Section 3
COMPARABLE ELECTRIC COMMUTER RAIL

3.1 NORTHERN INDIANA COMMUTER TRANSIT DISTRICT (NICTD)

The NICTD operates a commuter railroad between Chicago and South Bend, Indiana using trackage rights over Chicago METRA (former Illinois Central) between Kensington and Randolph Street, Chicago. NICTD has its own station adjacent to the METRA station. Mr. John Parsons, Director of Marketing (phone 219-926-5744), furnished operating and cost information. The basic data source has been the Section 15 Report to FTA for 1999, published May 1, 2000.

Route mileage is 90 of which 14 miles are by trackage rights. 14 trains are operated per day Monday through Friday, 4 trains on Saturday and 3 on Sunday. Five trains in each direction operate to or from South Bend on weekdays, the balance terminating/originating at Gary or Michigan City. All weekend trains operate to or from South Bend. In 1999, the average train consisted of 3.56 cars.

NICTD operates a fleet of 58 identical single level electrically powered cars (EMU's), the oldest dating from 1983. There is a single maintenance facility at Michigan City dating from 1926. Daily inspections and light repairs are made at Randolph Street, and Gary. There is no maintenance personnel at South Bend. All other repair work is performed at Michigan City. 52 cars are required for normal weekday operations, requiring a minimum availability of 89.7 percent. Catenary voltage is 1,500 dc with all cars having dc motors. Power is supplied through NICTD owned and maintained substations except on Metra where power is purchased from that agency.

NICTD has recently converted one car to ac motors with modern computer control as an experiment. This has been highly successful and a program has been initiated to convert all cars to ac propulsion. Both the NICTD and the equipment supplier, Toshiba, have estimated that this will result in significant cost reductions. Estimates of the savings were not obtained, as these are currently conjectural and not based on actual experience. The conversion will be made during scheduled heavy overhauls.

3.1.1 Operating Costs

All costs have been taken from the Section 15 Report for 1999 submitted to FTA, supplemented by telephone discussions with Mr. Parsons.

Electric power costs are estimated as follows: in 1999, NICTD used 15,209,250 kWh for train operations at a cost of $1,562,249 or 10.3 cents per kWh. Power cost per car mile is 56.7 cents or $2.016 per average train (3.56 cars) mile.

On train staffing consists of engineer, conductor and one trainman for each two cars. Train operator wages are reported as $899,868 or $1.161 per train mile. Reported fringe benefits of $2,159,159 apply to total operating salaries of $3,672,955, representing 58.8 percent of direct salaries and wages. Adding fringe benefits at 58.8 percent increases the cost per train mile to $1.844. Within the Operating Function, total hours worked were reported as 191,017. The average cost per hour worked, including staff other than on-train, was $19.228.

3.1.2 Maintenance Costs

Total maintenance salaries were $2,408,635 with fringes of $1,800,719 or 74.8 percent. This figure includes all staff assigned to rolling stock maintenance including supervision. A total of 144,050 hours were worked resulting in an average cost of $16.72 per hour. Adding fringes increases the hourly cost to $29.227. This results in a cost of $1.528 per car mile or $5.431 per average train mile. Average labor input per car per year was 2,483.621 hours or a labor cost of $72,575 per car per year.

Materials cost was reported as $1,062,801. This represents a cost of 38.6 cents per car mile or $18,337 per car per year. Much of the rolling stock included in this analysis is relatively new, indicating that materials costs may be understated on a long-term basis.

Total rolling stock maintenance is $1914 per car mile or, since much of the maintenance expense is time rather than distance related, $90,912 per car per year.

Heavy overhauls, planned for fifteen-year intervals but actually being performed at a longer interval, are not included in the above costs. Overhauls are considered a capital expense and included in the Capital Budget. The 1999 Rolling Stock Capital Budget was for $20,319,631, which included $17,716,439 for the purchase of eight new cars, which will have ac motors. The remaining $2,603,192 covered the heavy overhaul of three cars and included $1,562,192 for labor and $1,041,000 for materials. This is an average of approximately $868,000 per overhaul, or $57,866 per year assuming these overhauls are performed at fifteen-year intervals. NICTD now has 26 mechanical employees assigned to capital work. These employees worked a total of 53,413 hours during 1999.

Adding the annual overhaul cost to normal maintenance increases the total cost per car to $148,778 per car.

3.2 SOUTH EASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY (SEPTA)

This visit was to the Frazier Workshop of SEPTA, located at Malvern, PA. The primary contact was Mr. Paul Norcini, Director of Maintenance (phone 610-251-9680).

Power Supply and Facilities

SEPTA's electrification is at 12 kV, 25 Hz. Power is purchased from a local supplier and delivered through SEPTA owned and maintained substations. For operations over AMTRAK lines, power is purchased from AMTRAK.

Locomotives and Rolling Stock

SEPTA's fleet consists of the following:

8 AEM-7 Locomotives, Built 1987 and identical with those of Amtrak

- 12 Cab Control Coaches(*)

33 Trailer Coaches plus 10 new coaches just delivered (new are identical with NJTC Comet cars)(*)

- 300 (Approximate) EMU Coaches built between 1964 and 1975(*)

12 Diesel Electric Locomotives (used for work trains).
(*)All passenger coaches are of single level design.

The locomotive hauled trains operate in rush hours only, Monday through Friday. They are permanently coupled in seven sets of six coaches (at least one cab control car) and locomotive. Seven locomotives and 42 coaches are required for daily operation requiring a minimum availability of 87.5 percent for locomotives and 93.3 percent for coaches. To date, this availability has been achieved. The ten coaches that have just been delivered will be used to expand the existing train sets. EMUs customarily operate in sets of 2 to 6 cars. Most are single units (not married pairs). Some problems have been encountered with the older EMUs as parts are no longer available from commercial suppliers.

Maintenance Facilities

SEPTA's maintenance facilities consist of the following:

- Frazier Shop which performs all maintenance on locomotives, cab cars and coaches. In addition, this shop performs daily inspections and light repairs on EMUs and has one diesel-electric locomotive assigned for maintenance, however Mr. Norcini reported that it was not normally maintained at this point. The shop also makes control system parts which can not be purchased in the open market and overhauls pantograph collector shoes. Carbon inserts are purchased. This workshop is 12 years old.

- Overbrook Maintenance Facility. This facility performs trip servicing and daily inspections on both EMUs and locomotive hauled trains.

- Wayne Junction Workshop performs all heavy and light repairs on EMUs. In addition, Wayne Junction does all air-brake component overhaul and has the system wheel shop.

  In addition, there are inspection and light repair facilities at points where trains terminate their trips.

Specialized work including traction motor overhauls, repair of major electrical components and upholstery is contracted to specialized firms.

The Frazier Workshop has a total staff of fifty five persons including six management. Of this staff, three persons are at Media and four at Overbrook. These individuals report to managers at Frazer. The Frazier Workshop operates on a three-shift basis with most work being concentrated on the day shift. Based on observations during the visit, it appeared that four persons were engaged in making of repair parts for other facilities, rather than in repair of equipment maintained at Frazier.

The Storeroom at Frazier is staffed by the Purchasing Department during the day shift only. However, the storeroom is open at other times so that mechanics have access to needed parts. Staffing in the storeroom appeared to be about three people.

3.2.4. Maintenance Procedures

The basic maintenance procedure used for all equipment maintenance is the periodic inspection. All rolling stock is inspected after each day's operation with minor repairs, such as brake shoe replacement being performed at that time. Individual inspections by type of equipment are shown below. Inspection forms, show the specific items, which are inspected. Inspections are also designed to comply with applicable Federal and state laws.

Locomotives. The basic locomotive inspection is the 92-day Federally mandated procedure. Several other inspections, which were formerly performed at 60-day intervals, have been consolidated with the 92-day inspection in order to reduce out of service time as well as cost. Other than the air brake inspections noted below, the same inspection is performed at each quarterly interval. There are no expanded inspections performed at semi-annual and annual intervals.

There is a one-year inspection of major brake system components (combined with the 92-day inspection) and a much more detailed three-year inspection. Where necessary, components are removed and replaced with overhauled components on a unit exchange basis. Removed components are sent to the Wayne Junction brake shop for overhaul.

The separate cab signal inspection is performed with the 92-day inspection.

Cab Control Cars. Cab control cars also receive a 92-day inspection, as do locomotives, including cab signals. In addition to appropriate tests for control equipment, interior lights and passenger amenities are included. This inspection is a combination of the appropriate items included in the locomotive and coach inspections. There are also one and three year air brake inspections similar to that for locomotives. Note that the same inspection form is used for both cab control cars and coaches with items to be included shown by the initial lines on the inspection forms.

Air conditioning is inspected annually at the beginning of the summer season and heating systems at the beginning of winter.

Coaches (Also referred to as trailers). Coaches are inspected on the same basis as cab control cars with one exception. The two-year air brake inspection for cab cars is performed on a three-year basis for coaches.

3.2.5 Maintenance Costs

The present cost reporting system leaves a great deal to be desired. The Director of Maintenance at Frazier has access only to those costs, which are under his direct control. He has no knowledge of the costs of overhauling air brake components at Wayne Junction or of the costs of wheels. Likewise, he is unaware of the costs of overhauls performed by outside contractors. There is no adjustment of costs at Frazier to reflect work performed for other facilities nor is there any breakdown of costs between different types of rolling stock. The only source of costs for individual types of equipment maintained at Frazier is estimates by the Director of Maintenance. These estimates have been used in the following discussion.

As this equipment has not reached the point at which major overhauls are required, there is no major overhaul expense included in these costs. The Director of Maintenance indicated that it had recently been necessary to overhaul a main transformer on one of the AEM-7 locomotives due to a failure. This was contracted out at a cost of $224,000.

It was also indicated that rolling stock acquired in the future will require additional systems to meet emergency exit requirements and other recently implemented Federal standards. This equipment will increase maintenance requirements and costs. The ten coaches currently being delivered have this additional equipment.

Locomotives. Each locomotive receives four 92-day inspections per year plus one one-year brake and one-half of a two-year brake inspection per year. Each 92-day inspection is estimated to require 40 man-hours at an estimated cost of $20 per hour. Estimated labor cost is $800. Materials are estimated at $450, for a total cost per inspection of $1,250. Four inspections result in a cost of $5,000 per locomotive per year. For eight locomotives, the cost is $40,000.

The cab signal inspection requires 16 hours or a total of 64 hours for the four inspections required per year. With eight locomotives, the total inspection time is 512 hours or a cost of $10,240. Note that in this, as in several other inspections, no material costs are included as any components requiring replacement are changed and replaced with rebuilt units. The Director of Maintenance has no information available to him on the overhaul costs of these components so no cost, other than change-out labor is included.

The one-year brake inspection requires 24 hours at a cost per hour of $20 or $480 per inspection. Total cost for eight units is $3,840.

The two-year brake inspection requires 48 hours but only four locomotives will receive this inspection in any one year. The labor cost per inspection is $960 or $3,840 per year.

Total estimated cost of maintaining the eight AEM-7 locomotives is $57,920 or $7,240 per locomotive. Note that this does not include any material costs except for consumables used in the 92-day inspections. Based on information from other sources, this cost is considered to be substantially understated.

Control Cab Coaches. These cars receive virtually the same inspections, as do the locomotives. Although the 92-day inspection for locomotives includes some additional work, both inspections are considered to require the same number of man-hours. Checking emergency escape windows and door

pulls were noted as a major time consuming operation. Although the coach interior is included in the 92-day inspection, there was no reference to the possible need to replace damaged seats and removal of graffiti. The annual maintenance cost for these coaches is the same as for locomotives with one exception. The one-year brake inspection is limited to work necessary to meet Federal requirements. The estimated time required is still the same.

Each control cab coach receives an air-conditioning check at the beginning of the cooling season and a heating check in the fall. Each inspection is estimated to require four hours, or a total of eight hours per car per year. This represents a cost of $160 per car.

Annual maintenance costs are estimated as $7,400 per unit per year, subject to the same limitations on material costs as discussed under locomotives.

Coaches. Coaches receive the same 92 day inspection as do the control cab cars. Although control systems are not included, this inspection is also estimated to require 40 man hours at a labor cost of $800, plus consumables of $400. The annual cost per coach, including four inspections, is $4,800.

The three-year brake inspection, including change out of components, requires 32 man-hours at a cost of $640. One third of the coaches receive this inspection each year resulting in an annual cost per coach of $213.

All coaches receive the air-conditioning and heating checks as do the control cab cars at the same cost of $160 per car per year.

The total cost per year per coach is $5,173, again subject to the comments on material costs noted above.

The Director of Maintenance indicated that virtually all repairs to the locomotives and coaches are made on the 92 day inspections due to the extremely low mileage being operated, as little as 70 miles per day in some cases. There is some level of discrepancy in this statement. Adjusted for personnel assigned to other facilities and for management, there are about 37 employees performing actual maintenance work. Assuming 2,008 working hours per year, this staff has 74,246 working hours available. Assuming 25 percent of work hours are lost to lunch breaks, make ready time etc., this leaves 55,722 available work hours. Using the time estimates furnished by the Director times the number of inspections required indicates that 4,112 hours are required. This is only 7.4 percent of the available work hours.

This workshop also performs daily inspections and running repairs on EMUs that terminate runs at Malvern. This will require the use of some staff but there was no estimate available of the number of cars involved or how long this takes.

See also the report on the discussion with Amtrak regarding maintenance of AEM-7 locomotives. Amtrak has indicated that, given the very low mileage, which these locomotives accumulate, wheelwork and motor overhauls should be extremely limited.

3.3 NATIONAL RAILROAD PASSENGER CORPORATION - AMTRAK

A telephone discussion was held with Mr. Terry Brunner, Amtrak (302-429-6371) on May 12, 2000. This discussion concentrated on maintenance of AEM-7 locomotives.

Amtrak is currently converting 30 of the AEM-7 electric locomotives from dc to ac motors with IGBT control. Test operations have indicated that maintenance expense for ac motors will be significantly less than for dc. As an example, Amtrak recently conducted its first 92 day inspection on an ac motored unit. It required only four hours. They anticipate that no additional maintenance will be required until the annual inspection. Given that the type of motor does not affect many requirements of the 92-day inspection, this time seems too short. SEPTA has indicated that the 92 day inspection may be spread over two or three days (40 man-hours, locomotive is not out of service). With installation of the IGBT control and ac motors, the present very high maintenance costs are expected to be greatly reduced although no verifiable figures were available at this time.

In addition to maintenance savings, ac motors are expected to result in substantial reductions in energy consumption. These should have a power factor of 0.8. This will represent a saving of about 20 percent.

Mr. Brunner indicated that he does not feel that Amtrak experience is relevant to commuter operations because of the difference in operating speeds and mileage operated. Amtrak's AEM-7's currently operate 155,000 miles per year. With the institution of electric service between New Haven and Boston, this is expected to rise to 170,000 miles. These locomotives operate at speeds of 125 mph. Many locomotives in commuter service may operate 5,000 to 10,000 miles per year and rarely exceed 79 mph. Higher operating speeds increase running gear maintenance significantly.

Amtrak currently gets about 450,000 miles from wheels. They are rarely turned but are occasionally trued using an underfloor lathe. Truing takes about two hours. The cost of a new AEM-7 wheel is $5,000 (51-1/2 inches diameter) each. Trucks are overhauled each three years (450,000 miles). Cost is about $6,000. The primary maintenance items are the actuators of which there are 16 per truck. Unit cost is $500 each maximum.

Amtrak is evaluating a program to install AEM-7 type trucks under other classes of locomotives. This is to correct problems with excessive flange wear on other types.