

Appendices to Preparation of Emissions Inventories for the  
Version 6.1, 2011 Emissions Modeling Platform

## Appendix A: 2011 NEI Nonpoint Oil and Gas SCCs

**Table A.1** SCCs in the 2011 NEI Version 1 Nonpoint Oil and Gas Sector (np\_oilgas)\*

SCC	SCC Description
2310000000	IP;OGEP;All Processes;Total: All Processes
2310000220	IP;OGEP;All Processes;Drill Rigs
2310000230	IP;OGEP;All Processes;Workover Rigs
2310000330	IP;OGEP;All Processes;Artificial Lift
2310000550	IP;OGEP;All Processes;Produced Water
2310000660	IP;OGEP;All Processes;Hydraulic Fracturing Engines
2310002000	IP;OGEP;Off-Shore Oil And Gas Production;Total: All Processes
2310002301	IP;OGEP;Off-Shore Oil And Gas Production;Flares: Continuous Pilot Light
2310002305	IP;OGEP;Off-Shore Oil And Gas Production;Flares: Flaring Operations
2310002401	IP;OGEP;Off-Shore Oil And Gas Production;Pneumatic Pumps: Gas And Oil Wells
2310002411	IP;OGEP;Off-Shore Oil And Gas Production;Pressure/Level Controllers
2310002421	IP;OGEP;Off-Shore Oil And Gas Production;Cold Vents
2310010000	IP;OGEP;Crude Petroleum;Total: All Processes
2310010100	IP;OGEP;Crude Petroleum;Oil Well Heaters
2310010200	IP;OGEP;Crude Petroleum;Oil Well Tanks - Flashing & Standing/Working/Breathing
2310010300	IP;OGEP;Crude Petroleum;Oil Well Pneumatic Devices
2310010700	IP;OGEP;Crude Petroleum;Oil Well Fugitives
2310010800	IP;OGEP;Crude Petroleum;Oil Well Truck Loading
2310011000	IP;OGEP;On-Shore Oil Production;Total: All Processes
2310011020	IP;OGEP;On-Shore Oil Production;Storage Tanks: Crude Oil
2310011100	IP;OGEP;On-Shore Oil Production;Heater Treater
2310011201	IP;OGEP;On-Shore Oil Production;Tank Truck/Railcar Loading: Crude Oil
2310011450	IP;OGEP;On-Shore Oil Production;Wellhead
2310011500	IP;OGEP;On-Shore Oil Production;Fugitives: All Processes
2310011501	IP;OGEP;On-Shore Oil Production;Fugitives: Connectors
2310011502	IP;OGEP;On-Shore Oil Production;Fugitives: Flanges
2310011503	IP;OGEP;On-Shore Oil Production;Fugitives: Open Ended Lines
2310011504	IP;OGEP;On-Shore Oil Production;Fugitives: Pumps
2310011505	IP;OGEP;On-Shore Oil Production;Fugitives: Valves
2310011506	IP;OGEP;On-Shore Oil Production;Fugitives: Other
2310012000	IP;OGEP;Off-Shore Oil Production;Total: All Processes
2310012020	IP;OGEP;Off-Shore Oil Production;Storage Tanks: Crude Oil
2310012511	IP;OGEP;Off-Shore Oil Production;Fugitives, Connectors: Oil Streams
2310012512	IP;OGEP;Off-Shore Oil Production;Fugitives, Flanges: Oil
2310012515	IP;OGEP;Off-Shore Oil Production;Fugitives, Valves: Oil
2310012516	IP;OGEP;Off-Shore Oil Production;Fugitives, Other: Oil
2310012521	IP;OGEP;Off-Shore Oil Production;Fugitives, Connectors: Oil/Water Streams
2310012522	IP;OGEP;Off-Shore Oil Production;Fugitives, Flanges: Oil/Water
2310012526	IP;OGEP;Off-Shore Oil Production;Fugitives, Other: Oil/Water
2310020000	IP;OGEP;Natural Gas;Total: All Processes
2310020600	IP;OGEP;Natural Gas;Compressor Engines
2310020800	IP;OGEP;Natural Gas;Gas Well Truck Loading

SCC	SCC Description
2310021010	IP;OGEP;On-Shore Gas Production;Storage Tanks: Condensate
2310021011	IP;OGEP;On-Shore Gas Production;Condensate Tank Flaring
2310021030	IP;OGEP;On-Shore Gas Production;Tank Truck/Railcar Loading: Condensate
2310021100	IP;OGEP;On-Shore Gas Production;Gas Well Heaters
2310021101	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 2Cycle Lean Burn Compressor Engines < 50 HP
2310021102	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 2Cycle Lean Burn Compressor Engines 50 To 499 HP
2310021103	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 2Cycle Lean Burn Compressor Engines 500+ HP
2310021201	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 4Cycle Lean Burn Compressor Engines <50 HP
2310021202	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 4Cycle Lean Burn Compressor Engines 50 To 499 HP
2310021203	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 4Cycle Lean Burn Compressor Engines 500+ HP
2310021209	IP;OGEP;On-Shore Gas Production;Total: All Natural Gas Fired 4Cycle Lean Burn Compressor Engines
2310021251	IP;OGEP;On-Shore Gas Production;Lateral Compressors 4 Cycle Lean Burn
2310021300	IP;OGEP;On-Shore Gas Production;Gas Well Pneumatic Devices
2310021301	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 4Cycle Rich Burn Compressor Engines <50 HP
2310021302	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 4Cycle Rich Burn Compressor Engines 50 To 499 HP
2310021303	IP;OGEP;On-Shore Gas Production;Natural Gas Fired 4Cycle Rich Burn Compressor Engines 500+ HP
2310021309	IP;OGEP;On-Shore Gas Production;Total: All Natural Gas Fired 4Cycle Rich Burn Compressor Engines
2310021310	IP;OGEP;On-Shore Gas Production;Gas Well Pneumatic Pumps
2310021351	IP;OGEP;On-Shore Gas Production;Lateral Compressors 4 Cycle Rich Burn
2310021400	IP;OGEP;On-Shore Gas Production;Gas Well Dehydrators
2310021401	IP;OGEP;On-Shore Gas Production;Nat Gas Fired 4Cycle Rich Burn Compressor Engines <50 HP w/NSCR
2310021402	IP;OGEP;On-Shore Gas Production;Nat Gas Fired 4Cycle Rich Burn Compressor Engines 50 To 499 HP w/NSCR
2310021403	IP;OGEP;On-Shore Gas Production;Nat Gas Fired 4Cycle Rich Burn Compressor Engines 500+ HP w/NSCR
2310021411	IP;OGEP;On-Shore Gas Production;Gas Well Dehydrators – Flaring
2310021500	IP;OGEP;On-Shore Gas Production;Gas Well Completion - Flaring And Venting
2310021501	IP;OGEP;On-Shore Gas Production;Fugitives: Connectors
2310021502	IP;OGEP;On-Shore Gas Production;Fugitives: Flanges
2310021503	IP;OGEP;On-Shore Gas Production;Fugitives: Open Ended Lines
2310021504	IP;OGEP;On-Shore Gas Production;Fugitives: Pumps
2310021505	IP;OGEP;On-Shore Gas Production;Fugitives: Valves
2310021506	IP;OGEP;On-Shore Gas Production;Fugitives: Other
2310021509	IP;OGEP;On-Shore Gas Production;Fugitives: All Processes
2310021600	IP;OGEP;On-Shore Gas Production;Gas Well Venting
2310021601	IP;OGEP;On-Shore Gas Production;Gas Well Venting - Initial Completions
2310021602	IP;OGEP;On-Shore Gas Production;Gas Well Venting – Recompletions
2310021603	IP;OGEP;On-Shore Gas Production;Gas Well Venting – Blowdowns
2310021604	IP;OGEP;On-Shore Gas Production;Gas Well Venting - Compressor Startups
2310021605	IP;OGEP;On-Shore Gas Production;Gas Well Venting - Compressor Shutdowns
2310021700	IP;OGEP;On-Shore Gas Production;Miscellaneous Engines

SCC	SCC Description
2310022000	IP;OGEP;Off-Shore Gas Production;Total: All Processes
2310022010	IP;OGEP;Off-Shore Gas Production;Storage Tanks: Condensate
2310022051	IP;OGEP;Off-Shore Gas Production;Turbines: Natural Gas
2310022090	IP;OGEP;Off-Shore Gas Production;Boilers/Heaters: Natural Gas
2310022105	IP;OGEP;Off-Shore Gas Production;Diesel Engines
2310022410	IP;OGEP;Off-Shore Gas Production;Amine Unit
2310022420	IP;OGEP;Off-Shore Gas Production;Dehydrator
2310022501	IP;OGEP;Off-Shore Gas Production;Fugitives, Connectors: Gas Streams
2310022502	IP;OGEP;Off-Shore Gas Production;Fugitives, Flanges: Gas Streams
2310022505	IP;OGEP;Off-Shore Gas Production;Fugitives, Valves: Gas
2310022506	IP;OGEP;Off-Shore Gas Production;Fugitives, Other: Gas
2310030000	IP;OGEP;Natural Gas Liquids;Total: All Processes
2310030210	IP;OGEP;Natural Gas Liquids;Gas Well Tanks - Flashing & Standing/Working/Breathing, Uncontrolled
2310030300	IP;OGEP;Natural Gas Liquids;Gas Well Water Tank Losses
2310030401	IP;OGEP;Natural Gas Liquids;Gas Plant Truck Loading
2310111100	IP;OGEP;On-Shore Oil Exploration;Mud Degassing
2310111401	IP;OGEP;On-Shore Oil Exploration;Oil Well Pneumatic Pumps
2310111700	IP;OGEP;On-Shore Oil Exploration;Oil Well Completion: All Processes
2310112401	IP;OGEP;Off-Shore Oil Exploration;Oil Well Pneumatic Pumps
2310121100	IP;OGEP;On-Shore Gas Exploration;Mud Degassing
2310121401	IP;OGEP;On-Shore Gas Exploration;Gas Well Pneumatic Pumps
2310121700	IP;OGEP;On-Shore Gas Exploration;Gas Well Completion: All Processes
2310122100	IP;OGEP;Off-Shore Gas Exploration;Mud Degassing

\* IP;OGEP=Industrial Processes; Oil and gas Exploration and Production

## Appendix B: Mapping of Fuel Distribution SCCs to BTP, BPS and RBT

Table B-1 provides a crosswalk between SCC and classification type for portable fuel containers (PFC), fuel distribution operations associated with the bulk-plant-to-pump (BTP), refinery to bulk terminal (RBT) and bulk plant storage (BPS).

**Table B-1.** Crosswalk of SCC to PFC, BTP, BPS, and RBT

SCC	Description	Type
40300201	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Deleted - Do Not Use (See 4-03-011 and 4-07);Gasoline	RBT
40300302	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Deleted - Do Not Use (See 4-03-011 and 4-07);Gasoline	RBT
40301001	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Fixed Roof Tanks (Varying Sizes);Gasoline RVP 13: Breathing Loss (67000 Bbl. Tank Size)	RBT
40301002	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Fixed Roof Tanks (Varying Sizes);Gasoline RVP 10: Breathing Loss (67000 Bbl. Tank Size)	RBT
40301003	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Fixed Roof Tanks (Varying Sizes);Gasoline RVP 7: Breathing Loss (67000 Bbl. Tank Size)	RBT
40301004	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Fixed Roof Tanks (Varying Sizes);Gasoline RVP 13: Breathing Loss (250000 Bbl. Tank Size)	RBT
40301006	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Fixed Roof Tanks (Varying Sizes);Gasoline RVP 7: Breathing Loss (250000 Bbl. Tank Size)	RBT
40301007	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Fixed Roof Tanks (Varying Sizes);Gasoline RVP 13: Working Loss (Tank Diameter Independent)	RBT
40301101	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Floating Roof Tanks (Varying Sizes);Gasoline RVP 13: Standing Loss (67000 Bbl. Tank Size)	RBT
40301102	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Floating Roof Tanks (Varying Sizes);Gasoline RVP 10: Standing Loss (67000 Bbl. Tank Size)	RBT
40301103	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Floating Roof Tanks (Varying Sizes);Gasoline RVP 7: Standing Loss (67000 Bbl. Tank Size)	RBT
40301105	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Floating Roof Tanks (Varying Sizes);Gasoline RVP 10: Standing Loss (250000 Bbl. Tank Size)	RBT
40301151	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Floating Roof Tanks (Varying Sizes);Gasoline: Standing Loss - Internal	RBT
40301202	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Variable Vapor Space;Gasoline RVP 10: Filling Loss	RBT
40301203	Petroleum and Solvent Evaporation;Petroleum Product Storage at Refineries;Variable Vapor Space;Gasoline RVP 7: Filling Loss	RBT
40400100	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;undefined	RBT
40400101	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Breathing Loss (67000 Bbl Capacity) - Fixed Roof Tank	RBT
40400102	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Breathing Loss (67000 Bbl Capacity) - Fixed Roof Tank	RBT
40400103	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Breathing Loss (67000 Bbl. Capacity) - Fixed Roof Tank	RBT

SCC	Description	Type
40400104	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Breathing Loss (250000 Bbl Capacity)-Fixed Roof Tank	RBT
40400105	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Breathing Loss (250000 Bbl Capacity)-Fixed Roof Tank	RBT
40400106	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Breathing Loss (250000 Bbl Capacity) - Fixed Roof Tank	RBT
40400107	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Working Loss (Diam. Independent) - Fixed Roof Tank	RBT
40400108	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Working Loss (Diameter Independent) - Fixed Roof Tank	RBT
40400109	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Working Loss (Diameter Independent) - Fixed Roof Tank	RBT
40400110	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Standing Loss (67000 Bbl Capacity)-Floating Roof Tank	RBT
40400111	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Standing Loss (67000 Bbl Capacity)-Floating Roof Tank	RBT
40400112	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Standing Loss (67000 Bbl Capacity)-Floating Roof Tank	RBT
40400113	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Standing Loss (250000 Bbl Cap.) - Floating Roof Tank	RBT
40400114	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Standing Loss (250000 Bbl Cap.) - Floating Roof Tank	RBT
40400115	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Standing Loss (250000 Bbl Cap.) - Floating Roof Tank	RBT
40400116	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13/10/7: Withdrawal Loss (67000 Bbl Cap.) - Float Rf Tnk	RBT
40400117	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13/10/7: Withdrawal Loss (250000 Bbl Cap.) - Float Rf Tnk	RBT
40400118	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space	RBT
40400119	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space	RBT
40400120	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space	RBT
40400130	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Specify Liquid: Standing Loss - External Floating Roof w/ Primary Seal	RBT
40400131	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Standing Loss - Ext. Floating Roof w/ Primary Seal	RBT
40400132	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Standing Loss - Ext. Floating Roof w/ Primary Seal	RBT

SCC	Description	Type
40400133	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Standing Loss - External Floating Roof w/ Primary Seal	RBT
40400140	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Specify Liquid: Standing Loss - Ext. Float Roof Tank w/ Second'y Seal	RBT
40400141	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Standing Loss - Ext. Floating Roof w/ Secondary Seal	RBT
40400142	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Standing Loss - Ext. Floating Roof w/ Secondary Seal	RBT
40400143	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Standing Loss - Ext. Floating Roof w/ Secondary Seal	RBT
40400148	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13/10/7: Withdrawal Loss - Ext. Float Roof (Pri/Sec Seal)	RBT
40400149	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Specify Liquid: External Floating Roof (Primary/Secondary Seal)	RBT
40400150	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Miscellaneous Losses/Leaks: Loading Racks	RBT
40400151	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Valves, Flanges, and Pumps	RBT
40400152	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Vapor Collection Losses	RBT
40400153	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Vapor Control Unit Losses	RBT
40400160	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Specify Liquid: Standing Loss - Internal Floating Roof w/ Primary Seal	RBT
40400161	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Standing Loss - Int. Floating Roof w/ Primary Seal	RBT
40400162	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Standing Loss - Int. Floating Roof w/ Primary Seal	RBT
40400163	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Standing Loss - Internal Floating Roof w/ Primary Seal	RBT
40400170	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Specify Liquid: Standing Loss - Int. Floating Roof w/ Secondary Seal	RBT
40400171	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13: Standing Loss - Int. Floating Roof w/ Secondary Seal	RBT
40400172	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 10: Standing Loss - Int. Floating Roof w/ Secondary Seal	RBT
40400173	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 7: Standing Loss - Int. Floating Roof w/ Secondary Seal	RBT
40400178	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Gasoline RVP 13/10/7: Withdrawal Loss - Int. Float Roof (Pri/Sec Seal)	RBT
40400179	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;Specify Liquid: Internal Floating Roof (Primary/Secondary Seal)	RBT
40400199	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Terminals;See Comment **	RBT

SCC	Description	Type
40400201	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13: Breathing Loss (67000 Bbl Capacity) - Fixed Roof Tank	BTP
40400202	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10: Breathing Loss (67000 Bbl Capacity) - Fixed Roof Tank	BTP
40400203	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 7: Breathing Loss (67000 Bbl. Capacity) - Fixed Roof Tank	BPS
40400204	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13: Working Loss (67000 Bbl. Capacity) - Fixed Roof Tank	BPS
40400205	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10: Working Loss (67000 Bbl. Capacity) - Fixed Roof Tank	BPS
40400206	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 7: Working Loss (67000 Bbl. Capacity) - Fixed Roof Tank	BTP
40400207	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13: Standing Loss (67000 Bbl Cap.) - Floating Roof Tank	BTP
40400208	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10: Standing Loss (67000 Bbl Cap.) - Floating Roof Tank	BPS
40400210	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13/10/7: Withdrawal Loss (67000 Bbl Cap.) - Float Rf Tnk	BPS
40400211	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space	BTP
40400212	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space	BTP
40400213	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 7: Filling Loss (10500 Bbl Cap.) - Variable Vapor Space	BTP
40400230	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Specify Liquid: Standing Loss - External Floating Roof w/ Primary Seal	BTP
40400231	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13: Standing Loss - Ext. Floating Roof w/ Primary Seal	BTP
40400232	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10: Standing Loss - Ext. Floating Roof w/ Primary Seal	BPS
40400233	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 7: Standing Loss - External Floating Roof w/ Primary Seal	BTP
40400240	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Specify Liquid: Standing Loss - Ext. Floating Roof w/ Secondary Seal	RBT
40400241	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13: Standing Loss - Ext. Floating Roof w/ Secondary Seal	BPS
40400248	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10/13/7: Withdrawal Loss - Ext. Float Roof (Pri/Sec Seal)	BPS
40400249	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Specify Liquid: External Floating Roof (Primary/Secondary Seal)	RBT
40400250	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Loading Racks	BPS



SCC	Description	Type
40400251	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Valves, Flanges, and Pumps	BPS
40400252	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Miscellaneous Losses/Leaks: Vapor Collection Losses	BPS
40400253	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Miscellaneous Losses/Leaks: Vapor Control Unit Losses	BPS
40400260	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Specify Liquid: Standing Loss - Internal Floating Roof w/ Primary Seal	RBT
40400261	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13: Standing Loss - Int. Floating Roof w/ Primary Seal	BTP
40400262	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10: Standing Loss - Int. Floating Roof w/ Primary Seal	BTP
40400263	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 7: Standing Loss - Internal Floating Roof w/ Primary Seal	BTP
40400270	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Specify Liquid: Standing Loss - Int. Floating Roof w/ Secondary Seal	BPS
40400271	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 13: Standing Loss - Int. Floating Roof w/ Secondary Seal	BTP
40400272	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10: Standing Loss - Int. Floating Roof w/ Secondary Seal	BPS
40400273	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 7: Standing Loss - Int. Floating Roof w/ Secondary Seal	BPS
40400278	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Gasoline RVP 10/13/7: Withdrawal Loss - Int. Float Roof (Pri/Sec Seal)	BTP
40400279	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Bulk Plants;Specify Liquid: Internal Floating Roof (Primary/Secondary Seal)	BPS
40400401	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Petroleum Products - Underground Tanks;Gasoline RVP 13: Breathing Loss	BTP
40400402	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Petroleum Products - Underground Tanks;Gasoline RVP 13: Working Loss	BTP
40400403	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Petroleum Products - Underground Tanks;Gasoline RVP 10: Breathing Loss	BTP
40400404	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Petroleum Products - Underground Tanks;Gasoline RVP 10: Working Loss	BTP
40400405	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Petroleum Products - Underground Tanks;Gasoline RVP 7: Breathing Loss	BTP
40400406	Petroleum and Solvent Evaporation;Petroleum Liquids Storage (non-Refinery);Petroleum Products - Underground Tanks;Gasoline RVP 7: Working Loss	BTP
40600100	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;undefined	BTP
40600101	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Splash Loading	BTP
40600126	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Submerged Loading	BTP
40600131	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Submerged Loading (Normal Service)	BTP

SCC	Description	Type
40600136	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Splash Loading (Normal Service)	BTP
40600141	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Submerged Loading (Balanced Service)	BTP
40600144	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Splash Loading (Balanced Service)	BTP
40600147	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Submerged Loading (Clean Tanks)	BTP
40600162	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Loaded with Fuel (Transit Losses)	BTP
40600163	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Gasoline: Return with Vapor (Transit Losses)	BTP
40600197	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Not Classified	BTP
40600198	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Not Classified	BTP
40600199	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Tank Cars and Trucks;Not Classified	BTP
40600231	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Ship Loading - Cleaned and Vapor Free Tanks	RBT
40600232	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Ocean Barges Loading	RBT
40600233	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Barge Loading - Cleaned and Vapor Free Tanks	BTP
40600234	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Ship Loading - Ballasted Tank	RBT
40600235	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Ocean Barges Loading - Ballasted Tank	BTP
40600236	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Ship Loading - Uncleaned Tanks	RBT
40600237	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Ocean Barges Loading - Uncleaned Tanks	RBT
40600238	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Barges Loading - Uncleaned Tanks	RBT
40600239	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Tanker Ship - Ballasted Tank Condition	RBT
40600240	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Barge Loading - Average Tank Condition	RBT
40600241	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Gasoline: Tanker Ship - Ballasting	BTP
40600298	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Not Classified	RBT
40600299	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Marine Vessels;Not Classified	RBT
40600301	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Gasoline Retail Operations - Stage I;Splash Filling	BTP
40600302	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Gasoline Retail Operations - Stage I;Submerged Filling w/o Controls	BTP
40600305	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Gasoline Retail Operations - Stage I;Unloading	BTP

SCC	Description	Type
40600306	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Gasoline Retail Operations - Stage I;Balanced Submerged Filling	BTP
40600307	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Gasoline Retail Operations - Stage I;Underground Tank Breathing and Emptying	BTP
40600399	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Gasoline Retail Operations - Stage I;Not Classified	BTP
40600401	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Vapor Loss w/o Controls	BTP
40600403	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Filling Vehicle Gas Tanks - Stage II;Vapor Loss w/o Controls	BTP
40600501	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Pipeline Petroleum Transport - General - All Products;Pipeline Leaks	RBT
40600502	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Pipeline Petroleum Transport - General - All Products;Pipeline Venting	RBT
40600503	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Pipeline Petroleum Transport - General - All Products;Pump Station	RBT
40600504	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Pipeline Petroleum Transport - General - All Products;Pump Station Leaks	RBT
40600602	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Consumer (Corporate) Fleet Refueling - Stage II;Liquid Spill Loss w/o Controls	BTP
40600701	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Consumer (Corporate) Fleet Refueling - Stage I;Splash Filling	BTP
40600702	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Consumer (Corporate) Fleet Refueling - Stage I;Submerged Filling w/o Controls	BTP
40600706	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Consumer (Corporate) Fleet Refueling - Stage I;Balanced Submerged Filling	BTP
40600707	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Consumer (Corporate) Fleet Refueling - Stage I;Underground Tank Breathing and Emptying	BTP
40688801	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Fugitive Emissions;Specify in Comments Field	BTP
40688802	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Fugitive Emissions;Specify in Comments Field	BTP
40688803	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Fugitive Emissions;Specify in Comments Field	RBT
40688805	Petroleum and Solvent Evaporation;Transportation and Marketing of Petroleum Products;Fugitive Emissions;Specify in Comments Field	BTP
2501011011	Storage and Transport;Petroleum and Petroleum Product Storage;Residential Portable Gas Cans;Permeation	PFC
2501011012	Storage and Transport;Petroleum and Petroleum Product Storage;Residential Portable Gas Cans;Evaporation (includes Diurnal losses)	PFC
2501011013	Storage and Transport;Petroleum and Petroleum Product Storage;Residential Portable Gas Cans;Spillage During Transport	PFC
2501011014	Storage and Transport;Petroleum and Petroleum Product Storage;Residential Portable Gas Cans;Refilling at the Pump - Vapor Displacement	PFC
2501011015	Storage and Transport;Petroleum and Petroleum Product Storage;Residential Portable Gas Cans;Refilling at the Pump - Spillage	PFC
2501012011	Storage and Transport;Petroleum and Petroleum Product Storage;Commercial Portable Gas Cans;Permeation	PFC
2501012012	Storage and Transport;Petroleum and Petroleum Product Storage;Commercial Portable Gas Cans;Evaporation (includes Diurnal losses)	PFC
2501012013	Storage and Transport;Petroleum and Petroleum Product Storage;Commercial Portable Gas Cans;Spillage During Transport	PFC

<b>SCC</b>	<b>Description</b>	<b>Type</b>
2501012014	Storage and Transport;Petroleum and Petroleum Product Storage;Commercial Portable Gas Cans;Refilling at the Pump - Vapor Displacement	PFC
2501012015	Storage and Transport;Petroleum and Petroleum Product Storage;Commercial Portable Gas Cans;Refilling at the Pump - Spillage	PFC
2501050120	Storage and Transport;Petroleum and Petroleum Product Storage;Bulk Terminals: All Evaporative Losses;Gasoline	RBT
2501055120	Storage and Transport;Petroleum and Petroleum Product Storage;Bulk Plants: All Evaporative Losses;Gasoline	BPS
2501060051	Storage and Transport;Petroleum and Petroleum Product Storage;Gasoline Service Stations;Stage 1: Submerged Filling	BTP
2501060052	Storage and Transport;Petroleum and Petroleum Product Storage;Gasoline Service Stations;Stage 1: Splash Filling	BTP
2501060053	Storage and Transport;Petroleum and Petroleum Product Storage;Gasoline Service Stations;Stage 1: Balanced Submerged Filling	BTP
2501060100	Storage and Transport;Petroleum and Petroleum Product Storage;Gasoline Service Stations;Stage 2: Total	BTP
2501060201	Storage and Transport;Petroleum and Petroleum Product Storage;Gasoline Service Stations;Underground Tank: Breathing and Emptying	BTP
2501995000	Storage and Transport;Petroleum and Petroleum Product Storage;All Storage Types: Working Loss;Total: All Products	BTP
2505000120	Storage and Transport;Petroleum and Petroleum Product Transport;All Transport Types;Gasoline	RBT
2505020120	Storage and Transport;Petroleum and Petroleum Product Transport;Marine Vessel;Gasoline	RBT
2505020121	Storage and Transport;Petroleum and Petroleum Product Transport;Marine Vessel;Gasoline - Barge	RBT
2505030120	Storage and Transport;Petroleum and Petroleum Product Transport;Truck;Gasoline	BTP
2505040120	Storage and Transport;Petroleum and Petroleum Product Transport;Pipeline;Gasoline	RBT
2660000000	Waste Disposal, Treatment, and Recovery;Leaking Underground Storage Tanks;Leaking Underground Storage Tanks;Total: All Storage Types	BTP

## Appendix C: Memo Describing the Differences in MOVES speciated PM and CMAQ PM

The following memo from Madeleine Strum describes in detail the differences between MOVES speciated PM and AE5 PM species and the derivation of the equations to convert between them. The original memo was “MOVES2010 PM25 Onroad Speciation method\_24feb2011.docx” and has been copied below in full:

### Interim Approach to develop CMAQ PM2.5 species from Partially-speciated MOVES2010 EXHAUST PM2.5

#### Introduction

This document presents the interim approach developed by OTAQ and OAQPS to speciate the partially speciated PM<sub>2.5</sub> exhaust emissions from MOVES2010. The advantage of using this approach over the approach used for speciating total PM<sub>2.5</sub> is that it allows the speciated emissions from MOVES; i.e., elemental carbon and particulate sulfate to be retained and only the remainder of the PM<sub>2.5</sub> to rely on speciation profiles.

The table below shows the MOVES2010 EXHAUST PM<sub>2.5</sub>-related species and how they relate to the five CMAQ 4.7 model species: PEC, POC, PSO4, PNO3, and PMFINE

MOVES2010 Pollutant Name	shortName	Variable name for Equations	Relation to CMAQ model species
Primary Exhaust PM2.5 - Total	PM2.5 Total Exh	PM25_TOTAL	
Primary PM2.5 - Organic Carbon	PM2.5 Organic C	PM25OM	Sum <sup>1</sup> of <b>POC</b> , <b>PNO3</b> and <b>PMFINE</b>
Primary PM2.5 - Elemental Carbon	PM2.5 Elem C	PM25EC	<b>PEC</b>
Primary PM2.5 - Sulfate Particulate	PM2.5 Sulfate	PM25SO4	<b>PSO4</b>

We need to further disaggregate the MOVES species “PM25OM” into the CMAQ model species.

MOVES species are related as follows:  $PM25\_TOTAL = PM25EC + PM25OM + PSO4$

The five CMAQ species also sum to total PM<sub>2.5</sub>:

$$PM_{2.5} = POC+PEC+PNO3+PSO4+PMFINE$$

Section 2 discusses the procedure we used when using the draft version of MOVES prior to the MOVES2010 release. The issues with this approach and rational for the changes for MOVES2010 are presented here.

Section 3 provides the approach, data and assumptions used.

Sections 4 and 5 present the equations to be used for 2 situations: 1) when MOVES is run with actual temperatures, such as the case when MOVES is run within the SMOKE model (currently under design) and

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<sup>1</sup> For draft MOVES, for gasoline sources (in all cases using draft MOVES for the platform including 2005ai , 2005ak, 2005ap), this MOVES pollutant also included PSO4, since it was the difference of total PM<sub>2.5</sub> and PEC. With MOVES2010, this species is now the difference between total PM<sub>2.5</sub> and the sum of PEC and PSO4.

2) when MOVES is run at 72 F, such as the case when pre-computed MOVES emissions are input into SMOKE, and are adjusted based on gridded hourly temperatures prior to be input into CMAQ.

## **Background: Previous Approach Using Draft MOVES**

When we received output from the draft version of MOVES for gasoline vehicles (summer 2008), it did not include Primary Exhaust  $PM_{2.5}$  - Total. MOVES output provided emissions for the following:

- 1) Primary  $PM_{2.5}$  - Elemental Carbon (PEC)
- 2) Primary  $PM_{2.5}$ - Sulfate Particulate (PSO4)
- 3) The difference between total  $PM_{2.5}$  and PEC, which *was* labeled “PM25OC”

The total  $PM_{2.5}$  and PEC (from which the MOVES PM25OC was derived) were based on the Kansas City Study; the MOVES PSO4 was based on the fuel sulfur content. In our previous approach, we first subtracted PSO4 from PM25OC prior to further speciating it into the necessary CMAQ inputs.

When we tried to implement the same approach for draft MOVES for diesel vehicles, the  $PM_{2.5}$  Sulfate exceeded the PM25OC. Therefore we chose not to subtract  $PM_{2.5}$  Sulfate. Note that the diesel results did not come from the Kansas City study and the actual relationship between  $PM_{2.5}$  Total Exh ,  $PM_{2.5}$  Organic C and PEC is not necessarily the same as in the Kansas City study.

It should also be noted, that for the gasoline approach, the sulfates included in the gasoline-based “PM25OC” would have been specific to Kansas City and very small. It is possible that in other parts of the country or that for different years, the sulfate is much larger and would be inconsistent with the “PM25OC” of the Kansas City study. As a result, it was decided at the OTAQ/OAQPS Inventory Coordination Team meeting on 25Feb2010, that in the interim we will no longer remove PSO4 mass from MOVES “PM25OC” **for neither gasoline nor diesel vehicles.**

In addition to the above changes, there were also changes to the values used for the speciation approach. Attachment 1 provides the details.

Ultimately, the plan is for MOVES to provide the species that CMAQ requires (potentially a 6 month timeframe). In the meantime, adjustments will continue be made in a post processing step of the MOVES outputs that we describe in this document.

## **Previous Approach using MOVES2010 for the Version 4.1 Platform (“cr” series and pre-HD GHG “cs” series)**

Partially speciated  $PM_{2.5}$  emissions for diesel vehicles were first introduced into the MOVES2010 runs and used for Version 4.1 of the 2005 Platform. We used the same equations (other than computation of PMC) to obtain the pre-temperature adjusted CMAQ  $PM_{2.5}$  species for diesel and gasoline (only the computation of coarse particulate matter, PMC, was different between gasoline and diesel vehicles). These equations are the equations in section 4 that apply to gasoline vehicles. Thus, equation (7) is used to compute  $NH_4$  and equation (8) is not used at all.

The approach was changed by introducing equation (8) which zeroes out ammonium ( $NH_4$ ) for diesel vehicles instead of computing it stoichiometrically (equation 7). This was first implemented for post

processing the MOVES partially speciated PM emissions for the HD GHG modeling effort. The change was made because the v4.1 platform equations, when applied to diesel exhaust in some counties, resulted in negative POC due to the large fraction of sulfate and ammonium (NH<sub>4</sub>) resulting from the stoichiometric equation that relates ammonium mass to the mass of sulfate and nitrate. This stoichiometric equation assumes that the NH<sub>4</sub> balances the anions of sulfate and nitrate in the mix. However, this is not the case – in particular for diesel exhaust which has little or no ammonia and for which the sulfate is emitted as H<sub>2</sub>SO<sub>4</sub> acid as opposed to ammonium sulfate.

Section 4 thus provides the updated approach.

## Approach

The MOVES output provides total PM<sub>2.5</sub> and three components of PM<sub>2.5</sub>: two pre-speciated components of PM<sub>2.5</sub> which are: 1) *PEC*, and 2) *PSO4*, and a non-speciated component termed “*PM25OM*”, which is defined as the difference between total PM<sub>2.5</sub> and *PEC*.

It is important to note that *PM25OM* is not solely made up of organic matter, but is defined as the following:

$$\text{MOVES total PM}_{2.5} = \text{PEC} + \text{PM25OM} + \text{PSO4} \quad (1)$$

We can compute the CMAQ PM<sub>2.5</sub> species from (1) the MOVES2010 output pollutants: *PEC*, *PSO4* and *PM25OM*, and (2) the speciation profile for total PM<sub>2.5</sub> exhaust. The equations used are presented below.

MOVES total PM<sub>2.5</sub> is the sum of the two pre-speciated components of PM<sub>2.5</sub> and a remainder term, *R*.

$$\text{MOVES total PM}_{2.5} = \text{PEC} + \text{PSO4} + R \quad (2)$$

The remainder term is the provided as a MOVES output

$$R = \text{PM25OM} \quad (3)$$

The *R* term includes POM, which consists of POC and the hydrogen and oxygen atoms attached to the carbon as part of the organic matter, PNO<sub>3</sub>, soil oxides and metals (also known as “crustal” and called METAL here), ammonium, and water, and thus can be also written as:

$$R = \text{POM} + \text{PNO3} + \text{METAL} + \text{NH4} + \text{H}_2\text{O} \quad (4)$$

To correctly calculate the five PM<sub>2.5</sub> species needed for CMAQ, we first needed to break out the POC, PNO<sub>3</sub>, and PMFINE from *R*. We can use the proportional relationship of known species to unknown species from the speciation profile. Note that there are different speciation profiles for gasoline vehicles, light duty diesel vehicles and heavy duty diesel vehicles. They are provided along with the corresponding data used for these calculations in Table 1.

The primary nitrate is computed based on the ratio of nitrate to elemental carbon, i.e.,  $F_{\text{NO}_3} / F_{\text{EC}}$  and metals component from the ratio of metals to elemental carbon,  $F_{\text{METAL}} / F_{\text{EC}}$  using equations (5) and (6), respectively.

$$\text{PNO3} = \text{PEC} \times F_{\text{NO}_3} / F_{\text{EC}} \quad (5)$$

$$\text{METAL} = \text{PEC} \times F_{\text{METAL}} / F_{\text{EC}} \quad (6)$$

where,

$F_{EC}$  = Fraction of elemental carbon in the speciation profile

$F_{NO3}$  = Fraction of nitrate in the speciation profile

$F_{METAL}$  = Fraction of metals in the speciation profile

Table 1 shows the values for the above fractions and the profiles from which they are to be derived.

**Table 1:** Values and basis for fractions used to compute PNO3 and METAL

Vehicle Type	SCC list	Speciation Profile Code and Name <sup>1</sup>	Profile Percentages
LDDV	All SCCs that begin with: 2230001 2230002 2230003 2230004 2230005 2230006	92042 LDDV Exhaust – Simplified	$F_{EC} = 57.48051203\%$
		91017 LDDV Exhaust - Composite	$F_{NO3} = 0.23\%$
		See Note 2	$F_{METAL} = 0.6513\%$
HDDV	All SCCs that begin with: 223007	92035 HDDV Exhaust – Simplified	$F_{EC} = 77.1241\%$
		3914 Diesel Exhaust	$F_{NO3} = 0.1141\%$
		See Note 3	$F_{METAL} = 0.2757\%$
LDGV and HDGV	All SCCs that begin with 2201	92050 Onroad Gasoline Exhaust – Simplified	$F_{EC} = 20.80113619\%$
		91022 Onroad Gasoline Exhaust - Composite	$F_{NO3} = 0.1015\%$
			$F_{METAL} = 2.2256\%$
<p>NOTES</p> <p>1. The values of <math>F_{EC}</math> and <math>F_{NO3}</math> are the same in the simplified and non-simplified profiles. The value for <math>F_{METAL}</math> was computed from the non-simplified profile as the sum of percentages of all ions of the metals and metal elements in the profile.</p> <p>2. Previously (Attachment 1), for LDDV in the draft MOVES approach, we used the value of <math>F_{NO3}</math> and <math>F_{METAL}</math> from the HDDV profile. We changed so that all fractions for each species come from the LDDV</p> <p>3. The value of <math>F_{METAL}</math> for HDDV previously used (Attachment 1 ) was corrected since it had inadvertently excluded the chloride ion percentage in the HDDV speciation profile.</p>			

As of 2/24/11 call with OTAQ experts, for diesel AND gasoline exhaust vehicles:

$$NH_4 = 0 \tag{8}$$

The final component of PMFINE is the non-carbon mass of organic carbon. To calculate the non-carbon mass, we first needed to compute organic carbon from the remainder term,  $R$ .

A key assumption is that POM is a factor of 1.2 greater than the mass of primary organic carbon, which is also used in the CMAQ postprocessing software at EPA.

$$POM = 1.2 \times POC \tag{9}$$



Using this assumption and assuming that the H<sub>2</sub>O is negligible, the equation needed for the calculation of POC is shown in equation (10) below.

$$\text{POC} = 5/6 \times (R - \text{METAL} - \text{NH}_4 - \text{PNO}_3) \quad (10)$$

From equation (9), the non-carbon portion of the organic carbon matter is 20%, of the POC. By definition, PMFINE is the sum of the non-carbon portion of the mass, METAL and NH<sub>4</sub>.

$$\text{PMFINE} = \text{METAL} + \text{NH}_4 + 0.2 \times \text{POC} \quad (11)$$

For gasoline mobile sources, the PMC is 8.6% of the PM<sub>2.5</sub> mass

Gasoline vehicles only:  $\text{PMC} = 0.086 \times (\text{PMFINE} + \text{PEC} + \text{POC} + \text{PSO}_4 + \text{PNO}_3)$

For diesel mobile sources, the PMC is 3.09% of the PM<sub>2.5</sub> mass

Diesel vehicles only:  $\text{PMC} = 0.0309 \times (\text{PMFINE} + \text{PEC} + \text{POC} + \text{PSO}_4 + \text{PNO}_3)$

## Implementation for when MOVES is run with actual temperatures

The MOVES pollutants of interest are summarized from the below table provided by OTAQ.

### Pollutants

MOVES PollutantId	Data Transfer PollutantCode
101	PM10OM
102	PM10EC
105	PM10SO4
111	PM25OM
112	PM25EC
115	PM25SO4

The purpose of the equations in Section 5 is to fully speciate the MOVES2010 partially-speciated EXHAUST PM<sub>2.5</sub> to create the model species needed for CMAQ. The equations apply to PM from all exhaust processes.

The equations below utilize the following MOVES 2010 outputs  
 PM25EC, which is identical to the elemental carbon portion of PM<sub>2.5</sub>, or PEC  
 PM25SO4, which is identical to the sulfate portion of PM<sub>2.5</sub>, or PSO4  
 PM25OM, which contains all components of PM<sub>2.5</sub> other than PEC and PSO4.

For gasoline vehicles, MOVES applies a temperature adjustment factor that accounts for the impact of cold temperatures on PM25OM and PM25EM with decreasing temperature at temperatures below 72 °F. At 72 °F or higher, there is no dependency of any component of PM<sub>2.5</sub> on temperature. There is also no dependency of any component of PM<sub>2.5</sub> on temperature for diesel vehicles. At temperatures lower than 72 °F, the temperature dependence is different for start emissions (including crankcase starts) versus running emissions (including crankcase running).

Not all components of PM<sub>2.5</sub> for gasoline vehicles are a function of temperature. The following table shows the components and their temperature dependence. The components shown in red font are four of the five PM<sub>2.5</sub> species used in CMAQ; the other species shown in black font are used to compute the fifth CMAQ species, PMFINE.

<b>PM<sub>2.5</sub> components that can vary with temperature, gasoline vehicles</b>	<b>PM<sub>2.5</sub> components that do not vary with temperature</b>
PEC, POC, non-carbon organic matter	PSO4, PNO3, NH4, METAL
Because PMFINE is the sum of temperature adjusted and non-temperature adjusted components, it is a function of temperature.	

For gasoline vehicles, the unadjusted PEC is needed to compute the components of PM<sub>2.5</sub> that are not impacted by temperature. We denote unadjusted PEC as:  
 PEC<sub>72</sub>

There are two ways to determine PEC<sub>72</sub>:

1. Run MOVES at 72 °F or higher.

2. Calculate it by “backing out” the temperature adjustment from the adjusted MOVES PEC. This is done by dividing PEC by the MOVES cold temperature adjustment factor, PEC\_Tadj: **PEC\_72 = PEC/ PEC\_Tadj**

The approach chosen for SMOKE MOVES is to back out the adjustment factor, because it eliminates the need to specify a temperature bin for the MOVES runs that is greater than or equal to 72 °F.

MOVES uses the following for PEC\_Tadj

Diesel vehicles: PEC\_Tadj = 1

Gasoline vehicles: PEC\_Tadj is determined based on type of exhaust and temperature (in °F) using the values the below table.

<b>Vehicle Type</b>	<b>Temperature Range, T (°F)</b>	<b>PEC_Tadj for start emissions (including crankcase start), gasoline vehicles</b>	<b>PEC_Tadj for running emissions (including crankcase running), gasoline vehicles</b>
Gasoline vehicles	T < 72 °F	$28.039 * \exp(-0.0463 * T)$	$9.871 * \exp(-0.0318 * T)$
	72 °F or higher	1.0	1.0
Diesel vehicles	All Temperatures	1.0	1.0

The equations are

- (1)  $PEC = PM25EC$
- (2)  $PEC_{72} = PEC / PEC\_Tadj$
- (3)  $PSO4 = PM25SO4$
- (4)  $PNO3 = PEC_{72} \times FNO3 / FEC$
- (5)  $METAL = PEC_{72} \times FMETAL / FEC$
- (6) Compute NH4
  - a. For GASOLINE Vehicles:  $NH4 = 0$
  - b. For DIESEL Vehicles:  $NH4 = 0$
- (7)  $POC = 5/6 \times (PM25OM - METAL - NH4 - PNO3)$
- (8)  $PMFINE = METAL + NH4 + 0.2 \times POC$
- (9)  $PMC = (R_{PM10-to-PM25} - 1) \times (PMFINE + PEC + POC + PSO4 + PNO3)$

where

<b>PEC</b>	Mass of Primary elemental carbon, a species needed for the air quality model									
<b>PEC<sub>72</sub></b>	Mass of Primary elemental carbon when MOVES is run at 72 °F or higher temperature; calculated by backing out the temperature adjustment factor, PEC_Tadj									
<b>PEC_Tadj</b>	<p>For diesel vehicle SCCs: PEC_Tadj= 1</p> <p>For gasoline vehicle SCCs:</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Temperature Range, T (°F)</th> <th>PEC_Tadj for start emissions (including crankcase start), gasoline vehicles</th> <th>PEC_Tadj for running emissions (including crankcase running), gasoline vehicles</th> </tr> </thead> <tbody> <tr> <td>T &lt; 72 °F</td> <td><math>28.039 \times \exp(-0.0463 \times T)</math></td> <td><math>9.871 \times \exp(-0.0318 \times T)</math></td> </tr> <tr> <td>72 °F or higher</td> <td>1.0</td> <td>1.0</td> </tr> </tbody> </table>	Temperature Range, T (°F)	PEC_Tadj for start emissions (including crankcase start), gasoline vehicles	PEC_Tadj for running emissions (including crankcase running), gasoline vehicles	T < 72 °F	$28.039 \times \exp(-0.0463 \times T)$	$9.871 \times \exp(-0.0318 \times T)$	72 °F or higher	1.0	1.0
Temperature Range, T (°F)	PEC_Tadj for start emissions (including crankcase start), gasoline vehicles	PEC_Tadj for running emissions (including crankcase running), gasoline vehicles								
T < 72 °F	$28.039 \times \exp(-0.0463 \times T)$	$9.871 \times \exp(-0.0318 \times T)$								
72 °F or higher	1.0	1.0								
<b>gasoline SCCs</b>	All SCCs that begin with 2201									
<b>diesel SCCs</b>	All SCCs that begin with 2230									
<b>PM25EC</b>	Mass of Primary elemental carbon provided by the MOVES model									
<b>PM25SO4</b>	Mass of Primary sulfate provided by the MOVES model									
<b>PSO4</b>	Mass of Primary sulfate, a species needed for the air quality model									
<b>PNO3</b>	Mass of Primary nitrate, a species needed for the air quality model									
<b>METAL</b>	Mass of metal component of PM <sub>2.5</sub> , which is a component of PMFINE									
<b>FNO3, FEC, FMETAL</b>	Percentages of nitrate, elemental carbon and derived from the vehicle-type-specific speciation profile, values are provided in Table 1									
<b>NH4</b>	Mass of ammonium component of PM <sub>2.5</sub> , which is a component of PMFINE Note that this is assumed 0 for both gasoline and diesel exhaust as of 2/24/11									
<b>62.0049</b>	Molecular weight of nitrate									
<b>96.0576</b>	Molecular weight of sulfate									
<b>18.0383</b>	Molecular weight of ammonium									
<b>POC</b>	Mass of Primary organic carbon, a species needed for the air quality model									
<b>PM25OM</b>	Mass of organic material provided by the MOVES model, actually includes more than organic matter; it includes the mass of all components of PM <sub>2.5</sub> other than PEC and PSO4									
<b>PMFINE</b>	Mass of other Primary PM <sub>2.5</sub> not accounted for in PEC, POC, PSO4 and PNO3, a species needed for the air quality model. This mass includes the ammonium, metals, water and the and the mass of the non-carbon material, i.e., hydrogen and oxygen and other atoms attached to the organic carbon									
<b>PMC</b>	Mass of the coarse fraction of the PM10; defined as PM10 – PM <sub>2.5</sub> , a species needed for CMAQ									
<b>R<sub>PM10-to-PM25</sub></b>	Ratio of PM10-to-PM <sub>2.5</sub> which is a constant dependent upon fuel type Values are provided in Table 1									

Quality Assurance Check:

$$EXH\_PM25 = PMFINE + PEC + POC + PSO4 + PNO3$$

Table 1 has the values for  $FNO3$ ,  $FEC$  and  $FMETAL$  and  $R_{PM10-to-PM25}$

They are based on the vehicle type (first 7 digits of the SCC), except that  $R_{PM10-to-PM25}$  is based solely on fuel type.

**Table 1:** Values and basis for fractions used to compute PNO3 and METAL

Vehicle Type	SCC list	$FEC$ (%)	$FNO3$ (%)	$FMETAL$ (%)	$R_{PM10-to-PM25}$
LDDV	All SCCs that begin with: 2230001, 2230002, 2230003, 2230004, 2230005, 2230006	57.48051203	0.23	0.6513	1.0309
HDDV	All SCCs that begin with: 223007	77.1241	0.1141	0.2757	1.0309
LDGV and HDGV	All SCCs that begin with 2201	20.80113619	0.1015	2.2256	1.086

# Implementation for when MOVES-based emissions at 72 Fahrenheit are Input into SMOKE

The equations below utilize the following MOVES 2010 outputs:

PM25OM

PM25EC

PM25SO4

However, EXH\_PM25 can be used for QA

**All red-fonted variables are fed into SMOKE**

**All blue-fonted variables are from MOVES output**

**Table 1 (Section 4) provides the values of the constants (italics): *FNO3, FEC, FMETAL and  $R_{PM10-to-PM25}^{-1}$***

**The equations are**

(1) **PEC\_72** = PM25EC

(2) **PSO4** = PM25SO4

(3) **PNO3** = PEC\_72 × *FNO3* / *FEC*

(4) **METAL** = PEC\_72 × *FMETAL* / *FEC*

(5) Compute NH4

a. For GASOLINE Vehicles: NH4 = 0 (*PNO3*/**62.0049** + 2 × *PSO4*/**96.0576**) × **18.0383**

b. For DIESEL Vehicles

NH4=0

(6) **POC\_72** = 5/6 × (PM25OM – METAL – NH4 – PNO3)

(7) **OTHER** = METAL+NH4

Temperature adjustments are made to the SMOKE intermediate files to produce POC and PEC. That program also computes the remainder of the species that are needed prior to the final SMOKE merge using the adjusted POC and PEC and other intermediate species.. These species are shown in green font.

(8) **POC** = Look-up-table\_Function (Temperature, **POC\_72**)

(9) **PEC** = Look-up-table\_Function (Temperature, **PEC\_72**)

Note that OTHER, PNO3 and PSO4 are not temperature-adjusted and come directly from the SMOKE intermediate files

(10) **PMFINE** = **OTHER** + 0.2 × POC

(11) **PMC** = (*R<sub>PM10-to-PM25</sub><sup>-1</sup>*) × (PMFINE + PEC + POC + **PSO4** + **PNO3**)

ATTACHMENT 1

Fractions of Utilized in Draft MOVES approach and rationale for the changes for MOVES 2010

$$\text{PNO}_3 = \text{PEC} \times \text{FNO}_3 / \text{FEC}$$

$$\text{METAL} = \text{PEC} \times \text{FMETAL} / \text{FEC}$$

Vehicle/ SCCs	FNO3 value and basis	FEC value and basis	FMETAL value and basis
LDDV: 2230001000 through 2230060334	0.1141% Based on <b>HDDV</b> speciation profile (92035-simplified, 3914-composite containing all species).  NOTE: Agreed that it is more technically sound to use the LDDV profile for all LDDV fractions. Will change to use LDDV (92042 simplified, 91017, composite) the value is 0.23%	57.4805% Based on LDDV speciation profile (92042 simplified, 91017, composite)	0.2663% based on Value provided by Catherine Yanca and Joe Somers to OAQPS in email provided 11/6/2009. It was based on the HDDV profile (3914)  NOTE: Agreed that it is more technically sound to use the LDDV profile for all LDDV fractions. Will change to 0.6513% , that Madeleine computed using LDDV profile 91017
HDDV: 2230071110 through 2230075330	0.1141% Based on HDDV speciation profile (92035-simplified, 3914-composite containing all species).	77.1241% Based on HDDV speciation profile (92035-simplified, 3914-composite containing all species).	0.2663% based on Value provided by Catherine Yanca and Joe Somers to OAQPS in email provided 11/6/2009 “Equations for diesel MOVES speciation use in CMAQ 110609.doc”  NOTE: Will change to 0.2757% , that Madeleine computed using 3914. The difference is that the chloride ion percent was inadvertently left out of the 0.2663% value
LDGV and HDGV 2201001 through 220107	0.1015% based on 92050 simplified, 91022-composite	20.80113619% based on 92050 simplified, 91022-composite	2.2256% based on 91022-composite

## Updates/FIXES

March 16, 2010 updated from March 11 version to use a different constant to generate PMC from PM<sub>2.5</sub> for gasoline versus diesel vehicles and to provide a table of variable names under section 4

March 26, 2010 Fixed Table 1, last row 2<sup>nd</sup> column. All SCCs that begin with 2201 are LDGV and HDGV. (not 2202001)

April 7, 2010. Section 4. Replaced “These equations are used only when Etype has the values RUNEXH and STARTEXH.” With “**The equations apply to PM from all exhaust processes.**” Per the email Michele Jiminez sent to Marc Houyoux on 4/5/2010 that indicates that in addition to **Running Exhaust** and **Start Exhaust** MOVES includes processes

- Crankcase Running Exhaust
- Crankcase Start Exhaust
- Crankcase Extended Idle Exhaust
- Extended Idle Exhaust

June 4 2010: Section 4: the equations for gasoline SCCs were changed to use non-temperature-adjusted PEC in the calculations for PNO<sub>3</sub> and METAL. Note that diesel SCCs can use the same equations or use the temp adjusted values since for diesel, they are the same.

July 7, 2010: Section 4: Equations added to compute non-temperature adjusted PEC in terms of the MOVES adjustment factor. Also provided the formula for the temperature adjustment factor (needed to compute the non-temperature adjusted PEC). This formula is specific to MOVES2010. Also added text explanation indicating which particular PM<sub>2.5</sub> components are temperature dependent and which are not.

July 15, 2010. Section 4: Changed the temperature ranges for the adjustment factor. MOVES does not have a maximum value of the temperature adjustment factor, PEC\_Tadj, and will thus continue to increase at values below -20 °F. There are now just two temperature ranges for the factor for gasoline vehicles: (1) below 72 °F and (2) greater-or-equal to 72 °F.

February 23: NH<sub>4</sub> =0 for diesel vehicles. Reason: there is very little NH<sub>3</sub> from diesel vehicles. Likely the sulfate and nitrate anions are balanced by hydrogen ions (as opposed to NH<sub>4</sub>). We did not compute the mass of these hydrogen ions (which would be a component of PMFINE) because we believe they are very small and would not make an appreciable difference on the speciation, given the other assumptions being made with regards to relative components of metals and nitrate to elemental carbon.

February 24: NH<sub>4</sub> = 0 for gasoline vehicles. Reason: OTAQ chemistry experts (Joe Summers, Rich Cook and Catherine Yanca) all agree that it makes no sense to include NH<sub>4</sub> for gasoline exhaust. NH<sub>4</sub> for gasoline exhaust was much smaller relative to its computed value for diesel exhaust so this will have little impact on increasing POC and decreasing PMFINE.



## **Appendix D: Future Animal Population Projection Methodology, Updated 07/24/12**

In the EPA's ammonia inventory for animal agricultural operations (National Emission Inventory - Ammonia Emissions from Animal Agricultural Operations; Revised Draft Report; April 22, 2005), population projections for the beef, dairy, swine, and poultry animal sectors were developed and used to estimate future ammonia emissions from these animal sectors. To develop the 2005 population projections, EPA used inventory data from the U.S. Department of Agriculture (USDA) and the Food and Agriculture Policy and Research Institute (FAPRI).

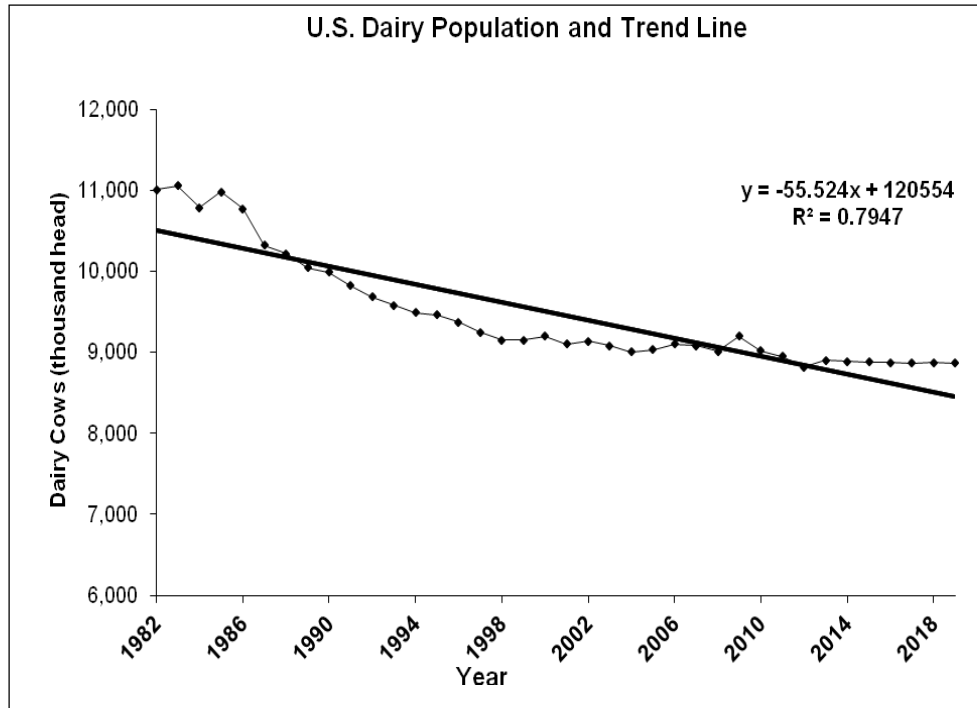
Since completion of the 2005 ammonia emissions inventory, USDA and FAPRI have released updated reports that contain animal population data and projections. These data were used to update the 2005 animal inventory projections.

The data sources and the methodology used to develop the population projections for each animal type are discussed below. These future projections do not account for any changes in animal populations or regional dislocations associated with EPA's revised effluent limitations guidelines and standards for concentrated animal feeding operations promulgated in December 2002 (68 FR 7176, February 12, 2003). Due to insufficient data, animal population projections and future emission estimates were not developed for sheep, goats, and horses.

*Dairy Cattle.* The 2010 FAPRI *U.S. and World Agricultural Outlook* (FAPRI 2010) report provides estimated national milk cow inventory data and projections from 2009 through 2019 and shows an overall decline in U.S. dairy cow populations. The FAPRI projections depict an essentially linear relationship between 2001 milk cow populations and subsequent years. The EPA estimated future dairy cattle populations using a linear regression analysis of the national population data available from the FAPRI report, covering 1982 through 2019. Figure G-1 illustrates the linear projection of the U.S. dairy cow population and trend line.

*Beef Cattle.* The USDA *Agricultural Projections to 2021* (USDAa) provides estimated national cattle inventory data and projections from 2010 through 2021. Beef production has a clear cycle generated by producers' expectations about future prices, grain market cycles, and other economic conditions. The pace of the cycle is limited by the reproductive capacity of the animal. Cattle inventories can expand only as fast as cows can reproduce. This has historically resulted in a 7- to 12-year cycle, from peak to peak (Kohls, 1998). Peaks and troughs of the cycle are 5 to 6 percent higher or lower than the general trend in cattle populations so the stage of the cycle can make a significant difference in population at any given future date.

**Figure G-1. Dairy Cow Inventory Projections**

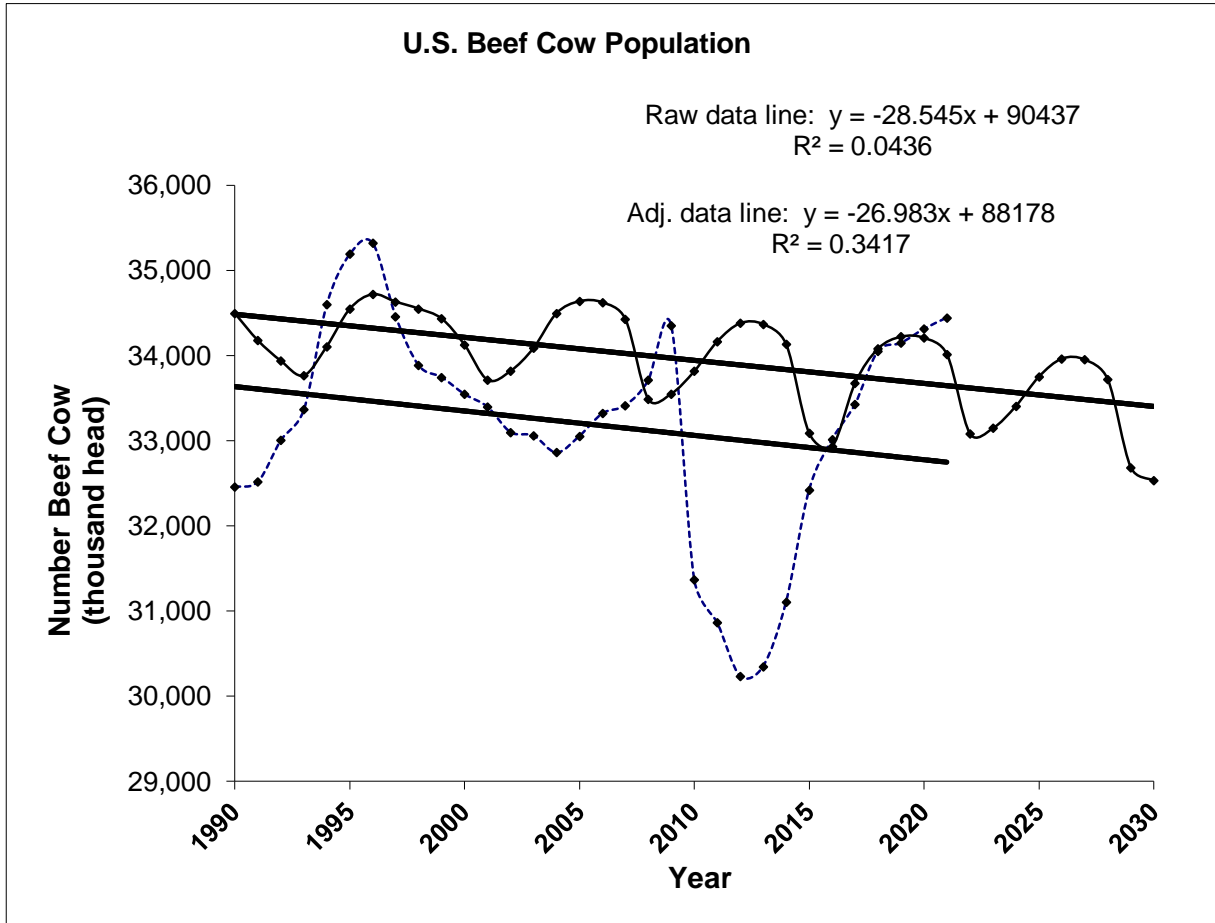


The EPA decomposed the beef cow inventory time series into a trend line, a cyclical component, and a random error component (Bowerman, 1987). The trend line was estimated by linear regression of the inventory data from 1990 to 2015 on a time variable. The cyclical component was then estimated as the percentage deviation from the trend line in the historical data. A graph of that information appeared to show a cyclic trend (trough to peak). The robust U.S. economy of the 1990s may explain the longer than average cycle. With so little data, EPA assumed the down side of the cycle was symmetrical with the up side, so the data set would contain three values for each stage of the cycle. The average of the absolute value of the three observations represents the cyclical component. The EPA forecasted the trend line out to 2030 and adjusted it by the average percentage deviation from the trend for that stage of the cycle, as illustrated in Figure G-2.

The projection data for the beef cattle inventory show some difference in growth cycle of beef cows versus other beef cattle (e.g., steers, bulls). The EPA conducted a separate analysis of these animal populations. Other beef cattle populations appear to follow similar cycles and were forecasted using the same technique as beef cows (see Figure G-3).

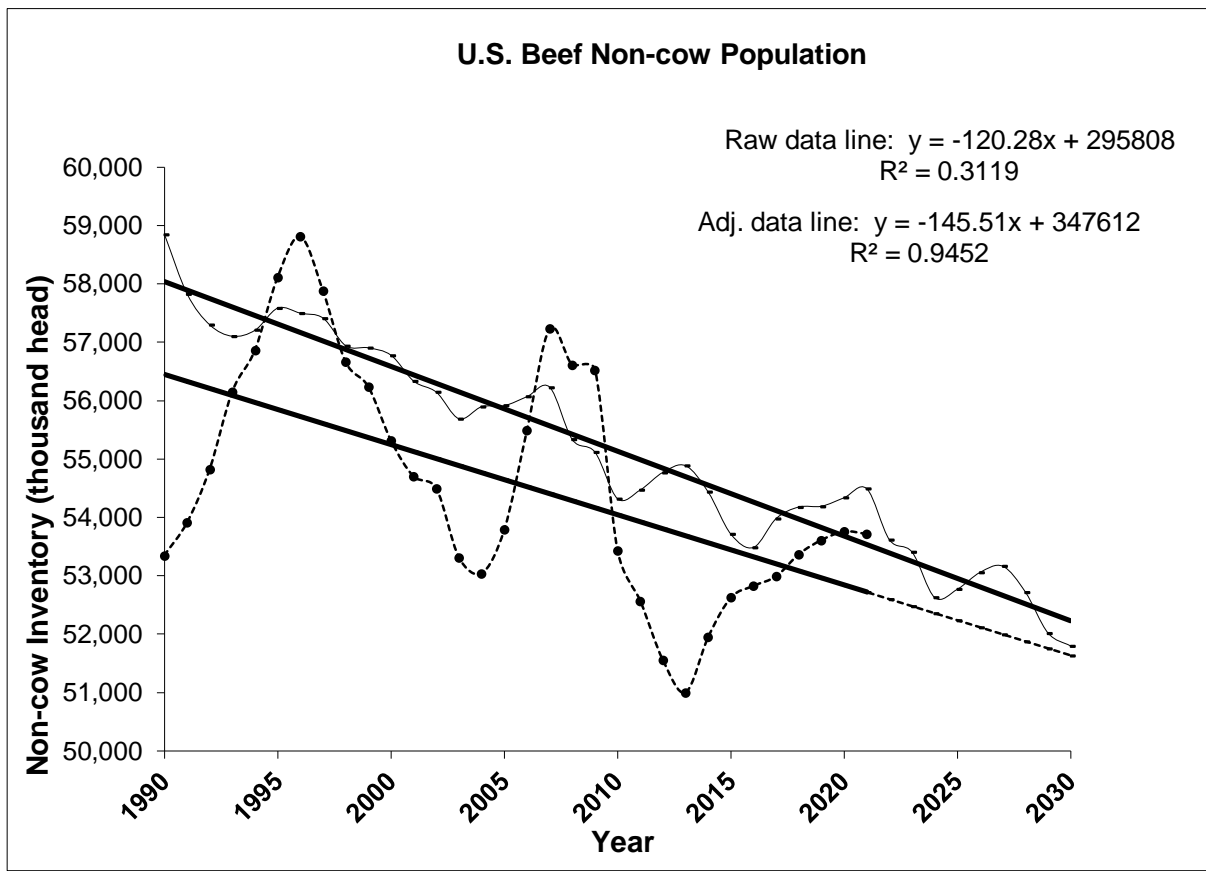
*Swine.* Annual swine populations are categorized by breeding and market swine. The 2010 FAPRI *U.S. and World Agricultural Outlook* (FAPRI 2010) report presents annual inventory data and projections from 2009 through 2019 for breeding swine and market swine inventories (rather than a combined total). The FAPRI data show an overall increase in swine production over time. Due to increasing productivity (i.e., increased number of pigs per litter), the population of breeding swine is expected to decline over the long term.

Figure G-2. Beef Cow Inventory Projections



The EPA estimated future swine populations using a cycle and trend decomposition analysis. Breeding and market swine population projections and inventory data from the FAPRI report capture the variability of the swine production cycle. Changes in the pork industry in the 1990's have made recent data atypical and inconsistent. For example, EPA replaced the 1996 market hog cyclical deviation with the average of all of the other data because it was so far out of line with the hog cycle.

**Figure G-3. Non-cow Beef Inventory Projections**



The EPA estimated the trend and deviations from the trend as in the beef cattle analysis. However, it was not possible to apply the identical technique from the beef cattle industry to the hog industry because a well-defined periodic cycle was not evident in the annual data. The EPA evaluated a 3-year moving average of the deviation to further reduce the random component. As the smoothed cycle continued to appear irregular, EPA assumed that the 2010's will repeat the pattern of the 1990's. Breeding hog populations were estimated using a similar approach. See Figures G-4 and G-5 for an illustration of the swine projections for the market hog and breeding hog inventories, respectively.

*Poultry.* Annual poultry populations in the EPA's ammonia emissions inventory for animal agriculture are presented for broilers, turkeys, and layers. To project poultry populations, EPA used population and projection data from the annual summary of the USDA/NASS *Poultry – Production and Value* reports (USDAb) for broilers and turkeys, and the *Chickens and Eggs* reports (USDAc). With these data, EPA used a linear regression analysis to predict the number of birds produced in the U.S. for years beyond 2011. Figures G-6 and G-7 present the population projections for broilers and turkeys, respectively. Figure G-8 shows the population projections for egg layers.

Figure G-4. Market Hog Inventory Projections

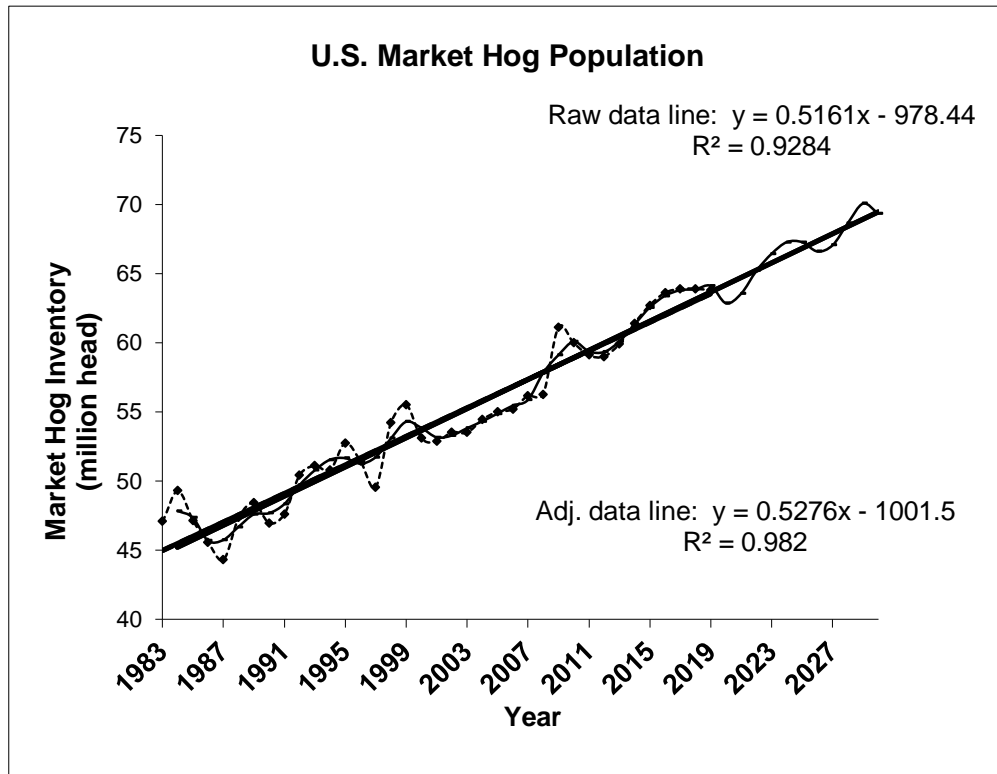


Figure G-5. Breeding Hog Inventory Projections

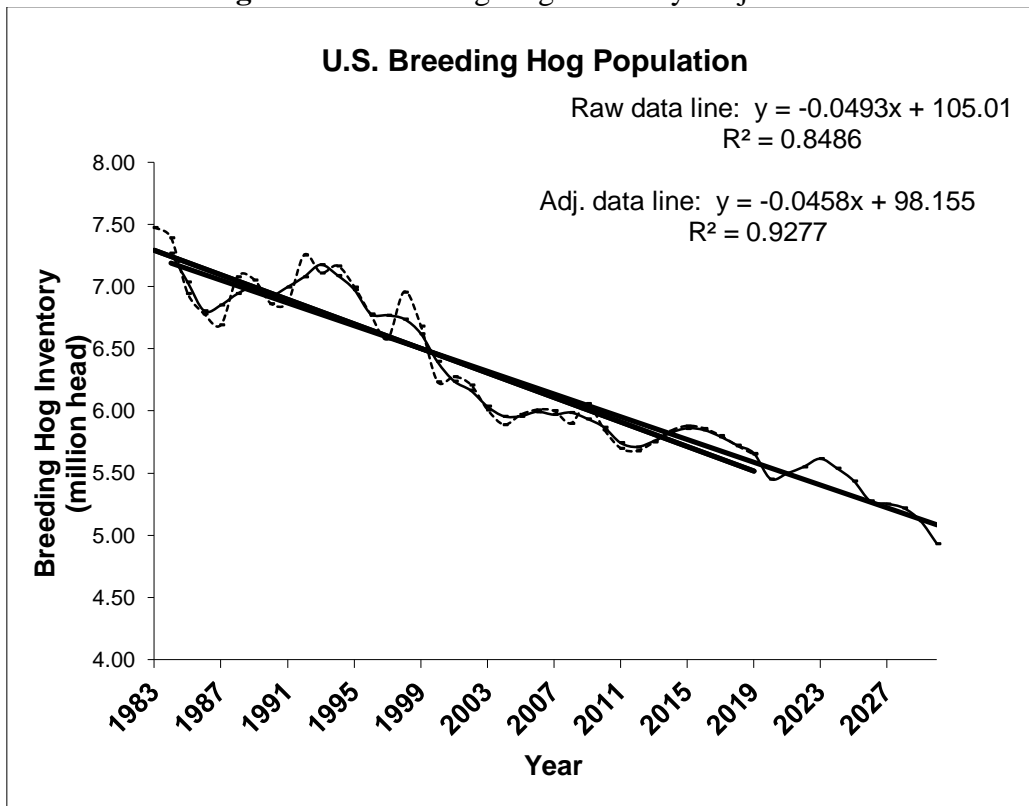


Figure G-6. Broiler Inventory Projection

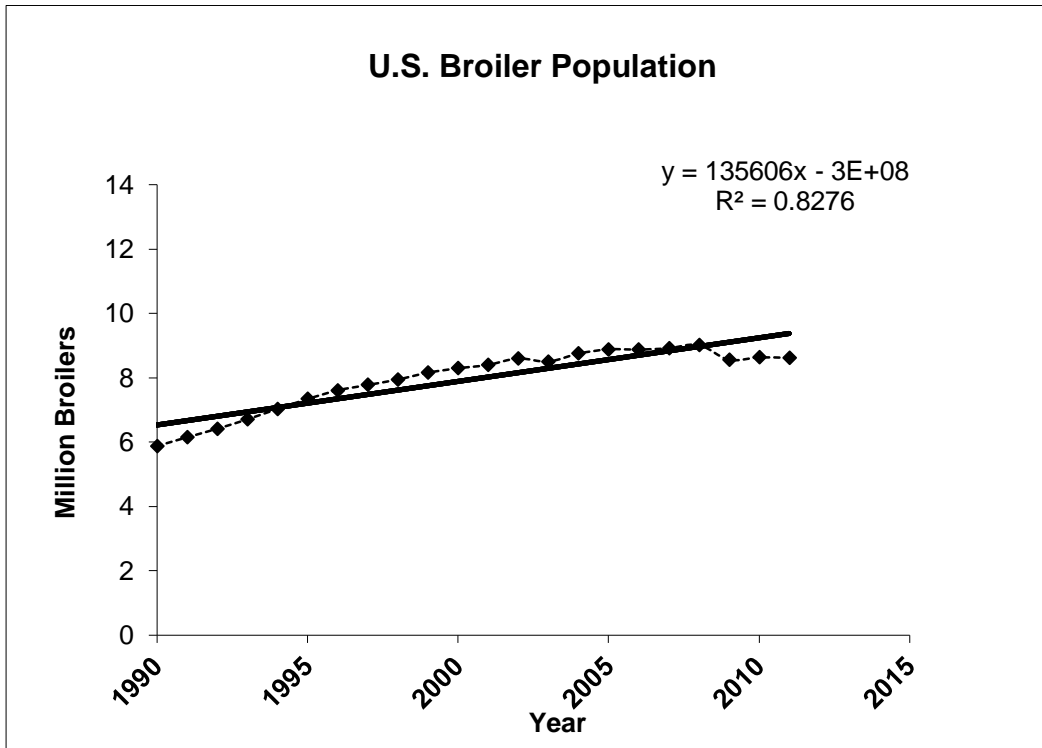


Figure G-7. Turkey Inventory Projection

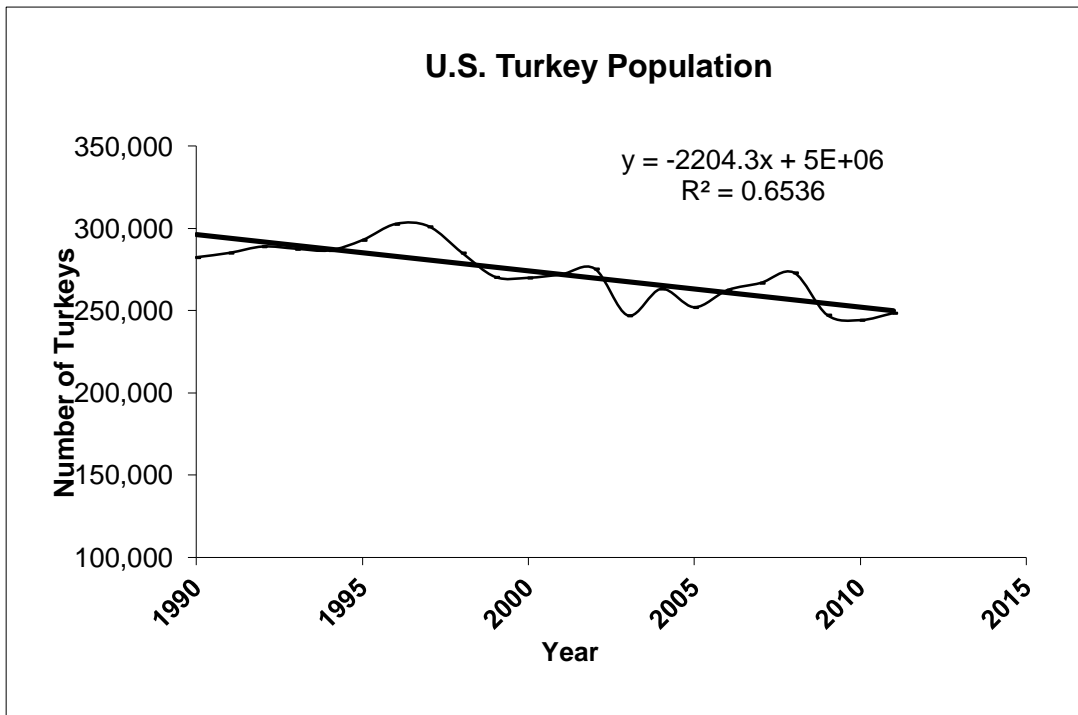
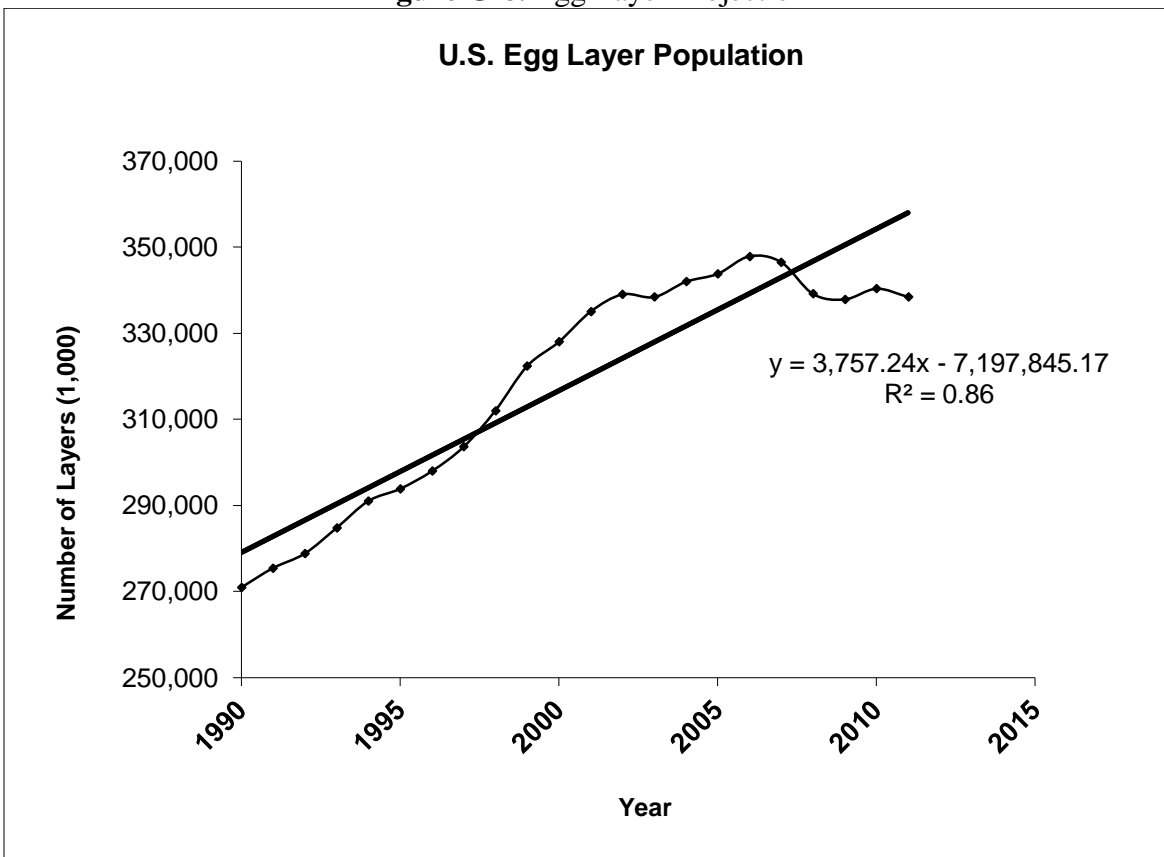


Figure G-8. Egg Layer Projection



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## Appendix E: SCC mapping to ICR Fuel types for Boiler MACT Reconsideration Control Packet

Fuel	ICR Category	SCC	Description
coal	Coal	10100101	External Combustion Boilers;Electric Generation;Anthracite Coal;Pulverized Coal
coal	Coal	10100201	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Pulverized Coal: Wet Bottom (Bituminous Coal)
coal	Coal	10100202	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (Bituminous Coal)
coal	Coal	10100203	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Cyclone Furnace (Bituminous Coal)
coal	Coal	10100204	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Spreader Stoker (Bituminous Coal)
coal	Coal	10100205	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Traveling Grate (Overfeed) Stoker (Bituminous Coal)
coal	Coal	10100212	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (Tangential) (Bituminous Coal)
coal	Coal	10100217	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Atmospheric Fluidized Bed Combustion: Bubbling Bed (Bituminous Coal)
coal	Coal	10100218	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Atmospheric Fluidized Bed Combustion: Circulating Bed (Bitum. Coal)
coal	Coal	10100222	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (Subbituminous Coal)
coal	Coal	10100224	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Spreader Stoker (Subbituminous Coal)
coal	Coal	10100226	External Combustion Boilers;Electric Generation;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom Tangential (Subbituminous Coal)
coal	Coal	10100303	External Combustion Boilers;Electric Generation;Lignite;Cyclone Furnace
Residual Oil	Heavy Liquid	10100401	External Combustion Boilers;Electric Generation;Residual Oil;Grade 6 Oil: Normal Firing
Residual Oil	Heavy Liquid	10100404	External Combustion Boilers;Electric Generation;Residual Oil;Grade 6 Oil: Tangential Firing
Distillate Oil	Light Liquid	10100501	External Combustion Boilers;Electric Generation;Distillate Oil;Grades 1 and 2 Oil
Distillate Oil	Light Liquid	10100504	External Combustion Boilers;Electric Generation;Distillate Oil;Grade 4 Oil: Normal Firing
Natural Gas	Gas 1 (NG Only)	10100601	External Combustion Boilers;Electric Generation;Natural Gas;Boilers : 100 Million Btu/hr except Tangential
Natural Gas	Gas 1 (NG Only)	10100602	External Combustion Boilers;Electric Generation;Natural Gas;Boilers < 100 Million Btu/hr except Tangential
Natural Gas	Gas 1 (NG Only)	10100604	External Combustion Boilers;Electric Generation;Natural Gas;Tangentially Fired Units
Process Gas	Gas 2	10100701	External Combustion Boilers;Electric Generation;Process Gas;Boilers : 100 Million Btu/hr
Process Gas	Gas 2	10100702	External Combustion Boilers;Electric Generation;Process Gas;Boilers < 100 Million Btu/hr
Process Gas	Gas 2	10100703	External Combustion Boilers;Electric Generation;Process Gas;Petroleum Refinery Gas
Process Gas	Gas 2	10100712	External Combustion Boilers;Electric Generation;Process Gas;Digester Gas
Petroleum Coke	Coal	10100801	External Combustion Boilers;Electric Generation;Petroleum Coke;All Boiler Sizes
Wood/Bark Waste	Wet Biomass	10100901	External Combustion Boilers;Electric Generation;Wood/Bark Waste;Bark-fired Boiler
Wood/Bark Waste	Wet Biomass	10100902	External Combustion Boilers;Electric Generation;Wood/Bark Waste;Wood/Bark Fired Boiler
Wood/Bark Waste	Wet Biomass	10100903	External Combustion Boilers;Electric Generation;Wood/Bark Waste;Wood-fired Boiler - Wet Wood (:=20% moisture)
Wood/Bark Waste	Wet Biomass	10100908	External Combustion Boilers;Electric Generation;Wood/Bark Waste;Wood-fired Boiler - Dry Wood (<20% moisture)
Wood/Bark Waste	Wet Biomass	10100910	External Combustion Boilers;Electric Generation;Wood/Bark Waste;Fuel cell/Dutch oven boilers **
Wood/Bark Waste	Wet Biomass	10100911	External Combustion Boilers;Electric Generation;Wood/Bark Waste;Stoker boilers **
Liquified Petroleum Gas (LPG)	Gas 1 (Other)	10101001	External Combustion Boilers;Electric Generation;Liquified Petroleum Gas (LPG);Butane
Liquified Petroleum Gas (LPG)	Gas 1 (Other)	10101002	External Combustion Boilers;Electric Generation;Liquified Petroleum Gas (LPG);Propane
Bagasse	Bagasse	10101101	External Combustion Boilers;Electric Generation;Bagasse;All Boiler Sizes
Solid Waste	Wet Biomass	10101201	External Combustion Boilers;Electric Generation;Solid Waste;Specify Waste Material in Comments
Solid Waste	Wet Biomass	10101202	External Combustion Boilers;Electric Generation;Solid Waste;Refuse Derived Fuel

Fuel	ICR Category	SCC	Description
Solid Waste	Wet Biomass	10101204	External Combustion Boilers;Electric Generation;Solid Waste;Tire Derived Fuel : Shredded
Solid Waste	Wet Biomass	10101206	External Combustion Boilers;Electric Generation;Solid Waste;Agricultural Byproducts (rice or peanut hulls, shells, cow manure, etc
Solid Waste	Wet Biomass	10101207	External Combustion Boilers;Electric Generation;Solid Waste;Other Biomass Solids
Liquid Waste	Heavy Liquid	10101301	External Combustion Boilers;Electric Generation;Liquid Waste;Specify Waste Material in Comments
Liquid Waste	Heavy Liquid	10101302	External Combustion Boilers;Electric Generation;Liquid Waste;Waste Oil
Methanol	Heavy Liquid	10101601	External Combustion Boilers;Electric Generation;Methanol;All
Other Oil	Light Liquid	10102101	External Combustion Boilers;Electric Generation;Other Oil;All
coal	Coal	10200101	External Combustion Boilers;Industrial;Anthracite Coal;Pulverized Coal
coal	Coal	10200104	External Combustion Boilers;Industrial;Anthracite Coal;Traveling Grate (Overfeed) Stoker
coal	Coal	10200201	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Pulverized Coal: Wet Bottom
coal	Coal	10200202	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom
coal	Coal	10200203	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Cyclone Furnace
coal	Coal	10200204	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Spreader Stoker
coal	Coal	10200205	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Overfeed Stoker
coal	Coal	10200206	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Underfeed Stoker
coal	Coal	10200212	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (Tangential)
coal	Coal	10200217	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Atmospheric Fluidized Bed Combustion: Bubbling Bed (Bituminous Coal)
coal	Coal	10200218	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Atmospheric Fluidized Bed Combustion: Circulating Bed (Bitum. Coal)
coal	Coal	10200219	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Cogeneration (Bituminous Coal)
coal	Coal	10200221	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Pulverized Coal: Wet Bottom (Subbituminous Coal)
coal	Coal	10200222	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (Subbituminous Coal)
coal	Coal	10200224	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Spreader Stoker (Subbituminous Coal)
coal	Coal	10200225	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Traveling Grate (Overfeed) Stoker (Subbituminous Coal)
coal	Coal	10200229	External Combustion Boilers;Industrial;Bituminous/Subbituminous Coal;Cogeneration (Subbituminous Coal)
coal	Coal	10200306	External Combustion Boilers;Industrial;Lignite;Spreader Stoker
Residual Oil	Heavy Liquid	10200401	External Combustion Boilers;Industrial;Residual Oil;Grade 6 Oil
Residual Oil	Heavy Liquid	10200402	External Combustion Boilers;Industrial;Residual Oil;10-100 Million Btu/hr **
Residual Oil	Heavy Liquid	10200403	External Combustion Boilers;Industrial;Residual Oil;< 10 Million Btu/hr **
Residual Oil	Heavy Liquid	10200404	External Combustion Boilers;Industrial;Residual Oil;Grade 5 Oil
Residual Oil	Heavy Liquid	10200405	External Combustion Boilers;Industrial;Residual Oil;Cogeneration
Distillate Oil	Light Liquid	10200501	External Combustion Boilers;Industrial;Distillate Oil;Grades 1 and 2 Oil
Distillate Oil	Light Liquid	10200502	External Combustion Boilers;Industrial;Distillate Oil;10-100 Million Btu/hr **
Distillate Oil	Light Liquid	10200503	External Combustion Boilers;Industrial;Distillate Oil;< 10 Million Btu/hr **
Distillate Oil	Light Liquid	10200504	External Combustion Boilers;Industrial;Distillate Oil;Grade 4 Oil
Distillate Oil	Light Liquid	10200505	External Combustion Boilers;Industrial;Distillate Oil;Cogeneration
Natural Gas	Gas 1 (NG Only)	10200601	External Combustion Boilers;Industrial;Natural Gas;> 100 Million Btu/hr
Natural Gas	Gas 1 (NG Only)	10200602	External Combustion Boilers;Industrial;Natural Gas;10-100 Million Btu/hr
Natural Gas	Gas 1 (NG Only)	10200603	External Combustion Boilers;Industrial;Natural Gas;< 10 Million Btu/hr
Natural Gas	Gas 1 (NG Only)	10200604	External Combustion Boilers;Industrial;Natural Gas;Cogeneration
Process Gas	Gas 2	10200701	External Combustion Boilers;Industrial;Process Gas;Petroleum Refinery Gas
Process Gas	Gas 2	10200704	External Combustion Boilers;Industrial;Process Gas;Blast Furnace Gas

Fuel	ICR Category	SCC	Description
Process Gas	Gas 2	10200707	External Combustion Boilers;Industrial;Process Gas;Coke Oven Gas
Process Gas	Gas 2	10200710	External Combustion Boilers;Industrial;Process Gas;Cogeneration
Process Gas	Gas 2	10200711	External Combustion Boilers;Industrial;Process Gas;Landfill Gas
Process Gas	Gas 2	10200799	External Combustion Boilers;Industrial;Process Gas;Other: Specify in Comments
Petroleum Coke	Coal	10200802	External Combustion Boilers;Industrial;Petroleum Coke;All Boiler Sizes
Petroleum Coke	Coal	10200804	External Combustion Boilers;Industrial;Petroleum Coke;Cogeneration
Wood/Bark Waste	Wet Biomass	10200902	External Combustion Boilers;Industrial;Wood/Bark Waste;Wood/Bark-fired Boiler
Wood/Bark Waste	Wet Biomass	10200903	External Combustion Boilers;Industrial;Wood/Bark Waste;Wood-fired Boiler - Wet Wood (:=20% moisture)
Wood/Bark Waste	Wet Biomass	10200904	External Combustion Boilers;Industrial;Wood/Bark Waste;Bark-fired Boiler (< 50,000 Lb Steam) **
Wood/Bark Waste	Wet Biomass	10200905	External Combustion Boilers;Industrial;Wood/Bark Waste;Wood/Bark-fired Boiler (< 50,000 Lb Steam) **
Wood/Bark Waste	Wet Biomass	10200906	External Combustion Boilers;Industrial;Wood/Bark Waste;Wood-fired Boiler (< 50,000 Lb Steam) **
Wood/Bark Waste	Wet Biomass	10200907	External Combustion Boilers;Industrial;Wood/Bark Waste;Wood Cogeneration
Wood/Bark Waste	Wet Biomass	10200908	External Combustion Boilers;Industrial;Wood/Bark Waste;Wood-fired Boiler - Dry Wood (<20% moisture)
Wood/Bark Waste	Wet Biomass	10200910	External Combustion Boilers;Industrial;Wood/Bark Waste;Fuel cell/Dutch oven boilers **
Wood/Bark Waste	Wet Biomass	10200911	External Combustion Boilers;Industrial;Wood/Bark Waste;Stoker boilers **
Wood/Bark Waste	Wet Biomass	10200912	External Combustion Boilers;Industrial;Wood/Bark Waste;Fluidized bed combustion boiler
LPG	Gas 1 (Other)	10201001	External Combustion Boilers;Industrial;Liquified Petroleum Gas (LPG);Butane
LPG	Gas 1 (Other)	10201002	External Combustion Boilers;Industrial;Liquified Petroleum Gas (LPG);Propane
LPG	Gas 1 (Other)	10201003	External Combustion Boilers;Industrial;Liquified Petroleum Gas (LPG);Butane/Propane Mixture: Specify Percent Butane in Comments
Bagasse	Bagasse	10201101	External Combustion Boilers;Industrial;Bagasse;All Boiler Sizes
Solid Waste	Wet Biomass	10201201	External Combustion Boilers;Industrial;Solid Waste;Specify Waste Material in Comments
Solid Waste	Wet Biomass	10201202	External Combustion Boilers;Industrial;Solid Waste;Refuse Derived Fuel
Liquid Waste	Heavy Liquid	10201301	External Combustion Boilers;Industrial;Liquid Waste;Specify Waste Material in Comments
Liquid Waste	Heavy Liquid	10201302	External Combustion Boilers;Industrial;Liquid Waste;Waste Oil
Liquid Waste	Heavy Liquid	10201303	External Combustion Boilers;Industrial;Liquid Waste;Salable Animal Fat
Methanol	Heavy Liquid	10201601	External Combustion Boilers;Industrial;Methanol;Industrial Boiler
coal	Coal	10300102	External Combustion Boilers;Commercial/Institutional;Anthracite Coal;Traveling Grate (Overfeed) Stoker
coal	Coal	10300203	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Cyclone Furnace (Bituminous Coal)
coal	Coal	10300206	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (Bituminous Coal)
coal	Coal	10300207	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Overfeed Stoker (Bituminous Coal)
coal	Coal	10300208	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Underfeed Stoker (Bituminous Coal)
coal	Coal	10300209	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Spreader Stoker (Bituminous Coal)
coal	Coal	10300216	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (Tangential) (Bituminous Coal)
coal	Coal	10300217	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Atmospheric Fluidized Bed Combustion: Bubbling Bed (Bituminous Coal)
coal	Coal	10300218	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Atmospheric Fluidized Bed Combustion: Circulating Bed (Bitum. Coal)
coal	Coal	10300221	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Pulverized Coal: Wet Bottom (Subbituminous Coal)
coal	Coal	10300222	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Pulverized Coal: Dry Bottom (Subbituminous Coal)
coal	Coal	10300224	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Spreader Stoker (Subbituminous Coal)
coal	Coal	10300225	External Combustion Boilers;Commercial/Institutional;Bituminous/Subbituminous Coal;Traveling Grate (Overfeed) Stoker (Subbituminous Coal)

Fuel	ICR Category	SCC	Description
Residual Oil	Heavy Liquid	10300401	External Combustion Boilers;Commercial/Institutional;Residual Oil;Grade 6 Oil
Residual Oil	Heavy Liquid	10300402	External Combustion Boilers;Commercial/Institutional;Residual Oil;10-100 Million Btu/hr **
Residual Oil	Heavy Liquid	10300403	External Combustion Boilers;Commercial/Institutional;Residual Oil;< 10 Million Btu/hr **
Residual Oil	Heavy Liquid	10300404	External Combustion Boilers;Commercial/Institutional;Residual Oil;Grade 5 Oil
Distillate Oil	Light Liquid	10300501	External Combustion Boilers;Commercial/Institutional;Distillate Oil;Grades 1 and 2 Oil
Distillate Oil	Light Liquid	10300502	External Combustion Boilers;Commercial/Institutional;Distillate Oil;10-100 Million Btu/hr **
Distillate Oil	Light Liquid	10300503	External Combustion Boilers;Commercial/Institutional;Distillate Oil;< 10 Million Btu/hr **
Distillate Oil	Light Liquid	10300504	External Combustion Boilers;Commercial/Institutional;Distillate Oil;Grade 4 Oil
Natural Gas	Gas 1 (NG Only)	10300601	External Combustion Boilers;Commercial/Institutional;Natural Gas;> 100 Million Btu/hr
Natural Gas	Gas 1 (NG Only)	10300602	External Combustion Boilers;Commercial/Institutional;Natural Gas;10-100 Million Btu/hr
Natural Gas	Gas 1 (NG Only)	10300603	External Combustion Boilers;Commercial/Institutional;Natural Gas;< 10 Million Btu/hr
Process Gas	Gas 2	10300701	External Combustion Boilers;Commercial/Institutional;Process Gas;POTW Digester Gas-fired Boiler
Process Gas	Gas 2	10300799	External Combustion Boilers;Commercial/Institutional;Process Gas;Other Not Classified
Landfill Gas	Gas 2	10300811	External Combustion Boilers;Commercial/Institutional;Landfill Gas;Landfill Gas
Wood/Bark Waste	Wet Biomass	10300902	External Combustion Boilers;Commercial/Institutional;Wood/Bark Waste;Wood/Bark-fired Boiler
Wood/Bark Waste	Wet Biomass	10300903	External Combustion Boilers;Commercial/Institutional;Wood/Bark Waste;Wood-fired Boiler - Wet Wood (:=20% moisture)
Wood/Bark Waste	Wet Biomass	10300908	External Combustion Boilers;Commercial/Institutional;Wood/Bark Waste;Wood-fired Boiler - Dry Wood (<20% moisture)
Wood/Bark Waste	Wet Biomass	10300910	External Combustion Boilers;Commercial/Institutional;Wood/Bark Waste;Fuel cell/Dutch oven boilers **
LPG	Gas 1 (Other)	10301001	External Combustion Boilers;Commercial/Institutional;Liquified Petroleum Gas (LPG);Butane
LPG	Gas 1 (Other)	10301002	External Combustion Boilers;Commercial/Institutional;Liquified Petroleum Gas (LPG);Propane
LPG	Gas 1 (Other)	10301003	External Combustion Boilers;Commercial/Institutional;Liquified Petroleum Gas (LPG);Butane/Propane Mixture: Specify Percent Butane in Comments
Solid Waste	Wet Biomass	10301201	External Combustion Boilers;Commercial/Institutional;Solid Waste;Specify Waste Material in Comments
Liquid Waste	Heavy Liquid	10301301	External Combustion Boilers;Commercial/Institutional;Liquid Waste;Specify Waste Material in Comments
Liquid Waste	Heavy Liquid	10301302	External Combustion Boilers;Commercial/Institutional;Liquid Waste;Waste Oil
coal	Coal	10500102	External Combustion Boilers;Space Heaters;Industrial;Coal **
Distillate Oil	Light Liquid	10500105	External Combustion Boilers;Space Heaters;Industrial;Distillate Oil
Natural Gas	Gas 1 (NG Only)	10500106	External Combustion Boilers;Space Heaters;Industrial;Natural Gas
LPG	Gas 1 (Other)	10500110	External Combustion Boilers;Space Heaters;Industrial;Liquified Petroleum Gas (LPG)
Waste oil	Heavy Liquid	10500113	External Combustion Boilers;Space Heaters;Industrial;Waste Oil: Air Atomized Burner
Waste oil	Heavy Liquid	10500114	External Combustion Boilers;Space Heaters;Industrial;Waste Oil: Vaporizing Burner
coal	Coal	10500202	External Combustion Boilers;Space Heaters;Commercial/Institutional;Coal **
Distillate Oil	Light Liquid	10500205	External Combustion Boilers;Space Heaters;Commercial/Institutional;Distillate Oil
Natural Gas	Gas 1 (NG Only)	10500206	External Combustion Boilers;Space Heaters;Commercial/Institutional;Natural Gas
Wood	Dry Biomass	10500209	External Combustion Boilers;Space Heaters;Commercial/Institutional;Wood
LPG	Gas 1 (Other)	10500210	External Combustion Boilers;Space Heaters;Commercial/Institutional;Liquified Petroleum Gas (LPG)
Waste oil	Heavy Liquid	10500213	External Combustion Boilers;Space Heaters;Commercial/Institutional;Waste Oil: Air Atomized Burner
Waste oil	Heavy Liquid	10500214	External Combustion Boilers;Space Heaters;Commercial/Institutional;Waste Oil: Vaporizing Burner
Distillate Oil	Light Liquid	30190001	Industrial Processes;Chemical Manufacturing;Fuel Fired Equipment;Distillate Oil (No. 2): Process Heaters
Residual Oil	Heavy Liquid	30190002	Industrial Processes;Chemical Manufacturing;Fuel Fired Equipment;Residual Oil: Process Heaters
natural gas	Gas 1 (NG Only)	30190003	Industrial Processes;Chemical Manufacturing;Fuel Fired Equipment;Natural Gas: Process Heaters
Process Gas	Gas 2	30190004	Industrial Processes;Chemical Manufacturing;Fuel Fired Equipment;Process Gas: Process Heaters

Fuel	ICR Category	SCC	Description
Distillate Oil	Light Liquid	30290001	Industrial Processes;Food and Agriculture;Fuel Fired Equipment;Distillate Oil (No. 2): Process Heaters
Residual Oil	Heavy Liquid	30290002	Industrial Processes;Food and Agriculture;Fuel Fired Equipment;Residual Oil: Process Heaters
natural gas	Gas 1 (NG Only)	30290003	Industrial Processes;Food and Agriculture;Fuel Fired Equipment;Natural Gas: Process Heaters
LPG	Gas 1 (Other)	30290005	Industrial Processes;Food and Agriculture;Fuel Fired Equipment;Liquified Petroleum Gas (LPG): Process Heaters
Distillate Oil	Light Liquid	30390001	Industrial Processes;Primary Metal Production;Fuel Fired Equipment;Distillate Oil (No. 2): Process Heaters
natural gas	Gas 1 (NG Only)	30390003	Industrial Processes;Primary Metal Production;Fuel Fired Equipment;Natural Gas: Process Heaters
Process Gas	Gas 2	30390004	Industrial Processes;Primary Metal Production;Fuel Fired Equipment;Process Gas: Process Heaters
Distillate Oil	Light Liquid	30490001	Industrial Processes;Secondary Metal Production;Fuel Fired Equipment;Distillate Oil (No. 2): Process Heaters
natural gas	Gas 1 (NG Only)	30490003	Industrial Processes;Secondary Metal Production;Fuel Fired Equipment;Natural Gas: Process Heaters
Process Gas	Gas 2	30490004	Industrial Processes;Secondary Metal Production;Fuel Fired Equipment;Process Gas: Process Heaters
Distillate Oil	Light Liquid	30590001	Industrial Processes;Mineral Products;Fuel Fired Equipment;Distillate Oil (No. 2): Process Heaters
Residual Oil	Heavy Liquid	30590002	Industrial Processes;Mineral Products;Fuel Fired Equipment;Residual Oil: Process Heaters
natural gas	Gas 1 (NG Only)	30590003	Industrial Processes;Mineral Products;Fuel Fired Equipment;Natural Gas: Process Heaters
LPG	Gas 1 (Other)	30590005	Industrial Processes;Mineral Products;Fuel Fired Equipment;Liquified Petroleum Gas (LPG): Process Heaters
oil	Light Liquid	30600101	Industrial Processes;Petroleum Industry;Process Heaters;Oil-fired **
gas	Gas 2	30600102	Industrial Processes;Petroleum Industry;Process Heaters;Gas-fired **
oil	Light Liquid	30600103	Industrial Processes;Petroleum Industry;Process Heaters;Oil-fired
gas	Gas 2	30600104	Industrial Processes;Petroleum Industry;Process Heaters;Gas-fired
natural gas	Gas 1 (NG Only)	30600105	Industrial Processes;Petroleum Industry;Process Heaters;Natural Gas-fired
Process Gas	Gas 2	30600106	Industrial Processes;Petroleum Industry;Process Heaters;Process Gas-fired
LPG	Gas 1 (Other)	30600107	Industrial Processes;Petroleum Industry;Process Heaters;LPG-fired
Landfill Gas	Gas 2	30600108	Industrial Processes;Petroleum Industry;Process Heaters;Landfill Gas-fired
oil	Light Liquid	30600111	Industrial Processes;Petroleum Industry;Process Heaters;Oil-fired (No. 6 Oil) : 100 Million Btu Capacity
unknown	Gas 1 (NG Only)	30600199	Industrial Processes;Petroleum Industry;Process Heaters;Other Not Classified
Distillate Oil	Light Liquid	30890001	Industrial Processes;Rubber and Miscellaneous Plastics Products;Fuel Fired Equipment;Distillate Oil (No. 2): Process Heaters
Residual Oil	Heavy Liquid	30890002	Industrial Processes;Rubber and Miscellaneous Plastics Products;Fuel Fired Equipment;Residual Oil: Process Heaters
natural gas	Gas 1 (NG Only)	30890003	Industrial Processes;Rubber and Miscellaneous Plastics Products;Fuel Fired Equipment;Natural Gas: Process Heaters
LPG	Gas 1 (Other)	30890004	Industrial Processes;Rubber and Miscellaneous Plastics Products;Fuel Fired Equipment;Liquified Petroleum Gas (LPG): Process Heaters
Distillate Oil	Light Liquid	30990001	Industrial Processes;Fabricated Metal Products;Fuel Fired Equipment;Distillate Oil (No. 2): Process Heaters
Natural Gas	Gas 1 (NG Only)	30990003	Industrial Processes;Fabricated Metal Products;Fuel Fired Equipment;Natural Gas: Process Heaters
Distillate Oil	Light Liquid	31390001	Industrial Processes;Electrical Equipment;Process Heaters;Distillate Oil (No. 2)
Residual Oil	Heavy Liquid	31390002	Industrial Processes;Electrical Equipment;Process Heaters;Residual Oil
Natural Gas	Gas 1 (NG Only)	31390003	Industrial Processes;Electrical Equipment;Process Heaters;Natural Gas
Distillate Oil	Light Liquid	39900501	Industrial Processes;Miscellaneous Manufacturing Industries;Process Heater/Furnace;Distillate Oil
Natural Gas	Gas 1 (NG Only)	39900601	Industrial Processes;Miscellaneous Manufacturing Industries;Process Heater/Furnace;Natural Gas
Process Gas	Gas 2	39900701	Industrial Processes;Miscellaneous Manufacturing Industries;Process Heater/Furnace;Process Gas
Landfill Gas	Gas 2	39900801	Industrial Processes;Miscellaneous Manufacturing Industries;Process Heater/Furnace;Landfill Gas
LPG	Gas 1 (Other)	39901001	Industrial Processes;Miscellaneous Manufacturing Industries;Process Heater/Furnace;LPG
Distillate Oil	Light Liquid	39990001	Industrial Processes;Miscellaneous Manufacturing Industries;Miscellaneous Manufacturing Industries;Distillate Oil (No. 2): Process Heaters
natural gas	Gas 1 (NG Only)	39990003	Industrial Processes;Miscellaneous Manufacturing Industries;Miscellaneous Manufacturing Industries;Natural Gas: Process Heaters
Process Gas	Gas 2	39990004	Industrial Processes;Miscellaneous Manufacturing Industries;Miscellaneous Manufacturing Industries;Process Gas: Process Heaters

