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Economic Analysis

Standby Conservation Plan No. 1: Emergency Weekend Gasoline Sales Restrictions.

February 1979

U.S. Department of Energy
Economic Regulatory Administration
Office of Regulations and Emergency Planning

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U.S. Department of Energy
Economic Regulatory Administration
Office of Regulations and Emergency Planning
Washington, D.C.

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SUMMARY

PURPOSE

The Emergency Weekend Gasoline Sales Restrictions Plan was developed pursuant to the Energy Policy and Conservation Act (P.L. 94-163) for use in the event of a petroleum supply interruption or to satisfy the obligations of the United States under the International Energy Program. The purpose of this report is to identify and analyze, to the extent practicable, the potential economic impacts of the plan.

DESCRIPTION OF PLAN

The Emergency Weekend Gasoline Sales Restrictions Plan has been designed to conserve gasoline and diesel fuel normally used for social and recreational purposes. The plan would authorize the Secretary of Energy to impose restrictions on the retail sale of motor fuels during weekend hours, defined as Friday noon to Sunday midnight. Only certain types of commercial vehicles and emergency vehicles could purchase fuel during these hours.

The implementation of the measure is examined relative to a baseline economy characterized by a 15 percent petroleum shortfall. It is estimated that the measure would save 246,000 barrels per day of motor fuels, principally gasoline. Because the saved fuel can be made available to other sectors of the economy that are less petroleum intensive, it is

projected that GNP would rise by approximately \$7 billion as a result of the measure. The impact of the measure would vary sharply from one sector of the economy to another, however, with some industries experiencing losses in revenue.

The cost of imposing the measure is preliminarily estimated at \$5.2 million for nine months.

TABLE OF CONTENTS

	<u>Page</u>
SUMMARY	i
1.0 INTRODUCTION	1.1
1.1 PURPOSE OF THIS STUDY	1.1
1.2 APPROACH	1.2
1.3 THE WEEKEND GASOLINE SALES RESTRICTIONS PLAN	1.2
2.0 ESTIMATED FUEL SAVINGS	2.1
2.1 GASOLINE AND VMT DISTRIBUTION IN A NORMAL ECONOMY	2.1
2.2 CHANGES IN DRIVING PATTERNS	2.4
2.3 HOUSEHOLD GASOLINE CONSUMPTION WITH A FUEL SHORTFALL	2.6
2.4 GASOLINE DEMAND REDUCTIONS UNDER THE WEEKEND GASOLINE RESTRICTIONS	2.8
2.4.1 Automobile Fuel Consumption	2.8
2.4.2 Pleasure Boats	2.11
2.4.3 Private Aircraft	2.11
2.4.4 Summary of Total Potential Reduction	2.12
3.0 NATIONAL ECONOMIC IMPACTS	3.1
4.0 SIGNIFICANT SECTORAL IMPACTS	4.1
4.1 IMPACTS OF A SUPPLY INTERRUPTION ON INDIVIDUAL SECTORS	4.1
4.1.1 Inference 1	4.2
4.1.2 Inference 2	4.5
4.1.3 Inference 3	4.5
4.1.4 Inference 4	4.5

4.2	INCREMENTAL IMPACTS OF THE WEEKEND GASOLINE SALES RESTRICTIONS PLAN ON THE "TRAVEL" INDUSTRY	4.6
4.2.1	Impacts on Commercial Lodging Industry	4.7
4.2.2	Impact on the Restaurant Industry	4.9
4.2.3	Recreation and Entertainment	4.10
4.2.4	Incidental Travel Expenditures	4.17
4.2.5	Transportation Related Studies	4.18
4.3	TRAVEL-RELATED DURABLE GOODS	4.20
4.3.1	Automotive Sales	4.20
4.3.2	Recreational Vehicles	4.21
4.3.3	Pleasure Boats	4.22
4.3.4	Impact on Sales of Private Aircraft	4.23
4.3.5	Summary of Affected Industries	4.23
4.3.6	Offsetting Gains	4.25
5.0	PROJECTED STATE AND REGIONAL IMPACTS	5.1
5.1	PROJECTED IMPACTS OF A 1980-1981 SUPPLY INTERRUPTION	5.1
5.1.1	Regional Manufacturing Employment	5.1
5.2	INCREMENTAL STATE AND REGIONAL IMPACTS OF THE WEEKEND SALES RESTRICTIONS PLAN	5.6
5.2.1	Impacts on State Motor Fuel, Automotive and Highway Use Receipts	5.6
5.2.2	State and Regional Economic Impacts	5.6
6.0	FEDERAL COSTS	6.1

APPENDIX A:	DETAILED CALCULATIONS OF MAJOR INDUSTRY IMPACTS	. . .	A.1
A.1	NEW AUTOMOBILE SALES	. . .	A.1
A.2	IMPACTS ON HOTEL-MOTEL INDUSTRY	. . .	A.2
A.3	IMPACT ON CAMPGROUNDS AND TRAILER PARKS	. . .	A.2
A.4	IMPACT ON RESTAURANT INDUSTRY	. . .	A.3
A.5	IMPACT ON EXPENDITURES FOR ENTERTAINMENT AND INCIDENTALS	. . .	A.4

EXHIBITS

	<u>Page</u>
2.1 Distribution of Household VMT by Trip Purpose and Day of the Week 1980-1981 Normal Economy (Billions of VMT)	2.2
2.2 Distribution of Household Gasoline Consumption by Trip Purpose and Day of the Week 1980-1981 Normal Economy (Billions of Gallons)	2.2
2.3 Computation of Market Clearing Price for Gasoline in a 20 Percent Shortfall (per gallon)	2.3
2.4 Distribution of Household VMT by Trip Purpose and Day of the Week 1980-1981 Interrupted Economy (Billions of VMT)	2.6
2.5 Distribution of Household Gasoline Consumption by Trip Purpose and Day of the Week 1980-1981 Interrupted Economy (Billions of Gallons)	2.7
2.6 Household Automobile Gasoline Demand Reduction from Weekend Sales Restrictions (Billions of Gallons per Year)	2.9
4.1 Most Affected Industries as Estimated by Various Embargo Studies	4.3
4.2 Summary of Embargo Studies	4.4
4.3 1972 Amusement Industry Revenues	4.16
4.4 Revenue Losses of Affected Industries as the Result of Restriction of Weekend Gasoline Distribution	4.24
5.1 <u>Manufacturing and Nonagricultural Employment by Region, 5-Quarter Embargo Average (1980-1981)</u> (Thousands of People)	5.3
5.2 Relative Importance of Travel-Generated Tax Revenues	5.7

1.0 INTRODUCTION

1.1 PURPOSE OF THIS STUDY

The Weekend Gasoline Sales Restrictions Plan, developed pursuant to the Energy Policy and Conservation Act (Public Law 94-163), is intended to be implemented in the event of a petroleum supply interruption or to satisfy the obligations of the United States under the International Energy Program. The principal purpose of this study is to identify and evaluate the economic impacts of the plan in accordance with Section 201(f) of EPCA. Section 201(f) specifies that the conservation plan shall, to the extent practicable, be accompanied by an evaluation of the potential economic impacts of the plan, including analysis of:

1. any effects of the plan on
 - (a) vital industrial sectors of the economy,
 - (b) employment (on a national and regional basis),
 - (c) the economic vitality of states and regional areas,
 - (d) the availability and price of consumer goods and services,
 - (e) the gross national product; and
2. any potential anticompetitive effects.

1.2 APPROACH

The fuel savings resulting from the plan and the economic impacts of the plan are both estimated relative to a baseline characterized by the U.S. economy in 1980-81, experiencing a hypothesized 15 percent interruption in the availability of petroleum. It is assumed that petroleum allocation and price controls are in effect and that, because of shifts in the refinery mix, the shortfall amounts to 20 percent for gasoline and correspondingly less for other petroleum products. The study makes a sharp distinction between the effects of the shortfall and of implementing the weekend restrictions measure.

If the plan were to be implemented in a less severe petroleum shortfall, the fuel savings would be substantially greater but the economic impacts would be less favorable.

1.3 THE WEEKEND GASOLINE SALES RESTRICTIONS PLAN

The purpose of the weekend gasoline sales distribution restrictions plan is to significantly reduce the consumption of fuel for discretionary purposes without severely restricting commerce or necessary health and safety activities. To carry out this objective, retail gasoline outlets, including those that sell marine fuel and aviation gasoline, will be authorized to distribute gasoline and diesel fuel only to certain types of commercial and emergency vehicles during the weekend hours specified by the Department of Energy (DOE).

During the weekend hours between Friday noon and Sunday midnight, retail filling station operators would be authorized to sell diesel fuel to all trucks. They could also sell gasoline to single unit and combination trucks which have (1) six tires or more and/or (2) a gross vehicle weight rating of at least 10,000 pounds. Other vehicles for which gasoline and diesel fuel could be distributed are:

- ° emergency vehicles,
- ° vehicles which are registered as common carriers with the ICC or which are certified pursuant to ICC regulations,
- ° taxicabs, limousines, buses and other commercial passenger carriers for hire,
- ° commercial marine craft,
- ° heavy construction and farm equipment,
- ° emergency utility vehicles, and
- ° emergency production vehicles.

STANDBY ENERGY CONSERVATION
PLAN NO. 1
EMERGENCY WEEKEND GASOLINE SALES RESTRICTIONS
ECONOMIC ANALYSIS

February 1979

U.S. Department of Energy
Economic Regulatory Administration
Office of Regulations and Emergency Planning
Washington, D.C.

2.0 ESTIMATED FUEL SAVINGS

This chapter provides estimates of the savings in highway fuel, marine fuel, and aviation gasoline that would be obtained from implementing the weekend restrictions on sales of gasoline and diesel fuel. Most of the savings is obtained from the anticipated cutback in highway driving and virtually all of this is motor gasoline. Only one percent of the highway motor fuel projected to be saved is diesel fuel. For ease of exposition, therefore, this report uses the term "gasoline" to include all motor fuel for highway use.

2.1 GASOLINE AND VMT DISTRIBUTION IN A NORMAL ECONOMY

Exhibit 2.1 shows a breakdown of vehicle miles traveled (VMT) in a normal 1981 economy. The 1981 total of approximately 1.3 trillion vehicle miles was taken from a current study being prepared by Jack Faucett Associates for the DOE. The pattern of vehicle miles is assumed to be the same as that in the last Nationwide Personal Transportation Study (NPTS) conducted in 1969-1970. These percentages, by purpose and day of the week, are relative to total vehicle miles and are shown in parentheses.

The breakdowns of vehicle miles by length of trip within the social and recreational category are more uncertain. Data from both the NPTS and the National Travel Survey relating to the distribution of trips by mileage intervals were used as starting points.

EXHIBIT 2.1 Distribution of Household VMT by Trip Purpose
and Day of the Week 1980-1981 Normal Economy
Billions of VMT

	<u>M</u>	<u>T</u>	<u>W</u>	<u>Th</u>	<u>F</u>	<u>Sat</u>	<u>Sun</u>	<u>Total</u>
Earning a Living	95.41	94.28	93.14	95.79	85.95	35.09	16.28	515.9
Subtotal	(7.56%)	(7.47%)	(7.38%)	(7.59%)	(6.81%)	(2.78%)	(1.29%)	(40.9%)
Family Business, Educational, Civic and Religious.	41.27	43.42	43.29	48.59	45.31	47.96	35.72	305.6
Subtotal	(3.27%)	(3.44%)	(3.43%)	(3.85%)	(3.59%)	(3.80%)	(2.83%)	(24.2%)
Social, Recreational and other:								
Subtotal	33.70	41.52	35.21	39.76	56.79	108.79	124.70	440.5
	(2.67%)	(3.29%)	(2.79%)	(3.15%)	(4.50%)	(8.62%)	(9.88%)	(34.9%)
Trip Length 0-99 (one-way)	23.30	23.30	23.30	23.30	34.45	67.14	80.02	274.8
	(1.85%)	(1.85%)	(1.85%)	(1.85%)	(2.73%)	(5.32%)	(6.34%)	(21.8%)
100+	10.40	18.22	11.91	16.46	22.34	41.65	44.68	165.7
	(0.85%)	(1.44%)	(0.95%)	(1.30%)	(1.77%)	(3.30%)	(3.54%)	(13.1%)
Total	170.38	179.22	171.64	184.14	188.05	191.84	176.70	1262.1
	(13.5%)	(14.2%)	(13.6%)	(14.6%)	(14.9%)	(15.2%)	(14.0%)	(100.0%)

Source: U.S. Department of Transportation Federal Highway Administration, Nationwide Personal Transportation Study Report No. 19, 1974. See Appendix B.

Exhibit 2.2 shows the corresponding distribution of gasoline consumption. A 1981 projected mile-per-person figure of 16.5 is used to derive a control total of 76.5 billion gallons. Automobiles used for trips in excess of 100 miles would ordinarily obtain better gasoline mileage. Therefore, these trips were assumed to achieve a 25 percent increase in fuel economy.

EXHIBIT 2.2 Distribution of Household Gasoline Consumption
by Trip Purpose and Day of the Week 1980-1981
Normal Economy (Billions of Gallons)

	<u>M</u>	<u>T</u>	<u>W</u>	<u>Th</u>	<u>F</u>	<u>Sat</u>	<u>Sun</u>	<u>Total</u>
Earning a Living	5.96	5.89	5.82	5.99	5.37	2.19	1.02	32.2
Subtotal	(7.79%)	(7.70%)	(7.61%)	(7.83%)	(7.02%)	(2.86%)	(1.33%)	(42.1%)
Family Business, Educational, Civic and Religious	2.58	2.71	2.71	3.04	2.83	3.00	2.23	19.1
Subtotal	(3.37%)	(3.54%)	(3.54%)	(3.97%)	(3.70%)	(3.92%)	(2.92%)	(25.0%)
Social, Recreational and Other:								
Subtotal	1.82	2.24	1.90	2.15	3.33	6.38	7.35	25.2
	(2.38%)	(2.93%)	(2.48%)	(2.81%)	(4.35%)	(8.34%)	(9.61%)	(32.9%)
Trip Length 0-99 (one-way)	1.46	1.46	1.46	1.46	2.15	4.19	5.00	17.2
	(1.91%)	(1.91%)	(1.91%)	(1.91%)	(2.81%)	(5.48%)	(6.54%)	(22.5%)
100+	.36	.78	.44	.69	1.18	2.19	2.35	8.0
	(.47%)	(1.02%)	(.57%)	(.90%)	(1.54%)	(2.86%)	(3.07%)	(10.4%)
Total	10.36	10.84	10.43	11.18	11.53	11.57	10.60	76.5
	(13.5%)	(14.2%)	(13.6%)	(14.6%)	(15.1%)	(15.1%)	(13.9%)	(100.0%)

Source: U.S. Department of Transportation Federal Highway Administration, Nationwide Personal Transportation Study Report No. 19, 1974. See Appendix B.

2.2 CHANGES IN DRIVING PATTERNS IN A FUEL SHORTFALL

A supply interruption of petroleum will lead to a higher "price" for gasoline, either in terms of price at the pump or time spent in queues at retail gasoline stations. The higher price can be expected to cause consumers to reallocate their gasoline consumption to more highly valued uses.

Assume first that the price of gasoline is allowed to rise to its market clearing level. Exhibit 2.3 calculates the estimated market price of gasoline to be \$1.75 assuming a 20 percent shortage.

In computing the free market price, an assumed short-run demand elasticity of -0.15 is used. This estimate is consistent with a number of econometric studies that have been published

EXHIBIT 2.3 Computation of Market Clearing Price for Gasoline in a Shortfall (per gallon)

Assumed Quantities

E -- Elasticity of Demand	-0.15
$\frac{\Delta Q}{Q}$ -- Assumed % Change in Consumption (a)	-20%
P ₁ -- Initial Pre-shortfall Price per Gallon (1980 dollars)	\$0.75

Unknown

P₂ -- Market Price per Gallon in the Absence of Price Controls

Defined Relation

$$E = \frac{\Delta Q}{Q} \div \frac{P_2 - P_1}{P_1}$$

Result

$$P_2 = \$1.75$$

(a) Given a 15% petroleum supply interruption, DOE has assumed that refineries would tend to lower their output of gasoline relative to other petroleum products. This would result in a 20% gasoline shortfall.

in the last four years. ⁽¹⁾ The -0.15 figure is treated as an arc elasticity rather than a point elasticity. That is, 0.15 is assumed to be the ratio of the percentage change in quantity to the percentage change in price for a single large change in the price or quantity.

There is little empirical information on demand elasticities for gasoline by various trip purposes. However, most observers would agree that work trips show the least responsiveness to gasoline price changes in the short run. It is assumed, for illustrative purposes, that the price elasticity for work trips is one-third that for nonwork trips. Under such an assumption, gasoline consumed for social, recreational, and personal business trips falls by 28 percent in the hypothesized shortfall and fuel consumption for work trips falls by only nine percent.

In a situation where market prices are not allowed to rise, the allocation of gasoline between work and nonwork trips would be roughly the same. In this case, the "rationing" function would be performed primarily by waiting in lines at gasoline service stations rather than by a higher fuel price. However, some degree of black market activity would surely arise as some consumers would pay a higher effective price in the form of bribes, favors, and tied sales (gasoline sold at unpublicized

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1. John Kraft and Mark Rodekohr, "Regional Demand for Gasoline; A Temporal Cross-Section and Specification," Journal of Regional Science, 18(1), 1978. Page 53 of this article lists 10 recent studies of automobile gasoline demand.

hours with purchases of, for example, batteries or tires). In any event, the money and implicit time costs per gallon would be an estimated \$1.75 per gallon in a 20 percent gasoline shortfall.

2.3 HOUSEHOLD GASOLINE CONSUMPTION WITH A FUEL SHORTFALL

The shortfall scenario breakdown of vehicle miles traveled (VMT) and gallons consumed are shown in Exhibits 2.4 and 2.5 respectively. The procedure used to obtain these results is the same as that described above. All categories of nonwork trips were reduced by the same percentage (27.9 percent). There is no empirical evidence to indicate which types of nonwork driving would be most likely cut back the most.

EXHIBIT 2.4 Distribution of Household VMT by Trip Purpose and Day of the Week 1980-1981 Interrupted Economy (Billions of VMT)

	M	T	W	TH	F	Sat	Sun	Total
Earning a Living	86.56	85.44	84.48	86.88	77.92	31.84	14.88	468.0
Subtotal	(8.57%)	(8.46%)	(8.37%)	(8.60%)	(7.72%)	(3.15%)	(1.47%)	(46.3%)
Family Business Educational, Civic and Religious	29.76	31.36	31.36	35.04	32.64	34.72	25.76	220.6
Subtotal	(2.95%)	(3.11%)	(3.11%)	(3.47%)	(3.23%)	(3.44%)	(2.55%)	(21.9%)
Social, Recreational and Other:	24.99	30.68	25.70	29.46	41.28	78.85	90.14	321.1
Subtotal	(2.47%)	(3.03%)	(2.54%)	(2.91%)	(4.09%)	(7.81%)	(8.93%)	(31.8%)
Trip Length 0-99 (one-way)	16.80	16.80	16.80	16.80	24.80	48.48	57.76	198.2
	(1.66%)	(1.66%)	(1.66%)	(1.66%)	(2.46%)	(4.80%)	(5.72%)	(19.6%)
100+	8.19	13.88	8.90	12.66	16.48	30.37	32.28	122.9
	(.81%)	(1.37%)	(.88%)	(1.25%)	(1.63%)	(3.01%)	(3.21%)	(12.2%)
Total	141.11	147.48	141.54	151.58	151.84	145.41	130.78	1009.7
	(14.0%)	(14.6%)	(14.0%)	(15.0%)	(15.0%)	(14.4%)	(13.0%)	(100.0%)

Source: U.S. Department of Transportation Federal Highway Administration, Nationwide Personal Transportation Study Report No. 10, 1974. See Appendix B.

EXHIBIT 2.5 Distribution of Household Gasoline Consumption
by Trip Purpose and Day of the Week 1980-1981
Interrupted Economy (Billions of Gallons)

	M	T	W	Th	F	Sat	Sun	Total
Earning a Living	5.41	5.34	5.28	5.43	4.87	1.99	.93	29.2
Subtotal	(8.84%)	(8.73%)	(8.63%)	(8.87%)	(7.96%)	(3.25%)	(1.52%)	(47.8%)
Family Business Educational, Civic and Religious	1.86	1.96	1.96	2.19	2.04	2.17	1.61	13.8
Subtotal	(3.04%)	(3.20%)	(3.20%)	(3.58%)	(3.33%)	(3.55%)	(2.63%)	(22.5%)
Social, Recreational and Other:	1.31	1.62	1.37	1.55	2.40	4.61	5.31	18.2
Subtotal	(2.14%)	(2.65%)	(2.24%)	(2.53%)	(3.92%)	(7.53%)	(8.68%)	(29.7%)
Trip Length 0-99 (one-way)	1.05	1.05	1.05	1.05	1.55	3.03	3.61	12.4
	(1.72%)	(1.72%)	(1.72%)	(1.72%)	(2.53%)	(4.95%)	(5.90%)	(20.3%)
100+	.26	.57	.32	.50	.85	1.58	1.70	9.4
	(.42%)	(.93%)	(.52%)	(.81%)	(1.39%)	(2.58%)	(2.78%)	(5.78%)
Total	8.58	8.92	8.61	9.17	9.31	8.77	7.85	61.2
	(14.0%)	(14.6%)	(14.1%)	(15.0%)	(15.2%)	(14.3%)	(12.8%)	(100.0%)

Source: U.S. Department of Transportation Federal Highway Administration, Nationwide Personal Transportation Study Report No. 10, 1974. See Appendix B.

No mention, thus far, has been made of probable behavior on the part of retail gasoline station operators. In the 1973-1974 embargo, weekend travel was inhibited by the closure of the majority of stations on Saturdays and especially Sundays. In tourist areas, such behavior on the part of operators would probably diminish the longer the interruption continued. One would expect the market to produce a variety of arrangements by which gasoline would at least be made available to some weekend travelers to recreational and tourist areas. Various sorts of arrangements were beginning to emerge toward the end of the 1974 embargo period and their reemergence in any future shortfall would, likely occur more rapidly.⁽²⁾

2. Impact of the United States Energy Policy on the Tourism Industry, U.S. Department of Commerce, U.S. Travel Service, pp. 15-16, 1975.

2.4 GASOLINE DEMAND REDUCTIONS UNDER THE WEEKEND GASOLINE RESTRICTIONS

2.4.1 Automobile Fuel Consumption

A basic assumption in the present report is that nearly all weekend round trips for social and recreational purposes in excess of 300 miles would be eliminated as a result of the plan. Trips over 300 miles are generally outside the range of a full tank of gas for most automobiles in the U.S. For trips less than 300 miles, it would be reasonable to expect that longer trips would be curtailed more than shorter trips. Most motorists would desire to maintain a precautionary reserve of fuel for essential purposes, including work, emergencies, etc. Uncertainty as to the availability of emergency repair services, such as changing of flat tires and towing, would also serve to discourage weekend driving. These considerations would become stronger in a motorist's decision-making process in relation to the length of the planned trip. The assumption in this report is that perhaps only 10 percent of driving on very short trips (less than 50 miles one-way) would be eliminated by the plan. Percentage reductions for trips between 50 and 150 miles are assumed to increase in a linear fashion from 10 percent to 100 percent. All reductions are assumed to occur in the category of Social and Recreational Driving.

Column (2) of Exhibit 2.6 summarizes the potential reductions relative to the shortfall scenario for trips of various lengths. The numbers in parentheses represent the percentage reductions that are assumed.

As a result of the plan, motorists are likely to shift both to trips on weekdays and to shorter trips. Assumed effects of these two offsetting factors are shown in Columns (3) and (4) of Exhibit 2.6. It is difficult to estimate the tendency to shift social and recreational driving to weekdays. It is unlikely that the VMT shift would be greater than 20 percent, without significant time away from jobs.

EXHIBIT 2.6 Household Automobile Gasoline Demand Reduction from Weekend Sales Restrictions (Billions of Gallons per Year) (1)

Trip Length (One-Way)	(1) Social & Recreational Weekend Gasoline Consumption- Interrupted Economy		(2) Gross Impact(2)	(3) Weekday Offset(3)	(4) Trip Offset(4)	(5) Net Reduction (5)
0-19	3.378		-.338 (10%)	+.068		-.270
20-49	2.781		-.279 (10%)	+.056		-.223
50-99	2.001		-.667 (-32.5%)	+.130	+.347	-.173
100-149	1.004		-.778 (-77.5%)	+.156	+.249	-.373
150-299	1.646		-1.646 (-100%)	+.329	+.299	-1.018
300+	1.499		-1.499 (-100%)	+.300	+.122	1.077
Total	12.319		5.190 (42.1%)	1.039	1.017	-3.134

1. Weekend refers to Friday-Sunday
2. Figures in parentheses are percentage reductions from column (1)
3. Computed as 20 percent of column (2)
4. Computed as 50/mean trip length x [col. (1) + col. (2) + col. (3)] See text discussion.
5. A total gasoline reduction of 3.134 billion gallons represents a daily reduction of approximately 204,500 barrels/day. This reduction represents 4.10% of the projected 1981 normal economy household gasoline demand and 5.12% of the projected 1981 interrupted economy household gasoline demand.

Recreational pursuits that could not be accomplished by weekday trips, might be accommodated by shorter weekend trips. For the present study, it is assumed that every weekend trip, 50 miles or longer, not shifted to a weekday (i.e., 80 percent of such trips), is replaced by a trip of roughly 50 miles. For instance, if the average (unshifted) trip within the 100 to 150 mile category is 125 miles, then an offsetting trip within this category is assumed to be 50 miles.

Column (5) shows the net impact of the measure for each trip length interval. The total demand reduction is 3.1 billion gallons per year, or 204,000 barrels per day (1 bbl = 42 gallons of gasoline).

In the first few months of the interruption, it would not be surprising to find the majority of trips over 300 miles eliminated. If half of all trips over 300 miles were eliminated as a result of the shortfall and a full 20 percent of the curtailed weekend driving were shifted to weekdays, the daily demand reduction from the weekend restrictions would be only an additional 141,000 barrels per day. This figure would seem to be a reasonable lower limit of the impact of the plan on personal gasoline consumption. On the other hand, if weekend driving were cut back only 25 percent in the interrupted economy, and there were no shifting of curtailed weekend driving to weekdays, then the demand reduction resulting from the measure might be as high as 271,000 barrels per day.

2.4.2 Pleasure Boats

(3)

It is estimated that 2.5 billion gallons of marine fuel will be consumed by pleasure boats in the 1981 normal economy. In a 20 percent petroleum shortfall, it is assumed that boat owners would reduce their marine fuel consumption by 20 percent.

It is estimated that 75 percent of marine fuel is consumed on weekends. Although the measure prohibits purchases of marine fuel on weekends, it does not prohibit consumption. The majority of outings would be unaffected since they could use fuel purchased prior to the weekend. As a rough estimate, it is assumed that the measure would eliminate one-third of boating fuel consumption.

The estimate of demand reduction potential was derived as follows:

-
3. Marine fuel is defined here as actual marine fuel and gasoline used for boating purposes. This projection for marine fuel consumption comes from a 1977 Coast Guard survey of marine fuel consumption. U.S. Coast Guard, Recreational Boating in the Continental U.S. in 1973 and 1976: The Nationwide Boating Survey, 1978. Figures for pleasure boat gasoline consumption are available for 1976 and 1973. Boats in circulation figures are available for 1973, 1976 and 1980. Therefore, 1981 figures for gasoline consumption are based on the annual growth rate in boats in circulation. Because the marine fuel consumption figure provided by the Coast Guard is relatively high compared to other estimates, our figure represents a compromise between those of the Coast Guard and others.

2.5 billion gallons of marine fuel or 59.5 million barrels of marine fuel are projected to be consumed by pleasure boats in the 1981 normal economy. It is anticipated that a 20 percent gasoline shortfall will reduce marine fuel consumption by 20 percent. Therefore, 2.0 billion gallons of marine fuel or 47.6 million barrels of marine fuel are projected to be consumed by pleasure boats in the 1981 interrupted economy. It is anticipated that 75 percent or 35.7 million barrels of marine fuel will be consumed on weekends in the 1981 interrupted economy. Divided by 365 days per year, this equates to 98,000 barrels per day. Assuming that the measure would eliminate one-third of marine fuel consumption, the potential demand reduction is approximately 33,000 barrels per day. Reflecting the uncertainty in the estimates of marine fuel consumption, "low" and "high" estimates for the reductions are 25,000 barrels per day and 40,000 barrels per day, respectively.

2.4.3 Private Aircraft

It is anticipated that a petroleum supply interruption will cause a 20 percent reduction in aviation gasoline consumption. The weekend consumption of aviation gas by private aircraft is estimated at 18,300 barrels per day in

(4)
the 1981 interrupted economy, assuming that 50 percent of flying is done on weekends. The potential for demand reduction is decreased somewhat by the fact that some pleasure flying could be shifted to weekdays. A more realistic assessment of the demand reduction potential, therefore, is about one-half of total weekend consumption.

The estimate of demand reduction potential was derived as follows:

Approximately 563 million gallons of fuel are projected to be consumed by private aircraft in the 1981 interrupted economy. This equates to 13.4 million gallons annually. Fifty percent or 6.7 million gallons are expected to be consumed on weekends. Dividing by 365 days per year and converting to barrels, total weekend consumption equals approximately 18,000 barrels per day. The increased flying on weekdays is expected to decrease potential demand reduction by about 50 percent. The most likely potential demand reduction, therefore, is estimated at 9,000 barrels per day.

2.4.4 Summary of Total Potential Reduction

The summary of potential demand reductions in thousands of barrels per day induced by the measure is shown below:

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4. DOT, FAA, Aviation Forecasts, Fiscal Years 1979-1990, September 1978, p. 62.

	<u>Low</u>	<u>"Most Probable"</u>	<u>High</u>
(1) Household Travel	141	204	271
(2) Pleasure Boating	25	33	40
(3) Private Aircraft	<u>5</u>	<u>9</u>	<u>14</u>
TOTAL	171	246	327

The low and high figures for category (3) were derived by multiplying the weekday offset with factors of 0.50 and 1.50. The ranges for reductions in household automobile travel and boating were discussed in Sections 2.4.1 and 2.4.2.

3.0 NATIONAL ECONOMIC IMPACTS

The imposition of weekend restrictions on gasoline and diesel fuel will have adverse impacts on those industries that are directly affected by the reductions in weekend driving and in the use of pleasure boats and private aircraft. These impacts are discussed in Chapter 4.

Offsetting these adverse impacts, there will be a positive economic impact resulting from the use of the conserved fuel. Because the curtailed activities tend to be highly petroleum intensive, diverting fuel for use in other sectors of the economy, at a time when petroleum is in very short supply, will permit an expansion in those industries that are most critically constrained by the petroleum shortage. This will ease production bottlenecks, thereby permitting other sectors to expand. The net effect will be an increase in economic activity. Thus, although there will be some economic setbacks in some sectors, the economy as a whole will benefit.

The precise magnitude of the economic stimulus depends on how the saved fuel is distributed among industries. A rough approximation of the gains can be obtained through the use of a response function.

A GNP response function has been developed by SAI.

This analysis projects that GNP loss increases at a constant percentage rate from the first barrels of shortfall. If conservation efforts were made prior to a supply shortfall, the response function probably would be roughly linear instead of consisting of two segments. However, at a 15 percent shortfall, the difference between these two forms of response functions are negligible in relationship to the overall uncertainty associated with projections of this type.

The GNP response function indicates that, with a 15 percent shortfall of petroleum, increasing the supply of petroleum by an incremental 1,000 barrels per day leads to an increase in GNP of approximately \$16 million. Accordingly, the weekend restrictions, by saving an estimated 246,000 barrels per day, can be expected to increase GNP by an estimated \$16 billion. After subtracting the \$9 billion loss projected to result directly from the weekend restrictions (discussed in Chapter 4), there is a net GNP gain of \$7 billion. Corresponding to this rise in GNP there is likely to be a small increase in employment.

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1. Science Applications, Inc. Integrated Economic Impact Assessment of Petroleum Supply Interruption Contingency Actions (October 1977).

4.0 SIGNIFICANT SECTORAL IMPACTS

This chapter describes the impact of the Weekend Gasoline Sales Restrictions Plan on various sectors of the economy. After reviewing those sectors that would be most impacted by a petroleum supply interruption, the incremental impact of the Weekend Gasoline Sales Restrictions Plan on this interrupted economy is discussed.

4.1 IMPACTS OF A SUPPLY INTERRUPTION ON INDIVIDUAL SECTORS

An analysis of the overall impact of a petroleum shortfall on economic activity is best done with macroeconomic models, such as those used in existing studies of petroleum supply interruptions, either based upon the 1973-1974 embargo or upon (1) projections concerning some possible future shortfall.

1. A partial list of these studies includes:

- FEA Study: Report to Congress on the Economic Impact of Energy Actions, Federal Energy Administration, May 1976;
- George Perry Study: Higher Oil Prices and the World Economy, Chapter 2 - The United States, Edward Fried and Charles Schultze, editors, The Brookings Institute, 1975;
- SAI Study: Integrated Economic Impact Assessment of Petroleum Supply Interruption Contingency Actions, Science Applications, Inc., October 1977;
- EPRCP Study: Report on the Feasibility of Developing an Emergency Percentage Reduction Contingency Plan for Petroleum, June 1977;
- DRI Study: "The Potential Economic Impact of a 1980 OPEC Oil Embargo," from The Data Resources U.S. Long-Term Review, Fall 1977.

These studies differ in many respects: they refer to shortfalls occurring during different time frames, they assume different types of shortfalls, they use different types of models, and they consider different allocation programs or no allocation program at all. For detailed comparison of the outputs of these studies it would be necessary to analyze the structure, assumptions, and constraints of each model used. Without attempting such an extended analysis, it is still possible to draw certain inferences from these studies based upon the conclusions or areas of agreement common to all. The following four inferences are the most significant.

4.1.1 Inference 1

A major effect of a petroleum supply interruption will be to create a depressed economic condition. Because of lags that affect economic impacts, this depression may not begin until after the beginning of the supply interruption, and may continue after the interruption has ended. This decline in the economy will most affect industries that are sensitive to economic downturns, such as construction and durable equipment. Industries heavily dependent upon petroleum, such as transportation industries, will also be particularly affected. The industries listed as being most affected by a supply interruption are shown in Exhibit 4.1,

EXHIBIT 4.1 Most-Affected Industries as Estimated by Various
Embargo Studies (a)

Always Mentioned

- ° Motor Vehicles and Parts
- ° Residential Construction

Almost Always Mentioned

- ° Other Transportation Equipment, such as
 - Aircraft and Parts
 - Railroad Equipment
- ° Transportation Services
- ° Nonresidential Construction
- ° Other Durable Goods, such as
 - Basic Metals
 - Various Metal Products
 - Various Types of Machinery
 - Stone, Clay, and Glass
 - Rubber and Plastics

-
- a. These sectors are identified in the six studies referred to in this section.

The most affected industries will experience a percentage decline equal to about 2.5 to 5 times the percentage decline in gross national product. The average factor from all the studies is approximately 3. Assuming a GNP decline in a supply interruption of approximately six percent, this implies that the most affected industries will decline by approximately 18 percent. Because of the effects described earlier in this chapter, specific industries may suffer more or less than would otherwise be predicted. Exhibit 4.2 shows the information on which this estimate is based.

EXHIBIT 4.2 Summary of Embargo Studies

Study and Scenario ^(a)	(A) Size of ^(b) GNP Shortfall (%)	(B) Average Shortfall of Five Most Affected Industries (%)	B/A Ratio of Average Shortfall to Size of GNP Shortfall	Nature of Most Affected Industries
FEA	8.2	27 ^(c)	3.3	Transporta- tion, Con- struction, Durables
Perry				
FRB model	3.2	--	--	--
Michigan model	4.8	--	--	--
Battelle	1.9	--	--	Automobiles, Construction
SAI				
No allocation	4.4	27.1	6.1	Transporta- tion, Durable Equipment, Construction
EPAA allocation plan	16.0	46.2	2.9	Same plus Mobile Homes & Textile Products
RPA allocation plan	9.5	31.4	3.3	Same - plus Mobile Homes
PRP allocation plan	5.6	16.1	2.9	Same as EPAA
EPRCP				
No allocation	12 ^(c)	30.2 ^(c)	2.5	Transporta- tion, Durable Equipment, Construction
EPAA allocation plan	22	--	--	
DRI	2.3	11 ^(c)	4.8	Transporta- tion, Con- struction, Durable Manufactures

a. These studies are cited in detail in the text.

b. Some of the statistics in this column are for a single quarter of the 1973-75 reference period. Exhibit 4.3 in Chapter 4 shows averages for the four quarters of 1974.

c. Estimate.

4.1.2 Inference 2

The majority of the nation's industries will be affected at about the same rate as GNP. These include many manufacturers and a number of consumer services and products.

4.1.3 Inference 3

Most of the studies predict that consumer goods industries will be affected least. Specifically mentioned are such areas as leather goods, tobacco, and food products. These least affected industries are usually assumed to suffer no more than 1/2 to 2/3 the percentage decline in GNP.

4.1.4 Inference 4

All of the studies agree that investment and durable goods industries will be relatively harder hit than consumption goods industries, although the estimated difference in impact varies greatly from study to study.

As noted previously, the discussion of impacts in this section has referred to petroleum supply interruption impacts, with allocation and price control programs assumed in effect. The following section discusses the effects on industrial sectors which would result from implementing the proposed gasoline restrictions program.

4.2 INCREMENTAL IMPACTS OF THE WEEKEND GASOLINE SALES

RESTRICTIONS PLAN ON THE "TRAVEL" INDUSTRY

A variety of industries dependent on weekend automobile travel are expected to be impacted by weekend gasoline sales restrictions. Examples are commercial lodging, restaurants, boating, and entertainment. The projected magnitudes of adverse impacts on these industries depend on assumptions regarding the extent to which weekend trips are curtailed and how the fuel saved from these trips is used. In addition to the service industries that would be affected by the measure, several consumer durable goods industries would be affected. Sales of automobiles, recreational vehicles, boats and private aircraft would be expected to decline, but the quantitative estimates of these impacts are highly uncertain.

It is expected the Weekend Gasoline Sales Restrictions Plan would sharply curtail weekend auto travel over 300 miles. The plan will also substantially reduce trips of shorter length since individuals will seek to maintain precautionary reserves of gasoline in their tanks. The exact impact of the plan on miles traveled and losses to affected industries will also depend on the extent to which individuals substitute a shorter weekend trip for a lengthy one and weekday travel for weekend. For example, weekday travel in extended vacations may be substituted for weekend travel of substantial distances. In addition, some businesses might be expected to shift work schedules toward weekends allowing workers to have days off

in midweek. While many industries would be severely affected by an elimination of all weekend travel, the shifting to shorter trips and to weekday travel serves to mitigate the impact.

4.2.1 Impacts on Commercial Lodging Industry

Hotels and Motels

The total drop in person-nights spent in indoor commercial lodging due to the proposed restrictions is estimated at 92.7 million person-nights per year. ⁽²⁾ Assuming an average room rate of \$15 per person-night, this implies annual gross revenue losses to the industry of \$1,391 million or 10.5 percent of ⁽³⁾ estimated gross 1981 revenues.

Rather than being spread evenly across the entire lodging industry, the brunt of the reductions would be borne by lodging establishments concentrated geographically along major interstate highways and in resort/recreation areas, for which weekend lodgers constitute a much larger proportion of the total business.

-
2. See Appendix A for detailed calculations of the impacts. These figures assume an offset in weekend losses due to substitution toward weekday and shorter trips. With no offset, the losses are \$1,855 million.
 3. 1978 U.S. Industrial Outlook, U.S. Department of Commerce, U.S. Government Printing Office, p. 455, 1978.

In extreme cases during the 1973-1974 limitations on Sunday gas sales, motels along the major interstates and primary highways reported weekend occupancy as low as three to five percent of normal levels.

It is difficult to separate the incremental impacts of a Weekend Gasoline Sales Restrictions Plan from the petroleum shortfall itself. However, in an industry that in 1976 employed over a million full- and part-time workers, a proportional cutback in employment would mean some 100,000 additional unemployed.

Campgrounds, Trailer Parks, Etc.

The net drop in person-nights spent in outdoor commercial accommodations such as campgrounds, trailer parks, etc., due to the proposed restrictions is estimated at 79 million person-nights per year. Assuming an average fee of \$1.50 per person-night, this implies annual gross revenue losses to the industry of \$119 million.⁽⁴⁾

As in the case of conventional hotel/motel lodgings, it is difficult to assess the potential impact of the measure on employment in campgrounds, trailer parks, etc. Many of these outdoor facilities tend to be run by families, which would be reluctant to discharge employees.

4. See Appendix A, part 3.

4.2.2 Impact on the Restaurant Industry

The reduction in weekend driving is estimated to cost the restaurant industry approximately \$3.7 billion in revenues. This figure is obtained by estimating the gross reduction in sales of meals resulting from reductions in weekend driving and correcting for the substitution of shorter trips for displaced long weekend trips. In addition, the reduction in weekend travel will not prevent individuals from patronizing local restaurants so that restaurant meals formerly taken on weekend trips may be transferred to local restaurants. A complete derivation of the revenue loss estimate is shown in Appendix A.

However, the figure for the reduction in restaurant revenues can be misleading. The impact will be uneven with certainly some large net losers and probably some gainers. Restaurants that cater to weekend travel or recreation areas will undoubtedly experience substantial losses. Restaurants near populated areas could actually gain from the diverted travel the plan encourages.

The ratio of the increase in sales between 1974 and 1977 to the increase in employment implies a one employee addition for each \$22,000 in sales. Using a sales decline of \$3.1 billion translates to an employment reduction of about 140,000;

this is approximately five percent of total restaurant
(5)
employment.

4.2.3 Recreation and Entertainment

Tourist expenditures for recreation and entertainment while on weekend automobile trips are estimated to have been about \$2 billion in 1976. (6) After taking into account the possible offsets due to shorter weekend and weekday trips, expenditures by tourists on these services are expected to decline by about \$1 billion in a 1981 economy.

The National Travel Expenditure Survey does not provide an expenditure breakdown of the individual amusement industries associated with weekend auto travel. Given this lack of information, the approach taken is to identify those industries that are likely to be most affected by the measure and to qualitatively discuss the potential impacts.

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5. Data from the U.S. Industrial Outlook -- 1978, U.S. Department of Commerce, Washington, D.C., pp. 187-188, 1978. The relationship is one employee for \$22,000 in sales revenues.
 6. U.S. Travel Data Service, 1976 National Travel Expenditure Survey.

Winter Sports

The skiing industry, a \$2 to \$2.5 billion industry, was among the recreation industries hardest hit by the 1973-1974 supply interruption and limits on Sunday gas sales. It is expected any future supply interruption would have a similar crippling effect. The additional impact of the Weekend Gasoline Sales Restrictions Plan could be severe since two-thirds of all skiing is done on weekends.⁽⁷⁾ Some of this revenue loss may be regained by an increase in weekday skiing or longer stays at ski resorts.

Among ski resort owners, Vermont operators reported that weekend skiing was down by 35 percent in early 1974, and this figure probably was not atypical of other New England ski areas, which depend on the weekend auto trade from the mid-Atlantic States. Interestingly, ski vacations of a week or more in duration did not suffer noticeably, indicating that the decline in weekend skiing was indeed largely due to the Sunday gas limitations and attendant uncertainty about gas availability, rather than poor snow conditions or the general economic decline.

7. Booz, Allen and Hamilton, Inc., "Sensitivity of the Leisure-Recreational Industry to the Energy Crisis," prepared for the Federal Energy Office, January 18, 1974. Appendix "Skiing."

In the East, ski areas in upstate New York and Pennsylvania, which are located closer to major population centers than the New England ski resorts, presumably suffered smaller weekend losses, and may even have been partly compensated by the diversion of some regular New England skiers, although capacity at these resorts is limited. Midwestern ski areas for the most part display a similar regional character, and hence, probably suffered less of a decline than New England. Although precise data are not available, it is estimated that the Mid-Atlantic and Midwestern ski areas suffered losses of up to 15 percent of their normal business.

Some of the Western ski resorts--in California, Colorado, New Mexico, etc.--draw a greater proportion of their clientele from relatively distant parts of the country. Skiers at these resorts as a group are wealthier, more likely to arrive by plane and stay for periods longer than a single weekend than their counterparts in other parts of the country. On the other hand, many of the Western ski areas are located 50 to 150 miles from the populated metropolitan areas. Weekend trips by local residents to these ski resorts would be significantly impacted.

Snowmobiling, unlike skiing, does not appear to have been severely affected by the ban, since the machines themselves use relatively little fuel, and for the most part, their owners employ them relatively close to home.

Water Sports - Boating

The boating industry would be negatively affected by the measure since Saturday and/or Sunday sales of both gasoline and marine fuel would be restricted. Approximately 75 percent of all boating is on weekends, and most boat owners must drive cars either to reach their craft or to trailer-haul their boats to water. However, according to one study, the average boat owner drives about 50 miles per week to use his boat, well within the normal driving radius of one full tank of gas. (8) Boat owners planning to haul their small boats to more distant waters also have the option in most cases of traveling instead to nearer waters. Conceptually, then, the restrictions on auto gas sales would appear to have little direct impact on recreational boating.

Far more serious, from the standpoint of boat owners, vendors and manufacturers, is the problem posed by restricted weekend sales of marine fuel. Use of large inboard and high-powered outboard craft with their relatively high fuel consumption would be more severely affected by a Sunday-only restriction than small outboards, due to the latter's greater cruising range on a tank of fuel. The all-weekend restriction should cut back significantly on all forms of weekend boat use.

8. Booz, Allen and Hamilton, Inc., Op. Cit.

For the fuel reductions estimated in Chapter 2, it was assumed that total demand would be cut by one-third. It is not known to what extent weekend boaters, like skiers, would shift boating activity away from the weekend boating toward the longer vacations.

Marina operators, exclusive of those with marine sales franchises, should not be affected severely since, for boats kept in the water, marina fees and maintenance requirements remain relatively constant. Lost revenues on fuel sales would depend on the magnitude of the shortfall to marine fuel dealers, and the extent to which boat owners choose and would be able to fill their tanks during the week in anticipation of the weekend unavailability of fuel.

Outdoor Sports - Hunting and Fishing

Total annual revenues in manufacturing and other industries catering to hunters and fishermen have been estimated at up to \$7 billion annually, accounting for employment in the vicinity of 30,000 workers. According to one study, approximately 95 percent of all hunting and fishing related travel is by auto, but the average number of vehicle miles traveled is only 23 miles per trip.⁽⁹⁾ Thus, the aggregate impact of the plan on hunting and fishing manufacturers and outfitters is unlikely

9. Booz, Allen and Hamilton, Inc., Op. Cit., Appendix "Hunting and Fishing."

to be severe, especially since hunters and fishermen traveling long distances are likely to shift toward locations closer to home. Conversely, remote areas whose economies depend heavily on expenditures by out-of-area hunters and fishermen, particularly in the West, would probably be significantly affected.

Park Use

In terms of park use, there would presumably be less use of the national parks and recreation areas concentrated in the West, which cater almost exclusively to auto travelers. There would be increased use of local, state and regional parks closer to home. The direct impact of such a trend on park revenues would be insignificant, since direct tourist revenues to all Federal parks (admissions, fees, etc.) were only \$17.2 million in 1975.⁽¹⁰⁾ However, the indirect effect of such a trend on local economies that are dependent on Federal park generated tourist expenditures for food, accommodations and incidentals would probably be severe.

Miscellaneous Leisure - Recreation Industries

This category includes most leisure and recreation industries not covered in the discussion up to this point.

10. U.S. Bureau of the Census, Statistical Abstract of the U.S.: 1976 (97th Edition), Table 351, p. 214.

The main exclusion from this category is motion pictures which probably would not be seriously affected. The main subcategories, together with 1972 receipts, are listed in Exhibit 4.3.

EXHIBIT 4.3 1972 Amusement Industry Revenues

<u>Recreation and Amusement Industry</u>	<u>1972 Receipts (Million \$)</u>
Producers, Orchestras, Entertainers	1436
Bowling Alleys, Billiards, Pools	1204
Dance Halls, Studios, Schools ^(a)	95
Baseball, Football Clubs, etc., Promoters ^(a)	504
Racetrack Operation ^(a)	1079
Public Golf Course ^(a)	270
Skating Rinks ^(a)	95
Amusement Parks ^(a)	492
Coin-Operated Amusement Devices ^(a)	312
Concession Operators, Amusement Devices, Rides ^(a)	120
Carnivals, Circuses, Fairs ^(a)	168
Other ^(a)	2830
Total	<u>8635</u> ^(b)

^(a) Estimated

^(b) Totals may not add due to independent rounding.

SOURCE: Statistical Abstract of the U.S., p. 787, 1975.

Of course, certain subcategories are more likely to be seriously affected by the measure than others, inasmuch as some are more auto dependent than others. Race track operators would be more seriously affected than baseball, football and other commercial sports, since the former are more likely to be located well outside major population centers and tend to draw customers from a relatively wide geographical area. Similar observations pertain to amusement areas, concessionaries, carnivals, circuses and other subcategories including aquariums, boat and canoe rentals, art galleries and museums. Some of these categories could be unaffected or even gain from shifts away from long weekend trips.

4.2.4 Incidental Travel Expenditures

In addition to expenditures for lodging, food, and entertainment, automobile travelers also purchase a variety of other goods on trips. These purchases include medicine, cosmetics, clothing, personal services, and services. The Weekend Gasoline Sales Restrictions Plan would mainly affect only the geographic distribution of these sales; most of these items would be purchased regardless of whether the trip were taken or not. Of course, on the other hand, some items, such as souvenirs, suntan lotion, etc., would only be purchased if a trip were taken.

The 1976 National Travel Expenditure indicated that weekend automobile travelers spend for incidentals about \$4.00 per person per day (after conversion to 1977 dollars). It is assumed that 20 percent of these expenditures would be foregone if the Weekend Gasoline Sales Restrictions Plan were implemented. On the basis that approximately 490 million person-days (see Appendix A) on trips would be eliminated under the measure, the drop in expenditure for travel-related incidentals is \$400 million.

4.2.5 Transportation-Related Sectors

Service Station Sales

It is assumed that service stations would be able to sell their entire gasoline allocation in spite of the weekend ban on gas sales, and inasmuch as stations would be permitted to remain open (but not sell gasoline other than to commercial and emergency vehicles) on weekends, the measure would not directly lead to large unemployment in the retail gasoline sales sector. An obvious concern is that with the proposed measure's prohibition of gasoline sales to most vehicles, there are incentives for only a very few stations to remain open during weekends. Accordingly, it may be difficult for emergency vehicles to obtain fuel. There appears no administratively easy method by which DOE can ensure that a minimal number of stations remain open for this purpose. Programs to have some service stations open (on perhaps a rotating basis) can be most

efficiently set up by local authorities or by local retail service station associations.

Public Transport

It is questionable to what extent auto travelers in the 300 to 600 mile range, mainly affected by the plan, would find the airlines a practicable alternative to the auto, inasmuch as only two percent of all person-trips in this category were made by air in 1974.⁽¹¹⁾ The auto evidently is the preferred means of transport in this shorter-range category. This conclusion is strengthened by the results of a 1974 opinion research study that found that respondents taking trips of 100 to 499 miles preferred the auto over planes by more than a 2-to-1 margin.⁽¹²⁾ Questioned about the effect of the winter 1974 gasoline shortage on their weekend travel plans, only one to two percent of the respondents noted an inclination to fly more instead of driving.⁽¹³⁾

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11. National Travel Survey, Table 4, p. 46 and Table 1, p. 34.
 12. Opinion Research Corp., "Impact of the Energy Shortage on U.S. Travel Habits," conducted for U.S. Travel Data Center, p. 288.
 13. Ibid, p. 261.

Other mass transport modes (bus and rail), while enjoying somewhat greater favor as alternatives to the auto for purposes of weekend travel, apparently do not have sufficient equipment to handle a large percentage of weekend auto trips. (14)

4.3 TRAVEL-RELATED DURABLE GOODS

In addition to impacts on the travel industry, the measure is expected to influence the sales of consumer durable goods related to weekend recreation. The largest impacts are expected to be on the sales of automobiles, recreational vehicles, boats and private aircraft. Predicting sales of consumer durables is always very uncertain even in a normal economy. The uncertainties are even greater in a situation with no historical precedent. If consumers view the measure as being implemented indefinitely, the impacts would likely be greater than a measure viewed as lasting a short time.

4.3.1 Automotive Sales

The Weekend Gasoline Sales Restrictions Plan could reinforce the impact of the shortfall on retail automotive sales. The predicted level of 1981 motor vehicles and parts expenditures is \$99 billion, (15) of which \$59.4 billion is projected new auto sales.

14. Booz, Allen and Hamilton, Inc., Op. Cit., p. 17.

15. Data Resources, Inc., The Data Resources U.S. Long Term Review, Fall 1976 and using the ratio of new auto sales to total vehicles and parts from the U.S. Bureau of the Census, Statistical Abstract of the United States: 1976 (97th Edition), Washington, D.C., p. 791.

It is plausible to assume that auto sales will decline by approximately 1-1/2 percent as a result of the measure; or about \$900 million.

The plan will encourage the purchase of certain types of automobiles relative to others. In order to offset the effects of the weekend restrictions on gasoline sales, consumers will shift purchases toward automobiles with a larger mileage range per gas tank.

4.3.2 Recreational Vehicles

The recreational vehicle (RV) industry is one of the few recreation and leisure industries for which considerable data from the 1973-1974 crisis are available, presumably because it was one of the hardest and most directly hit. Sales of motor homes, travel trailers, camping trailers, truck campers and pickup covers were about 40 percent lower in 1974 and 1973. (16) Sales of recreational vehicles in 1980-1981 are projected to be \$5.4 billion in 1977 dollars. (17) Assuming a 40 percent reduction in sales due to the shortfall, such as occurred in

16. U.S. Bureau of the Census, Statistical Abstract of the United States: 1976 (97th Edition), p. 599, Table 999.

17. Recreation Vehicle Industry Association, Facts and Trends - 1977, p. 5, 1978.

1973-1974, and a 25 percent reduction due to the measure, the estimated impact on recreational vehicles is \$800 million. The 25 percent decline is based on an equivalent reduction in all weekend social and recreational driving.

4.3.3 Pleasure Boats

To the extent it is assumed that new boat sales are reflected in existing ownership patterns, 31 percent of new boat unit sales are sailboats (with or without auxiliary in-board power) and presumably would be little affected by the measure. Thus, approximately 70 percent of all boat units sold are in categories directly affected by the fuel sales plan; this implies a reduction in boat sales of \$720 million⁽¹⁸⁾ due to the measure. There is no way to predict what percentage of reduced sales would be simply postponed until the termination of the measure.

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18. Annual sales of boats are estimated to be \$4 billion. A 15 percent petroleum shortfall is expected to reduce sales by 20 percent to \$3.2 billion. The percentage reduction in sales due to the measure is assumed to be approximately the percentage of boating done on weekends times the percentage reduction in weekend use of boats. As discussed in Section 2.4.2, these percentages are 0.75 and 0.33, respectively. This implies a 25 percent reduction in sales or approximately \$700 million.

4.3.4 Impact on Sales of Private Aircraft

In 1977 domestic retail sales of single-engine civilian aircraft, the category which includes most privately flown aircraft, was approximately 13,800 units valued at an estimated (19) \$483 million. The demand reduction calculations for this component of the gasoline sales measure assume 50 percent of all private flying is done on weekends. If it is assumed that the plan would likewise reduce demand for private aircraft by 50 percent, the aircraft industry would face retail sales losses estimated at \$250 million per year.

4.3.5 Summary of Affected Industries

Exhibit 4.4 provides an appraisal of revenue losses for impacted industries. The total revenue loss to impacted industries is over \$9 billion dollars. These losses are distributed unevenly both across industries and within the impacted industries. For example, the hotel/motel industry experiences large revenue losses from the weekend plan, but within the industry selected hotels and motels may gain while others near resorts or the tourist centers may be forced to close.

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19. U.S. Industrial Outlook 1978, gives total 1977 factory shipments of 17,500 units, from which 3,700 was deducted for export sales. Based on figures in General Aviation Manufacturers Association, General Aviation Aircraft Fleet Directory 1976, average retail sales price of this type of aircraft is estimated to be \$35,000.

EXHIBIT 4.4 Revenue Losses of Affected Industries
as the Result of Restriction of Week-
end Gasoline Distribution

<u>Affected Industries</u>	<u>1980-1981 Sales Losses (Millions \$)</u>
Automobiles	900
Recreation Vehicles	800
Boats	700
Private Aircraft	250
Hotels/Motels	1390
Campgrounds, Trailer Parks	120
Restaurants	3680
Recreation and Entertainment	1050
Travel-Related Incidentals	400
Total	9290

There are a variety of sources of uncertainty and error surrounding the figures for revenue losses. These include:

1. The degree of response of affected industries toward attracting and retaining sales cannot be predicted.

The 1973-1974 embargo led to a multitude of marketing tactics tried by individual producers to counteract the reduction in demand for their products. Many producers introduced rebates to persuade consumers to purchase now rather than wait. Many hotels and motels provided packages that included gasoline for return trips. It is not clear if the present plan

will allow heavily impacted resorts or areas to make similar offers.

2. Firms and individuals will have an incentive to offer work schedules that allow employees to have nonwork days in the middle of the week. If this behavior becomes widespread, considerably more shifting to weekday travel may occur than is anticipated.
3. The short term emergency nature of the plan implies many of the impacts will occur because purchases are postponed rather than eliminated. The period following the plan and oil shortfall may find many consumers buying the postponed articles. This behavior could apply to trips as well as durable purchases. Saving up vacation time or postponing weekend travel may result in abnormally high travel-related expenditures following the measure's termination.

For these reasons, the \$9 billion estimated revenue loss would appear to represent a worst-case scenario.

4.3.6 Offsetting Gains

The losses discussed above will be offset by a gain of approximately \$16 billion (discussed in Chapter 3) resulting from the use of the fuel saved by the weekend restrictions. There will consequently be a net gain to the economy of approximately \$7 billion.

Some of the \$16 billion gain will go to the industries discussed in this chapter, reducing the adverse impacts that they realize. Part of the gain will go to other economic sectors. Precisely how the gain is distributed depends on how the saved fuel is used. It seems likely that the industries most severely impacted by the shortfall will be the ones that tend to gain most from implementing the measure.

5.0 PROJECTED STATE AND REGIONAL IMPACTS

5.1 PROJECTED IMPACTS OF A 1980-1981 SUPPLY INTERRUPTION

This chapter discusses the State and regional impacts of the Weekend Gasoline Sales Restrictions Plan measure. To begin, a quick review of the State and regional impacts of the hypothetical 15 percent shortfall is provided. The impacts were analyzed for regional manufacturing employment, and travel-related employment. Differences in impacts on regional productivity for rural and urban areas were also examined.

Because the standby allocation program would use a period immediately before the interruption as a base period, any regional imbalances induced by the allocation program itself during a future supply interruption would almost certainly be smaller than those during the 1973-1974 embargo. Also, greater administrative experience with the allocation regulations should lead to a better balance of supply. Depending on the nature and severity of the interruption, however, some imbalances probably would result. Such imbalances would produce productivity losses in the gasoline-deficient States and regions.

5.1.1 Regional Manufacturing Employment

One recent study⁽¹⁾ has projected manufacturing and non-agricultural employment levels for five quarters in 1980-1981 under each of three scenarios.

- No petroleum shortfall.
- A four million barrel per day petroleum shortfall without mandatory allocation or price controls.
- A four million barrel per day petroleum shortfall with mandatory allocation and price controls.

1. Science Applications, Inc., Integrated Economic Impact Assessment of Petroleum Supply Interruption Contingency Actions, October 1977.

The results, presented in Exhibit 5.1, are similar to FEA's estimation of the employment effects of the 1973-1974 embargo.⁽²⁾ States on the East Coast, particularly in the Northeast, would be adversely affected, as would States in the South and in the Midwest.

2. Federal Energy Administration, Report to Congress on the Economic Impact of Energy Activities, May 1976.

Manufacturing and Nonagricultural Employment
by Region 5-Quarter Embargo Average (1980-1981)
(Thousands of people)

MANUFACTURING

Region (*)	A No Petroleum Shortfall	B 4 MMB/D Petroleum Shortfall Without Mandatory Allocation	C 4 MMB/D Petroleum Shortfall With Mandatory Allocation	C-A A	C-B B
1	1,464.1	1,393.5	1,317.5	-10.0%	-5.5%
2	2,218.0	2,095.7	1,942.5	-12.5%	-7.3%
3	2,278.0	2,163.6	2,020.8	-11.3%	-6.6%
4	3,812.9	3,648.6	3,369.1	-11.6%	-7.7%
5	5,614.9	5,322.4	5,030.4	-10.4%	-5.5%
6	1,742.1	1,673.7	1,596.6	- 8.3%	-4.6%
7	1,060.0	1,009.6	967.7	- 8.7%	-4.1%
8	360.2	349.2	336.5	- 6.5%	-3.6%
9	2,041.6	1,946.3	1,845.3	- 8.6%	-5.2%
10	595.5	572.3	545.3	- 8.4%	-4.7%
U.S. Total	21,187.2	20,175.0	18,971.6	-10.5%	-6.0%

NONAGRICULTURAL

1	5,286.8	5,168.5	4,975.1	- 5.9%	-3.7%
2	9,975.5	9,750.7	9,354.0	- 6.3%	-4.1%
3	10,306.5	10,100.4	9,726.7	- 5.6%	-3.7%
4	14,692.7	14,411.4	13,922.0	- 5.9%	-4.1%
5	19,297.3	18,847.1	18,160.8	- 5.9%	-3.6%
6	9,637.6	9,486.0	9,201.2	- 4.5%	-3.0%
7	4,964.5	4,722.0	4,625.0	- 4.9%	-3.1%
8	2,936.8	2,800.6	2,724.8	- 3.9%	-2.7%
9	11,299.3	11,107.0	10,769.0	- 4.7%	-3.0%
10	3,136.5	3,088.6	2,999.5	- 4.3%	-2.9%
U.S. Total	91,333.5	89,532.3	86,358.2	- 5.4%	-3.5%

- *: Region 1: Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont
 Region 2: New Jersey, New York
 Region 3: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia
 Region 4: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
 Region 5: Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
 Region 6: Arkansas, Louisiana, New Mexico, Oklahoma, Texas
 Region 7: Iowa, Kansas, Missouri, Nebraska
 Region 8: Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming
 Region 9: Arizona, California, Hawaii, Nevada
 Region 10: Alaska, Idaho, Oregon, Washington

Source: Science Applications, Inc., Integrated Economic Assessment of Petroleum Supply Interruption Contingency Actions, October 1977.

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5.2 INCREMENTAL STATE AND REGIONAL IMPACTS OF THE WEEKEND
GASOLINE SALES RESTRICTIONS PLAN

5.2.1 Impacts on State Motor Fuel, Automotive and Highway
Use Receipts

If refinery yields were changed to transform some of the "saved" gasoline to other refined products, state gasoline tax receipts would decline. If all of the 204,000 BPD savings (formerly used by automobiles) were converted to other products, state gasoline revenues would decline by about \$300 million per year.

5.2.2 State and Regional Economic Impacts

The major determinant of the Weekend Gasoline Sales Restrictions Plan on state and regional economies is the importance of the affected industries. Exhibit 5.2 displays information on the importance of tourism to state economies. In addition to being strongly impacted by an oil supply restriction, states with high percentages of travel-generated employment will be additionally damaged by weekend restrictions on gasoline sales.

EXHIBIT 5.2 Relative Importance of Travel-Generated Tax Revenues

	1976 Travel-generated State Tax Revenues (a) Millions	State Tax (b) Revenues Millions	Percent of State Taxes Generated By Travel
Alabama	51.1	1,111	4.6
Alaska	24.8	203	12.2
Arizona	96.6	938	10.3
Arkansas	53.3	653	8.2
California	1,003.6	9,565	10.4
Colorado	86.5	866	10.0
Connecticut	75.0	1,059	7.1
Delaware	8.7	336	2.6
Florida	441.1	2,791	15.8
Georgia	98.5	1,548	6.4
Hawaii	45.1	576	7.8
Idaho	25.3	298	8.5
Illinois	170.3	4,410	3.9
Indiana	87.9	1,854	4.7
Iowa	42.2	1,062	4.0
Kansas	45.6	769	5.9
Kentucky	93.1	1,284	7.3
Louisiana	71.2	1,529	4.7
Maine	48.6	369	13.2
Maryland	86.5	1,731	5.0
Massachusetts	179.7	2,219	8.1
Michigan	187.8	3,486	5.4
Minnesota	159.9	2,022	7.9
Mississippi	55.7	797	7.0
Missouri	113.7	1,303	8.7
Montana	16.4	233	7.0
Nebraska	36.4	425	8.6
Nevada	53.7	267	20.1
New Hampshire	16.5	172	9.6
New Jersey	168.6	2,101	8.0
New Mexico	46.2	520	8.9
New York	347.3	8,939	3.9
North Carolina	103.3	1,900	5.4
North Dakota	23.0	264	8.7
Ohio	147.9	3,039	4.9
Oklahoma	52.2	884	5.9
Oregon	38.0	793	4.8
Pennsylvania	301.3	4,733	6.4
Rhode Island	14.1	350	4.0
South Carolina	82.5	951	8.6

EXHIBIT 5.2 (Continued)

	1976 Travel-generated State Tax Revenues (a) Millions	State Tax (b) Revenues Millions	Percent of State Taxes Generated By Travel
South Dakota	27.2	171	15.9
Tennessee	79.0	1,141	6.9
Texas	241.6	3,637	6.6
Utah	43.2	399	10.8
Vermont	31.4	187	16.8
Virginia	105.7	1,663	6.4
Washington	115.5	1,554	7.4
West Virginia	32.5	741	4.4
Wisconsin	119.2	2,141	5.6
Wyoming	45.8	154	29.7

- a. Source: U.S. Travel Data Center, The Impact of Travel on State Economies-1976, pp. 41-42, 1977.
- b. Source: U.S. Bureau of the Census, Statistical Abstract of the United States-1976. (97th edition.) Washington, DC p. 274. 1976.

The states most dependent on tourism are:

- Nevada
- Hawaii
- Vermont
- Florida
- Wyoming
- Maine
- New Hampshire
- Minnesota
- Arizona
- Colorado

Several of these states (Hawaii and possibly Florida) generate relatively more of their tourism through air travel. A restriction on weekend automobile travel would be damaging but air travel and tours could absorb some of the losses.

Several areas can be identified which rely heavily on tourism and recreational industries. Historical sites of the East, ski areas in many states, and the resort areas of Nevada and New Jersey all depend on weekend visitors to contribute a substantial portion of their sales. Many of these areas are over 200 miles round trip from metropolitan areas; the plan would almost completely eliminate customers traveling by automobile.

Many of the states that depend on tourism for employment and sales revenue also depend on tourism for state tax receipts. Each dollar of travel spending generates an average 5.3 cents in state revenue of tax receipts.⁽³⁾ Exhibit 5.3 shows U.S. travel generated state tax receipts, totally and as a percentage of total state taxes collected. States most likely to lose significantly depend heavily on travel generated taxes to support local public services. States generating 10 percent of state taxes from tourist travel are:

- Wyoming
- Nevada
- Vermont
- South Dakota
- Florida
- Maine
- Alaska
- Utah
- California
- Arizona
- Colorado

3. U.S. Travel Data Center, The Impact of Travel on State Economies 1976, p. 40, 1977.

The adverse impacts discussed above would be offset by benefits from using the conserved fuel. States most likely to benefit are those with significant proportions of total employment engaged in manufacturing and those hardest hit by the shortfall. As Exhibit 5.1 shows, the areas showing the greatest potential for employment gains would be in the East, South and Midwest.

6.0 FEDERAL COSTS

It has been tentatively estimated that this plan could be implemented for nine months duration at a cost of about \$5.2 million. This represents \$1.2 million in direct Federal costs (including 32 staff years of effort) and \$4.0 million in reimbursable costs to State and local government (including 170 staff years of effort). These estimates assume that this plan would be implemented alone. If, however, other standby conservation plans were in effect at the same time, operating economies could be achieved which would result in reduced overall costs. The estimates, which are very preliminary and are subject to budget review, include the cost of reimbursing the States for functions delegated to them.

It is contemplated that the Federal government would maintain a small staff to implement, administer and monitor this program. These personnel, located at headquarters and in the regional offices, would have designated responsibilities in the following areas:

- ° Program management and administration
- ° Exceptions and appeals
- ° Public information
- ° Enforcement

It is DOE's intent, however, to delegate, to the extent possible, the enforcement and exceptions and appeals functions to State and local government. This approach has been selected for the following reasons:

° The nature of the plan is such that State and local government may, with some relatively minor adjustments and by using such on-board personnel as building inspectors, police, etc., be prepared to conduct the inspections and investigations necessary to ensure compliance with this plan.

° State and local officials are aware of the special conditions and/or problems peculiar to specific areas or regions of the country. They are, therefore, in an excellent position to evaluate petitions for exceptions and appeals objectively and fairly.

° For this plan to be effective, a cooperative effort is necessary between all levels of government and the people of this Nation. Planning for meaningful participation of State and local government in this measure is an important way of coordinating Federal actions with the other levels of government and, in so doing, ensuring their cooperation.

APPENDIX A

DETAILED CALCULATIONS OF MAJOR INDUSTRY IMPACTS

This appendix presents methods for calculating impacts to new automobile sales, the hotel-motel industry, campgrounds and trailer parks and the restaurant industry.

A.1 NEW AUTOMOBILE SALES

DRI Estimate of 1980-81 Automobile and Parts Retail Sales	= \$99 billion ⁽¹⁾
Fraction of New Automobiles to New Automobiles plus Parts	= .60 ⁽²⁾
Projected New Auto Sales	= \$59.4 billion
Sales after Shortfall ⁽³⁾	= \$46.3 billion
Sales Reduction Due to Plan ⁽⁴⁾	= \$ 0.926 billion

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1. 1977 dollars. Data Resources, Inc., The Data Resources U.S. Long Term Review. Fall, 1977.
 2. 1973 ratio. U.S. Bureau of the Census, Statistical Abstracts of the United States: 1976. (97th edition) Washington DC, 1976, p.791.
 3. 22 percent reduction equal to that experienced in 1973-74.
 4. Assumed 2 percent reduction.

A.2 IMPACTS ON HOTEL-MOTEL INDUSTRY

Trip Range (1)	Number of Person-nights (1000s)			Impact of Weekend Closure (5) (3 - 4)	Percent Spent in Hotel-Motel (8) (6)	Impact on Hotel-Motel (7) (5) x (6)
	Baseline ⁽⁵⁾ (2)	After Supply Interruption ⁽⁶⁾ (3)	After Plan ⁽⁷⁾ (4)			
200-299	124,858	93,643	16,855	76,787	22	16,893
300-599	326,709	245,032	0	245,032	27	66,159
600-999	162,332	121,749	0	<u>121,749</u>	33	<u>40,177</u>
				443,568		123,229

5. U.S. Travel Data Center, 1976 National Travel Survey. 1977, p. 55.
 6. Assumed 25 percent reduction due to supply interruption (see Section 4.3).
 7. 200-299 mile trips are reduced by 82 percent, all others are eliminated.
 8. These are the percentages for all travellers in these mileage ranges, not just weekend travellers. U.S. Travel Data Center, 1976 National Travel Survey. 1977. p. 37.

Reduction in Person-nights = 123,641,000

Average per-person-night rate⁽⁹⁾ = \$15

Gross loss of sales = \$1,848 million

Assume 25 percent offset⁽¹⁰⁾ = \$1,386 million

A.3 IMPACT ON CAMPGROUNDS AND TRAILER PARKS

Trip Range	Weekend closure * Impact	% Person-nights ** Spent in Category	Reduction in Person-nights
200-299	76,787	34	26,108
300-599	245,032	21	51,456
600-999	121,749	17	<u>20,697</u>
			98,261

* From "Impacts on HOTEL-MOTEL Industry".

** U.S. Travel Data Center, 1976 National Travel Survey, p.37,1977.

9. Laventhol and Horwath, "Trend of Business in The Lodging Industry", Philadelphia, PA, Nov. 1977, provides a \$25/night average for motels. The average number of persons per occupied room in 1976 was 1.70, from the 1976 National Travel Survey, p. 10.
10. A 25 percent offset due to substitution toward weekend trips and shorter trips. In addition it is expected hotels and motels would actively promote weekend business.

Reduction in person-nights	=	98,261,000
Average fee per person-night	x	1.50
		<hr/>
		\$147,391,000

Dollar loss to Campgrounds is roughly \$147 million.

After 20 percent offset due to substitution
to weekday trips and shorter for longer trips = \$118 million

A.4 IMPACT ON RESTAURANT INDUSTRY

(a) Number of person-days on weekend auto trips (1976) (11)	=	938 million
(b) Number of person-days on weekend auto trips (1981) (12)	=	822 million
(c) Reduction in person-days in plan (13)	=	493 million
(d) Gross reductions in food expenditures on trips (1977\$) (14)	=	\$5.17 billion
(e) Gross reduction in restaurant revenues from auto travellers (15)	=	\$4.14 billion
(f) Gross reductions in total consumer expenditures on food (16)	=	\$2.29 billion

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11. The number is calculated by dividing total food expenditures on weekend automobile trips (200 roundtrip miles or more) by average food expenditure per person-day as shown in the 1976 National Travel Expenditure Survey (U.S. Travel Data Center, Washington, D.C.).
 12. Assume 4% growth from 1976-1981 and 28% reduction from the shortfall.
 13. All person-days on auto trips greater than 300 miles are eliminated. Seventy-two percent of person-day on trips between 200-300 miles are curtailed (see Section 4.4.2). Offset due to shorter and weekday trips is assumed to be forty percent (see gasoline consumption offsets in Exhibit 2.6).
 14. Assume \$10.50/person-day on food expenditures.
SOURCE: 1976 National Travel Expenditure Survey

- (g) Net reduction in total restaurant revenues⁽¹⁷⁾ = 3.68 billion
- (h) Net reductions in total consumer expenditures on food⁽¹⁸⁾ = 2.04 billion

A.5 IMPACT ON EXPENDITURES FOR ENTERTAINMENT AND INCIDENTALS

- (a) Reduction in person-days on auto trips from plan⁽¹⁹⁾ = 450 million
- (b) Expenditures on entertainment per person-day (1977\$)⁽²⁰⁾ = 2.14 billion
- (c) Total expenditure reduction (a) x (b) = 1050 million
- (d) Expenditures on incidental per person-day (1977\$)⁽²¹⁾ = 4.00 billion
- (e) Assumed fraction related to trips (Souvenirs, suntan lotion, etc) = .20
- (f) Total expenditure reduction on incidentals = 400 million

15. Assume 80% of food expenditures on trips is in eating establishments.

16. Consumers are assumed to purchase the same quantity of food (valued at the wholesale level) whether they are on a trip or stay at home. According to the National Restaurant Association (NRA Washington Report, July 18, 1977), 1975 food service industry sales totaled \$71.0 billion and food and beverage purchasers by all food service establishments were \$31.6 billion. This implies an average margin of 125%. This margin has been applied to the 1981 reduction in restaurant sales.

17. Per capita daily expenditures at commercial food service establishments was \$.93 in 1977. It is assumed that each potential traveler continues to spend this average at restaurants and other eating places for each trip-day curtailed. Thus, the offset is (c) x .93 = \$.46 billion.

18. Subtract .55 x \$.46 billion to (f).

19. See Section A.4.

20. U.S. Travel Data Center, 1976 National Travel Expenditure Survey, Table 8, p. A-15.

21. Ibid.