

gasoline lines, (d) revenue losses to government (fuel taxes and tolls), and (e) losses to travel and recreation industries.

Such an assessment in advance of a shortage can minimize opposition by those directly affected and can help identify those steps that can relieve some of the hardships created by the emergency measures.

SUMMARY AND CONCLUSIONS

While emergency energy conservation planning is certainly not progressing uniformly throughout the country, the survey noted that a considerable amount of activity is (or at least was) under way. The conflict in the Persian Gulf region, the escalation of prices by the Organization of Petroleum Exporting Countries, and the DOE Emergency Planning Grants have served as the impetus for further planning. However, as conditions change in the demand, supply, and price of fuel, the plans need to be refined to ensure their responsiveness.

Some of the more specific shortcomings of emergency planning to date include the following:

1. Lack of money for plan development and implementation,
2. Inadequate cost estimates of measures,
3. Lack of good coordination with local plans,
4. Lack of evaluations regarding energy savings due to the plans, and
5. No assessment of economic impacts of the measures.

The current redirection of federal policy appears to be toward reliance on an unregulated market to ensure an orderly adjustment to any future interruption in energy supply. States cannot rely on the Federal Gasoline Rationing Plan, the federal standby plan, or EECA regulations for the next shortage. Funding for developing state plans or implementing

them may not be forthcoming. Thus, the onus is on the state to ensure that appropriate measures are evaluated and included in its planning efforts.

REFERENCES

1. State EECA Planning Status Summary of State Responses. National Governors' Assn., Washington, DC, June 2, 1980.
2. Emergency Energy Conservation Programs: Department of Energy Oversight. Committee on Government Operations, U.S. Congress, 22nd Rept., Sept. 26, 1980.
3. T.M. Downs and R.H. McManus. Action Energy Contingency Plans. U.S. Department of Transportation, Memorandum, March 29, 1979.
4. Statement of FHWA Policy on Energy Conservation. FHWA, Notice 55204, March 21, 1980.
5. U.S. Department of Energy. Standby Federal Emergency Energy Conservation Plan. Federal Register, Feb. 7, 1980.
6. U.S. Department of Energy. Federal Register, Feb. 23, 1981.
7. The Department of Energy's Reorganization of Energy Contingency Planning Holds Promise--But Questions Remain. U.S. General Accounting Office, EMD 81-57, March 4, 1981.
8. Transportation Contingency Plans for Future Gas Shortages Will Not Meet Commuter Needs. U.S. General Accounting Office, CED-81-79, July 1, 1981.
9. Local Energy Emergency Operation Plan Guidelines. California Department of Transportation, Sacramento, Aug. 11, 1980.
10. R. Bixby, A. Reno, and T. Corsi. New York State Transportation Energy Contingency Planning. New York State Department of Transportation, Albany, Preliminary Res. Rept. 196, Jan. 1981.

Efficacy of Urban-Area Transportation Contingency Plans: A Study of Completed Plans

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As of October 1981, approximately 93 percent of all urban areas had begun transportation energy contingency plans and 37 percent of all urban areas had completed them. An exploratory study of a sample of completed plans was undertaken in order to understand their ability to be implemented and to suggest improvements that would increase the efficacy of those plans not yet completed. The study relied on the Federal Highway Administration's field resources to collect completed plans. A total of 20 completed plans were studied by the headquarter's staff of the Federal Highway Administration and the Urban Mass Transportation Administration. The sample was chosen randomly, and the population of the corresponding cities ranged from 25 000 to 1 180 000, covering all regions of the country. The summer 1979 energy shortage showed that some plans were implemented well and others were not. Based on these experiences, four elements of completed plans were examined: scope, organization, timing, and efficacy of measures. As a result of the study, it was possible to identify those aspects of a plan that could make it more implementable and effective. The plan would (a) cover an entire urbanized area and all modes, (b) include intergovernmental and interagency agreements concerning responsibility for implementation, (c) identify preimplementation tasks and a mechanism to phase in tasks, and (d) contain provisions to evaluate the potential and appropriateness of a measure and its attendant barriers. It is hoped that these observations will help local areas to improve the quality of transportation energy contingency plans.

On January 28, 1981, President Reagan removed price and allocation controls on U.S. crude oil and refined petroleum products by issuing Executive Order 12287. By eliminating restrictive price and allocation controls, the President sought to encourage conservation of energy through the increase of domestic oil prices.

Consistent with the President's direction, the U.S. Department of Energy (DOE) issued its latest National Energy Policy Plan (1). The policy plan relies on (a) market forces, (b) growth in the Strategic Petroleum Reserve, (c) dual-fuel capability for manufacturers and utilities, (d) increased domestic output, and (e) international coordination in order to ensure emergency preparedness on a national level. These actions will reduce the pressure on local areas to take drastic actions in the event of future energy emergencies. In order to assist local areas to help themselves, a reexami-

nation of urban area experiences with energy contingency planning may prove helpful.

Although the energy shortages of 1973 and 1974 dissipated quickly, they left the federal government and the Congress with a resolve to avoid future hardships resulting from shortages. The first major effort was begun by Congress with the passage of the Energy Policy and Conservation Act of 1975. In it, Congress required the President to submit an energy conservation contingency plan to apply to all states.

The next major effort of Congress was the passage of the Power Plants and Industrial Fuel Act of 1978. In responding to the growing dependence of the U.S. economy on foreign oil and its implications for national security, Congress required the President to issue an executive order that would promote energy conservation among federal agencies and their respective federal-aid programs. The last major effort of Congress was the passage of the Emergency Energy Conservation Act of 1979. This act (a) allowed the President to establish energy conservation targets for federal and state governments, (b) required state governors to submit emergency conservation plans within 45 days of the publication of conservation targets, and (c) directed the President to prepare a Standby Federal Energy Conservation Plan for states whose plans fail to meet conservation targets.

Subsequently, the above actions have undergone some modification. As per the Energy Conservation Act of 1979, the standby federal plan would be implemented in each state if the state were to fail to meet conservation targets set by the President in the time of a shortage. Congress approved a standby rationing plan in December 1979.

Almost independently of the congressional efforts, the Federal Highway Administration (FHWA) and the Urban Mass Transportation Administration (UMTA) on March 29, 1979, issued a joint memorandum to their field staffs, advising that they stress energy contingency planning as a priority planning activity. This memorandum was issued prior to any formal regulation after an examination of oil stocks and consumption demand indicated a potential shortage. In support of the accelerated planning activity, the U.S. Department of Transportation (DOT) amended a DOE contract with the Massachusetts Institute of Technology, requesting the development of appropriate technical information. This resulted in the familiar trilogy of reports entitled Transportation Energy Contingency Strategies (2).

On August 29, 1980, DOT formally issued regulations (Petroleum and Natural Gas Conservation: Federal Transportation Assistance Programs) responding to the requirements of Executive Order 12185. The approach of FHWA and UMTA to this effort was to modify existing regulations. Under Section 450.120(a)(8)(ii)(c) of the regulations, metropolitan planning organizations (MPOs) were asked to include, as necessary, efforts to "respond to short-term disruptions in their energy supply" as part of their planning activities. The role of DOT has been primarily to provide nonprescriptive technical assistance. In order to determine the status of urban energy contingency plans and to suggest improvements that would increase their local effectiveness, FHWA and UMTA embarked on a short-term study of 20 completed contingency plans.

APPROACH

The study approach consisted of four tasks. The first task was to identify a universe of states whose urban areas had completed transportation energy contingency plans. This information was readily available from the December 31, 1980, Pro-

gram Emphasis Area reports of FHWA. For each region, the reports included a state-by-state summary of the number of local contingency plans initiated and completed.

The second task was to select urban areas and to solicit contingency plans. In order to ensure national representation, the sample of urban areas had to be drawn from as many regions as possible and had to reflect a variety of sizes. Of the 21 states that reported completed urban area contingency plans, 10 were randomly selected and supplemented with 4 other states to enlarge regional representation. The states and respective urban areas studied were as follows:

<u>State</u>	<u>Urban Area</u>
Colorado	Denver, Pueblo
Connecticut	Westport, Norwalk
Florida	Gainesville, Miami
Idaho	Boise
Indiana	Indianapolis, Anderson
Louisiana	New Orleans
Minnesota	Minneapolis-St. Paul
Mississippi	Jackson
Missouri	Kansas City, St. Louis
North Carolina	Asheville, Charlotte
Pennsylvania	Allentown
Tennessee	Nashville
Texas	San Antonio
West Virginia	Parkersburg

For each state, two completed plans were selected, when available. The first was selected from a small metropolitan area and the second from a large one. From the combined 14 states, a total of 20 urban areas were selected for the sample.

Once the sample was selected, the next step was to acquire the plans. For this step, the FHWA regional and division offices were most helpful. As necessary, these offices obtained the plans from either the state or the urbanized area.

The fourth and last step in the analysis was to identify the criteria according to which the completed plans would be studied. Experience with energy contingency plans has indicated that most areas made efforts to prepare effective plans. The great majority of plans followed a list of activities suggested in part 1 of the March 1980 report, Transportation Energy Contingency Strategies. This report, prepared by the Massachusetts Institute of Technology, listed activities for urban areas to pursue. Encouraged by the report, most areas undertook a comprehensive planning effort.

Still, areas experienced difficulties in implementing their contingency plans. Consequently, it was decided to concentrate the study on plan implementability, since this was the more pressing concern. The basis for this focus comes from several sources (3;4;5, p. 28), all of which pointed to the need for implementable plans.

The criteria used in the study are listed below:

1. Organization--(a) Identification of agencies responsible for planning and implementing conservation measures and their respective and specific tasks (3,4), (b) interagency agreement specifying implementation responsibilities, measures to be applied, and a single coordinating agency (3,4), (c) intergovernmental agreement among elected officials specifying the nature of support for implementing the contingency plan (3,4), and (d) mechanism to coordinate plans with the state energy office and state transportation agency (5);

2. Process--(a) Inclusion of a mechanism that can phase in measures in order to avoid a crisis (4,5), (b) availability of local funds and resources to

support implementation of contingency measures (4,5), and (c) existence of a process to periodically update plans and suitability of measures (4,5);

3. Scope--Coverage of entire metropolitan area and all modes (4,5); and

4. Measures--(a) Evaluation of a measure's ability to conserve fuel and maintain mobility (3,5), (b) identification and completion of preimplementation tasks for each measure (3-5), (c) measures specifically tailored to the urban area (3,4), and (d) identification and resolution of barriers to the implementation of measures (3-5).

The criteria were combined to form common review materials, which were applied to each of the 20 urban contingency plans. Both UMTA and FHWA headquarters staff participated in the reviews.

RESULTS

As of October 1981, 93 percent of all metropolitan areas had initiated plans. Fifty-five plans have been completed, which represents about 37 percent of all metropolitan areas. The 20 plans used in this analysis, 90 percent of which were prepared after the spring of 1979, were completed between February 1978 and January 1981.

The 20 plans cover a range of cities, from Westport, Connecticut, with a population of 25 000 to New Orleans with a population of 1 180 000. Of all plans used in this study, more than 70 percent came from cities with less than 500 000 population.

The agency that most often prepared the energy contingency plan was the MPO. MPOs completed 55 percent of all plans; transit agencies 20 percent, and cities 15 percent.

The four elements of contingency plans listed earlier--scope of plans, organization, timeliness of measures, and efficacy of measures--are discussed below.

Scope

The plans in the study sample cover the range of modes and areas. Nevertheless, most of the plans cover a single mode, mostly transit-related measures (40 percent), and other modes (15 percent). The remainder (45 percent) cover all modes. Furthermore, most actions cover the public sector (65 percent). The remainder cover both the public and private sectors. In addition, most plans (65 percent) cover all areas; the remainder cover only the central city.

Organization

Of the 20 plans in the study sample, 55 percent indicate neither the agency responsible for coordinating plan implementation nor which agencies are to implement which measures, leaving a doubt about how these plans would be applied.

Most plans that indicate a coordinated implementation approach do it through a metropolitanwide council or commission (20 percent of the entire sample). Other means include a transit authority, an emergency energy coordinator, or a sharing of responsibility based on each agency's expertise.

The existence of formal agreements would eliminate confusion between agencies and speed a coordinated implementation. Yet 90 percent of all plans reviewed have no formal agreements among implementing agencies, 85 percent have no agreements among government agencies, and 75 percent show no coordination between the state transportation and energy offices.

Timeliness of Measures

Of the 20 plans in the study sample, 45 percent explicitly identify preimplementation tasks for energy contingency measures. Description of preimplementation tasks ranges from a brief sentence to a more expanded description. Thirty percent of the plans give some attention to phasing in contingency measures.

Moreover, of the 20 plans studied, only 20 percent have provisions for updating. These facts suggest difficulty with the timely implementation of measures.

Efficacy

Of the 20 plans studied, only 45 percent consider financing in one fashion or another. Two plans provide specific information on the costs to implement measures. The remaining areas plan on seeking funds from metropolitan councils or state or federal governments. Of the 20 plans studied, 40 percent identify sources of funds to implement contingency measures.

It is appropriate to select contingency measures based on specific local and statewide contexts rather than on expected common conditions. To do otherwise would severely limit the public acceptability of a measure and its efficacy. Still, a review of 20 contingency plans shows that only 25 percent of all plans specifically select measures based on local needs. In the remaining cases (75 percent of all plans), areas identify candidate measures for implementation but leave it to others to make a selection. This latter case is a potentially confusing situation.

Of the 20 plans studied, 50 percent consider the energy conservation potential of a measure and 35 percent consider, in general fashion, the ability of a measure to maintain mobility. The approach has been to identify the increase in transit ridership or demand for carpooling and to develop measures to meet increases in demand. The sole emphasis on conservation seems to miss the concern for maintaining mobility. Above all, the concern for people, and thereby mobility, is paramount.

Last, 35 percent of the plans identify barriers to implementation, and 10 percent of the plans discuss ways of overcoming them. This suggests that only a few cities will not face delays in implementing contingency measures.

RECOMMENDATIONS

In 1979, the fuel shortage dissipated so quickly that contingency plans were not fully implemented and in some cases were never implemented (4). Implementation of contingency plans requires preparatory work and coordination. Many competing interests have to be brought together and made to operate cooperatively. In addition, if contingency measures are to be effective locally, they should be evaluated and ready for implementation in advance of a shortage. Only in this way can the impacts of a shortage be abated.

Scope

For contingency plans to be truly comprehensive and evenhanded, it would seem desirable to develop contingency plans that cover a broad range of locations and modes. Intrasuburban travel, private-sector participation, and automobile-related measures are more often neglected. These are lost opportunities for addressing emergency circumstances at the local level.

An example of comprehensive energy contingency plans covering the entire region can typically be found in plans prepared by MPOs (approximately 55 percent of sample plans). A good example of a comprehensive plan is the one developed for the Kansas City Metropolitan Region by the Mid-American Regional Council (MARC), the MPO (6). MARC covers eight counties and three cities in the Kansas City area.

With few exceptions, the focus of most plans is on the work trip, ostensibly because it is identifiable and repetitive. Yet some measure could be applied to nonwork trips. Non-work-oriented measures, taken from the Miami contingency plan (7), have included (a) voluntary driveless days, (b) reducing travel through telecommunication, (c) reducing or combining discretionary trips, and (d) bicycle transportation incentives. Some thought regarding the use of measures, focusing on nonwork trips and intrasuburban trips, appears necessary.

Organization

Unless institutional roles are decided and organizational planning is completed in advance of an emergency, local areas will lose valuable time that could be better used to phase in measures. Appropriately, then, a major task of contingency planning could be to identify the jurisdiction or the agency that should act in a crisis and to get it to acknowledge responsibility. To do this, key elected officials should be made aware of the important and potential benefit of contingency planning and should agree to provide appropriate action in an emergency.

With the help of interagency agreements between implementing agencies and intergovernmental agreements between local jurisdictions, the structure and context for implementing measures are set. Rather than being a stumbling block, interaction between agencies and governments could be used to develop complementary responses to a shortage.

To be effective at the local level, interagency agreements may have to identify (a) the lead coordinating agency, (b) participating agencies, (c) responsibility for implementing measures, (d) responsibility for coordinating implementation, and (e) measures to be applied. Similarly, intergovernmental agreements may include (a) support for implementing designated measures in a jurisdiction and (b) commitment to implement measures as required or indicated by the lead coordinating agency or in some other manner. However, many elements in an agreement will depend on the complexity of transportation issues in each local area.

Timing of Measures

During the 1979 shortage, calls for assistance flooded the ridesharing agencies and, because of insufficient staff, agencies were slow in responding. Similarly, calls for transit information were overloading existing lines. Agencies were often too late to react and with too little effort (4).

For all energy contingency measures, a need exists to identify and accomplish preimplementation tasks if the measures are to be implemented smoothly and if the implementation is to abate the shortage. In addition, once contingency measures have been identified, they should be periodically reviewed to ensure that the plans are consistent with current circumstances. The events of the 1979 energy shortage showed that those areas that implemented energy contingency measures in advance of the shortage could cope better. In the Dallas-Fort Worth area, local energy coordinators were already in place prior to the fuel shortage and were very effective

in keeping the general public and local governments informed (4).

Timeliness is a plan's relevancy to current conditions. Alternatively, we might ask, How current is it? The justification for updating plans periodically is understandable. The external assumptions with which contingency plans are prepared change. Unless the plan and the measures reflect the change, implementation, at best, will not benefit the area and, at worst, will be a waste of time. From the plans studied, an update may be indicated every third year or on an as-needed basis.

Efficacy

A U.S. General Accounting Office report (5) found that the issue of funding is likely to be a constraint on the effectiveness of local response to an energy shortage. Judging by the austerity of the national economy, cities can best meet the expenses by exploring local sources of financing in advance of a shortage. Some options have included preprogramming of funds, as in Kansas City, Missouri, or establishing a contingency fund, as in Norwalk, Connecticut. In any case, local areas could identify needed funds and budget an equivalent amount for use in the event of an emergency. Expenses may include hiring additional staff and extra overtime costs.

A study from the Office of the Secretary of Transportation (4) found that several transit properties could not meet the surge in demand in spite of the fact that they had prepared for a shortage by rehabilitating and placing old buses in service. In other cases, a shortage of vans and personnel existed. Consequently, the surge in demand could not be met by the contingency measure taken. These difficulties raise a question as to whether measures are evaluated for their ability to maintain mobility in addition to their ability to conserve energy. Moreover, one could question whether measures were specifically chosen to meet the area's needs.

The purpose of a contingency plan is to provide for basic mobility and public safety during an emergency situation. Therefore, the ability of each selected measure to maintain mobility should be known. In this way, a local area can determine whether a measure can alleviate the situation by itself or whether other measures are needed. Furthermore, it is important to know at what intensity a measure will be implemented. Only by knowing the potential of a measure to maintain mobility can an area determine how intensively a measure should be applied.

In some cases, even though appropriate measures were selected and implemented, barriers reduced the effectiveness of a measure. In 1979, for example, the use of school buses was hampered by constraints on vehicle design, the fact that school hours coincided with the peak morning travel period, etc. Common sense suggests that ways of overcoming barriers to the implementation of any measure should be considered and acted on before a shortage occurs.

CONCLUSIONS

Since the March 29, 1979, memorandum on energy contingency planning, the U.S. oil picture has changed. In 1979, gasoline consumption exceeded production. Since December 1980, the opposite has been true (8). As recently as June 1981, the Lundberg Letter reported that "high gasoline stocks are still with us" (9).

On the international level, any interruption in supply, deliberate or otherwise, could change this situation suddenly and radically. It is unclear

whether world petroleum supplies will tighten with other Middle Eastern conflicts. If so, supplies could be tight and the familiar shortages, lines, and price increases could recur. On the national level, any number of possible scenarios may affect the availability of fuels and consequently may disrupt transportation. These scenarios may include severe winter weather, natural disaster, transit strikes or work stoppages, increased consumer demand, changes in the price of crude oil, and others. Since the demand-supply balance is tenuous and since both international and national events cannot be predicted with certainty, local self-interest would suggest a review of the implementability of an urban plan with respect to maintaining mobility under any of the above scenarios.

The most recent federal action to avoid shortages was taken on January 28, 1981, with the decontrol of crude oil and petroleum products. In this case, the market is the allocation mechanism, since the price is allowed to rise to the market-clearing level. The price reduces the demand for gasoline to the level of the supply available; very simply, as prices increase the gallons consumed decrease. Some research indicates that a 1 percent shortage in gasoline will result in a 5 percent increase in price (10).

Since the marketplace allocates gasoline according to what the buyer will bear, there are other issues of equity and costs that may have to be considered. Certain segments of the population may be affected more than others. A contingency plan may begin to consider these issues also.

Although decontrol of oil and petroleum products may lead to less concern about gasoline consumption in urban areas, the implementability of their plans may still be a concern because of the possible emergencies listed in this paper. The one that has been occurring with increasing frequency is the transit strike. A noteworthy example is the New York strike of April 1980, in which all bus and subway services stopped for 11 days. Since a contingency plan had been prepared in advance of the strike, public agencies were able to coordinate their efforts and maintain mobility and public safety. Thus, a contingency plan was able to alleviate the adverse effects of the strike.

Based on this study of 20 contingency plans, more emphasis on plan implementation appears necessary to make the plans effective in meeting local mobility needs. The following tasks seem particularly useful:

1. Increase the scope of plans to include all modes on a regional basis, including, where appropriate, the private as well as the public sector.
2. Develop interagency agreements or memoranda of understanding that specify each jurisdiction's commitment and cooperation in implementing the regional contingency plan.
3. Develop a monitoring mechanism that can be used to signal an energy shortage in an area.
4. Identify and complete preimplementation tasks.
5. Update energy contingency plans and measures to reflect the existing situation, perhaps every 3 years or as necessary.
6. Identify and commit local sources of funds to support implementation of the plan.
7. Evaluate each measure for its appropriateness to each area, its potential effectiveness in bring-

ing about the desired mobility and conservation levels, and its potential impact.

8. Identify obstacles to implementing measures and develop appropriate solutions.

If these tasks are completed, it is likely that urbanized areas will be prepared for dealing with an energy shortage. The eight tasks listed above require considerable effort. It appears appropriate for local governments to take the lead in preparing, implementing, and financing local contingency plans. Since local governments would be closest to the effects of a shortage, they are in the best position to prepare specific measures for abating the effects of a shortage. By taking the lead, they will also have the flexibility to prepare a plan that is sensitive to their own needs. To supplement local efforts, the federal role will likely be one of providing nonprescriptive technical assistance on an as-needed basis.

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REFERENCES

1. Securing America's Energy Future: The National Energy Policy Plan. U.S. Government Printing Office, July 1981, pp. 13, 14.
2. Massachusetts Institute of Technology. Transportation Energy Contingency Strategies: Parts 1-3. FHWA and UMTA, March 1980.
3. Considerations in Transportation Energy Contingency Planning. TRB, Special Rept. 191, 1980.
4. Peat, Marwick, Mitchell and Company. Federal, State, and Local Responses to 1979 Fuel Shortages. Office of the Secretary of Transportation, draft, Jan. 1981, pp. II-2, II-5, II-7.
5. Contingency Planning Is Inadequate to Meet Commuter Transportation Needs During Future Gasoline Shortages. U.S. General Accounting Office, July 1981.
6. Transportation Energy Contingency Plan. Mid-American Regional Council, Kansas City, MO, Feb. 1980.
7. Contingency Action Plan for Transportation Energy Conservation. Metropolitan Planning Organization, Miami, FL, Feb. 1980.
8. D. Lundberg. Gasoline Shortage: The Beginning of the End. Lundberg Letter, North Hollywood, CA, Vol. 7, No. 19, March 7, 1980.
9. D. Lundberg. The Texture of Competition. Lundberg Letter, North Hollywood, CA, Vol. 8, No. 32, June 12, 1981.
10. T.J. Tardiff, J.L. Benham, and S. Greene. Methods for Analyzing Fuel Supply Limitations on Passenger Travel. NCHRP, Rept. 229, Dec. 1980.