

SUPPLEMENTAL DECLARATION OF MARGO OGE

EXHIBIT A

Records of Emails between EPA Staff and Stakeholders about the OMEGA Model

Source:

Records published by EPA, in response to Freedom of Information Act Request Number EPA-HQ-2018-007517 submitted by the Environmental Defense Fund,
<https://www.foiaonline.gov/foiaonline/action/public/submissionDetails?trackingNumber=EPA-HQ-2018-007517&type=request>

Message

From: Michael Hartrick [MHartrick@autoalliance.org]
Sent: 8/1/2016 6:56:42 PM
To: Olechiw, Michael [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=9f564b92ff96459ab606eb66e5892e2d-Olechiw, Michael]
CC: Cherry, Jeff [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=17c907940ac14cbab1236dfdfeca8300-Cherry, Jeff]; Charmley, William [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=fb1828fb00af42ffb68b9e0a71626d95-Charmley, William]; Bolon, Kevin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f7c0684aaef44174801c0406b51034d2-Bolon, Kevin]; Moran, Robin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=cdc537a0f9d5433dae083bca681af983-Moran, Robin]; Kargul, John [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=57edb801d8d1408991163c50e4efa276-Kargul, John]; Silverman, Steven [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=2cabad28b2394fbda8c047cdc4ef3fdc-SSILVE02]; Barba, Daniel [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ba2d819c3cae4c14a8446ed4a918a3c5-Barba, Daniel]; Chris Nevers [CNevers@autoalliance.org]
Subject: RE: ALPHA Model Inputs and Outputs Request

Thank you again, Mike. We will review and let you know if we have any questions. -Mike Hartrick

Sent from my Verizon 4G LTE smartphone

----- Original message -----

From: "Olechiw, Michael" <olechiw.michael@epa.gov>
Date: 8/1/16 2:01 PM (GMT-05:00)
To: Michael Hartrick <MHartrick@autoalliance.org>
Cc: "Cherry, Jeff" <Cherry.Jeff@epa.gov>, Bill Charmley <charmley.william@epa.gov>, "Bolon, Kevin" <Bolon.Kevin@epa.gov>, "Moran, Robin" <moran.robin@epa.gov>, "Kargul, John" <kargul.john@epa.gov>, "Silverman, Steven" <silverman.steven@epa.gov>, "Barba, Daniel" <Barba.Daniel@epa.gov>, Chris Nevers <CNevers@autoalliance.org>
Subject: RE: ALPHA Model Inputs and Outputs Request

Mike,

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 - All of the lumped parameter model inputs, outputs, and source code are located on the OMEGA webpage: <https://www3.epa.gov/otaq/climate/models.htm>

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

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olechiw.michael@epa.gov

From: Michael Hartrick [mailto:MHarttrick@autoalliance.org]

Sent: Wednesday, July 27, 2016 5:25 PM

To: Olechiw, Michael <olechiw.michael@epa.gov>

Cc: Cherry, Jeff <Cherry.Jeff@epa.gov>; Charmley, William <charmley.william@epa.gov>; Bolon, Kevin <Bolon.Kevin@epa.gov>; Moran, Robin <moran.robin@epa.gov>; Kargul, John <kargul.john@epa.gov>; Silverman, Steven <silverman.steven@epa.gov>; Barba, Daniel <Barba.Daniel@epa.gov>; Chris Nevers <CNevers@autoalliance.org>

Subject: RE: ALPHA Model Inputs and Outputs Request

Mike,

Thanks for the quick response. We've taken a look at the sites and dockets that you reference. It is still not clear that these sites have the information requested. For example:

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Mike Hartrick
Director of Fuel Economy and Climate
Alliance of Automobile Manufacturers
Desk (248) 357-4717 x103
Mobile (248) 212-3590
MHartrick@autoalliance.org

From: Olechiw, Michael [<mailto:olechiw.michael@epa.gov>]
Sent: Monday, July 25, 2016 12:47 PM
To: Michael Hartrick
Cc: Cherry, Jeff; Bill Charmley; Bolon, Kevin; Moran, Robin; Kargul, John; Silverman, Steven; Barba, Daniel
Subject: RE: ALPHA Model Inputs and Outputs Request

Michael,

Thank you for your inquiry regarding EPA's ALPHA model as it relates to the Midterm Evaluation Draft TAR. To meet the commitments EPA made in the DTAR regarding transparency, we posted the ALPHA model, the LPM and DTAR ALPHA runs on our website on July 18th, the same day that the DTAR was released. (The links are provided below.)

If you have any further questions, please let me know.

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

ALPHA and LPM Links:

1. The ALPHA model is written in standard MATLAB/Simulink/Stateflow (no additional toolboxes are required) and the dedicated webpage is located here:

<https://www3.epa.gov/otaq/climate/alpha.htm>

- In the "ALPHA v2.0 Simulation Samples" section you will find twelve complete ready to run ALPHA models. These models contain the MATLAB workspace, ALPHA Simulink source diagrams, engine maps, transmission maps, and other data used in the Draft TAR analysis.
- The "readme.txt" file explains the installation and execution process within a standard MATLAB/Simulink/Stateflow 2014A environment.
- The "standard_car_lpm_matrix_results_2016_07_14_15_52.csv" file is a summary of the inputs and outputs of the twelve models. The summary outputs include cycle CO₂ and performance results.

2. Additional information available on the ALPHA (<https://www3.epa.gov/otag/climate/alpha.htm>) and Data Testing (<https://www3.epa.gov/otag/climate/data-testing.htm>) webpages:
 - Reference publications and SAE papers for the development and validation of the ALPHA model
 - Benchmarking information
 - Engine mapping process
3. Additional information in the federal docket:
 - EPA-HQ-OAR-2015-0827-0899 is a memo containing the docket locations for several engine and transmission benchmarking projects
4. Link to the Lumped Parameter Model webpage (<https://www3.epa.gov/otag/climate/lpm.htm>)

From: Michael Hartrick [<mailto:MHarttrick@autoalliance.org>]

Sent: Friday, July 22, 2016 9:43 AM

To: Olechiw, Michael <olechiw.michael@epa.gov>; Barba, Daniel <Barba.Daniel@epa.gov>

Subject: ALPHA Model Inputs and Outputs Request

Mike and Dan,

Throughout the Draft Technical Assessment Report the agencies discuss how the mid-term evaluation is intended to be, among other things, a transparent process. Specific to the ALPHA model, EPA states, "using ALPHA improves the transparency of the process," (TAR 5-246) and that "EPA developed an in-house vehicle simulation model that could freely be released to the public." (TAR 5-256)

The Alliance of Automobile Manufacturers respectfully requests that you make the following data publicly available as soon as possible such that adequate time for review and response is provided prior to the close of the TAR comment period:

1. The executable version of the ALPHA model used to inform the TAR.
2. The source code for the version of the ALPHA model used to inform the TAR.
3. All ALPHA model inputs for each vehicle simulated that informed the central analysis of the TAR including:
 - a. Vehicle weight
 - b. Road load information
 - c. Powertrain type
 - d. Engine displacement
 - e. Number of engine cylinders
 - f. Aspiration method
 - g. Boost pressure
 - h. Compression ratio
 - i. Fuel injection type
 - j. Valve timing system
 - k. Valve lift system
 - l. Presence of cylinder deactivation system
 - m. Presence of lean operation (if any)

- n. Presence of high expansion ratio (e.g. Atkinson)
 - o. Engine stop-start system presence
 - p. Assumptions for the operation of the stop-start system
 - q. Engine idle speed
 - r. Hybrid type, if applicable
 - s. Off-board charge capability
 - t. Traction motor size
 - u. Generator size
 - v. Traction battery capacity
 - w. Transmission type
 - x. Transmission step ratios
 - y. Launch device (e.g. clutch, torque converter, other)
 - z. Driveline (FWD, RWD, AWD, 4WD)
 - aa. Secondary axle disconnect
 - bb. Tire and wheel size
 - cc. Overall ratios for transmission and final drive
 - dd. Electrical load assumptions
 - ee. Accessory load assumptions
 - ff. Fuel properties including LHV, mass density, carbon density, and octane
4. ALPHA model outputs associated with each set of inputs including:
- a. City fuel consumption
 - b. Highway fuel consumption
 - c. City CO2
 - d. Highway CO2
 - e. Vehicle performance (time to speed and passing)

Please let me know when you make the above publicly available and provide a link to its location. If for some reason you do not intend to make this data available in a reasonable timeframe for public review and comment in association with the draft TAR, please let me know this and your reasoning for not permitting such review as soon as possible.

Thank you for your time and consideration.

Sincerely,

Michael Hartrick
Director of Fuel Economy and Climate
Alliance of Automobile Manufacturers

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Mobile (248) 212-3590
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Message

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Subject: RE: ALPHA Model Inputs and Outputs Request
Attachments: Catalog of available data (ALPHA) 08 01 2016a.xlsx

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Message

From: Sherwood, Todd [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=F6A5D8DECF654CE99B5DE0923CCFF361-SHERWOOD, TODD]
Sent: 8/11/2016 8:52:03 PM
To: Dennis F. Kahlbaum [kbomb@umich.edu]
CC: Olechiw, Michael [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=9f564b92ff96459ab606eb66e5892e2d-Olechiw, Michael]; Bolon, Kevin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f7c0684aaef44174801c0406b51034d2-Bolon, Kevin]
Subject: RE: TechnologyTracking File

I think you're looking at rpe_aeoR, Ref_in2025. That's what I used here.

The Tech file is still controlling the sequencing, or stepping thru of techpacks. Remember that the TechPackSales.log shows the techpack usage on Platform 1003, not the techpack usage of individual vehicles mapped to that platform. So your second table is not really correct since you're applying those platform percentages to each individual vehicle.

Vehicle 23, being an HEV, stays an HEV despite having techpacks 1-24 made available to it. This is controlled by the Machine which generates the TEBs/CEBs/OEBs and Tech codes shown in your 3rd table. Those tech codes are used for tech tracking on individual vehicles. OMEGA does not use these in the compliance determination algorithms since OMEGA works on platforms for that task with the platform being a sales-weighted amalgamation of vehicles mapped into that platform. In the Machine, the main algorithm compares vehicle engine techs to package engine techs, determines which are better, then either ignores the package or adds to the vehicle the techs that make it package better. It then does this for trans techs, and for electrification techs and for road load techs. I would need Jeff Cherry to explain any more or what I may have wrong in that simple description. Veh 23, being an HEV, is already awfully good so the Machine doesn't see much reason to do much to it. Therefore, the tech codes don't show much other than some WR techs. But that's an input to OMEGA generated by the Machine. OMEGA uses the Tech file applied to platforms to make decisions about compliance (so OMEGA doesn't use the Tech file on Veh 23, only on platform 1003), then OMEGA uses the tech codes to disaggregate on a vehicle level so that we can generate more meaningful techpen data. Looking at the TechTracking file for Veh 23 and comparing to what was on the baseline vehicle, all it has done is add some WR (it had 3% in the baseline). Notice how the Tech code data in the Market file starts with package 0 (the baseline vehicle) while the TEB/CEB/OEB data starts with package 1. OMEGA needs package 0 so that it can disaggregate by vehicle.

If that fails to help, let me know.

From: Dennis F. Kahlbaum [mailto:kbomb@umich.edu]
Sent: Thursday, August 11, 2016 9:08 AM
To: Sherwood, Todd <sherwood.todd@epa.gov>
Subject: Re: TechnologyTracking File

Hi Todd:

According to your Item 5, the Technology file provides the tech pathways that are applied. However, what happens when vehicles start with and use different technologies that have the same Tech Pack Number?

For example, from the Market file:

Platform	Vehicle			Vehicle	Fleet	Classic	Vehicle	CVCM		Baseline	Baseline	Annual
Index	Index	Manufacturer	Model	Type	Type	Fleet	Safety	Class	EPA Class	Price	Sales	Sales
No	No			No		Type	Class			- Cycle1		

1003	21	Volkswagen	Q5 2.0T	8	T	T	CM		Small SUV 4WD		75958	- Cycle 1 75958
1003	23	Volkswagen	Q5 Hybrid	8	T	T	CM		Small SUV 4WD		1101	1101

Note that Vehicle # 23 is a Hybrid.

According to the TechPackSales file, both of these vehicles use the following Tech Packs (sales have been converted to percents):

Platform Index No	Vehicle Index No	TP14	TP19	TP20	TP21	TP22	TP23	TP24
1003	21	10.00%	10.00%	5.00%	5.00%	40.00%	25.00%	5.00%
1003	23	10.00%	10.00%	5.00%	5.00%	40.00%	25.00%	5.00%

According to the Market file, the technologies used by these vehicles are significantly different but have the same Tech Pack Number:

TP#	Vehicle Index No 21
TECH 14	LUB EFR1 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX22 Stop-Start IACC1 EPS Aero1 LRRT2 LDB SAX-NA WRtech- 10 WRpen- 0 WRnet- 10
TECH 19	EFR2 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX22 MHEV48V IACC2 EPS Aero2 LRRT2 LDB SAX-NA WRtech- 5 WRpen- 2.5 WRnet- 2.5
TECH 20	EFR2 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 Stop-Start IACC2 EPS Aero2 LRRT2 LDB SAX-NA WRtech- 5 WRpen- 0 WRnet- 5
TECH 21	EFR2 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX22 Stop-Start IACC1 EPS Aero1 LRRT2 LDB SAX-NA WRtech- 10 WRpen- 0 WRnet- 10
TECH 22	EFR2 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 MHEV48V IACC2 EPS Aero2 LRRT2 LDB SAX-NA WRtech- 5 WRpen- 2.5 WRnet- 2.5
TECH 23	LUB EFR1 V6 VVT Deac-V6 EGR DI ATK2 TRX21 Stop-Start IACC2 EPS Aero2 LRRT1 LDB SAX-NA WRtech- 5 WRpen- 0 WRnet- 5
TECH 24	LUB EFR1 V6 VVT Deac-V6 EGR DI ATK2 TURBM TRX22 Stop-Start IACC1 EPS Aero1 LRRT2 LDB SAX-NA WRtech- 5 WRpen- 0 WRnet- 5

TP#	Vehicle Index No 23
TECH 14	LUB EFR1 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 P2 IACC1 EPS LRRT1 SAX-NA WRtech- 10 WRpen- 7 WRnet- 3
TECH 19	LUB EFR1 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 P2 IACC1 EPS LRRT1 SAX-NA WRtech- 5 WRpen- 2 WRnet- 3
TECH 20	LUB EFR1 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 P2 IACC1 EPS LRRT1 SAX-NA WRtech- 5 WRpen- 2 WRnet- 3
TECH 21	LUB EFR1 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 P2 IACC1 EPS LRRT1 SAX-NA WRtech- 10 WRpen- 7 WRnet- 3
TECH 22	LUB EFR1 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 P2 IACC1 EPS LRRT1 SAX-NA WRtech- 5 WRpen- 2 WRnet- 3
TECH 23	LUB EFR1 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 P2 IACC1 EPS LRRT1 SAX-NA WRtech- 5 WRpen- 2 WRnet- 3
TECH 24	LUB EFR1 I4 VVT VVLTD-OHC-I4 DI TURB18 TRX21 P2 IACC1 EPS LRRT1 SAX-NA WRtech- 5 WRpen- 2 WRnet- 3

Whereas Vehicle #21 uses a variety of technologies, Vehicle #23 uses the same technologies (but with different WRs).

The TechnologyTracking file data for these vehicles are shown below (all column with 0% have been removed to fit the page):

Manufac turer	Vehicle In	Vehicle T...	Platform	TRX21	TRX22	Aero1	Aero2	ATK2	Deac-V6	DI	EFR1	EFR2	EGR	EPS	I4
VOLKSWAGEN	21	8	1003	70.0%	30.0%	20.0%	80.0%	30.0%	30.0%	100.0%	40.0%	60.0%	30.0%	100.0%	70.0%
VOLKSWAGEN	23	8	1003	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%

Manufacturer	Vehicle in	Vehicle Type	Platform	LRRT1	LRRT2	LUB	MHEV48V	P2	SAX-NA	Stop-Start	TURB18	TURB1	V6	WLTD-OHC-14	WT
VOLKSWAGEN	21	8	1003	25.0%	75.0%	40.0%	50.0%	0.0%	100.0%	50.0%	70.0%	5.0%	30.0%	70.0%	100.0%
VOLKSWAGEN	23	8	1003	100.0%	0.0%	100.0%	0.0%	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	100.0%	100.0%

It is obvious that these values came from a merger of the TechPackSales file and vehicle-specific technologies from the Market file. (The percentages for Vehicle 21 correspond to those from the TechPackSales file and, since all of the technologies for Vehicle 23 are the same, they are at 100% (except for the WRs, as expected).)

Now then, the corresponding Tech Pack data for Vehicle Type 8 from the Technology file are shown below:

Vech. Type No.	Tech. Pkg. No.	Package Name	Cap
8	1	MPVt 4VDV6+LUB+EFR1+LRRT2+IACC1+EPS+Aero1+LDB+DCP+WR5%+TRX11	75%
8	2	MPVt 4VDV6+LUB+EFR1+LRRT1+IACC1+EPS+Aero1+LDB+DCP+WR5%+TRX11	100%
8	3	MPVt 4VDV6+LUB+EFR1+LRRT1+IACC1+EPS+Aero1+LDB+DCP+WR5%+TRX21	100%
8	4	MPVt 4VDV6+LUB+EFR1+LRRT2+IACC1+EPS+Aero1+LDB+DCP+WR5%+TRX21	73%
8	5	MPVt 4VDV6+LUB+EFR1+LRRT2+IACC1+EPS+Aero1+LDB+DCP+WR5%+TRX22	100%
8	6	MPVt 4VDV6+LUB+EFR1+LRRT2+IACC2+EPS+Aero2+LDB+DCP+WR5%+TRX21	100%
8	7	MPVt 4VDI4+LUB+EFR1+LRRT1+IACC1+EPS+Aero1+LDB+DCP+GDI+TDS18+WR5%+TRX21	100%
8	8	MPVt 4VDI4+LUB+EFR1+LRRT2+IACC1+EPS+Aero1+LDB+DCP+GDI+TDS18+WR5%+TRX22	100%
8	9	MPVt 4VDI4+LUB+EFR1+LRRT2+IACC2+EPS+Aero2+LDB+DCP+GDI+TDS18+WR5%+TRX21	100%
8	10	MPVt 4VDI4+LUB+EFR1+LRRT1+IACC2+EPS+Aero2+LDB+DCP+GDI+SS+TDS18+WR5%+TRX21	100%
8	11	MPVt 4VDV6+LUB+EFR1+LRRT1+IACC2+EPS+Aero2+LDB+DCP+Deac+GDI+ATK2+EGR+WR5%+TRX21	100%
8	12	MPVt 4VDI4+EFR2+LRRT2+IACC2+EPS+Aero2+LDB+DCP+GDI+SS+TDS18+WR5%+TRX21	100%
8	13	MPVt 4VDI4+EFR2+LRRT2+IACC2+EPS+Aero2+LDB+DCP+DVVL+GDI+MHEV48V+TDS18+WR5%+TRX21	91%
8	14	MPVt 4VDI4+LUB+EFR1+LRRT2+IACC1+EPS+Aero1+LDB+DCP+DVVL+GDI+SS+TDS18+WR10%+TRX22	100%
8	15	MPVt 4VDI4+EFR2+LRRT2+IACC1+EPS+Aero1+LDB+DCP+GDI+TDS24+EGR+WR5%+TRX22	25%
8	16	MPVt 4VDI4+EFR2+LRRT2+IACC2+EPS+Aero2+LDB+DCP+GDI+MHEV48V+TDS18+WR5%+TRX22	20%
8	17	MPVt 4VDV6+LUB+EFR1+LRRT1+IACC2+EPS+Aero2+LDB+DCP+Deac+GDI+SS+ATK2+EGR+WR5%+TRX21	100%
8	18	MPVt 4VDV6+LUB+EFR1+LRRT2+IACC1+EPS+Aero1+LDB+DCP+Deac+GDI+SS+ATK2+EGR+WR5%+TRX22	100%
8	19	MPVt 4VDI4+EFR2+LRRT2+IACC2+EPS+Aero2+LDB+DCP+DVVL+GDI+MHEV48V+TDS18+WR5%+TRX22	100%
8	20	MPVt 4VDI4+EFR2+LRRT2+IACC2+EPS+Aero2+LDB+DCP+DVVL+GDI+SS+TDS18+WR5%+TRX21	100%
8	21	MPVt 4VDI4+EFR2+LRRT2+IACC1+EPS+Aero1+LDB+DCP+DVVL+GDI+SS+SAX+TDS18+WR10%+TRX22	33%
8	22	MPVt 4VDI4+EFR2+LRRT2+IACC2+EPS+Aero2+LDB+DCP+DVVL+GDI+MHEV48V+SAX+TDS18+WR5%+TRX21	100%
8	23	MPVt 4VDV6+LUB+EFR1+LRRT1+IACC2+EPS+Aero2+LDB+DCP+Deac+GDI+SS+SAX+ATK2+EGR+WR5%+TRX21	100%
8	24	MPVt 4VDV6+LUB+EFR1+LRRT2+IACC1+EPS+Aero1+LDB+DCP+Deac+GDI+SS+ATK2+TURBM+EGR+WR5%+TRX22	100%

Clearly, the red-highlighted tech package descriptions only match* those for Vehicle 21. (*There are differences with the WRs, however.)

Therefore, please explain how the Technolog file is used for Vehicle 23.

Also, please explain how you should trace technologies in this situation. Since they match*, do the Vehicle 21 Technology file descriptions overrule those in the Market file (even though the TechnologyTracking file says otherwise)?

Thanks much for all your help!!

--Dennis

On 8/10/16 4:52 PM, Dennis F. Kahlbaum wrote:

OK. So always use the TechPackSales.log file when performing calculations of what actually happened. Correct?

On 8/10/16 4:18 PM, Sherwood, Todd wrote:

Oh, yes. The TechPackSF file shows what's allowed to happen, not what does happen. That's confusing. That file, essentially, shows the ranking results although it's calculated from data in the Tech file. You can see how the 40% techpack cap I mentioned in item 5 (below) was determined for the Tech file (by the ranking algorithm which generates the Tech file for OMEGA to then generate TechPackSF which is, obviously, redundant). Cell T15 shows a value of 10. Cell T11 shows a value of 15. Notice that cell S11 shows 25. So 40% of that 25 has moved from techpack 9 to techpack 13.

From: Dennis F. Kahlbaum [<mailto:kbomb@umich.edu>]

Sent: Wednesday, August 10, 2016 3:51 PM

To: Sherwood, Todd <sherwood.todd@epa.gov>

Subject: Re: TechnologyTracking File

Todd:

OK, so contrary to my last e-mail stating that I had answered all of my questions, your information proves that using the TechPackSales.log file is better than using the TechPackSF.xls, and other improvements.

Therefore, THANK YOU!

--Dennis

On 8/10/16 3:37 PM, Sherwood, Todd wrote:

Stream of consciousness reply, so might be scattered.

- 1) Keep in mind that "Ref_in2025b-vh1" is for the reference case in 2025, so it's not for the control case standards.
- 2) Col K in that file simply shows the last techpack used for vehicles mapped into that platform 1008. That doesn't mean every vehicle on that platform ended on techpack 16. Of more interest for the purpose of seeing what techpacks are applied is the TechPackSales.log file which shows that platform 1008 uses techpacks 12/13/14/16. The Tech file for that scenario shows those packages to be

Vech. Type No.	Tech. Pkg. No.	Package Name
3	12	Auto 4VDI4+LUB+EFR1+LRRT2+IACC1+EPS+Aero1+LDB+DCP+GDI+TDS24+EGR
3	13	Auto 4VDV6+LUB+EFR1+LRRT1+IACC2+EPS+Aero2+LDB+DCP+Deac+GDI+SS+A
3	14	Auto 4VDI4+EFR2+LRRT2+IACC2+EPS+Aero2+LDB+DCP+GDI+SS+TDS18+WR10
3	16	Auto 4VDI4+LUB+EFR1+LRRT1+IACC2+EPS+Aero2+LDB+DCP+GDI+SS+TDS18+

- 3) Keep in mind that not all of the models on that platform can get the WR shown in the techpack – the safety analysis limits the WR to several different levels for vehicles in that platform, including some that can't get any additional WR. Also, some have 1% WR in our baseline file.
- 4) The attached shows how the final CO2 of 194.55 would be calculated (remember to include off-cycle credits which are also included in the Market file).
- 5) As for the importance of the Tech input file, among other things it determines the ordering of techpacks – for platform 1008 (vehtype 3), techpack 12 would come from techpack 8, not 11. Then 13 would come from 9, 14 from 11 and 16 from 15. This is shown in col I of the Tech file. This ordering of techpacks is what the package ranking process is all about. Note also col E which shows the caps applied to techpacks – so techpack 13 could only take 40% from techpack 9.
- 6) As for the breakdown of the 70/30 percent split on trans techs for that platform, the info above makes that clear. 20% TP12/10% TP13 makes 30%. Same logic for 70%.
- 7) I'm not sure where you got 30% for ATK2. I see 10%. That 10% is getting techpack 13.
- 8) 45/55 percent for EFR techs are evident from above and the knowledge that 55% go to techpack 14 (from the TechPackSales.log and the attached).
- 9) Same with the aero techs – just 20% stay at techpack 12 with aero1.

Hopefully I have answered things. If not, let me know.

From: Dennis F. Kahlbaum [mailto:kbomb@umich.edu]
Sent: Wednesday, August 10, 2016 11:13 AM

To: Sherwood, Todd <sherwood.todd@epa.gov>

Subject: Re: TechnologyTracking File

Hi Todd:

I realize that yesterday's questions about the TechnologyTracking file were difficult to respond to. Therefore, here are similar but hopefully simpler questions:

1) In the "Ref_in2025b-vh1.xls" file, there is a "Last Tech Pack #" column (K). What exactly does this value mean?

For example, parts of the first 10 lines from that file are reproduced below:

Index No	Manufacturer	Model	Vehicle Type No	Vehicle Class	Baseline Sales	Annual Sales	Baseline CO2	Last Step
1008	BMW	BMW_1008_C_3	3	C	47,429	47,429	241.80	191
1009	BMW	BMW_1009_C_3	3	C	94,937	94,937	239.52	185
1010	BMW	BMW_1010_C_5	5	C	21,129	21,129	284.36	198
1011	BMW	BMW_1011_C_3	3	C	16,664	16,664	247.05	188
1012	BMW	BMW_1012_C_5	5	C	46,319	46,319	314.39	210
1013	BMW	BMW_1013_C_2	2	C	3,859	3,859	0.00	122
1014	BMW	BMW_1014_C_2	2	C	13,100	13,100	112.60	200
1015	BMW	BMW_1015_C_2	2	C	4,157	4,157	121.14	170
1016	BMW	BMW_1016_C_5	5	C	9,783	9,783	276.72	201
1017	BMW	BMW_1017_T_8	8	T	33,096	33,096	283.20	182

As shown in red, for Index No 1008, the Last Tech Pack # is "16". According to the Market file "Market_Ref_in2025B-rep_aeoR.xls", Platform Index No 1008 consists of 52 BMW "Class 3" vehicles, each with their own set of information, including TEBs, CEBs, OEBs, and Techs (numbered 1-50). Does that "16" mean that these 52 BMW vehicles each used their Techs associated with "Tech 16" (Column GU) to arrive at the "Final CO2" shown in the table above?

2) If the Techs in the Market file are being used, what is the purpose of the "Technology" files (e.g. "Technology_Ref_in2025B_rpe_aeoR.xls")?

Thanks.

--Dennis

On 8/9/16 12:05 PM, Dennis F. Kahlbaum wrote:

Hi Todd:

I need some more insight regarding the TechnologyTracking files. For the questions below, I referring to "Ref_in2025B-TechnologyTracking.xls".

In reviewing this file, I noticed that it has tabs for Vehicle and Vehicle Sales. The first 6 lines of both tabs shows data for BMW, Vehicle IDs 54 through 59. Upon reviewing the Market file, "Market_Ref_in2025B_rpe_aeoR.xls", I found that these 6 entries are all BMW 228i Coupes, divided into 2 groups: 3 with 4244 annual sales (Group 1), the other 3 with 441 annual sales (Group 2). The remaining data for each group contain only a few differences (footprint, etc). Also, each group contains 37 Tech descriptions.

My questions, again referring to just these 6 BMW entries, are as follows:

1) Where did the data come from that allowed OMEGA to generate the various percentages and sales in the "Vehicle" and "Vehicle Sales" tabs, respectively? A review of the "Technology_Ref_in2025B_rpe_aeoR.xls" files for Vehicle Class 3 didn't reveal such breakdowns or Caps. Reviews of the other input files didn't locate them either. As examples, where did these splits come from?:

BMW Group 1: 70%/30% split for
TXR21/TRX22
Both Groups: 30% for ATK2
Both Groups: 45%/55% for EFR1/EFR2
Both Groups: 20%/80% Aero1/Aero2

(Note: Since almost all of the percentages in the "Vehicle" tab are multiples of 5% or 10%, this indicates to me that an input file is being used, rather than computed values.)

2) What Tech Package(s) was/were actually used in the calculations for each of the 6 BMW Technology/Tracking entries? The file "Ref_in2025b-vh1.xls" says that the "Last Tech Pack #" was 16, but it is apparently referring to "Index No." 1008, which not only contains these 6 BMW entries, but many others.

3) Since the Market file contains 37 Tech descriptions, are they used in lieu of 37 Vehicle Class 3 Teck Packages listed in the file "Technology_Ref_in2025B_rpe_aeoR.xls"? Which "Last Tech Pack #" is OMEGA referring to (Market file, or Technology file)?

If it would be easier/quicker to discuss these questions over the phone, please call me at 973-3070.

Thanks much.

--Dennis

Message

From: Sherwood, Todd [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=F6A5D8DECF654CE99B5DE0923CCFF361-SHERWOOD, TODD]
Sent: 8/26/2016 3:06:44 PM
To: Cherry, Jeff [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=17c907940ac14cbab1236dfdfeca8300-Cherry, Jeff]; Bolon, Kevin [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f7c0684aaef44174801c0406b51034d2-Bolon, Kevin]
Subject: FW: Curb Weights

Since this question is meant to support the Alliance efforts, I want to be sure about the response. Can you guys confirm which approach you see as our approach to determining the final curb weight (which, of course, we never calculate but we have the percent reductions).

Baseline curb wt	4079
Baseline WR	3%
Package WR	10%

OR	1) Final curb wt=	$4079 - (4079) * (10\% - 3\%)$	3793
	2) Final curb wt=	$[(4079) / (100\% - 3\%)] * (100\% - 10\%)$	3785

From: Dennis F. Kahlbaum [mailto:kbomb@umich.edu]
Sent: Friday, August 26, 2016 10:13 AM
To: Sherwood, Todd <sherwood.todd@epa.gov>
Subject: Re: Curb Weights

Hi Todd:

Thank you for the informative meeting yesterday!

As discussed, I am trying to fulfill the Alliance's request to compute the by-Vehicle, by-Technology-Package, Curb Weights. I have changed the processing so that the WRnet value provided in the Technology Package (TP) itself is now obtained and used, instead of the platform-based OMEGA value.

As an example, let's use our now-familiar VW Q5s (Vehicle IDs 21 (conventional) and 23 (hybrid)). The table below shows the relevant data, by vehicle and TP:

Vehicle Index	Model	Curb Weight (lb)	Tech Pckg	WRnet
21	Q5 2.0T	4,079	0	3.00%
21	Q5 2.0T	4,079	17	7.50%
21	Q5 2.0T	4,079	18	10.00%
21	Q5 2.0T	4,079	19	2.50%
23	Q5 Hybrid	4,431	0	3.00%
23	Q5 Hybrid	4,431	17	3.00%
23	Q5 Hybrid	4,431	18	3.00%

23	Q5 Hybrid	4,431	19	3.00%
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As I understand it, the Curb Weight value is applicable to TP0, and includes the WRnet reduction for TP0. (Hence, for Vehicle 21, the Curb Weight of 4,079 pounds already includes a 3.00% reduction.) Also, according to the documentation, WRnet values are relative to the "null" vehicle. Therefore, in order to compute the TP-specific Curb Weight, you need to remove the TP0 WRnet reduction to bring the Curb Weight to the "null" level, and then apply the WRnet reduction of the TP to this "null" level. In formula notation, this corresponds to:

$$\text{Curb Weight(TP\#)} = \text{Curb Weight} * (100\% - \text{WRnet\%(TP\#)}) / (100\% - \text{WRnet\%(TP0)})$$

As an example, for Vehicle 21, Tech Package 18: $\text{Curb Weight(TP18)} = 4,079 * (100\% - 10.00\%) / (100\% - 3.00\%) = 3,785$.

The following table contains the results for all of the TPs:

Vehicle Index	Model	Curb Weight (lb)	Tech Pckg	Wrnet%	TP Curb Weight (lb)
21	Q5 2.0T	4,079	0	3.00%	4,079
21	Q5 2.0T	4,079	17	7.50%	3,890
21	Q5 2.0T	4,079	18	10.00%	3,785
21	Q5 2.0T	4,079	19	2.50%	4,100
23	Q5 Hybrid	4,431	0	3.00%	4,431
23	Q5 Hybrid	4,431	17	3.00%	4,431
23	Q5 Hybrid	4,431	18	3.00%	4,431
23	Q5 Hybrid	4,431	19	3.00%	4,431

Please advise if this is the correct methodology to use. If it is not, please explain how to proceed.

Thanks.

--Dennis

On 8/22/16 9:03 AM, Sherwood, Todd wrote:

You mean you want to calculate the "final" curb weights? You should be able to use the WRnet data matched with the Market file's baseline curb weight. Be sure to line things up by Vehicle index of course since the Market file and TechnologyTracking file may not be aligned the same way. The WRnet shows actual WRnet, not package WR. There are some glitches in the WR tracking for packages containing the P2 technology but there are not many in the baseline and OMEGA didn't create many either.

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

From: Dennis F. Kahlbaum [mailto:kbomb@umich.edu]
 Sent: Friday, August 19, 2016 4:13 PM
 To: Sherwood, Todd <sherwood.todd@epa.gov>
 Subject: Curb Weights

Hi Todd:

Is there a way of computing the vehicle curb weights based on the by-TechPackage WRs in the TechnologyTracking files? A concern is that the TechPackage might indicate 5% mass reduction, but an overriding safety consideration might limit it to something less than that.

Thanks.

--Dennis