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FreedomCAR & Vehicle Technologies
Advanced Vehicle Testing Activity***

***NYPA/TH!NK Clean Commute Program Final
Report - Inception through December 2004***



TECHNICAL REPORT

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James Francfort***

November 2005

***Idaho National Laboratory
Operated by Battelle Energy Alliance***

**U.S. Department of Energy
FreedomCAR & Vehicle Technologies
Advanced Vehicle Testing Activity**

**NYPA/TH!NK Clean Commute Program Final Report -
Inception through December 2004**

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November 2005

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ABSTRACT

The Clean Commute Program was launched in October 2001 by the New York Power Authority (NYPA) and Ford Motor Company's electric vehicle group, TH!NK Mobility, in conjunction with the Long Island Power Authority, the Metropolitan Transportation Authority and the U.S. Department of Energy's Advanced Vehicle Testing Activity. The Clean Commute Program used TH!NK *city* electric vehicles from TH!NK Mobility to demonstrate the feasibility of using electric transportation in urban applications. Suburban New York City railroad commuters used the TH!NK *city* vehicles to commute from their private residences to railroad stations, where they caught commuter trains into New York City. Electric vehicle charging infrastructure for the TH!NK *city* vehicles was located at the commuters' private residences as well as at seven train stations.

Ford leased a total of 97 TH!NK *city* electric vehicles to commuters from Westchester, Putnam, Rockland, Queens, Nassau, and Suffolk counties for \$199 per month. First Clean Commute Program vehicle deliveries occurred late in 2001, with data collection commencing in February 2002. Through May, 2004, 24 of the lessees had returned their vehicles to Ford and no longer participate in the Clean Commute Program. Reasons given for leaving the program include relocation out of the program area, change in employment status, change in commuting status, and, in a few cases, dissatisfaction with the vehicle. In addition, 13 vehicles were returned to Ford when the lease was completed. In August 2002, Ford announced that it was ceasing production of the TH!NK *city* and would not extend any TH!NK *city* leases. Mileage accumulation dropped in the last quarter of the program as vehicle leases were returned to Ford.

Overall, the positive impact of the program was significant, as participants in the Clean Commute Program drove their vehicles over 406,074 miles, avoiding the use of over 18,887 gallons of gasoline. During the active portion of the program, the TH!NK *city* vehicles were driven an average of between 180 and 230 miles per month. Over 95% of all trips taken with the TH!NK *city* vehicles replaced trips previously taken in gasoline vehicles. This report covers the period from program inception through December 2004.

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NYPA/TH!NK Clean Commute Program Report Inception through December 2004

PROGRAM DESCRIPTION

The Clean Commute Program was launched in October 2001 by the New York Power Authority (NYPA) and Ford Motor Company's electric vehicle group, TH!NK Mobility, in conjunction with the Long Island Power Authority, the Metropolitan Transportation Authority and the U.S. Department of Energy's Advanced Vehicle Testing Activity. The program was designed to reduce air pollution and traffic congestion and to promote national energy independence by using electricity for transportation.

The program goal was to lease 100 emission-free TH!NK *city* electric vehicles to suburban rail commuters for 34 months. Ford leased a total of 97 TH!NK *city* electric vehicles to commuters from Westchester, Putnam, Rockland, Queens, Nassau, and Suffolk counties for \$199 per month. The first Clean Commute Program vehicle deliveries occurred late in 2001, with data collection starting in February 2002. By the end of May 2004, 24 of the 97 lessees had returned their vehicles to Ford and no longer participated in the Clean Commute Program. Reasons given for leaving the program included relocation out of the program area, change in employment status, change in commuting status, and, in a few cases, dissatisfaction with the vehicle. In addition, 13 vehicles were returned to Ford, because their leases had expired. In August 2002, Ford announced that it was ceasing production of the TH!NK *city* and would not extend any TH!NK *city* leases. By the end of 2004, all participants were contacted to arrange return of the vehicles to Ford.

Clean Commute participants used charging stations at railroad station parking lots, where their vehicles were charged during the workday. Railroad stations participating in the Clean Commute Program and the number of vehicle chargers at each station are as follows:

Chappaqua, Westchester County—
Twenty Chargers.



Brewster North, Putnam County—
Ten Chargers.





Huntington, Suffolk County—
Twenty-two Chargers.



Hicksville, Nassau County—
Sixteen Chargers.

White Plains, Westchester County—
Ten chargers.



North White Plains,
Westchester County—
Eight Chargers.



The railroad station at Nanuet, Rockland County, originally participated in the Clean Commute Program. However, none of the program participants used this station. All of the participants also had charging equipment installed at their homes to increase the opportunity for vehicle use.

The TH!NK *city* is a two-passenger electric vehicle with a range of about 50 miles and a top speed of 55 miles per hour. Local Ford dealers leased the TH!NK *city* directly to consumers and provided maintenance service and basic vehicle instruction. The electric vehicle was manufactured by Ford's TH!NK Nordic subsidiary in Norway.

NYPA, in partnership with the Metropolitan Transportation Authority, Metro North Railroad, and Long Island Rail Road, coordinated activities to ensure sufficient railroad station parking and charging stations. Additional support and funding were provided by the New York State Energy Research and Development Authority, Long Island Power Authority, New York State Department of Transportation, New York City Department of Transportation, and the U.S. Department of Energy.

The U.S. Department of Energy, through its Advanced Vehicle Testing Activity (AVTA) and its subcontractor, Electric Transportation Applications, provided data collection, analysis, and reporting support for the Clean Commute vehicle operations. This is the third and final report issued by the AVTA to analyze the Clean Commute Program's vehicle operations. The first report covered the period from program inception through February 28, 2003. The second report covered the period from program inception through May 30, 2004. The final report provides analysis of the entire clean commute program.

DATA COLLECTION PROGRAM

Program Objectives

The objective of Clean Commute data collection was to gather data from Clean Commute Program customers and determine the following accomplishments:

- Vehicle utilization
- Reduction in the use of petroleum fuel
- Reduction in emissions
- Customer satisfaction with the Clean Commute vehicles and infrastructure
- Long-term program viability.

Program Participants

The Clean Commute Program had a total of 97 participants; each of whom leased a TH!NK *city* vehicle and took delivery of the vehicle. Seventy-one of the Clean Commute Program participants completed an initial survey. These participants were considered active in the Clean Commute Program. During the program, 13 participants returned their TH!NK *city* vehicles to Ford at the end of lease. Twenty-four of the vehicles were returned early for various reasons. Due to Ford's cancellation of the TH!NK *city* vehicle in 2004, the remaining vehicles were returned as their leases expired, and no lease extensions were offered these participants. Eleven of the vehicles were returned to Ford before their leases expired.

Collection Methodology

Data collection for the Clean Commute Program began in April 2002, primarily through the Internet. Once participants had taken delivery of their TH!NK *city* vehicle, they were sent an e-mail directing them to a Web page where they could complete an initial survey. Appendix A presents a sample initial survey. Data from the survey was automatically entered into a Clean Commute participant database. Initial surveys were completed in May 2002. Of the 97 participants that leased a TH!NK *city* vehicle and took delivery of a vehicle, 71 completed the initial survey and were considered active in the Clean Commute Program. Ten participants returned their vehicles before the initial surveys were completed. These participants had provided only minimal data, and their responses were deleted from the database. The remaining 16 participants did not complete an initial survey but did provide data on an ongoing basis, which was included in the database.

After completing the initial survey, participants were requested by e-mail to complete a monthly survey detailing their Clean Commute Program experience. Appendix B presents a sample monthly survey. The data from these monthly surveys were also automatically entered into the Clean Commute participant database. The first monthly surveys were transmitted in June 2002 to collect data for May.

A Supplemental Survey was transmitted to participants in July 2003. This survey collected additional data requested by NYPA for their evaluation of the Clean Commute Program. Appendix C presents a sample Supplemental Survey. The Supplemental Survey was sent to 58 participants in the Clean Commute Program, who were offered a stipend of \$30.00 if they completed the Supplemental Survey, as an incentive for their participation. Twenty-eight participants completed the Supplemental Survey.

Analysis Protocols

Clean Commute Program participant demographic data obtained from the initial survey are presented in the following section. Data for initial survey collection efficiency are presented in the section following it. Data collected and stored in the Clean Commute participant database were analyzed to determine various measures of program performance. These measures are presented in the final sections:

- Projected Performance Parameters – Projected Vehicle Use

- Measured Performance Parameters – Actual Vehicle Use
 - Derived Performance Parameters – Petroleum Abatement and Emissions Reductions.
- Results of these analyses were reported and monitored on an ongoing basis to provide program guidance.

DATA ANALYSIS

Participant Demographics

Participant demographics were obtained from the initial survey (Appendix A). Figures 1 through 4 present demographic data for TH!NK *city* lessees completing the initial survey. Figure 1 presents gender data, which were provided by all 71 of the active Clean Commute Program participants. In addition, gender was gleaned from contact with nine other participants, yielding a total of 80 data for participant gender.

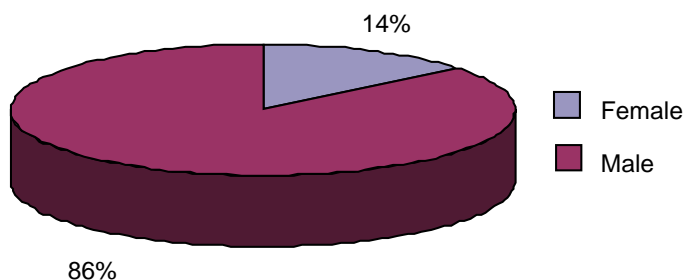


Figure 1. Participant gender.

Figure 2 presents participant age distribution data, which were provided by 58 of the 71 active Clean Commute Program participants.

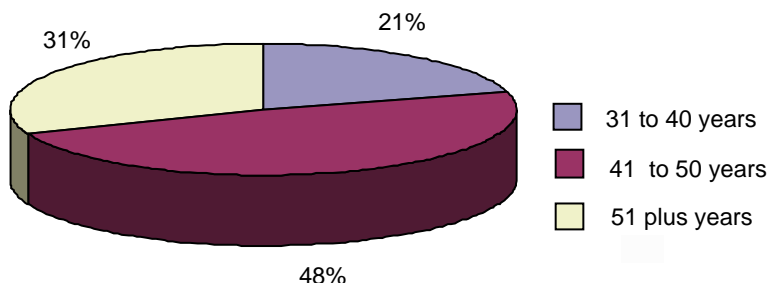


Figure 2. Participant age distribution.

Figure 3 presents participant's annual household income distribution data, which were provided by all 71 of the active Clean Commute Program participants.

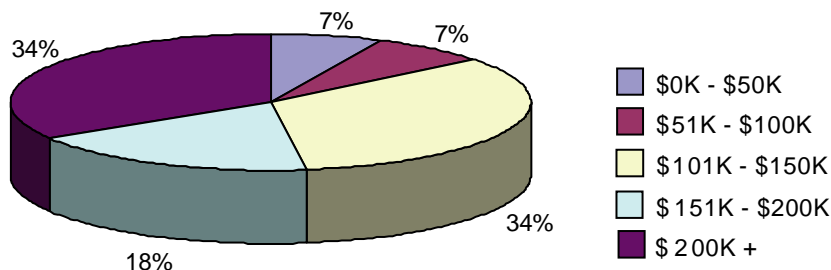


Figure 3. Participant household annual income distribution.

Figure 4 presents data detailing the number of vehicles in participant families other than TH!NK city. All 71 of the active Clean Commute Program participants provided data.

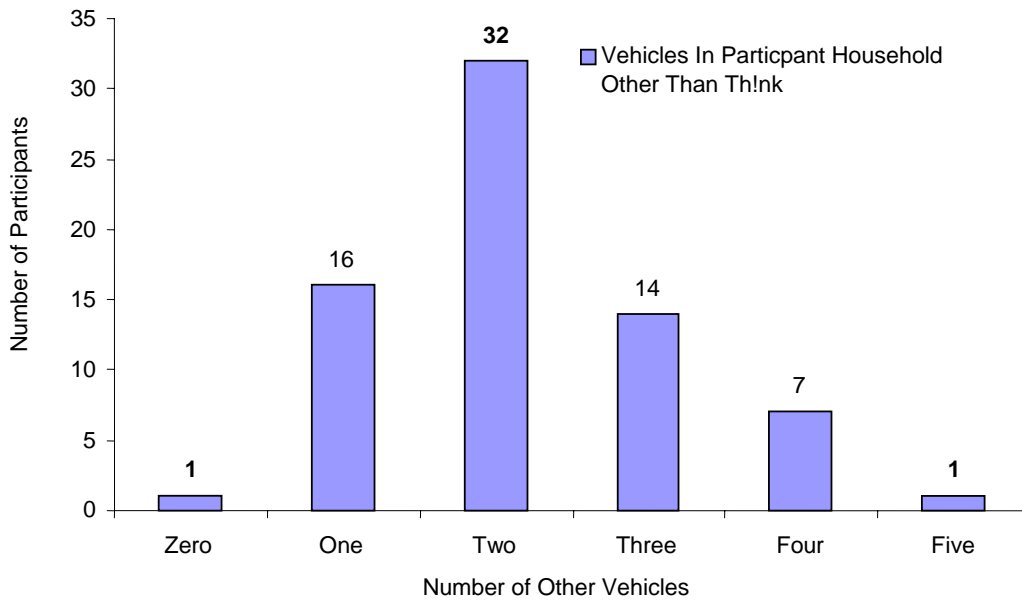


Figure 4. Number of vehicles other than TH!NK city in participant households.

Data Collection Efficiency

Ford leased a total of 97 TH!NK city electric vehicles to commuters from Westchester, Putnam, Rockland, Queens, Nassau, and Suffolk counties. Of the 97 commuters that leased a TH!NK city vehicle and took delivery of a vehicle, 71 commuters completed the initial survey and are considered active participants in the program. Ten commuters returned their vehicles before the initial surveys were completed. These commuters submitted only a minimal number of data, and their responses were deleted from the Clean Commute Program database. The remaining 16 commuters did not complete an initial survey but did provide data on an ongoing basis, which were included in the program database. These 16 commuters were also considered participants in the Clean Commute Program. Figure 5 shows the percentage of the 87 Clean Commute Program participants completing the initial survey and, therefore, defined as active participants.

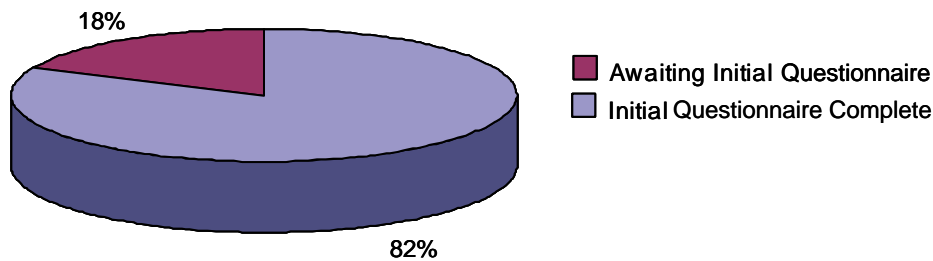


Figure 5. Efficiency of Initial Survey data collection.

Supplemental Surveys, as shown in Appendix D, were transmitted to 58 participants in the Clean Commute Program. To encourage their participation, a stipend of \$30.00 was given to participants who completed a Supplemental Survey. Twenty-eight participants completed the Supplemental Survey. Figure 6 presents the percentage of the 58 participants receiving a Supplemental Survey who completed the survey. Responses to the Supplemental Survey are in Appendix E.

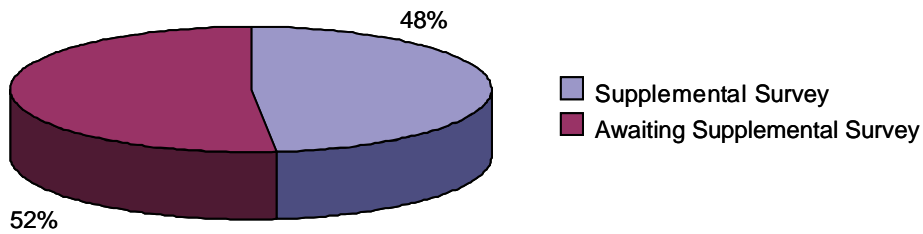


Figure 6. Efficiency of the Supplemental Survey data collection.

Projected Performance Parameters: Projected Vehicle Use

Based on the data given by program participants in the initial survey (Appendix A), Figures 7 and 8 present the projected use of TH!NK *city* vehicles. Figure 7 presents the data projecting the type of trips to be taken in their TH!NK *city*, which were obtained from 69 of the 70 active Clean Commute Program participants.

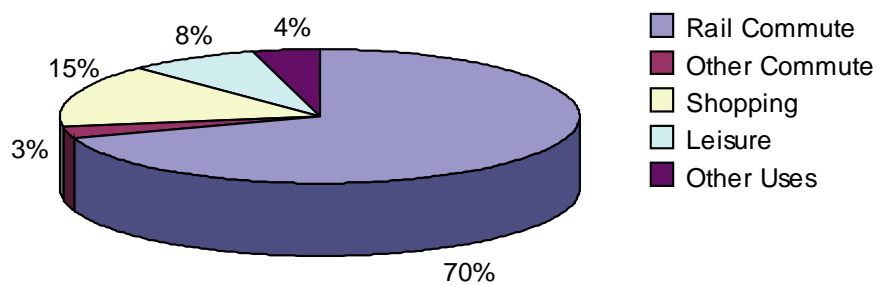


Figure 7. Projected use by trip type.

Figure 8 presents by projected trip type the percentage of TH!NK *city* trips presented in Figure 7 that would otherwise have been taken in a gasoline-fueled vehicle.

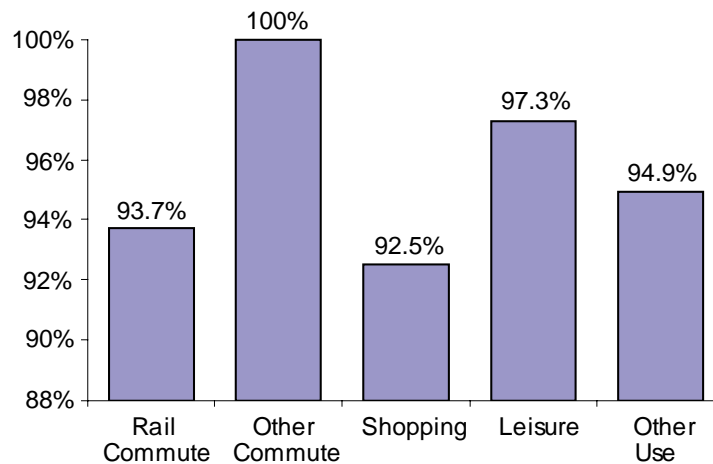


Figure 8. Percentage of projected trips replacing gasoline-fueled vehicle trips.

Figure 9 presents data detailing prior methods of rail station commute for Clean Commute Program participants, which were provided by all 71 of the active Clean Commute Program participants.

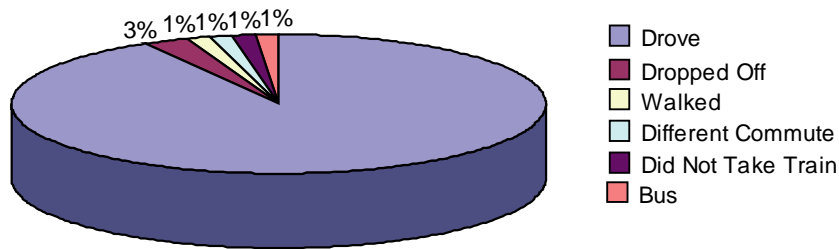


Figure 9. Prior methods of rail station commute.

Measured Performance Parameters – Actual Vehicle Use

Using data collected from the monthly surveys (Appendix B), Figures 10 through 13 present the performance of the TH!NK *city* vehicles, using various metrics. Figure 10 presents the total program vehicle usage by month for all active participants in the Clean Commute Program. Beginning in February 2002, data were reported manually from such sources as delivery and service records. A significant number of vehicles were added to the program during March and April 2002, resulting in large increases in miles driven during these months. Data for May 2002 and beyond were collected using the Internet-based monthly survey. Total monthly mileage data for 2004 shows a steady decline, resulting from multiple factors: (1) additional participants left the program because they no longer had commuting needs (2) vehicles were returned because the lease had expired (3) fewer participants reported data, and (4) vehicles were returned early when Ford cancelled remaining leases.

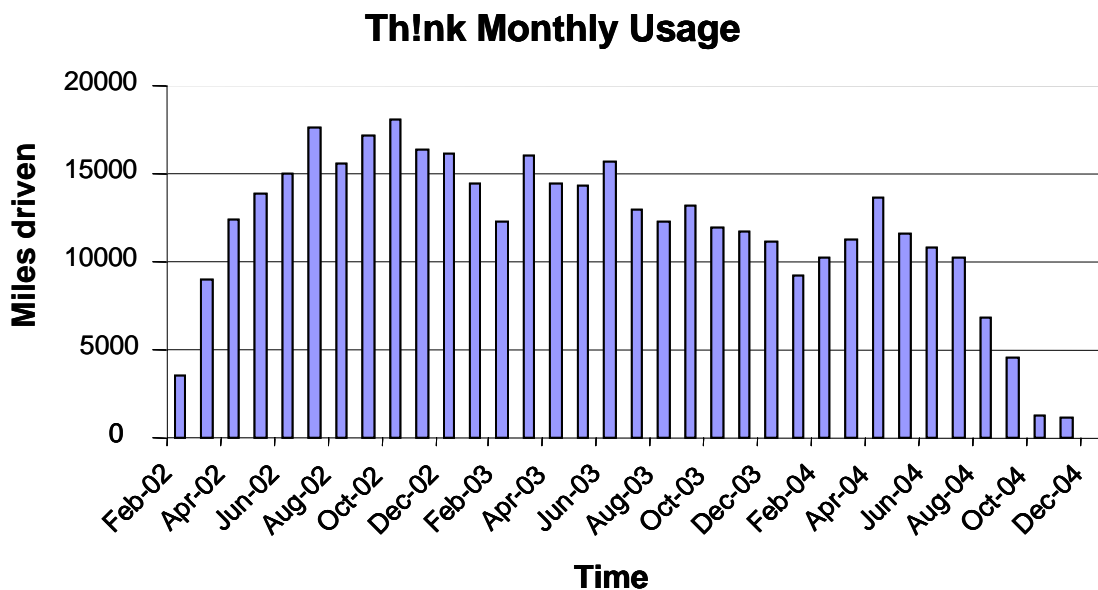


Figure 10. Total program vehicle usage (miles).

Through December 2004, Clean Commute Program active participants reported a total of 406,074 miles of TH!NK *city* operation. The first leases expired in August of 2004, resulting in a marked decline of program mileage. “Derived Performance Parameters: Petroleum Abatement and Emissions Reductions” (pages 17–19) presents the impacts on air emissions and fuel utilization of traveling the miles reported using an electric vehicle rather than a gasoline-fueled vehicle.

Charging energy is provided by vehicle chargers located at Clean Commute Program railroad stations and at the homes of program participants. Data for charger power and vehicle efficiency are presented in the U.S. Department of Energy’s Summary Data Sheet for Baseline Performance testing conducted on the TH!NK *city*, in Appendix E. Table 1 reports the electrical demand for chargers located at railroad stations for the sampling period,

May 2002 through February 2003. The TH!NK *city* onboard battery charger demands about 2.5 kW at full power, and the TH!NK *city* operates 2.15 miles for each kilowatt-hour of AC energy used for battery charging.

Table 1. Charging power peak demands at Clean Commute Program railroad stations.

Station Name	Number of Station Chargers	2002 (kW)										2003 (kW)	
		May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb		
Brewster North	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chappaqua	20	19.20	19.20	16.80	15.20	22.40	20.00	22.40	22.40	21.60	20.80		
Hicksville	16	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Huntington	22	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Little Neck	8	14.80	14.80	14.80	14.80	10.40	10.80	8.40	8.40	9.60	8.00		
White Plains	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
North White Plains	8	5.04	2.16	2.16	2.16	4.32	7.02	8.10	9.36	9.36	9.90		

N/A = data not available.

Each month, Clean Commute Program participants reported the occurrence (if any) of the following events.

- Vehicle failed to charge on the home charger
- Vehicle failed to charge at the rail station charger
- Vehicle ran out of charge while in operation
- Vehicle brakedown on the road
- Vehicle required either preventative or corrective maintenance.

Figures 11a through 11e present the monthly number of occurrences of each of these events from May 2002 through December 2004. No data were collected for July 2002.

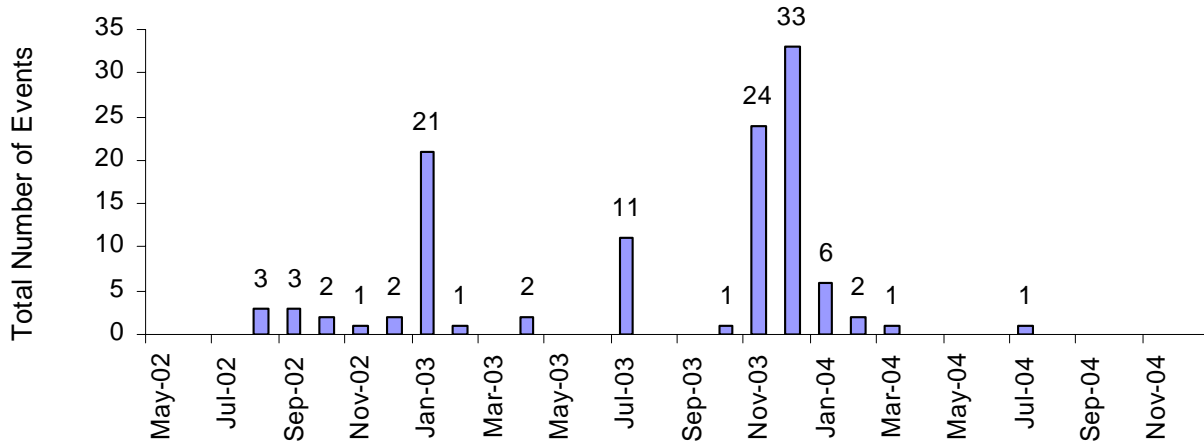


Figure 11a. Did-not-charge home events, program inception through December 2004.

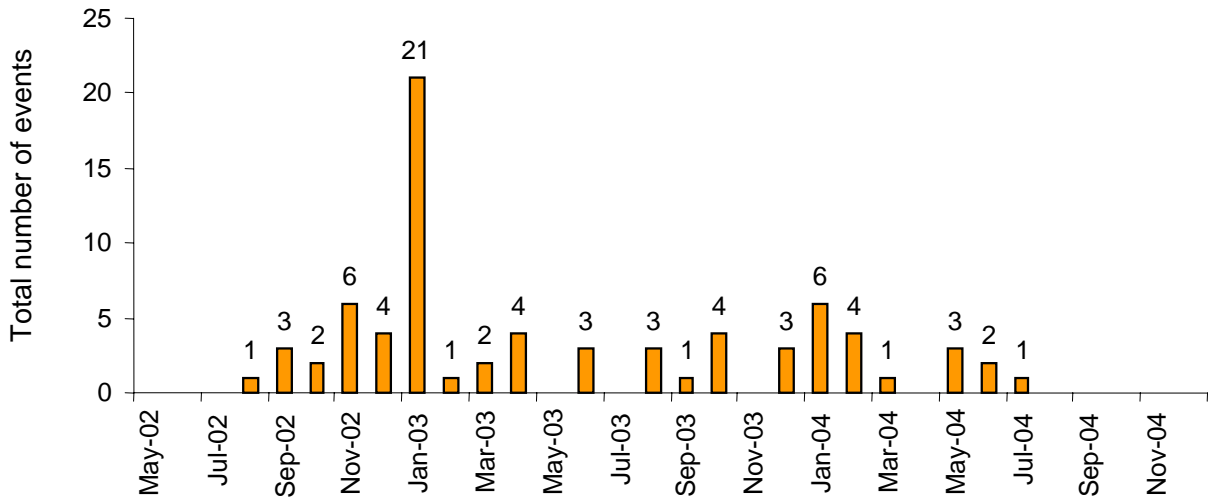


Figure 11b. Did-not-charge station events, program inception through December 2004.

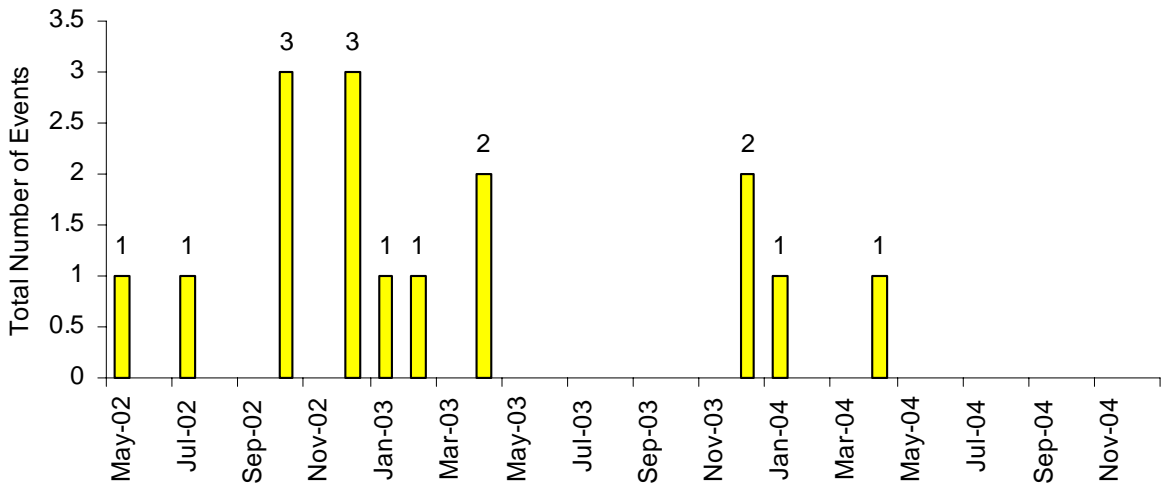


Figure 11c. Ran-out-of-charge events, program inception through December

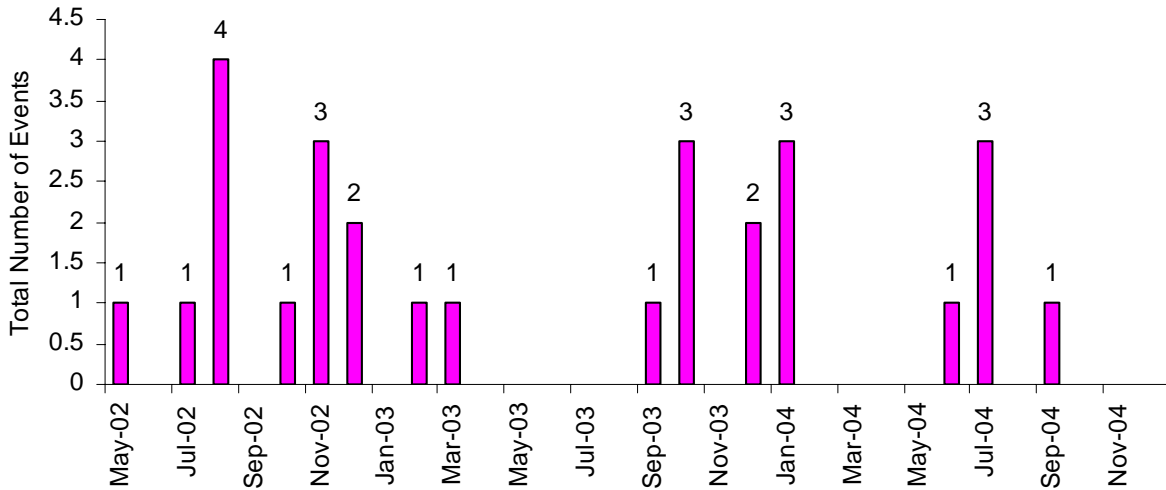


Figure 11d. Brakedown events, program inception through December 2004.

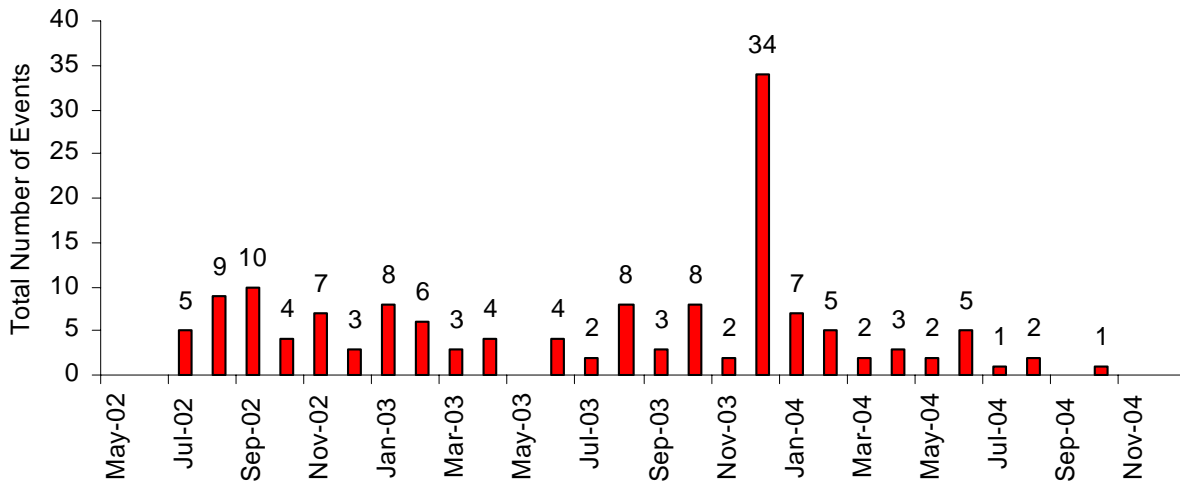


Figure 11e. Required-maintenance events, program inception through December 2004.

Maintenance for the TH!NK *city* vehicles was reported by vehicle system and by the type of maintenance (scheduled preventative maintenance or maintenance required to correct a specific problem). Figure 12 presents the number of repair incidents for the electric propulsion system, the charging power system, and all other vehicle systems. The large number of Other Systems repairs was related to nonelectric vehicle repairs, such as wiper blade problems. Figure 13 presents the type of maintenance work performed, either repair or scheduled maintenance. Scheduled maintenance is currently required every 3,000 miles for the TH!NK *city*. The primary maintenance activity required is leveling (conditioning) of the nickel cadmium traction battery pack.

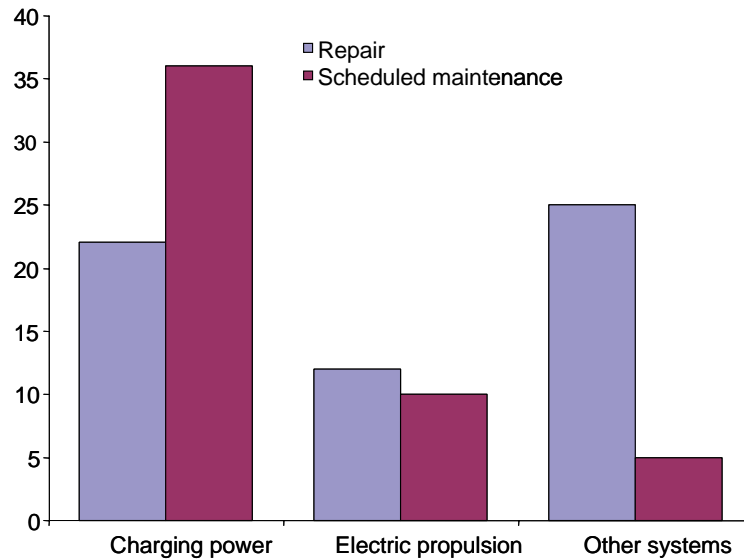


Figure 12. Vehicle maintenance activities by system.

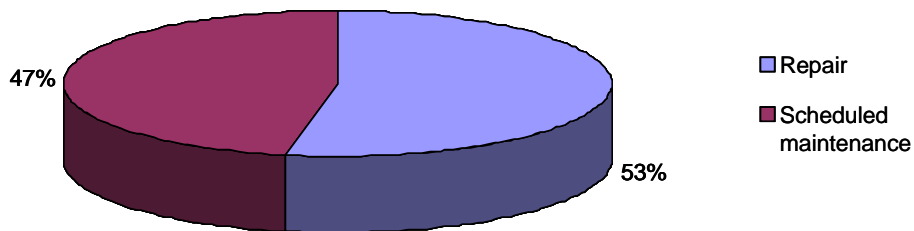


Figure 13. Vehicle maintenance by type.

Participants reported monthly their degree of satisfaction with the Clean Commute Program. Figure 14 presents the average participant program satisfaction monthly from program inception through December 2004. Zero represents a participant who is completely dissatisfied. Ten represents a participant who is completely satisfied. No data were collected in July 2002. Figure 15 presents the distribution of program participant satisfaction over the course of the Clean Commute Program.

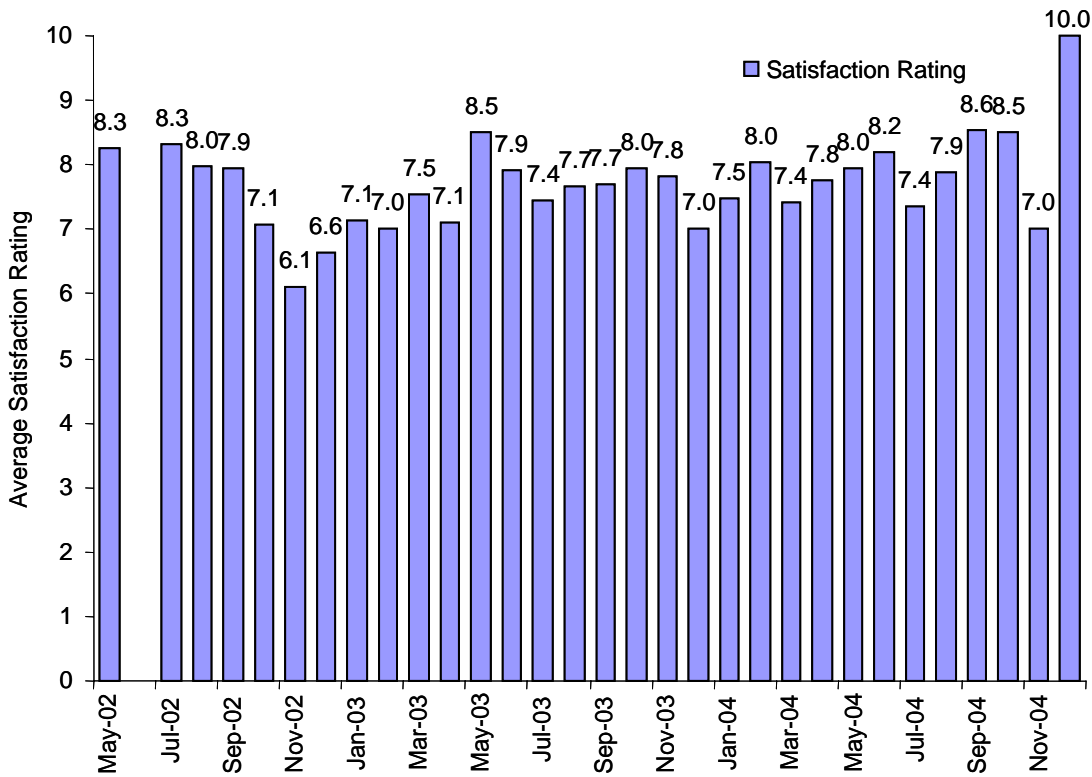


Figure 14. Participant program satisfaction, program inception through December 2004.

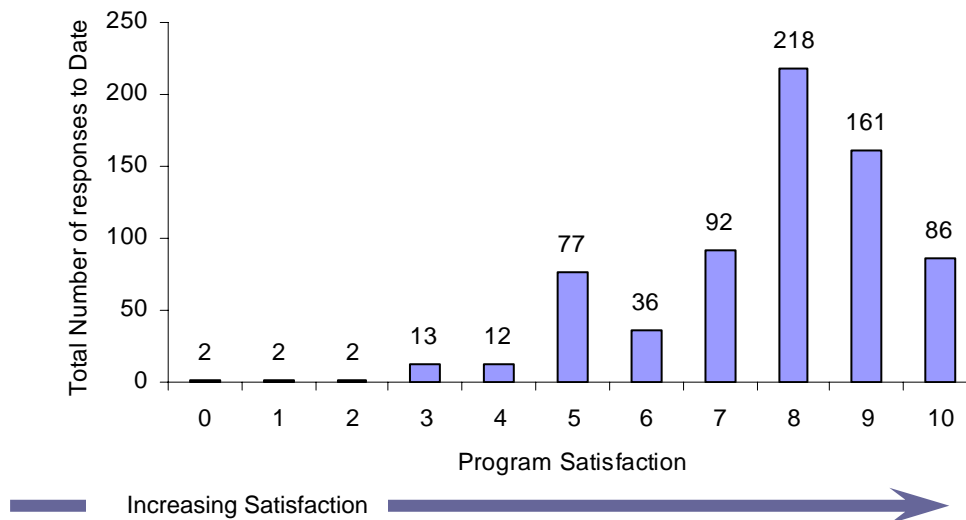
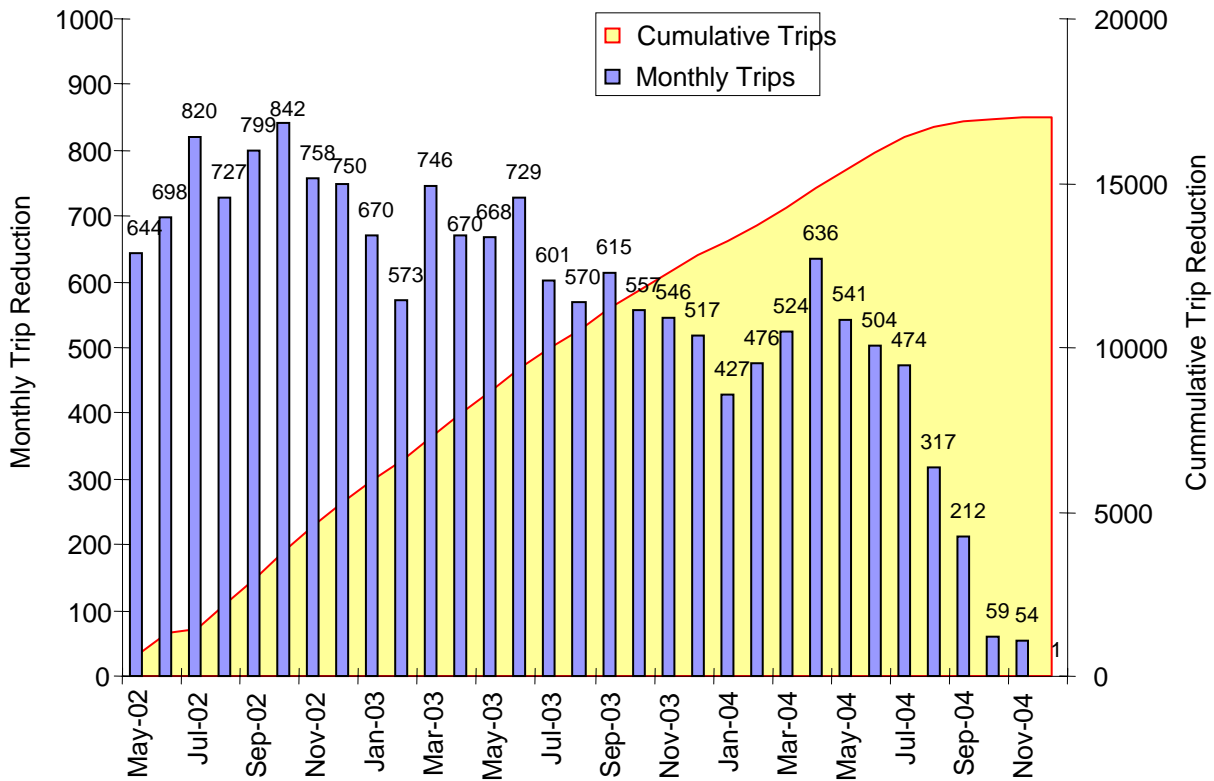


Figure 15. Participant-satisfaction distribution. Program inception through December 2004, with some participants responding more than once.

Derived Performance Parameters: Petroleum Abatement and Emissions Reductions

From data collected with the monthly survey (Appendix B), positive air quality impacts from the use of TH!NK *city* vehicles are presented in Figures 16 through 19. Inasmuch as formal data collection via the Internet did not initiate until May 2002, the miles driven, gasoline use, and emissions avoided were all extrapolated back for February, March, and April 2002, based on mileage data collected during May.

As shown in Figure 16, Clean Commute Program participants avoided 17,025 trips that, without the Clean Commute Program, would have been driven using an internal combustion engine-powered vehicle. Clean Commute Program participants reported 406,074 miles driven for these 17,025 trips, for an average distance traveled per trip during the reporting period of 24.0 miles. Cold starts and hot soaks (evaporated gasoline emissions occurring after the end of a vehicle trip due to the heating of the fuel, fuel lines, and fuel vapors) produce a significant fraction of the air emissions associated with a driving trip. As shown in Figure 17, Clean Commute Program participants avoided a total of 68,102 cold starts and hot soaks by driving their TH!NK *city* vehicles. Clean Commute Program participants also avoided the use of 18,887 gallons of gasoline (Figure 18) by driving their TH!NK *city* vehicles rather than gasoline-fueled vehicles. By avoiding cold starts and hot soaks and by avoiding the use of gasoline, Clean Commute Program participants reduced emissions of pollutants into the atmosphere, as quantified in Figure 19.



1. Initial vehicle deliveries in January 2002.
2. Not all current Program participants were active in February, March, and April, 2002.
3. Participants began returning vehicles off lease in May 2004.

Figure 16. Estimated number of avoided gasoline vehicle trips (17,025 trips total).

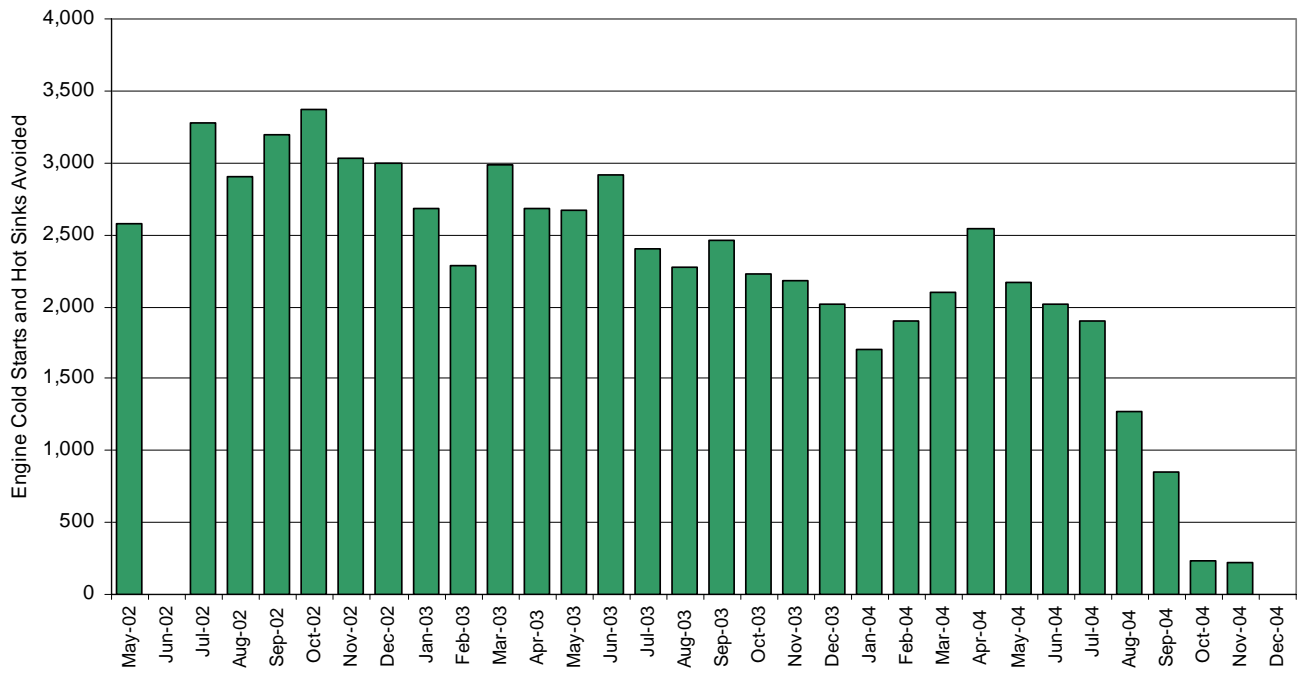


Figure 17. Number of engine cold starts and hot soaks avoided.

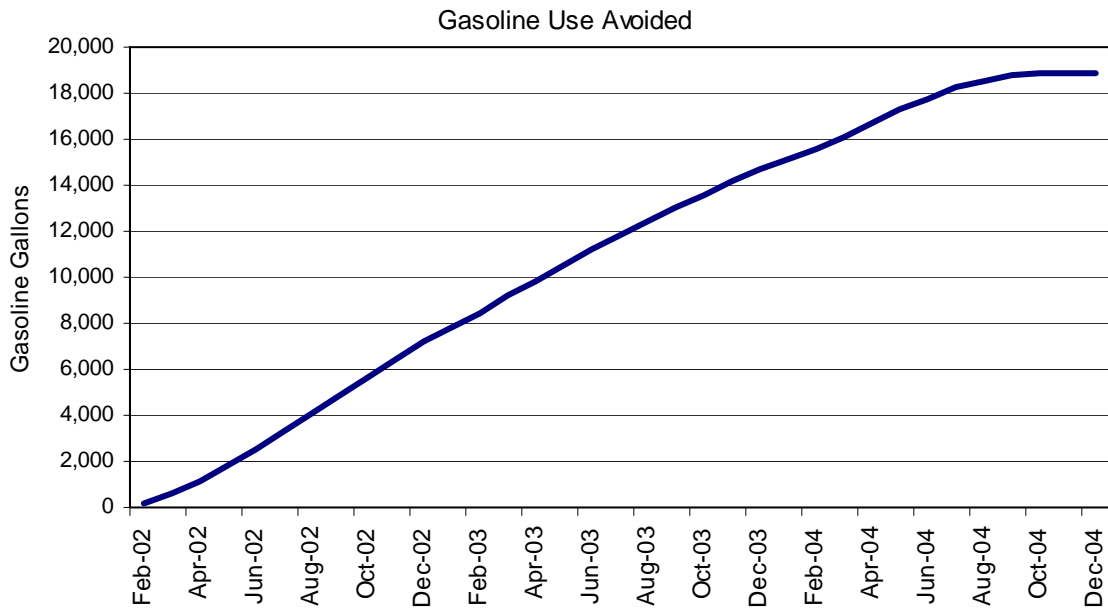


Figure 18. Use of petroleum avoided.

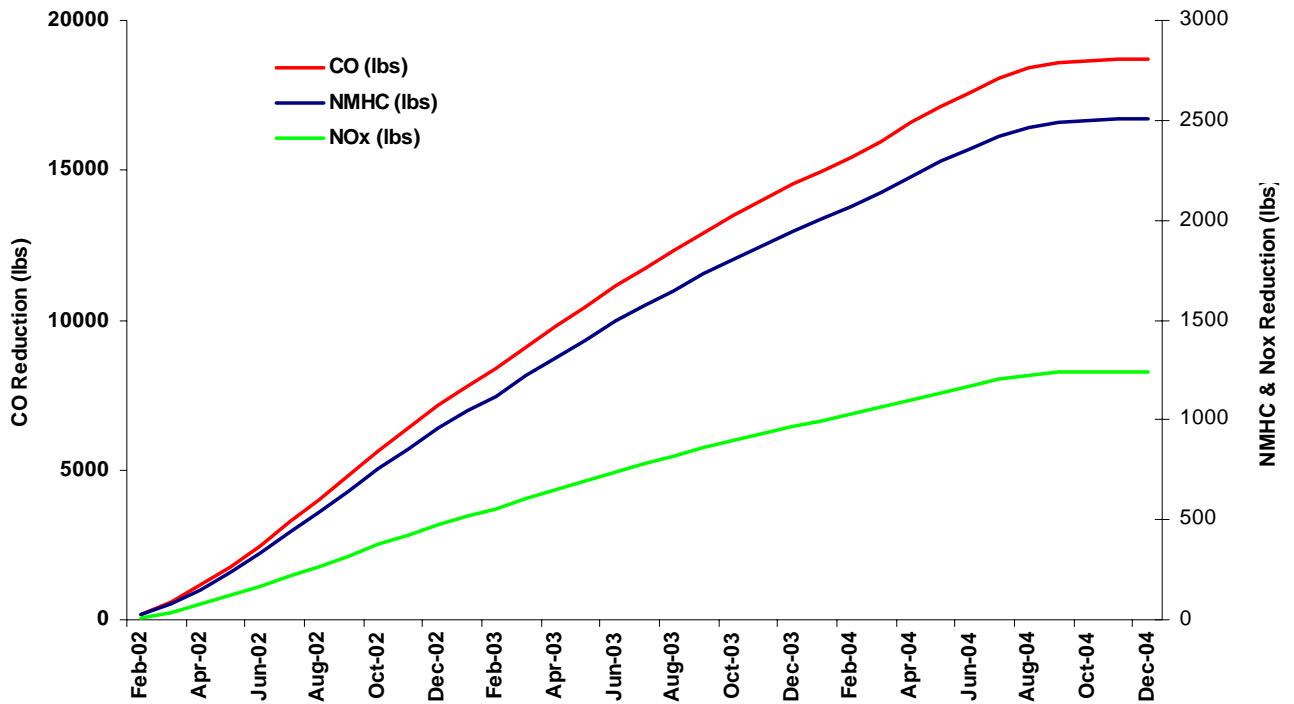


Figure 19. Air emissions avoided.

It is assumed that vehicles replaced by the THINK *city* fleet meet average annual emissions and fuel economy factors as reported by the USEPA Office of Transportation and Air Quality in their April 2000 Report, EPA420-F-00-013. These factors are:

Nitrogen oxides (NOx)	1.39 grams/mile
Hydrocarbons (NMHC)	2.80 grams/mile
Carbon monoxide (CO)	20.9 grams/mile
Gasoline (0.0465 gallon/mile)	21.5 miles/gallon

CONCLUSIONS

Using data collected through December 31, 2004, the following conclusions can be reached in regard to the Clean Commute Program:

- Clean Commute Program participants had driven over 406,074 miles by the end of the program. Participants avoided the use of over 18,887 gallons of gasoline and avoided over 17,025 round trips in gasoline-fueled vehicles.
- Clean Commute participants averaged between 180 and 230 miles a month of vehicle use. Some variation in vehicle use was detectable based on the season of the year—cold months seeing less use than temperate months.
- Data collection efficiency began at 80% (all Clean Commute Program participants having completed an initial survey). After Ford's announcement canceling the TH!NK *city* vehicle, data collection fell to 48% for a Supplemental Survey issued to participants (even with a \$30 stipend offered for completed surveys).
- While the majority of trips using the TH!NK *city* are for railroad station commute, one third of the trips are for other family activities, indicating that the TH!NK *city* can integrate into family transportation.
- Before the Clean Commute Program, over 90% of railroad station commuting was by gasoline-fueled vehicles, indicating that the program can have a significant affect on gasoline usage and emissions.
- Over 95% of all trips with the TH!NK *city* replaced trips that would have otherwise been taken in a gasoline-fueled vehicle, indicating that the TH!NK *city* vehicles are replacing gasoline vehicle trips, not just being used for additional trips.
- Participants frequently reported insufficient range for the TH!NK *city* vehicle to complete all the trips they would like to make using the vehicle. Incidents of charge depletion were, however, low. Together, these data indicate that participants would use the TH!NK *city* vehicle for more trips if it had additional range, but participants adequately adapted to the limited range for the trips with the TH!NK *city* vehicle.
- The number of times the vehicle did not charge was dominated by a few participants reporting a large number of events. These appear to have been related to extended charger outages, either at home or at the railroad station, rather than to a large number of random charging failures.
- Failure-on-the-road events were frequent (6.2 events/100,000 miles) compared to the rate for internal combustion vehicles. This is also high compared to electric vehicles tested by the AVTA (Toyota RAV4, 1.5 events/100,000 miles), although participants rated vehicle reliability mostly excellent and high in the Supplemental Survey.
- Vehicle repair frequency was high (37 events/100,000 miles) compared to the frequency for internal combustion vehicles.
- Vehicle repair time was predominantly ten days to two weeks. In only a few instances was the vehicle repaired in one day.
- Most repair problems appear to be associated with the charging system and may relate to the charge connector.
- Program participant satisfaction was skewed by a few participants frequently reporting that they were completely dissatisfied (zero rating). This significantly reduces the average satisfaction rating. Many participants routinely reported that they were completely satisfied with the Clean Commute Program (ten rating).
- The most frequent program participant satisfaction rating was 8 of 10, with many program participants very reluctant to return their vehicles to Ford at the end of lease.
- The Clean Commute Program resulted in significant reductions in air emissions.

Appendix A
Initial User Survey

Appendix A

NYPA/TH!NK Clean Commute Program – Initial User Survey

Please have the Clean Commuter using your TH!NK *city* answer the following questions.

1. Please describe the primary Clean Commuter using your TH!NK *city*.
 MALE FEMALE AGE

2. Please check off your approximate household income. This will help us attract future Clean Commute Program participants.
 \$50,000 and under \$50,001 to \$100,000 \$100,001 to \$150,000
 \$150,001 to \$200,000 \$200,001 and greater

3. What was the odometer reading when you received your TH!NK *city*? _____
 (Please record all digits on the odometer including tenths)

4. On what date did you receive your TH!NK *city*? month/day/year

5. How many motor vehicles, other than the TH!NK *city*, are in your household?
1 2 3 4 5

6. Have you ever leased a car before for use in your household? YES NO

7. Please characterize how you will be using the TH!NK *city* and the approximate percentage of trips that will be involved with each type of use. Please provide your best guess. Example – commute 65%, shopping, 25%, and school 10% of the trips. The percentage must total 100%.

Trip Type	Percentage of All Trips	Would These Trips Be Driven in a Gasoline Vehicle If You Did Not Have a Th!nk City?
Rail commute	%	<input type="checkbox"/> Yes <input type="checkbox"/> No
Other commute	%	<input type="checkbox"/> Yes <input type="checkbox"/> No
Shopping	%	<input type="checkbox"/> Yes <input type="checkbox"/> No
Leisure	%	<input type="checkbox"/> Yes <input type="checkbox"/> No
All other uses	%	<input type="checkbox"/> Yes <input type="checkbox"/> No

8. Before leasing the TH!NK *city*, how did you primarily get to the train station?
 DROVE GASOLINE VEHICLE & PARKED WALKED BUS BICYCLE
 CARPOOL DROPPED OFF AT STATION DID NOT TAKE TRAIN
 OTHER _____

Appendix B

NYPA/TH!NK Clean Commute Program

Monthly User Survey

Please have the primary Clean commuter using your TH!NK *city* answer the questions.

1. How many miles are on the TH!NK *city* odometer? _____
(Please record all digits on the odometer including tenths)
2. On what date did you read the odometer? month/day/year
3. What is the reading of the energy meter? _____
(Please record all digits on the meter)
4. On what date did you read the energy meter? month/day/year
5. List the number of times, if any, that the following events occurred with the TH!NK *city* this month?

<input type="checkbox"/> Did not have enough range to meet my needs	<input type="checkbox"/> Ran out of charge on the road
<input type="checkbox"/> Did not charge at home	<input type="checkbox"/> Broke down on the road
<input type="checkbox"/> Did not charge at my rail station	<input type="checkbox"/> Required maintenance (see #6)
6. If your TH!NK *city* required maintenance, please provide the following information (example provided):

Maintenance Start Date	Vehicle System Repaired			Maintenance Type		Cost of Repair (\$)	Days Out of Service For Repair
	Electric Propulsion	Charging Power	Other Systems	Repair Failure	Routine Service		
						\$	
/ /						\$	
/ /						\$	
/ /						\$	
/ /						\$	
/ /						\$	

Electric propulsion system includes the motor, motor controller, battery and onboard battery charger
 Charging power system includes off vehicle power control station, charge connector (plug) and charge inlet (receptacle)

7. How many round trips did you drive your TH!NK *city* this month?
8. How many of these round trips would have been driven in a gasoline-powered car if you did not have your TH!NK *city*?
9. Compared to last month, are you using your TH!NK *city* for more trips?

More trips Less trips About the same number of trips

10. If you are using your TH!NK city for more or less trips, please briefly explain why.

11. If more public charging stations could be installed, please identify where you would use them.

Shopping Centers (the mall) Movie theaters Sports Events Cultural Events
 Elementary or high schools Food stores Large office buildings or complexes
 Other _____

12. Please rate your overall satisfaction with the TH!NK *city* and the NYPA/TH!NK Clean Commute Program, with 10 being Completely Satisfied and 0 being Completely Dissatisfied

Dissatisfied Satisfied
 0 1 2 3 4 5 6 7 8 9 10

Appendix C

NYPA/TH!NK Clean Commute Program

Supplemental Questions

Please respond to each of the following questions. You will not be able to submit this Supplemental Survey unless you have entered a response to each question. A check for \$30.00 will be sent within three weeks of you submitting this Supplemental Survey.

1. Do you use your EV as your primary vehicle?
 - a. yes
 - b. no

2. How many people in your household are licensed drivers?
 - a. 1
 - b. 2
 - c. 3
 - d. more than 3

3. How many people in your household drive the TH!NK *city*?
 - a. 1
 - b. 2
 - c. 3
 - d. more than 3

4. What portion (in miles) of your average weekly commute is done on:
 - a. Streets with speed limits at or below 35 mph _____ miles
 - b. City, county and state roads with speed limits 35-55 mph _____ miles
 - c. Parkways with speed limits 55-70 mph _____ milesIf none, enter zero (0).

5. What portion (in miles) of all other trips are done on:
 - a. Streets with speed limits at or below 35 mph _____ miles
 - b. City, county and state roads with speed limits 35-55 mph _____ miles
 - c. Parkways with speed limits 55-70 mph _____ milesIf none, enter zero (0).

6. Name the top three types of trips you make in the TH!NK City other than when you are driving to and from the train station:
 1. _____
 2. _____
 3. _____

7. What about the "Clean Commute Program" least satisfies you? _____

8. How much would you be willing to pay monthly to lease a similar EV if the Clean Commute Program were not available (includes the loss of preferred parking and free charging)? _____\$/mo
9. What features convinced you to lease the vehicle? (Please check all that apply or enter a feature in "other".)
- a. low cost
 - b. simple electric fueling
 - c. guaranteed upfront parking
 - d. other (please specify) _____
10. If a reserved parking place at the train station were not included as part of the lease, would you still consider leasing an electric vehicle?
- a. yes
 - b. no
11. Please list additional locations where you would like to see public charging
 _____.
12. Would you consider leasing another electric vehicle?
- a. yes
 - b. no
13. Would you consider purchasing an electric vehicle?
- a. yes
 - b. no
14. If you were to lease another electric vehicle, what length of lease would you prefer?
- a. 2 year
 - b. 3 year
 - c. 4 year
 - d. 5 year
15. Do you prefer driving your EV more or less than a gasoline vehicle?
- a. more
 - b. the same
 - c. less
16. Of the time you charge your car, what percentage is:
- At Home? _____
- At the public charging station? _____
- (Answers must total 100%)

17. How important is the ability to charge your vehicle at home?
- a. extremely important
 - b. very important
 - c. somewhat important
 - d. not important
 - e. not important at all
18. List three improvements that could be made to the vehicle to enhance its value to you:
- 1. _____
 - 2. _____
 - 3. _____
19. Do you feel the vehicle and included services you are currently receiving are:
- a. a bargain
 - b. about right
 - c. expensive
20. How would you rate the vehicle's reliability?
- a. excellent
 - b. very good
 - c. good
 - d. fair
 - e. poor
21. How would you rate the vehicle's handling and steering?
- a. excellent
 - b. very good
 - c. good
 - d. fair
 - e. poor
22. How would you rate the vehicle's interior noise level?
- a. excellent
 - b. very good
 - c. good
 - d. fair
 - e. poor
23. How would you rate the convenience of charging hardware?
- a. excellent
 - b. very good
 - c. good
 - d. fair
 - e. poor

24. How would you rate the vehicle's air conditioning?
- excellent
 - very good
 - good
 - fair
 - poor
25. How would you rate the vehicle's heating?
- excellent
 - very good
 - good
 - fair
 - poor
26. What seating capacity would you prefer in your vehicle?
- excellent
 - very good
 - good
 - fair
 - poor
27. How would you rate the vehicle's cargo capacity?
- excellent
 - very good
 - good
 - fair
 - poor
28. How has leasing the TH!NK *city* affected your household's usage of your other vehicles?
- added the EV vehicle and used another less
 - sold a vehicle and replaced it with the EV
 - avoided the purchase of an additional vehicle

29. For the three cars that you use the most (in addition to your TH!NK City) please list what type of vehicle that you have? (Please check all that apply, or indicate "none" if you have less than three additional cars)

Vehicle 1	Vehicle 2	Vehicle 3
a. luxury	a. luxury	a. luxury
b. minivan	b. minivan	b. minivan
c. fullsize	c. fullsize	c. fullsize
d. sport utility	d. sport utility	d. sport utility
e. midsize	e. midsize	e. midsize
f. performance	f. performance	f. performance
g. pickup	g. pickup	g. pickup
h. compact/subcompact	h. compact/subcompact	h. compact/subcompact
i. full-size van	i. full-size van	i. full-size van
j. none	j. none	j. none

30. How would you characterize the terrain of your typical commute?
- a. mostly flat
 - b. somewhat hilly
 - c. very hilly
31. How often do you drive with a passenger who is a licensed driver?
- a. all of the time
 - b. most of the time
 - c. sometimes
 - d. rarely
 - e. never
32. How often do you drive with children who use a child safety seat?
- a. all of the time
 - b. most of the time
 - c. sometimes
 - d. rarely
 - e. never
33. Does your employer have an established program that offers incentives for participating in an alternative transportation program?
- a. yes
 - b. no
34. If yes to question 33, please list a brief description of incentive:
- _____
- Name of employer (optional):_____
35. Do you primarily work at one work site all day, or do you travel around to different locations?
- a. one site
 - b. travel to multiple sites
36. Does your employer have a central motor pool or fleet?
- a. yes
 - b. no
37. If yes to question 36, do you have access to these cars?
- a. yes
 - b. no
38. If yes to question 36, are any of these cars electric or some other alternative fuel?
- a. yes
 - b. no

39. What would it take for this vehicle to become more widely used? (Please check all that apply)
- a. lower cost
 - b. more interior space
 - c. more driving range – 100 miles
 - d. more driving range – 120 miles
 - e. more places to charge
 - f. other (please specify) _____

40. What suggestions do you have for improvements in the Clean Commute Program?

41. Please provide the name and address of the person you wish to receive the compensation for completing the Clean Commute Monthly Survey for July 2003.

Name; _____

Street; _____

City; _____ State; _____ Zip: _____

Please allow three weeks to receive your check for \$30.00.

Thank you for taking the time to provide us with your feedback. It is greatly appreciated.

Appendix D

NYPA Supplemental Survey Responses

Total respondents = 49

1. a-27 b-22
2. a-0 b-34 c-10 d-5
3. a-17 b-22 c-7 d-3
4. average a-34 miles b-20 miles c-3.5 miles
5. average a-23 miles b-11 miles c-3 miles
6. shopping, errands, pickup/drop-off
7. NA
8. average \$152.58
9. a-37 b-33 c-32 d-21 (environmental concerns)
10. a-31 b-18
11. shopping malls, schools, municipal parking lots
12. a-48 b-1
13. a-39 b-10
14. a-22 b-25 c-1 d-1
15. a-28 b-13 c-8
16. average a-22.57% b-77.43%
17. a-24 b-10 c-12 d-2 e-1
18. NA
19. a-17 b-29 c-3
20. a-12 b-25 c-6 d-5 e-1
21. a-6 b-21 c-16 d-6 e-0
22. a-2 b-19 c-17 d-7 e-4
23. a-15 b-18 c-13 d-2 e-1
24. a-3 b-10 c-11 d-14 e-11
25. a-4 b-10 c-19 d-10 e-6
26. a-0 b-11 c-9 d-28 e-1
27. a-4 b-9 c-14 d-14 e-8
28. a-25 b-14 c-10
29. vehicle 1: a-9 b-9 c-6 d-14 e-8 f-0 g-0 h-3 i-0 j-0
29. vehicle 2: a-1 b-0 c-4 d-11 e-2 f-4 g-1 h-10 i-0 j-16
29. vehicle 3: a-0 b-2 c-1 d-2 e-2 f-2 g-0 h-3 i-0 j-37
30. a-16 b-24 c-9
31. a-0 b-3 c-27 d-18 e-1
32. a-0 b-1 c-6 d-4 e-38
33. a-0 b-49
34. NA
35. a-47 b-2
36. a-2 b-47
37. a-1 b-1
38. a-0 b-2
39. a-16 b-16 c-21 d-33 e-43 f-NA
40. NA

Appendix E

Th!nk city Summary Data Sheet



UEV AMERICA
U.S. DEPARTMENT OF ENERGY
ADVANCED VEHICLE TESTING ACTIVITY



**1999 Ford TH!NK City
Urban Electric Vehicle**

**PERFORMANCE
STATISTICS**

VEHICLE SPECIFICATIONS¹

<p>VEHICLE FEATURES</p> <p>Base Vehicle: 1999 Ford TH!NK City VIN: YYCDA11A0WAAA1018 Seatbelt Positions: Two Standard Features:</p> <ul style="list-style-type: none"> CARB Certified as a ZEV AM/FM CD Front Wheel Drive Single Speed Transmission Front Disc/Rear Drum Brakes Regenerative Braking Heated Front & Rear Windshields Passenger Compartment Pre-heat State-Of-Charge Meter Back-up Alarm Low Rolling Resistance Tires Thermoplastic Body Panels Daytime Running Lights Driver Air Bag ABS Plastic Roof <p>BATTERY</p> <p>Manufacturer: SAFT Type: Nickel Cadmium (NiCd) Number of Modules: 19 Weight of Modules: 12.9 kg Weight of Pack(s): 245 kg Pack(s) Location: Under Seats Nominal Module Voltage: 6 VDC Nominal System Voltage: 114 VDC Nominal Capacity (C/3): 100 Ah</p>	<p>WEIGHTS</p> <p>Design Curb Weight: 2112 lbs Delivered Curb Weight: 2043 lbs Distribution F/R: 55/45 % GVWR: 2563 lbs GAWR F/R: 1334/1289 lbs Payload: 451 lbs Performance Goal: 400 lbs</p> <p>DIMENSIONS</p> <p>Wheelbase: 77.8 inches Track F/R: 54.9/52.5 inches Length: 117.0 inches Width: 62.2 inches Height: 60.8 inches Ground Clearance: 4.3 inches Performance Goal: 5.0 inches</p> <p>CHARGER</p> <p>Location: On Board Type: Conductive Input Voltages: 240 VAC - Single Phase</p> <p>TIRES</p> <p>Tire Mfg: Continental Tire Model: ContEcoContact EP Tire Size: 155/70/R13 Tire Pressure F/R: 35/35 psi</p> <p>DRIVE MOTOR</p> <p>Output: 27 kW Type: AC Induction</p>
---	---

Acceleration 0-30 mph
At 100% SOC: 7.8 seconds
At 50% SOC: 8.3 seconds
Performance Goal: 8.5 seconds

Maximum Speed @ 50% SOC
At 1/4 Mile: 49.9 mph
In 1 Mile: 54.6 mph
Performance Goal: 45 mph in one mile

Constant Speed Range @ 35 mph
Range: 65.5 miles
Energy Used: 8.8 kWh
Average Power: 4.6 kW
Efficiency: 134.7 Wh-DC/mile
Specific Energy: 36.0 Wh/kg
Performance Goal: 30 miles

Range at Maximum Speed
Range: 40.5 miles
Energy Used: 8.7 kWh
Average Power: 9.5 kW
Efficiency: 215.2 Wh-DC/mile
Specific Energy: 35.6 Wh/kg

Driving Cycle Range
Range per SAE J1634: 30.2 miles
Energy Used: 7.6 kWh
Average Power: 5.2 kW
Efficiency: 251.2 Wh-DC/mile
Specific Energy: 31.0 Wh/kg
Performance Goal: 30 miles

Braking From 45 mph
Controlled Dry: 110.3 feet
Controlled Wet: 120.8 feet
Panic Wet: 123.7 feet
Course Deviation: 0.0 feet

Handling
Average Time: 60.2 seconds
Average Dodge Neon Time: 54.6 seconds

Gradeability (Calculated)
Maximum Speed @ 3%: 48.7 mph
Maximum Speed @ 6%: 40.3 mph
Maximum Grade: 33.6 %

Charging Efficiency²:
Efficiency: 465 Wh-AC/mi
Energy Cost: @ \$0.10/kWh: \$0.047/mi

Charger
Max Ground Current: <0.01 mA
Max Battery Leakage : <0.01 MIU
Max DC Charge Current: 20.2 A
Max AC Charge Current: 10.9 A
Peak Demand: 2440 W
Time to Recharge: 7.15 hours
Performance Goal: 12 hours

TEST NOTES:

1. This vehicle does not comply with Federal Motor Vehicle Safety Standards applicable on the date of manufacture

2. Based on Drive Cycle Range

This vehicle meets all HEV America Minimum Requirements (except #1) listed on back of this sheet
Values in red indicate the Performance Goal was not met. All Power and Energy Values are DC unless otherwise specified.

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