

Appendix F

Economic Analysis Support

Proposed Revisions to the On-Board Diagnostic System Requirements and Associated Enforcement Provisions for Passenger Cars, Light-Duty Trucks, Medium-Duty Vehicles and Engines, and Heavy-Duty Engines

Date of Release: June 1, 2021

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For the cost analysis, each proposed modification was analyzed for its cost impact. The following tables show the cost assessment for some of the key proposed modifications to the regulations for illustrative purposes. The assessment was done for a typical "large light- and medium-duty vehicle manufacturer", a typical "small light- and medium-duty vehicle manufacturer", a typical "large heavy-duty engine manufacturer", and a typical "small heavy-duty engine manufacturer", respectively, and scaled to apply to the corresponding industry sectors. To simplify the analysis, only cost increases and cost savings that were easily quantifiable based on information and data available to staff and had significant impact were estimated. Additionally, when estimating the cost of SAE J1979-2 implementation, staff assumed a worst case scenario where a manufacturer develops software from the ground up even though many of the affected manufacturers already have a certain degree of existing software supporting SAE J1979-2. Regulatory changes that were considered clarifications of the existing regulation to ensure consistent implementation of OBD systems across manufacturers were also assigned zero costs because the associated costs should have previously been accounted for and/or the number of systems needing modifications to ensure consistent implementation were difficult to quantify to estimate the potential cost impact.

Table F-1. Large LD and MD Vehicle Manufacturer Major Costs of the OBD II Proposal

OBD II Proposal	Total hardware costs (\$)	Total software algo dev costs (\$)	Total calibration costs (\$)	Total testing costs (\$)	Total reporting costs (\$)	Total costs per manufacturer (\$)	Total annual costs per manufacturer (\$)
3-byte fault codes	252,004	922,560	0	82,034	0	1,256,598	209,433
Status bits	107,711	46,128	0	41,017	0	194,856	32,476
Fault code specific readiness	107,711	46,128	0	41,017	0	194,856	32,476
Additional freeze frames	41,662	18,451	0	103	0	60,216	10,036
Supplemental monitor activity data	201,197	110,707	0	61,526	4,889	378,318	63,053
Fault code specific IUMPR	15,445	59,966	0	30,763	7,333	113,508	18,918
Fault code specific test results	18,087	59,966	0	30,763	0	108,817	18,136
Additional data stream parameters	12,478	3,229	0	3,076	0	18,783	3,131
EVAP system sealing function	2,032	9,226	4,268	4,102	0	19,628	3,271
PVE testing relaxations	0	0	0	(24,444)	0	(24,444)	(4,074)
Gasoline CSERS modifications	0	6,458	0	0	0	6,458	1,076
Gasoline CSERS catalyst heating monitor	99,573	46,128	101,614	39,062	0	286,376	47,729
Gasoline stall monitor	99,573	92,256	60,968	39,062	0	291,858	48,643
Diesel PM filter monitor and IUMPR	850,937	4,613	814	587	0	856,951	142,825
Diesel feedgas generation monitoring	0	0	0	(244)	0	(244)	(41)
Diesel CSERS modifications	0	4,059	0	0	0	4,059	677
Diesel CSERS CWS monitor	2,042	73,805	4,070	782	0	80,698	13,450
Diesel CSERS trackers	417	36,902	2,035	782	0	40,136	6,689
Diesel NOx sensor monitor data	0	0	0	1,043	313	1,356	226
Diesel catalyst/adsorber malfunction criteria determination requirements	0	0	0	880	782	1,662	277
Total	1,810,870	1,540,583	173,768	351,908	13,317	3,890,446	648,408

Table F-2. Small LD and MD Vehicle Manufacturer Major Costs of the OBD II Proposal

OBD II Proposal	Total hardware costs (\$)	Total software algo dev costs (\$)	Total calibration costs (\$)	Total testing costs (\$)	Total reporting costs (\$)	Total costs per manufacturer (\$)	Total annual costs per manufacturer (\$)
3-byte fault codes	641	36,902	0	5,867	0	43,410	7,235
Status bits	274	1,845	0	2,933	0	5,052	842
Fault code specific readiness	274	1,845	0	2,933	0	5,052	842
Additional freeze frames	106	738	0	7	0	851	142
Supplemental monitor activity data	512	4,428	0	4,400	4,889	14,229	2,371
Fault code specific IUMPR	39	2,399	0	2,200	7,333	11,971	1,995
Fault code specific test results	46	2,399	0	2,200	0	4,645	774
Additional data stream parameters	32	129	0	220	0	381	63
EVAP system sealing function	5	369	305	293	0	972.7421	162
PVE testing relaxations	0	0	0	(1,748)	0	(1,748)	(291)
Gasoline CSERS modifications	0	258	0	0	0	258	43
Gasoline CSERS catalyst heating monitor	253	1,845	7,631	2,793	0	12,522	2,087
Gasoline stall monitor	253	3,690	4,578	2,793	0	11,315	1,886
Diesel PM filter monitor and IUMPR	0	0	0	0	0	0	0
Diesel feedgas generation monitoring	0	0	0	0	0	0	0
Diesel CSERS modifications	0	0	0	0	0	0	0
Diesel CSERS CWS monitor	0	0	0	0	0	0	0
Diesel CSERS trackers	0	0	0	0	0	0	0
Diesel NOx sensor monitor data	0	0	0	0	313	313	52
Diesel catalyst/adsorber malfunction criteria determination requirements	0	0	0	0	0	0	0
Total	2,435	56,848	12,514	24,892	12,535	109,224	18,204

Table F-3. Large HD Engine Manufacturer Major Costs of the HD OBD Proposal

HD OBD Proposal	Total hardware costs (\$)	Total software algo dev costs (\$)	Total calibration costs (\$)	Total testing costs (\$)	Total reporting costs (\$)	Total costs per manufacturer (\$)	Total annual costs per manufacturer (\$)
3-byte fault codes	828	395,383	0	21,281	0	417,493	69,582
Status bits	354	19,769	0	10,641	0	30,764	5,127
Fault code specific readiness	354	19,769	0	10,641	0	30,764	5,127
Additional freeze frames	137	7,908	0	27	0	8,071	1,345
Supplemental monitor activity data	661	47,446	0	15,961	2,095	66,163	11,027
Fault code specific IUMPR	51	25,700	0	7,980	3,143	36,874	6,146
Fault code specific test results	59	25,700	0	7,980	0	33,740	5,623
Additional data stream parameters	41	1384	0	798	0	2,223	370
EVAP system sealing function	30	9,226	2,583	2,483	0	14,322	2,387
Gasoline CSERS modifications	0	0	0	0	0	0	0
Gasoline CSERS catalyst heating monitor	0	0	0	0	0	0	0
Gasoline stall monitor	0	0	0	0	0	0	0
Diesel CSERS modifications	0	10,148	0	0	0	10,148	1,691
Diesel CSERS CWS monitor	1,395	184,512	129,174	24,828	0	339,910	56,652
Diesel CSERS trackers	285	92,256	64,587	24,828	0	181,956	30,326
Diesel NOx sensor monitor data	0	0	0	26,074	782	26,856	4,476
Diesel catalyst/adsorber malfunction criteria determination requirements	0	0	0	6,600	1,956	8,555	1,426
Total	4,197	839,200	196,345	160,122	7,976	1,207,839	201,307

Table F-4. Small HD Engine Manufacturer Major Costs of the HD OBD Proposal

HD OBD Proposal	Total hardware costs (\$)	Total software algo dev costs (\$)	Total calibration costs (\$)	Total testing costs (\$)	Total reporting costs (\$)	Total costs per manufacturer (\$)	Total annual costs per manufacturer (\$)
3-byte fault codes	40	36,902	0	2,829	0	39,771	6,629
Status bits	17	1,845	0	1,414	0	3,277	546
Fault code specific readiness	17	1,845	0	1,414	0	3,277	546
Additional freeze frames	7	738	0	4	0	748	125
Supplemental monitor activity data	32	4,428	0	2,121	2095	8,677	1,446
Fault code specific IUMPR	2	2,399	0	1,061	3143	6,605	1,101
Fault code specific test results	3	2,399	0	1,061	0	3,462	577
Additional data stream parameters	2	129	0	106	0	237	40
EVAP system sealing function	1	369	343	330	0	1,044	174
Gasoline CSERS modifications	0	258	0	0	0	258	43
Gasoline CSERS catalyst heating monitor	6	1,845	572	2,475	0	4,898	816
Gasoline stall monitor	6	3,690	286	2,475	0	6,457	1,076
Diesel CSERS modifications	0	406	0	0	0	406	68
Diesel CSERS CWS monitor	68	7,380	4,292	825	0	12,565	2,094
Diesel CSERS trackers	14	3,690	2,146	825	0	6,675	1,113
Diesel NOx sensor monitor data	0	0	0	2,607	782	3,390	565
Diesel catalyst/adsorber malfunction criteria determination requirements	0	0	0	2,200	1956	4,155	693
Total	215	68,325	7,640	21,747	7,976	105,902	17,650