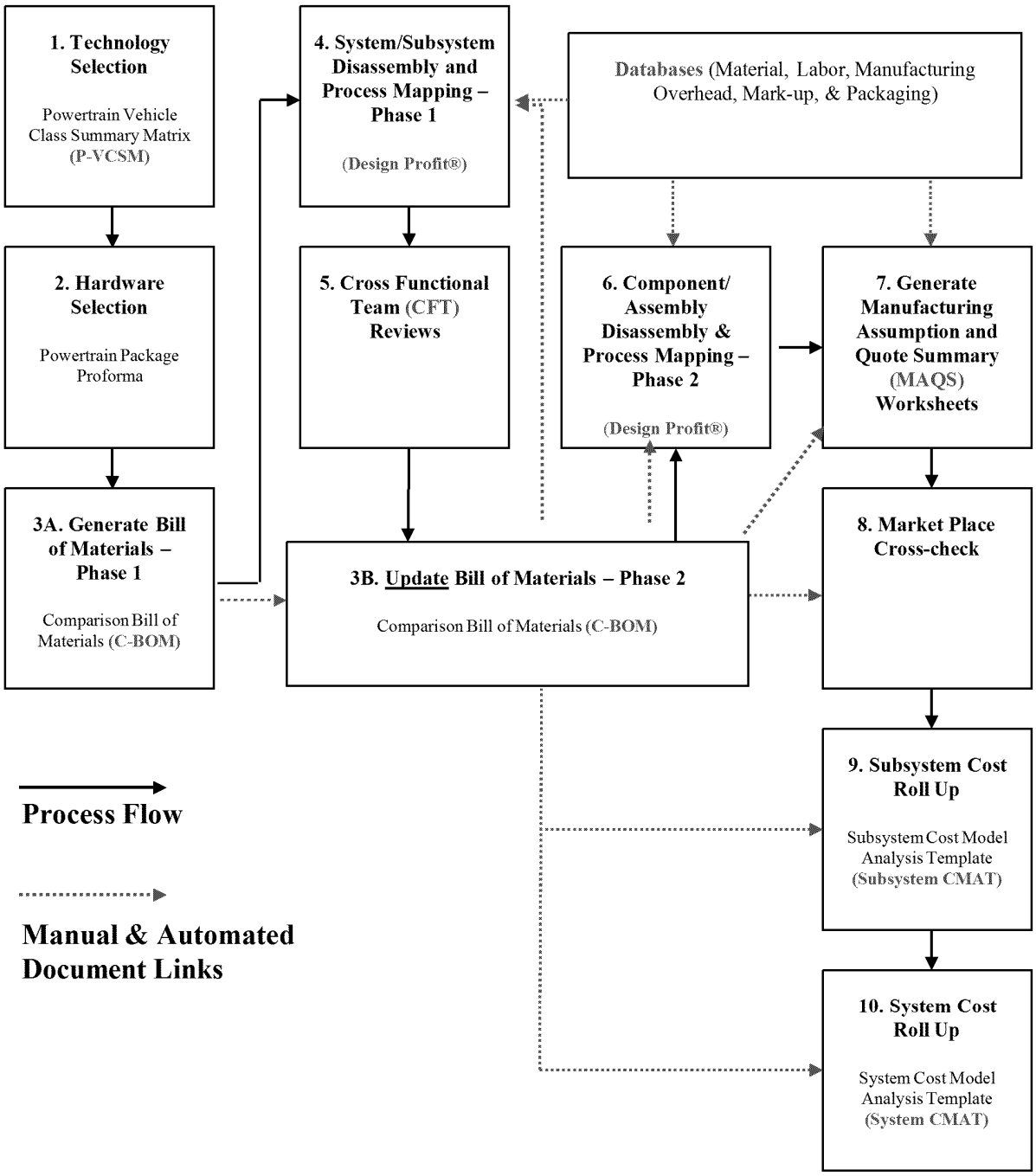

Figure 1-1: Cost Analysis Process Flow Steps and Document Interaction

1.3 Manufacturing Assumptions

When conducting the cost analysis for the various technology configurations, a number of assumptions are made in order to establish a consistent framework for all costing. The manufacturing assumptions can be broken into generic and specific case study assumptions.

The generic manufacturing assumptions apply to all technology configurations under analysis and are carry-over from the pilot study. Listed below are the fundamental assumptions:

1) Manufacturing rates are considered high volume (>450K Units/Year) and maintained throughout the product life. In the four (4) case studies which follow, a yearly capacity planning volume (CPV) of 450,000 units was assumed.

2) All OEM and supplier manufacturing locations are in North America, unless otherwise stated. This serves to make the resulting costs conservative to the extent that OEMs use offshore suppliers to reduce costs.

3) OEMs and suppliers have manufacturing equipment and facilities capable of handling required manufacturing processes and capacities unless otherwise stated.

4) All manufacturing processes and operations are based on standard/mainstream industrial practices.

5) Supplier and OEM manufacturing costs (material costs, labor rates, manufacturing overhead/burden rates) are based on 2008/2009 economics.

6) Supplier mark-up rates (end-item scrap, SG&A, profit, and ED&T) are based on mature technology and manufacturing methods (e.g. mature product designs, high production volumes, significant marketplace competition, and established manufacturing processes) unless otherwise specified.

7) All OEM mark-up will be applied using indirect cost (IC) multipliers. These are not within the scope of this analysis but should be separately determined and applied to the results of this analysis to obtain total (direct + indirect) manufacturing costs.

The specific case study assumptions are those unique to a given technology and hardware configuration. Listed below are some of the case study specific considerations:

1) Manufacturing site for defined operation or process; OEM, Tier 1 or Tier 2/3.

2) Intellectual property expense.

3) Neighboring system costs as a result of new technology adaptation.

4) A new or modified, maintenance and/or end-of-life expense.

5) Availability of significant material cost reductions (MCRs).

6) Performance and/or cost implications of alternative new technology advances (NTAs).

1.4 Subsystem Categorization

As with the first case study analysis, a design based classification system was used to group the various components and assemblies making up the technology configurations. In general, every vehicle system (e.g. engine system, transmission system, etc.) is made up of several subsystems levels (e.g. the engine system includes a crank drive subsystem, cylinder head subsystem, lubrication subsystem, air induction subsystem, etc.), which in-turn, is made up of several sub-subsystem levels (e.g. the air induction subsystem may include the following sub-subsystems: turbocharger, heat exchanger, pipes, hoses, and ducting). The sub-subsystem is the smallest classification level in which all components and assemblies are binned.

Adding new technology to a system will also affect the primary subsystem(s). Also impacted are the neighboring subsystems which require additions and/or modification for successful integration of the new technology into the system. For example, to add a turbocharged air induction subsystem to a naturally aspirated engine, as many as ten (10) additional subsystems may be affected relative to cost, some in the positive direction (added cost), others in the negative direction (cost savings). Table 1-2 and Table 1-3 provide an overview of the major subsystems and sub-subsystems included for each system (e.g. engine and transmission) evaluated within this analysis. In Section 2, Case Study Results, costs are presented for both the engine and transmission evaluations using these design subsystem categorizations.

Table 1-2: Engine System, Subsystem and Sub-Subsystem Classification

Subsystem	Sub-Subsystem
Engine Frames, Mountings & Brackets	Engine Frames, Engine Mountings, Hanging Hardware
Crank Drive	Crankshaft, Flywheels/Flexplates, Connecting Rods, Pistons, Bearing Elements
Counter Balance	Dynamic Parts, Static Parts, Drives
Cylinder Block	Cylinder Block, Crankshaft Bearing Caps, Bedplate, Piston Cooling
Cylinder Head	Cylinder Head, Valve Guides & Seats, Guides for Valvetrain, Camshaft Bearing Housing, Camshaft Sensors, Camshaft Carrier, Cylinder Head Covers.
Valvetrain	Camshaft, Intake Valves, Exhaust Valves, Valve Springs, Spring Retainers & Keepers & Seats,
Timing Drives	Timing Wheels, Tensioners, Guides, Belts, Chains
Accessory Drives	Pulleys, Tensioners, Guides, Belts
Intake	Intake Manifold, Air Filter Box, Air Filters, Throttle Housing Assembly & Supplies, Pipes/Hoses/Ducting
Fuel Induction	Fuel Rails, Fuel Injectors, Pressure Regulators & Sensors, Fuel Injection Pumps, Pipes/Hoses, Brackets
Exhaust	Exhaust Manifold, Collector Pipes, Catalysts, Silencers (Mufflers), Oxygen Sensors, Pipes/Hoses, Brackets
Lubrication	Oil Pans, Oil pumps, Pressure Regulators& Sensors, Oil Filters, Pipes/Hoses, Sealing Elements, Heat Exchangers
Cooling	Water Pumps, Thermostat Housing, Heat Exchangers, Pressure Regulators, Pipes/Hoses/Ducting, Brackets
Induction Air Charging	Turbochargers, Heat Exchangers, Pipes/Hoses/Ducting, Brackets
Breather	Oil/Air Separator, Valves, Adapters, Pipes/Hoses/Ducting
Electronic and Electrical	Engine Management, Engine Electronic, Engine Electrical (e.g. Wiring, Ignition, Plugs, Coils, Powertrain Control Module)
Accessory	Starter Motors, Alternators, Power Steering Pumps, Air Conditioning Compressors

Table 1-3: Transmission System, Subsystem and Sub-Subsystem Classification

Subsystem	Sub-Subsystem
Externally Mounted Component	Lift Eye, Vent Cap, Bracket, Bolting
Case(s)	Transaxle Case, Transaxle Housing, Covers, Bearing Race, Plug, Actuator
Gear Train	Input Shaft, Output Shaft, Transfer Shaft, Sun Gear, Planetary Gear, Ring Gear, Counter Gear, Differential Gear, Bearing (Roller, Needle)
Internal Clutch	Sprag Clutch, Clutch & Brake Hub, Disc and Plate, Piston, Snap Ring, Bearing (Roller, Needle), Synchronizer
Launch Clutch	Torque Converter, Clutch Assembly, Flexplate, Flywheel
Oil Pump and Filter	Oil pump, Cover, Oil Filter, Oil Cooler, Oil Squirter, Pipes/Tubes
Mechanical Control	Valve Body Assembly, Mechanical Controls (e.g. Shift Forks), Sealing Elements, Bearing Elements, Plugs & Cups
Electrical Control	Controller, Solenoid, Sensor, Switches, Wiring Harness
Park Mechanism	Rod/Shaft/Pin, Spring, Pawl, Bracket, Bolt

2 Case Study Results

The results for the four (4) case studies analyzed within this work assignment. For each case study, a brief description of the technology and its associated hardware is provided. Additional general specifications for each case study can also be found in the Powetrain Packaging Specification Proformas in Appendix A. A scaled-down version of the System Cost Model Analysis Template (CMAT) is provided, summarizing the incremental direct manufacturing costs for each major subsystem that was affected by adaptation of the new technology.

The full System CMATs for each case study can be found in Appendix B. The supporting Subsystem CMATs for each case study, which roll-up all the component and assembly costs for each subsystem, can be found in Appendix C. Table 2-1 provides a cross reference between each case study and the associated system and subsystem CMATs.

Because each case study consists of a large quantity of component and assembly Manufacturing and Assumption Quote Summary (MAQS) worksheets, approximately 200 pages per case study, hard copies were not included as part of this report. However, electronic copies of the MAQS worksheets, as well as all other supporting case study documents (e.g. CBOMs, Subsystem CMATs, System CMATs), can be accessed at **http://www.epa.gov/otaq/**.

Table 2-1: Location of System and Subsystem CMATs within Appendix

Case Study Numbers	Case Study Description	System CMAT Appendix Section	Subsystem CMAT Appendix Section
N0102 B0102	2.0L, I4, 4-valve, dual overhead cam (DOHC), dual variable valve timing (d-VVT), turbocharged, gasoline direct injection (GDI) engine, compared to an equivalent conventional 3.0L, V6, 4-valve, DOHC, d-VVT, naturally aspirated (NA), port fuel injected (PFI) engine.[a]	B1	C1
N0104 B0104	3.5L, V6, 4-valve, dual overhead cam (DOHC), d-VVT, turbocharged, GDI engine, compared to an equivalent conventional 5.4L, V8, 3-valve, single overhead cam (SOHC), VVT, NA, PFI engine.	B2	C2
N0802 B0802	A 6-speed automatic transmission, compared to an equivalent 5-speed automatic transmission	B3	C3
N0902 B0902	A 6-speed wet dual clutch transmission (DCT), compared to an equivalent 6-speed automatic transmission.	B4	C4

a For the purpose of these case studies, "equivalent" means similar performance and/or capability

2.1 Case Study #0102 Results (V6 Downsizing to I4)

Case Study #0102 analyzed the direct incremental manufacturing cost for downsizing from a conventional 3.0L, V6, 4-V, DOHC, d-VVT, NA, PFI engine to a 2.0L, I4, 4-V, DOHC, d-VVT, turbocharged, GDI engine. The performance specifications for both engine configurations were considered to be equivalent with a maximum power output of approximately 225 hp and maximum torque of approximately 210 lb-ft.

Note that in this analysis, neither the new or base engine actual hardware had d-VVT. Both sets of hardware only consisted of intake-VVT. However, as part of the overall study assumptions, both technologies were assumed to have d-VVT.

For the conventional/baseline engine configuration, a 2008 Ford Cyclone Duratec 35 (i.e. 3.5L V6) engine was used in combination with a 2008 Ford Mondeo Duratec 30 (i.e., 3.0L V6) engine. The 3.5L Duratec engine was the principal hardware referenced in this analysis, with the 3.0L Duratec engine primarily used to support size and weight scaling of the 3.5L V6 engine to a 3.0L V6 equivalent. This approach was taken for two main reasons: 1) the 3.5L Duratec is a relative new engine (launched in 2007 timeframe, winner of 2007 Ward's Top 10 Best Engines) and, as such, is considered to contain some of the latest design and manufacturing advances for conventional V6 engines; and 2) much of this same base engine cost analysis could be reused in Case Study #0104 (5.4L V8, NA, PFI downsized to a 3.5L V6, Turbo, GDI engine), reducing analysis time.

For the new technology configuration, the 2007 BMW/PSA Peugeot Citroën Prince 1.6L I4, Turbo, GDI engine (used in the 2008 Mini Cooper, S) was selected as the lead hardware, scaled up to a 2.0L I4, Turbo, GDI equivalent. Both the Chrysler GEMA 2.4L, I4, NA, PFI engine and GM Family II, Ecotec, 2.0L, I4, Turbocharged, GDI engine were used for size and weight scaling (e.g. pistons, connecting rods, cylinder head), feature counts (e.g. valve cover fasteners, oil sump fasteners), as well as for costing selected items not captured within the 1.6L I4 BOM (e.g. balance shaft). Because the 1.6L I4, Prince engine was used in a previous study (i.e. case study #0101), selected cost models for this previously completed work could be reprocessed with updated function and performance specifications, reducing analysis time.

Features of the 2.0L I4, Turbo, GDI fuel induction subsystem include a direct rotary drive, swash plate, high pressure fuel pump assembly servicing four (4) side-mounted solenoid injectors (7-hole type) with a maximum operating pressure of 150 bar. The air induction subsystem includes a twin-scroll turbocharger assembly, featuring a vacuum-actuated waste gate actuator, electronically-actuated anti-surge valve, along with a water-cooled, pressure-lubricated bearing housing. The maximum exhaust gas temperature permitted at the turbine inlet is 950°C. Compressed air leaving the turbocharger assembly is cooled via an air-to-air heat exchanger prior to reaching the intake manifold.

In this cost analysis, as well as in the V8 to V6 Turbo, GDI, engine downsizing analysis, no additional intellectual property expenses were identified beyond the typical contribution included in the selling, general and administrative (SG&A) expense. It is acknowledged that each supplier currently manufacturing air induction components (e.g. Honeywell-Garret, BorgWarner, Cummins) and/or high pressure fuel system components (e.g. Bosch, Continental, Delphi) will have a large number of patents to protect their intellectual property. Because of these patents, market-leading suppliers can recover some of their development costs in the short term. However the approach of this cost analysis assumes that a competitive supplier base will develop similar components (which do not infringe on the original developer's patents), and that the value of the originator's intellectual property will diminish, resulting in more modest intellectual property allowances as the technology matures. This allowance is captured by the assigned SG&A rate.

As with the first pilot case study (#0101), new technology advances (NTAs) were identified as possible performance upgrades to the physical hardware of the turbocharged engines. These NTAs included the following: variable geometry turbochargers, water-to-air charge air coolers, electric water pump (replacing the conventional mechanical water pump) paired with a smaller auxiliary after-run pump. At this time, these alternative technologies are recorded and identified (and may be evaluated at a later date when representative hardware is available), but are not included in the cost analysis.

Many material cost reduction (MCR) ideas were identified in case study #0102, and these MCRs were incorporated at the beginning of this analysis. For example, certain manufacturing processes are sometimes better suited to lower-volume products due to lower tooling costs. An example of this would be a part manufactured using a powdered metal process; at low production volumes, this may result in the lowest cost, but at high production volumes, a fine blanking process may make better financial sense. Generally, anywhere a component design or manufacturing method was originally adopted based on low volume production, a revised design assumption and/or process suitable for high volume mass production was selected. A second example of where MCRs were directly implemented into the analysis was in the selection of "best practice" or "upward trending" manufacturing processes. An example of this is the replacement of a sandcast aluminum cylinder block with a diecast cylinder block. In this particular case study, the actual block for the 3.0L, V6, Ford Duratec block was sandcast, whereas the 3.5L block was diecast. For this reason, the 3.5L, V6, Ford Duratec diecast cylinder block was evaluated for cost and scaled down to a 3.0L V6 equivalent.

In all of the turbo, GDI, engine downsizing studies (case studies #0101, #0102, and #0104), this same approach to NTAs and MCRs was utilized.

Figure 2-1 shows the net incremental direct manufacturing cost of $68.68 for downsizing from a 3.0L V6, NA, PFI conventional engine to a 2.0L I4, Turbo, GDI engine. In

addition to the subsystem cost breakdowns showing their net contribution to costs, the contribution from each cost element is also captured. Major incremental cost factors for the new technology were the fuel induction subsystem ($84.76) and air induction subsystem ($280.70). Major incremental cost savings for the new technology due to downsizing were the cylinder head subsystem ($158.70) and the valvetrain ($122.71).

Technology Level: 01-Downsized, Turbocharged, Gasoline Direct Inject (GDI) Engine
Vehicle Class: 02-Mid to Large Size Passenger Vehicle, 4-6 Passengers
Study Case#: 0102 (N0102 New Technology Configuration)
(B0102 Baseline Technology Configuration)

SYSTEM & SUBSYSTEM DESCRIPTION			INCREMENTAL COST TO UPGRADE TO NEW TECHNOLOGY PACKAGE										
			NEW TECHNOLOGY PACKAGE COST INFORMATION 2.0L I4, DOHC, Turbo DI										
			BASE TECHNOLOGY PACKAGE COST INFORMATION 3.0L V6, DOHC, NA, PFI										
			Manufacturing				Markup						
Item	Subsystem	Subsystem Description	Material	Labor	Burden	Total Manufacturing Cost (Component/ Assembly)	End Item Scrap	SG&A	Profit	ED&T-R&D	Total Markup Cost (Component/ Assembly)	Total Packaging Cost (Component/ Assembly)	Net Component/ Assembly Cost Impact to OEM
0100		ENGINE SYSTEM											
1	02	Engine Frames, Mountings & Brackets Subsystem	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	03	Crank Drive Subsystem	$ (5.96)	$ (7.87)	$ (24.93)	$ (38.69)	$ 0.38	$ (1.64)	$ (1.60)	$ (0.56)	$ (3.41)	$ (0.31)	$ (42.40)
3	04	Counter Balance Subsystem	$ 10.37	$ 6.22	$ 10.89	$ 27.47	$ 0.84	$ 3.16	$ 2.92	$ 0.91	$ 7.83	$ 0.05	$ 35.35
4	05	Cylinder Block Subsystem	$ (15.90)	$ 4.82	$ 16.04	$ 5.06	$ 0.88	$ 0.69	$ 0.57	$ (0.09)	$ 2.04	$ 0.40	$ 7.51
5	06	Cylinder Head Subsystem	$ (57.60)	$ (13.60)	$ (74.52)	$ (145.85)	$ (2.28)	$ (4.26)	$ (4.60)	$ (1.34)	$ (12.48)	$ (0.37)	$ (158.70)
6	07	Valvetrain Subsystem	$ (36.81)	$ (15.43)	$ (56.25)	$ (108.49)	$ (0.47)	$ (5.72)	$ (5.33)	$ (2.24)	$ (13.96)	$ (0.26)	$ (122.71)
7	08	Timing Drive Subsystem	$ (39.24)	$ (5.90)	$ (11.58)	$ (56.60)	$ (0.59)	$ (1.56)	$ (1.04)	$ (0.24)	$ (3.43)	$ (0.38)	$ (60.61)
8	09	Accessory Drive Subsystem	$ 7.00	$ -	$ -	$ 7.00	$ -	$ -	$ -	$ -	$ -	$ -	$ 7.00
9	10	Intake Subsystem	$ (10.69)	$ (3.38)	$ (9.69)	$ (23.96)	$ (0.11)	$ (1.45)	$ (1.34)	$ (0.56)	$ (3.46)	$ (0.24)	$ (27.66)
10	11	Fuel Subsystem	$ 29.35	$ 9.28	$ 27.31	$ 65.94	$ 0.81	$ 7.62	$ 7.53	$ 2.75	$ 18.71	$ 0.10	$ 84.75
11	12	Exhaust Subsystem	$ 9.22	$ (11.62)	$ (23.67)	$ (26.06)	$ 3.43	$ (1.57)	$ (1.80)	$ (0.91)	$ (0.85)	$ (0.39)	$ (27.30)
12	13	Lubrication Subsystem	$ (2.86)	$ 3.56	$ (5.40)	$ (4.69)	$ (0.04)	$ (0.28)	$ (0.38)	$ (0.27)	$ (0.99)	$ 0.02	$ (5.66)
13	14	Cooling Subsystem	$ 18.49	$ 6.29	$ 10.55	$ 35.32	$ 0.20	$ 2.40	$ 2.48	$ 1.06	$ 6.15	$ 0.11	$ 41.59
14	15	Induction Air Charging Subsystem	$ 98.15	$ 51.97	$ 73.38	$ 223.50	$ 7.36	$ 20.61	$ 20.71	$ 7.75	$ 56.44	$ 0.76	$ 280.70
15	16	Exhaust Gas Re-Circulation Subsystem- Not Applicable In Analysis	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
16	17	Breather Subsystem	$ 7.92	$ 1.99	$ 6.80	$ 16.71	$ 0.06	$ 1.14	$ 0.76	$ 0.19	$ 2.15	$ 0.03	$ 18.89
17	60	Engine Management, Engine Electronic and Electrical Subsystems	$ 11.16	$ (1.23)	$ 6.09	$ 16.03	$ 0.21	$ 1.76	$ 2.31	$ 1.25	$ 5.53	$ 0.01	$ 21.57
18	70	Accessories Subsystem (Starter Motors, Alternators, Power Steering Pumps, etc)	$ 2.44	$ 2.55	$ 7.45	$ 12.45	$ 0.09	$ 1.35	$ 1.10	$ 0.30	$ 2.84	$ 0.09	$ 15.38
19			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
20			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SUBSYSTEM ROLL-UP	$ 26.67	$ 27.51	$ (48.19)	$ 5.99	$ 10.77	$ 22.33	$ 22.08	$ 7.91	$ 63.08	$ (0.39)	$ 68.68

Figure 2-1: System Cost Model Analysis Template Illustrating the Incremental Subsystem Costs Roll Up for V6 to I4, Turbo, GDI Downsizing, Case Study #0102

An alternative method of binning component and assembly incremental costs is based on their contribution to cost relative to downsizing, GDI, or turbocharging categories. In Table 2-2, the incremental subsystems costs are broken out into these three (3) alternative categories. The combined subsystems cost of adding GDI to a 2.0L I4 over a conventional PFI subsystem is $213. The combined subsystems cost for adding turbocharging to an I4 engine over a conventional NA subsystem is $403. Lastly, the credit for downsizing from a conventional V6 to a conventional I4 is $547.

Table 2-2: Cost for Adding Turbocharging and GDI to a 2.0L, I4, NA, PFI engine and the Estimated Credit for Downsizing from a Conventional 3.0L V6 to 2.0L I4.

	Combine Subsystem Incremental Impact	Direct Subsystem Incremental Contribution	Indirect Subsystem Incremental Contribution
GDI	$213	$85	$128
Turbo	$403	$281	$122
Downsizing	(-$547)		
Net Incremental Cost	$69		

2.2 Case Study #0104 Results (V8 Downsizing to V6)

Case Study #0104 analyzed the direct incremental manufacturing cost for downsizing from a conventional 5.4L, V8, 3-V, SOHC, VVT, NA, PFI engine to a 3.5L V6, 4-V, DOHC, d-VVT, turbocharged, GDI engine.

For the conventional/baseline engine configuration, a 2008 Ford Modular 5.4L V8 engine was selected. Standard features of this engine include a cast iron block, forged crankshaft, aluminum heads, variable valve timing and hydraulic, roller finger valve lifters. The maximum power output rating is 300 hp @ 5000 rpm with a maximum torque of 365 lb.-ft. @ 3750 rpm.

For the new technology configuration, a 2008 Ford Cyclone Duratec 35 (i.e. 3.5L V6) base engine was selected for the foundation of the analysis. Utilizing the project team's expertise, published data on Turbo, GDI, V6 engine architectures, surrogate component data from existing benchmarking evaluations, and previously completed cost studies (i.e., case study #0101 and #0102), the project team developed a 3.5L V6, Turbo, GDI engine Bill of Materials (BOM). In regards to a target performance specification, the Ford EcoBoost engine (3.5L V6, 4-V, DOHC, i-VVT, Turbo, GDI, engine) specification was used as a surrogate; maximum 355 hp @ 5000 rpm and 350 lb.-ft. @ 3500 rpm.

Features of the 3.5L V6, Turbo, GDI fuel induction subsystem include a direct rotary drive, swash plate design, high-pressure fuel pump servicing six (6) side-mounted solenoid injectors (7-hole type), with a maximum operating pressure of 150 bar. The air induction subsystem features twin, single-scroll turbocharger assemblies. Each turbocharger assembly has a vacuum-actuated waste gate, an electronically-actuated anti-surge valve, and a water-cooled, pressure-lubricated bearing housing. The maximum exhaust gas inlet temperature permitted at the turbine inlet is 950°C. Compressed air leaving the turbocharger assemblies is cooled prior to reaching the intake manifold via an air-to-air heat exchanger.

Figure 2-2 shows the net incremental direct manufacturing cost of $846.26 for downsizing from a 5.4L V8, NA, PFI conventional engine to a 3.5L V6, Turbo, GDI engine. Major incremental cost factors for the new technology were the fuel induction subsystem ($124.59) and air induction subsystem ($448.79). The downsizing of many subsystems (e.g. intake, crank drive, cylinder block) resulted in a cost savings of $155.

Technology Level: 01-Downsized, Turbocharged, Gasoline Direct Inject (GDI) Engine
Vehicle Class: 04-Small to Midsize Truck, Passenger + Midsize Towing Capability
Study Case#: 0104 (N0104 New Technology Configuration)
(B0104 Baseline Technology Configuration)

SYSTEM & SUBSYSTEM DESCRIPTION			INCREMENTAL COST TO UPGRADE TO NEW TECHNOLOGY PACKAGE										
			NEW TECHNOLOGY PACKAGE COST INFORMATION 3.5L,V6 DOHC, Turbo DI										
			BASE TECHNOLOGY PACKAGE COST INFORMATION 5.4L V8, SOHC, NA, PFI										
			Manufacturing				Markup						
Item	Subsystem	Subsystem Description	Material	Labor	Burden	Total Manufacturing Cost (Component/ Assembly)	End Item Scrap	SG&A	Profit	ED&T-R&D	Total Markup Cost (Component/ Assembly)	Total Packaging Cost (Component/ Assembly)	Net Component/ Assembly Cost Impact to OEM
0100		ENGINE SYSTEM											
1		02 Engine Frames, Mountings & Brackets Subsystem	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2		03 Crank Drive Subsystem	$ (5.10)	$ (5.29)	$ (12.50)	$ (22.89)	$ 0.79	$ (1.45)	$ (1.43)	$ (0.49)	$ (2.58)	$ (0.23)	$ (25.70)
3		04 Counter Balance Subsystem	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
4		05 Cylinder Block Subsystem	$ 9.55	$ 1.91	$ (36.13)	$ (24.67)	$ 0.01	$ 1.02	$ 0.31	$ (0.25)	$ 1.09	$ (0.66)	$ (24.24)
5		06 Cylinder Head Subsystem	$ (8.66)	$ 2.31	$ 16.07	$ 9.71	$ (0.67)	$ (1.16)	$ (1.29)	$ (0.36)	$ (3.48)	$ (0.01)	$ 6.21
6		07 Valvetrain Subsystem	$ (62.89)	$ 12.60	$ 45.66	$ (4.63)	$ 0.35	$ 4.20	$ 4.12	$ 1.81	$ 10.48	$ 0.26	$ 6.11
7		08 Timing Drive Subsystem	$ (11.10)	$ -	$ -	$ (11.10)	$ (0.11)	$ (0.13)	$ (0.08)	$ (0.02)	$ (0.34)	$ -	$ (11.44)
8		09 Accessory Drive Subsystem	$ 11.00	$ -	$ -	$ 11.00	$ -	$ -	$ -	$ -	$ -	$ -	$ 11.00
9		10 Intake Subsystem	$ (19.56)	$ (2.70)	$ (4.96)	$ (27.23)	$ (0.18)	$ (1.85)	$ (2.11)	$ (0.53)	$ (4.67)	$ (0.03)	$ (31.94)
10		11 Fuel Subsystem	$ 41.04	$ 14.52	$ 42.50	$ 98.06	$ 1.11	$ 10.78	$ 10.58	$ 3.85	$ 26.32	$ 0.21	$ 124.59
11		12 Exhaust Subsystem	$ 54.98	$ 0.70	$ 0.80	$ 56.49	$ 2.80	$ 3.86	$ 4.84	$ 2.50	$ 14.00	$ (0.06)	$ 70.43
12		13 Lubrication Subsystem	$ 36.55	$ 15.16	$ 33.00	$ 84.71	$ 0.30	$ 4.09	$ 3.65	$ 1.38	$ 9.43	$ 1.08	$ 95.22
13		14 Cooling Subsystem	$ 24.98	$ 7.54	$ 12.56	$ 45.08	$ 0.25	$ 3.07	$ 3.14	$ 1.31	$ 7.79	$ 0.16	$ 53.03
14		15 Induction Air Charging Subsystem	$ 146.26	$ 76.44	$ 106.36	$ 329.41	$ 17.87	$ 38.21	$ 40.86	$ 16.27	$ 113.21	$ 6.17	$ 448.79
15		16 Exhaust Gas Re-Circulation Subsystem- Not Applicable In Analysis	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
16		17 Breather Subsystem	$ 14.78	$ 3.80	$ 12.32	$ 30.91	$ 0.10	$ 2.06	$ 1.38	$ 0.34	$ 3.88	$ 0.03	$ 34.83
17		60 Engine Management, Engine Electronic and Electrical Subsystems	$ 32.70	$ 8.88	$ 16.15	$ 57.73	$ 0.43	$ 4.69	$ 4.98	$ 2.95	$ 12.46	$ (0.04)	$ 70.15
18		70 Accessories Subsystem (Starter Motors, Alternators, Power Steering Pumps, etc)	$ 4.11	$ 2.92	$ 8.67	$ 15.69	$ 0.11	$ 1.62	$ 1.32	$ 0.37	$ 3.41	$ 0.11	$ 19.22
19			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
20			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
		SUBSYSTEM ROLL-UP	$ 268.64	$ 138.78	$ 240.51	$ 648.28	$ 23.16	$ 69.00	$ 70.27	$ 28.54	$ 190.97	$ 7.02	$ 846.27

Figure 2-2: System Cost Model Analysis Template Illustrating the Incremental Subsystem Costs Roll Up for V8 to V6, Turbo, GDI Downsizing, Case Study #0104

Similar to the V6 to I4 downsizing analysis, Table 2-3 breaks down the incremental component and subsystems costs into downsizing, GDI, and turbocharging categories. As shown in the table, the combined subsystem cost for adding GDI to a V6 (over a conventional PFI subsystem) is $321. The combined subsystem costs for adding turbocharging to a V6 engine over a conventional NA subsystem is $681. Lastly, the credit for downsizing from a conventional V8 to a conventional V6 is $155.

Table 2-3: Cost for Adding Turbocharging and GDI to a 3.5L, V6, NA, PFI engine and the Estimated Credit for Downsizing from a Conventional 5.4L V8 to 3.5L V4.

	Combine Subsystem Incremental Impact	Direct Subsystem Incremental Contribution	Indirect Subsystem Incremental Contribution
GDI	$321	$125	$196
Turbo	$681	$449	$232
Downsizing	(-$155)		
Net Incremental Cost	$846		

2.3 Case Study #0802 Results
(6-Speed versus 5-Speed Automatic Transmission)

Case Study #0802 analyzed the direct incremental manufacturing cost for updating from a conventional 5-speed automatic transmission to a next generation 6-speed automatic transmission.

The 5-speed automatic transmission selected for the analysis was the Toyota U151E FWD transmission. This transmission was used in various applications including the Toyota Camry through the 2005-2006 timeframe. The main construction of the transmission includes three (3) full planetary gear sets. The front and rear planetary gear sets are positioned in series along a common intermediate shaft assembly. Adjacent to the front and rear planetary sets, and mounted in series to the counter shaft assembly, is a third underdrive planetary set. The transmission contains a total of nine (9) shift elements, four (4) disc clutches, three (3) disc brakes, and two (2) one-way-clutches. The hydraulic valve body assembly, containing a total of seven (7) shift solenoid valves is controlled directly by the engine control module (ECM). The total weight of the transmission, including Automatic Transmission Fluid (ATF), is approximately 221 lbs. The maximum output torque rating for the U151E is 258 lb-ft.

The 6-speed automatic transmission selected for the analysis was the replacement transmission to the Toyota 5-speed. The Toyota 6-speed FWD transmission (U660E) was a complete redesign of the existing U151E transmission, which launched in the 2007 timeframe. Employing a Ravigneaux and underdrive planetary gear set, positioned along a common intermediate shaft assembly, the U660E gear driveline is much simpler compared to its predecessor. Only six (6) shift elements are required for operation of the transmission; two (2) disc clutches, three (3) disc brakes, and one (1) one-way-clutch. The U660E valve body assembly also contains a total of seven (7) shift solenoid valves interfacing with an exterior-mount transmission control module (TCM), which in-turn communicates with the engine control module (ECM). The total weight of the transmission, including ATF, is 208 lbs. The maximum output torque rating for the U660E is 295 lb.-ft.

As discussed in the initial report (EPA-420-R-09-020), the costing methodology employs an exclusion approach to costing. Following completion of the comparison bill of materials (CBOMs), the cross functional team began the process of rationalizing similarities and differences between hardware on the five (5) and six (6) speed transmissions. A combination of component function and content exclusion analysis was conducted, eliminating the majority of components which required costing. Since the 5-speed transmission contained more hardware (i.e., approximately 150 more parts), and was generally more complex, the 6-speed established a zero cost baseline from which an incremental cost for the 5-speed was established. The majority of incremental cost

increase of the five 5-speed over the 6-speed was associated with the two (2) additional clutch packs, the need for a counter shaft assembly, and some additional gearing.

According to the SAE Technical Paper 2006-01-0847 ("Toyota's New 6-Speed Automatic Transaxle U660E for FWD Vehicles"), the U660E's transmission geartrain structure, consisting of a Ravigneaux gear set and simpler planetary set, was Toyota's original invention. As such, there was no patent royalty fee penalization assessed against the 6-speed design. The patent rights for similar 6-speed transmission designs (e.g. Lepelletier) are due to expire in 2010. Therefore we do not expect royalty fees to be a significant part of the cost for 6-speed transmissions.

For the 6-speed automatic transmission, there were no NTA or MCR ideas identified as part of the cost analysis. It was obvious from the transmission teardown assessment that in addition to Toyota's goal for improving overall performance with their new 6-speed automatic transmission relative to the 5-speed predecessor, keeping costs at or below the existing manufacturing cost was a key metric. In regard to the 5-speed automatic transmission, many of innovative ideas implemented into the 6-speed automatic could have been incorporated into a new 5-speed if it were to be redesigned). The most obvious NTA would be adopting a similar Ravigneaux geartrain design, which could conceivably have the same financial benefit recognized by the 6-speed automatic. As part of this analysis, no additional work was conducted to determine what the financial impact would be on the 5-speed automatic by employing some of these NTA and MCRs concepts. As such, the net incremental direct manufacturing cost shown below is solely based on the physical hardware evaluated.

Figure 2-3 shows the net incremental direct manufacturing cost between the six (6) and five (5) speed automatic transmissions. In evaluating the physical hardware, the 6-speed automatic was analyzed to be less expensive to manufacture by approximately $105. Note that when the 6-speed transmission was redesigned, several other functional and performance updates not driven by the added 6th-gear ratio were incorporated (e.g. modified hydraulic control strategy, spool valve material, and friction discs, as well as a newly-developed torque converter). These modifications were not costed in the analysis since they are independent of the gear ratio addition and modifications.

Technology Level: 08 - 6 Speed Automatic versus 5 Speed Automatic Transmission
Vehicle Class: 02 - Mid to Large Size Passenger Vehicle, 4-6 Passengers
Study Case#: 0802 (N0802 New Technology Configuration)
(B0802 Baseline Technology Configuration)

INCREMENTAL COST TO UPGRADE TO NEW TECHNOLOGY PACKAGE

NEW TECHNOLOGY PACKAGE COST INFORMATION
6 Speed Automatic Transmission: 2007-2009 Toyota Camry

BASE TECHNOLOGY PACKAGE COST INFORMATION
5 Speed Automatic Transmission: 2004-2006 Toyota Camry

SYSTEM & SUBSYSTEM DESCRIPTION			Manufacturing				Markup						
Item	Subsystem	Subsystem Description	Material	Labor	Burden	Total Manufacturing Cost (Component/ Assembly)	End Item Scrap	SG&A	Profit	ED&T-R&D	Total Markup Cost (Component/ Assembly)	Total Packaging Cost (Component/ Assembly)	Net Component/ Assembly Cost Impact to OEM
0200		TRANSMISSION SYSTEM											
1	01	EXTERNAL COMPONENTS: Consists of installation of oil coolers, lift eyes, vent caps.	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	02	CASE(S): Includes pressed in components (i.e., bearing races), plugs, and associated hardware.	$ (0.83)	$ (0.53)	$ (4.66)	$ (6.03)	$ -	$ -	$ -	$ -	$ -	$ -	$ (6.03)
3	03	GEAR TRAIN: Includes Input Shafts, Output Shafts, Differential and all associated gears and bearings on the shaft.	$ (1.83)	$ (4.69)	$ (13.67)	$ (20.19)	$ (0.14)	$ (1.45)	$ (1.64)	$ (0.81)	$ (4.05)	$ -	$ (24.24)
4	04	INTERNAL CLUTCHES: Internal for Gears, Synchronizers, Bands, etc.	$ (19.46)	$ (8.87)	$ (34.46)	$ (62.80)	$ (0.47)	$ (4.27)	$ (4.28)	$ (1.90)	$ (10.91)	$ (0.26)	$ (73.98)
5	05	LAUNCH CLUTCHES: Torque Converter	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
6	06	OIL PUMP & FILTER: Includes Pump, Pump Shaft/Drive Mechanism, Oil Filters (Internal or External), Pick-up Tube, and Oil Baffles.	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
7	07	MECHANICAL CONTROLS	$ (0.17)	$ (0.52)	$ (0.50)	$ (1.19)	$ (0.00)	$ (0.04)	$ (0.03)	$ (0.01)	$ (0.07)	$ (0.02)	$ (1.28)
8	08	ELECTRICAL CONTROLS	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
9	09	PARK MECHANISM: Includes Park & Lock Pawl Mechanism and Actuating Levers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
10	10	MISCELLANEOUS:	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
11													
12													
		SUBSYSTEM ROLL-UP	$ (22.29)	$ (14.61)	$ (53.32)	$ (90.22)	$ (0.61)	$ (5.76)	$ (5.95)	$ (2.71)	$ (15.04)	$ (0.28)	$ (105.53)

Figure 2-3: System Cost Model Analysis Template Illustrating the Incremental Subsystem Costs Roll Up for a 6-Speed Automatic Transmission compared to a 5-Speed Automatic Transmission

2.4 Case Study #0902 Results
(6-Speed Wet Dual Clutch Transmission versus 6-Speed Automatic Transmission)

Case Study #0902 analyzed the direct incremental manufacturing cost for updating from a conventional 6-speed automatic transmission to a 6-speed, wet, dual clutch transmission.

The baseline technology configuration selected for the analysis was the Toyota 6-speed automatic transmission (U660E) of case study #0802. General design parameters of the U660E transmission can be found in section 2.3 of this report.

The new technology configuration selected for the analysis was the Volkswagen (VW) six 6-speed, wet, dual clutch transmission (DCT); model number DQ250. Other industry naming conventions for this technology configuration include twin-clutch gearbox or dual shift gearbox (DSG). The basic components of the DCT include a twin clutch pack assembly driving two (2) coaxial input shafts. Power from the engine is transmitted to the input shafts through a dual-mass flywheel which is connected in series to the twin-clutch pack. Each input shaft, dependent on the selected gear, is designed to mesh with one (1) of two (2) output shafts. Upon reverse gear selection, there is an intermediate shaft which engages with both input shaft one (1) and output shaft two (2). There are four (4) shift forks, two (2) on each output shaft, hydraulically activated into one of two positions from their neutral home position. The controls for the DCT, which include the hydraulic controls, electronic controls, and various sensors and actuators, are integrated into a single module VW refers to as a Mechatronic unit. The total weight of the transmission module, including the dual-mass flywheel, is approximately 207 lbs. The maximum output torque rating for the DQ250 transmission is 258 lb.-ft.

Relative to intellectual property costs, no additional allowances were provided, outside the general allowance covered as part of the selling, general and administrative (SG&A) expense, for protecting intellectual property. It is acknowledged that each supplier currently making a version of a DCT (e.g. BorgWarner, Getrag, ZF, LuK) will have a large number of patents on their own technology. Because of these patents, suppliers who are considered to be market leaders in DCT technology will certainly recover some of their development costs in the short term. However, it is assumed that as the supplier base and associated technologies mature, the value (i.e. function/cost) each supplier provides will begin to equalize, resulting in a diminishing intellectual property cost allowance for each design.

As part of the hardware review and evaluation, no NTA or MCR ideas were considered in the final cost analysis. The evaluation team felt that in general, both transmissions were robustly designed, with each consisting of a high level of component and function integration, which resulted in two financially competitive solutions.

In this analysis, approximately seventy-five (75) percent of the components on both the 6-speed automatic transmission and 6-speed wet DCT were evaluated for cost. This level of analysis was required due to the inherent differences between the automatic versus DCT components. The only subsystems identified as common in function and cost between the two (2) transmissions were the oil pump, filter, park mechanism, and external components.

Figure 2-5 shows the net, incremental, direct manufacturing cost between the 6-speed wet DCT and 6-speed automatic transmissions. In evaluating the physical hardware, the 6-speed wet DCT was analyzed to be less expensive to manufacture by approximately $97. The major cost increment of the 6-speed wet DCT was the launch clutch system ($64.79), which included a dual-mass flywheel and twin clutch assembly. The major incremental cost savings for the new technology were the internal clutches ($132.35) and the geartrain ($38.04).

Also shown in Figure 2-5, a differential exist between the electronic hardware and controls in the two transmission systems. Differences including Gear Selecting Solenoids and Sensors and well as wiring harnesses and communication drivers can be clearly identified in Figure 2-4 below. These components and controls account for an additional cost differential of $46.99 contributing to the net incremental direct manufacturing cost of $-97.34.

6-Speed DSG Device Description	Device Captured In MAQS	6-Speed AT Device Description	Device Captured In MAQS
Gearbox InputSpeed Sensor (G182)	Cost Neutral	Counter Gear Speed Sensor	Cost Neutral
Multi Plate Clutch Oil TemperatureSender (G509)	Cost Neutral	AFT Temperature Sensor	Cost Neutral
Drive Shaft 1 Speed Sensor (G501)	Cost Neutral	InputTurbine Speed Sensor	Cost Neutral
Drive Shaft 2 Speed Sensor (G502)	Cost		
Gearbox OutputSpeed Sensor (G195)	Cost		
Gearbox OutputDirection Sensor (G196)	Cost		
Automatic Gearbox HydraulicPressure Sender -1- (G193)	Cost Neutral	AFT Pressure Switch 1	Cost Neutral
Automatic Gearbox HydraulicPressure Sender -2- (G194)	Cost Neutral	AFT Pressure Switch 2	Cost Neutral
		AFT Pressure Switch 3	Cost
Solenoid Valve 1 (N88)	Cost	Shift Solenoid Valve SL1	Cost
Solenoid Valve 2 (N89)	Cost	Shift Solenoid Valve SL2	Cost
Solenoid Valve 3 (N90)	Cost	Shift Solenoid Valve SL3	Cost
Solenoid Valve 4 (N91)	Cost	Shift Solenoid Valve SL4	Cost
Solenoid Valve 5 (N92)	Cost	Shift Solenoid Valve SLU	Cost
		Shift Solenoid Valve SLT	Cost
		Shift Solenoid Valve SL	Cost
Electrical Pressure Control Valve 1 (N215)	Cost		
Electrical Pressure Control Valve 2 (N216)	Cost		
Electrical Pressure Control Valve 3 (N217)	Cost		
Electrical Pressure Control Valve 4 (N218)	Cost		
Electrical Pressure Control Valve 5 (N233)	Cost		
Electrical Pressure Control Valve 6 (N371)	Cost		
Gear Selector Travel Sensor -1- (G487)	Cost		
Gear Selector Travel Sensor -2- (G488)	Cost		
Gear Selector Travel Sensor -3- (G489)	Cost		
Gear Selector Travel Sensor -4- (G490)	Cost		
MechatronicControl Unit	Cost	MechatronicControl Unit	Cost
MechatronicControl Unit - Wiring Harness	Cost	MechatronicControl Unit - Wiring Harness	Cost

Figure 2-4: System Electronic Hardware & Controls Comparison Matrix for a 6-Speed DSG compared to a 6-Speed Automatic Transmission

Technology Level: 09 - 6 Speed Automatic versus 6 Speed Direct Shift Transmission
Vehicle Class: 02- Mid to Large Size Passenger Vehicle, 4-6 Passengers
Study Case#: 0902 (N0902 New Technology Configuration)
(B0902 Baseline Technology Configuration)

INCREMENTAL COST TO UPGRADE TO NEW TECHNOLOGY PACKAGE

NEW TECHNOLOGY PACKAGE COST INFORMATION
6 Speed Direct Shift Gearbox (dual clutch): 2007-2009 VW Jetta SportWagen

BASE TECHNOLOGY PACKAGE COST INFORMATION
6 Speed Automatic Transmission: 2007-2009 Toyota Camry

Item	Subsystem	SYSTEM & SUBSYSTEM DESCRIPTION: Subsystem Description	Manufacturing: Material	Manufacturing: Labor	Manufacturing: Burden	Total Manufacturing Cost (Component/ Assembly)	Markup: End Item Scrap	Markup: SG&A	Markup: Profit	Markup: ED&T-R&D	Total Markup Cost (Component/ Assembly)	Total Packaging Cost (Component/ Assembly)	Net Component/ Assembly Cost Impact to OEM
0200		TRANSMISSIONSYSTEM											
1	01	EXTERNAL COMPONENTS: Consists of installation of oil coolers, lift eyes, vent caps.	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	02	CASE(S): Includes pressed in components (i.e., bearing races), plugs, and associated hardware.	$ 5.82	$ (3.19)	$ (32.86)	$ (30.24)	$ 3.49	$ (1.88)	$ (1.73)	$ (1.94)	$ (2.06)	$ 0.39	$ (31.91)
3	03	GEAR TRAIN: Includes Input Shafts, Output Shafts, Differential and all associated gears and bearings on the shaft.	$ 9.38	$ (17.50)	$ (16.25)	$ (24.37)	$ (1.99)	$ (7.08)	$ (4.20)	$ 0.31	$ (12.96)	$ 1.76	$ (35.57)
4	04	INTERNAL CLUTCHES: Internal for Gears, Synchronizers, Bands, etc.	$ (44.06)	$ (22.63)	$ (37.74)	$ (104.43)	$ (1.32)	$ (12.82)	$ (13.06)	$ (4.30)	$ (31.49)	$ (2.26)	$ (138.19)
5	05	LAUNCH CLUTCHES: Torque Converter	$ (42.83)	$ 28.06	$ 60.71	$ 45.94	$ 0.99	$ 7.94	$ 7.48	$ 1.31	$ 17.71	$ 0.72	$ 64.37
6	06	OIL PUMP & FILTER: Includes Pump, Pump Shaft/Drive Mechanism, Oil Filters (Internal or External), Pick-up Tube, and Oil Baffles.	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
7	07	MECHANICAL CONTROLS	$ 8.41	$ (7.79)	$ 1.21	$ 1.83	$ 0.37	$ (1.98)	$ (1.95)	$ (0.34)	$ (3.89)	$ 0.37	$ (1.69)
8	08	ELECTRICAL CONTROLS	$ 30.89	$ 2.79	$ 5.88	$ 39.56	$ 0.21	$ 2.68	$ 2.48	$ 1.06	$ 6.43	$ 0.00	$ 45.99
9	09	PARK MECHANISM: Includes Park & Lock Pawl Mechanism and Actuating Levers	$ (0.20)	$ (0.16)	$ 0.04	$ (0.32)	$ (0.00)	$ (0.01)	$ (0.01)	$ (0.01)	$ (0.03)	$ -	$ (0.34)
10	10	MISCELLANEOUS:	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
11													
12													
		SUBSYSTEM ROLL-UP	$ (32.59)	$ (20.42)	$ (19.01)	$ (72.03)	$ 1.75	$ (13.14)	$ (11.00)	$ (3.91)	$ (26.29)	$ 0.98	$ (97.34)

Figure 2-5: System Cost Model Analysis Template Illustrating the Incremental Subsystem Costs Roll Up for a 6-Speed Wet DCT compared to a 6-Speed Automatic Transmission

3 GLOSSARY OF TERMS

Assembly: generally refers to a group of interdependent components joined together to perform a defined function (e.g. turbocharger assembly, high pressure fuel pump assembly, high pressure fuel injector assembly).

Buy: is the terminology used to identify those components or assemblies as ones in which a manufacturer would purchase versus manufacture. All parts designated as a "buy" part, within the analysis, only have a net component cost presented. Typically these types of parts are considered commodity purchase parts having industry established pricing.

CBOM (Comparison Bill of Materials): is a system bill of materials, identifying all the subsystems, assemblies and components associated with the technology configurations under evaluation. The CBOM records all the high level details of the technology configurations under study, identifies those items which have cost implications as a result of the new versus base technology differences, documents the study assumptions, and is the primary document for capturing input from the cross functional team.

Component: is the lowest level part within the cost analysis. An assembly is typically made up of several components acting together to perform a function (e.g. the turbine wheel in a turbocharger assembly). However, in some cases a component can act independently performing a function within a sub-subsystem or subsystem (e.g. exhaust manifold within the exhaust subsystem).

Cost Estimating Models: are cost estimating tools, external to the Design Profit® software, used to calculate operation and process parameters for primary manufacturing processes (e.g. injection molding, die casting, metal stamping, forging). Key information calculated from the costing estimating tools (e.g. cycle times, raw material usage, equipment size) is inputted into the Lean Design® process maps supporting the cost analysis. The Excel base cost estimating models are developed and validated by Munro & Associates.

Costing Databases: refer to the five (5) core databases which contain all the cost rates for the analysis. The material database lists all the materials used throughout the analysis along with the estimated price/pound for each. The labor database captures various automotive, direct labor, manufacturing jobs (supplier and OEM), along with the associated mean hourly labor rates. The manufacturing overhead rate database contains the cost/hour for the various pieces of manufacturing equipment assumed in the analysis. A mark-up database assigns a percentage of mark-up for each of the four (4) main mark-up categories (i.e. end-item scrap, SG&A, profit, and ED&T), based on the industry, supplier size, and complexity classification. The fifth database, the packaging database, contains packaging options and costs for each case.

Lean Design® (a module within the *Design Profit® software):* is used to create detailed process flow charts/process maps. Lean Design® uses a series of standardized symbols, each base symbol representing a group of similar manufacturing procedures (e.g. fastening, material modifications, inspection). For each group, a Lean Design® library/database exists containing standardized operations along with the associated manufacturing information and specifications for each operation. The information and specifications are used to generate a net operation cycle time. Each operation on a process flow chart is represented by a base symbol, operation description, and operation time, all linked to a Lean Design® library/database.

Make: is the terminology used to identify those components or assemblies as ones in which a manufacturer would produce internally versus purchase. All parts designated as a "make" part, within the analysis, are costed in full detail.

MAQS (Manufacturing Assumption and Quote Summary) Worksheet is the standardized template used in the analysis to calculate the mass production manufacturing cost, including supplier mark-up, for each system, subsystem and assembly quoted in the analysis. Every component and assembly costed in the analysis will have a MAQS worksheet. The worksheet is based on a standard OEM (original equipment manufacturer) quote sheet modified for improved costing transparency and flexibility in sensitivity studies. The main feeder documents to the MAQS worksheets are process maps and the costing databases.

MCRs (Material Cost Reductions): is a process employed to identify and capture potential design and/or manufacturing optimization ideas with the hardware under evaluation. These savings could potentially reduce or increase the differential costs between the new and base technology configurations, depending on whether an MCR idea is for the new or the base technology.

Net Component/Assembly Cost Impact to OEM: is defined as the net manufacturing cost impact per unit, to the OEM, for a defined component, assembly, subsystem or system. For components produced by the supplier base, the net manufacturing cost impact to the OEM includes total manufacturing costs (material, labor, and manufacturing overhead), mark-up (end-item scrap costs, selling, general and administrative costs, profit, and engineering design and testing costs) and packaging costs. For OEM internally manufactured components, the net manufacturing cost impact to the OEM includes total manufacturing costs and packaging costs; mark-up costs are addressed through the application of an indirect cost multiplier.

NTAs (New Technology Advances): is a process employed to identify and capture alternative advance technology ideas which could be substituted for some of the existing hardware under evaluation. These advanced technologies, through improved function and

performance, and/or cost reductions, could help increase the overall value of the technology configuration.

Powertrain Package Proforma: is a summary worksheet comparing the key physical and performance attributes of the technology under study with those of the corresponding base configuration.

Process Maps: are detailed process flow charts used to capture the operations and processes, and associated key manufacturing variables, involved in manufacturing products at any level (e.g. vehicle, system, subsystem, assembly, component).

P-VCSM (Powertrain–Vehicle Class Summary Matrix): records the technologies being evaluated, the applicable vehicle classes for each technology, and key parameters for vehicles or vehicle systems that have been selected to represent the new technology and baseline configurations in each vehicle class to be costed.

Quote: refers to the analytical process of establishing a cost for a component or assembly.

Sub-subsystem: refers to a group of interdependent assemblies and/or components, required to create a functioning sub-subsystem. For example, the air induction subsystem contains several sub-subsystems including the following: turbocharging, heat exchangers, and pipes, hoses and ducting.

Subsystem: refers to a group of interdependent sub-subsystems, assemblies and/or components, required to create a functioning subsystem. For example, the engine system contains several subsystems including the following: crank drive subsystem, cylinder block subsystem, cylinder head subsystem, fuel induction subsystem, and air induction subsystem.

Subsystem CMAT (Cost Model Analysis Templates): is the document used to display and roll up all the sub-subsystem, assembly and component incremental costs associated with a subsystem (e.g. fuel induction, air induction, exhaust), as defined by the Comparison Bill of Material (CBOM).

Surrogate part: refers to a part similar in fit, form and function as the part required for the cost analysis. Surrogate parts are sometimes used in the cost analysis when actual parts are unavailable. The cost of a surrogate part is considered equivalent to the cost of the actual part.

System: refers to a group of interdependent subsystems, sub-subsystems, assemblies and/or components, working together to create a vehicle primary function (e.g. engine system, transmission system, brake system, fuel system, suspension system).

EPA FOIA 2017-003707

System CMAT (Cost Model Analysis Template): is the document used to display and roll up all the subsystem incremental costs associated with a system (e.g. engine, transmission, steering), as defined by the CBOMs.

ED_001162_00012240-00039

To: Jonna Hamilton (JHamilton@ucsusa.org)[JHamilton@ucsusa.org]
From: Moran, Robin
Sent: Wed 4/15/2015 12:40:15 PM
Subject: FW: UCS & NGO coalition meetings with EPA on LD MTE

Hi Jonna, Ex. 6 - Personal Privacy and just wanted to check in to make sure you and Ben were able to connect on the Chris Grundler meeting (or if not, I'm glad to facilitate).

And if you'd like to go ahead and arrange the next technical level OTAQ/NGO discussion, do you have some suggested dates in mind?

Thanks

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

From: Moran, Robin
Sent: Thursday, April 02, 2015 4:34 PM
To: Charmley, William; Hengst, Benjamin
Cc: Jonna Hamilton (JHamilton@ucsusa.org); Olechiw, Michael; Nam, Ed
Subject: UCS & NGO coalition meetings with EPA on LD MTE

Ben and Bill,

Jonna and I just spoke about a couple levels of meetings the NGO coalition would like to have with EPA on the midterm review:

1) A meeting with Chris G and the NGOs on the strategy/politics front, esp in light of the coming NAS report.

Ben – Jonna (cc'd here so you have each other's contacts) will touch base with you directly to set this one up sometime before end of April when Chris is in DC. (BTW, NAS just told us to check back with them in 2-3 weeks and they'll have a better idea of the timeline, so sounding like not as soon as we thought).

Jonna mentioned the NGO coalition includes UCS, NRDC, Sierra, ACEEE, ICCT, EDF, Consumers Union, ALA, CFA, maybe others.

2) A series of technical calls to get updates on EPA work, where we need help from NGOs, what studies NGOs are thinking of supporting, etc.. Those will be at the Robin/Mike/Ed and team level and I'll work with Jonna on those.

Robin

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(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: Jonna Hamilton (JHamilton@ucsusa.org)[JHamilton@ucsusa.org]
From: Moran, Robin
Sent: Tue 3/17/2015 1:27:30 PM
Subject: EPA-UCS Meeting on Light-duty GHG Midterm Evaluation

Hi Jonna,

I just left you a v-mail but wanted you to have my contact info as well. Bill Charmley relayed that you're interested in setting up a discussion with EPA on the midterm evaluation. I'm one of the team leaders, and happy to talk with you about that.

Look forward to talking with you!

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

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Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

To: Carol Lee Rawn[rawn@ceres.org]
From: Moran, Robin
Sent: Mon 1/5/2015 8:24:25 PM
Subject: RE: Meeting in January

Let's do 10:30 on Wednesday then, thanks for being flexible!

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Monday, January 05, 2015 3:17 PM
To: Moran, Robin
Subject: Re: Meeting in January

I understand! I'm free from 10:30-12 and after 4 on Wed. - I don't think we need more than 15 minutes if that makes it easier. I'm also avail tomorrow between 10:30-12 and 12:30-4 if that works. Thanks!

Best, Carol Lee (I actually go by Carol Lee rather than Carol)

On Jan 5, 2015, at 2:30 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi Carol – I hate to do this, but is there any chance you could talk either at noon or 3pm Wednesday? I had another meeting in play that just tried to land on the 2pm spot as well!

Thanks,

Robin

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Monday, January 05, 2015 12:59 PM
To: Moran, Robin
Subject: Re: Meeting in January

Thanks Robin - look forward to talking to you at 2; shall I call you at (734) 214-4781 ?

On Jan 5, 2015, at 12:23 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi Carol Lee, thanks, the break was wonderful, I hope you're was too!

I can't meet at 11 Wednesday, but could do noon or 2pm.

Robin

Robin Moran

Senior Policy Advisor

U.S. EPA, Office of Transportation and Air Quality

2000 Traverwood Dr.

Ann Arbor, MI 48105

(734) 214-4781 (phone)

(734) 214-4821 (fax)

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Monday, January 05, 2015 12:05 PM
To: Moran, Robin
Subject: Re: Meeting in January

Hi Robin - hope you had a good break! Apologies- I now have a conflict Wed at 9:30 AM; can you talk at 11 instead? Thanks!

On Dec 18, 2014, at 8:42 AM, Moran, Robin <moran.robin@epa.gov> wrote:

Look forward to talking with you then, you enjoy the holidays as well!

Robin

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Wednesday, December 17, 2014 6:27 PM
To: Moran, Robin
Subject: Re: Meeting in January

Great - thanks for your time Robin! I just sent you an invite for 9:30 on 1/7. Hope you enjoy the holidays!

Best, Carol Lee

On Dec 17, 2014, at 1:14 PM, Moran, Robin <moran.robin@epa.gov> wrote:

Hi Carol Lee,

Thanks for your call yesterday about setting up a time to talk in early January. My schedule is pretty open on Wednesday, Jan. 7 except for 1-2pm. So why don't you pick a time that works well for you.

It was nice to see you on video last week, and I thought it was a very productive discussion with Janet. Your group brings such an important and unique perspective to the fuel efficiency issues, and I'm looking forward to collaborating on the midterm review.

Have a wonderful time off over the holidays!

Best,

Robin

Robin Moran

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(734) 214-4821 (fax)

Carol Lee Rawn

Director, Transportation Program

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99 Chauncy Street

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(M) 617-388-7879

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To: Carol Lee Rawn[rawn@ceres.org]
From: Moran, Robin
Sent: Mon 1/5/2015 6:01:23 PM
Subject: RE: Meeting in January

Yes, just call my desk phone, that's the right number.

Oh and by the way, I noticed on the invite my last name was spelled "Mohin" but its "Moran" (maybe that's why you had trouble with an earlier email bouncing back?)

Look forward to talking with you then.

Robin

From: Carol Lee Rawn [mailto:rawn@ceres.org]
Sent: Monday, January 05, 2015 12:59 PM
To: Moran, Robin
Subject: Re: Meeting in January

Thanks Robin - look forward to talking to you at 2; shall I call you at (734) 214-4781 ?

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Best, Carol Lee

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Have a wonderful time off over the holidays!

Best,

Robin

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To: Nic Lutsey[nic@theicct.org]; Olechiw, Michael[olechiw.michael@epa.gov]
From: Charmley, William
Sent: Mon 10/17/2016 7:07:15 PM
Subject: RE: Check in call on ICCT analysis

Nic -

Can I give you a call on this - I have a few background questions on the ICCT work, including timing, and then Mike can follow-up with you to discuss how we can help from a logistics perspective.

Thanks
Bill

-----Original Message-----
From: Nic Lutsey [mailto:nic@theicct.org]
Sent: Monday, October 17, 2016 2:41 PM
To: Charmley, William <charmley.william@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>
Subject: Check in call on ICCT analysis

Hi Mike and Bill,

I hope all is going great for you two. Congrats on the great body of work you released with the TAR. I can't say I've read through everything, but I've probably read through more of it than most. The ICCT is chipping away a few projects, including John's tech briefing series — and now a new major analysis to report on technology potential for 2025-2030 for our global CO2 analysis.

We think the best starting point for our 2025-2030 analysis is the TAR technology inputs, and the best modeling basis is to use the OMEGA platform. We wanted to reach out to try to schedule a short call to explain the project's approach and get input from your team on the use of the OMEGA modeling system. We are already well trained (we've worked with Ari over the years) and now have OMEGA 2016 up and running. At this point, ensuring that any of our modified technology inputs run through the TEB-CEB machine, lumped parameter, etc for the OMEGA modeling is a key remaining question for us.

Might we be able to schedule a call in the Oct 24-28, Oct 31- Nov 1 period? I think a call between our team and Mike, Todd, and others for 60 minutes would be extremely helpful to make sure we understand the final file preparation of OMEGA runs. Of course feel free to re-direct us to the applicable team members as you see fit. Here are my numbers if more context would help: 415-202-5743 (office) and 530-848-3740 (mobile).

Nic

To: Olechiw, Michael[olechiw.michael@epa.gov]
From: Dave Cooke
Sent: Fri 8/12/2016 5:01:21 PM
Subject: Two quick questions re: EPA/NHTSA engine assessments

Mike,

I continue to pour over the TAR and the volumes of research and analysis that the agencies have put together, and there were three pieces of information related to the engine that differed between the agencies that surprised me, and I wanted to see if I had that right and if there might be any further info that would bring them closer together.

1) **HCR:** In comparing the Volpe work to OMEGA, it appears that there is a huge discrepancy on HCR between the agencies (EPA is ~3% higher). I know that HCR was not included in the initial ANL work for Volpe, and purportedly NHTSA used EPA's engine maps for that tech, so this feels like something that will eventually move towards EPA's analysis.

2) **Cylinder Deactivation:** On the other hand, with cylinder deactivation, it seems like NHTSA is using much higher levels of improvement, especially for SUVs/trucks. Is there a clear reason for this discrepancy of which you are aware? I realize this might change as you look more at rolling deactivation or other technologies, but the differences (especially for SUVs) was pretty strong for these two, and it significantly affects how Volpe deals with HCR because of the (false) choice it places on HCR v. DEAC in the vehicle pathway.

3) **TDS:** In my examination of the two agencies' assessments, I was surprised to find that NHTSA's turbocharged, downsized engine effectiveness packages appear to be much more effective than EPA's, particularly since NHTSA relied on older engine maps. Is this a finding consistent with your analysis of the differences between the two agencies?

If there are not short answers to these questions, feel free to give me a call—I was mainly looking to truth-test some initial findings before I dig further at some of these issues. I thought maybe that since you all may have already worked out some of these differences in drafting the TAR you might have a quick synopsis explaining the larger discrepancies. While obviously the modeling tools used by the agencies for compliance are very different, which means that any fleet pathways for CAFE and GHG compliance in 2025 will have differences, in the FRM the inputs at least appear to be much more generally aligned than in the TAR, so I was trying to assess ways in which we might be able to provide clarity around these figures to help that process.

Thanks,

- Dave

David W. Cooke, Ph.D.

Senior Vehicles Analyst

Union of Concerned Scientists

1825 K Street, NW 8th floor

Washington, DC 20006

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e: dcooke@ucsusa.org

The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with citizens across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

Join our citizen action network or expert network. | Support our work. | Join the conversation on our blog or follow us on Twitter and Facebook.

From: Charmley, William
Location: DOT HQ - W40-300 - 1200 New Jersey Avenue, SE, Washington, DC 20590
Importance: Normal
Subject: Fwd: EPA/CARB/NHTSA Meeting organized by the Union of Concerned Scientists / NGO's (Confirmed)
Start Date/Time: Mon 5/23/2016 5:00:00 PM
End Date/Time: Mon 5/23/2016 6:00:00 PM

This meeting is on Monday

Do we know who is participating for CARB? They invited Richard Corey

Sent from my iPhone

Begin forwarded message:

From: "McCabe, Janet" <McCabe.Janet@epa.gov>
To: "Grundler, Christopher" <grundler.christopher@epa.gov>, "Hengst, Benjamin" <Hengst.Benjamin@epa.gov>, "Charmley, William" <charmley.william@epa.gov>
Subject: EPA/CARB/NHTSA Meeting organized by the Union of Concerned Scientists / NGO's (Confirmed)

EPA: Janet McCabe, Chris Grundler and Ben Hengst (in person) and Bill Charmley (by phone)
Re: to discuss the mid-term evaluation and specifically the upcoming Technical Assessment Report (TAR) that is due out in June of this year
In person attendees:

- Jonna Hamilton, Union of Concerned Scientists
- Aminah Zaghab, Environment America
- Luke Tonachel, Natural Resources Defense Council
- Jason Kuruvilla, Consumers Union
- Aaron Huertas, Cater Communications
- Chet France, Environmental Defense Fund
- Andrew Linhardt, Sierra Club
- Siddiq Khan, American Council on an Energy Efficient Economy
- Drew Kodjak, International Council on Clean Transportation *
- John German, International Council on Clean Transportation *
- Michelle Robinson, Union of Concerned Scientists *

Phone Attendees:

- Dan Becker, Safe Climate Campaign

- Jack Gillis, Consumer Federation of America
- Mel Hall-Crawford, Consumer Federation of America
- Zoe Lipman, Blue Green Alliance
- Carol Lee Rawn, Ceres
- Ruben Aronin, Better World Group
- Hilary Sinnamon, Environmental Defense Fund
- Jason Wynne, Pew Charitable Trusts
- Nic Lutsey, International Council on Clean Transportation *

*Tentative

To: Olechiw, Michael[olechiw.michael@epa.gov]
From: John German
Sent: Mon 4/27/2015 9:53:03 PM
Subject: Re: US/EU/China lightweight vehicle technology study - Next call April 28

Failure to communicate. The call tomorrow may be relatively short. :)
The tentative agenda I circulated earlier is as follows:

1) Discuss level of detail needed for the data collection, for the parameters laid out by Ducker.

- Regions should be clear and I think we want the most detailed data possible on materials.
- Do we want data by component or forming process, or is an overall vehicle assessment adequate?
- Do we want data by vehicle model or manufacturer, or is market segment adequate?
- Do we want data by both both location of final assembly plant and by market location?
- EPA has requested an analysis of global platforms, so we need data on whether platform is local or global.

2) How does the data from A2mac1 overlap with that from Ducker? What unique data does each offer?

3) Who would like to be part of a group to discuss costs and contract proposals with Ducker and A2mac1?

4) How does data from the SAE-China Lightweight Alliance compare with these parameters? (Assuming SAE-China can make the call.)

John

On Apr 27, 2015, at 4:20 PM, "Olechiw, Michael" <olechiw.michael@epa.gov> wrote:

John,

I am not sure what the agenda is/should be. I was under the impression that you wanted to meet and discuss the status of your research program. I am not sure that I have much more to offer than that.

Please let me know what your thoughts are regarding an agenda.

Mike

From: John German [mailto:john@theicct.org]
Sent: Friday, April 24, 2015 1:46 PM

To: Olechiw, Michael
Subject: Fwd: US/EU/China lightweight vehicle technology study - Next call April 28

Michael,

Can you give me some quick feedback on what you want to do at the April 28 call? Cheryl is asking me to postpone the call, but I scheduled it for April 28 because you suggested this would work for you.

What would you like to discuss at the call? Should we postpone?

John

Begin forwarded message:

From: John German <john@theicct.org>
Subject: Fwd: US/EU/China lightweight vehicle technology study - Next call April 28
Date: April 23, 2015 3:20:12 PM EDT
To: Cheryl Caffrey <caffrey.cheryl@epa.gov>
Cc: Ken White <slippery09@hotmail.co.uk>, Michael Olechiw <olechiw.michael@epa.gov>

Unfortunately, Doug just shot down my idea of inviting Ducker and A2mac1 to give presentations (see below).

Can EPA at least talk in general terms about the kind of data they are likely to need, including baseline years desired (e.g. would you like 2010 to match the rulemaking and are you going to use an updated year for the MTE)? I would late to postpone the meeting, given that most of the main players have already committed and it will be 3 more weeks before I could reschedule.

John

Begin forwarded message:

From: "Richman, Doug" <Doug.Richman@kaiseral.com>
Subject: RE: US/EU/China lightweight vehicle technology study - Next call April 28
Date: April 23, 2015 3:14:19 PM EDT
To: "John German" <john@theicct.org>

John,
I recommend developing an initial consensus description of what we think we want before we start discussions with Ducker or A2mac1. This exercise will help us focus on clearly defined articulated project goals, objectives and scope. Contractors will then be in a position to propose the services they can provide to support those objectives. Contractors will, by the nature of their business, offer suggested revisions to the draft project description.
Doug

From: John German [mailto:john@theicct.org]
Sent: Thursday, April 23, 2015 1:53 PM
To: Richman, Doug
Cc: george.coates@thephxway.com Coates
Subject: Re: US/EU/China lightweight vehicle technology study - Next call April 28

Thanks, Doug.

A quick question about the agenda for April 28. Do you think it would be worthwhile to have Ducker and A2mac1 give brief presentations on April 28 and answer a few questions? Or should we try to hash out what we want first?

John

On Apr 23, 2015, at 1:35 PM, "Richman, Doug" <Doug.Richman@kaiseral.com> wrote:

John,
I am available April 28 at 11 ET.
Doug Richman

From: John German [mailto:john@theicct.org]
Sent: Wednesday, April 22, 2015 3:25 PM
To: Michael Olechiw; Kevin Bolon; Cheryl Caffrey; Richman, Doug; Patrik Ragnarsson; Ed Opbroek; Russ Balzer; Jody R Shaw;george.coates@thephxway.com Coates; Ken White; Jan Guy; Amanda Kasik; Gina-Marie Oliver; Ingo.Sartorius@Plasticseurope.org; Patricia Vangheluwe; Pat Davis; Gong Huiming; Zhang Xiuli; 赵冬昶; 杨洁; 郭千里; lvwang@catarc.ac.cn; Ian Hodgson; Drew Kodjak; Hui He; Zifei Yang; Anup Bandivadekar; Peter Mock; Keri Browning
Subject: Re: US/EU/China lightweight vehicle technology study - Next call April 28

Although I have not heard back from most people and I have had two people say they cannot make April 28, I have decided to schedule the next meeting for April 28 (8am PT/11am ET/5pm ECT) for two reasons. First, the proposed date is only 6 days away and we need to get moving. Second, both EPA and Ian Hodgson (EC) are available on April 28 and I

would like to focus the next call on the data requirements, which will be largely determined by the regulators from EPA, EU, and China.

ICCT will once again set up a GoToMeeting for April 28. We will distribute this before the end of the week.

I talked to Scott Ulnick at Ducker this morning. He gave me some background information on the type of data that they can supply and how the data can be stratified:

- Region: North America, EU-27, other EU, Japan, China, S. Korea, South America, India.
- Vehicle Components, such as body-in-white, closures, bumpers, powertrain
- Materials: Type of materials (e.g. metals, plastics) and grades
- Forming process, such as stamping, cast materials, etc.
- Geographic: Their data is stored by the location of the final assembly plant. They also have sales, so they can link to where the vehicles are sold, but this would cost more.
- Vehicle models: Typically sort their data by vehicle class, such as A, B, C. They can dive deeper into models and manufacturers, but would cost more.

Please come to the April 28 call prepared to discuss the level of detail needed for the data collection. This is an important step before we can proceed with discussions with Ducker and A2mac1 on supplying data and cost.

Following is a tentative agenda for the April 28 meeting. Let me know if you have comments or suggestions on agenda items:

Tentative Agenda for April 28:

1) Discuss level of detail needed for the data collection, for the parameters laid out by Ducker.

- Regions should be clear and I think we want the most detailed data possible on materials.
- Do we want data by component or forming process, or is an overall vehicle assessment adequate?
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4) How does data from the SAE-China Lightweight Alliance compare with these parameters? (Assuming SAE-China can make the call.)

John
734-355-1055

On Apr 20, 2015, at 5:59 PM, John German <john@theicct.org> wrote:

Existing studies: Two additional links:

- The European Aluminum Association has a public version of their latest Ducker report: http://www.alueurope.eu/wp-content/uploads/2012/04/EAA-Aluminium-Penetration-in-cars_Final-Report-Public-version.pdf
- A September 2014 report by the American Chemistry Council on "Plastics and Polymer Composites in Light Vehicles" is attached.

Next meeting. So far, I have only had feedback on the proposed April 28 meeting from EPA (yes), Ed Opbroek (yes), and Patrick Ragnarsson (no). Please let me know if April 28 works for you, so that we can get this scheduled or try to find a different time.

John

On Apr 17, 2015, at 2:42 PM, John German <john@theicct.org> wrote:

Thanks to everyone for participation in the kickoff meeting yesterday. We had a good discussion and helped lay out some parameters and next steps.

Notes from the meeting are attached. Note that I have reorganized this a bit, plus we have some additions and corrections from CATARC and SAE-China. Please let me know if you have any corrections or comments.

Next meeting. During the call, we tentatively discussed April 30. Unfortunately, EPA is not available on April 30 or the following week. They suggested that Tuesday, April 28 would be best for them. Please let me know your availability for April 28. Time would be the same - 8 PT/11ET/5 CET.

Existing studies:

•SAE Paper 2015-01-0574 on A2mac1 data and statistical methods by Malen & Hughes.

The authors are presenting this paper at next weeks SAE Congress in Detroit Thursday morning, Paper is available on the SAE website. Abstract is b
elow.

•Plastics report is at: http://www.plastics-car.com/Tomorrows-Automobiles/Plastics-and-Polymer-Composites-Technology-Roadmap/Plastics-and-Polymer-Composites-Technology-Roadmap-for-Automotive-Markets-Full-Report.pdf
•Please send me links to any additional materials.

Next Steps:

•WorldAutoSteel will organize a briefing on the statistical methods used for the A2mac1 SAE paper.
•ICCT will follow up with EPA (and EU and CATARC?) to define the level of segregation they need for the data.
•ICCT will follow up with organizations that are interested but have not yet committed to participating.
•By next meeting hope to be able to define a scope of work, so we can request proposals.
•Any other suggestions?

John

On Apr 13, 2015, at 4:09 PM, John German <john@theicct.org> wrote:

Following is the GoToMeeting information for our meeting this Thursday. Please let me know if you need additional information - or if you have suggestions for the agenda (attached again).

1. Please join my meeting, Apr 16, 2015 at 8:00 AM PDT.
https://global.gotomeeting.com/join/616257053

2. Use your microphone and speakers (VoIP) - a headset is recommended. Or, call in using your telephone.

United States: +1 (224) 501-3316
Germany: +49 (0) 692 5736 7207

Access Code: 616-257-053
Audio PIN: Shown after joining the meeting

Meeting ID: 616-257-053
John
734-355-1055

Begin forwarded message:

From: John German <john@theicct.org>
Subject: Re: US/EU/China lightweight vehicle technology study - kickoff meeting April 16
Date: March 31, 2015 10:16:04 AM EDT

Sorry to take so long to pick a date for our kickoff meeting. This is a group of busy people and it was hard to come up with a day everyone could participate.

The best compromise is Thursday, April 16, 8am PT, 11am ET, 5pm CET (thanks to the steel folks for being flexible). I will sent up a GoToMeeting and send this with the call-in information in a followup email. We have a lot to cover so please plan on two hours for the meeting.

Attached is a draft agenda, along with a preliminary list of project goals. This includes ICCT's original ideas (below) and some input from EPA and WorldAutoSteel. I would appreciate any additional suggestions on the agenda and items that you would like to discuss - including the specific tasks that your organization would like to support.

While the meeting is focused on the participants, I am also sending this email to a number of potential participants and other interested observers. We encourage you to join the meeting and participate as appropriate.

John

<Plastics in LD vehicles - Sep2014.pdf>

To: Olechiw, Michael[olechiw.michael@epa.gov]
From: John German
Sent: Thur 1/29/2015 2:45:18 PM
Subject: Fwd: EPA participation in US/EU/China lightweighting study

I am available anytime today through 8:00 pm, except for a brief conference call at 3:30.
John

Begin forwarded message:

From: John German <john@theicct.org>
Subject: Re: EPA participation in US/EU/China lightweighting study
Date: January 28, 2015 9:14:53 AM EST
To: "Olechiw, Michael" <olechiw.michael@epa.gov>

I am available now through 10:30, from 1:00 to 2:30, and from 4:00 to 8:00 this evening.
John
734-355-1055

On Jan 28, 2015, at 7:42 AM, "Olechiw, Michael" <olechiw.michael@epa.gov> wrote:

Good morning John,

I did speak to Bill yesterday. What time is good to talk today? (and which number can I call you at?)

Mike

From: John German [mailto:john@theicct.org]
Sent: Tuesday, January 27, 2015 4:47 PM
To: Olechiw, Michael
Cc: Bolon, Kevin
Subject: Re: EPA participation in US/EU/China lightweighting study

Any update, Mike?

John

On Jan 14, 2015, at 4:25 AM, "Olechiw, Michael" <olechiw.michael@epa.gov> wrote:

John

I have not had the opportunity to speak with Bill yet. It was a short work week last week for me and I am now in Geneva at the GRPE. I have a meeting with Bill next week and I will discuss the issue with him then and get back to you. I know you are

anxious to receive confirmation of our participation.

Best Regards,

Mike

Michael R. Olechiw
Director - Light-duty Vehicles and Small Engines Center
USEPA/OTAQ/ASD
2000 Traverwood Drive
Ann Arbor MI 48105
Tel: +1-734-214-4297
Mobile: +1-734-546-8079
Fax: +1-734-214-4050
olechiw.michael@epa.gov

From: John German [mailto:john@theicct.org]
Sent: Tuesday, January 13, 2015 9:53 AM
To: Olechiw, Michael; Bolon, Kevin
Subject: Fwd: EPA participation in US/EU/China lightweighting study

Mike,

As per the voice message I just left you, I am following up to see if you had a chance to run this by Charmley. We are anxious to get moving, but we don't want to misrepresent EPA's position either.

Also, following are the notes I circulated internally on Dec. 19. I thought I had sent this to you, but I can't find anything in my mail box so I am attaching it here. Let me know if you have any comments or corrections.

John

Begin forwarded message:

From: John German <john@theicct.org>
Subject: Re: EPA participation in US/EU/China lightweighting study
Date: December 19, 2014 6:25:18 PM EST
To: Anup Bandivadekar <anup@theicct.org>
Cc: Peter Mock <peter@theicct.org>, Fanta Kamakate <fanta@theicct.org>, Drew Kodjak <drew@theicct.org>, Nic Lutsey <nic@theicct.org>

I met with Mike Olechiw and Kevin Bolon at EPA this afternoon to discuss possible EPA contributions to our US/EU/China lightweighting study. They were very interested and engaged.

Bottom line - EPA's primary interest is in obtaining baseline lightweight material data. They need this for the mid-term review and they have been discussing ways to get this. They purchased a somewhat reduced access to the A2mac1 data, but this does not meet their needs. Thus, Mike is interested in participating in the ICCT study - and contributing maybe $50-$100k. Two caveats:

- Mike has to talk to Bill Charmley about this and get his blessing, so please keep this internal to ICCT until then.
- If ICCT is to do the work, contract mechanism is a problem. EPA would have to go through an existing contractor, such as FEV or ERG, who would take 20% off the top. Another option would be to carve out some work that one of EPA's existing contractors could do and EPA would pay them.

Let me know if you have any concerns about parting out some of the work to an EPA contractor. I told Mike that ICCT would prefer to do the work ourselves, but that the actual work process would be dictated by the organizations that put up the money.

Mike and Kevin also made some constructive suggestions for the project "methodology:

- 1) a) - Add "trim level" and feature content to the calculation of "mass-eficiency" - as this is probably more significant for vehicle weight than nameplate.
- 3) - Honda has raised the issue that worldwide platforms may sacrifice some lightweighting material benefit due to the need to use common materials worldwide (i.e. the latest materials may only be available from one supplier in one region). Kevin doesn't necessarily buy this, but they would like this included in the analyses.
- 4) - Need to consider the impact of government safety policies on lightweighting, not just efficiency/CO2 policies.

John

From: Jonna Hamilton <JHamilton@ucsusa.org>
To: "Atkinson, Emily" <Atkinson.Emily@epa.gov>, "heather.laca@dot.gov"<heather.laca@dot.gov>, "carolina.zavala@arb.ca.gov"<carolina.zavala@arb.ca.gov>
Cc: "Dana.Douglas@dot.gov" <Dana.Douglas@dot.gov>
Subject: Attendees for Monday May 23 1 pm meeting

Dear Heather, Emily, and Carolina,

Here are the attendees for the meeting on Monday at 1 pm with Deputy Administrator Anderson, Assistant Administrator McCabe, and Mr. Corey. I am still working on the bios, but will have those to you tomorrow.

Can I also ask for a complete list for who will be joining the meeting/call from each agency?

Thanks – attendees are below,

Jonna

In person attendees:

Jonna Hamilton, Union of Concerned Scientists

Aminah Zaghab, Environment America

Luke Tonachel, Natural Resources Defense Council

Jason Kuruvilla, Consumers Union

Aaron Huertas, Cater Communications

Chet France, Environmental Defense Fund

Andrew Linhardt, Sierra Club

Siddiq Khan, American Council on an Energy Efficient Economy

Drew Kodjak, International Council on Clean Transportation *

John German, International Council on Clean Transportation *

Michelle Robinson, Union of Concerned Scientists *

*Tentative

Phone

Dan Becker, Safe Climate Campaign

Jack Gillis, Consumer Federation of America

Mel Hall-Crawford, Consumer Federation of America

Zoe Lipman, Blue Green Alliance

Carol Lee Rawn, Ceres

Ruben Aronin, Better World Group

Hilary Sinnamon, Environmental Defense Fund

Jason Wynne, Pew Charitable Trusts

Nic Lutsey, International Council on Clean Transportation *

From: "heather.laca@dot.gov" <heather.laca@dot.gov>
To: "JHamilton@ucsusa.org" <JHamilton@ucsusa.org>
Cc: "Atkinson, Emily" <Atkinson.Emily@epa.gov>, "carolina.zavala@arb.ca.gov"<carolina.zavala@arb.ca.gov>, "Dana.Douglas@dot.gov" <Dana.Douglas@dot.gov>
Subject: RE: Meeting Request

Monday, May 23 at 1 pm works out great. I have just sent out the calendar invite

From: Douglas, Dana (NHTSA)
Sent: Wednesday, May 04, 2016 5:08 PM
To: Jonna Hamilton
Cc: Laca, Heather (NHTSA); Atkinson, Emily; Zavala, Carolina@ARB
Subject: RE: Meeting Request

Hi,

Since Deputy Anderson will be participating on behalf of Administrator Rosekind, I have cc'd Heather Laca who is Assistant and will schedule. Thank you.

Dana

Dana Douglas

Executive Assistant to Administrator Rosekind

Office of the Administrator

National Highway Traffic Safety Administration

1200 New Jersey Avenue, SE

Washington, DC 20590

Dana.Douglas@dot.gov

Tel: 202-366-0361/1836

From: Atkinson, Emily [mailto:Atkinson.Emily@epa.gov]
Sent: Wednesday, May 04, 2016 9:51 AM
To: Jonna Hamilton; Zavala, Carolina@ARB

Cc: Douglas, Dana (NHTSA); Blackman, Anita (NHTSA)
Subject: RE: Meeting Request

Excellent – EPA is currently holding Monday, May 23 for a one hour meeting starting at 1:00pm ET. If this works for everyone, then we will wait to receive an official scheduler from the host, which I believe is NHTSA. Below is contact information for EPA's attendees, please send the official scheduler to this group.

Janet McCabe – mccabe.janet@epa.gov

Chris Grundler – Grundler.christopher@epa.gov

Ben Hengst – Hengst.benjamin@epa.gov

Bill Charmley – Charmley.William@epa.gov (by phone)

Thank you!

Emily

Emily Atkinson
Staff Assistant

Immediate Office of the Acting Assistant Administrator
Office of Air and Radiation, USEPA
Room 5406B, 1200 Pennsylvania Avenue NW
Washington, DC 20460
Voice: 202-564-1850
Email: atkinson.emily@epa.gov

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]
Sent: Tuesday, May 03, 2016 6:57 PM
To: Zavala, Carolina@ARB <carolina.zavala@arb.ca.gov>
Cc: Atkinson, Emily <Atkinson.Emily@epa.gov>; Dana.Douglas@dot.gov; Anita.Blackman@dot.gov
Subject: Re: Meeting Request

Thanks all - we will be able to do May 23 at 1 pm EST as well.

Thanks for getting this together.

Jonna

Sent from my iPhone

On May 3, 2016, at 5:23 PM, Zavala, Carolina@ARB <carolina.zavala@arb.ca.gov> wrote:

Hi Jonna/Emily,

I'm currently assisting Alberto Ayala and would like to know if the time proposed on Monday, May 23 at 1:00pm is in EST or PST? If this is at 1:00pm est (10:00am pst), that will work for ARB.

Thank you,

Carolina

From: Atkinson, Emily [mailto:Atkinson.Emily@epa.gov]
Sent: Monday, May 02, 2016 10:51 AM
To: Jonna Hamilton
Cc: Dana.Douglas@dot.gov; Anita.Blackman@dot.gov; Ayala, Alberto@ARB; Corey, Richard@ARB
Subject: RE: Meeting Request

Hi Joanna,

Unfortunately we would not be able to make Friday, May 6 at 11:00am work. We have a meeting with an outside organization planned at that time and could not move it.

EPA would like to include Janet McCabe, Chris Grundler and Ben Hengst (in person) and Bill Charmley (by phone) at this meeting.

We have a quite a bit of travel during the month of May but we could fit it in the week of May 23 – specifically Monday, 5/23 at 1pm. Could that work for you all? Adding back in CARB and NHTSA staff too to see if this could work for them.

Emily Atkinson
Staff Assistant

Immediate Office of the Acting Assistant Administrator
Office of Air and Radiation, USEPA
Room 5406B, 1200 Pennsylvania Avenue NW
Washington, DC 20460
Voice: 202-564-1850
Email: atkinson.emily@epa.gov

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]
Sent: Monday, May 02, 2016 1:29 PM
To: Atkinson, Emily <Atkinson.Emily@epa.gov>
Subject: FW: Meeting Request

Hi Emily,

I was going to ping you today to see if your office would be willing to pull together the three agency meeting that the NGO community requested and I just got a meeting time from Admin Rosekind's office. Is there any way that EPA can also join this meeting this Friday?

Thanks,

Jonna

Jonna Hamilton

Senior Washington Representative

Clean Vehicles Program

Union of Concerned Scientists

1825 K Street NW, Suite 800

Washington, DC 20001

202-331-5451

JHamilton@ucsusa.org

From: Dana.Douglas@dot.gov [mailto:Dana.Douglas@dot.gov]
Sent: Monday, May 02, 2016 1:26 PM
To: Jonna Hamilton
Cc: Anita.Blackman@dot.gov
Subject: Meeting Request

Hi Jonna,

Thank you for your request. Dr. Rosekind has availability on May 6 at 11:00am. Please provide bios for all the attendees participating from your end. The address is 1200 New Jersey Avenue, SE, Washington, DC 20590. Attendees should bring their government issued ID's so they can clear security. When your party enters the main entrance they should proceed to the guards desk and dial 202-366-1836 so that an escort can be provided. Please let me know if your team is available to meet at the specified date and time at your earliest convenience. Thank you.

Regards,

Dana

Dana Douglas

Executive Assistant to Administrator Rosekind

Office of the Administrator

National Highway Traffic Safety Administration

1200 New Jersey Avenue, SE

Washington, DC 20590

Dana.Douglas@dot.gov

Tel: 202-366-0361/1836

From: Jonna Hamilton [mailto:JHamilton@ucsusa.org]
Sent: Wednesday, April 27, 2016 2:17 PM
To: mccabe.janet@epa.gov; mark.rosekind@dot.gov; Corey, Richard@ARB
Cc: Atkinson.emily@epa.gov; hengst.benjamin@epa.gov; yvonne.e.clarke@dot.gov; Ayala, Alberto@ARB
Subject: Meeting request

Dear Assistant Administrator McCabe, Administrator Rosekind, and Mr. Corey,

On behalf of the NGO communities that represent environmental organizations, consumer groups, national security groups, and business groups, I would like to request a meeting in May to discuss the mid-term evaluation and specifically the upcoming Technical Assessment Report (TAR) that is due out in June of this year. Our organizations would like to learn more about your approach to the mid-term evaluation process and the TAR and share our view on the mid-term evaluation as well as preview some additional analysis that we are working on.

We look forward to talking with you.

Thank you,

Jonna Hamilton

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Thanks for getting this together.

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Staff Assistant

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Dana

Dana Douglas

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Cc: Atkinson.emily@epa.gov; hengst.benjamin@epa.gov; yvonne.e.clarke@dot.gov; Ayala, Alberto@ARB
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We look forward to talking with you.

Thank you,

Jonna Hamilton

Jonna Hamilton

Senior Washington Representative

Clean Vehicles Program

Union of Concerned Scientists

1825 K Street NW, Suite 800

Washington, DC 20001

202-331-5451

JHamilton@ucsusa.org

To: John German[john@theicct.org]
From: Olechiw, Michael
Sent: Tue 12/20/2016 11:50:13 AM
Subject: RE: Technology papers - Publication of Transmission Working Paper

John,

Thank you for sending these links. I have forwarded them to the EPA tech team for review.

Mike

From: John German [mailto:john@theicct.org]
Sent: Monday, December 19, 2016 3:38 PM
To: Charmley, William <charmley.william@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>; Alson, Jeff <alson.jeff@epa.gov>; Alberto@ARB Ayala <Alberto.Ayala@arb.ca.gov>; Mike McCarthy <michael.mccarthy@arb.ca.gov>
Cc: Anup Bandivadekar <anup@theicct.org>; NIc Lutsey <nic@theicct.org>; Joe Schultz <joe@theicct.org>; Aaron Isenstadt <aaron.isenstadt@theicct.org>
Subject: Re: Technology papers - Publication of Transmission Working Paper

FYI, we just published our detailed working paper on lightweighting, written in cooperation with suppliers:

http://www.theicct.org/lightweighting-technology-development-and-trends-us-passenger-vehicles

Except for the diesel working paper, which we hope to publish in February, this is the last of our working papers. You can find the home page for all of the pages at:

http://www.theicct.org/series/us-passenger-vehicle-technology-trends

Note that the page includes both the detailed working papers we wrote with suppliers and the shorter ICCT technology briefs, so most of the subjects are listed twice.

Specific web links for the other detailed technology working papers are as follows:

http://www.theicct.org/downsized-boosted-gasoline-engines

http://www.theicct.org/automotive-thermal-management-technology

http://www.theicct.org/PV-technology-transmissions-201608

http://www.theicct.org/naturally-aspirated-gas-engines-201606

http://www.theicct.org/hybrid-vehicles-trends-technology-development-and-cost-reduction

Please let me know if you have any questions or would like additional information.

John

On Aug 29, 2016, at 2:29 PM, John German <john@theicct.org> wrote:

FYI, we just published our second detailed technology working paper, this one on transmissions. Dana, BorgWarner, ITB, and FEV contributed to this paper:

http://www.theicct.org/PV-technology-transmissions-201608

Unfortunately, we have not yet finished ICCT's technology "brief" on transmissions, summarizing the results and adding a bit about implications on the mid-term review. I will let you know when this has been completed.

The papers on gasoline turbocharged engines and thermal management have finished supplier review and are now undergoing a final internal review by our communications team. The lightweighting paper was sent out for supplier review on Aug. 10, with their comments due by August 31. We are still hopeful that these can be finished by the end of September, with the paper on diesels following by the end of the year.

John

On Jun 21, 2016, at 10:51 AM, John German <john@theicct.org> wrote:

FYI, we just published two papers on naturally aspirated gasoline engines. These are the first in a series of technology reports in support of the 2017-25 mid-term review. Reports on transmissions, gasoline turbocharged engines, lightweighting, and thermal management will (hopefully) be finished by September, with a report on diesels following by the end of the year.

The first paper is the detailed working paper that we did in collaboration with Eaton, BorgWarner, and ITB.

Working paper: <http://theicct.org/naturally-aspirated-gas-engines-201606>

The second is ICCT's technology "brief", which summarizes the results of the working paper and adds a bit about implications on the mid-term review.
Tech brief: <http://theicct.org/naturally-aspirated-engines-techbrief-jun2016>

Let me know if you have any questions or want additional information.

John

Bcc: Charmley, William[charmley.william@epa.gov]; Bolon, Kevin[bolon.kevin@epa.gov]; Moran, Robin[moran.robin@epa.gov]; Barba, Daniel[barba.daniel@epa.gov]; john.lemanski@dow.com[john.lemanski@dow.com]; mmirdamadi@dow.com[mmirdamadi@dow.com]; doug_patton@denso.diam.com[doug_patton@denso.diam.com]; Alexandria_reed@denso-diam.com[Alexandria_reed@denso-diam.com]; shunichi_maeda@denso-diam.com[shunichi_maeda@denso-diam.com]; David Robertson[DRobertson@mazdausa.com]; dbarker@subaru.com[dbarker@subaru.com]; Jay Baron[jbaron@CARGROUP.ORG]; Brian Esterberg[besterberg@CARGROUP.ORG]; marianne.morgan@basf.com[marianne.morgan@basf.com]; Richman, Doug[doug.richman@kaiseraluminum.com]; Meuwissen Ana (RBNA/GOV)[Ana.Meuwissen@us.bosch.com]; Ian.Musselman@continental-corporation.com[Ian.Musselman@continental-corporation.com]; Chris Miller[cmiller@ajw-inc.com]; christopherdhess@eaton.com[christopherdhess@eaton.com]; Rasto Brezny[rbrezny@meca.org]; Olechiw Family[molechiw@gmail.com]; jakob.olechiw@gmail.com[jakob.olechiw@gmail.com]; Claire Olechiw[grazgirl2000@gmail.com]; zoel@bluegreenalliance.org[zoel@bluegreenalliance.org]; rawn@ceres.org[rawn@ceres.org]; msolomon@nescaum.org[msolomon@nescaum.org]; nkruger@4cleanair.org[nkruger@4cleanair.org]; mbreen@trumancnp.org[mbreen@trumancnp.org]; paul.billings@lung.org[paul.billings@lung.org]; lkavanagh@steel.org[lkavanagh@steel.org]; jhall@steel.org[jhall@steel.org]; gina-Marie_oliver@americanchemistry.com[gina-Marie_oliver@americanchemistry.com]; sanghamitra.sircar@owenscorning.com[sanghamitra.sircar@owenscorning.com]; lmerino@mema.org[lmerino@mema.org]; awilson@mema.org[awilson@mema.org]; dlancaster@borgwarner.com[dlancaster@borgwarner.com]; Jeff Zyburt[zyburt.dcyi@comcast.net]; Vandall, Todd[Todd.Vandall@magna.com]; stacey.bernards@honeywell.com[stacey.bernards@honeywell.com]; McKinley, Steve[Steven.McKinley@Honeywell.com]; kevin.hallstrom@basf.com[kevin.hallstrom@basf.com]; dbjmdassoc@aol.com[dbjmdassoc@aol.com]; neil.jackson@magna.com[neil.jackson@magna.com]; jorg.trampler@zf.com[jorg.trampler@zf.com]; patrick.sexton@dana.com[patrick.sexton@dana.com]; ragiemra.amato@delphi.com[ragiemra.amato@delphi.com]; terry.thiele@lubrizol.com[terry.thiele@lubrizol.com]; scott.hailey@lubrizol.com[scott.hailey@lubrizol.com]; christopher.kemmer@roechling-automotive.us[christopher.kemmer@roechling-automotive.us]; philip.george@schaeffler.com[philip.george@schaeffler.com]; hsullivan@tenneco.com[hsullivan@tenneco.com]; gweber@tenneco.com[gweber@tenneco.com]; hugh.blaxill@us.mahle.com[hugh.blaxill@us.mahle.com]; marc.wiseman@ricardo.com[marc.wiseman@ricardo.com]; matt.vint@veleo.com[matt.vint@veleo.com]; dgreenhaus@nada.org[dgreenhaus@nada.org]; akoblenz@nada.org[akoblenz@nada.org]; hupperich@fev.com[hupperich@fev.com]; diarmuid@teslamotors.com[diarmuid@teslamotors.com]; Kenneth Morgan[kmorgan@teslamotors.com]; johnsontv@corning.com[johnsontv@corning.com]; Pat Quinn[pquinn@theaccordgroup.com]; james.chen@ff.com[james.chen@ff.com]; kevin.vincent@ff.com[kevin.vincent@ff.com]; Nic Lutsey[nic@theicct.org]; drew@icct.org[drew@icct.org]; cfrance@sbcglobal.net[cfrance@sbcglobal.net]; hilary@redmtngroup.com[hilary@redmtngroup.com]; dcooke@ucsusa.org[dcooke@ucsusa.org]; ltonachel@nrdc.org[ltonachel@nrdc.org]; rhwang@nrdc.org[rhwang@nrdc.org]; mrobinson@ucsusa.org[mrobinson@ucsusa.org]; jack@jagillis.com[jack@jagillis.com]; danair@ucsusa.com[danair@ucsusa.com]; sbaker-branstetter@consumer.org[sbaker-branstetter@consumer.org]; 'Tober Werner K.'[Werner.Tober@ifa.tuwien.ac.at]; jthannon50@gmail.com[jthannon50@gmail.com]; Bellamy, Joanna (EC)[joanna.bellamy@canada.ca]; rdiamond@secureenergy.org[rdiamond@secureenergy.org]; John German[john@theicct.org]; jack@consumerfed.org[jack@consumerfed.org]; jhamilton@ucsusa.org[jhamilton@ucsusa.org]; Rick Gezelle[rick.gezelle@toyota.com]; Julia Rege[jrege@globalautomakers.org]; barbara.kiss@gm.com[barbara.kiss@gm.com]; james_kliesch@ahm.honda.com[james_kliesch@ahm.honda.com]; Robert_Bienenfeld@ahm.honda.com[Robert_Bienenfeld@ahm.honda.com]; Homeister, Nancy (N.L.)[nhomeist@ford.com]; Oshnock Gary (FCA)[gary.oshnock@fcagroup.com]; Nakamura-Newbraugh, Yasumi[yasumi.nakamura-newbraugh@Nissan-Usa.com]; tracy.woodard@nissan-usa.com[tracy.woodard@nissan-usa.com]; thom.tb.becker@bmw.de[thom.tb.becker@bmw.de]; Bryan.Jacobs@bmwna.com[Bryan.Jacobs@bmwna.com]; Glenn.Schmidt@bmw.de[Glenn.Schmidt@bmw.de]; kyehl@volvocars.com[kyehl@volvocars.com];

Clinton Blair[cblair18@jaguarlandrover.com]; william.craven@mbusa.com[william.craven@mbusa.com]; Bakker, Deborah[dbakker@hatci.com]; jviera@ford.com[jviera@ford.com]; Stuart Johnson[Stuart.Johnson@vw.com]; Michael Hartrick[MHartrick@autoalliance.org]; matthew.rudnick@gm.com[matthew.rudnick@gm.com]; David Patterson[david.patterson@na.mitsubishi-motors.com]; Nikolaus Steininger[Nikolaus.Steininger@ec.europa.eu]; Albus, Christoph[christoph.albus@bmvi.bund.de]; narusawa[narusawa@ntsel.go.jp]; Giallonardo, Andrew (EC)[andrew.giallonardo@canada.ca]; Klomp, Ryan[ryan.klomp@tc.gc.ca]; Lothrop, Jim[jim.lothrop@tc.gc.ca]; McCarthy, Mike@ARB[mmccarth@arb.ca.gov]; P Hughes[phughes@arb.ca.gov]; Sarah Carter[sarah.carter@arb.ca.gov]; Gagne,Louis-Philippe [NCR][Louis-Philippe.Gagne@ec.gc.ca]; Couroux, Stephane (EC)[stephane.couroux@canada.ca]; Kamal Charafeddine[kamal.charafeddine@porsche.de]; chris.hennessy@iav-usa.com[chris.hennessy@iav-usa.com]; richards@ducker.com[richards@ducker.com]; Glenn Passavant[glenn.passavant@ingevity.com]; Nam, Ed[nam.ed@epa.gov]; dwertheim@ferrariusa.com[dwertheim@ferrariusa.com]; eric.fedwa@ihs.com[eric.fedwa@ihs.com]; michael.robinet@ihs.com[michael.robinet@ihs.com]; tjozaki@jatco-usa.com[tjozaki@jatco-usa.com]; tim.skszek@maga.com[tim.skszek@maga.com]; jeff.conklin@magna.com[jeff.conklin@magna.com]; jeff.hemphill@shaeffler.com[jeff.hemphill@shaeffler.com]; klaus.land@daimler.com[klaus.land@daimler.com]; jon.yarrow@astonmartin.com[jon.yarrow@astonmartin.com]; swood@lotus.com[swood@lotus.com]; Cawdron, Ian[ICawdron@lotuscars.com]; Montague, Peter[peter.montague@mclaren.com]; Chris Nevers[CNevers@autoalliance.org]
From: Olechiw, Michael
Sent: Mon 7/18/2016 5:58:06 PM
Subject: Release of the Draft Technical Assessment Report for the 2022~2025 MY Light-duty Greenhouse Gas and CAFE Standards

Dear Stakeholder,

Today EPA, NHTSA, and CARB have released the Draft Technical Assessment Report for the 2022-2025 MY GHG & CAFE standards. Below is a link to the EPA web-page which has the Draft TAR available for download.

https://www3.epa.gov/otaq/climate/mte.htm

This report is the first formal step in the Midterm Evaluation process and is not intended to be a decision document, but rather an opportunity for the agencies to seek comment on the information and the methodologies that will be used by the Administrator in making the Proposed and Final Determinations. We encourage all of you to review the report and comment on the content.

Best Regards,

Michael R. Olechiw

Director - Light-duty Vehicles and Small Engines Center

USEPA/OTAQ/ASD

2000 Traverwood Drive

Ann Arbor MI 48105

Tel: +1-734-214-4297

Mobile: +1-734-546-8079

Fax: +1-734-214-4050

olechiw.michael@epa.gov

To: John German[john@theicct.org]
From: Olechiw, Michael
Sent: Mon 4/27/2015 8:20:10 PM
Subject: RE: US/EU/China lightweight vehicle technology study - Next call April 28

John,

I am not sure what the agenda is/should be. I was under the impression that you wanted to meet and discuss the status of your research program. I am not sure that I have much more to offer than that.

Please let me know what your thoughts are regarding an agenda.

Mike

From: John German [mailto:john@theicct.org]
Sent: Friday, April 24, 2015 1:46 PM
To: Olechiw, Michael
Subject: Fwd: US/EU/China lightweight vehicle technology study - Next call April 28

Michael,

Can you give me some quick feedback on what you want to do at the April 28 call? Cheryl is asking me to postpone the call, but I scheduled it for April 28 because you suggested this would work for you.

What would you like to discuss at the call? Should we postpone?

John

Begin forwarded message:

From: John German <john@theicct.org>

Subject: Fwd: US/EU/China lightweight vehicle technology study - Next call April 28

Date: April 23, 2015 3:20:12 PM EDT

To: Cheryl Caffrey <caffrey.cheryl@epa.gov>

Cc: Ken White <slippery09@hotmail.co.uk>, Michael Olechiw <olechiw.michael@epa.gov>

Unfortunately, Doug just shot down my idea of inviting Ducker and A2mac1 to give presentations (see below).

Can EPA at least talk in general terms about the kind of data they are likely to need, including baseline years desired (e.g. would you like 2010 to match the rulemaking and are you going to use an updated year for the MTE)? I would late to postpone the meeting, given that most of the main players have already committed and it will be 3 more weeks before I could reschedule.

John

Begin forwarded message:

From: "Richman, Doug" <Doug.Richman@kaiseral.com>

Subject: RE: US/EU/China lightweight vehicle technology study - Next call April 28

Date: April 23, 2015 3:14:19 PM EDT

To: "John German" <john@theicct.org>

John,

I recommend developing an initial consensus description of what we think we want before we start discussions with Ducker or A2mac1. This exercise will help us focus on clearly defined articulated project goals, objectives and scope. Contractors will then be in a position to propose the services they can provide to support those objectives. Contractors will, by the nature of their business, offer suggested revisions to the draft project description.

Doug

From: John German [mailto:john@theicct.org]
Sent: Thursday, April 23, 2015 1:53 PM
To: Richman, Doug
Cc: george.coates@thephxway.com Coates
Subject: Re: US/EU/China lightweight vehicle technology study - Next call April 28

Thanks, Doug.

A quick question about the agenda for April 28. Do you think it would be worthwhile to have Ducker and A2mac1 give brief presentations on April 28 and answer a few questions? Or should we try to hash out what we want first?

John

On Apr 23, 2015, at 1:35 PM, "Richman, Doug" <Doug.Richman@kaiseral.com> wrote:

John,

I am available April 28 at 11 ET.

Doug Richman

From: John German [mailto:john@theicct.org]
Sent: Wednesday, April 22, 2015 3:25 PM
To: Michael Olechiw; Kevin Bolon; Cheryl Caffrey; Richman, Doug; Patrik Ragnarsson; Ed Opbroek; Russ Balzer; Jody R Shaw;george.coates@thephxway.com Coates; Ken White; Jan Guy; Amanda Kasik; Gina-Marie Oliver; Ingo.Sartorius@Plasticseurope.org; Patricia Vangheluwe; Pat Davis; Gong Huiming; Zhang Xiuli; 赵冬昶; 杨洁; 郭千里; lvwang@catarc.ac.cn; Ian Hodgson; Drew Kodjak; Hui He; Zifei Yang; Anup Bandivadekar; Peter Mock; Keri Browning
Subject: Re: US/EU/China lightweight vehicle technology study - Next call April 28

Although I have not heard back from most people and I have had two people say they cannot make April 28, I have decided to **schedule the next meeting for April 28 (8am PT/11am ET/5pm ECT)** for two reasons. First, the proposed date is only 6 days away and we need to get moving. Second, both EPA and Ian Hodgson (EC) are available on April 28 and **I would like to focus the next call on the data requirements,** which will be largely determined by the regulators from EPA, EU, and China.

ICCT will once again set up a GoToMeeting for April 28. We will distribute this before the end of the week.

I talked to Scott Ulnick at Ducker this morning. He gave me some background information on the type of data that they can supply and how the data can be stratified:

- **Region**: North America, EU-27, other EU, Japan, China, S. Korea, South America, India.
- **Vehicle Components,** such as body-in-white, closures, bumpers, powertrain
- **Materials**: Type of materials (e.g. metals, plastics) and grades
- **Forming process**, such as stamping, cast materials, etc.
- **Geographic:** Their data is stored by the location of the final assembly plant. They also have sales, so they can link to where the vehicles are sold, but this would cost more.
- **Vehicle models:** Typically sort their data by vehicle class, such as A, B, C. They can dive deeper into models and manufacturers, but would cost more.

Please come to the April 28 call prepared to **discuss the level of detail needed for the data collection**. This is an important step before we can proceed with discussions with Ducker and A2mac1 on supplying data and cost.

Following is a tentative agenda for the April 28 meeting. Let me know if you have comments or suggestions on agenda items:

Tentative Agenda for April 28:

1) Discuss level of detail needed for the data collection, for the parameters laid out by Ducker.

- Regions should be clear and I think we want the most detailed data possible on materials.
- Do we want data by component or forming process, or is an overall vehicle assessment adequate?
- Do we want data by vehicle model or manufacturer, or is market segment adequate?
- Do we want data by both both location of final assembly plant and by market location?
- EPA has requested an analysis of global platforms, so we need data on whether platform is local or global.

2) How does the data from A2mac1 overlap with that from Ducker? What unique data does each offer?

3) Who would like to be part of a group to discuss costs and contract proposals with Ducker and A2mac1?

4) How does data from the SAE-China Lightweight Alliance compare with these parameters? (Assuming SAE-China can make the call.)

John

734-355-1055

On Apr 20, 2015, at 5:59 PM, John German <john@theicct.org> wrote:

Existing studies: Two additional links:

- The European Aluminum Association has a public version of their latest Ducker report: http://www.alueurope.eu/wp-content/uploads/2012/04/EAA-Aluminium-Penetration-in-cars_Final-Report-Public-version.pdf
- A September 2014 report by the American Chemistry Council on "Plastics and Polymer Composites in Light Vehicles" is attached.

Next meeting. So far, I have only had feedback on the proposed April 28 meeting from EPA (yes), Ed Opbroek (yes), and Patrick Ragnarsson (no). **Please let me know if April 28 works for you**, so that we can get this scheduled or try to find a different time.

John

On Apr 17, 2015, at 2:42 PM, John German <john@theicct.org> wrote:

Thanks to everyone for participation in the kickoff meeting yesterday. We had a good discussion and helped lay out some parameters and next steps.

Notes from the meeting are attached. Note that I have reorganized this a bit, plus we have some additions and corrections from CATARC and SAE-China. **Please let me know if you have any corrections or comments.**

Next meeting. During the call, we tentatively discussed April 30. Unfortunately, EPA is not available on April 30 or the following week. They suggested that Tuesday, April 28 would be best for them. **Please let me know your availability for April 28.** Time would be the same - 8 PT/11ET/5 CET.

Existing studies:

- SAE Paper 2015-01-0574 on A2mac1 data and statistical methods by Malen & Hughes.

The authors are presenting this paper at next weeks SAE Congress in Detroit Thursday morning, Paper is available on the SAE website. Abstract is b

elow.

- Plastics report is at: http://www.plastics-car.com/Tomorrows-Automobiles/Plastics-and-Polymer-Composites-Technology-Roadmap/Plastics-and-Polymer-Composites-Technology-Roadmap-for-Automotive-Markets-Full-Report.pdf
- **Please send me links to any additional materials.**

Next Steps:

- WorldAutoSteel will organize a briefing on the statistical methods used for the A2mac1 SAE paper.
- ICCT will follow up with EPA (and EU and CATARC?) to define the level of segregation they need for the data.
- ICCT will follow up with organizations that are interested but have not yet committed to participating.
- By next meeting hope to be able to define a scope of work, so we can request proposals.
- **Any other suggestions?**

John

On Apr 13, 2015, at 4:09 PM, John German <john@theicct.org> wrote:

Following is the GoToMeeting information for our meeting this Thursday. Please let me know if you need additional information - or if you have suggestions for the agenda (attached again).

1. Please join my meeting, Apr 16, 2015 at 8:00 AM PDT.
https://global.gotomeeting.com/join/616257053

2. Use your microphone and speakers (VoIP) - a headset is recommended. Or, call in using your telephone.

United States: +1 (224) 501-3316
Germany: +49 (0) 692 5736 7207

Access Code: 616-257-053
Audio PIN: Shown after joining the meeting

Meeting ID: 616-257-053

John

734-355-1055

Begin forwarded message:

From: John German <john@theicct.org>

Subject: Re: US/EU/China lightweight vehicle technology study - kickoff meeting April 16

Date: March 31, 2015 10:16:04 AM EDT

Sorry to take so long to pick a date for our kickoff meeting. This is a group of busy people and it was hard to come up with a day everyone could participate.

The best compromise is **Thursday, April 16, 8am PT, 11am ET, 5pm CET** (thanks to the steel folks for being flexible). I will sent up a GoToMeeting and send this with the call-in information in a followup email. We have a lot to cover so please plan on **two hours for the meeting**.

Attached is a draft agenda, along with a preliminary list of project goals. This includes ICCT's original ideas (below) and some input from EPA and WorldAutoSteel. **I would appreciate any additional suggestions on the agenda and items that you would like to discuss - including the specific tasks that your organization would like to support.**

While the meeting is focused on the participants, I am also sending this email to a number of potential participants and other interested observers. We encourage you to join the meeting and participate as appropriate.

John

<Plastics in LD vehicles - Sep2014.pdf>

To: John German[john@theicct.org]
From: Olechiw, Michael
Sent: Wed 1/28/2015 12:42:03 PM
Subject: RE: EPA participation in US/EU/China lightweighting study

Good morning John,

I did speak to Bill yesterday. What time is good to talk today? (and which number can I call you at?)

Mike

From: John German [mailto:john@theicct.org]
Sent: Tuesday, January 27, 2015 4:47 PM
To: Olechiw, Michael
Cc: Bolon, Kevin
Subject: Re: EPA participation in US/EU/China lightweighting study

Any update, Mike?

John

On Jan 14, 2015, at 4:25 AM, "Olechiw, Michael" <olechiw.michael@epa.gov> wrote:

John

I have not had the opportunity to speak with Bill yet. It was a short work week last week for me and I am now in Geneva at the GRPE. I have a meeting with Bill next week and I will discuss the issue with him then and get back to you. I know you are anxious to receive confirmation of our participation.

Best Regards,

Mike

Michael R. Olechiw

Director - Light-duty Vehicles and Small Engines Center

USEPA/OTAQ/ASD

2000 Traverwood Drive

Ann Arbor MI 48105

Tel: +1-734-214-4297

Mobile: +1-734-546-8079

Fax: +1-734-214-4050

olechiw.michael@epa.gov

From: John German [mailto:john@theicct.org]
Sent: Tuesday, January 13, 2015 9:53 AM
To: Olechiw, Michael; Bolon, Kevin
Subject: Fwd: EPA participation in US/EU/China lightweighting study

Mike,

As per the voice message I just left you, I am following up to see if you had a chance to run this by Charmley. We are anxious to get moving, but we don't want to misrepresent EPA's position either.

Also, following are the notes I circulated internally on Dec. 19. I thought I had sent this to you, but I can't find anything in my mail box so I am attaching it here. Let me know if you have any

comments or corrections.

John

Begin forwarded message:

From: John German <john@theicct.org>

Subject: Re: EPA participation in US/EU/China lightweighting study

Date: December 19, 2014 6:25:18 PM EST

To: Anup Bandivadekar <anup@theicct.org>

Cc: Peter Mock <peter@theicct.org>, Fanta Kamakate <fanta@theicct.org>, Drew Kodjak <drew@theicct.org>, NIc Lutsey <nic@theicct.org>

I met with Mike Olechiw and Kevin Bolon at EPA this afternoon to discuss possible EPA contributions to our US/EU/China lightweighting study. They were very interested and engaged.

Bottom line - **EPA's primary interest is in obtaining baseline lightweight material data.** They need this for the mid-term review and they have been discussing ways to get this. They purchased a somewhat reduced access to the A2mac1 data, but this does not meet their needs. Thus, **Mike is interested in participating in the ICCT study - and contributing maybe $50-$100k.** Two caveats:

- **Mike has to talk to Bill Charmley about this and get his blessing, so please keep this internal to ICCT until then.**
- If ICCT is to do the work, contract mechanism is a problem. EPA would have to go through an existing contractor, such as FEV or ERG, who would take 20% off the top. Another option would be to carve out some work that one of EPA's existing contractors could do and EPA would pay them.

Let me know if you have any concerns about parting out some of the work to an EPA contractor. I told Mike that ICCT would prefer to do the work ourselves, but that the actual work process would be dictated by the organizations that put up the money.

Mike and Kevin also made some constructive suggestions for the project "methodology:

- 1) a) - Add "trim level" and feature content to the calculation of "mass-eficiency" - as this is probably more significant for vehicle weight than nameplate.
- 3) - Honda has raised the issue that worldwide platforms may sacrifice some lightweighting material benefit due to the need to use common materials worldwide (i.e. the latest materials may only be available from one supplier in one region). Kevin doesn't necessarily buy this, but they would like this included in the analyses.
- 4) - Need to consider the impact of government safety policies on lightweighting, not just efficiency/CO2 policies.

John

Cc: Olechiw, Michael[olechiw.michael@epa.gov]
To: Sherwood, Todd[sherwood.todd@epa.gov]
From: Nic Lutsey
Sent: Thur 12/1/2016 6:46:04 PM
Subject: Re: Questions about ICCT OMEGA modeling

Hi Todd,

Thanks, this is great. Yep, this should do the trick. And I really appreciate the quick response too.

Nic

> On Dec 1, 2016, at 10:36 AM, Sherwood, Todd <sherwood.todd@epa.gov> wrote:
>
> Nic,
>
> You're right that a separate tool, actually 2 tools are used to generate a MasterSet (MS) file from the MachineOutput file. I have attached them but want to be sure to express the caveat that they were developed for my use to make my life easier so they are not meant to be elegant or user friendly or any such thing.
>
> What's attached is a MasterSet_generator (basically an input table where you specify input filenames to use along with output filenames), and a MasterSet_template into which the generator's VBA will paste values from the MachineOutput files, other values from the generator's table of input values, and then calc all of the fuel savings, etc., information that makes up the MS file.
>
> Hopefully that explanation is enough, if not then don't hesitate to call or email for more details.
>
> As for the PD, everything is on our webpage at https://www.epa.gov/regulations-emissions-vehicles-and-engines/optimization-model-reducing-emissions-greenhouse-gases
>
> There are 3 separate zip files. And it's all there this time since several people have asked for these internal, inelegant tools so I just posted the whole lot.
>
> Good luck.
>
> -----Original Message-----
> From: Nic Lutsey [mailto:nic@theicct.org]
> Sent: Thursday, December 01, 2016 11:51 AM
> To: Sherwood, Todd <sherwood.todd@epa.gov>; Olechiw, Michael <olechiw.michael@epa.gov>
> Subject: Questions about ICCT OMEGA modeling
>
> Hi Todd and Mike,
>
> I can imagined you’re as busy as ever right now. We are continuing to chip away at our analysis at ICCT, including work with OMEGA, and had two questions.
>
> (1) Regarding the Draft TAR analysis, we have successfully located all the files and can recreate the same results as EPA, so thanks for sharing all the datafiles. But we can’t quite recreate all the steps to compile and rank the packages. Is the OMEGA Master-set generator tool available? This appears to be the tool that would supplement the master set cost and effectiveness data produced by the "Machine 2014B" Excel code with additional information (e.g., discounted fuel savings, lifetime CO2, etc.) that is used to produce the input file required for the tech package ranking routine. This tool does not appear to be included with the available OMEGA data. In that data, the output file(s) from "Machine 2014B" are of the naming convention "MachineOutput_MS_YYYY_inYYYYAB" while the input files that go into the

ranking routine are of the convention "MS_YYYY_inYYYYAB_scenario.xlsb." The latter file includes data from the former plus supplemental data that is apparently generated by a software tool. It is that tool that appears to be missing (and that we are seeking).
>
> (2) Will you be releasing the full set of new datafiles for the Proposed Determination and TSD that were released yesterday? At this stage in our research project, I'm not inclined to update to the latest TSD-associated OMEGA files, but I figure best to know if this is even a possibility.
>
> Also, I'd be glad to chat through our analysis of scenarios and I'd be curious about your latest. Apologies for the intrusion and questions! I've tried to limit our team's inquiries as much as possible.
>
> Please feel free to call anytime at my cell Ex. 6 - Personal Privacy and office (415-202-5743).
>
> Nic
>
> <3_MasterSet_template.xlsb><4_MasterSet_generator.xlsm>