Advanced Petroleum-Based Fuels - Diesel Emissions Control (APBF-DEC) Project Overview

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DEC Mission

- Identify optimal combinations of fuels, lubricants, diesel engines, and emission control systems to:
  - Meet projected emission standards during the period 2000 to 2010 while maintaining continuous improvement in engine efficiency and durability
  - Maintain customer satisfaction with vehicle performance
  - Provide the basis for economical transport of people and goods
  - Meet additional potential constraints (e.g., emissions of unregulated substances, including ultra-fine particulate matter and greenhouse gases)
- Explore the potential to achieve even lower emissions of criteria and unregulated pollutants beyond 2010

APBF-DEC Products

- Light and heavy-duty platforms for measurement of effects of fuel and lubricant composition on emissions under transient operation
- Comprehensive data on status of fuel-engine-emission control technologies for reducing criteria emissions for U.S. EPA's biennial technology assessments
- Comprehensive data on effects of fuel & lubricant properties on emissions of unregulated substances

DEC Summary

- Includes vehicles from automobiles to heavy-duty trucks
- Systems approach investigating fuels, lubricants, engines, emission control systems
- Builds upon work done in DECSE, where individual emission control devices were examined
- Initial timeframe 2000 to 2003 to provide information to industry and government within regulatory environment
- Resource needs for Phase 1, $33 million, including $19.3 million in cash and $14 million in in-kind contributions
- Government planning for $14 million of the $19.3 million cash contribution
- Government/industry Steering Committee and Work Groups guiding the DEC Project

APBF-DEC Project Schedule

	CY2001	2002	2003	2004	2005	2006	2007
Fuels, Engines, DPFs, SCR, and NO_x Adsorbers	***Phase I*** →			***Phase II*** →			
	Develop test platforms →			Post 2010 fuels and emissions →			
		Fuel sulfur and criteria pollutants →					
			Fuels and unregulated emissions →				
Lubricants	Lubricant effects on engine-out emissions →						
		Lubricant effects on emission control performance and durability →					
			Engine/emission control system confirmatory tests →				
Regulatory Environment	EPA technology reviews of NO_x adsorbers:						
	2002 EPA status report ◆			*2004 EPA status report* ◆		*2006 EPA status report* ◆	
	EPA FACA report ◆			Diesel sulfur fuel (15 ppm S cap) ◆			
				Heavy-duty emission standards (phased in MY07-10) ◆			
				Tier 2 emission standards (phased in MY04-09) →			

Study of Fuel Composition Effects

	Phase I 2001-2003	Phase II (Tentative) 2004-2007
Fuel Effect Studied	Sulfur	Sulfur, other substances & properties (e.g., aromatics, oxygen, cetane)
Test Fuels	**DECSE** • 3 ppm sulfur (set-up) • 8 & 15 ppm sulfur • 30 ppm sulfur BP15	Refinery Process Fuels • Fuel B • Fuel C • Fuel D Fischer-Tropsch Fuels • Fuel E • Fuel F
Emission Measurements	NO_x Particulate matter • Soluble organic fraction • Sulfate Hydrocarbons (HC) Carbon monoxide (CO) Unregulated substances (limited measurements)	NO_x, HC, CO, N_2O Particulate matter • Soluble organic fraction • Sulfate • PAH , Nitro-PAH Speciated non-methane organic gases Formaldehyde Other unregulated substances

Participating Companies/Organizations

Automobile:
- Ford
- GM
- DaimlerChrysler
- Toyota

Engines:
- EMA
- Caterpillar
- Detroit Diesel
- Cummins
- John Deere
- Mack Trucks
- International Truck & Engine

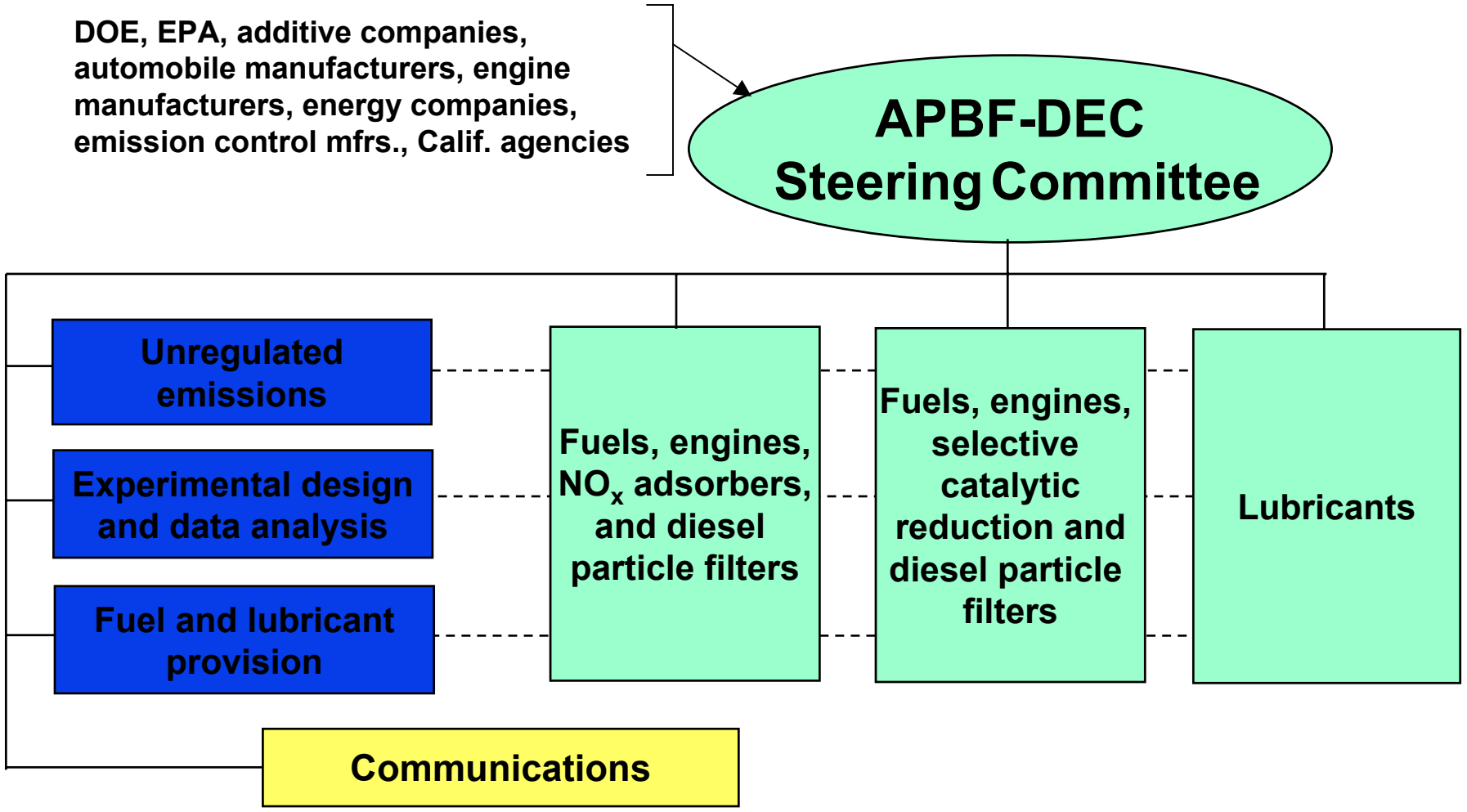
Government:
- DOE
- NREL
- ORNL
- EPA
- CARB/SCAQMD

Technology:
- Battelle

Emission Control:
- MECA
- Johnson Matthey
- Delphi
- 3M
- Engelhard
- Siemens
- Benteler
- ArvinMeritor
- Clean Diesel Tech.
- Corning
- Donaldson Co.
- OMG
- NGK
- Rhodia
- Tenneco Automotive

Energy/ Additives:
- API
- American Chemistry Council
- NPRA
- BP
- Ethyl
- ExxonMobil
- Marathon Ashland
- Pennzoil-Quaker State
- Lubrizol
- Equilon
- Castrol
- ChevronTexaco
- Chevron Oronite
- Ciba
- Ergon
- Valvoline
- Motiva
- Infineum

Integrated Systems Approach



APBF-DEC Subcontractors

- SCR/DPF Technologies

  SwRI – HD Engine
  TIAX - SCR/Urea Infrastructure Study

- NO_x Adsorber/DPF Technologies

  FEV - Light-Duty Passenger Car
  SwRI – SUV/Pickup
  Ricardo - HD Engine

- Lubricants ATL – MD Engine