Nevertheless, transit systems should note that regardless of their fuel storage requirements reserve storage can be tailor-made to suit their needs.

None of us know what the future holds. We may have a secure fuel supply far into the next decade; on the other hand, we may not. Prudent behavior would indicate a serious look at fuel storage requirements. At Seattle Metro, we not only assessed our needs for fuel storage, but took action. Even in this time of glut, we are glad we did.

REFERENCE

1. Emergency Fuel Reserve Storage Planning: A Guide for Transit Managers. Municipality of Metropolitan Seattle, Seattle, Wash., Jan. 1983.

How Consumers Cope With Transportation Emergencies: The New York and New Jersey Experiences

Joanna M. Brunso

During the last decade the United States faced two energy supply interruptions, both of which were followed by rapidly rising gasoline prices. Although the gasoline shortage was unevenly distributed in both the 1973-1974 and 1979 crises, most parts of the United States were affected to some degree. The New York City area was particularly hard hit in 1979 primarily because of the reliance on foreign imported oil during the crisis. In the 1979 crisis gasoline consumption dropped by 11 percent in the summer (1,2) and traffic dropped by 10 percent. Transit ridership in the New York City urban area increased substantially as consumers faced a shortage of fuel and turned to other modes of transportation to avoid gasoline lines at service stations and to preserve as much mobility as possible.

In the aftermath of the two crises, studies and analyses have been published; energy contingency plans have been prepared, and in some cases, adopted; and rules and regulations have been passed and repealed. A great deal is known about what transit can do in an emergency and for how long (3,4). We know how to establish ridesharing services at various levels of sophistication and in various jurisdictions (5,6). Also we are beginning to understand how consumers respond initially, and over time, to gasoline shortages and rapid increases in gasoline prices (1,7).

The experience of the two oil shortages led Congress to enact the Emergency Energy Conservation Act of 1979 which encouraged the development of statewide plans to deal with future energy shortages. This act was followed by U.S. Department of Transportation (DOT) regulations which directed metropolitan planning organizations (MPOs) to include among their activities contingency plans in the event of disruptions of energy supplies. An assessment of state plans by the New York State Department of Transportation (NYSDOT) (8) and a similar study of urban-area plans by the federal government (9) revealed that these plans were deficient in several respects. Among the deficiencies were the lack of a regional scope that includes all modes, the lack of agreements and coordination concerning the commitment and cooperation of various jurisdictions, the lack of commitment of local funds to implement each aspect of the plans, and the lack of identification of barriers and agreements for the removal of these barriers during a crisis.

In the light of these findings it is instructive to study the ways in which urban areas cope when mobility becomes limited. The strike of two commuter rail lines in New York City and suburban New York and New Jersey is an illustration of a limited emergency. At the time this paper was written, two rail lines were striking concerning work rules, but all bus lines, subways, and PATH lines continued to operate. A third-party vanpool operator, Metropool, was operating in Westchester County and the New Jersey Department of Transportation (NJDOT) was operating an active ridesharing office.

Because there was a 3-month advance warning of the intent to strike, both the Metropolitan Transportation Authority (MTA) and New Jersey Transit were able to develop contingency plans. These plans involved essentially seven components of several possible suggested strategies (Table 1). Detailed information about the seven components of the contingency plans was obtained from telephone interviews with the following persons: Lona Mayer, Supervisor, Transportation Systems Management and Research, Port Authority of New York and New Jersey; Douglas Reilly, Special Projects Manager, Office of Ridesharing, New Jersey Department of Transportation; James Redeker, Manager of Evaluation and Analysis, New Jersey Transit; and Arthur Perfall, Public Relations Officer, Metropolitan Transportation Authority. The seven components include:

1. Flexible work hours (informal, varies with employers),
2. Rail station-based carpool program (New Jersey only),
3. Additional service of existing transit,
4. Refurbish old buses not yet auctioned off,
5. Charter additional buses,
6. Establish additional remote park-and-ride lots, and
7. Public information.

Table 1. Strategies for urban mobility.

Strategy	Immediate Implementation Possible	Long Lead Time	Expensive	Elements of Strike Contingency Plan
Carpool and Vanpool				
Carpool matching services				
Employer based	X			
Community based		Moderate		X
Vanpooling				
Employer based		X	X	
Third party		X	X	
Existing vanpool drivers make two runs	Prior agreement			
Existing vanpools fill empty seats	X			
Fill empty seats with noncompany riders	Prior agreement			
Existing vans cruise by transit stops or stations and take surplus riders	Prior agreement			
Use extra vans for intersuburban jitney service	Prior agreement			
Use company motor pools for carpools	X			X
Parking				
Establish additional park-and-ride lots			X	X
Increase fares	Prior agreement			
Special parking privileges for carpools and vanpools	Prior agreement			
Public Information				X
Tolls				
Reduced tolls for shared rides	Prior agreement			
Flexible working hours				X
Transit				
Additional service on existing lines				
Refurbish older buses		Moderate	X	X
Charter additional buses	X			X
Relax operating standards	X			X

As the plans were developed, the rail stationed-based carpool program was abandoned by New Jersey Transit because of the high cost of developing an additional subroutine for New Jersey's batch ride-share matching program, plus the cost of printing and keypunching the applications. The Westchester County DOT, the Connecticut DOT, and New Jersey Transit established additional remote park-and-ride lots and chartered additional buses to run from the former rail stations to subway lines running into Newark or Manhattan. Additional subway service was instituted and additional traffic agents were employed to keep transit moving smoothly.

Early in the strike it was apparent that though traffic was flowing smoothly, the peak hours of traffic had lengthened. Counts at the bridges and tunnels monitored by the Port Authority indicated that more commuters were traveling into Manhattan between the hours of 6 am and 8 am and somewhat less between 8 am and 9 am (10). This was to be expected as parking was no longer available at the later hours. Ridesharing had increased. To encourage ridesharing the Port Authority made its company fleet available to carpools. Metropool, a third-party ridesharing agency in southwestern Connecticut and Westchester County, received an estimated 30 percent increase in calls during the first few days of the strike. According to Arthur Perfall, Public Relations Officer, Metropolitan Transit Authority, New Jersey Transit estimated that the plans were sufficient to carry the 50,000 plus peak-hour rail commuters as follows:

Mode	No.	Percent
Substitute buses	22,000	44
Existing bus service	5,000	10
Drive by auto	8,000	16
Additional subway passengers (PATH)	13,000	24
Additional Amtrak	3,000	6
Total	51,000	100

Note that this emergency did not include a gasoline shortage; one form of transit was substituted for another. New Jersey Transit was fortunate to have several retired buses that had not yet been auctioned off. There was sufficient fuel to keep existing vehicles running.

In this transportation emergency, transit demonstrated that given time to consider a limited emergency, it can cope extremely well. However, it has now been 4 years since the last fuel shortage and the problems that resulted have dimmed in memory. At the time the gasoline shortage occurred it appeared to develop unevenly and on short notice. A survey of New York State residents in October 1979 (1,7) indicated that where transit exists, people will use it to solve commuting problems and to avoid the use of gasoline in their own cars. To respond to a sudden increase in transit ridership, transit will need to rapidly increase vehicles, service, personnel, and funds. Table 2 gives 15 transit-expansion options (4) 5 of which were adopted during the commuter rail strike. All of these options depend on an adequate supply of fuel for transit. Would transit systems have funds to purchase fuel on the open market? Where would the funds come from?

Note also that in spite of the recent advancement of ridesharing techniques (both New Jersey Ridesharing and Metropool are locally oriented, employer-based services), there are no areawide capabilities to match commuters traveling into the New York City metropolitan areas. Ridesharing components of contingency plans are needed, however, because transit would be strained in a fuel shortage, and it is precisely the suburban commuters affected by the rail strike who are most willing to adopt the ridesharing mode.

Metropool perpetuated a mistaken assumption by residents that its vans would be made available to assist in moving commuters during the strike. This assumption ignored the reality that the vans are contracted by employers and employees. Although

Table 2. Summary of peak-hour capacity–expanding options.

Option	Positive Aspects	Negative Aspects
New transit vehicles	Simplest way to carry more people	Very expensive Time lag up to 2 years Capacity problem in crisis does not justify fleet expansion
Larger transit vehicles	Can increase transit capacity while possibly reducing labor costs	Very expensive May not be cost effective Time lag of up to 2 years Little operating experience
Exclusive lane for high-occupancy vehicles	Works well if existing buses are available and if high-demand corridor exists	Not effective if no extra capacity is available. May be costly Enforcement difficulties
Use of privately owned transit vehicles	Expands capacity without expanding fleet Buses generally compatible for transit service	Availability of buses and cost of leasing unknown
Use of school buses	Expands capacity without expanding fleet	Conflicts with school needs likely School buses not designed for transit use or for adults
Storage and rehabilitation of older buses	Reserve fleet provides considerable flexibility	Needs to be done in advance of a crisis Maintenance needs will be greater Storage space needed
Deferring nonessential maintenance	Can be done immediately. If time between nonessential maintenance checks is increased on the order of 25 percent, serious problems less likely Effective in short run	Negative effects (increased breakdowns and other maintenance problems) accumulated in lengthy crisis Not feasible if spare ratio is already low
Adjusting routes and schedules	Can increase system effectiveness	Reduced service will bring opposition, particularly in crisis Best done in noncrisis situation
Instituting or expanding express bus service	Effective if extra buses are available	Need extra buses to implement High cost
Instituting or expanding demand-responsive services	Can help transit system meet increased demand	Not energy-efficient Administrative problems possible
Changing service standards	Can be done immediately No cost Gives operator time to consider alternatives	Quality of service lowered May not be appropriate for long run
Changing marketing practices	Supporting action	
Using other transportation systems management techniques		Not likely to affect capacity
Variable work hours	By shifting demand, increases peak capacity without cost to operator Increases system effectiveness Works best in dense downtowns with high concentration of public employees	Implementation of large-scale program can be difficult Local factors important in determining success Needs pre-crisis planning
Peak and off-peak fare differential	Can raise revenue if peak fare increased. Fair for uses to pay more for peak service, which costs more to provide	Best implemented in noncrisis. Flat fare system popular because of simplicity

there are interesting possibilities in strategies for mobility using vans, such as asking van drivers to make double runs, filling all seats--even with employees of other firms, and the use of vans during the day for jitney service on intersuburban routes, all of these possibilities require advance agreements with employers, local jurisdictions, transit agencies, and the taxi industry.

With the help of transit and paratransit services, residents of urban areas can and do make adjustments in travel patterns when under duress. Where urban transit and ridesharing services are available they are used, although as time goes by there is a tendency to revert to old travel patterns as consumers purchase fuel-efficient automobiles, share rides for nonwork travel, plan household business trips more efficiently, curtail recreational travel, and make use of other strategies that ensure the conduct of necessary household business. However, many of these strategies have severe economic impacts on entertainment, recreation, and service industries, which ultimately result in an increase in unemployment.

In recent months the price of gasoline has declined and oil producers have cut production in an attempt to stabilize the price. Once again travel is up 2 percent nationwide and there has been a slight increase in the amount of gasoline consumed (11). Energy contingency plans remain incomplete. Plans that were developed to cope with the limited-strike emergency failed to consider modes other than alternative transit. The northeast has twice been stunned by fuel shortages and remains vulnerable for future shortages. Plans must now be made that include comprehensive strategies for all modes of transportation, agreements between public sector agencies as well as between the public and private sectors, and funds must be designated to develop and implement plans.

REFERENCES

1. D.T. Hartgen and A.J. Neveu. The 1979 Energy Crisis: Who Conserved How Much? Preliminary Res. Rept. 173, Planning Division, New York State Department of Transportation, Albany, April 1980.
2. D.T. Hartgen. New York's Perspective on Transportation Energy Contingency Planning. Transportation Analysis Rept. 13, Planning Division, New York State Department of Transportation, Albany, April 1982.
3. D.K. Boyle. Transit Use and Gasoline Shortages. Preliminary Res. Rept. 200, Planning Division,

New York State Department of Transportation, Albany, Oct. 1981.

4. D.K. Boyle. When and How to Increase Peak-Hour Transit Capacity in an Energy Crisis. Transportation Analysis Rept. 14, Planning Division, New York State Department of Transportation, Albany, Aug. 1982.
5. D.T. Hartgen and J.M. Brunso. Neighborhood Ridesharing Demonstration Study Final Report. Transportation Analysis Rept. 6, Planning Division, New York State Department of Transportation, Albany, May 1972.
6. Ridesharing Needs and Requirements: The Role of the Private and Public Sectors. TRB, Special Rept. 193, 1981.
7. A.J. Neveu. The Sensitivity of Work and Non-Work Travel to Energy Shortages or Price Rises. Preliminary Res. Rept. 201, Planning Division, New York State Department of Transportation, Albany, July 1981.
8. M.A. Kocis and M. Fuhrman. Assessment of State Emergency Conservation Planning. TRB, Transportation Research Record 870, 1982.
9. A. Politano. Efficiency of Urban-Area Transportation Contingency Plans: A Study of Completed Plans. TRB, Transportation Research Record 870, 1982.
10. E.J. Lessieu. N.J. Railroad Strike--Alternate Passenger Routing. Interdepartment Memorandum, The Port Authority of New York and New Jersey, New York, March 22, 1983.
11. Traffic Volume Trends. FHWA, U.S. Department of Transportation, Dec. 1982.

Toward Strategies for Calm and Order During an Energy Emergency

Thomas F. Humphrey

The purpose of this paper is to present background information that can be used as the basis for discussion at the workshop titled Strategies for Calm and Order. This background information is based on a project completed in February 1982, by the Massachusetts Institute of Technology Center for Transportation Studies (MIT/CTS) under the sponsorship of the U.S. Department of Energy (DOE).

The purpose of this project was to develop passenger transportation contingency strategies for implementation at the state and local levels to deal with a sudden interruption in the supply of petroleum in the new environment of price decontrol. This new environment was created in January 1981 by the Reagan Administration, and it has led to the need for reevaluating the problems that might occur and the actions that can be taken to deal with those problems.

MIT/CTS work with the DOE began in August 1978 and was first sponsored by the Economic Regulatory Administration and then the Office of Conservation and Solar Application. The main objective of the initial work was to aid the DOE in designing and evaluating mandatory transportation emergency energy contingency plans for implementation on a national basis, in accordance with the provisions of the Energy Policy and Conservation Act of 1975 (EPCA).

The focus of the MIT/CTS work changed somewhat after the enactment of the Emergency Energy Conservation Act of 1979 (EECA) on November 5, 1979. EECA shifted the responsibility for transportation contingency plan preparation to the states, which were asked to develop their own state-level contingency strategies. In addition, the DOE was required to prepare a Standby Federal Emergency Energy Conservation Plan that could be imposed in a particular state if that state did not have its own plan to implement or if its plan did not meet federal targets during an energy emergency. MIT/CTS assisted the DOE in the anslysis of various measures that were considered for inclusion in the Standby Federal Plan. In addition, MIT/CTS prepared technical assistance materials for use by the states and conducted a series of technical workshops for DOE and state energy offices during Fall 1980.

During 1979-1980 MIT/CTS, in a closely related project, also prepared three technical assistance documents for the U.S. Department of Transportation (DOT). These documents provide guidance on transit, paratransit, and ridesharing strategies to deal with energy emergencies in urban areas (1).

The focus of the MIT/CTS work changed once again after the President removed federal price and allocation controls on domestic petroleum supplies by executive order January 28, 1981. In addition to that presidential action, it is also important to note that on September 30, 1981, the Emergency Petroleum Allocation Act of 1973, with its authority for coupon rationing of gasoline, expired and has not been renewed. Consequently, this new environment of decontrol and the absence of standby authority to implement a coupon rationing program has resulted in the need for reevaluating strategies to deal with the impact of a sudden interruption in the supply of petroleum. The MIT/CTS work on this new set of problems began in May 1981 and was completed in February 1982.

CAN ANOTHER SERIOUS PETROLEUM SHORTFALL OCCUR?

Current world circumstances indicate that there is a reasonably high probability that an interruption in the supply of petroleum will occur at some time in the future. The question, then, is not "What if it