Diesel fuel efficiency protocol from the Canadian Hydrogen Energy Company Ltd.

Fuel Efficiency Protocol Objective:

1. To establish a Trip Data "Base Line" which is conducted under controlled conditions on a specific vehicle (Cab or Cab and Trailer). All pertinent data must be accurately detailed and recorded. Base Line data collection to be performed with HFI Unit "OFF".
2. Perform Trip Collection Session(s) with HFI Unit "ON" (*STM-3* added).
3. Each subsequent Trip Collection Session will have selective parameter(s) [varied by design] for comparative purposes.
4. The Base Line Data Point will then be compared to all other Trip Data Collection Sessions (where appropriate).
5. Data variable variations must be kept to a minimum as analysis/conclusions may be affected.
    Data Collection: A Base Trip Data Collection Point and 1 Trip Collection Sessions have been recorded using a CAT 430. Data Collection sessions occurred on June 3, 2005.
6. Select a start-return route of 100 miles. Base Trip Data Collection.
7. Ensure the vehicle (Cab only or Cab and Trailer) is readied for the trip.
8. Check /correct/record tire pressure.
9. Fill fuel tank(s) to maximum and record fuel data.
10. Weigh vehicle and driver at certified scale at same location as fuel fill location, e.g., Fifth Wheel.
11. Record atmospheric temperature
12. Record prevailing wind data
13. Ready to begin trip 'first leg'
14. Record odometer reading
15. Ensure HR unit is OFF
16. Record time of trip "START"
17. Ensure constant speed`
18. Reach half-way point and begin return portion
19. Arrive to start location
20. Record time
21. Record odometer reading
22. Weigh vehicle and driver at same certified scale
23. Transfer data to Analysis Spreadsheet
24. Base Data Collection Completed

Trip Data Collection
• Ready to collect Trip Data with STM-3 added and to compare Base Data
• Ensure that minimum of 1 hour cool down
• Ensure that the maximum amounts of variables are the same as for Base Data temp., wind, driver, weight, tire pressure, etc.)

• Fuel tanks should be filled to maximum (verify)
• Weigh vehicle at same certified scale
• Start trip, record time
• Match base driving speed(s), etc. as per Base Collection Trip
• Return to start and record data

Variables to be kept constant on each trip as compared to Base Trip:
• Driver: Same
• Vehicle: Same
• Tire pressure
• Weight Driving
Conditions:
• Speed: Same
• Cruise Same
• Lane selection Same
• Stop Same
• Start. Etc. Same
Atmospheric Conditions:
• Temperature Same
• Prevailing winds Same

NOTE :
1. Distance and Time of Trips should be within 0.5%
2. Variable variations between Base Data and other trip data collection sessions may affect
    analysis/conclusions
3. All data to be recorded in appropriately bound Log Book

CONCLUSION FROM TEST RESULT : The test conducted by Canadian Hydrogen Energy Company Ltd. is an on-the-road test that simulates normal highway driving conditions experienced by most truck driving fleets across the United States and Canada. The `Real World' test enables accurate recording of: fuel consumption, mileage, weight, weather conditions, tire pressure, driver factor, and a predetermined route. The use of the *STM-3* resulted in significant increases in fuel economy. After driving a mere 100 miles after adding *STM-3* , fuel economy increased 16.15%. These results indicate that the *STM-3* has an immediate effect to the combustion chamber, providing better compression in the engine and increasing the efficiency in the fuel ignition system. (It should be noted that using *STM-3* in diesel engines does not show full results until 500 to 1000 miles of use. This test data is based on only the first 100 miles after introduction of *STM-3*).

Trip Data Collection Protocol

1.   Select a start-return route of 100 to 200 miles.

Base Trip Data Collection

2.   Ensure the vehicle (Cab only or Cab and Trailer) is readied for the trip.
   - Check / correct / record tire pressure
   - Fill fuel tank(s) to maximum and record fuel data
   - Weigh vehicle and driver at certi! ed scale at same location as fuel
       ! ll location, eg. Fifth Wheel
   - Record atmospheric temperature
   - Record prevailing wind data, eg. 15 mph. NW
   - Ready to begin trip "! rst leg"
   - Record odometer reading
   - Ensure HFI unit is OFF
   - Record time of trip "Start"
   - Ensure "constant speed" (ie. Cruise, lane selection, etc.)
   - Reach half-way point and begin return portion
   - Arrive to start location
   - Record time
   - Record odometer reading
   - Weigh vehicle and driver at same certi! ed scale
   - Fill fuel tank(s) to maximum
   - Record fuel data
   - Weigh vehicle and driver at same certi! ed scale
   - Transfer all data to Analysis Spreadsheet
   - Base Data Collection completed

Trip Data Collection

3.   Ready to collect Trip Data with HFI - ON and compare to Base Data
   - Ensure that a minimum of 1 hour cool down
   - Ensure that the maximum amount of variables are the same as for
     Base Data (temp, wind, driver, weight, tire pressure, etc.)
   - Fuel tank(s) should be ! lled to maximum (verify)
   - Weigh vehicle at same certi! ed scale
   - Start trip, record time
   - Match base driving speed(s), etc. as per Base Collection Trip.
   - Return to start and record all data.

Variables to be kept constant on each trip as compared to Base Trip:

Driver   - same

Vehicle
  - Tire pressure   - same
  - Weight   - same

Driving Conditions
  - Speed   - same
  - Cruise   - same
  - lane selection   same
  - stop   - same
  - start, etc.   - same

Atmospheric Conditions
  - Temperature   - same
  - Prevailing winds   -same

Note:
  1. Distance and Time of Trips should be within 0.5%
  2. Variable variations between Base Data and other trip data collection sessions may a! ect analysis conclusions, etc.
  3. All data to be recorded in appropriately bound Log Book.

<u>APPENDIX B</u>
TRIP DATA
May 18, 2005
Parameter Settings A

	May 18, 2005-START	May 18, 2005-Return to **START**	COMMENTS
TRIP WITH HFI "OFF" BASE DATA			Weight prior to refueling
Vehicle	CAT 430		Fuel Used on Trip
Odometer-Miles Vehicle	576,932.0	577,060.0 **128.0**	Approx. Trip Time
Weight-Lbs. Tire Pressure	20,080.0	19,940.0 **140.0**	Weight prior to refueling
Atmospheric Temperture	Not Recorded	Not Recorded	Fuel Used on Trip
Prevailing Wind	23	23	Approx. Trip Time
	Not Recorded	Not Recorded	
Location	5th Wheel (Hwy 401 and Exit 431	To Belleville and return to START	
Fuel	Bowmanville, ONTARIO)	69.724 69.724	
Time	291.48 9:58	12:08 2:10	
Fuel Temperature	Not Recorded C.	Not Recorded	
Driver	Coratti C.	C. Coratti	
Data Recorded By:	Coratti	C. Coratti	
TRIP 1 WITH HFI "ON"			
Vehicle	**CAT 430**		
Odometer-Miles Vehicle	577,194.0	577,322.0 128.0	
Weight Tire Pressure	20,080.0	19,960.0 120.0	
Atmospheric Temperture	Not Recorded	Not Recorded	
Prevailing Wind	Not Recorded	Not Recorded	
	Not Recorded	Not Recorded	
Location	5th Wheel (Hwy 401 and Exit 431	To Belleville and return to START	
Fuel	Bowmanville, ONTARIO)	52.888	
Time	69.724 12:31		
Fuel Temperature	Not Recorded C.	52.88	
Driver	Coratti C.	8	
Data Recorded By:	Coratti	15:07 2:35	
		Not Recorded	
		C. Coratti	
		C. Coratti	

ANALYSIS

	TRIP WITH HFI "OFF" BASE DATA	**TRIP WITH HFI "ON"**		
Difference in Fuel by Weight	140.0	120.0	20.0	Savings in Fuel-Pounds
% Fuel Savings by Weight			16.67%	Improvement-Weight
Difference in Fuel by Liters %	69.724	52.888	16.8	Savings in Fuel-Liters
Fuel Savings by Liters			**24.15%**	Improvement-Liters

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APPENDIX C
Trip Data
May 19, 2005
Parameter Settings B

TRIP2 WITH HFI "ON"	May 19, 2005-START	May 19, 2005-Return toSTART	DIFFERENCE	COMMENTS
Vehicle	CAT 430			
Odometer-Miles	577,194.0	577,322.0	128.0	
Vehicle Weight-Lbs.	20,080.0	19,980.0	100.0	Weight prior to refueling
Tire Pressure	Not Recorded	Not Recorded		
Atmospheric Temperture	Not Recorded	Not Recorded		
Prevailing Wind	Not Recorded	Not Recorded		
Location	5th Wheel (Hwy 401 and Exit 431 @ Bowmanville, ONTARIO)	To Belleville and return to START		
Fuel	27.432	50.18	50.18	Fuel Used on Trip
Time	11:28	13:41	2:14	Approx. Trip Time
Fuel Temperature	Not Recorded	Not Recorded		
Driver	C. Coratti	C. Coratti		
Data Recorded By:	C. Coratti	C. Coratti		

ANALYSIS

	BASE May 18, 2005	TRIP WITH HFI "ON" and Parameter Settings B		
Difference in Fuel by Weight	140.0	100.0	40.0	Savings in Fuel-Pounds
% Fuel Savings by Weight			40.00%	Improvement-Weight
Difference in Fuel by Liters	69.724	50.18	19.5	Savings in Fuel-Liters
% Fuel Savings by Liters			28.03%	Improvement-Liters