Report #:DOE/EIA-0554(2009)
Release date: March 2009
Next release date: March 2010

Assumptions to the Annual Energy Outlook 2009

Table 7.11. High Technology Matrix For Cars

	Fractional Fuel Efficiency Change	Incremental Cost (1990$)	Incremental Cost ($/Unit Wt.)	Incremental Weight (Lbs.)	Incremental Weight (Lbs./Unit Wt.)	Introduction Year	Fractional Horse-power Change
Unit Body Construction	4	100	0	0	-6	1980	0
Material Substitution II	3.3	0	0.4	0	-5	1990	0
Material Substitution III	6.6	0	0.6	0	-10	1998	0
Material Substitution IV	9.9	0	0.5	0	-15	2006	0
Material Substitution V	13.2	0	1.1	0	-20	2014	0
Drag Reduction II	1.6	16	0	0	0	1988	0
Drag Reduction III	3.2	32	0	0	0.2	1992	0
Drag Reduction IV	6.3	45	0	0	0.5	2000	0
Drag Reduction V	8	53.5	0	0	1	2010	0
Roll-Over Technology	-1.5	100	0	0	2.2	2004	0
Side Impact Technology	-1.5	100	0	0	2.2	2004	0
Adv Low Loss Torque Converter	2	25	0	0	0	1999	0
Early Torque Converter Lockup	1	25.6	0	0	0	2002	0
Aggressive Shift Logic	3.5	45	0	0	0	1999	0
4-Speed Automatic	4.5	285	0	10	0	1980	0
5-Speed Automatic	8	106.5	0	20	0	1995	0
6-Speed Automatic	5.5	103.8	0	30	0	2003	0
6-Speed Manual	2	91.4	0	20	0	1995	0
CVT	6	213.9	0	-25	0	1998	0
Automated Manual Trans	12	120.4	0	0	0	2004	0
Roller Cam	2	16	0	0	0	1980	0
OHC/AdvOHV-4 Cylinder	3	93.1	0	0	0	1980	10
OHC/AdvOHV-6 Cylinder	3	108.9	0	0	0	1987	10
OHC/AdvOHV-8 Cylinder	3	124.7	0	0	0	1986	10
4-Valve/4-Cylinder	8.8	205	0	10	0	1988	17
4-Valve/6-Cylinder	8.8	280	0	15	0	1992	17
4 Valve/8-Cylinder	8.8	320	0	20	0	1994	17
5 Valve/6-Cylinder	9	300	0	18	0	1998	20
VVT-4 Cylinder	2.5	35	0	10	0	1994	5
VVT-6 Cylinder	2.5	87.5	0	20	0	1993	5
VVT-8 Cylinder	2.5	140	0	20	0	1993	5
VVL-4 Cylinder	5	144.3	0	25	0	1997	10
VVL-6 Cylinder	5	27.1	0	40	0	2000	10
VVL-8 Cylinder	5	398	0	50	0	2000	10
Camless Valve Actuation-4cyl	7.5	280	0	35	0	2020	13
Camless Valve Actuation-6cyl	7.5	420	0	55	0	2020	13
Camless Valve Actuation-8cyl	7.5	560	0	75	0	2020	13
Cylinder Deactivation	6	173.4	0	10	0	2004	0
Turbocharging/ Supercharging	5	295.1	0	-100	0	1980	15
Engine Friction Reduction I	2	54	0	0	0	1992	3
Engine Friction Reduction II	3.5	60.9	0	0	0	2000	5
Engine Friction Reduction III	5	92.2	0	0	0	2008	7
Engine Friction Reduction IV	6.5	177	0	0	0	2016	9
Stoichiometric GDI/4-Cylinder	7	231.4	0	20	0	2006	10
Stoichiometric GDI/6-Cylinder	7	311.3	0	30	0	2006	10
Lean Burn GDI	6	640.5	0	20	0	2020	0
5W-30 Engine Oil	1	6.0	0	0	0	1998	0
5W-20 Engine Oil	2	37.5	0	0	0	2003	0
OW-20 Engine Oil	3.1	150	0	0	0	2030	0
Electric Power Steering	2	127.5	0	0	0	2004	0
Improved Alternator	0.3	15	0	0	0	2005	0
Improved Oil/Water Pump	0.5	10	0	0	0	2000	0
Electric Oil/Water Pump	1	93.4	0	0	0	2007	0
Tires II	2	6.1	0	-8	0	1995	0
Tires III	3.5	12.3	0	-12	0	2005	0
Tires IV	5	16.9	0	-16	0	2015	0
Front Wheel Drive	6	250	0	0	-6	1980	0
Four Wheel Drive Improvements	2	577.3	0	0	-1	2000	0
42V-Launch Assist and Regen	5	280	0	80	0	2005	-5
42V-Engine Off at Idle	7.5	496.6	0	45	0	2005	0
Tier 2 Emissions Technology	-1	120	0	20	0	2006	0
Increased Size/Weight	-1.7	0	0	0	2.55	2003	0
Variable Compression Ratio	4	350	0	25	0	2015	0

Source: Energy and Environmental Analysis, *Documentation of Technology included in the NEMS Fuel Economy Model for Passenger Cars and Light Trucks* (September, 2002). National Research Council, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards* (Copyright 2002). National Highway Traffic Safety Administration, *Corporate Average Fuel Economy for MY 2011-2015 Passenger Cars and Light Trucks* (April 2008). U.S. Environmental Protection Agency, *Interim Report: New Powertrain Technologies and Their Projected Costs* (October 2005)