

Five-Year Results of Employee Commute Options in Southern California

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To give employers in Southern California a sense of what their efforts have accomplished and to provide other metropolitan regions that are currently developing and implementing similar employer trip reduction regulations with some guidelines for setting goals and expectations of progress, an analysis of 5 years of employer trip reduction plans and average vehicle ridership (AVR) survey data compiled by the South Coast Air Quality Management District is presented. The following areas are covered: (a) employer and employee coverage, (b) AVR progress and determinants of progress, (c) commute mode share progress, (d) telecommuting, (e) compressed work week schedules, (f) charge-for-parking, and (g) incentive programs.

As part of the Air Quality Management Plan for the South Coast Air Basin, mandatory employer-based vehicle trip reduction regulation was adopted as a strategy to reduce air pollution from mobile sources. Rule 1501, developed and implemented by the South Coast Air Quality Management District (SCAQMD), was enacted in December 1987 (then called Regulation XV) giving large employers in Los Angeles, Orange, and the nondesert portions of San Bernardino and Riverside counties the responsibility to create and implement programs to reduce the number of vehicles arriving at their work sites during the morning peak hours. This study is a report of the accomplishments of these employer efforts since the first plan was approved in December 1988 through November 1993, exactly 5 years.

Rule 1501 specifically requires that all employers with 100 or more employees at any work site complete and file a trip reduction plan outlining how they intend to increase the average vehicle ridership (AVR) toward a specified goal within 1 year of the approval of the plan. AVR is defined roughly as the number of employees reporting to work at the peak morning hours (originally 6 to 10 a.m. and subsequently changed to the 4-hour period between the hours of 5 and 11 a.m., when the majority of employees arrive at the site), divided by the number of motor vehicles driven to work by these employees. The ratio is calculated over a 5-day work week to account for the use of compressed work week (CWW) schedules and telecommuting. The goals are set by geographical location: 1.75 for the central business district (CBD) of Los Angeles with high employment density and significant access to transit, 1.5 for other developed urban and suburban areas, and 1.3 for outlying, low-density areas.

Notices of the requirement to comply with the regulation were sent to targeted employers in phases, first to the largest employers in the region, and, then over time, to progressively smaller and smaller sites, of those identified as having 100 or more employees.

Employers may choose any number of incentives and disincentives to convince their employees to use alternatives to driving alone

to work. Plans submitted to the SCAQMD are reviewed by staff specialists who determine whether adequate effort is being expended by employers. The SCAQMD has decided not to require use of any preassembled packages of strategies, allowing maximum flexibility for employers to customize strategies for their sites. Plan approval is based on some determination that the proposed program will achieve additional AVR progress toward the site's AVR target. Hundreds of firms have been fined for being in violation of the regulation, but in most cases the reason was for not submitting a plan and not a consequence of poor AVR performance.

The data for this study come from the SCAQMD Rule 1501 data base compiled from employer trip reduction plans (TRPs) submitted by employee transportation coordinators (ETCs) and signed by the highest-ranking managers at these sites. The data base has some limitations for any analysis seeking to report levels of progress and reasons for progress. First, it contains no information on individual commuters, as all information in an employer TRP is aggregated and reported at the site level. Second, data on incentives include only limited descriptions (e.g., carpool subsidy amounts are just estimates, dates of actual implementation are not specified). Third, some reporting requirements and definitions have changed over time. Fourth, there is no record of trip reduction results from employer-based programs in place prior to the regional regulation.

This paper, a revision of the executive summary of a larger study, outlines the major research findings: employer and employee coverage of the regulation over time; AVR progress and possible determinants of progress; commute mode share progress; levels of telecommuting, CWW schedules and charge-for-parking; and incidence of use of incentive elements. After the summary of key findings, conclusions relating to employer accomplishments reached as a result of the analysis are outlined. We did not make any recommendations for policymakers or employers because our aim is merely to describe the vehicle trip reduction achievement. A determination of the effectiveness and cost-effectiveness of the regulation is also beyond the scope of this study.

A full detailed report has been developed as a reference document with statistics for employers and groups looking to make performance comparisons and projections. Both the executive summary and the full report are the first steps in an effort to provide employers with site-specific reports for site performance evaluation.

KEY FINDINGS

Employer and Employee Coverage

Rule 1501 was enacted in 1987 and called for an annual plan submittal. However, the interval between consecutive plans tended to be longer than 1 year, especially in the early years of implementa-

tion. Moreover, notification to comply was phased in starting with the largest employers. As a result, not until 1992 did a majority of the regulated sites have 1 full year of TRP experience.

As of November 1993, 6,604 employer sites had at least one plan approved. Of the 6,604 sites, 0.2 percent had five plans approved, 16.4 percent had four plans approved, 28.6 percent had three plans approved, 33.6 percent had two plans approved, and 21.1 percent had just one plan approved. On average, these sites have 2.4 plans approved, representing roughly an average of 1-1/2 years of TRP experience.

Figure 1 illustrates the coverage of Rule 1501 over time in terms of the number of employees working at regulated sites. The coverage numbers represent the total number of employees and not just the number of employees arriving during the peak a.m. period (AVR and mode split data shown in subsequent figures represent only employees at regulated sites arriving at work during peak hours). As of November 1989, a total of 854,000 employees were working at sites with one plan approved. One year later, 1,269,000 employees were working for employers with one plan approved, but only 245,000 employees were working at sites with two plans approved, indicating at least 1 full year of trip reduction program experience. A total of 2.3 million employees work at sites subject to the regulation, which represents over a third of all workers in the region. Peak-arrival employees represent 70 percent of total employees at regulated work sites. Not until 1992 did a majority of employees at sites covered by the regulation have 1 full year of TRP experience.

AVR Progress

Base-year Aggregate AVR

Before analyzing progress in AVR, we need to explore possible explanations for base-year AVR. A previous study, based on a sample of 1,110 sites, used analysis of variance to test the hypothesis that a site's AVR would depend on its geographic location, its size or number of employees, its industrial sector, and the date of employer survey (1). It found that geographic location and industrial sector are only marginally significant, and size is not unless combined with industrial sector. By using virtually the same classifications of geographic location, size, and industrial sector, our

analysis—based on the 6,324 sites with at least one approved plan and valid data—produced only slightly different results. Still, a regression analysis indicates that the relationship between base-year AVR and geographic location, size, and industrial sector is very weak. In conclusion, it is apparent that these variables are not predictors of site AVRs at the start of compliance with Rule 1501.

Aggregate AVR Progress

Because of a lack of sound AVR data before inception of Rule 1501, the authors looked only at sites with at least 1 full year of trip reduction program experience, that is, those sites with two or more plans approved, with valid AVR data available. As of November 1993, 4,999 sites had two or more plans approved with valid AVR information in the data base; on average, these sites have 2.8 plans approved, or roughly 2 full years of trip reduction program experience on average under the regulation. The initial or base-year aggregate AVR for these 4,999 sites was 1.205. As of November 1993, the aggregate AVR for these sites increased to 1.257, representing an increase of 4.3 percent.

Although not strictly a normal distribution, there is a concentration of sites at the middle ranges, representing modest gains or losses. The highest concentration of sites (1,209) falls in the AVR change of little or no gain (0.000 to 0.049 AVR change from initial to current plan). At the extremes are 520 sites for which AVR increased 0.2 AVR point or more, and 235 sites for which AVR decreased more than 0.2 AVR point (Figure 2).

AVR progress for each of the four counties covered by Rule 1501 is similar, with the exception of Orange County, the second largest county. The absolute value of AVR increase (0.07) and the percentage increase (6 percent) were the same for Los Angeles, Riverside, and San Bernardino. Orange County employers achieved an increase of 0.01 in AVR, representing only a 1-percent gain.

Analysis of AVR Change

The analysis of AVR change examines the relationships between AVR change and: (a) site characteristics, (b) duration of program implementation, and (c) initial AVR.

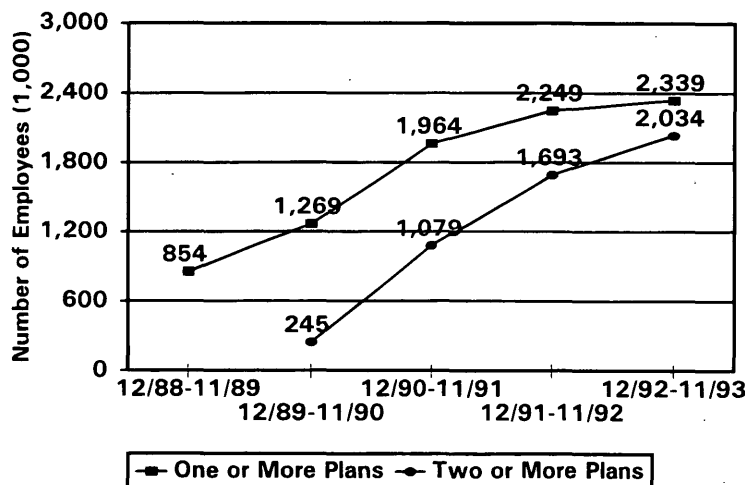


FIGURE 1 Rule 1501—employee coverage over 5 years.

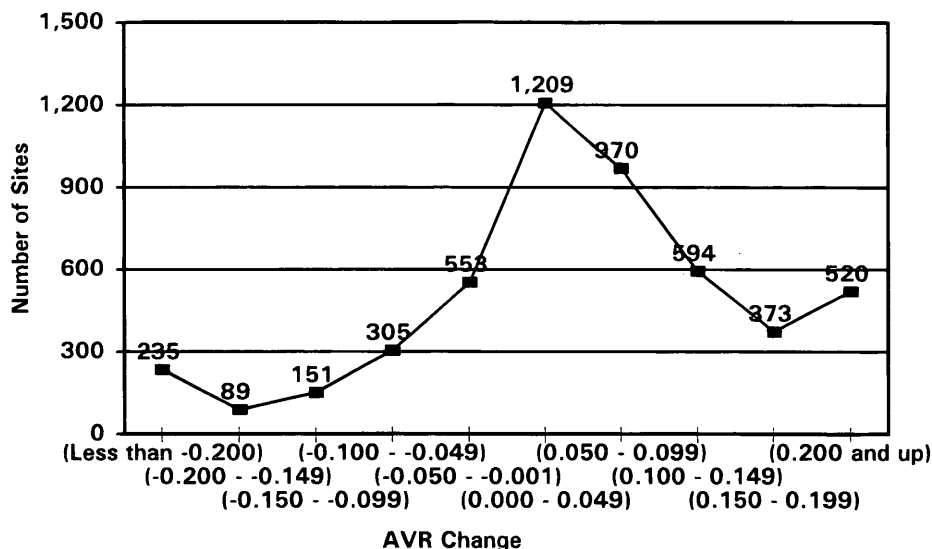


FIGURE 2 Number of sites by AVR change: first plan versus current plan.

The same earlier study of Rule 1501 mentioned previously, which compared Year 1 and Year 2 plans at 1,110 sites that were the first to complete a year of TRP implementation, concluded that none of the site characteristics examined (size, geography and industry) were found to be significantly related to AVR progress (*1*).

Now that more sites have appreciably more history, a similar analysis was conducted using data for 4,999 sites with two or more plans approved. Although we discovered a statistically significant relationship between AVR change and site characteristics, the relationship is very weak, suggesting that site characteristics cannot explain the change in AVR.

Although not related to site characteristics, the earlier study found that the AVR change was attributed to implementation of the TRP (*1*). Therefore, it is reasonable to assume that duration of program implementation would have a stronger impact on the change of AVR than the site characteristics. We repeated the previous statistical analysis adding duration as a new independent variable. In addition, a stepwise regression model was also constructed. Both analyses did point to a statistically stronger impact of the duration on AVR change than the site characteristics. However, again, the relationship between AVR change and duration is so weak (adjusted $R^2 = 0.01$) that it is virtually meaningless, and it reflects the fact that, on average, AVR progress is greatest in the early years of compliance, dropping off significantly after Year 2.

This is most apparent in an analysis of the AVR change year-by-year, which provides a clearer understanding of the weak relationship between AVR change and duration. Furthermore, progress year by year can be most accurately assessed using the same base of employer sites in each plan sequence rather than a varied base of employer sites. Therefore, a panel of 817 sites with four or more AVR surveys is used to chart AVR progress year by year. The 817 panel sites, on average, are much larger than the whole regulated site population and had a lower initial aggregate AVR. However, their industrial composition and geographic distribution are similar to those of the total regulated employer population. Progress at these sites was actually steepest between the second and third plans, with aggregate AVR increasing from 1.220 to 1.271. We found

more modest AVR progress from the first to the second plan sequence, 1.196 to 1.220, and from the third to the fourth plan sequence, 1.271 to 1.288. This pattern of AVR change to some extent explains the weak relationship between AVR change and duration. It also suggests it first takes some time for employers to implement plans, to achieve an adequate level of awareness of program elements among employees, and for employees to make mode changes. Then, once a significant shift takes place, additional progress comes more slowly (Figure 3).

In general, the higher the initial AVR, the lower the percentage gain in AVR. In fact, sites with an initial AVR of 1.50 and above actually experienced a 14-percent decrease in AVR on average (Figure 4). Our correlation analyses show that AVR change has a much higher though negative correlation with initial AVR than with duration, industry, location, or size.

Thus, the strong negative correlation between AVR change and initial AVR, together with the weak correlation between AVR change and duration of program implementation, indirectly supports the finding of earlier studies that there exists a threshold capping level of increase in ridesharing from employer-based vehicle TRPs (*1,2*).

Commute Mode Share Progress

Overall Commute Mode Share Progress

Figure 5 shows the change in commute mode shares from the first approved plan (initial or base plan) to the most currently approved plan at the 4,999 sites that have two or more plans approved and valid information in the data base.

The drive-alone share of commute trips decreased from 73.5 percent to 67.2 percent a decrease of six share points or a 9.6-percent decline. The decrease in the drive-alone share was almost entirely the result of increased carpooling (from 15.5 percent to 21.4 percent share of commute trips). In addition, the vanpooling share increased (from 1.2 percent to 1.9 percent), the transit share increased only slightly (from 4.0 percent to 4.3 percent), and the

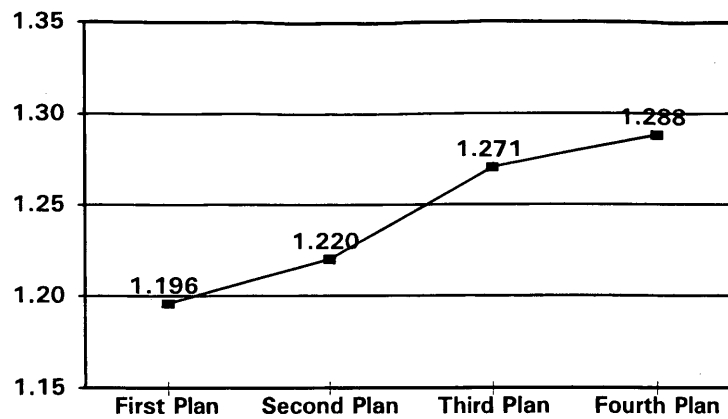


FIGURE 3 Aggregate AVR progress by plan for 817 sites with four or more approved plans.

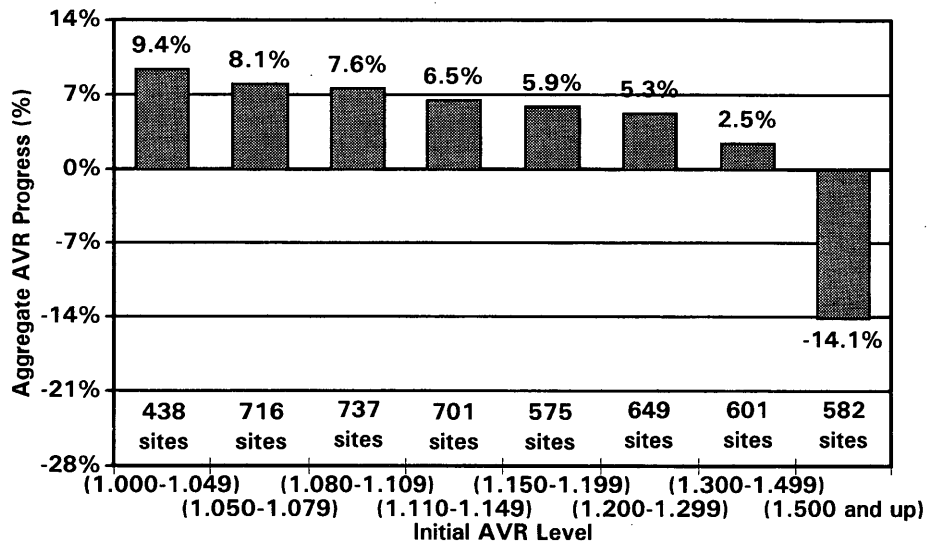
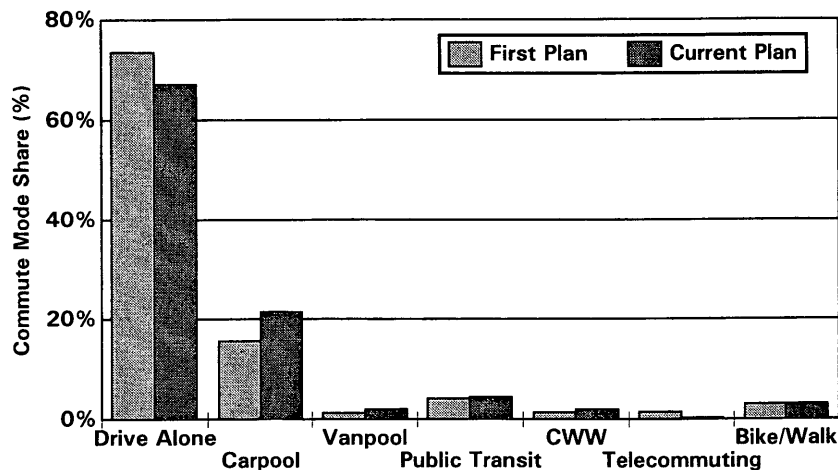


FIGURE 4 Aggregate AVR progress by initial AVR: first plan versus current plan.



Base: 4,999 regulated sites with two or more approved plans as of November 1993.

FIGURE 5 Commute mode share progress: first plan versus current plan.

CWW day off share increased (from 1.3 percent to 1.9 percent). The telecommuting share, however, decreased (from 1.4 percent to 0.3 percent). The combined shares for bike and walk modes did not change (3.0 percent).

Change of Carpooling and Transit: All Sites versus CBD Sites

At all regulated sites with two or more AVR surveys (4,999 sites), the carpooling share (21 percent) is currently five times the size of the transit share (4 percent). In fact, carpooling increased 6 share points and the transit share did not change at these sites, from the initial to the most current plans. At 188 Los Angeles sites located in the CBD, where transit is more likely to be an option, the carpool and transit shares are roughly the same (21 to 22 percent), with carpooling increasing 4 share points and transit increasing 3 share points, from the initial to the most current plans.

Reduction in Vehicle Trips

To translate the commute mode share progress into vehicle trips reduced, the inverse of AVR, vehicle trips per 100 person trips or VE ratio is used because it directly measures the vehicle trip reduction relative to employee trips. The following analysis first estimates the overall vehicle trips reduced at the 4,999 sites with two or more approved plans from the initial plan to the current plan. Then, to look at year-to-year change, the VE ratios for the 817 sites with four or more approved plans are calculated for each year.

Overall Vehicle Trip Reduction The VE ratio at the 4,999 sites with two or more approved plans declined from 82.96 vehicle trips per 100 employee trips in the first approved plan to 79.55 vehicle trips per 100 employee trips in the most currently approved plan. However, if the VE ratio had remained the same 82.96 vehicle trips per 100 employee trips from the first survey to the current survey, vehicle trips would have increased 9.12 percent—the same growth rate of total employee trips—to 1,987,283. Because of the decline in the VE ratio, the actual vehicle trips have increased only 4.6 percent to 1,905,283. Therefore, the difference is 81,538 (1,987,283–1,905,745) vehicle trips per day, which represents the vehicle trips that have been effectively eliminated at these sites. These vehicle trips represent a 4.8-percent reduction compared to the 1,987,285 vehicle trips we would expect in the absence of the regulation.

Vehicle Trip Reduction Year by Year: A Panel Analysis To estimate vehicle trip reduction year by year, the VE ratio is calculated for the same 817 panel sites with four or more approved plans for each plan sequence. The index declined consistently from 83.62 in the initial plan to 81.95 in the second plan, down to 78.71 in the third plan, and further down to 77.64 in the fourth plan. This represents a total decline of 5.98 vehicle trips per 100 employee trips, or a 7.2-percent decline over the VE ratio in the base year, at these sites over a 3-year period. As a result, a total of 40,043 vehicle trips have been eliminated per day at these sites, a 7.2-percent reduction in daily vehicle trips, over a period of about 3 years.

Telecommuting, CWW Schedules, and Charge-for-Parking

Telecommuting

Rule 1501 currently defines telecommuting as “an employee working at home or at a satellite work center provided the center reduces an employee’s work trip by at least 20 mi. one way for an entire work day” (3). This definition was tightened from the definition originally used: “Telecommuting means working at home or at satellite work stations using electronic or other means to communicate with the usual place of work” (3). Therefore, results reported indicating the change over time should be used with caution.

To understand telecommuting activity level, AVR survey data were reviewed. Because the data are aggregated at the employer level, and because each respondent reports mode choices for 5 days, we cannot say with certainty how many employees are telecommuting (100 telecommuting responses may be 100 employees telecommuting 1 day during the survey week, 50 employees each telecommuting two times a week, or any other combination). We therefore report telecommuting activity in terms of the share of all employee or commute “trips” or days. Over 8 in 10 (83 percent) work sites do not have any telecommuting at all based on their most current AVR survey data. Of those sites reporting some telecommuting activity, only a very small proportion of sites has a meaningful level: merely 1 percent of sites have activity greater than or equal to 5 percent of all employee days (Figure 6).

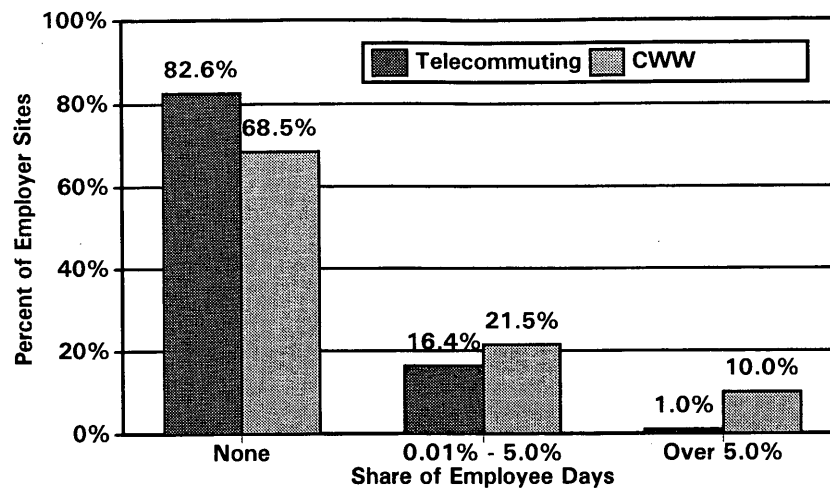
In fact, as discussed in the previous section, over time, telecommuting as an overall share of employee days at regulated sites with two or more plans approved has declined. The tightening of the definition of telecommuting by SCAQMD in February 1993, which imposes conditions to the eligibility of working at a satellite work center as a telecommuting credit, may somewhat contribute to this decline (3). But it by no means can fully explain such a large decline because most telecommuting took place at home rather than at telecommuting centers. An examination by industry revealed that nonbusiness entities (e.g., government agencies) accounted for a large share of the decline. The larger the site, the more likely there is to be some telecommuting. However, the larger the site, the lower the actual share (percentage of all AVR survey responses).

CWW Schedules

CWW schedule is an alternative to the normal five 8-hour work days in a 1-week schedule. Rule 1501 recognizes three compressed work week schedules: (a) three 12-hr workdays in 1 week (3/36); (b) four 10-hr workdays in 1 week (4/40); and (c) 8 hours over 9 workdays in a 2-week period (9/80).

Like the analysis of telecommuting activity, the analysis of CWW schedules is conducted using AVR survey data aggregated at the employer level. But unlike telecommuting, CWW day-off responses are indicated by schedule type (4/10, 9/80, 3/36), and each schedule type implies a number of days off per week. Therefore, from number of days off by schedule type in the AVR data base, we can derive the number of employees who are working CWW schedules at any given site.

Compared to telecommuting, CWW schedules have been offered by more regulated employer sites. Nearly one-third (32 percent) of the 6,483 sites with reliable data in the data base report that there are some employees working a CWW schedule based on their most cur-



Base: 6,483 regulated sites with one or more approved plans as of November 1993.

FIGURE 6 Telecommuting and CWW schedule activity.

rently approved plans as of November 1993. Still, employee participation rates are very low. Only 1 in 10 sites in the data base shows a CWW share of employee days of 5 percent or greater (See Figure 6). In fact, as a share of all employee days, CWW days off remain small, increasing from 1.3 percent of employee days in initial trip reduction plans to 1.9 percent in the most current AVR surveys of sites with two or more plans approved (see previous section). Similar to telecommuting, the larger the site, the more likely it is that some employees work CWW schedules. However, the larger the site, the lower is the CWW days-off share of employee days.

Charge-for-Parking Program

Although charging-for-parking is known to be the most effective strategy for convincing employees to switch from driving alone to some multiple-occupant mode, it remains unpopular among employers. Just 364 employers (6 percent of regulated sites) report that they charge their employees for some or all of the cost of parking. A sign of the effectiveness of the strategy is that together, these 364 sites have achieved an AVR of 1.37, significantly above the average AVR for the region.

While concentrated in the CBD and satellite business centers, the location of employers who pass some of the cost of parking along to their employees is more widespread geographically than originally thought. More than three quarters of the 364 sites were located in suburban area while less than one quarter of the 364 sites were located in the central city area of downtown Los Angeles. This suggests that a charge-for-parking policy may be suitable for employers in a wide range of locations, although certainly not in outlying areas.

Incentive Programs

The last section of the study covers the strategies used by employers in their vehicle trip reduction programs. Table 1 gives the number and percentage of sites incorporating each incentive group as part of their strategy. (Totals represent numbers reported

in trip reduction plans filed, indicating only that an element in the specific group is used. The level and weight applied to the incentive in the actual execution of the program is not reported. For example, the 74.8 percent of employers offering direct financial incentives no doubt differ by the level of financial reward offered, which behaviors are rewarded, and the number of employees who have the opportunity to receive a reward. Therefore, an analysis of the effectiveness of each of these program elements alone and in combination with other elements is not possible with this data.) The most widely used incentives as reported in the most currently approved trip reduction plans are marketing elements, rideshare matching services and facility improvements (over four in five of all regulated employers report using each). Direct financial incentives, offered by 74.8 percent of the sites, is the next most widely used category of incentives. In addition, more than 7 in 10 sites reported that they offer a guaranteed return trip program.

Of all the incentive groups, direct financial incentives most directly rewards employees for using alternatives to driving alone to work. Only employers who offer direct financial incentives actually give some money (cash or redeemable vouchers) to employees who use transit, carpool, vanpool, bike, or walk. While most employers offer some type of direct financial incentives, a closer look at the specific types offered indicates that money is not actually awarded widely.

The most widely offered is ongoing transit subsidies (64.9 percent) as presented in Table 2. Transit subsidies are required by a number of cities including the city of Los Angeles. Still, the transit share of commute trips is low and has remained relatively flat.

Ongoing carpool subsidies are currently offered by 4 in 10 employers. As carpooling is the most widely used alternative and has experienced the most dramatic increase in use of all alternatives since the regulation has been in effect, this incentive is likely to account for the largest direct (out-of-pocket) cost to employers. Still, the majority of employers do not offer these subsidies.

Overall, as a group, the share of employers offering direct financial subsidies declined 15.6 share points, from 69.1 percent in the initial plan year to 53.4 percent in the current plan year. In addition, by

TABLE 1 Regulated Sites Offering Incentives by Group

| Incentive Groups | Sites with Offerings | |
|---------------------------------------|----------------------|---------|
| | Number | Percent |
| Marketing Elements | 4,918 | 90.5 |
| Rideshare Matching Services | 4,604 | 84.7 |
| Facility Improvements | 4,382 | 80.6 |
| Direct Financial Incentives | 4,066 | 74.8 |
| Guaranteed Return Trip Program | 3,905 | 71.8 |
| Employee Benefit and Services | 3,459 | 63.6 |
| On-site Services | 2,967 | 54.6 |
| Direct Non-Financial Incentives | 2,840 | 52.3 |
| Flexible Work Hours | 1,606 | 29.5 |
| Compressed Work Week | 1,268 | 23.3 |
| Telecommuting | 555 | 10.2 |
| Other (Not classified by other codes) | 354 | 6.5 |
| Parking Management | 343 | 6.3 |
| Transportation Allowances | 36 | 0.7 |

specific element, a comparison is made of the incidence of offerings used in the first year to the incidence of offerings in the most current year at 4,032 sites with two or more plans approved (Figure 7).

Strikingly, there was a decline in the incidence of use for all elements. It seems as though employers have cut back their investment in vehicle trip reduction and that the SCAQMD has lowered its compliance standards.

A determination of the effectiveness and cost-effectiveness of specific strategies is outside the scope of this study. As stated earlier, the data compiled by the SCAQMD will not allow these analyses, largely because descriptive details of incentives and timing of implementation are not recorded.

CONCLUSIONS

First, progress, both in terms of aggregate AVR increase and vehicle trips reduced, has been significant, but short of targets. Progress in the second year tends to be greater than in the first year; however,

progress in the third year, for the small number of employers with enough history, slowed dramatically.

Secondly, AVR progress levels are relative to the nature of the programs being implemented by employers and the compliance standards applied by the SCAQMD. Increases in carpooling account for most of the progress, primarily because employers have emphasized strategies that support carpool formation rather than strategies that are more disruptive to existing organization and work, such as charges for parking, CWW schedules, and telecommuting. Transit is still not a prevalent option, and, therefore, did not show any significant increase in use, except in downtown Los Angeles.

Third, employers looking to minimize the cost of compliance have cut back on the use of direct financial incentives to encourage ridesharing. It appears as though costs incurred by employers have largely gone to finance investments in "soft" strategies—such as marketing, guaranteed ride home, rideshare matching—which are necessary, but not sufficient, inducements to change commute modes.

TABLE 2 Regulated Sites Offering Direct Financial Incentives by Element

| Direct Financial Incentive | Sites with Offerings | |
|---------------------------------------|----------------------|---------|
| | Number | Percent |
| On-going Transit Subsidies | 3,528 | 64.9 |
| On-going Carpool Subsidies | 2,164 | 39.8 |
| On-going Walk to Work Subsidies | 1,923 | 35.4 |
| On-going Bike to Work Subsidies | 1,910 | 35.1 |
| On-going Vanpool Subsidies | 885 | 16.3 |
| Other Subsidies | 860 | 15.8 |
| Introductory Transit Passes/Subsidies | 423 | 7.8 |
| Subsidized Vanpool Seats | 167 | 3.1 |

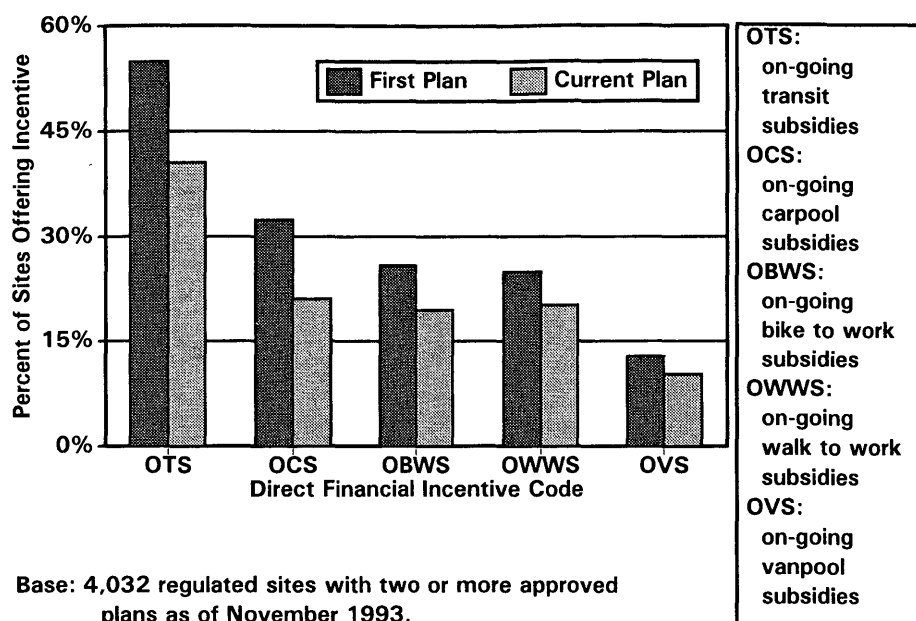


FIGURE 7 Ongoing direct financial incentive offerings: first plan versus current plan.

Moreover, absolute AVR progress achieved by employers approximates a bell curve, with majority of employers making only very modest gains. Employers making the most AVR progress are those with the lowest initial AVRs. Site characteristics such as size, industry, and geography do not predict AVR change, which suggests that other tangible and intangible factors acting in combination determine the success or lack of success of any one site.

In addition, the phased-in approach to the introduction of the regulation means a large portion of the targeted employer population did not implement a program until several years after the adoption of the regulation. Therefore, several years later, progress may fall short of expectations because program history is not as broad or deep as commonly believed. Further, a study of effectiveness and cost-effectiveness can only be done using a site-by-site comparison of strategies employed and results achieved, among sites with the same number of years of implementation experience, and with more TRP details than are currently available in the data base.

Finally, if employers are to have a role to play in working toward solutions of the problems exacerbated by economic growth—namely, air pollution and congestion—an evaluation of the merit of the vehicle trip reduction, or “ridesharing,” regulation must weigh emissions reduction achieved against employer investment made, compared to investments in alternative strategies required from employers to achieve similar benefits.

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