Electric and Hybrid Vehicle Project

QUARTERLY REPORT OF PRIVATE-SECTOR OPERATIONS

FIRST QUARTER 1982

June 1, 1982

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U.S. Department of Energy

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BY
BOOZ • ALLEN & HAMILTON Inc.
TRANSPORTATION CONSULTING DIVISION

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ELECTRIC AND HYBRID VEHICLE PROJECT

DOE/CS/51518--1

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OF
PRIVATE-SECTOR OPERATIONS

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I. INTRODUCTION

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This report has two basic functions. First, it is intended to inform the Department of Energy (DOE) concerning progress and problems encountered in private sector site operations. Second, the report is intended as a mechanism to better inform site operators concerning each others' activities and to provide essential feedback of data submitted under the program.

Although it is not our intent to adopt a stereotyped format for this report, we expect the chapters that follow to be indicative of future report content. However, the emphasis on prior-year operating experience evidenced in this report will probably shift to quarterly updates and significant departures, if any, from established patterns or trends.

Site operators and others to whom the report is distributed are invited to comment on the scope and content of these reports and submit information of general interest for inclusion.

II. CURRENT STATUS OF SITE OPERATIONS

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On January 1, 1982, sixteen site operators were under contract to Booz, Allen, and activities were under way or in the process of being implemented at 30 sites nationwide. The identity of the 16 site operators and the distribution of the 30 sites are shown in Figure 1. All except the AT&T Culver City site and ConEd's Queens Division remained active in the program as of March 31.

The March 31 status of vehicle orders and deliveries is presented in Table 1. Of the 436 vehicles delivered through the end of 1981, Jet Industries supplied 281 (about 64 percent). Electric Vehicle Associates and South Coast Technology supplied about 12 percent and 11 percent, respectively, with the remainder supplied by GMC, Lectra Motors, Batronic, JMJ Electronics and Unique Mobility.

The March 31 status of site operations in terms of key subcontract milestones is shown in Table 2. As indicated in the table, Long Island Lighting is reviewing its operation plans for Round 2 vehicles to determine whether a proposal for modification is justified in light of technology developments. It should also be noted that some of the milestones scheduled for Advanced Vehicle Technology, Electric Vehicle Leasing, and Electric Transportation Systems depend largely on their ability to recruit dealers and negotiate second-tier subcontracts with them in a timely manner. Other milestones depend primarily on the completion of sales and leases by those dealers.

FIGURE 1
Locations of Private Sector Sites

As of December 31, 1981

APS	Arizona Public Service Company
AT&T	American Telephone & Telegraph Company
AVT	Advanced Vehicle Technology
CENTEL	Central Telephone Company
CONED	Consolidated Edison of New York
EVL	Electric Vehicle Leasing Corporation
ETS	Electric Transportation Systems
GTE	General Telephone & Electronics Corporation
ITT	ITT Continental Baking Company
LES	Lincoln Electric System
LILCO	Long Island Lighting Company
NORTHROP	Northrop Corporation
PECO	Philadelphia Electric Corporation
SWRI	Southwest Research Institute
WDW	Walt Disney World Company

TABLE 1
Private Sector Vehicle Order/Delivery Status

NAME OF DEMONSTRATION OPERATOR	MARCH 31, 1982	TYPES OF VEHICLES IN DEMONSTRATION																														
		NUMBER OF VEHICLES UNDER CONTRACT	NUMBER OF VEHICLES ORDERED	NUMBER OF VEHICLES DELIVERED	NUMBER OF VEHICLES PLACED IN OPERATION	PACER WAGON	ELECTRIC VEHICLE ASSOC.				JET INDUSTRIES				JAI ELECTRONICS		UNIQUE MOBILITY	GMC	BATTRONIC		LECTRA MOTORS		SOUTH COAST TECHNOLOGY		CURRENT SCHEDULE FOR LAST VEHICLE DELIVERY	NUMBER OF VEHICLES RETIRED FROM PROJECT						
							CURRENT FARE WAGON	CURRENT FARE SEDAN	CURRENT FARE COUPE	MODEL 800 VAN	MODEL 1000 VAN	MODEL 1400 VAN	MODEL 1000P PICK-UP	MODEL 750 PICK-UP	MODEL 807 OMNI COUPE	ELECTRICA ESCORT CONVERSION	OMNI SEDAN	GENERAL MOTORS "X" CARS	ELECTREX 2-2 SEDAN	ELECTREX 2 SEAT HATCHBACK	BEV. 1 VAN	MODEL 65 MINIVAN	MODEL 96 MINIVAN	VOLTAVAN			SUBURBAN BUS	LECTRICKAR SEDAN	LECTRICKAR PICKUP	RABBIT SEDAN	RABBIT PICKUP	VAN
ADVANCED VEHICLE TECHNOLOGY (2)		500	0	0	0																										2/83	
AMERICAN TELEPHONE & TELEGRAPH COMPANY		35	35	35	35																										20 (1)	
ARIZONA PUBLIC SERVICE COMPANY		20	20	20	20				2		14		3					1														
CENTRAL TELEPHONE CO.		20	20	20	20							8	2								2	8										
CONSOLIDATED EDISON OF NEW YORK		40	40	40	40	20	20																								20	
DETROIT EDISON		24	24	24	24																		24									
ELECTRIC TRANSPORTATION SYSTEMS		240	0	0	0																										11/82	
ELECTRIC VEHICLE LEASING CORPORATION		520	6	4	2		1						3																		2/83	
GTE SERVICE COMPANY		180	170	170	170				25				128	17																	9/81(1)	
ITT CONTINENTAL BAKING COMPANY		10	10	4	3																								4	11/81(1)		
LINCOLN ELECTRIC SYSTEM		15	7	7	7		3							1	2							1									4/82	
LONG ISLAND LIGHTING COMPANY		90	62	62	62	8			26	4			2	21	1																5/81(1)	
NORTHROP CORPORATION		16	16	2	0																		1	1							6/82	
PHILADELPHIA ELECTRIC CO.		20	20	19	16		1												3				13	2							4/82	
SOUTHWEST RESEARCH INSTITUTE		15	14	14	14				6	1		2			5																9/80(1)	
WALT DISNEYWORLD COMPANY		20	15	15	12						15																				9/81(1)	
TOTALS		1765	459	436	425	28	20	5	51	12	1	29	140	46	2	7	1		35		3	2	R	39	3		4		40			

FOOTNOTES:
(1) Schedule Revision Pending
(2) Formerly Mercantile Ford

TABLE 2
Commercial Site Operators Status Report

	SITE OPERATIONS MILESTONES														
	SIGN DEMONSTRATION CONTRACT	SUBMIT OPERATIONS PLAN	APPROVE OPERATIONS PLAN	SELECT VEHICLES FOR DEMONSTRATION	PLACE VEHICLES FOR DEMONSTRATION	PLACE PURCHASE ORDERS FOR VEHICLES (Partial Orders)	PLACE PURCHASE ORDERS FOR VEHICLES (Full Orders)	MODIFY FACILITIES	CONDUCT VEHICLE ACCEPTANCE TESTS	TRAIN DRIVERS & MECHANICS	PLACE VEHICLES IN DEMONSTRATION	COLLECT & SUBMIT DATA	ESTIMATED CONTRACT DATE COMPLETION	NUMBER OF VEHICLES UNDER CONTRACT	
THRU MARCH 31, 1982															
COMMERCIAL SITE OPERATOR (CONTRACT ROUND)															
ADVANCED VEHICLE TECHNOLOGY (Round 4)	●	●	●	8/82	2/82	1/83	8/82	8/82	2/83	2/83	2/84	3/84	500	(1)	
AMERICAN TELEPHONE & TELEGRAPH COMPANY (Round 1)	●	●	●	●		●	●	●	●	●	○	4/82	20	(2)	
AMERICAN TELEPHONE & TELEGRAPH COMPANY (Round 2)	●	●	●	●		●	●	●	●	●	○	12/82	15		
ARIZONA PUBLIC SERVICE COMPANY (Round 2)	●	●	●	●		●	●	●	●	●	○	6/84	20		
CENTRAL TELEPHONE COMPANY (Round 3)	●	●	●	●		●	●	●	●	●	○	10/84	20		
CONSOLIDATED EDISON OF NEW YORK (Round 1)	●	●	●	●		●	●	●	●	●	○	6/82	40	(3)	
DETROIT EDISON COMPANY (Round 3)	●	●	●	●		●	●	●	●	●	○	10/84	24		
ELECTRIC TRANSPORTATION SYSTEMS (Round 4)	●	●	●	8/82	3/82	10/82	8/82	11/82	11/82	11/82	11/83	11/83	240	(1)	
ELECTRIC VEHICLE LEASING CORPORATION (Round 2)	●	●	●	●	●		●	○	○	○	○	6/85	20	(1)	
ELECTRIC VEHICLE LEASING CORPORATION (Round 4)	●	●	●	8/82	2/82	1/83	8/82	8/82	2/83	2/83	2/84	3/84	500	(1)	
GTE SERVICE CORPORATION (Round 2)	●	●	●	●		●	●	●	●	●	○	2/84	75		
GTE SERVICE CORPORATION (ROUND 3 - Nickel Iron)	●	4/82	5/22	●		2/82	6/82	6/82	6/82	7/82	7/82	7/85	10		
GTE SERVICE CORPORATION (Round 3 - Lead Acid)	●	●	●	●		●	●	●	●	●	○	10/84	95		
ITT CONTINENTAL BAKING COMPANY (Round 2)	●	●	●	●		●	○	○	○	○	○	5/85	10		
LINCOLN ELECTRIC SYSTEM (Round 2)	●	●	●	●	●		●	●	●	○	○	6/85	15		
LONG ISLAND LIGHTING COMPANY (Round 1)	●	●	●	●		●	●	●	●	●	○	11/84	60		
LONG ISLAND LIGHTING COMPANY (Round 2)	●	R	R	●	●		○	○	○	R	R	R	30	(4)	
NORTHROP CORPORATION (Round 2)	●	●	●	●		●	1/82	3/82	2/82	4/82	4/82	6/85	16	(5)	
PHILADELPHIA ELECTRIC COMPANY (Round 3)	●	●	●	●		●	●	○	○	○	○	4/85	20	(6)	
SOUTHWEST RESEARCH INSTITUTE (Round 2)	●	●	●	●		●	●	●	●	○	○	9/84	15	(7)	
WALT DISNEYWORLD COMPANY (Round 1)	●	●	●	●	●		●	○	●	○	○	11/83	20		

- ACTIVITY IN PROGRESS
● MILESTONE COMPLETED
7/81 SCHEDULED COMPLETION
TBD - TO BE DETERMINED
R - ITEM UNDER REVIEW
- NOTES:
(1) COMPLETION DATE DEPENDS ON SALES AND LEASES
(2) OPERATION OF 10 VEHICLES MAY EXTEND THROUGH 7/83
(3) COMPLETION DATE UNDER REVIEW
(4) REVISION TO PROJECT PLAN UNDER CONSIDERATION
(5) VEHICLE DELIVERY DELAYED
(6) INDEFINITE DELAY IN PUTTING LAST 4 VEHICLES IN SERVICE
(7) CANCELLATION OF 1 VEHICLE ANTICIPATED

III. SITE OPERATOR HIGHLIGHTS

III. SITE OPERATOR HIGHLIGHTS

This chapter is intended to present information on site operator activities, events, problems and solutions believed to be of general interest to the readership. Although much of the material is obtained from monthly progress reports, no attempt is made to provide comprehensive coverage of all activities or problems reported.

1. AT&T COMPLETED EV OPERATIONS AT CULVER CITY

In March of this year, AT&T completed EV operations at Culver City under its subcontract and conducted a briefing for representatives of Booz, Allen and DOE on its operations at that site. As of March 31, AT&T had accumulated 131,945 miles on its EVs at Culver City for a total of 242,541 miles on EVs at both of its sites. During AT&T's operations at Culver City, AT&T and GMC had solved many of the problems encountered early in the program and were achieving battery charging efficiencies of 75-77 percent at both of its sites.

2. CONED'S PERIOD OF PERFORMANCE EXPIRED FOR ITS FIRST 20 VEHICLES

The end of February signaled completion of ConEd's subcontract period of performance of its first 20 vehicles which were assigned to its Queens Division. However, ConEd continued to operate three of these Change of Pace wagons for a total of 204 miles in March.

ConEd's plans for 1981 called for replacement of batteries, battery compartments and battery chargers on all 20 Change of Pace vehicles in addition to start-up of site operations at the Manhattan Division garage. Actually, ConEd was not able to arrive at a mutually acceptable arrangement with the vehicle supplier to accomplish the Change of Pace retrofit. As a consequence, except for three vehicles which ConEd modified itself, these vehicles were virtually idle throughout the year.

In contrast, Manhattan garage operations involving 20 EVA Current Fare vehicles were far more successful. Ten vehicles started operations at that site in February 1981

while transmission defects were being corrected in the other ten. All 20 vehicles were in operation in April. In 1981, ConEd accumulated 45,842 miles on its Current Fare vehicles and achieved average energy usage for all vehicles of 0.91 KWH per mile. During the first quarter of 1982 Manhattan Division operations continued at a level of nearly 3,000 miles per month for the 20 vehicles assigned.

The success at the Manhattan site is attributable, in part, to operating procedures introduced there. ConEd restricted vehicle operation to good streets, where possible, and drivers were limited to 25 miles between battery charges. Energy consumption was kept low by charging vehicles only when they had traveled over 20 miles and setting the charge duration at 8 hours. With these driving and charging procedures fewer battery failures were experienced.

3. NORTHROP RECEIVED ITS FIRST NICKEL-IRON BATTERY POWERED VEHICLES

Northrop's site operator project, initiated in November 1979, was planned as a 30-vehicle operation featuring two shifts and employing quick-change lead-acid battery packs. Extensive investigations during 1980 convinced Northrop that nickel-iron batteries without the quick-change feature would provide a better alternative, and Northrop proposed to change its program accordingly.

Following modification of its subcontract, Northrop placed its order with Eagle-Picher for 16 nickel-iron battery powered vehicles. The order was placed in April 1981 with a scheduled delivery 20 weeks later. Several schedule slippages were encountered, but during the first week of March 1982, the first two vehicles, one SCT sedan and one SCT pickup truck, underwent acceptance testing. Both vehicles met or exceeded the Northrop specification--60 miles on the SAE "C" cycle and 80 miles on the "Joplin urban cycle." Overall drivability and "finish" of the vehicles were judged to be very good. By the end of March the first two vehicles were delivered to Northrop's Hawthorne, California, facility and initial shakedown testing was under way.

4. INCIDENTS OF RUNAWAY MOTORS REOCCURRED--THIS TIME AT WALT DISNEY WORLD (WDW)

WDW reported two instances of runaway motors with the same vehicle. The first was on February 27 when a drive motor was destroyed due to overspeed. Indications are that the control system malfunctioned, causing a motor

runaway. The driver did not make this known at the time, and the impression was given that driver error had caused the failure. The motor was replaced and the vehicle placed back in service.

The runaway condition occurred again with a different driver who had the presence of mind to leave the vehicle in gear, which prevented the motor from overspeeding to destruction. The vehicle was finally brought to a stop with the emergency disconnect switch. When the driver opened the emergency disconnect switch, the resultant arc melted the switch and ignited the nearby 12-volt wiring harness. The fire was rapidly extinguished and no further damage was sustained.

WDW also reported in March that it instituted an Electric Vehicle Fleet Computerized Preventative Maintenance Program. Each of the 15 vehicles has been recorded in the equipment file with the necessary identifying data (serial number, model type, etc.) and the maintenance procedures to be performed. The preventative maintenance (PM) worksheets will be printed each month with the appropriate monthly, quarterly, semiannual or annual procedures plus applicable safety notations. The system is easily modified to incorporate "lessons learned." WDW expects improvements in battery monitoring and vehicle reliability to result.

IV. 1981 OPERATING RESULTS

IV. 1981 OPERATING RESULTS

Results of site operations in 1981 are summarized below in terms of the level of vehicle utilization, energy usage and maintenance labor hours. Further detailed analyses of operating and maintenance data are being performed and will be presented in separate reports on a continuing basis.

1. VEHICLE UTILIZATION

Tables 3 through 5 present data on mileage accumulated through 1981 organized according to site operators and site operator subcontractors, vehicle types and vehicle missions. Clearly GTE, with its large number of EVs, and AT&T, with its high utilization, lead the list with 35 percent and 24 percent, respectively, of the miles traveled. Nor is it surprising that telephone installation and repair account for 62 percent of the miles traveled in the various vehicle missions. Similarly, from Table 6 it may be seen that GTE reported 38 percent and AT&T reported 23 percent of the mission days through 1981.

To reduce, but not eliminate, the bias of vehicle quantities, mileage figures may be divided by the number of vehicles reporting as presented in Table 7. The resulting ratios of 1981 miles per vehicle month reported and 1981 mission days per vehicle months reported are shown in Table 8. Both ratios vary over a wide range.

While these figures are of interest, they should not be taken as authoritative indicators of EV fleet utilization because EV fleet size does not necessarily equal the number of vehicles reporting during any given month.

2. ENERGY USAGE

The average energy consumption in kilowatt-hours per mile for each of the principal sites (excluding LILCO site operator subcontractors) is displayed in Table 9. The 1981 energy consumption ranges from a low of 0.72 KWH/mile for Detroit Edison's SCT Rabbits to 2.19 KWH/mile for AT&T's BE Vans at Culver City, California. Energy consumption reported in 1980 varied between 0.64 and 2.85 KWH/mile.

TABLE 3
EV Mileage Accumulated by Each Site Operator
and Site Operator Subcontractor

*****														
	1981													
SITE	1979-80	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
*****														
LILCO	38412	3038	4323	6196	5549	5245	4606	5820	5892	4580	4508	4240	3450	95859
CONED	27746	0	1155	3267	4182	4044	5398	4592	5919	5708	4330	3564	3683	73588
AT-T	113658	10064	10072	11557	11156	10292	10454	10326	10112	9034	9143	7730	28602	26458
WED	2625	655	747	1428	2305	838	483	326	1389	486	3176	2340	939	17737
GTE	66092	10504	9453	17641	24089	22465	25313	29829	22760	26216	25040	25465	20374	325241
ROCKVILLE CTR	3419	427	374	496	480	431	551	372	271	130	165	187	195	7498
SO NEW ENG TEL	1837	59	311	53	370	75	414	567	373	257	93	201	0	4610
LEVITON	1697	91	371	359	349	229	244	269	293	141	0	272	29	4344
NYS ELECT+GAS	1298	0	77	0	39	29	0	60	319	61	51	4	44	1982
APS	2773	1953	2547	3129	2865	3127	4203	3153	3298	3050	3295	4028	4423	41844
LI RAILROAD	4423	266	95	471	397	153	199	234	273	270	171	207	180	7339
ITT	0	0	0	0	0	0	0	0	134	518	572	515	350	2094
LES	0	110	832	1121	812	539	894	0	1035	933	0	0	0	6276
NORTHROP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SWRI	3340	2211	1681	1679	2156	1517	1874	2314	2325	2069	1764	1536	1722	26188
BRONX ZOO,	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VILLAGE OF WESTBURY	0	0	58	0	0	0	0	0	0	0	0	0	0	58
TWN OF BABYLON	0	317	274	147	932	557	92	338	12	115	84	0	0	2868
PRINCETON UNIV	0	0	0	0	155	0	0	0	0	0	0	0	153	308
CENTEL	0	0	1550	1348	1567	2836	2297	1353	2296	2320	4258	3368	1711	24904
DETROIT ED	0	0	0	231	642	1408	4257	8514	9435	9526	7556	8096	6965	56630
PECO	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*****														

IV-3

*****														
1981														
MFG/MODEL	1979-80	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
*****														
GMC B E VAN	113010	9660	9231	10625	10107	10292	10454	10326	10112	9034	9143	7730	28602	2584
EVA-PACER WGN	34500	245	203	747	1022	640	1245	505	966	380	234	264	81	41032
JET IND 600 VAN	46573	2898	4052	5529	6186	5138	6238	6276	4548	4203	4724	4773	4281	105419
JET IND 1000 VAN	8656	1405	1103	1356	1738	1336	1579	1169	1540	996	758	1172	909	23717
JET IND 1000P TRK	5190	1659	2472	3825	4156	2971	3179	2854	4033	2923	5721	4449	3881	47313
JET IND 750 TRK	50328	9012	8870	15862	20557	20813	23161	25275	21277	24144	21920	22404	167432	80366
JET IND ELECTRICA	8060	3722	4723	5291	7228	6428	4471	7773	6151	6029	6192	6178	5235	77481
JET IND 1400 VAN	264	297	259	196	291	113	105	564	704	672	703	621	669	5458
JMJ ELECTRIC OMNI	91	393	666	806	625	602	921	219	720	753	226	150	182	6354
EVA-CURFARE COUPE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EVA-CURFARE SEDAN	0	0	345	456	262	0	271	0	597	528	0	0	0	2459
EVA-CURFARE WAGON	0	0	1155	3267	4182	4044	5398	4592	5919	5708	4330	3564	3683	45842
AMG TRK	648	404	841	932	1049	0	0	0	0	0	0	0	0	3874
UNIQUE MOB SEDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCT VW	0	0	0	231	642	1408	4257	8514	9435	9526	7556	8096	6965	56630
BALTRONIC VAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LECTRA MTRS TRK	0	0	0	0	0	0	0	0	0	0	2127	1837	1239	5203
LECTRA MTRS SEDAN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SCT VAN	0	0	0	0	0	0	0	0	134	518	1154	1030	350	3186
*****														

TABLE 5

1981

IV-5

*****														
1981														
SITE	1979-80	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
*****														
LILCO	2336	211	315	372	365	312	298	351	378	374	355	273	204	6144
CONED	1389	0	94	212	282	262	329	280	309	327	277	263	280	4304
AT-T	6760	671	611	713	690	609	640	584	572	452	432	378	213	13325
WED	122	85	58	88	155	64	36	25	102	26	161	113	54	1089
GTE	4185	722	667	1113	1554	1554	1612	1886	1478	1752	1829	2041	1660	22053
ROCKVILLE CTR	282	42	36	43	40	39	42	40	25	14	15	18	22	658
SO NEW ENG TEL	111	7	27	8	34	6	31	34	28	27	12	20	0	345
LEVITON	125	7	25	26	25	20	21	17	21	13	0	17	6	323
NYS ELECT+GAS	134	0	6	2	2	2	0	5	15	4	5	1	3	179
APS	334	110	160	191	180	179	214	182	210	180	185	188	218	2531
LI RAILROAD	232	24	8	43	41	22	21	22	22	24	27	21	19	526
ITT	0	0	0	0	0	0	0	0	5	20	20	38	14	97
LES	0	5	51	92	78	30	49	0	59	79	0	0	0	443
NORTHROP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SWRI	203	122	135	120	129	88	107	129	130	123	117	112	99	1614
BRONX ZOO,	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VILLAGE OF WESTBURY	0	0	9	0	0	0	0	0	0	0	0	0	0	9
TWN OF BABYLON	0	24	27	13	48	35	9	14	3	7	4	0	0	184
PRINCETON UNIV	0	0	0	0	16	0	0	0	0	0	0	0	16	32
CENTEL	0	0	88	75	121	156	137	120	127	184	301	237	116	1662
DETROIT ED	0	0	0	8	23	46	146	289	375	388	348	383	691	2697
PECO	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*****														
TOTAL	16213	2030	2317	3119	3783	3424	3692	3978	3859	3994	4088	4103	3615	58215
*****														

TABLE 7
Vehicles Reported by Each Site Operator
and Site Operator Subcontractor

SITE	1981											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LILCO	28	29	31	29	25	21	30	40	39	41	41	40
CONED	0	8	17	20	20	19	20	20	20	20	20	20
AT-T	42	41	42	44	35	35	34	35	25	24	25	10
WED	3	4	5	5	5	5	5	5	5	7	8	9
GTE	67	71	90	120	127	116	141	122	133	138	138	138
ROCKVILLE CTR	2	2	2	2	2	2	2	2	2	2	2	2
SO NEW ENG TEL	4	4	4	4	3	4	4	4	4	4	4	4
LEVITON	1	1	1	1	1	1	1	1	1	1	1	1
NYS ELECT+GAS	2	2	2	2	2	2	2	2	2	2	2	2
APS	8	12	12	14	16	17	20	20	19	20	20	19
LI RAILROAD	2	1	2	2	2	1	2	2	2	2	2	2
ITT	0	0	0	0	0	0	0	1	1	1	1	1
LES	1	5	5	5	2	3	0	5	5	0	0	0
NORTHROP	0	0	0	0	0	0	0	0	0	0	0	0
SWRI	10	10	10	9	10	10	11	13	13	13	13	13
BRONX ZOO	0	0	0	0	0	0	0	0	0	0	0	0
VILLAGE OF WESTBURY	0	1	0	0	0	0	0	0	0	0	0	0
TWN OF BABYLON	2	2	2	2	2	1	2	2	2	2	2	2
PRINCETON UNIV	0	0	0	1	0	0	0	0	0	0	0	1
CENTEL	0	8	8	10	10	10	10	10	10	20	20	20
DETROIT ED	0	0	1	1	10	12	18	18	24	24	24	24
PECO	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL VEHICLES	172	201	234	271	272	259	302	302	307	321	323	308

TABLE 8
Miles Traveled and Mission Days
Accumulated per Vehicle Month Reported

	<u>Miles per Vehicle Month Reported</u>	<u>Mission Days per Vehicle Month Reported</u>
LILCO	146	9.7
ConEd	225	14.3
AT&T	288	16.7
WED	229	14.7
GTE	185	12.8
Rockville Center	170	15.7
So. New England Telephone	59	5.0
Leviton	221	16.5
NYS Electric & Gas	29	1.9
APS	198	11.2
LI Rail Road	133	13.4
ITT	419	19.4
LES	202	14.3
Northrop	NMF	NMF
SWRI	169	10.5
Bronx Zoo	NMF	NMF
Village of Westbury	58	9.0
Town of Babylon	125	8.0
Princeton University	154	16.0
CENTEL	183	12.2
Detroit Edison	363	17.3
PECO	NMF	NMF

TABLE 9
Energy Usage by Principal Site

Site	Vehicle Type	1980 Miles Driven	1980 KWH/Mile	1981 Miles Driven	1981 KWH/Mile
LILCO	EVA Pacer Wagon	6,052	1.22	6,532	1.46
LILCO	Jet Ind. 600 Van	15,428	1.23	9,555	1.17
LILCO	Jet Ind. 1000 Van	837	1.20	293	1.85
LILCO	Jet Ind. 750 Truck	157	1.08	1,469	1.11
LILCO	Jet Ind. Electrica	3,105	.71	41,118	1.07
CON ED	EVA Pacer Wagon	22,611	1.42	45,842	.91
AT&T, CA	GMC BE Van	59,616	2.85	49,660	2.19
AT&T, MI	GMC BE Van	28,127	1.96	64,867	1.99
WED	Jet Ind. 100P Truck	1,351	2.07	5,760	1.29
APS	Jet Ind. 100P Truck	3,616	1.28	1,436	.91
APS	Jet Ind. Electrica			10,624	.80
LES	JMJ Electric Omni	430	.71	3,817	.76
ITT	SCT Van			1,919	1.34
LES	EVA Current Fare Sedan			2,459	1.02
SWRI	Jet Ind. 1000 Van	2,268	1.22	9,904	1.36
SWRI	Jet Ind. 750 Truck	717	1.34	5,304	1.13
SWRI	Jet Ind. 1400 Van	264	1.09	5,194	.93
SWRI	JMJ Electric Omni	91	.64	2,446	1.16
CENTEL, FL	Jet Ind. 750 Truck			16,890	1.55
CENTEL, FL	Jet Ind. Electrica			2,811	1.35
CENTEL, NE	Lectra Motors Truck			5,203	1.45
Detroit Ed.	SCT VW			56,630	.72
GTE, FL	Jet Ind. 600 Van	13,034	1.10	37,049	1.19
GTE, CA	Jet Ind. 750 Truck	31,005	1.23	64,412	1.46
GTE, HI	Jet Ind. 750 Truck	18,093	1.31	15,717	1.52
GTE, HI	Jet Ind. Electrica	3,615	.95	41	1.00
GTE, IL	Jet Ind. 750 Truck			4,351	1.45
GTE, IL	Jet Ind. Electrica			2,720	1.09
GTE, KY	Jet Ind. 750 Truck			8,058	1.44
GTE, WA	Jet Ind. 750 Truck			24,813	1.39
GTE, WA	Jet Ind. Electrica			1,758	1.37
GTE, OR	Jet Ind. 750 Truck			13,659	1.37
GTE, OH	Jet Ind. 750 Truck			21,218	1.43
GTE, OH	Jet Ind. Electrica			897	.77
GTE, PA	Jet Ind. 750 Truck			17,335	1.37
GTE, PA	Jet Ind. Electrica			2,302	1.44
GTE, NC	Jet Ind. 750 Truck			8,500	1.68
GTE, TX	Jet Ind. 750 Truck			15,731	1.19
GTE, TX	Jet Ind. Electrica			4,397	1.10

3. MAINTENANCE LABOR HOURS

Labor hours used to maintain and repair each vehicle type operated during 1981 are presented in Table 10. More than 15,000 labor hours were expended in 1981, and they averaged 82.7 labor hours per year per vehicle reported.

These figures may be misleading if taken out of context in that they represent start-up experience and are indicative of the developmental status of some of the products. Nevertheless, there is no question that maintenance labor hours must be radically reduced if EVs are to achieve a significant niche in the marketplace.

TABLE 10
Labor Hours

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V. DATA ANALYSIS

V. DATA ANALYSIS

As indicated in Figure 2, the current EV data base represents a small percentage of the data to be gathered. Nevertheless, the data base is now of sufficient size to merit increased analytical effort. As a first step in this direction, several alternative report formats to facilitate the analytical process have been examined. Tables 11-14 comprise an example of one set of such reports using 1981 data. Each table represents a report type based on how the vehicles are grouped in various subsets, for example:

- . Site-Vehicle Subset (SVS) - Groupings of unique vehicle types at unique vehicle operating sites. For example, the vehicles at Culver City represent one subset, and the vehicles at Michigan Bell represent a second subset. GTE Hawaii has two subsets--one for each vehicle type operating at that location.
- . Mission-Vehicle Subset (MVS) - Groupings of unique vehicle types operating specific missions. These distinguish various vehicle types (and performance factors) operating in similar usage patterns.
- . Component-Vehicle Subset (CVS) - Groupings of unique vehicle types in sets determined by particular associated components. For example, Jet 750s using ALCO batteries and Jet 750s using Exide XPV-23 batteries might be two distinct subsets for which operating parameters could be analyzed.

The same types of data are presented in each of the thirteen columns in each report type. Column definitions are as follows:

1	Location by state
2	{ Total number of unique vehicle identification codes that appeared in subset during report period
	{ Summation of months of data reported in period for subset

- 3 Identification of vehicle type/model in subset
- 4 Gross vehicle weight rating for subset model/type
- 5 Summation of all mileage reported for subset in period of report
- 6 Summation of all charge cycles for subset in period of report
- 7 Total energy used by subset in period divided by miles driven (Column 5). Energy in kilowatt-hours
- 8 Energy in watt-hours (total used by subset) divided by total subset miles, normalized (divided) by GVW for subset vehicle type
- 9 Fraction determined by dividing number of mission days performed or in service, whichever is larger, by total business days in period (5-day week), i.e.:

$$\frac{\text{Schedule Days} - \text{Maintenance Days Out}}{\text{Schedule Days}}$$

- 10 Summation of total number of battery module replacements divided by total miles traveled in subset in period
- 11 Summation of total maintenance hours reported divided by total miles traveled in subset in period. All maintenance and repair reports included
- 12 Number (total) of maintenance and repair instances reported divided by miles traveled in subset in period, all multiplied by 10,000 to show average rate projected over 10,000 miles, i.e.:

$$\frac{\text{M+R Actions}}{\text{Miles Traveled}} = \text{Actions per Mile}$$

$$\text{Actions per Mile} \times 10,000 = \text{Actions Expected per 10,000 Miles}$$

- 13 Summation of all M+R actions specifically identified as "PM" (preventive maintenance) divided by miles traveled in subset in period, all multiplied by 10,000 to show average rate projected over 10,000 miles

FIGURE 2
Private Sector Demonstration Data
Collection Status

TABLE 11
E&HV Demonstration Vehicle Operation Report
(Site-Vehicle Subset)

SVS REPORT EV OPERATIONS ANALYSIS REPORT PERIOD ANALYZED 1981										
SITE VEHICLES					OPERATING PERFORMANCE					
1 STATE VEHICLES		2 LOC. OPT. MO		3 VEHICLE MFG TYPE	4 VEHICLE	5 MILES DRIVEN	6 CHARGE CYCLES	7 AVE KWH/MILE	8 AVE WH/MILE	9 AVAIL
LILCO	NY	R	70	EVA-PACER WGN	4250	6532	632	1.46	.344	.79
LILCO	NY	12	133	JET IND 600 VAN	2690	9555	953	1.17	.435	.75
LILCO	NY	1	12	JET IND 1000 VAN	5760	293	44	1.85	.321	.91
LILCO	NY	1	10	JET IND 750 TRK	4980	1469	60	1.11	.223	.85
LILCO	NY	19	178	JET IND ELECTRICA	3650	41116	2366	1.07	.293	.90
CONED	NY	20	205	EVA-CURFARE WAGON	4320	45842	2432	.91	.211	.95
AT-T	CA	20	200	GMC R E VAN	8300	49660	3677	2.19	.264	.96
AT-T	MI	19	179	GMC B E VAN	8300	84887	2950	1.99	.239	.95
WED	FL	7	26	JET IND 1000P TRK	5760	5760	345	1.29	.224	.96
ROCKVILLE CTR	NY	2	20	JET IND 600 VAN	2690	3697	325	1.51	.560	.88
SO NEW ENR TEL	CT	3	30	JET IND 600 VAN	2690	2170	183	1.11	.411	.85
LEVITON	NY	1	11	JET IND 600 VAN	2690	2346	220	.90	.333	.85
NYS ELECT+GAS	NY	1	10	JET IND 600 VAN	2690	136	5	.74	.273	.82
NYS ELECT+GAS	NY	1	12	JET IND 1000 VAN	5760	900	15	.13	.023	.59
APS	AZ	2	15	JET IND 1000 VAN	5760	1436	114	.91	.159	.85
APS	AZ	14	152	JET IND 1000P TRK	5760	27011	1796	1.48	.257	.88
APS	AZ	3	24	JET IND ELECTRICA	3650	10824	313	.80	.220	.91
LI RAILROAD	NY	2	18	JET IND 1000 VAN	5760	2529	379	1.92	.333	.97
ITT	CA	1	5	SCT VAN	15000	1919	61	1.34	.089	1.00
LES	NB	2	15	GMJ ELECTRIC OMNI	3774	3817	242	.76	.202	.91
LES	NB	3	25	EVA-CURFARE SEDAN	3800	2459	199	1.02	.268	.79
SWRI	TX	6	70	JET IND 1000 VAN	5760	9904	577	1.36	.236	.91
SWRI	TX	2	24	JET IND 750 TRK	4980	5304	279	1.13	.227	.92
SWRI	TX	1	12	JET IND 1400 VAN	6600	5194	197	.93	.141	.94
SWRI	TX	4	29	JMJ ELECTRIC OMNI	3774	2446	153	1.16	.308	.89
VILLAGE OF WESTBURY	NY	1	1	JET IND 600 VAN	2690	58	14	3.17	1.179	1.00
TWN OF BARYLON	NY	2	23	JET IND ELECTRICA	3650	2868	186	1.18	.323	1.00
PRINCETON UNIV	NJ	1	1	JET IND 750 TRK	4980	155	15	1.58	.317	1.00
CENTEL	FL	8	88	JET IND 750 TRK	4980	16890	1164	1.55	.311	.90
CENTEL	FL	2	18	JET IND ELECTRICA	3650	2811	169	1.35	.371	.95
CENTEL	FL	10	30	LECTRA MTRS TRK	4880	5203	315	1.45	.297	1.00
DETROIT EN	MI	24	156	SCT VW	3800	98630	3021	.72	.199	.95
GTE	FL	25	251	JET IND 600 VAN	2690	37049	3051	1.19	.442	.92
GTE	CA	25	275	JET IND 750 TRK	4980	64412	4819	1.46	.293	.98
GTE	MI	14	134	JET IND 750 TRK	4980	19717	1516	1.92	.306	.77
GTE	MI	5	35	JET IND ELECTRICA	3650	41	3	1.00	.274	.90
GTE	IL	6	27	JET IND 750 TRK	4980	4351	306	1.45	.290	.90
GTE	IL	4	20	JET IND ELECTRICA	3650	2720	140	1.09	.298	.98
GTE	KY	10	40	JET IND 750 TRK	4980	8058	504	1.44	.290	.99
GTE	WA	12	107	JET IND 750 TRK	4980	24813	1312	1.39	.279	.99
GTE	WA	1	10	JET IND ELECTRICA	3650	1758	133	1.37	.375	1.00
GTE	OR	12	86	JET IND 750 TRK	4980	13659	1035	1.37	.276	.98
GTE	OH	13	103	JET IND 750 TRK	4980	21218	1281	1.43	.288	.95
GTE	OH	1	5	JET IND ELECTRICA	3650	897	36	.77	.212	.90
GTE	PA	9	90	JET IND 750 TRK	4980	17335	1078	1.37	.274	.91
GTE	PA	1	10	JET IND ELECTRICA	3650	2302	152	1.44	.394	1.00
GTE	NC	10	97	JET IND 750 TRK	4980	8500	795	1.68	.338	.90
GTF	TX	11	68	JET IND 750 TRK	4980	15731	911	1.19	.239	1.00

TABLE 11
(Continued)

1981

		10	11	12	13
		BATT.RE	MAINT.HR	H.R	BATT.PH
		PLACED/MI	PER MI	ACTIONS/10KMI	PER 10KMI
LILCO	EVA-PACER WGN	.0007	.031	147.0	112.6
LILCO	JET IND 600 VAN	.0045	.047	264.3	191.0
LILCO	JET IND 1000 VAN	.0049	.086	617.3	449.1
LILCO	JET IND 750 TRK	0.0000	.029	132.2	125.3
LILCO	JET IND ELECTRICA	.0016	.020	109.3	72.0
CONED	EVA-PACER WGN	.0007	.204	656.9	459.9
CONED	EVA-CURFARE WAGON	.0016	.029	90.0	36.0
AT-T	GMC R E VAN	.0171	.011	71.9	61.3
AT-T	GMC R E VAN	.0076	.013	87.8	26.0
ROCKVILLE CTR	JET IND 600 VAN	.0095	.034	92.5	47.5
SO NEW ENG TEL	JET IND 600 VAN	.0003	.085	371.7	325.6
LEVITON	JET IND 600 VAN	.0008	.011	45.8	34.3
NYS ELECT+GAS	JET IND 600 VAN	.0107	.101	426.2	213.1
NYS ELECT+GAS	JET IND 1000 VAN	.0022	.019	58.7	51.4
APS	JET IND 1000 VAN	.0050	.030	62.4	40.0
APS	JET IND 1000P TRK	.0053	.043	80.3	43.0
APS	JET IND ELECTRICA	.0009	.017	30.0	13.7
APS	UNIQUE MOR SEDAN	0.0000	.071	255.1	102.0
LI RAILROAD	JET IND 1000 VAN	.0018	.032	95.4	73.4
LES	JMJ ELECTRIC OMNI	0.0000	.013	78.6	54.4
SWRI	JET IND 1000 VAN	.0003	.048	182.7	103.6
SWRI	JET IND 750 TRK	.0018	.044	118.9	92.5
SWRI	JET IND 1400 VAN	.0010	.018	103.1	60.6
SWRI	JMJ ELECTRIC OMNI	.0006	.058	162.5	94.9
TWN OF BABYLON	JET IND ELECTRICA	.0006	.016	122.6	96.8
CENTEL	JET IND 750 TRK	.0030	.019	128.2	116.8
CENTEL	JET IND ELECTRICA	.0092	.015	105.4	98.6
DETROIT ED	SCT VW	.0035	.010	32.2	12.7
GTE	JET IND 600 VAN	.0037	.026	90.1	16.8
GTE	JET IND 750 TRK	.0036	.022	126.8	102.5
GTE	JET IND 750 TRK	.0039	.020	81.6	37.1
GTE	JET IND ELECTRICA	0.0000	.053	123.2	11.2
GTE	JET IND 750 TRK	.0025	.025	175.5	110.4
GTE	JET IND ELECTRICA	.0022	.017	167.4	126.5
GTE	JET IND 750 TRK	.0028	.018	93.9	30.2
GTE	JET IND 750 TRK	.0059	.018	75.8	55.5
GTE	JET IND ELECTRICA	.0036	.013	65.2	43.4
GTE	GMC R F VAN	0.0000	0.000	0.0	0.0
GTE	JET IND 750 TRK	.0006	.014	86.0	31.8
GTE	JET IND 750 TRK	.0031	.024	108.9	73.1
GTE	JET IND ELECTRICA	.0391	.027	87.9	78.1
GTE	JET IND 750 TRK	.0073	.053	189.0	30.2
GTE	JET IND ELECTRICA	.0015	.019	87.3	14.5
GTE	JET IND 750 TRK	.0002	.031	219.7	2.0
GTE	JET IND 750 TRK	.0008	.011	57.1	31.9
GTE	JET IND ELECTRICA	.0006	.017	77.9	27.0

TABLE 12
E&HV Demonstration Vehicle Operation Report
(Mission-Vehicle Subset)

E&HV OPERATIONS ANALYSIS REPORT									
PERIOD ANALYZED 1981								REPORT DATE	
SITE VEHICLES				OPERATING PERFORMANCE					
1	2	3	4	5	6	7	8	9	
STATE VEHICLES	VEHICLE	MFG TYPE	MILES	CHARGE	AVE	AVE	AVAIL		
LOC. ORT. NOS.	GVW	DRIVEN	CYCLES-KWH/MILE	MH/MI/LR					
FIELD SUPERVISION	2 23	JET IND 750 TRK	4980	4939.	283	1.23	.248	.89	
FIELD SUPERVISION	3 32	JET IND ELECTRICA	3650	4626.	319	1.25	.343	1.00	
FIELD SUPERVISION	1 11	EVA-CURFARE WAGON	4320	2844.	154	.88	.204	.96	
FIELD INSPECTION	1 10	JET IND 750 TRK	4980	1469.	60	1.11	.223	.85	
FIELD INSPECTION	2 18	JET IND ELECTRICA	3650	3410.	201	.56	.154	.94	
FIELD INSPECTION	11 112	EVA-CURFARE WAGON	4320	24935.	1344	.94	.217	.94	
METER TEST + INST	1 10	EVA-CURFARE WAGON	4320	2120.	118	.88	.204	.95	
PART PICKUP + DEL	1 11	JET IND 600 VAN	2690	2346.	220	.90	.333	.85	
PART PICKUP + DEL	1 12	JET IND 1000 VAN	5760	945.	41	1.17	.204	.93	
PART PICKUP + DEL	1 12	JET IND 750 TRK	4980	2776.	143	1.17	.234	.96	
COMMUTER	4 30	EVA-PACER WGN	4250	3114.	241	.94	.220	.88	
COMMUTER	5 55	JET IND ELECTRICA	3650	19003.	993	.92	.251	.94	
PUBLIC RELATIONS	1 11	EVA-CURFARE WAGON	4320	1547.	92	.97	.224	.96	
PUBLIC RELATIONS	24 156	SCT VAN	3680	56630.	3021	.72	.199	.95	
METER READER	3 32	EVA-PACER WGN	4250	3189.	306	1.96	.462	.91	
METER READER	15 163	JET IND 600 VAN	2690	13388.	1283	1.26	.468	.77	
METER READER	14 162	JET IND 1000P TRK	5760	27011.	1796	1.48	.257	.88	
METER READER	6 69	JET IND ELECTRICA	3650	14064.	927	1.36	.373	.91	
TELEPHONE INST/REPAI	35 379	GMC B E VAN	8300	114527.	6627	2.07	.250	.96	
TELEPHONE INST/REPAI	28 281	JET IND 600 VAN	2690	39219.	3234	1.19	.441	.91	
TELEPHONE INST/REPAI	134 1064	JET IND 750 TRK	4980	208273.	14594	1.44	.288	.94	
TELEPHONE INST/REPAI	6 38	JET IND ELECTRICA	3650	5531.	309	1.22	.335	.96	
TELEPHONE INST/REPAI	10 30	LECTRA MIRS TRK	4880	5203.	315	1.45	.297	1.00	
SUR STATION MAINT.	3 30	JET IND 1000 VAN	5760	4707.	527	1.69	.293	.97	
MAIL SERVICE	1 8	EVA-PACER WGN	4250	229.	65	1.61	.378	.75	
MAIL SERVICE	5 50	JET IND 1000 VAN	5760	4509.	293	1.09	.188	.79	
METER MAIN SERVICE	1 1	JET IND 600 VAN	2690	58.	14	3.17	1.179	1.00	
PARK SERVICE	1 1	JET IND 750 TRK	4980	155.	15	1.58	.317	1.00	
BAKERY PRODUCTS DEL	1 5	SCT VAN	15000	1919.	61	1.34	.889	1.00	
INTERPLANT TRANS	2 23	JET IND 1000 VAN	5760	3225.	187	1.43	.248	.94	
INTERPLANT TRANS	1 12	JMJ ELECTRIC OMNI	3774	1505.	91	1.19	.315	.94	
INTERPLANT TRANS	6 61	EVA-CURFARE WAGON	4320	14396.	724	.87	.202	.97	
TRANSPORTATION POOL	14 90	JET IND ELECTRICA	3650	16983.	769	.94	.257	.89	
TRANSPORTATION POOL	8 32	JMJ ELECTRIC OMNI	3774	4758.	304	.83	.221	.88	
TRANSPORTATION POOL	3 25	EVA-CURFARE SEDAN	3800	2450.	100	1.02	.268	.79	
MORILE ELECT LAR	1 12	JET IND 1000 VAN	5760	1276.	81	1.33	.232	.89	
VAN POOL	1 12	JET IND 1400 VAN	6600	5194.	197	.93	.141	.94	
THEME PARK MAINT	5 18	JET IND 1000P TRK	5760	3476.	245	1.47	.256	.92	

TABLE 12
(Continued)

1981

		10	11	12	13
		BATT.RE	MAINT.HR	M+R	BATT.PM
		PLACED/MI	PER MI	ACTIONS/10KMI	PER 10KMI
FIELD SUPERVISION	EVA-PACER WGN	0.0000	.119	403.2	282.3
FIELD SUPERVISION	JET IND 750 TRK	.0011	.042	126.2	100.9
FIELD SUPERVISION	JET IND ELECTRICA	.0020	.015	95.5	71.6
FIELD SUPERVISION	EVA-CURFARE WAGON	.0025	.018	74.4	31.9
FIELD INSPECTION	EVA-PACER WGN	.0036	.470	1494.7	996.4
FIELD INSPECTION	JET IND 750 TRK	0.0000	.029	132.2	125.3
FIELD INSPECTION	JET IND ELECTRICA	.0010	.029	139.2	85.1
FIELD INSPECTION	EVA-CURFARE WAGON	.0016	.030	94.5	37.2
METER TEST + INST	EVA-PACER WGN	0.0000	.168	578.0	289.0
METER TEST + INST	EVA-CURFARE WAGON	0.0000	.029	86.1	26.9
PART PICKUP + DEL	EVA-PACER WGN	0.0000	1.120	3200.0	2800.0
PART PICKUP + DEL	JET IND 600 VAN	.0008	.011	45.8	34.3
PART PICKUP + DEL	JET IND 1000 VAN	0.0000	.056	175.6	165.3
PART PICKUP + DEL	JET IND 750 TRK	.0012	.020	89.0	76.8
COMMUTER	EVA-PACER WGN	.0011	.048	222.7	167.7
COMMUTER	JET IND ELECTRICA	.0006	.013	77.6	49.5
PUBLIC RELATIONS	EVA-PACER WGN	0.0000	.107	412.0	337.1
PUBLIC RELATIONS	EVA-CURFARE WAGON	.0016	.076	209.3	77.5
PUBLIC RELATIONS	SCT VW	.0035	.010	32.2	12.7
METER READER	EVA-PACER WGN	.0003	.022	100.7	76.9
METER READER	JET IND 600 VAN	.0056	.045	230.2	161.3
METER READER	JET IND 1000P TRK	.0053	.043	80.3	43.0
METER READER	JET IND ELECTRICA	.0010	.025	142.4	101.6
TELEPHONE INST/REPAI	MC B E VAN	.0115	.012	81.3	40.4
TELEPHONE INST/REPAI	JET IND 600 VAN	.0034	.031	112.6	41.4
TELEPHONE INST/REPAI	JET IND 750 TRK	.0033	.021	107.8	66.9
TELEPHONE INST/REPAI	JET IND ELECTRICA	.0059	.016	135.0	111.9
SUR STATION MAINT.	JET IND 1000 VAN	.0011	.033	113.8	85.3
MAIL SERVICE	EVA-PACER WGN	.0029	.093	391.9	319.3
MAIL SERVICE	JET IND 1000 VAN	.0034	.040	110.7	72.9
INTERPLANT TRANS	JET IND 1000 VAN	.0010	.045	212.9	99.8
INTERPLANT TRANS	JMJ ELECTRIC OMNI	0.0000	.047	270.3	127.6
INTERPLANT TRANS	EVA-CURFARE WAGON	.0017	.027	75.1	32.1
TRANSPORTATION POOL	JET IND ELECTRICA	.0031	.019	49.8	16.8
TRANSPORTATION POOL	JMJ ELECTRIC OMNI	.0006	.046	106.7	73.1
TRANSPORTATION POOL	UNIQUE MOR SEDAN	0.0000	.071	255.1	102.0
MORILE ELECT LAB	JET IND 1000 VAN	0.0000	.039	228.9	105.6
VAN POOL	JET IND 1400 VAN	.0010	.018	103.1	60.6

TABLE 13
E&HV Demonstration Vehicle Operation Report
(Mission-Vehicle Subset)

EVS REPORT									
EV OPERATIONS ANALYSIS REPORT									
PERIOD ANALYZED 1981								REPORT DATE	
*****									
SITE VEHICLES				OPERATING PERFORMANCE					
*****									
1	2	3	4	5	6	7	8	9	
STATE VEHICLES	VEHICLE	MFG TYPE	VEHICLE	MILES	CHARGE	AVE	AVE	AVAIL	
LOC. OPT MOS			GVW	DRIVEN	CYCLES	KWH/MILE	WH/MI/LS		
*****									
FIELD SUPERVISION	1	11	EVA-CURFARE WAGON	4320	2844.	154	.98	.204	.96
FIELD INSPECTION	2	10	JET IND ELECTRICA	3650	3410.	201	.96	.154	.94
FIELD INSPECTION	11	112	EVA-CURFARE WAGON	4320	24935.	1344	.94	.217	.94
METER TEST + INST	1	10	EVA-CURFARE WAGON	4320	2120.	118	.88	.204	.95
PART PICKUP + DEL	1	12	JET IND 1000 VAN	5760	945.	41	1.17	.204	.93
COMMUTER	5	55	JET IND ELECTRICA	3650	19003.	993	.92	.251	.94
PUBLIC RELATIONS	1	11	EVA-CURFARE WAGON	4320	1547.	92	.97	.224	.96
PUBLIC RELATIONS	24	156	SCT VW	3600	56630.	3021	.72	.199	.95
METER READER	11	117	JET IND 1000P TRK	5760	21313.	1427	1.46	.253	.90
METER READER	6	69	JET IND ELECTRICA	3650	14064.	927	1.36	.373	.91
TELEPHONE INST/REPAI	15	179	SMC B E VAN	8300	64867.	2950	1.99	.239	.95
TELEPHONE INST/REPAI	67	546	JET IND 750 TRK	4980	113526.	8168	1.47	.294	.95
SUB STATION MAINT.	1	12	JET IND 1000 VAN	5760	2178.	148	1.42	.246	.96
MAIL SERVICE	1	11	JET IND 1000 VAN	5760	2280.	120	1.30	.228	.77
BAKERY PRODUCTS DEL	1	5	SCT VAN	15000	1919.	61	1.34	.089	1.00
INTERPLANT TRANS	2	23	JET IND 1000 VAN	5760	3225.	187	1.43	.248	.94
INTERPLANT TRANS	6	61	EVA-CURFARE WAGON	4320	14396.	724	.87	.202	.97
MOBILE ELECT LAB	1	12	JET IND 1000 VAN	5760	1276.	81	1.33	.232	.89
*****									

TABLE 13
(Continued)

MAINTENANCE/RELIABILITY					
*****					
		10	11	12	13
		BATT. RE	MAINT. HR	M.R	BATT. PM
		PLACED/MI	PER MI	ACTIONS/100MI	PER 100MI
*****					
FIELD SUPERVISION	EVA-CURFARE WAGON	.0025	.018	74.4	31.9
FIELD INSPECTION	JET IND ELECTRICA	.0010	.029	139.2	85.1
FIELD INSPECTION	EVA-CURFARE WAGON	.0016	.030	94.5	37.2
METER TEST + INST	EVA-CURFARE WAGON	0.0000	.029	86.1	26.9
PART PICKUP + DEL	JET IND 1000 VAN	0.0000	.056	175.6	165.3
COMMUTER	JET IND ELECTRICA	.0006	.013	77.6	49.5
PUBLIC RELATIONS	EVA-CURFARE WAGON	.0016	.076	200.3	77.5
PUBLIC RELATIONS	SCT VW	.0035	.010	32.2	12.7
METER READER	JET IND 1000P TRK	.0051	.038	75.6	41.1
METER READER	JET IND ELECTRICA	.0010	.025	142.4	101.6
TELEPHONE INST/REPAIR	MC B E VAN	.0076	.013	87.8	26.0
TELEPHONE INST/REPAIR	JET IND 750 TRK	.0036	.025	129.5	80.0
SUB STATION MAINT.	JET IND 1000 VAN	0.0000	.035	140.9	103.0
MAIL SERVICE	JET IND 1000 VAN	0.0000	.068	146.7	73.3
INTERPLANT TRANS	JET IND 1000 VAN	.0010	.045	212.9	99.8
INTERPLANT TRANS	EVA-CURFARE WAGON	.0017	.027	75.1	32.1
MOBILE ELECT LAB	JET IND 1000 VAN	0.0000	.039	228.9	105.6

TABLE 14
E&HV Demonstration Vehicle Operation Report
(Component-Vehicle Subset)

CVS REPORT									
EV OPERATIONS ANALYSIS REPORT									
PERIOD ANALYZED 1981								REPORT DATE	
*****									
SITE VEHICLES					OPERATING PERFORMANCE				
*****									
1	2	3	4	5	6	7	8	9	
STATE VEHICLES	VEHICLE	MFG TYPE	VEHICLE	MILES	CHARGE	AVE	AVE	AVAIL	
LOC. ORT MOS	GVN	DRIVEN	CYCLES	KWH/MILE	WH/MI/LR				
*****									
BAKER	6	51	EVA-PACER WGN	4250	3294.	314	1.92	.452	.79
DELCO REMY	35	379	GMC B E VAN	8300	114527.	6627	2.07	.250	.96
GE 9 INCH	44	448	JET IND 600 VAN	2690	55011.	4751	1.19	.443	.87
GE 9 INCH	139	1110	JET IND 750 TRK	4980	217612.	15095	1.43	.286	.93
GE 9 INCH	43	345	JET IND ELECTRICA	3650	69536.	3820	1.86	.291	.83
GE 9 INCH	6	44	JMJ ELECTRIC OMNI	3774	6263.	395	.92	.243	.90
GE 11 INCH	2	19	EVA-PACER WGN	4250	3238.	318	.99	.234	.79
GE 11 INCH	12	127	JET IND 1000 VAN	5760	14662.	1129	1.38	.240	.88
GE 11 INCH	21	178	JET IND 1000P TRK	5760	32771.	2141	1.45	.251	.89
GE 11 INCH	1	12	JET IND 1400 VAN	6600	5194.	197	.93	.141	.94
GE 11 INCH	3	25	EVA-CURFARE SEDAN	3880	2459.	199	1.02	.268	.79
GE 11 INCH	20	205	EVA-CURFARE WAGON	4320	45842.	2432	.91	.211	.95
PRESTOLITE	10	30	LECTRA MTRS TRK	4880	5203.	315	1.45	.297	1.00
SIEMENS SHUNT 23 HP	24	156	SCT VW	3600	56630.	3821	.72	.199	.95
GE SHUNT 50 HP	1	5	SCT VAN	15000	1919.	61	1.34	.089	1.00

VI. FIRST QUARTER DATA

VI. FIRST QUARTER DATA

Tables 15 through 19 are 1982 printouts similar to the 1981 results presented in Tables 3 through 7. Examination of the 1982 data reveals that significant gaps in first quarter data still exist even in late May. Such gaps are generally traceable to late or incomplete submissions by site operators, although there is also a significant and somewhat uniform data processing lead time on the Booz, Allen end. It is clear, however, that prompt and meaningful feedback of operating results is critically dependent on timely and complete inputs.

TABLE 15
EV Mileage Accumulated by Each Site Operator
and Site Operator Subcontractor (1982)

*****														
	1982													
SITE	1979-81	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
*****														
LILCO	95859	2381	2848	2179	0	0	0	0	0	0	0	0	0	0103267
CONED	73588	2241	2743	2782	0	0	0	0	0	0	0	0	0	0 81354
AT-T	226458	8562	7094	9098	0	0	0	0	0	0	0	0	0	0251212
WED	17737	1375	1971	2112	0	0	0	0	0	0	0	0	0	0 23195
GTE	327241	18888	16143	21049	0	0	0	0	0	0	0	0	0	0383321
ROCKVILLE CTR	7498	349	404	505	0	0	0	0	0	0	0	0	0	0 8756
SO NEW ENG TEL	4610	0	0	0	0	0	0	0	0	0	0	0	0	0 4610
LEVITON	4344	55	19	234	0	0	0	0	0	0	0	0	0	0 4652
NYS ELECT+GAS	1982	40	141	154	0	0	0	0	0	0	0	0	0	0 2317
APS	41844	4024	3543	5552	0	0	0	0	0	0	0	0	0	0 54963
LI RAILROAD	7339	88	111	269	0	0	0	0	0	0	0	0	0	0 7807
ITT	2094	1038	802	1232	0	0	0	0	0	0	0	0	0	0 5166
LES	6276	0	0	0	0	0	0	0	0	0	0	0	0	0 6276
NORTHROP	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0
SWRI	26188	1586	1801	1886	0	0	0	0	0	0	0	0	0	0 31461
BRONX ZOO.	0	0	0	0	0	0	0	0	0	0	0	0	0	0 0
VILLAGE OF WESTBURY	58	0	0	0	0	0	0	0	0	0	0	0	0	0 58
TWN OF BARYLON	2868	1177	0	0	0	0	0	0	0	0	0	0	0	0 4045
PRINCETON UNIV	308	0	0	0	0	0	0	0	0	0	0	0	0	0 308
CENTEL	24904	2227	1496	2147	0	0	0	0	0	0	0	0	0	0 30774
DETROIT ED	56630	4475	5389	6610	0	0	0	0	0	0	0	0	0	0 73104
PECO	0	0	2415	1784	0	0	0	0	0	0	0	0	0	0 4199
*****														
TOTAL	928918	48506	46920	57593	0	0	0	0	0	0	0	0	0	01081937
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TABLE 16
Mileage Accumulated by Each Vehicle
Type (1982)

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TABLE 17
Mileage Accumulated by Each
Vehicle Mission (1982)

MISSION	1979-81	1982												TOTAL
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
FIELD SUPERVISION	19593	1487	374	482	0	0	0	0	0	0	0	0	0	21936
FIELD INSPECTION	38722	1293	1465	2323	0	0	0	0	0	0	0	0	0	43803
METER TEST + INST	5011	49	32	20	0	0	0	0	0	0	0	0	0	5112
PART PICKUP + DEL	9025	273	221	379	0	0	0	0	0	0	0	0	0	9898
COMMUTER	29083	1126	833	238	0	0	0	0	0	0	0	0	0	31280
PUBLIC RELATIONS	65039	4732	5741	6725	0	0	0	0	0	0	0	0	0	82237
METER READER	94106	3497	3904	4858	0	0	0	0	0	0	0	0	0	106365
TELEPHONE INST/REPAI	567611	29544	24129	31483	0	0	0	0	0	0	0	0	0	652767
SUB STATION MAINT.	10032	153	181	447	0	0	0	0	0	0	0	0	0	10813
MAIL SERVICE	8496	40	175	867	0	0	0	0	0	0	0	0	0	9578
METER MAID SERVICE	58	0	0	0	0	0	0	0	0	0	0	0	0	58
PARK SERVICE	308	0	0	0	0	0	0	0	0	0	0	0	0	308
BAKERY PRODUCTS DEL	3186	1038	802	1232	0	0	0	0	0	0	0	0	0	6258
INTERPLANT TRANS	19846	1199	1422	1191	0	0	0	0	0	0	0	0	0	23658
TRANSPORTATION POOL	28115	1515	1720	2235	0	0	0	0	0	0	0	0	0	33585
MOBILE ELECT LAB	1484	42	75	47	0	0	0	0	0	0	0	0	0	1648
VAN POOL	5458	629	699	710	0	0	0	0	0	0	0	0	0	7496
THEME PARK MAINT	13782	754	1021	1346	0	0	0	0	0	0	0	0	0	16903

TABLE 18
Mission Days for Each Site Operator
and Site Operator Subcontractor (1982)

*****														
	1982													
SITE	1979-81	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
*****														
LILCO	6144	127	185	194	0	0	0	0	0	0	0	0	0	6650
CONED	4304	186	198	223	0	0	0	0	0	0	0	0	0	4911
AT-T	13325	455	390	453	0	0	0	0	0	0	0	0	0	14623
WED	1089	80	99	117	0	0	0	0	0	0	0	0	0	1385
GTE	22053	1467	1316	1505	0	0	0	0	0	0	0	0	0	26341
ROCKVILLE CTR	658	34	34	46	0	0	0	0	0	0	0	0	0	772
SO NEW ENG TEL	345	0	0	0	0	0	0	0	0	0	0	0	0	345
LEVITON	323	8	15	7	0	0	0	0	0	0	0	0	0	353
NYS ELECT+GAS	179	2	4	25	0	0	0	0	0	0	0	0	0	210
APS	2531	199	184	273	0	0	0	0	0	0	0	0	0	3187
LI RAILROAD	526	13	12	24	0	0	0	0	0	0	0	0	0	575
ITT	97	30	24	17	0	0	0	0	0	0	0	0	0	168
LES	443	0	0	0	0	0	0	0	0	0	0	0	0	443
NORTHROP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SWRI	1614	131	134	141	0	0	0	0	0	0	0	0	0	2020
BRONX ZOO,	0	0	0	0	0	0	0	0	0	0	0	0	0	0
VILLAGE OF WESTBURY	9	0	0	0	0	0	0	0	0	0	0	0	0	9
TWN OF BABYLON	184	2	0	0	0	0	0	0	0	0	0	0	0	186
PRINCETON UNIV	32	0	0	0	0	0	0	0	0	0	0	0	0	32
CENTEL	1662	170	134	194	0	0	0	0	0	0	0	0	0	2160
DETROIT ED	2697	271	275	345	0	0	0	0	0	0	0	0	0	3588
PECO	0	0	152	125	0	0	0	0	0	0	0	0	0	277
*****														
TOTAL	58215	3175	3156	3689	0	0	0	0	0	0	0	0	0	68235
*****														

TABLE 19
Vehicles Reporting for Each Site Operator
and Site Operator Subcontractor (1982)

SITE	1982											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
LILCO	40	40	33	0	0	0	0	0	0	0	0	0
CONED	20	20	20	0	0	0	0	0	0	0	0	0
AT-T	25	24	25	0	0	0	0	0	0	0	0	0
WED	7	10	8	0	0	0	0	0	0	0	0	0
GTE	131	120	127	0	0	0	0	0	0	0	0	0
ROCKVILLE CTR	2	2	2	0	0	0	0	0	0	0	0	0
SO NEW ENG TEL	4	4	0	0	0	0	0	0	0	0	0	0
LEVITON	1	1	1	0	0	0	0	0	0	0	0	0
NYS ELECT+GAS	2	2	2	0	0	0	0	0	0	0	0	0
APS	20	20	20	0	0	0	0	0	0	0	0	0
LI RAILROAD	2	2	2	0	0	0	0	0	0	0	0	0
ITT	2	2	2	0	0	0	0	0	0	0	0	0
LES	0	0	0	0	0	0	0	0	0	0	0	0
NORTHROP	0	0	0	0	0	0	0	0	0	0	0	0
SWRI	13	13	14	0	0	0	0	0	0	0	0	0
BRONX ZOO	0	0	0	0	0	0	0	0	0	0	0	0
VILLAGE OF WESTRURY	0	0	0	0	0	0	0	0	0	0	0	0
TWN OF BARYLON	2	2	2	0	0	0	0	0	0	0	0	0
PRINCETON UNIV	1	1	0	0	0	0	0	0	0	0	0	0
CENTEL	20	20	20	0	0	0	0	0	0	0	0	0
DETROIT ED	24	24	24	0	0	0	0	0	0	0	0	0
PECO	0	16	16	0	0	0	0	0	0	0	0	0
TOTAL VEHICLES	316	323	318	0	0	0	0	0	0	0	0	0