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EPAct Program Update for Chet France

Status and Budget

February 19, 2008

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Status of Testing and Fuel Blending

- Phase 1 testing complete
  - 75°F testing of 19 vehicles on 3 fuels (E0, E10, E15)
- Interim FTP-cycle testing complete
  - 75°F testing of 6 vehicles on 3 fuels (E0, E10, E15)
- Phase 2 testing complete
  - 50°F testing of 19 vehicles on 3 fuels (E0, E10, E15)
- Phase 3 testing expected to begin next week
  - 75°F testing of 10? (originally19) vehicles on 27 fuels (E0, E10, E15, E20)
- Test fuel development being done by Haltermann and ASD
  - EPA defines fuel recipes
  - Haltermann prepares hand blends, bulk blends and performs fuel analyses
- 22 of the 28 fuels needed in Phase 3 have been blended in bulk
  - 13 have been delivered to SWRI

Budget Considerations Going Forward

	Program or Project	Cost	Cumulative Cost	Difference of Total From the Original Estimate of $4,200,000	
ORIGINAL PROGRAM	Original EPAct Program Budget	$ 4,200,000	-	-	-
	EPAct Program, February 2009 Cost Estimate	$ 5,728,700	Ex. 4 - CBI		
	Fuel Cost Adjustment	Ex. 4 - CBI			
ADDITIONAL PROJECTS	FTP Testing (Partially Competed)				
	EFM Resolution (Completed)				
	Miscellaneous				
	Blending of Two CRC Fuels				
	EmissionTesting of Two CRC Fuels				
		Grand Total >>>>	$ 6,479,200	$ 2,279,200	54.3%

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Budget Considerations Going Forward (Cont'd)

- Original program cost estimate: $4,200,000
- Cost overrun wrt the original scope of program: Ex. 4 - CBI
- Cost overrun including additional projects: Ex. 4 - CBI
- Funds spent or incurred as of Feb. 19, 2009: Ex. 4 - CBI
- Funds "remaining" in LD EPAct budget as of Feb. 19, 2009: Ex. 4 - CBI
- Estimated cost of Phase 3: Ex. 4 - CBI
- Estimated cost of testing 2 CRC fuels in Phase 3: Ex. 4 - CBI
- New funds needed to get us through the end of fiscal year: Ex. 4 - CBI

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Causes of Cost Overrun

- Unrealistically low original cost estimates by SWRI
  - Underestimation of base program cost Ex. 4 - CBI
    - On January 7, 2009, SWRI was estimating base program cost overrun by 10% vs. 36.4 % on Feb. 5, 2009
    - Unexpectedly high cost of "coming up to speed": Ex. 4 - CBI
    - Additional checkout tests to resolve HC analyzer saturation and secondary dilution ratio issues in Phase 2: Ex. 4 - CBI
    - Higher than originally estimated test replication rate (+6%): Ex. 4 - CBI
- Fuel cost increase (modified fuel development protocol): Ex. 4 - CBI
- Blending of two CRC fuels: $55,000
- Additional tasks:
  - EFM resolution: Ex. 4 - CBI
  - Fuel matrix redesign: Ex. 4 - CBI
  - FTP testing: Ex. 4 - CBI

Program execution problems:

- Inadequate temperature control in Phase 2 of the program
- Fuels blended for Phases 1 and 2 contained undesireable components

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Options to Reduce Cost

- Delay testing of CRC fuels: $195,000
- Reduce the number of test fuels
  - Reduction of the number of fuels by 1-2 would drop the G-efficiency of emission models below the minimum acceptable limit of 50%
  - The emphasis of this program is on fuels, not vehicles
- Reduce the number test vehicles
  - Reduction of the number of vehicles from 19 to 15 doubles the probability of getting a non-significant result in emission models. The power of the statistical test of 0.80 is the lowest acceptable in std practice (0.95 was used in AutoOil)
    - We are working with DOE on vehicle selection
  - Reducing the number of test replicates from 2 to 1 has an even stronger impact
- Eliminate continuous THC, NOx…. measurements in raw exhaust
  - Would make critical types of information unavailable
  - Minimal savings
- Reduce the scope of exhaust HC speciation
  - The cost of HC and alcohol/carbonyl speciation: $ **Ex. 4 - CBI**
  - Data necessary for AQ modeling and toxic emission factors
    - Phase I and II data not adequate due to fuel blending problems

Options to Reduce Cost (Cont'd)

- Work with SWRI to reduce program cost
  - Discussions between Chet and Bruce Bykowski (Vice President; Engine, Emissions and Vehicle Research)

- Request additional DOE support

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Back-up Slides

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Revised EPAct Fuel Matrix

Phase 3
Base Program (EPA)
(Fuels 1-16)

Phases 1 and 2
RFS 2 Subset (EPA/DOE)
(Fuels 17-19)

Phase 3
Additional Fuels (DOE)
(Fuels 20-29)

E85 (DOE)

CRC Additional Fuels

Fuel #	T50 °F	T90 °F	ETOH %	RVP psi	ARO %
1	150	300	10	10	15
2	240	340	0	10	15
3	220	300	10	7	15
4	220	340	10	10	15
5	240	300	0	7	40
6	190	340	10	7	15
7	190	300	0	7	15
8	220	300	0	10	15
9	190	340	0	10	40
10	220	340	10	7	40
11	190	300	10	10	40
12	150	340	10	10	40
13	220	340	0	7	40
14	190	340	0	7	15
15	190	300	0	10	40
16	220	300	10	7	40
17	215	325	0	9	30
18	202	325	10	9	25
19	195	325	15	9	23
20	160	300	20	7	15
21	160	300	20	7	40
22	160	300	20	10	15
23	160	340	20	7	15
24	160	340	20	10	15
25	160	340	20	10	40
26	150	340	15	10	40
27	190	340	15	7	15
28	190	300	15	7	40
29	TBD	TBD	85	TBD	TBD
30	150	325	10	10	40
31	160	325	20	10	15

Revised Fuels

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Light Duty Exhaust Program Summary

- EPA/DOE collaboration
- Objective: Establish effects of RVP,T50,T90, aromatic content and EtOH on exhaust emissions from Tier 2 vehicles
- Fuel matrix includes 29 fuels + 2 added by CRC = total of 31
- Test Program Design
  - Phase 1: RFS 2 Pilot at 75°F
    - 3 fuels (E0, E10 and E15) tested in 19 vehicles
    - Test results to be available for RFS 2 NPRM
  - Phase 2: RFS 2 Pilot at 50°F
    - Same as Phase 1, except temperature
  - Phase 3: Main Program
    - 27 fuels tested in 19 Tier 2 vehicles, E85 tested in 4 FFVs
- LA92 test cycle used throughout the program
- Species measured: Regulated emissions, CO_2, NO_2, VOCs, ethanol, carbonyl compounds
  - N_2O, NH_3 and HCN by FTIR
  - Some PM and SVOC speciation

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Measured Species

- Bag (phase) level and composite emissions of THC, NMHC, NMOG, CO, CO_2, NOx, NO_2, ethanol and PM
- Bag (phase) level speciated volatile organic compounds (VOCs)
  - Over 200 compounds, incl. alcohols and carbonyls
- Continuous and integrated by bag (phase) emissions of the following species in raw exhaust:
  - THC, NMHC, CO, CO_2, NOx
  - N_2O, NH_3 and HCN by FTIR for a subset of tests
- Semi-volatile and high molecular weight VOC and PM measured in Phases 1 and 2 only

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Projected Schedule Going Forward

- Launch of Phase 3 testing: Mid-February 2009
- Completion of Phase 3 testing: Early December 2009
- Reporting: December 2009 – mid-March 2010

		JAN 2009				FEB 2009				MAR 2009					APR 2009				MAY 2009				JUN 2009					JUL 2009				AUG 2009					SEP 2009				OCT 2009				NOV 2009					DEC 2009			
		5	12	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28
Phase 1[a]	14 weeks																																																						
50F setup	3 weeks																																																						
Phase 2[b]	9 weeks	4	5	6	7	8	9																																																
50F teardown	2 weeks																																																						
Phase 3[a]	26 weeks							1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26																							
NREL fuels[a]	17 weeks																																	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17				
CRC fuels	4 weeks																																																			1	2	3
NREL high emitter	2 weeks																																																						
draft final report	6 weeks																																																			1	2	3
EPA/NREL review	4 weeks																																																						
final report	4 weeks																																																						

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