

1. Report No. SWUTC/00/467202-1		2. Government Accession No.		3. Recipient's Catalog No.	
An Examination of the Effectiveness of Voluntary Trip Reduction Programs				5. Report Date November 2000	
				6. Performing Organization Code	
7. Author(s) Carol A. Lewis				8. Performing Organization Report No. Research Report 467202-1	
9. Performing Organization Name and Address Center for Transportation Training and Research Texas Southern University 3100 Cleburne Avenue Houston, Texas 77004				10. Work Unit No. (TRAIS)	
				11. Contract or Grant No. 10727	
12. Sponsoring Agency Name and Address Southwest Region University Transportation Center Texas Transportation Institute The Texas A&M University System College Station, Texas 77843-3135				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes Supported by general revenues from the State of Texas.					
16. Abstract Employee Trip Reduction (ETR) in Texas gained prominence between 1991 and 1992 as one method to address air quality problems in major urban areas. ETR was a requirement in the federal Clean Air Act Amendments of 1990 requiring pollution reduction plans in non-attainment areas. Houston, then and now, registered the most severe air pollution in the state and was under mandatory trip reduction according to guidelines administered by the Texas Natural Resources Conservation Commission (TNRCC), the agency charged with air quality compliance in Texas. Although Dallas, Beaumont, and El Paso were also found to be outside of compliance, the ratings for those cities were less severe and mandatory trip reduction was not required. From the program's onset, employers responded negatively to the requirements and began lobbying elected officials and others to repeal the mandatory trip reduction program. The principal objections centered on the cost of implementing the program, stringent record keeping requirements, and doubtful benefits. By the mid-1990s, political support for the mandatory programs began to wane and elected officials rescinded the mandatory program. TNRCC, then, structured a voluntary trip reduction program for the state. The purpose of this work is to examine trip reduction in its voluntary form and assess its effectiveness. Specifically, this study reviews the experience of companies that have voluntary trip reduction programs. It seeks to answer the question of what conditions seem to attract the greatest participation.					
17. Key Words Clean Air Act, Employee Trip Reduction Programs, Air Quality			18. Distribution Statement No Restrictions. This document is available to the public through NTIS: National Technical Information Service 5285 Port Royal Road Springfield, Virginia 22161		
19. Security Classif.(of this report) Unclassified		20. Security Classif.(of this page) Unclassified		21. No. of Pages 68	22. Price

**An Examination of the Effectiveness
Of Voluntary Trip Reduction Programs**

SWUTC/00/467202-1

**Center for Transportation Training and Research
Texas Southern University
3100 Cleburne Avenue
Houston, Texas 70004**

ABSTRACT

Employee Trip Reduction (ETR) in Texas gained prominence between 1991 and 1992 as one method to address air quality problems in major urban areas. ETR was a requirement in the federal Clean Air Act Amendments of 1990 requiring pollution reduction plans in non-attainment areas. Houston, then and now, registered the most severe air pollution in the state and was under mandatory trip reduction according to guidelines administered by the Texas Natural Resources Conservation Commission (TNRCC), the agency charged with air quality compliance in Texas. Although Dallas, Beaumont, and El Paso were also found to be outside of compliance, the ratings for those cities were less severe and mandatory trip reduction was not required. From the program's onset, employers responded negatively to the requirements and began lobbying elected officials and others to repeal the mandatory trip reduction program. The principal objections centered on the cost of implementing the program, stringent record keeping requirements, and doubtful benefits. By the mid-1990s, political support for the mandatory programs began to wane and elected officials rescinded the mandatory program. TNRCC, then, structured a voluntary trip reduction program for the state. The purpose of this work is to examine trip reduction in its voluntary form and assess its effectiveness. Specifically, this study reviews the experience of companies that have voluntary trip reduction programs. It seeks to answer the question of what conditions seem to attract the greatest participation.

EXECUTIVE SUMMARY

Improving air quality is a critical goal for many urban areas. A series of legislative acts, the Clean Air Act of 1970 and its subsequent amendment, set the standard for air quality in the United States. The purpose of the legislation is to set minimum standards designed to guard against pollution levels known to be damaging to public health. Houston, Texas and Los Angeles, California hold the number one and two positions for cities failing to meet national ambient air quality standards. The rating references the number of days each city showed pollution levels higher than those allowed in the standards. Mandatory Employee Trip Reduction (ETR) was one method identified initially to address air quality problems in major urban areas. In essence, the program placed the responsibility for attaining program goals on individual employers. Employers who had more than 100 employees at a single work site were subject to a target average number of passengers per vehicle arriving at their worksite, depending on its location. Employers not achieving their target Average Vehicle Occupancy by 1996 would be subjected to fines until the target was met.

From the program's onset, employers responded negatively to the requirements and began lobbying elected officials and others to repeal the mandatory trip reduction program. The principal objections centered on the cost of implementing the program, stringent record keeping requirements, and doubtful benefits. By the mid-1990s, political support for the mandatory programs began to wane as more conservative officials took national offices. In that environment, the Texas State Legislature advanced SB 290 and the House advanced a similar bill which suspended implementation of the employer trip reduction program for 180 days with allowance for the Governor to issue 45 day extensions of the suspension. Subsequent to the rescinding of the mandatory program, the Texas Natural Resource Conservation Commission (the agency charged with air quality compliance in Texas) structured a voluntary trip reduction program for the state. The current emissions reduction plan for the Houston area includes a voluntary trip reduction component. The Houston-Galveston Area Council (HGAC) is the agency

that prepares the local document describing air quality plans and programs. HGAC identified numerous projects for inclusion in the State Implementation Plan, such as telecommuting, bus fare promotions, alternative fuel programs, and ozone action days.

The purpose of this work is to examine trip reduction in its voluntary form and assess its effectiveness. Specifically, the basic question under review is what is the experience of companies that have voluntary trip reduction programs and under what conditions do voluntary trip reduction programs seem to attract the greatest participation? An examination of the experiences of existing voluntary employer trip reduction programs will provide a source of valuable information for others considering similar programs for their companies. Further, this information is important for public officials in determining the appropriate applications for voluntary trip reduction programs. It is important that the experiences of some existing employer trip reductions are documented, particularly if the voluntary component will continue to be a part of Texas' air quality response.

Summary Findings

The research showed that employer trip reduction has the potential to make a significant contribution toward meeting air quality goals for non-attainment regions. In addition to improving air quality, trip reduction reduces the miles traveled positively influencing efforts to better manage travel demand. Several key elements are necessary to achieve successful trip reduction programs as follows.

- ***There must be a positive message relative to trip reduction coming from the state government.*** The states of New Jersey, Maryland and Washington provided leadership guiding active trip reduction programs by including some provision encouraging or requiring trip reduction in non-attainment areas. As a point of comparison, the Texas legislature charged the Texas Natural Resource Conservation Commission with program administration, but advanced no additional statutes or ordinances supporting trip reduction efforts.
- ***Chief executive officers of individual companies must embrace trip reduction.*** “Buy-in” of trip reduction in an individual company must come from the head of the organization because of the intensive internal effort required to ensure program

success. Funds must be provided for incentives, decisions must be made relative to working hours, and communication handled within the workforce. These elements cannot occur without the support of the head of the company.

- ***Citizens must be educated regarding the benefits of trip reduction programs.*** A study by the Center for Transportation Training and Research (Ledé and Lewis, 1993) showed that citizens have a strong sense of environmental sensitivity and responsibility; consequently, they will use transit when they sense their individual effort will improve the overall environment. It behooves those in positions of responsibility relative to trip reduction to ensure that the benefits of trip reduction programs are clearly articulated to potential participants.
- ***Programs for transit, carpooling, vanpooling and other travel demand management strategies should offer an advantage to the user.*** Users should receive a benefit by committing to participate in trip reduction programs. For instance, transit routes using high occupancy vehicle lanes provide travel time savings over driving a single-occupant vehicle. System costs should be structured to save the individual money over driving alone. Those promoting trip reduction should think about the programs and design improvements to provide the user greater benefits over driving alone.

TABLE OF CONTENTS

	PAGE
ABSTRACT	iii
EXECUTIVE SUMMARY	v
TABLE OF CONTENTS	ix
LIST OF TABLES	xi
DISCLAIMER	xii
ACKNOWLEDEGMENT	xiii
CHAPTER 1. INTRODUCTION	1
CHAPTER 2. THE CLEAN AIR ACT AMENDMENTS AND CASE STUDY: COMPANY A	
Graduate Student: Robert Allen	7
CHAPTER 3: THE CLEAN AIR ACT AMENDMENT AND CASE STUDY: COMPANY B	
Graduate Student: Anthony Ezeani	11
CHAPTER 4: THE CLEAN AIR ACT AMENDMENT AND CASE STUDY: COMPANY C	
Graduate Student: Gideon N. Anyanwu	15
CHAPTER 5: AIR QUALITY AND CASE STUDY: COMPANY D	
Graduate Student: Qiang Yi	23
CHAPTER 6: AIR QUALITY AND CASE STUDIES: WASHINGTON STATE COMMUTE PROGRAM AND COMPANY E	
Graduate Student: Michel Benoit	29
CHAPTER 7: SUMMARY FINDINGS	35
BIBLIOGRAPHY	37
APPENDIXES	39

Appendix A: Survey on Voluntary Commute Option Participation.....41

**Appendix B: Role of Intelligent Transportation Systems Improvements
in Employee Trip Reduction.....43**

Appendix C: Clean Air Act Amendment Components and Specifications...45

Appendix D: A Summary of Commute Facts.....47

Appendix E: Air Resources Board’s Ridesharing Definitions.....51

LIST OF TABLES

TABLE	DESCRIPTION	PAGE
1	Texas Air Quality Non-Attainment Cities.....	3

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the Department of Transportation, University Transportation Centers Program, in the interest of information exchange. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

ACKNOWLEDGEMENT

This publication was developed as part of the University Transportation Centers Program which is funded 50% with general revenue funds from the State of Texas.

Also, the contributions of the following graduate students to the compilation of data and drafting of various section of the report is greatly valued:

Robert Allen

Gideon N. Anyanwu

Michel Benoit

Qiang Yi

Anthony Ezeani

Chapter 1

Introduction

Employee Trip Reduction (ETR) in Texas gained prominence between 1991 and 1992 as one method to address air quality problems in major urban areas. ETR was a requirement in the federal Clean Air Act Amendments of 1990 requiring pollution reduction plans in nonattainment areas. Houston, then and now, registered the most severe air pollution in the state and was under mandatory trip reduction according guidelines administered by the Texas Natural Resources Conservation Commission (TNRCC). Although Dallas, Beaumont, and El Paso were also found to be outside of compliance, the ratings for those cities were less severe and mandatory trip reduction was not required. TNRCC Rule 30 TAC Section 114.21 delineated the targets, specifications and compliance dates for achieving the trip reduction requirements placed on Houston.(TNRCC, 1992). In essence, the program placed the responsibility for attaining program goals on individual employers. Employers who had more than 100 employees at a single work site were subject to a target average number of passengers per vehicle arriving at their worksite, depending on its location. Employers not achieving their target Average Vehicle Occupancy by 1996 would be subjected to fines of \$10,000 to \$25,000 per day until the target was met.

From the program's onset, employers responded negatively to the requirements and began lobbying elected officials and others to repeal the mandatory trip reduction program. The principal objections centered on the cost of implementing the program, stringent record keeping requirements, and doubtful benefits. By the mid-1990s, political support for the mandatory programs began to wane as more conservative officials took national offices. In that environment, the Texas State Legislature advanced SB 290 and the House advanced a similar bill, which suspended implementation of the employer trip reduction program for 180 days with allowance for the Governor to issue 45-day extensions of the suspension. Subsequent to the rescinding of the mandatory program, TNRCC structured a voluntary trip reduction program for the state. The current emissions reduction plan for the Houston area includes a voluntary trip reduction component. The Houston-Galveston Area Council identified numerous projects for

inclusion in the State Implementation Plan, such as telecommuting, bus fare promotions, alternative fuel programs, and ozone action days.

An examination of the experiences of existing voluntary employer trip reduction programs will provide a source of valuable information for others considering similar programs for their companies. Further, this information is important for public officials in determining the appropriate applications for voluntary trip reduction programs. It is important that the experiences of some existing employer trip reductions are documented, particularly if the voluntary component will continue to be a part of Texas' strategy. This is especially the case since the standards for air quality will become more stringent after 2000 and more Texas cities are expected to be designated non-attainment for various particulates. This document explores trip reduction programs in several companies into the Houston area, as well as one company with statewide offices.

Research Objective

The purpose of this work is to examine trip reduction in its voluntary form and assess its effectiveness. Trip reduction through telework programs, rideshare initiatives, flexible hours, and other strategies is an important component in many areas emissions reduction plans. Specifically, the questions under review is what is the experience of companies that have voluntary trip reduction programs and under what conditions do voluntary trip reduction programs seem to attract the greatest participation.

Background

Improving air quality is a critical goal for many urban areas. A series of legislative acts, the Clean Air Act of 1970 and its subsequent amendment, set the standard for air quality in the United States. The purpose of the legislation is to set minimum standards designed to guard against pollution levels known to be damaging to public health. Houston, Texas and Los Angeles, California hold the number one and two positions for cities failing to meet national ambient air quality standards. The rating references the number of days each city showed pollution levels higher than those allowed in the standards. Other Texas cities, including Beaumont, El Paso, and Dallas also failed to achieve minimum air quality standards for some

days within a year. Cities may be non-attainment with respect to one or more particulates. The ratings of the Texas cities are shown in Table 1 below.

Table 1
Texas Air Quality Non-Attainment Cities

City	Non-attainment for:	Rating	No. of Days Exceeding Minimum Standard (1999)
Houston	Ozone	Severe	58
Dallas	Ozone, Lead	Moderate	37
El Paso	Ozone, Lead, Particulate Matter	Serious	1
Beaumont	Particulate Matter	Serious	10

Source: TNRCC, www.tnrcc.state.tx.us

Air quality problems occur when various particles in the atmosphere are mixed with sunlight. Sources of the chemicals are point sources (stationary sources such as large industry), area sources (such as small commercial sites like gasoline stations and cleaners), mobile sources (cars and other vehicles) and natural sources (such as plant life). The relevant contributions of each source may vary by location and by year. Because the causes are many, strategies to meet air quality goals are multiple. Improvements in air quality are likely to be cumulative, relying on implementation of several strategies concurrently. As previously noted, one method is the Employer Trip Reduction programs. The program's goal is to reduce the number of individuals driving to work alone. The nucleus of the mandatory program was to be with companies having more than 100 employees. It was anticipated that strategically approaching the home-to-work trip could assist in reducing the miles traveled in urban areas seeking to reach attainment. Several studies have examined the impact of trip reduction programs. Farkas (1996) showed that in Baltimore and Philadelphia showed that incentives could change behavior relative the propensity to drive alone, but the number of affected trips and the air quality benefit are small. Another study regarding mandatory and voluntary programs in Texas was conducted by

Lindquist (1996). This researcher did not find an important influence on trip reduction due to the mandatory or voluntary nature of the program, but rather because of the coalition of constituents supporting trip reduction. In fact, the area with voluntary trip reduction had a more formalized coordinated process, at that time.

Study Approach

This research includes a set of papers compiled based on literature reviews, other state experiences and surveys from several companies in the Houston area that are engaged in voluntary trip reduction. The literature review and surveys were conducted by graduate students in the Transportation Studies Department at Texas Southern University. Dr. Carol A. Lewis adapted the survey instrument (based on an instrument used by the Texas Natural Resource Conservation Commission), identified the companies to be surveyed, supervised the work and compiled the final report. The survey instrument is Appendix A. Each student's work is presented as a complete report. The companies are identified by alphabetical designation, only.

Summary Findings

The research showed that employer trip reduction has the potential to make a significant contribution toward meeting air quality goals for non-attainment regions. In addition to improving air quality, trip reduction reduces the miles traveled positively influencing efforts to better manage travel demand. Several key elements are necessary to achieve successful trip reduction programs as follows.

- ***There must be a positive message relative to trip reduction coming from the state government.*** The states of New Jersey, Maryland and Washington provided leadership guiding active trip reduction programs by including some provision encouraging or requiring trip reduction in non-attainment areas. As a point of comparison, the Texas legislature charged the Texas Natural Resource Conservation Commission with program administration, but advanced no additional statutes or ordinances supporting trip reduction efforts.
- ***Chief executive officers of individual companies must embrace trip reduction.*** “Buy-in” of trip reduction in an individual company must come from the head of the organization because of the intensive internal effort required to ensure program success. Funds must be provided for incentives, decisions must be made relative to working hours, and

communication handled within the workforce. These elements cannot occur without the support of the head of the company.

- ***Citizens must be educated regarding the benefits of trip reduction programs.*** A study by the Center for Transportation Training and Research (Ledé and Lewis, 1993) showed that citizens have a strong sense of environmental sensitivity and responsibility; consequently, they will use transit when they sense their individual effort will improve the overall environment. It behooves those in positions of responsibility relative to trip reduction to ensure that the benefits of trip reduction programs are clearly articulated to potential participants.
- ***Programs for transit, carpooling, vanpooling and other travel demand management strategies should offer an advantage to the user.*** Users should receive a benefit by committing to participate in trip reduction programs. For instance, transit routes using high occupancy vehicle lanes provide travel time savings over driving a single-occupant vehicle. System costs should be structured to save the individual money over driving alone. Those promoting trip reduction should think about the programs and design improvements to provide the user greater benefits over driving alone.

Chapter 2

The Clean Air Act Amendments and Case Study for Company A

Graduate Student: Robert Allen

Introduction and Background

The Clean Air Act Amendment of 1990 (CAAA) placed greater responsibility on individual citizens to contribute to improved air quality compared to previous legislation. Initially, states that included cities not meeting ozone standards were requested to initiate mandatory trip reduction programs. After the Republicans swept Congress in 1994, state governors had the momentum to reverse the policy. Governor, George W. Bush of Texas rescinded the mandatory requirement for this state. By January 1995 State agencies and MPOs charged with meeting air quality standards began to advocate voluntary programs.

In addition to trip reduction, the Clean Air Act Amendments of 1990 advanced a set of strategies to reduce pollutants. One element is to tighten emission standards. By 1998, hydrocarbon emissions should be cut 30% below the prior standard, while nitrogen oxides should be cut 60%. The standards were to be phased in during 1994-1998. Unless EPA determines that tougher standards are unnecessary or infeasible, a second tier of reductions would be required by 2003, cutting emissions by about another 50%. Also, states have the option of adopting the even tougher California emission standards.

Further, the 1990 amendments created an ambitious new program change that addressed the composition of gasoline in heavily polluted cities. There are two reasons for this program change. First, the changed tailpipe standards will have a gradual impact on pollution levels since they affect only new cars. Second, leaks from the system may defeat even the best exhaust treatment. The reformulated gasoline must contain fewer volatile organic compounds and more oxygen in the form of alcohol or an ether compound. These changes in fuel composition are projected to reduce ozone and carbon monoxide levels in the most smog-ridden cities.

The Amendments established a new system of classifications for purposes of description and allowances. Each region in the country that complies with these requirements is put into one of three classes. Large national parks and wilderness areas are Class I areas, where very little deterioration of air quality is allowed. Other areas are Class II, where moderate increases in

ambient concentrations are allowed; Class III, where larger increments are allowed, usually may permit new industry. A governor may reclassify a Class II area in his state as Class I, To establish a major new source in any area, the owner must apply for a permit. The permit requires that the new emissions remain within allowed increments, and that the source use "best available control technology" for all pollutants, apart for the allowable increments.(Findley and Farbe, 1996)

In many cities, the single largest source of carbon dioxide emissions is the transportation sector. Even when it is not the dominant source, as in Houston, transportation is a major contributor to urban air pollution. There are two ways by which these emissions can be reduced: decreasing the number of passenger miles traveled and utilizing more efficient means of transportation. The private automobile is the most popular means of urban transportation and the largest source of mobile emissions. The freedom and flexibility of car travel, as well as low fuel prices in many jurisdictions have combined to make the automobile the most popular choice of urban travel. Automobile use today tends to be a very inefficient means of transportation. Combined with the fact that many automobile trips are made with a single occupant in the car, using far more energy, and emitting far more carbon dioxide and other pollutants per passenger mile traveled than other alternatives.

Public transit in the form of buses, trains, streetcars, or subways is far more efficient means of transportation than the single occupant vehicle, using far less energy and producing fewer emissions of greenhouse gases and other pollutants per passenger mile. Car pools are another way to reduce transportation energy use and emissions. A car with four passengers uses only about one quarter of the fuel of four single occupant vehicles. The most fuel-efficient forms of transportation with respect to energy use and emissions are non-motorized modes such as walking and bicycling.

Public transit is most economical and convenient in areas with somewhat dense populations. If municipalities are zoned to permit mixed residential and commercial uses, it is more likely that people can walk or cycle to work or to shop. Comparisons of cities around the world show a clear link between urban population density and gasoline consumption. Municipalities have a great deal of control over the transportation systems within their boundaries. Aggressive land use planning which promotes compact development without the

typical sprawl of recent automobile-dependent suburbs is one way that cities can reduce the number of miles inhabitants must travel.

As well as being responsible for roads, municipalities often run local public transit systems, and as such can exert a great influence over the cost and convenience of transit compared to that of the automobile. Municipalities can use their existing system of roads to provide lanes dedicated to public or high occupancy vehicles. Providing wide sidewalks for pedestrian or bicycle paths and lanes are additional methods by which local governments can influence the public's choice of transportation mode.

As a starting point, local governments can reduce transportation related emissions of which are a direct result of their municipal operations. By concentrating on emissions under the control of municipalities first, local governments can play a leadership role within their jurisdictions, while at the same time potentially profiting from a more efficient vehicle fleet and a more productive work-force. A review of the experience of one such public agency is in the following section.

Case Study: Company A

Company A is a public entity with several field offices located throughout the state. Company A's local office is considered to be suburban and not close to other offices. Eight hundred employees work at the organization and could participate in the company's Travel Demand Management program (TDM) program. According to a company spokesperson, the originally mandated trip reduction requirements would have led to creation of a department to actively promote trip reductions within the company. Under the voluntary program, there is one employee transportation coordinator who actively promotes the following commute options: compressed work week, flexible work schedules, carpooling, and transit bus scheduling information.

Currently Company A maintains records of all information pertaining to the number of employees that participate in its TDM program. To date, roughly 76-100 employees utilize the commute options which is nearly 13% of the employee base. Moreover, the prevailing attitude toward trip reduction within the company seems to be laissez-faire in nature. Company A is accustomed to a more classical style organization and has full authority to enforce all of the programs, mandatory or voluntary. The Management of Company A has the ability to operate

from a position of strength with their voluntary trip reduction program, including the allocation of financial resources and the direct influence it has on its employees. However, the relaxed political environment in Texas towards trip reduction contributes to the tone at Company A and the lack of interest exhibited towards voluntary trip reduction.

The survey from Company A indicated that it will be necessary for the present political climate to change to increase emphasis on trip reduction at Company A. This could result from grater emphasis toward more citizen interest in preserving the environment or a more eminent situation like imposing sanctions by EPA.

Summary Findings

Many environmentalists believe the government's lack of enforcement of some policies outlined in the EPA's Clean Air Act of 1990, like mandatory trip reduction in some areas, to be a mistake. They suggest the repercussions of the mandatory to voluntary switch will be seen after the price tag for repairing air quality problems is of astronomical proportion. Company A's management support is needed on all levels to encourage their employees to participate in the voluntary trip reduction program by offering incentives as outlined in TDM manuals, such as rearranging work loads to off peak hours, allowing more flexible work schedules, and offering compressed work week. Public acceptance of measures that impose higher costs or constraints on single occupancy vehicle travel will be important to the success of the transportation control measures and their effectiveness in reducing emissions. The EPA has formulated much data pertaining to the mandatory and voluntary trip reductions; it stands to reason that the information should be disseminated to the public.

Chapter 3

The Clean Air Act Amendments and Case Study for Company B

Graduate Student: Anthony Ezeani

Background

The original Clean Air Act was passed in 1970 and amendments were made in 1990. Guidelines were set for the pollutants lead, sulfur dioxide, carbon monoxide, and nitrogen oxide, particular matter and ground-level ozone. Historically, mobile source control strategies have focused primarily on reducing emissions through vehicle and fuel technology improvements. Tremendous strides have been made resulting in new light-duty vehicle emission rates which are 70 to 90 percent less than for the 1970 model year. However, transportation emissions continue to be a significant cause of air pollution due to a doubling of vehicle miles traveled (VMT) from 1970 to 1990, and tripling since 1960. As mentioned earlier several variables contribute to this effect. Automobile travel has increased substantially. Between 1983 and 1990, vehicle miles traveled increased by 41% continuing a century-long trend. Also increasing have been vehicle ownership rates and suburb-to-suburb trip-making. Decreasing has been the cost of operating personal automobiles. The real cost of gasoline is now lower than it was in 1950. Efforts to reduce travel in single occupant vehicles and vehicles and vehicular miles traveled faces tremendous challenges in light of these trends (Deaton, 1994). In some quickly developing urban areas, the more recent VMT growth rate is even more dramatic.

The trip reduction program was initiated due to the Clean Air Act Amendments of 1990. Section 108(f)(3) of this amendment requires the Secretary of Transportation and the administration of the Environmental Protection Agency to submit to Congress by January 1, 1993, and every 3 years thereafter, a report that reviews and analyzes existing state and local air quality transportation programs. This amendment of 1990 places greater responsibility on individual citizens to contribute to improved air quality compared to previous legislation. Previous legislation on clean air targeted industries such as oil refineries and automobile manufacturers. These companies were charged with reducing air pollution, but this was

considered unfair by big industries since other factors contribute about 41% of air pollution. Thus, they argued that they should not bear the total responsibility of reducing or controlling pollution, especially when a portion of the cause was out of their control. The Clean Air Act Amendment of 1990 sought to expand the responsibility of reducing air pollution. In the beginning states that included cities not meeting ozone standards were asked to initiate mandatory trip reduction programs. Due to the shifts in Congress in 1994, several state governors resisted this new policy. In Texas George W. Bush rescinded the mandatory trip reduction requirement for Texas, thus forcing state agencies that are responsible for meeting air quality standards to advocate voluntary programs.

The requirements for the Federal Clean Air Act Amendment (CAAA) are that each of the non-attainment areas in the country for various particulates should achieve compliance with clean air standards over the next 20 years. The affected state must submit a plan to reduce volatile organic compounds (VOCs). Volatile organic compounds are the major pollutants targeted because they are believed to be the main contributor to the formation of ozone smog. The CAAA requires that by 1996, VOCs must be reduced in each non-attainment area by 15% from 1990 levels. By November 15, 1994, each non-attainment area must calculate the additional reductions necessary to achieve and maintain compliance with clean air standards and they must be achieved by a deadline set by the CAAA. State plans to reduce VOCs by 1996 were to be submitted to the EPA November 15, 1993. These reductions are achieved through several strategies including, but not limited to industry pollution reduction, inspection and maintenance programs, employer trip reduction programs and reformulated gasoline.

The passage of the Clean Air Act Amendments along with the regulatory mandates will lead to greatly reduced emissions of toxic air pollution and acid rain-causing pollutants. The purpose is to attain air quality standards nationwide by year 2010. There is also a significant effect of the Clean Air Act Amendment on the petroleum refining industry. The first oxygenated gasoline season began in November of 1992 and mandates that motor gasoline sold during at least 4 winter months in 39 areas of the country classified as "moderate or serious carbon monoxide in non-attainment areas must have a minimum oxygen content of 2.7% by weight. Starting January 1995, the nine worst ozone non-attainment areas with population in excess of 250,000 had to begin using motor gasoline that meets mandated emissions and composition requirements. As a result U.S. refiners have committed considerable resources to plant

reformulation and research and development to advance processing, which meet the requirement.

Case Study

The responses to the air quality problems will be multi-faceted. One avenue is voluntary trip reduction. Voluntary trip reduction is an example of transportation demand management (TDM) strategies that describe a system of actions whose purpose is to alleviate traffic and congestion problems through improved management of vehicle trip demand. TDM strategies are primarily directed at commuter travel and are structured to either reduce the dependence on and use of single occupant vehicles or to alter the timing of travel to other less congested time periods. Incentives and disincentives are another tool that can be used with trip reduction programs. Incentives are necessary to overcome advantages of single occupant driving and provide greater economic competition between the auto and the other modes. Incentives can include travel time savings, such as are afforded by high occupancy vehicle lanes (HOVs), priority treatment at ramps and entranceways, and preferential parking at the destination. Financial incentives are also important and can consist of direct subsidies to non-single occupancy vehicle (SOV) users, and also subsidies such as discounted transit fares or "inverted" parking rates which favor HOV lane users.

This section of this paper will focus on the voluntary trip reduction experiences of one company, a Texas state office (hereafter referred to as company B). Company B is a medium size service oriented organization that has approximately 500 employees. It is located in southeast Texas in an urban area that is in non-attainment as set forth by the Clean Air Act Amendment of 1990. This state office has a trip reduction program that is monitored by a transportation coordinator who is employed with the company. The company employs several commute options for its employees including flexible work hours, vanpooling and carpooling. An emergency ride home component is available for unanticipated needs. The company's transportation coordinator tracks information on these commute options that serve 100 employees of the company. Of the company's 500 employees, only 285 are considered eligible to participate in the trip reduction program. Reasons range from isolated home locations to irregular, inflexible working hours. The employee trip coordinator does not have financial incentives at her disposal. Preferential parking is offered; those who live in corridors served by

an HOV receive the only other benefit. There is a moderate level of support for the program by the highest-ranking officer in the company.

Summary Findings

Voluntary trip reduction as employed by company B has the potential to contribute in a cost-effective manner to emission reductions required for this region. That more than a third of those offered the opportunity to participate in the program choose to is encouraging. The analysis of company B's trip reduction program shows that it is less effective than it could be due to several factors. The factors include lack of strong support from the highest-ranking officer in the company, limitations on the number of employees that are eligible to participate in the program, and lack of incentive and disincentive programs. When the employees detect that top ranking officials of the company are not enthusiastic about this program, they tend not to be enthusiastic themselves. Top ranking officers that set an example for lower level employees by promoting a company culture that is receptive to trip reduction program could be an important variable leading to the success of voluntary trip reduction programs.

It is important to note that Company B set a limit on how many of its employees could participate in their trip reduction program. This limitation in defeats the purpose for which this program was initiated. All employees should be given an opportunity to participate in the program, thus allowing the maximum results possible for this program. Further, employees of company B are not offered many incentives to carpool or vanpool. If financial incentives, like carpool and vanpool subsidies and discounted transit fares were offered employees might be more motivated to rideshare or adjust travel hours. Disincentives are also not a part of this company's program; for instance, employees have free parking. Company B's trip reduction program has not been as effective as it could be due to the previously mentioned reasons. A summary of recommendation for company B is as follows:

- Institute parking management measures
- Embark on a transit and rideshare enhancement
- Phase-in charges for employee parking
- Employ telecommuting as a option
- Educate employees about the air quality problem and how they can be a part of the solution

- Encourage a culture change in the company to become environmentally conscious
- Finally provide regular feedback to employees regarding how the program is working

Chapter 4

The Clean Air Act Amendments and Case Study of Selected State Initiatives

Graduate Student: Gideon N. Anyanwu

Background and History

The Clean Air Act, enacted in 1970, is a comprehensive environmental law designed to regulate activities that affect air quality. The Clean Air Act directed the United States EPA to set air quality standards and emission limitation. The Clean Air Act Amendments (CAAA) of 1990 (P.L. 101-549) called for stricter air pollution controls in urban areas that do not meet National Ambient Air Quality Standards (NAAQS). The Environmental Protection has established minimum air quality standards for six air pollutants (sulfur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, ozone, and lead). Areas are categorized based on the extent to which they exceed the ozone NAAQS from marginal to extreme nonattainment. States must develop State Implementation Plans (SIPs), which impose necessary controls on existing emissions sources to ensure that national standards are achieved and maintained.

The 1990 amendments require States to revise their SIPs to demonstrate that all nonattainment areas (except those classified as marginal) will achieve a percentage reduction in emissions of volatile organic compounds (VOC) by the end of 1996. States with serious, severe, and extreme nonattainment areas must impose the necessary controls to achieve further VOC reductions of 3 percent each year from 1997 through 1999. The Clean Air Act Amendments of 1990 recognized that emissions from automobiles are significant contributors to air quality air problems in urban areas. The amendments specifically call for certain transportation control measures to be adopted in nonattainment areas to help them achieve the required 15 percent reductions in VOCS. Automobiles emit VOCs, which react with nitrogen oxides in sunlight to form ground-level ozone, which is also known as smog. Automobiles are also responsible for significant amounts of nitrogen oxide and carbon monoxide emissions. Although substantial reductions in automobile tailpipe emissions were achieved over the last two decades through improved fuel efficiency and the use of catalytic converters, the decrease in auto emissions has

been partially offset by increases in vehicle usage. According to the Environmental Protection Agency, “it is widely accepted that shortly after the year 2000, the increased emissions caused by more vehicles being driven more miles under more congested conditions will outweigh the fact that each new vehicle pollutes less, resulting in an increase in emissions from mobile sources (US EPA, 1991). In order to address this condition, the CAAA included mandatory trip reduction as a component. Many communities proceeded with voluntary, as opposed to mandatory reduction.

Overview of Trip Reduction Programs

A trip reduction program is a set of measures designed to reduce motor vehicle trip miles to the work site by promoting the use of commute alternatives such as transit, ridesharing, bicycling, walking and telecommuting. The program may include any combination of services, incentives, and disincentives and support measures. Rather than prescribe a particular set of measures, the rule provides employers with flexibility to develop a program that is appropriate for their work sites and employees.

The program must address vehicle trips made by employees who start work during the 6:00 a. m. through 10:00 a. m. peak period. Employers may choose to apply the program to all employees at the work site, including employees who start work outside the peak period. Employers with multiple work sites may develop a customized program for each site or one program covering all sites. Examples of trip reduction strategies are as follows:

Telecommuting Program: Telecommuting program is a proven strategy to get employees to change their commuting habits so that the worker performs the job function from home at least 1 day per week. Telecommuters who work at home just one day a week will reduce their fuel consumption and vehicle air pollution from by 20%. People who resist ridesharing as a solution to energy conservation, willingly telecommute because it increases their flexibility to meet the demand of work, family and community

Ride Sharing Program: Ride share consists of setting up various alternative methods of transportation to reduce the number of vehicles driven to work by employees that work in proximity of one another. In such a program, more than one person agrees to share a ride to the

work site. Carpooling and vanpooling are two of the most convenient and accepted methods of employee trip reduction. Carpooling basically consists of pooling two or more persons in a car for the purpose of reducing single-occupant vehicle travel. Vanpooling is similar, with the difference being that a vanpool typically consists of at least two or more persons sharing a ride. Bus riding is a component of this category.

Bicycling/Walking: Bicycling and walking are viable commute options for those living from one to four miles from their work sites. Bicycling and walking will only attract a limited number of state employees. However, much can be done to encourage those employees living close proximity to their work sites.

Flextime and Staggered Work Hours: Flextime gives the employees the option of changing their start times each workday away from the peak hour. Most flextime programs include a core period, which refers to selected hours during the workday in which all the employees should be present. During this time, meetings and other activities that require company-wide or department-wide are scheduled. Staggered work-hour programs stagger employees' starting and ending times by 15 minute to two-hour ranges. The main purpose of such a program is to shift some people out of the peak commuting period to other to time periods to relieve traffic congestion.

Compressed Work Week: A compressed workweek schedule provides employees their usual number of working hours in fewer days per week or per pay period. For example a "4/40" has employees work 10 four-hour days, while a 9/80 compresses the typical 10-day, two-week cycles into 9 days (TNRCC , 1994).

Potential Air Quality Impacts

Because automobiles are responsible for about half of the air pollution in urban areas, the Clean Air Act includes many provisions aimed at reducing emissions from mobile sources. Most of the requirements are placed on vehicle manufacturers and fuel refiners to limit vehicle emissions. Some requirements also aim to reduce the number of vehicle miles traveled in non-attainment areas. The employee trip reduction program is one of the few Federal provisions that

rely on direct action by private individuals for compliance. Although the trip reduction program is aimed at employers, they cannot meet the trip reduction goals without employee cooperation. Because the impact of this program relies heavily on the extent to which individual behavior is changed, potential air quality impacts resulting from this strategy are difficult to predict.

Approximately 55 trip reduction ordinances aimed at reducing traffic congestion and improving air quality have been enacted in the United States since 1982 (Fletcher et. al., 1993). The most recent Federal ETR program differs from many previous programs by adding stronger enforcement procedures. Employers may face penalties for failing to meet trip reduction goals.

Additionally, the CAAA and ETR require that each individual state to develop their own State Implementation Plan. The EPA has the authority to review all Sips for full compliance with the CAAA requirements. Each SIP must include, at a minimum, the following:

- The baseline average vehicle occupancy (AVO) for the nonattainment area;
- The target average passenger occupancy (APO) for employers, which must be no less than 25% above the baseline AVO;
- A process for compliance demonstration; and
- Enforcement procedures to ensure submission and implementation of compliance plans by employers subject to the trip reduction requirements.

Employer Responsibilities

Under mandatory trip reduction, each employer of 100 or more persons, at a single site, in severe ozone non-attainment area must increase its Average Passenger Occupancy per vehicle. The standards apply to commute trips from home to the work site and back during peak travel periods. Under the trip reduction program, the employers are to increase their APO by at least 25 percent, above the baseline for all such trips in the area. To determine their APO, employers must survey their employees who commute to work during the peak morning rush hours. Each affected employer within the non-attainment area is supposed to reach the target APO regardless of its own company's APO starting point. Therefore, some companies in the area will have to increase their own APO by more than 25 percent, while others will have to increase their APO by less than 25 percent. Employees must submit compliance plans within 2 years after the SIP revision is submitted detailing how they will achieve and maintain the target

APO. Employers should meet the target APO within 4 years of the SIP revision. Upon reaching that target, employers must submit a maintenance plan. To meet the trip reduction target, employers can offer a variety of options, incentives or disincentives for encouraging employees to abandon single occupancy vehicles as a primary means of commuting to work during the morning rush hour. Some of these measures include

- Offering cash incentives for ridesharing/using mass transit;
- Imposing or raising parking fees;
- Instituting preferential parking for ride sharers;
- Instituting compressed work weeks or staggered scheduling or offering telecommuting and work-at-home options;
- Providing a comprehensive ride-matching service;
- Subsidizing mid-day shuttles to local shopping areas;
- Providing company-owned vehicles for ride sharing;
- Providing a guaranteed ride home program; and,
- Promoting bicycling and walking to work; and,
- Promoting the establishment of on-site amenities like banks, drug stores, and restaurants.

In addition to developing a set of options and incentives and conducting outreach activities, some employers also might make some physical improvements to their facilities. For example, employers who encourage vanpooling would have to ensure that there is adequate clearance for vans at parking structures. Employers might add showers and changing facilities for walkers and cyclists, or provide secure bicycle parking or storage areas. Finally, to encourage telecommuting, employers may need to make capital investments to provide computers, telephones, fax machines for home use.

One State's Experience

On December 23, 1995, President Clinton signed H.R. 32S into law. This law amends the Federal Clean Air Act to provide for an optional provision for the reduction of work related vehicle trips and miles traveled in ozone attainment areas designated as severe. With the passing

of this important congressional legislation, states now have the option to make the Employer Trip Reduction Program voluntary, provided that the state develops an alternate program, which will achieve emissions reductions comparable to those achieved with the mandatory program.

In 1996, New Jersey Governor Whitman signed S498/A-1491 into law on November 1. The N.J. Department of Transportation's proposal to repeal and implement new rules for the voluntary ETR program, N.J.A.C. 16:50, appeared in the New Jersey Register on July 17, 1997. Due to the repeal of the mandatory provisions, an overall travel demand management program called the "Smart Moves Program" has been established.

New Jersey repealed the state law mandating employers with more than 100 employees undertake employer trip reduction programs and instead made the program voluntary. In addition, legislation extended and increased certain business tax credits for employers through 2007. Tax credits were increased for employers who filed a compliance plan with the Department of Transportation.

The New Jersey Department of Environmental Protection (NJDEP) identified a variety of strategies to achieve emissions reductions equal to the existing mandatory ER program. The state intends to offset any loss in emissions benefits through transportation-related air quality improvement strategies, such as implementing new computerized signal systems to move traffic more efficiently, adding new park and ride lots, providing public transit fare subsidies, and improving catalytic converters on government diesel truck fleets. There has also been a dramatic reduction in air emissions at major facilities covered by the NJDEP's Air Operating Permit Program (New Jersey State Chamber of Commerce, 1997).

The Effectiveness of ETR Programs

Whether mandatory or voluntary, no single package of measures will be effective for every employer. Each work site will generally need an ETR plan that is individually tailored based on such factors as the number and type of employees, geography or climate of the location, work schedules, type of business, and proximity to mass transit and other amenities. For instance, employers in warm climates may promote walking and cycling while employers in cold climates may promote telecommuting and work-at-home options. Urban employers may want to emphasize the use of mass transit over other alternatives while suburban employers may emphasize carpooling. Manufacturing employers may establish ride matching for employees on

the same shift while service employers may put employees on staggered schedules, both to reduce peak-time work trips.

To increase the effectiveness of chosen measures within a plan, employers may want to consider using complementary pairs or groups of measures. For example, an employer who raises the cost of parking for single drivers may award subsidies to ride sharers at the same time. The complementary strategies improve the incentive to carpool.

Many obstacles to developing and implementing ETR programs as well as achieving target APOs exist. Each employer faces a different set of difficulties depending on its size, type of employees location, experience with employee trip management, and financial constraints. Barriers that limit ETR programs may include the lack of availability or insufficiency of public transit.

Another barrier to implementing ETR program is that they may be expensive to implement. Also, program cost estimates vary widely. EPA estimates that the annual administrative costs for trip reduction program average \$17.50 per employee. Total program costs including an employer's administrative costs and the cost of funding incentives and subsidies may be higher. These cost estimates vary, in part, because they have not been measured the same way. There is no guidance on what should be included in an ETR cost estimate. ETR program development may also be expensive for states. States must provide state agencies with adequate resources to write SIP revisions, conduct outreach activities, and administer ETR programs.

Some ETR measures may not be compatible with the local environment. For example, local zoning laws may require adequate parking before construction permits are granted. Businesses, that do not provide sufficient parking for their employees may create spillover problems for neighboring businesses and residential areas. Yet, parking restrictions may serve as an incentive for ridesharing. Moreover, residential parking options may prevent employers from effectively monitoring employee trip reductions. Perhaps the most intractable obstacle to implementing ETR programs and achieving target APOs is uncertainty over how best to change human behavior given the current advantages of driving to work.

Summary Findings

The process of developing and implementing a trip reduction program will vary from employer to employer depending on the organizational structure and decision-making process and the nature of employer/employee relations. However, a number of key steps and activities are involved in developing a program at any work site. These include analysis, employee input, gaining development and management support, selecting program measures, securing resources, budget development and marketing. Because each employer and work site is unique, it is difficult to predict exactly what success a given set of measures will achieve at a specific work site. For this reason, it is important that the employer develops a well-integrated program that is appropriate for its work site.

Chapter 5

The Clean Air Act Amendments and Case Study for Company C

Graduate Student: Qiang Yi

Air pollution is a severe problem faced by many countries in the world. Actually, air pollution has been considered as a modern industry ill for a long time. Based on medical reports, air pollution can cause a series of injuries to our physical health and may have other unknown negative effects. According to some recent medical reports, air pollution can injure human beings by impairing the lungs and upper respiratory tract and causing or aggravating asthma and respiratory allergies. Also at risk are the blood system, the heart and blood vessels, the skin, the central nervous system, individual's moods, cognition and behavior, the immune system, the genitourinary tract, the endocrine and reproductive systems, the eyes, the musculoskeletal system and the digestive system

The most serious outdoor air pollutants are sulphur dioxide, carbon monoxide, lead, ozone, particulates and nitrogen dioxide. All six are regulated under the 1970 Clean Air Act and amendments; all but ozone and nitrogen dioxide levels have remained under relatively good control. However, control of the pollutants means keeping their average air content under relatively arbitrary values (currently set at .12 ppm), without sound medical studies to support the lack of adverse health effects at these levels.

Air pollution has been shown to induce attacks of asthma in epidemiological and controlled exposure studies of human volunteers. Ozone is an atmospheric pollutant that enhances the effect of inhaled allergens in asthmatics, suggesting that pollutants influence lung function by increasing airway inflammation. Over 50% of the United States population lives in an area which exceeds current national ambient air quality standards for ozone, nitrogen dioxide, sulphur dioxide, and particulates, as monitored by the U.S. Environmental Protection Agency (EPA)

About 5% to 10% of the United States population suffers from asthma and up to 20% have some form of respiratory allergy. In recent years, asthma deaths and morbidity have markedly increased in the United States, and many studies have demonstrated decreased

pulmonary function correlating with increased ozone levels. Air pollution plays a significant role in the exacerbation of airway disease in asthmatics and may contribute to the overall increase in asthma morbidity (Sheiman, 1996).

Every year, some 64,000 people may die prematurely from cardiopulmonary causes linked to particulate air pollution, according to Sheiman. Tens of thousands of these deaths could be avoided each year if the Environmental Protection Agency health standards for fine - particle pollution were met and kept. In the most polluted cities, lives are shortened by an average of one to two years. According to the National Resources Defense Council, Los Angeles tops the list with an estimated 5,873 early deaths, followed by New York with 4,024, Chicago 3,479, Philadelphia 2,599 and Detroit 2,123.

According to the federal reports, industry emissions top the list of sources for air pollution in the United States with vehicle emissions in the second position. In urban areas, motor contribution coming from highway motor vehicle to carbon monoxide pollution can exceed ninety percent, mobile sources (cars, buses and trucks) account for eighty eight percent of carbon monoxide and fifty percent of oxides of nitrogen and volatile organic compounds.

As mentioned above, air pollution has been becoming more oppressive in the whole world rather than only in the United States. In 1970, the Clean Air Act was legislated. In 1990, the Federal Clean Air Act Amendments were established. The purposes of those laws are to reduce the air pollution by controlling the emissions from industry, automobile and other sources. In the Clean Air Act Amendments, one element is the Employer Trip Reduction program (ETR), which requires that all employers with 100 or more employees at a single worksite must develop a plan which includes employee incentives to decrease the number of vehicles commuting to the worksite. The ETR program is aimed at reducing the number of vehicles over the entire nonattainment area by about 25 percent. Beginning in 1995, several state governors revised their responses shifting mandatory to voluntary trip reduction. In the following paragraphs, a voluntary trip reduction program will be analyzed for a downtown-based oil company.

Case Study: Company C

The oil company is located in the crowded urban area with many other offices around; the company has about 2,000 employees. In this urban area, a large number of people and

vehicles jam the space of the city during working time. The vehicle emissions are the number two reasons for air pollution in this urban area. As a large company in this area, obviously it could be a good model to affect other companies, if it effectively executes programs which can reduce vehicle miles traveled to work. Knowing that the Clean Air Act Amendments of 1990 required the Employer Trip Reduction Program (ETR) and later the policy changed the rule from mandatory to voluntary, the executives of company highly supported this program with much investment and decided to assign an Employee Transportation Coordinator.

Objectives of the ETR Program focus on encouraging employees to consider alternative models of travel to and from work instead of driving alone. Therefore, the theory is that reducing the number of cars on the road; particularly during peak travel periods will decrease the amount of pollution to acceptable levels. The EPA has elected to put the biggest responsibility for decreasing the number of vehicles on the road during the peak travel periods on employers.

The Employee Trip Reduction Program includes several different optional programs: the telecommuting program, ride share program, bicycling/walking program, flexible work schedule program and carpooling & vanpooling program.

The *telecommuting program* is a proven strategy to get employees to change their commuting habits. For the telecommuters who work at home just one day a week, the program can reduce their fuel consumption and vehicle air pollution from commuting by 20%. People who resist ridesharing as a solution to energy conservation, may respond favorably to telecommuting because it increases their flexibility to meet the demands of work, family and community.

Transit is also an important trip reduction tool. Employees are encouraged to ride the bus to the place of employment. Sometimes special lanes, roadways, or other methods of priority are provided to speed the bus trip. Larger cities with dense employment may provide rail systems.

The *ride share program* is provided based on the following: ride share consists of setting up various alternative methods of transportation to reduce the number of vehicles driven to work. Carpooling and vanpooling are the principle methods of ridesharing. Actually, carpooling is not a new idea for modern city residents. The carpooling and vanpooling also are two of the most convenient and accepted methods of employee trip reduction. Carpooling basically consists of pooling two or more persons in a car for the purposes of reducing single occupant vehicle

travel. Vanpooling is similar, with the difference being that a vanpool typically consists of at least two or more persons sharing a ride. Commuters can save significant amounts of money by choosing to either carpool or vanpool.

Bicycling and walking are viable commute options for those living from one to four miles from their worksites. This program will only attract a limited number of employees. However, much can be done to encourage those employees living in proximity to their worksite. By the way, this is also an idea can attract people who love nature and outdoor sports.

The *flexible work schedule program* encourages people to compress their work weeks by working nine or ten-hour days in exchange for a full day off each week or bi-weekly. These options are not costly to implement, low risk, and have a high potential return in terms of both trip reduction and employee morale.

In the oil company, the voluntary trip reduction program is very successful. Based on the survey findings, the company chose four of the five optional programs listed above: telecommuting program, flexible work schedule program, transit program and carpooling & vanpooling program. More than 10% of the employees in the company participate the program. The participants are still eligible for an emergency "guaranteed ride home" program. The program ensures that if anyone has an emergency, the person may rent a car and be reimbursed to make the trip home. The participant is allowed a set number of emergencies annually. The flexible option for emergency provides a high level of confidence for employees who participate in the program.

Summary Findings

The Trip Reduction Program is a sound idea for reducing air pollution. As formerly mentioned, the vehicle emission is the second biggest source of all air pollution sources. Automobile travel has increased substantially over the last several decades. For example, between 1983 and 1990, vehicle miles traveled (VMT) increased by 41 percent, continuing a century-long trend. Trip reduction offers a proactive response to mitigating the increase in travel. From current survey of the voluntary trip reduction program, we can conclude the following:

1. It is necessary to educate every individual to highlight the importance of protecting the environment and their role in the process.

2. The government must provide funding to supply the trip reduction program such as reducing taxes from those companies participating in the program and providing funding for technical research.
3. Legislating to change voluntary requirement to mandatory is needed. The legislation must consider each aspect of the trip reduction program, then originate the policies, procedures and suggestions for those choosing to implement the program.

Chapter 6

The Clean Air Act Amendments and Case Study for Company D

Graduate Student: Michel Benoit

Introduction

The U.S. Environmental Protection Agency has established National Ambient Air Quality Standards for six air pollutants: ozone, lead, carbon monoxide, sulfur dioxide, nitrogen dioxide, and particulate matter. The standards were established to protect the public from exposure to harmful amounts of pollutants. When the pollutant levels in an area have result in a violation of a particular standard, the area is classified as non-attainment for that pollutant. The EPA then applies federal standards for regulating pollutants and designates a time period in which the area must again attain the standard. (www.tnrcc.state.tx.us.updated/air). The causes of air pollution are numerous and include industry sources, mobile sources such as motor vehicles, stationary sources like cleaners and gas stations and others. The federal regulations establish guidelines for each of the sources. This report focuses on one element included for mobile sources, employer trip reduction.

Travelers base their choice of mode on perceived cost, convenience and – all too often – habits formed over long experience. In the past, pent-up demand for faster travel has out-paced population growth and quickly filled new lanes with traffic. While the harmful environmental effects of individual auto use is expected to diminish, the overall amount of urban travel is expected to dramatically increase, negating advances that are expected to occur through technology.

Air pollution can make people sick. It can cause burning in the eyes and nose and an itchy, irritated throat; pollution can cause trouble breathing, as well. Some chemicals found in polluted air cause cancer, birth defects, brain and nerve damage and long-term injury to the lungs and breathing passages. Some air pollutants are so dangerous that accidental releases can cause serious injury or even death. Air pollution can damage the environment. Trees, lakes and animals have been harmed by air pollution. Air pollutants have thinned the protective ozone layer above the Earth; this loss of ozone could cause changes in the environment, as well as

more skin cancer and cataracts (eye damage) in people. Air pollution can damage property. It can mar buildings and other structures. Some common pollutants eat away stone, damaging buildings, monuments and statues. Air pollution can cause haze, reducing visibility in national parks and sometime interfering with aviation. The Clean Air Act and Amendments are designed to improve air quality in the US, a good thing for health, property and the environment.

The Role of the Federal Government and the Role of the States

Although the 1990 Clean Air Act is a federal law covering the entire country, the states do much of the work to carry out the Act. For example, a state air pollution agency holds a hearing on a permit application by a power or chemical plant or may fine a company for violating air pollution limits. Under this law, EPA sets limits on how much a pollutant can be in the air anywhere in the United States. This ensures that all Americans have the same basic health and environmental protections. The law allows individual states to have stronger pollution controls, but states are not allowed to have weaker pollution controls than those set for the whole country. The law recognizes that it makes sense for states to take the lead in carrying out the Clean Air Act, because pollution control problems often require special understanding of local industries, geography and housing patterns. States have to develop state implementation plans (SIPs) that explain how each state will do its job according to the Clean Air Act requirements. A state implementation plan is a collection of the regulations a state will use to clean up polluted areas. The states must involve the public, through hearings and opportunities to comment, in the development of each state implementation plan. EPA must approve each SIP, and if a SIP is not acceptable, EPA can take over enforcing the Clean Air Act mandates in that state. The US government, through EPA, assists the states by providing scientific research, expert studies and advice to support clean air programs.

Public Participation

Public participation is a very important part of the 1990 Clean Air Act. Throughout the Act, the public is given opportunities to take part in determining how the law will be carried out. For instance, people can take part in hearings on the state and local plans for cleaning up air pollution. People can sue the government or a source's owner or operator to get action when

EPA or their state has not enforced the Act. They can request action by the state or EPA against violators.

Employer Trip Reduction Programs

In January 1994, employer based trip reduction became mandatory in nine major areas that meet the Clean Air Act's definition of severe non-attainment area. These areas are responsible for implementing employer trip reduction programs, pursuant to the Employer Commute options (ECO) provisions of the 1990 Clean Air Act Amendments. The logic behind such measures relies on the assumption that increasing the average numbers of riders per vehicle will result in fewer cars on the road and, consequently, less pollution in the air. It was believed that the easiest point of control for commuter behavior, employers, should produce these increases in average vehicle occupancy among their employees using a variety of incentives and disincentives to alter commuter behavior. California's Regulation XV is the most broadly implemented, best-known and most studied example of one such transportation control measure that satisfies the ECO requirements. Many Metropolitan Planning organizations (MPOs) are turning to variants of region XV, partly because it is available off-the-shelf, partly because of claims regarding its implementation made by some Southern California regulators, and partly because the Environmental Protection Agency (EPA) has already accepted it in satisfaction of the ECO requirements of the Clean Air Act. However, the full story of Region XV's shortcomings is still being studied, and many MPOs are unaware of the regulation's high cost and lack of popularity. On the brighter side, recent EPA clarification presents the possibility of implementing measures on a region wide basis that might allow an MPO to implement a minimalist approach to Employee Trip Reduction programs, thus minimizing the impacts on business communities, many of which are already straining under considerable regulatory burden. These programs have the potential for considerably greater pollution reduction effectiveness, as well as greater cost-effectiveness in producing the primary goal, cleaner air.

Case Study: The Washington State Commute Trip Reduction Program

Air pollution and traffic congestion in the state of Washington are now critical problems. Motor vehicles generate more than 40% of all air pollution in Washington. As a result, metropolitan areas of King, Pierce, Snohomish, Clark, Spokane and Yakima counties violate

federal health standards for carbon monoxide. Each year, Washington citizens spend \$2 billion to fuel motor vehicles, the largest single use of petroleum in the state. All this driving means Puget sound's I-5 corridor has the fourth worst traffic congestion in the nation. The traffic jams waste fuel, increase vehicle emissions and fray motorists' nerves. In 1990, an area survey ranked transportation and the environment as the top priorities for elected officials. To reduce automobile-related air pollution, energy consumption and traffic congestion, the Washington state legislature recently passed the commute trip reduction law. The law was part of the Washington Clean Air Act. The law calls for cities and counties with major employers in Clark, King, Kitsap, Pierce, Snohomish, Spokane, Thurston, and Yakima counties to adopt commute trip reduction ordinances detailing requirements for employers. Major employers must implement commute trip reduction programs, consistent with the state law and local ordinances, to reduce the number of trips and miles people commute alone to work. The employer programs are to use transportation demand management.

Several benefits accrue to Washington businesses that implement the strategies. Trip reduction programs benefit businesses by reducing parking expenses, increasing productivity, improving attendance and timely arrival. Trip reduction benefits employees by reducing commute costs, time and stress. The Washington plan called for the following implementation schedule.

Implementation Schedule

- January - June 1993: Cities & counties adopt commute trip reduction ordinances.
- Six months from ordinance adoption: employers submit trip reduction programs to cities & counties for approval.
- Three months from program submittal: cities & counties review employer programs.
- Six months from program submittal: employers implement programs.

The goals for employers are to reduce single occupant vehicles (SOV) and the vehicle miles traveled (VMT) by 15 % in 1995, 25 % in 1997, and 35 % in 1999. The reductions are measured from base year values for the employer's commute trip reduction zone. Employers will not be measured against their own performance nor their neighbors, but rather against the zone average.

One of the most frequently asked questions by Washington based employers are one of the most difficult to answer: that is, what is the cost? Studies of similar employer programs across the country have shown ranges between \$6.15 per employee per year to \$11.85 per employee per year. These costs can only be given as a guideline, since even among employers with similar characteristics having similar programs, costs can vary widely. Some program strategies have more potential cost than others.

The commute trip reduction law requires that the Task Force review progress toward the law's implementation and evaluate the costs and benefits of the law. Since major decisions will be based on the evaluation results, it is important that the information be of good quality. In order to do this, the state has developed a survey instrument for employers to use (WSDOT Eastern Region CTR Law/Internet).

Summary Observations about the Washington Program

The commute trip reduction law is a pragmatic solution to a substantial problem. It is a way that all the people can help to make communities better places to live and work. It can help make an organization more productive as well as increasing employee satisfaction. Consistent application of the law and cooperation from everyone will help to make this program a successful one, as well as maintain the qualities that make Washington State such a great place to live and work. Specific suggestions follow:

- Employers should further educate themselves on the commute trip reduction law. If they determine that they are affected employers;
- Affected employers should identify themselves to their local jurisdiction;
- A copy of the guidelines to the commute trip reduction law by should be obtained through their local jurisdiction or transit agency;
- Employers may consider joining transportation management organizations; and,
- Affected employers should identify their company resources for a commute trip reduction program, as well as transportation alternative available currently to their employees.

Case Study: Company D Trip Reduction Program

Company "D" is one of largest energy supplying companies in the USA. It is a global energy company with more than \$20 billion dollars in assets. It has a strong tradition to community service, environmental stewardship, community philanthropy, and is committed to human service. The company has implemented through company support measures--an Employer Trip Reduction Program with over 1,300 employees participating. A separate Employee Transportation Coordinator (ETC) is appointed to develop, market, administer, and monitor the trip reduction program on full-time basis.

The trip reduction measures adopted by this urban employer include the following:

- Transit/Bus Subsidies
- Transit Bus Information
- Carpooling and Vanpooling
- Flexible Work Schedule
- An Emergency "Guaranteed Ride Home" Program Incentive

The survey reflected that persons in this company hold the view that with better Metro services and co-operation with transportation management organizations more participants could be gained for trip reduction programs.

Recommendations and Conclusion

While opportunities exist to increase participation in trip reduction program, even the best design will have difficulty achieving an equal level of competition with the automobile, particularly in the suburban environment where employment destinations are widely scattered and parking on-site is generally provided free by the employers.

Incentives are, therefore, necessary to overcome these built-in advantages to single occupant travel and equalize the competition between the auto and other modes. These incentives can include travel time savings, such as are afforded by high occupancy vehicle (HOV) lanes, priority treatment at the ramps, and entrance ways, and preferential parking at the destination. Financial incentives are also important, and can consist of direct subsidies to non-single occupancy vehicle users, in-kind subsidies such as discounted transit fares.

Since the employers play a vital role in trip reduction, the federal government should encourage them with incentives such as tax write-offs for the cost incurred for reduction efforts.

Government or agencies responsible for implementation of trip reduction may create separate days of the week when cars with odd numbers and cars with even numbers can utilize the highways and streets. This will very much encourage transit, carpool and vanpool strategies.

Chapter 7

Summary Findings

The research showed that employer trip reduction has the potential to make a significant contribution toward meeting air quality goals for non-attainment regions. In addition to improving air quality, trip reduction reduces the miles traveled positively influencing efforts to better manage travel demand. Several key elements are necessary to achieve successful trip reduction programs as follows.

- ***There must be a positive message relative to trip reduction coming from the state government.*** The states of New Jersey, Maryland and Washington provided leadership guiding active trip reduction programs by including some provision encouraging or requiring trip reduction in non-attainment areas. As a point of comparison, the Texas legislature charged the Texas Natural Resource Conservation Commission with program administration, but advanced no additional statutes or ordinances supporting trip reduction efforts.
- ***Chief executive officers of individual companies must embrace trip reduction.*** “Buy-in” of trip reduction in an individual company must come from the head of the organization because of the intensive internal effort required to ensure program success. Funds must be provided for incentives, decisions must be made relative to working hours, and communication handled within the workforce. These elements cannot occur without the support of the head of the company.
- ***Citizens must be educated regarding the benefits of trip reduction programs.*** A study by the Center for Transportation Training and Research (Ledé and Lewis, 1993) showed that citizens have a strong sense of environmental sensitivity and responsibility; consequently, they will use transit when they sense their individual effort will improve the overall environment. It behooves those in positions of responsibility relative to trip reduction to ensure that the benefits of trip reduction programs are clearly articulated to potential participants.
- ***Programs for transit, carpooling, vanpooling and other travel demand management strategies should offer an advantage to the user.*** Users should receive a benefit by committing to participate in trip reduction programs. For instance, transit routes using high

occupancy vehicle lanes provide travel time savings over driving a single-occupant vehicle. System costs should be structured to save the individual money over driving alone. Those promoting trip reduction should think about the programs and design improvements to provide the user greater benefits over driving alone.

Bibliography

- Air Quality: impact of Trip Reduction Programs on States and Affected Employers
By Maura K. Fletcher, and Susan L. Mayer. *Environment and Natural Resources Policy Division 93- 745 ENR*.
- Bay Area Air Quality Management District, *Employee Trip Reduction Program Guide*. Nov. 1993.
- Deaton, Dan, Deputy Director, Dallas Regional Support Office, US Department of Energy (October 21, 1994), Keynote Address at the Center for Transportation Advisory Board Meeting and Transportation Symposium.
- Farkas, Z. Andrew (January 1996). "The Equity and cost Effectiveness of Employee Commute Options Programs", TRB 960078.
- Federal Highway Administration, *Highway Statistics 1991*, p. 17. p. 217
- Findley, Roger W. and Daniel A. Farbe, (1996) **Environmental Law In A Nutshell**, 4th Edition, West Publishing Co. St. Paul Minn.
- Lindquist, Eric (January 1996). "A Comparison of Policy Implementation Approaches: Vesus Mandatory Trip Reduction Ordinances", TRB 960151.
- New Jersey State Chamber of Commerce, *Employee Trip Reduction Program Guide*. Sept.]Oth 1997.
- New Jersey Department of Transportation, *How to Develop a Transportation Program for Your Employees*, 1993, pp. 22-23.
- New Jersey Statutes Annotated 27.-26a-15 et. al.
- Texas Natural Resource Conservation Commission, **Employer Trip Coordinator Training Manual**, 1992.
- The Bureau of National Affairs, " Commuter Reduction Plan Subject to EPA Scrutiny, Possible Sanctions, " *Daily Environmental Report*, August 2, 1993, p. A-3.
- U.S. Environmental Protection Agency, Office of Air and Radiation, *Employee Commute Options guidance*, Dec. 1992, p. 1
- U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *National Air Quality and Emission Trends Report*, 1991, 450-R-92-001, Oct. 1992.
- U.S. Environmental Protection Agency, Office of Air and Radiation, *Transportation Control Measure Information Documents*, Dec. 1992, P. 16

Appendixes

Appendix A

Survey on Voluntary Commute Option Participation

1. Is your company currently promoting a commute options program?, if no please indicate below if you want additional information. Yes No
2. Please indicate which of the following commute options your company currently promotes:
 Vanpooling Transit/Bus Service Other
 Carpooling Flex Work Hours _____
 Telecommuting Bicycling/Walking _____
 Compressed Work Week
3. Does your company currently track information on your commute options program?, if yes please indicate the approximate number of employees involved _____
 Yes No
4. Are you providing subsidies for employees participating in
 Vanpooling Transit Other _____
5. Are you aware of the voluntary Regional Commute Alternatives Program (RCAP) whose four components are: Rideshare Matching, Vanpool Program, Transportation Management Organization Development, and Public Outreach? Yes No
6. Check box if you would like additional information on any of the RCAP programs.

Company

Address

Point of Contact

Telephone #

()

Is the point of contact above, your Employee Transportation Coordinator (ETC) or the individual who handles your commuting program? Yes No

Appendix B

Role of Intelligent Transportation Systems Improvements in Employee Trip Reduction

These services can be used to encourage ridesharing and provide parking control, HOV lanes enforcement, mode change information, and air pollution/emission information and detection. Reduced travel demand on roadways due to increased HOV and transit use, or altered travel patterns, will confer a general benefit on the public and the following results may be observed:

- reduced trips
- reduced congestion
- reduced peak period vehicle use
- reduced need for additional parking - improved public transportation
- improved working conditions.

These benefits are directly related to the achievement of ITS goals, and although the reductions and improvements may be quantified, it is difficult to associate accurate monetary values. The costs of implementation and maintenance are likely to be split between the public and private sectors and shared with other user services. The major public sector cost is the development of systems and installation of the necessary infrastructure, although this may be shared with the private sector. Some of the infrastructure is already in place so the cost of upgrading could be minimal. Administrative costs must be borne by the regulating agency responsible for overseeing the implementation of TDM programs as required by the 1990 Clean Air Act. Cost to employers will vary depending on the strategy chosen. The success of demand management and operations depends on information which may be provided by a wide range of technologies. There is a significant overlap with other user technologies, and much of the infrastructure for implementation is in place or can be installed in a relatively short time. The cooperative nature of the overall effort makes it difficult to define what would constitute a system failure, and it would be even harder to pinpoint a specific reason and assign responsibility.

Appendix C

Clean Air Act Amendment Components and Specifications

Enforcement

The 1990 Clean Air Act gives important new enforcement powers to EPA. It used to be very difficult for EPA to penalize a company for violating the Clean Air Act. EPA had to go to court for even minor violations. The 1990 law enables EPA to fine violators, much like a police officer giving traffic tickets. Other parts of the 1990 law increase penalties for violating the Act bring the Clean Air Act's enforcement powers in line with other environmental laws.

Deadlines

The 1990 Clean Air Act sets deadlines for EPA, states, local governments and businesses to reduce air pollution. The deadlines in the 1990 Clean Air Act were designed to be more realistic than deadlines in previous versions of the law, so it is more likely that these deadlines will be met.

Appendix D: A Summary of Commute Facts

Commute Mode Choice

- The number of workers using the private vehicle as the main means of transportation to work (driving alone and ridesharing) increased from 41.4 million in 1960 to 99.6 million in 1990, an increase of 141%. The private vehicle mode share increased from 67% to 87% over the same time period.
- From 1980 to 1990, the number of workers driving to work alone increased from 62.2 million to 84.2 million, a growth rate of 35%. The share of work travel for driving alone increased from 64.4% in 1980 to 73% in 1990.
- All alternatives experienced declines in mode share in each of the past three decades, with the exception of working at home in the 1990's.
- Distinguished as a separate mode starting in 1980, the number of workers carpooling to work decreased from 19.1 million in 1980 to 15.4 million in 1990, a decline of 19%. The mode share also declined from 19.7% in 1980 to 13.4% in 1990.
- The number of workers walking to work decreased from 6.4 million in 1960, to 4.5 million in 1990, a decline of 30 %. The walk to work mode share for these two years was 10.4% and 3.9%, respectively.
- From 1960 to 1990, the number of workers using public transportation as their main means of transportation to work declined 22%, from 7.8 million to 6.1 million. The resulting mode share for the work trip declined from 12.6% in 1960 to 5.3% in 1990.
- From 1960 to 1980, the number of workers working at home fell significantly from 4.7 million to 2.2 million, a decline of 53%, however, the number increased to 3.4 million in 1990, a 56% increase in the 1980's. As a result, the work at home share declined from 7.5% in 1960 to 2.3% in 1980 and increased to 3.0% in 1990.

Vehicle Occupancy

- Vehicle occupancies declined significantly from 1980 to 1990, as the share for driving alone increased substantially and all categories of carpooling (2-person, 3-person) showed decline in share over the same time period.
- The number of workers driving alone increased 35%, from 62.2 million in 1980 to 84.2 million in 1990. As a result, the proportion of workers driving alone increased from 64.4% to 73.2% over this time period.
- The number of worker in each carpool category declined from 1980 to 1990, including a

9% decline for 2-person carpools and 46% decline for 4 or more person carpools.

- From 1980 to 1990, the commute share declined from 13.8% to 10.5% for 2-person carpools, and from 2.5% to 1.1% for 4 or more person carpools.
- The proportion of US workers departing for work between 6 and 9 a.m. was approximately 70 % from 1985 to 1991.
- This same proportion by region was approximately 72% for the northeast and south, and 68% for the Midwest and west. From 1985 to 1991, little or no change was observed in this distribution for each region.
- In 1985, 1989, and 1991, the proportion of US workers departing for work was 21% between 6 and 7 a.m., 32% between 7 and 8 a.m., and 17% between 8 and 9 a.m. The distribution of workers by departure time to work indicated virtually no change from 1985 to 1991.
- The same pattern also was observed for workers departing in off-peak times with virtually no change in the percentage distribution overtime.

Travel Time And Distance To Work

- The distribution of travel times to work remained stable in all travel time categories from 1985 to 1991.
- In the US, approximately 35% of work trips took less than 15 minutes, 34% took 15 to 29 minutes, and 14% took 30 to 44 minutes.
- Travel distance to work appears to be increasing as the proportion of shorter work trips has declined, while the proportion of longer work trips has increased.
- Given that travel times remained stable and travel distance appears to have increased, the result clearly suggests an increase in average speed.
- Travel time to work was shorter in the midwest and longer in the northeast, while the south and the west had similar travel times in between.
- Travel distance was shorter in the south and west relative to the northeast and midwest, as indicated by the proportion of work trips in the 'less than 1 mile' and ' 1 to 4 mile' categories.
- Travel time to work for the black population appeared to be generally longer than for the population as whole, while the Hispanic and elderly populations were close to the national distribution.

- Despite the longer travel times to work, the data suggest that the black population have shorter distances to travel to work than national average.
- Travel distance to work also appeared to be shorter than the national average for both the Hispanic and elderly populations.
- The travel time and travel distance to work for commuters below the poverty level were both lower than for the US as a whole.
- The data suggests that travel time and travel distance to work for suburban residents were generally longer than for the US as a whole.
- In contrast, travel time and travel distance for workers living outside the metropolitan area were much shorter than the national average.
- The travel distance for central city residents appears to be shorter than the US total, while travel time appears to be similar to US as a whole.

Appendix E

Air Resources Board's Ridesharing Definitions

*** EMPLOYER**

Any person, firm, business, educational institution, government agency, non-profit agency or corporation, or other entity that employs persons. Several subsidiaries or units that occupy the same worksite and report to, one common governing board or governing entity or that function as one corporate unit are considered to be one employer.

*** EMPLOYEE**

Any person employed by a person, firm, business, educational institution, non-profit agency or corporation, or government or other entity, including independent contractors. The term excludes the following as defined elsewhere in this rule: seasonal employees; temporary employees; volunteers; field personnel; and field construction workers.

***SEASONAL EMPLOYEE**

A person who is employed for less than a continuous 90-day period, or an agricultural employee who is employed for up to a continuous 16-week period.

***TEMPORARY EMPLOYEE**

Any person employed by an employment service that reports to a worksite other than the employment service worksite under a contractual arrangement with a temporary employer.

***FIELD PERSONEL**

Employees who spend 20% or less of their work time at the worksite and who do not report to the worksite during the peak period for pick-up and dispatch of an employer-provided vehicle.

***FIELD CONSTRUCTION WORKER**

An employee who reports directly to work at a construction site.

***VOLUNTEER**

A person who does not receive wages for work activity at the worksite.

***DEPENDENT CONTRACTOR**

An individual who enters into a direct written contract or agreement with an employer to perform certain services. The period of the contract or agreement is at least 90 continuous days, or is open-ended.

***EMPLOYER TRANSPORTATION COORDINATOR**

An employee, other individual, or entity appointed by an employer to develop, market, administer, and monitor the employer Trip Reduction Program or Employer Trip Reduction Plan on a full or part-time basis.

***WORKSITE**

A structure, building, portion of a building, or grouping of buildings that are in actual physical contact or are separated solely by a private or public roadway, or other private or public right-of-way, and that are occupied by the same employer.

***WORKSITE EMPLOYEE THRESHOLD**

X employees at a single worksite, on an average daily basis, for a 50-day period provided at least 50 employees are normally scheduled to report to the worksite on a daily basis during the peak commute period.

***AVERAGE VEHICLE RIDERSHIP CALCULATIONS**

AVR for the worksite shall be calculated by dividing the number of employee days summed over the survey week by the number of vehicle trips summed over the survey week.

***VEHICLE TRIP**

A vehicle trip is based on the means of transportation used for the greatest distance of an employee's home-to-work commute trip for employees who start work during the peak period. Each vehicle trip to the worksite shall be calculated as follows:

Single-occupant vehicle = 1

Carpool = 1.1 divided by number of people in carpool

Vanpool = 1. divided by number of people in vanpool

Motorcycle, moped, motorized scooter, or motor bike = 1

Public transit = 0

Buspool = 0

Bicycle = 0

Walking and other non-motorized transportation mode =0
Telecommuting = 0 on days employee is telecommuting for the entire day.

Compressed work week = 0 on employee's compressed day(s) off zero-emission Vehicle =0

*** PEAK PERIOD**

6:00 a.m. through 10:00a.m., Monday through Friday, inclusive.

***EMPLOYEE DAY**

Each day of the survey week that an employee starts work during the peak period. Notes: Employees telecommuting or who are off due to a compressed work week schedule are counted toward the total employee days. The following employees are not counted toward the total employee days: employees on vacation, sick leave, jury duty, or other time off; employees reporting to a different worksite or an off-site work related activity.

***CARPOOL**

A vehicle occupied by two to six people traveling together between their residence and their worksite or destination for the majority of the total trip distance. Employees who work for different employers, as well as non-employed people, are included within this definition as long as they are in the vehicle for the majority of the total trip distance.

***VANPOOL**

A vehicle occupied by seven to fifteen people traveling together between their residence and their worksite or destination for the majority of the total trip distance. Employees who work for different employers, as well as non-employed people, are included within this definition as long as they are in the vehicle for the majority of the total trip distance.

***BUSPOOL**

A vehicle occupied by sixteen or more people traveling together between their residence and their worksite or destination for the majority of the total trip distance. Employees, who work for different employers, as well as non-employed people, are included within this definition as long as they are in the vehicle for the majority of the total trip distance.

***COMPRESSED WORK WEEK**

A regular full-time work schedule that eliminates at least one round-trip commute trip (both home-to-work and work-to-home) at least once every two weeks. Examples include, but are not limited, to working three twelve-hour days (3/36) or four ten-hour days (4/40) within a one week period; or eight nine-hour days and one eight-hour day within a two week period.

***TELECOMMUTING**

A system of working at home, offsite, or at a telecommuting center, for a full workday that eliminates the trip to work or reduces travel distance by 50 % or more.

***ECO or EMPLOYER COMMUTE OPINION**

Another term for the Employer Trip Reduction program used by the Environmental Protection Agency and some agencies in other states. Texas is using the term ETR.

