

# Los Angeles Department of Water and Power



## Purchase of 42 Heavy-Duty CNG Vehicles Contract No. ML08038

### FINAL REPORT

February 12, 2013

Prepared for the Mobile Source Air Pollution Committee (MSRC)  
under the AB 2766 Discretionary Fund Work Program



## **Acknowledgments**

The following key personnel from the Los Angeles Department of Water and Power were involved with purchasing the CNG vehicles under this grant:

MSRC Grant Administrator:                      Stephen B. Gallie

Manager of Fleet Procurement:              Fausto H. Cetina

This report was submitted in fulfillment of Contract No. ML08038 and the Purchase of 42 Heavy-Duty CNG Vehicles by the Los Angeles Department of Water and Power under the partial sponsorship of the MSRC. Work was completed as of February 29, 2012, when the last vehicle was received.

## **Disclaimer**

The statement and conclusions in this report are those of the contractor and not necessarily those of the MSRC or the South Coast Air Quality Management District (SCAQMD). The mention of commercial products, their sources or their uses in connection with material reported is not to be construed as either an actual or implied endorsement of such products.

## **Project Description and Work Performed**

This grant helped to fund the replacement of existing diesel-powered vehicles with CNG powered ones, specifically twenty-seven (27) two-axle dump trucks and fifteen (15) two-axle stake trucks.

Engine Specifications for both the stake and dump trucks (see attached CARB Executive Order):

- Make: Cummins
- Model: ISL-G
- Engine Year: 2011
- Fuel Type: CNG/LNG
- Engine Size: 8.9 Liters

Vehicles Replaced and Retired Vehicles:

The older vehicles have either been sent to the salvage yard and are currently awaiting auction to be sold to a vendor for use outside California, or have already been sold. When a vehicle is sold, LADWP submits to the Department of Motor Vehicles a VIN stop and specifies that the vehicle can no longer be driven in California.

Procurement Schedule:

Ordered: Under LADWP Contract No.'s 7110 and 7133-B, dated August 13, 2010

Received: Began receiving vehicles on August 30, 2011 and received the last vehicle on February 29, 2012

Deployment: Began on October 12, 2011 and ended April 6, 2012

**Operational Experience and Problems Encountered:**

Some employees have complained of the supposed lag time once the foot is removed from the accelerator, claiming that the truck doesn't slow down quick enough. Fleet personnel took steps to compare the new CNG trucks side by side to existing diesel ones, and the time to slow down when releasing the accelerator is the same or better for the CNG. As a result, the engine manufacturer has come on site to provide training and an explanation of the different driving feel between CNG vs. diesel engines. Employees are still getting used to this difference and are slowly warming up to the new feel of the engine. This issue does not appear to be significant and it is anticipated that with ongoing training and awareness that over time there should be no long term problems.

## Emission Benefits

The emission benefits of replacing older diesel-powered vehicles with cleaner CNG powered ones is calculated in the table below, using the appropriate model year values from the Carl Moyer Program Guidelines, Table B-4.

The total emission reduction is as follows:

- PM (g/year) reduction from 59,067 to 4,189 (54,878 g/year)
- NOx (g/year) reduction from 2.17 million to 89,020 (2,081,493.44 g/year)

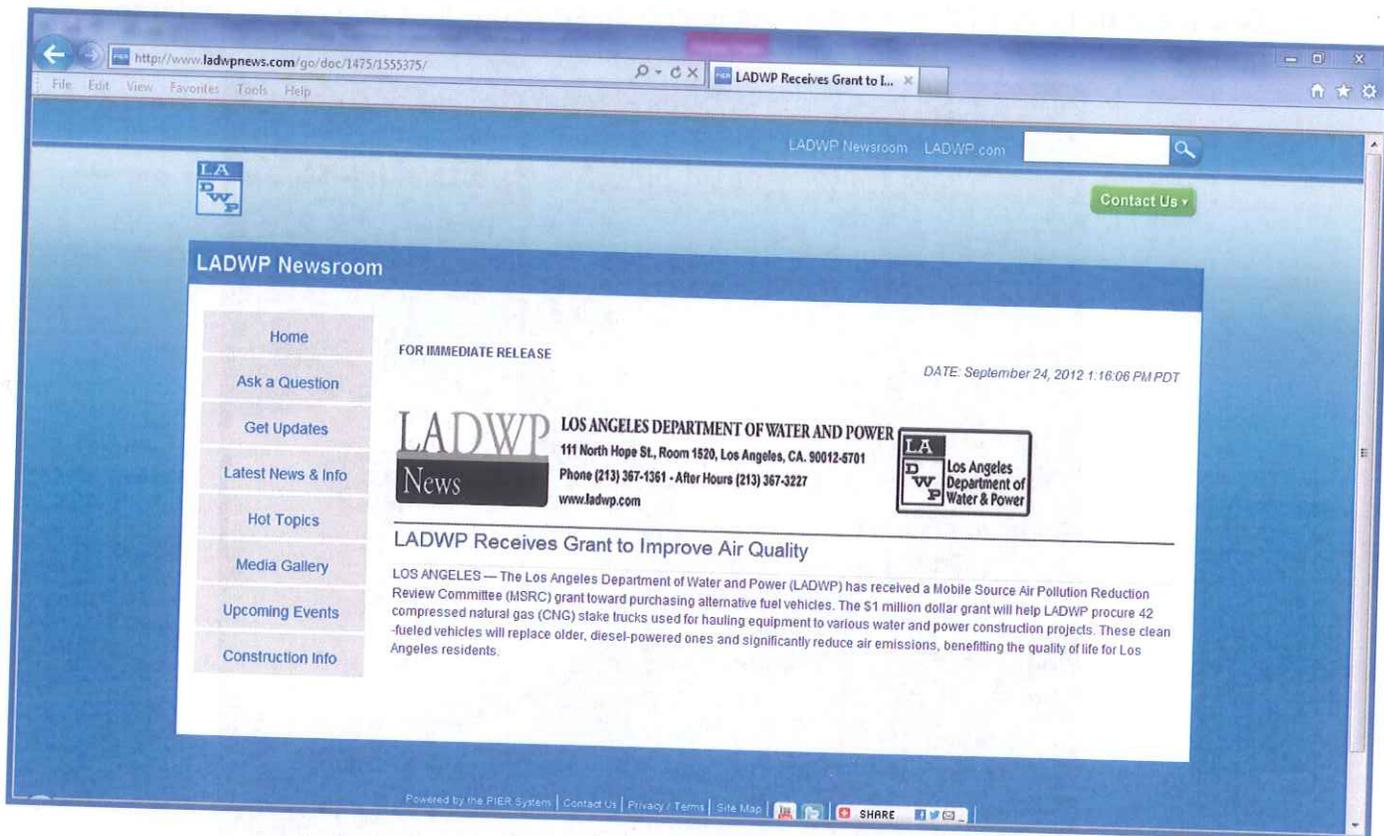
1	Description	Old LADWP No.	Model Year	Avg Miles per Year	Old Diesel Engine				New CNG Engines			
					PM	NOx	PM Emissions	NOx Emissions	PM	Nox	PM Emissions	Nox Emissions
					(g/mile)	(g/mile)	(g/year)	(g/year)	(g/mile)	(g/mile)	(g/year)	(g/year)
2	2-AXLE DUMP TRUCK	P58005	1985	8,043	0.72	16.65	5790.96	133915.95	0.024	0.51	193.032	4101.93
3	2-AXLE DUMP TRUCK	W58545	1991	5,856	0.288	12.18	1686.53	71326.08	0.024	0.51	140.544	2986.56
4	2-AXLE DUMP TRUCK	W58553	1991	5,378	0.288	12.18	1548.86	65504.04	0.024	0.51	129.072	2742.78
5	2-AXLE DUMP TRUCK	P58004	1985	3,286	0.72	16.65	2365.92	54711.90	0.024	0.51	78.864	1675.86
6	2-AXLE DUMP TRUCK	P58041	1985	1,042	0.72	16.65	750.24	17349.30	0.024	0.51	25.008	531.42
7	2-AXLE DUMP TRUCK	P58057	1988	1,536	0.504	14.6	774.14	22425.60	0.024	0.51	36.864	783.36
8	2-AXLE DUMP TRUCK	P58058	1988	1,777	0.504	14.6	895.61	25944.20	0.024	0.51	42.648	906.27
9	2-AXLE DUMP TRUCK	P58059	1988	919	0.504	14.6	463.18	13417.40	0.024	0.51	22.056	468.69
10	2-AXLE DUMP TRUCK	P58066	1988	3,970	0.504	14.6	2000.88	57962.00	0.024	0.51	95.28	2024.7
11	2-AXLE DUMP TRUCK	P58068	1988	3,858	0.504	14.6	1944.43	56326.80	0.024	0.51	92.592	1967.58
12	2-AXLE DUMP TRUCK	P58070	1988	3,824	0.504	14.6	1927.30	55830.40	0.024	0.51	91.776	1950.24
13	2-AXLE DUMP TRUCK	P58072	1988	1,210	0.504	14.6	609.84	17666.00	0.024	0.51	29.04	617.1
14	2-AXLE DUMP TRUCK	P58113	1988	2,013	0.504	14.6	1014.55	29389.80	0.024	0.51	48.312	1026.63
15	2-AXLE DUMP TRUCK	P58248	1993	4,160	0.288	12.18	1198.08	50668.80	0.024	0.51	99.84	2121.6
16	2-AXLE DUMP TRUCK	P58539	1991	4,014	0.288	12.18	1156.03	48890.52	0.024	0.51	96.336	2047.14
17	2-AXLE DUMP TRUCK	P58555	1991	3,122	0.288	12.18	899.14	38025.96	0.024	0.51	74.928	1592.22
18	2-AXLE DUMP TRUCK	P58556	1991	2,687	0.288	12.18	773.86	32727.66	0.024	0.51	64.488	1370.37
19	2-AXLE DUMP TRUCK	P58557	1991	1,586	0.288	12.18	456.77	19317.48	0.024	0.51	38.064	808.86
20	2-AXLE DUMP TRUCK	P58558	1991	1,183	0.288	12.18	340.70	14408.94	0.024	0.51	28.392	603.33
21	2-AXLE DUMP TRUCK	P58559	1991	1,598	0.288	12.18	460.22	19463.64	0.024	0.51	38.352	814.98
22	2-AXLE DUMP TRUCK	P58561	1991	5,364	0.288	12.18	1544.83	65333.52	0.024	0.51	128.736	2735.64
23	2-AXLE DUMP TRUCK	P58564	1991	1,642	0.288	12.18	472.90	19999.56	0.024	0.51	39.408	837.42
24	2-AXLE DUMP TRUCK	P58566	1991	4,878	0.288	12.18	1404.86	59414.04	0.024	0.51	117.072	2487.78
25	2-AXLE DUMP TRUCK	P58567	1991	3,905	0.288	12.18	1124.64	47562.90	0.024	0.51	93.72	1991.55
26	2-AXLE DUMP TRUCK	P58569	1991	4,645	0.288	12.18	1337.76	56576.10	0.024	0.51	111.48	2368.95
27	2-AXLE DUMP TRUCK	P58571	1991	5,245	0.288	12.18	1510.56	63884.10	0.024	0.51	125.88	2674.95
28	2-AXLE DUMP TRUCK	P58572	1991	1,924	0.288	12.18	554.11	23434.32	0.024	0.51	46.176	981.24
29	2-AXLE STAKE TRUCK	P56034	1995	2,573	0.216	10.7	555.77	27531.10	0.024	0.51	61.752	1312.23
30	2-AXLE STAKE TRUCK	P56412	1982	1,174	0.792	17.21	929.81	20204.54	0.024	0.51	28.176	598.74
31	2-AXLE STAKE TRUCK	P56493	1988	3,971	0.504	14.6	2001.38	57976.60	0.024	0.51	95.304	2025.21
32	2-AXLE STAKE TRUCK	P88462	1987	2,142	0.504	14.6	1079.57	31273.20	0.024	0.51	51.408	1092.42
33	2-AXLE STAKE TRUCK	P88464	1987	2,018	0.504	14.6	1017.07	29462.80	0.024	0.51	48.432	1029.18
34	2-AXLE STAKE TRUCK	W56057	1982	2,339	0.792	17.21	1852.49	40254.19	0.024	0.51	56.136	1192.89
35	2-AXLE STAKE TRUCK	W88473	1987	3,971	0.504	14.6	2001.38	57976.60	0.024	0.51	95.304	2025.21
36	2-AXLE STAKE TRUCK	P56030	1995	12,804	0.216	10.7	2765.66	137002.80	0.024	0.51	307.296	6530.04
37	2-AXLE STAKE TRUCK	P56031	1995	2,341	0.216	10.7	505.66	25048.70	0.024	0.51	56.184	1193.91
38	2-AXLE STAKE TRUCK	P56032	1995	8,135	0.216	10.7	1757.16	87044.50	0.024	0.51	195.24	4148.85
39	2-AXLE STAKE TRUCK	P56035	1995	8,930	0.216	10.7	1928.88	95551.00	0.024	0.51	214.32	4554.3
40	2-AXLE STAKE TRUCK	P56037	1995	1,507	0.216	10.7	325.51	16124.90	0.024	0.51	36.168	768.57
41	2-AXLE STAKE TRUCK	P56038	1995	12,803	0.216	10.7	2765.45	136992.10	0.024	0.51	307.272	6529.53
42	2-AXLE STAKE TRUCK	P56039	1995	11,480	0.216	10.7	2479.68	122836.00	0.024	0.51	275.52	5854.8
43	2-AXLE STAKE TRUCK	P56041	1995	9,697	0.216	10.7	2094.55	103757.90	0.024	0.51	232.728	4945.47
							Totals	59,066.93	2,170,513.94	Totals	4,189.20	89,020.50

**Photographs and Outreach**

Below are pictures of the two-axle dump and stake bed trucks purchased under this grant:



In accordance with the Public Outreach Plan approved by your office, the following news bulleting was posted on the LADWP website.



## Summary and Conclusions

In closing, this grant allowed for the purchase of twenty-seven (27) two-axle dump trucks and fifteen (15) two-axle stake trucks to replace older, diesel-powered ones. As a result the estimated total emission reduction for PM is 55,000 grams per year and for NOx nearly 2 million grams per year. This grant was very beneficial in helping to offset the additional cost of purchasing CNG powered vehicles, and has allowed LADWP to reduce its fleet emissions.

Pursuant to the authority vested in the Air Resources Board by Health and Safety Code Division 26, Part 5, Chapter 2; and pursuant to the authority vested in the undersigned by Health and Safety Code Sections 39515 and 39516 and Executive Order G-02-003;

**IT IS ORDERED AND RESOLVED:** The engine and emission control systems produced by the manufacturer are certified as described below for use in on-road motor vehicles with a manufacturer's GVWR over 14,000 pounds. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	ENGINE FAMILY	ENGINE SIZES (L)	FUEL TYPE <sup>1</sup>	STANDARDS & TEST PROCEDURE	INTENDED SERVICE CLASS <sup>2</sup>	ECS & SPECIAL FEATURES <sup>3</sup>	DIAGNOSTIC <sup>6</sup>
2011	BCEXH0540LBH	8.9	CNG/LNG	Diesel	HHDD	TBI, TC, CAC, ECM, EGR, TWC, HO2S	N/A
PRIMARY ENGINE'S IDLE EMISSIONS CONTROL <sup>5</sup>		ADDITIONAL IDLE EMISSIONS CONTROL <sup>5</sup>					
EXEMPT		N/A					
ENGINE (L)	ENGINE MODELS / CODES (rated power, in hp)						
8.9	ISL G 280 / 3517;FR93282 (280), ISL G 260 / 3517;FR93284 (260), ISL G 250 / 3517;FR93287 (250) ISL G 320 / 3517;FR93276 (320), ISL G 300 / 3517;FR93279 (300)						

<sup>1</sup> =not applicable; GVWR=gross vehicle weight rating; 13 CCR xyz=Title 13, California Code of Regulations, Section xyz; 40 CFR 88.abc=Title 40, Code of Federal Regulations, Section 88.abc; L=liter, hp=horsepower, kw=kilowatt, hr=hour;  
<sup>2</sup> CNG/LNG=compressed/liquefied natural gas; LPG=liquefied petroleum gas; E85=85% ethanol fuel; MF=multi fuel a.k.a. BF=bi fuel; DF=dual fuel; FF=flexible fuel;  
<sup>3</sup> L/M/H HDD=light/medium/heavy heavy-duty diesel; UB=urban bus; HDD=heavy duty Otto;  
<sup>4</sup> ECS=emission control system; TWC/OC=three-way/oxidizing catalyst; NAC=NOx adsorption catalyst; SCR-U / SCR-N=selective catalytic reduction - urea / - ammonia; WU (prefix) =warm-up catalyst; DPP=diesel particulate filter; PTOX=periodic trap oxidizer; HO2S/O2S=heated/oxygen sensor; HAFS/AFS=heated/air-fuel-ratio sensor (a.k.a., universal or linear oxygen sensor); TBI=throttle body fuel injection; SF/MFI=sequential/multi port fuel injection; DGI=direct gasoline injection; GCARB=gaseous carburetor; ID/DDI=indirect/direct diesel injection; TC/SC=turbo/super charger; CAC=charge air cooler; EGR / EGR-C=exhaust gas recirculation / cooled EGR; PAIR/AIR=pulsed/secondary air injection; SPL=smoke puff limiter; ECM/PCM=engine/powertrain control module; EM=engine modification; 2 (prefix)=parallel; (2) (suffix)=in series;  
<sup>5</sup> ESS=engine shutdown system (per 13 CCR 1956.8(a)(6)(A)(1); 30g=30 g/hr NOx (per 13 CCR 1956.8(a)(6)(C); APS =internal combustion auxiliary power system; ALT=alternative method (per 13 CCR 1956.8(a)(6)(D); Exempt=exempted per 13 CCR 1956.8(a)(6)(B) or for CNG/LNG fuel systems; N/A=not applicable (e.g., Otto engines and vehicles);  
<sup>6</sup> EMD=engine manufacturer diagnostic system (13 CCR 1971); OBD=on-board diagnostic system (13 CCR 1971.1);

Following are: 1) the FTP exhaust emission standards, or family emission limit(s) as applicable, under 13 CCR 1956.8; 2) the EURO and NTE limits under the applicable California exhaust emission standards and test procedures for heavy-duty diesel engines and vehicles (Test Procedures); and 3) the corresponding certification levels, for this engine family. "Diesel" CO, EURO and NTE certification compliance may have been demonstrated by the manufacturer as provided under the applicable Test Procedures in lieu of testing. (For flexible- and dual-fueled engines, the CERT values in brackets [ ] are those when tested on conventional test fuel. For multi-fueled engines, the STD and CERT values for default operation permitted in 13 CCR 1956.8 are in parentheses.).

in g/bhp-hr	NMHC		NOx		NMHC+NOx		CO		PM		HCHO	
	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO
STD	0.14	0.14	0.20	0.20	*	*	15.5	15.5	0.01	0.01	*	*
FEL	*	*	*	*	*	*	*	*	*	*	*	*
CERT	0.08	0.08	0.13	0.01	*	*	14.2	11.5	0.002	0.001	*	*
NTE	0.21		0.30		*		19.4		0.02		*	

<sup>4</sup> g/bhp-hr=grams per brake horsepower-hour; FTP=Federal Test Procedure; EURO=Euro III European Steady-State Cycle, including RMCSET=ram mode cycle supplemental emissions testing; NTE=Not-to-Exceed; STD=standard or emission test cap; FEL=family emission limit; CERT=certification level; NMHC/HC=non-methane/hydrocarbon; NOx=oxides of nitrogen; CO=carbon monoxide; PM=particulate matter; HCHO=formaldehyde; (Rev.: 2007-02-26)

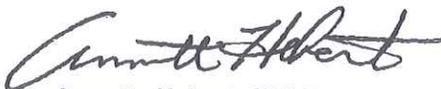
**BE IT FURTHER RESOLVED:** Certification to the FEL(s) listed above, as applicable, is subject to the following terms, limitations and conditions. The FEL(s) is the emission level declared by the manufacturer and serves in lieu of an emission standard for certification purposes in any averaging, banking, or trading (ABT) programs. It will be used for determining compliance of any engine in this family and compliance with such ABT programs.

**BE IT FURTHER RESOLVED:** For the listed engine models the manufacturer has submitted the materials to demonstrate certification compliance with 13 CCR 1965 (emission control labels) and 13 CCR 2035 et seq. (emission control warranty).

Engines certified under this Executive Order must conform to all applicable California emission regulations.

The Bureau of Automotive Repair will be notified by copy of this Executive Order.

Executed at El Monte, California on this 23 day of December 2010.

  
Annette Hebert, Chief  
Mobile Source Operations Division