US EPA ARCHIVE DOCUMENT

EPA

National Clean Diesel Campaign

Working Together for Cleaner Air

Diesel Emissions Quantifier (DEQ) of the National Clean Diesel Campaign

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Overview

- What is the DEQ
- Overall Structure
- Types of Inputs Needed
- Example Calculation
- Results and Interpretation

What is the DEQ?

The DEQ is a web-based interactive tool that evaluates retrofit projects for **medium- and heavy-heavy duty diesel engines** by estimating:

- Pollutant Emission Reductions
- Cost Effectiveness
- Health Benefits

Useful for fleet owners, grantees, non-profits, and state and local governments

Types of Projects for DEQ Calculation

Originally designed for the Diesel Emissions Reduction Act (DERA) projects, including:

- Exhaust After Treatment Technologies: catalysts, filters, SCR systems
- Engine repowers and replacements
- Fuel upgrades: Biodiesel, natural gas
- Idle Reduction Technologies: APUs, heaters, shore power

What the DEQ is not

- The DEQ does not currently provide estimates for light-heavy duty or non-heavy duty engines or vehicles, non-diesel engines or vehicles, pre-1980 engines or ocean going vessels
- The DEQ ***may not*** be used for State Implementation Plans (SIPs) and Conformity. Please consult your EPA Regional Office or relevant SIP and conformity guidance documents.

General DEQ Structure

Two types of calculations:

1. **On-Highway and Non-road.** These include many medium- and heavy-heavy duty diesel vehicles, engines, and equipment, as well some stationary and rail engines.

2. **Marine Vessels**. Includes C1 and C2 marine vessels only, which are between 700-11,000 hp, and less than 30L in displacement.

DEQ Structure 1 &2: Fleets and Vehicle Groups

1) A **fleet** is a collection of vehicles and/or engines and equipment (100 school buses and 200 bulldozers)

2) A **Vehicle or Engine Group** is a subset of your fleet, and should be similar in terms of vehicle type and age (i.e. model year 2007 School Buses). A fleet can have many vehicle groups

DEQ 3 and 4: Technology and Results

3. Technology Entry. Once your vehicle or engine group is complete, you can apply one or more **technology options** to the group. Options include filters, catalysts, alternative fuels, etc.

4. Quantify Results. After the technology has been applied, you can quantify and view the results, and download them in spreadsheet form.

Health Benefits

- The last part of the DEQ's calculation is monetary health benefits based on the tonnage of PM reduced
- After you have fully quantified the emission reductions, you can choose to quantify health benefits for up to **five counties** in the US (they do not have to be in the same state, or in the same state as your initial fleet)

Necessary DEQ Inputs

- State (of your project)
- Number of Vehicles
- Type of Fleet (School Bus, Transit Bus, etc)
- Class/Equipment (Class 5, 6, 7, etc)
- Model Year
- Year of Retrofit Installed
- Current Fuel Type
- Fuel Volume (annual gallons for fleet)
- (On Highway) Annual miles per vehicle and idling hours
- (Nonroad) Hp and annual usage rate
- Technology Details (i.e. idling hours reduced, new model year for engine replacements, etc)

DEQ Example Calculation: School Bus Idle Reduction

http://www.epa.gov/cleandiesel/quantifier/

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Quantifier Overview

Working Together for Cleaner Air

Overview | Use The Quantifier | My Account

For assistance, contact the National Clean Diesel Quantifier Helpline

The Diesel Emissions Quantifier (DEQ)

The DEQ is an interactive tool that can help evaluate clean diesel projects and options by estimating emission reductions, cost effectiveness, and health benefits. Users with air quality modeling experience may wish to use EPA's more technical models for quantifying the benefits of retrofit projects.

State Implementation Plans (SIPs) and Conformity

The Diesel Emission Quantifier ***should not*** be used for calculating emission reductions for State Implementation Plans (SIPs) or conformity determinations.

More Help

- Frequently Asked Questions (PDF) (20 pp, 400K, EPA-420-F-12-017, April 2012)
- Default Values (PDF) (6 pp, 600K, EPA-420-B-10-035, August 2010)
- User's Guide (PDF) (56 pp, 890K, EPA-420-B-10-033, August 2010)
- Health Benefits Methodology (PDF) (48 pp, 1.7MB, EPA-420-B-10-034, August 2010)

www.epa.gov/cleandiesel/quantifier/

1. Define the Fleet

Enter Fleet Information

Start Over

New

Fleet Name School Bus

Fleet Type On Highway/NonRoad

State Maryland

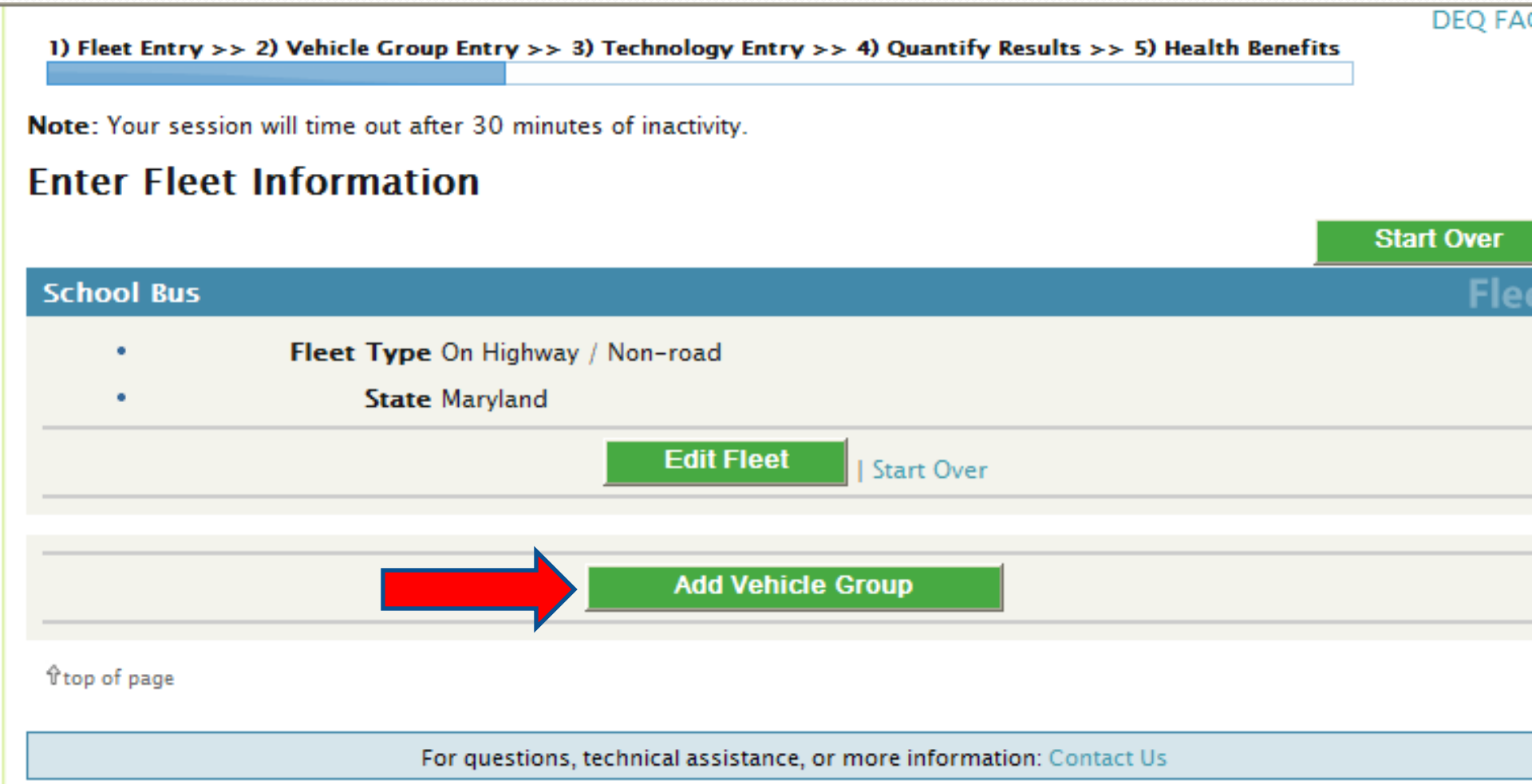
Do you want to estimate the total cost effectiveness of the project? Yes ◉ No ○

Total cost effectiveness numbers are based solely on the user inputs below

EPA $	100000	Private $	0	Other $	0
Other Federal $	20000	Match/Lev. $	0	Unknown $	0
CMAQ $	0	SEP $	0	State $	0
Local $	0				

Save Fleet

2. Add a Vehicle Group



New Vehicle Group

Group Name School Buses test

Quantity 10

Type On Highway

Target Fleet School Bus

Class/Equipmer School Buses

Model Year 2000

Year of Retrofit Action 2012

NOTE: If you select 2010 or earlier for the Year of Retrofit Action, calculations will be performed with the previously approved MOBILE 6.2 emission factors (regardless of Model Year). If you select 2011 or later for the Year of Retrofit Action, the new agency-approved MOVES emission factors will be used (regardless of Model Year). We highly recommend that you use the MOVES model for current and future projects. Please see Overview Tab for more info.

Fuel Type Regular Diesel (ULSD), 15 ppm

Get Default Values

Default values are not readily available for every vehicle and/or engine type. Please go to Default Values PDF, find your vehicle/engine, and enter these fields by hand.

Fuel Volume 15970 gal/year for group

Calc. Fuel Volume diesel gal/year for group

Vehicle Miles Traveled 13000 miles/vehicle/year

Idling Hours 270 hours/vehicle/year

Save Group | Cancel

3. Add a Technology

School Buses test — Vehicle Group

- **Quantity** 10
- **Type** On Highway
- **Target Fleet** School Bus
- **Class/Equipment** School Buses
- **Model Year** 2000
- **Retrofit Year of Action** 2012
- **Fuel Type** Regular Diesel (ULSD), 15 ppm
- **Fuel Volume** 15970
- **Veh. Miles Traveled** 13000
- **Idling Hours** 270

Technology

No retrofit technologies currently applied. To apply a retrofit technology, click on the link below.

Add a new technology

Add your first retrofit technology

Edit Group | Delete

Define Technology

- **Quantity** 10
- **Type** On Highway
- **Target Fleet** School Bus
- **Class/Equipment** School Buses
- **Model Year** 2000
- **Retrofit Year of Action** 2012
- **Fuel Type** Regular Diesel (ULSD), 15 ppm
- **Fuel Volume** 15970.00
- **Veh. Miles Traveled** 13000.00
- **Idling Hours** 270.00

New Technology Technology

Technology Type

Idling Control Strategies

Technology

Direct Fired Heater

Reduced Idling 200 hours/vehicle/year

Apply To 10 (out of 10) with no technology

Reduction by Pollutant

NOX %	98.0
PM2.5 %	99.0
HC %	0.0
CO %	0.0
CO2 %	93.0

Install Cost 5000 $ per vehicle

Unit Cost 10000 $ per vehicle

Save Technology | Cancel

4. Save and Quantify Results

- **Target Fleet** School Bus
- **Class/Equipment** School Buses
- **Model Year** 2000
- **Retrofit Year of Action** 2012
- **Fuel Type** Regular Diesel (ULSD), 15 ppm
- **Fuel Volume** 15970
- **Veh. Miles Traveled** 13000
- **Idling Hours** 270

Delete

Add a new technology

Edit Group | Delete

Add a New Vehicle Group

Quantify Emissions

Summary Emissions Results

Annual	NOx (short tons/year)	PM2.5 (short tons/year)	HC (short tons/year)	CO (short tons/year)	CO2 (short tons/year)	Diesel-Equivalent (gallons/year)
Baseline of Entire Fleet	1.6288	0.0663	0.1051	0.7524	177.2670	15,970.0000
Baseline of Vehicles Retrofitted	1.6288	0.0663	0.1051	0.7524	177.2670	15,970.0000
Percent Reduced (%)	19.1%	12.8%	0.0%	0.0%	5.8%	5.8%
Amount Reduced Per Year	0.3111	0.0085	0.0000	0.0000	10.3230	930.0000

Daily	NOx (kg/day)	PM2.5 (kg/day)	HC (kg/day)	CO (kg/day)	CO2 (kg/day)	Diesel-Equivalent (gal/day)
Kilograms Reduced Per Day (kg/day)	0.7733	0.0212	0.0000	0.0000	25.6572	2.5479

Lifetime	NOx (short tons)	PM2.5 (short tons)	HC (short tons)	CO (short tons)	CO2 (short tons)	Diesel-Equivalent (gallons)
Baseline of Entire Fleet	27.6897	1.1277	1.7869	12.7915	3,013.5390	271,490.0000
Baseline of Vehicles Retrofitted	27.6897	1.1277	1.7869	12.7915	3,013.5390	271,490.0000
Percent Reduced(%)	19.1%	12.8%	0.0%	0.0%	5.8%	5.8%
Amount Reduced	5.2890	0.1447	0.0000	0.0000	175.4910	15,810.0000
Amount Emitted After Retrofit, Retrofitted Vehicles	22.4007	0.9830	1.7869	12.7915	2,838.0480	255,680.0000
Amount Emitted After Retrofit, Entire Fleet	22.4007	0.9830	1.7869	12.7915	2,838.0480	255,680.0000
Fleet Capital Cost Effectiveness ($/ton), Retrofitted Vehicles	$28,360.87	$1,036,593.01	$0.00	$0.00	$854.74	$9.49
Total Cost Effectiveness ($/ton), Retrofitted Vehicles	**$22,688.69**	**$829,274.41**	**$0.00**	**$0.00**	**$683.80**	**$7.59**

Remaining Lifetime	School Bus | School Buses	17.0 year

Download Results

Download Results

?

You have the option to download the results and inputted data in a Comma Separated Value (CSV) format which can be opened by most spreadsheet software. The downloaded information will appear as it does in the Detailed Results and will include any funding and contact information inputted. For more information on downloading data, refer to the User's Guide 3.3 Preview/Download Data.

Detailed Report

This report contains **all** of your inputs and all the outputs.

View/Download detailed report as

- Microsoft Excel file
- CSV (comma separated values) file

Summary Report

This report contains **some** of your inputs and all the outputs.

View/Download summary report as

- Microsoft Excel file
- CSV (comma separated values) file

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5. Health Benefits

Health Benefits

The Health Benefits Module allows you to estimate the health benefits associated with the scenarios you have developed through the Quantifier, as a result of reductions in fine particulate matter. For more information about what the Health Benefits results do and do not include, please refer to the Health Benefits Methodology document.

Please choose up to five counties where the emission reductions will take place. The percentage of reductions in all the counties chosen must add up to 100 percent.

Calculate Benefits

State	County	Percent
Maryland	Baltimore	20
Maryland	Howard	15
Maryland	Frederick	10
District Of Columbia	District of Columbia	25
Virginia	Arlington	30
	Total	100

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Health Benefits Results

County and State	Annual Diesel PM2.5 Reduction (short tons)	Annual Cost++	Annual Benefits++
Baltimore, Maryland	0.0017	-	$3,100
Howard, Maryland	0.0013	-	$1,100
Frederick, Maryland	0.0009	-	$510
District of Columbia*, District Of Columbia	0.0021	-	$5,900
Arlington*, Virginia	0.0026	-	$4,500
Total	0.0085	$0	$15,000

++ More information is available on why costs and benefits are only presented on an annual basis.

Health benefit estimates are "flagged" for the county(s) marked with an asterisk(s), indicating that we have less confidence in these results due to a large amount of inter-county transport of emissions.

*The Benefits Module may be underestimating benefits for emissions reduction projects in this county because it has a relatively high density of emissions compared to surrounding areas. As a result, this county is likely to be a net exporter of diesel emissions, and some of the benefits of reducing these emissions are likely to take place in downwind counties. Please take this increased uncertainty into account when interpreting your results.

The Benefits Module reports total monetized benefits, which is a sum of the benefits of an array of individual health endpoints affected by PM2.5 exposure. Data limitations prevent us from providing detailed incidence estimates for each health endpoint. Specifically, the underlying health data, including concentration-response relationships and baseline incidence rates, lack sufficient spatial resolution to support county-level estimates of incidence changes.

Edit Counties

View/Download benefits table as Microsoft Excel File | as CSV (comma separated values) file.

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Save it by Creating a User Account

Logged in as Julie | logout

DEQ FAQs

My Account Information

- **Login/Email** hawkins.julie@epa.gov
- **Contact Name** Julie Hawkins
- **Organization** EPA
- **Phone** 2023439072
- **Password** ********

Edit Profile

My Fleets/Vessels

Return to current fleet

marine test Fleet

- **Fleet Type** Marine
- **State** Washington

Edit Fleet | Go To Results | Delete

Try the DEQ yourself!

http://www.epa.gov/cleandiesel/quantifier

For more guidance, make sure to read through the "Overview" Tab and the DEQ FAQs

http://www.epa.gov/cleandiesel/documents/420f12017.pdf