Policy Analysis

Cato Institute Policy Analysis No. 231: Highway Aggravation: The Case for Privatizing the Highways

June 27, 1995

Peter Samuel

Peter Samuel is a freelance journalist who writes on regulatory affairs. His work appears in *Forbes* and *National Review*, and he is writing a book on Superfund.

Executive Summary

Traffic congestion is a major annoyance to tens of millions of Americans and a $100 billion annual economic loss. The traditional answer to highway backups, mass transit and carpooling, have not worked. The convenience of the private car for the vast majority of commuters makes even the most lavishly subsidized mass transit uncompetitive.

Since 1956 most highways have been financed by gas taxes. Now those taxes are being siphoned off to transit and general revenue, and what is left for roads goes largely for maintenance and rebuilding, not new building. The revolt against rising taxes means that the only source of revenue for significant new highway capacity is the private sector.

The economics, politics, and technology are right for progressively privatizing highways and creating markets in highway service. Washington State, Virginia, and California have begun to do so. Private highway projects in those states are discussed in detail.

State highways should be sold section by section to private owners. With private operators responsible for maintenance as well as improvement of the highways, gasoline taxes and other government charges for roads could be phased out. New ideas and new technologies would be applied. For example, to eliminate stop-and-go conditions, private highway operators could vary toll rates by the minute to encourage less peak-hour travel.

Privatization of the highways should be attractive to elected officials needing to make good on promises of reducing budget deficits and lowering taxes. Officials who take the lead in sponsoring bold reforms may win public acclaim and votes.

Introduction

Backups on the highways are a daily source of frustration to tens of millions of Americans. Our cars and highways are engineered to transport us at 50 to 70 miles per hour (mph), yet in rush hours the highways regularly clog up and average speeds are 15 to 20 mph and declining each year. Worse perhaps than the average speed of travel is the variability of backups, which makes travel in rush hours so unpredictable and punctuality so difficult. The daily commute and other trips become tiresome irritations and a waste in our lives. Freeway systems are designed with generous high-speed lane widths, long acceleration and deceleration lanes, pull-off shoulders, and superelevation on curves, as well as long sight lines and no cross traffic. Superhighways are set up for our cars and trucks to cruise along safely at 50 to 70 mph, yet they are becoming parking lots full of stop-and-go traffic for hours each day. That is

frustrating to drivers because the time lost is largely unproductive. Drivers find it hard to relax in jammed traffic because they keep wondering how late they are going to be, whether they should try another route, and whether the congestion ahead will suddenly clear.

The communist economic model has been discredited and abandoned in most places, but not on America's highways. Generally, our highways are built and managed by state agencies and offered "free" to the public. Instead of paying for road use directly, motorists provide highway funds through a byzantine system of license fees, registration charges, gas and diesel taxes, truck charges, special transportation sales taxes, and development district levies. After some of that money has gotten through the various bureaucracies, tax agencies, treasuries, and transportation administrations at different levels of government, after some has been diverted to transit systems and even general government revenues, what is left for roads is political "pork"--allocated by dealmaking between various government actors in Washington, state capitals, and county seats.

In Russia communism's failure was epitomized by constant shortages in stores. Empty shelves in supermarkets and department stores and customers in line, wasting hours each week, became the face of the system's failure, as well as a source of huge personal frustration, even rage. Communism failed because prices were not flexible to match supply and demand; because stores were bureaucracies, not businesses; and because revenues went into a central treasury and did not fuel increased capacity and improved service. We in supposedly capitalistic America suffer communism--an unpriced service provided by an unresponsive monopolistic bureaucracy--on most of our highways. Our manifestation of shortage, our equivalent of Russian lines at stores, is daily highway backups. There is no price on rush-hour travel to clear the market. There is no revenue stream directly from road users to road managers to provide incentives either to manage existing capacity to maximum consumer advantage or to adjust capacity to demand.

"Whenever the price of using some valued good does not increase as demand increases, that good will be in short supply. Shortages will be acute if supply cannot readily be enhanced," wrote the Transportation Research Board, an arm of the National Research Council. "In the absence of efficient pricing, motorists who drive on congested facilities are not required to pay for the delays they cause each other, and these delays are substantial. The wasted time and fuel are estimated to cost (at least) $40 billion annually."[1]

The Texas Transportation Institute, a division of Texas A&M University, does regular studies of highway congestion under contract to the Federal Highway Administration. TTI surveys the congestion on the freeways and arterial roads of 50 cities with a total population of 106 million.[2]

In 1991, the latest year for which estimates are available, congestion caused 4.6 billion gallons of fuel to be wasted, cost 10.2 million hours of delays each day, and had an overall cost of $44 billion.[3] About half of that cost was incurred in five large metropolitan areas--Los Angeles ($7.8 billion), New York ($6.6 billion), San Francisco- Oakland ($2.8 billion), Washington, D.C. ($2.4 billion), and Chicago ($2.4 billion). Washington had the greatest congestion cost per vehicle ($1,440), followed by San Bernardino- Riverside, California ($1,340), New York ($1,090), and Los Angeles ($1,000). San Bernardino-Riverside had the highest congestion cost per person ($870), followed by Washington ($760), San Francisco-Oakland ($740), San Jose ($670), and Los Angeles ($660).[4]

Congestion has long been recognized as an inner-city problem, but, as the TTI notes, it has now gotten "into the suburbs, with street systems designed for service to residential areas (now) overburdened with traffic headed to large shopping malls and business parks."[5] Because many internal combustion engines operate most efficiently at a steady 40 to 50 mph, stop-and-go traffic adds considerably to air pollution--emissions of carbon monoxide and volatile organic compounds are worst at low engine speeds. In turn, the extra pollution increases the pressure, via the Clean Air Act, the Environmental Protection Agency (EPA), and local regulatory agencies, to adopt cleaner (but more expensive) fuels, including highly expensive battery-stored electricity.[6]

The congestion problem is getting steadily worse. In its traffic congestion index (TCI), the TTI expresses congestion as the ratio of daily vehicle-miles traveled (VMT) to roadway design capacity (i.e., a ratio of 1 means that the roadways are carrying the traffic for which they were built). The average TCI for the 50 cities surveyed has gotten worse every year since 1982. In the decade before 1991 congestion overall worsened 17.5 percent.[7] In 47 cities congestion got worse, and in only three (Phoenix, Houston, and Detroit) did it lessen. In some places it got

spectacularly worse: in San Diego the index went from 0.78 to 1.22, a 56 percent increase. The other cities with radically worsening congestion were Salt Lake City (0.63 to 0.86, up 37 percent), San Francisco-Oakland (1.01 to 1.34, up 33 percent), Sacramento (0.80 to 1.04, up 30 percent), and Washington (1.07 to 1.39, up 30 percent). In Los Angeles congestion worsened by 28 percent to an index of 1.56, in Chicago it worsened by 25 percent to 1.28, and in New York it worsened by 13 percent to 1.14.

The trend to gridlock is not confined to the largest cities. Medium-sized cities are also in trouble. Atlanta has a TCI of 1.14, a 28 percent deterioration over the decade; Seattle-Everett a TCI of 1.20, 27 percent worse; Dallas a TCI of 1.06, 26 percent worse; San Jose a TCI of 1.07, 26 percent worse; and Portland, Oregon, a TCI of 1.08, 24 percent worse. Twenty-five of the 50 largest cities had expressway and arterial traffic at saturated levels (TCI 1.0 and above) in 1991, compared with 11 of the 50 in 1982.[8]

Mass Transit

Mass transit does not seem to help to avert congestion. Both the Washington and San Francisco-Oakland areas in the 1970s and 1980s developed and continued to expand splendid new passenger rail systems at a cost of billions of dollars, yet those cities are among the gridlock leaders both in absolute terms and in congestion growth. New rail systems tend to gain their patrons from other transit systems--buses and vans--not cars, and those systems approximately double trip costs.[9] New York and Chicago have major subway and elevated commuter rail systems as well as huge bus fleets, but those cities suffer serious highway congestion. The basic problem with mass transit is that it serves mainly hub-and-spoke journeys between suburbs and downtown. The downtowns, however, are all declining, as work and shopping places move to what Joel Garreau has called "edge cities"-- emerging new urban centers such as Tysons Corner (Washington area), Las Colinas (Dallas), Burlington Mall (Boston, at Route 128), and the 287 corridor (White Plains, New York).[10] Most of the edge cities Garreau cites are nowhere near the edge of the built-up area, and some are nearly as central as the downtown. In each metropolitan area there are from 5 to 20 such suburban downtowns of office parks, malls, and concentrated commercial districts 5 to 20 miles away from the old downtown. The new downtowns are the sites of around 70 to 75 percent of new office construction and almost all new stores. Our urban areas are becoming hydra headed.[11]

Charles Lockwood argues that quite a number of suburban downtowns are in trouble.[12] Some of the earliest--he cites White Plains, New York; Stamford, Connecticut; Southfield- Detroit, Michigan; Greenpoint-Houston, Texas; Sherman Oaks- Los Angeles; Tysons Corner, northern Virginia--are struggling and may decline or collapse. He argues that some old downtowns, such as that of Boston, are making a comeback because of their historical character and cultural and educational resources. Lockwood suggests another trend as well: the move to small rural towns way beyond the edge. That trend, facilitated by the telecommunications and computer revolutions, points to the need for emphasizing adaptability in any transportation system, which suggests the general superiority of rubber tires on asphalt to steel rail technologies.

Workplaces, shops, and services are dispersed among edge cities. A great number of journeys are now suburb to suburb. In place of the hub-and-spokes pattern of urban- area journeys in the first half of the 20th century, we have a spider-web pattern or no pattern at all. In a hydra- headed urban area, single-center-oriented mass transit works only for a small proportion of journeys; there is really no alternative to the highway system for most intraurban journeys.

The automobile best suits multipurpose trips. People in busy households with husband and wife both working like to combine journeys, stopping off after work to go to a supermarket, convenience store, bar or restaurant, dry cleaners, liquor store, or video rental place. They may combine shopping and transport of children in one trip. Or they may buy materials for a weekend project during a lunch hour. The car is a goods hauler and storage locker as well as a people mover. Such multipurpose trips are so much more convenient in a car that mass transit cannot compete. A car goes door to door and leaves when you want to leave, not according to a printed timetable produced by a transit company. A car offers a degree of privacy and personal security that mass transit cannot match. Moreover, the great bulk of its costs--depreciation, insurance, and service--are fixed, so once you have a vehicle, its trip costs (e.g., gasoline, tire wear) are relatively low.

Anthony Downs of the Brookings Institution sums up the reason people are in general reluctant to abandon their cars

for transit or to share them as urged by carpool advocates. "The commuter who drives alone enjoys not only greater privacy and comfort but shorter travel times, more convenient timing, and if parking is free, lower day to day cash outlays."[13]

The Liberated Family

The average angry and articulate middle-class protester attending a city council meeting to oppose a local developer's application for permits for a new subdivision generally talks as if traffic congestion were the result of increased population. The protester does not want more people coming to live nearby because "that will mean more cars on the already crowded interstate." In fact, more people are a minor factor. The major cause of increased traffic is the transportation emancipation of the family. By about 1970 the majority of American families had a car, but only a minority had two cars. The man of the house did most of the driving until about 1970. The last two decades, however, have seen women all over America getting jobs and driving cars as regularly as men. And as the overcrowded parking lots and side streets around any senior high school will confirm, older children are getting their own cars, too.

Downs documents the numbers neatly. From the mid- 1970s to 1990 the U.S. population increased by 34 million (16 percent), employment increased by 32 million (37 percent), the number of licensed drivers increased by 38 million (29 percent), the number of cars increased by 46 million (42 percent), and VMT increased by 62 percent.[14]

At least three-quarters of the increase in traffic has nothing at all to do with population. It has everything to do with women and young people getting their own cars. That explains why areas of the country with little population growth have not been spared the upsurge of traffic on the roads. Cincinnati, whose population was static during the 1980s, saw daily traffic on its urban freeways increase from 8.5 million to 11.7 million VMT during that decade.[15] The TCI for Cincinnati increased 13 percent. In the same decade the Chicago area increased in population from 7.1 million to 7.5 million (6 percent) while traffic on the freeways increased from 26 million VMT to 39 million VMT, up 53 percent. Chicago's TCI worsened by 25 percent.

Paving America

Congestion is a function not of traffic itself but of traffic compared with highway capacity. Opponents of roads and cars say that building extra highway capacity is futile. It is true that under highly congested conditions some demand for roads will be suppressed and that providing extra roads will therefore cater to latent demand. For example, if roads during rush hours have been congested, relieving the conditions causing the congestion will encourage some drivers who were driving during off-peak times to avoid congestion to drive during peak times. Also, adding capacity to one highway while leaving untouched another one not far away will attract traffic to the enlarged road. However, claiming that increasing supply in and of itself can increase demand displays an ignorance of fundamental economics or indicates a hidden agenda or a fatalistic sense that there is no hope of building out of congested conditions. Doomsayers hold that road builders would have to pave the whole countryside to provide enough roads. But demand for highway space is not infinite, or there would be no uncongested highways at all.

None of that means that extra capacity may not be warranted. Relief of latent demand may, indeed, be a service worth providing. The TTI data support the contention that building extra capacity can help (though, in deference to current anti-road fashion, the institute does not advocate that course). The three cities that saw a reduction in their TCI in the 1980s all added major amounts to their freeway network--Phoenix (TCI down 10 percent) added 302 new lane-miles, or 88 percent; Houston (TCI declined 10 percent from 1986 to 1991) brought in an extra 378 lane-miles, or 23 percent; and Detroit (TCI down 3 percent) introduced 171 new lane-miles, or 11 percent.[16] San Francisco-Oakland, which is about the size of those three cities put together, brought in only 86 new lane-miles, or 4 percent, and southern California also expanded its highway capacity by less than half that needed to maintain current congestion levels. The Washington area needed an extra 147 lane-miles to maintain traffic conditions but added only 61 (4 percent), so of course the area now suffers increased stop-and-go traffic. New York added only 131 lane-miles of new freeway (2 percent) but managed to keep traffic conditions from deterio- rating as fast as they did in many places (its TCI went from 1.01 to 1.14) through the country's largest expansion of arterial road capacity: 724 miles (10 percent). Most of the expansion occurred early in the decade, and the increase in congestion in the Big Apple has been associated with that program's winding down.[17]

It is an understatement to say that building new highway capacity is often difficult. It is easier, perhaps, to build a new freeway than to build a new nuclear power plant in the United States, but not much easier.[18] Opposition has been largely a matter of ideology--cars and freeways are considered "politically incorrect." The statist crowd just does not like the individualism of driving and the personal freedom a car provides. Socialists and liberals have been waging ideological warfare against the automobile and all its manifestations for several decades, and they have won major victories, including the suspension of most inner-city freeway projects in the 1970s.[19] In the climate of protest against Vietnam, they succeeded in mobilizing allies among inner-city activists and local citizens threatened with displacement.

They were not entirely wrong in what they said. The use of eminent domain to threaten property owners with expropriation was an indefensible practice of highway authorities. Some of the inner-city projects did not make social or economic sense. Many were just "pork"--products of the political process or the pet projects of large state bureaucracies and grandiose planners. But freeways cut off midway, leaving half-built ramps to grow weeds and rust 100 feet above the ground, left unfinished system links that could have provided convenient movement through and access to the downtown areas. Ironically, the killing of innercity freeways by protesters of the 1960s and 1970s accelerated the process the protesters so deplored--the relative decline of the old downtowns and the rise of dispersed highway-dependent development.

Critics of the current car and highway regime should, however, be conceded several points: highway users are currently not paying their way; the system of roadway pricing is riddled with inefficiency and unfairness; state highway agencies have gone from being overaggressive advocates of an engineering solution (in the 1950s and 1960s) to being timid bureaucracies so cowed by small organized opposition groups and environmentalists that they have abdicated their responsibility to expand highway capacity to meet demand.

Highway agencies now emphasize what they call "demand management." "Demand suppression" might more accurately characterize efforts to delegitimize and demoralize motorists and to coerce them into carpools, vans, and mass transit. "Demand management" has become an excuse for state highway agencies to not do their job--building and maintaining highways.

There is a parallel here with electricity. The big utilities adding expensive "demand suppression" programs (subsidizing insulation, promoting more efficient appliances and the like) are now uncompetitive with small specialized new electricity producers. Maybe new, special-purpose private firms, formed to promote, develop, build, and manage particular highway projects, would be more efficient than large state highway agencies, especially where complicated new systems like congestion pricing are being introduced and success will depend on a single-minded commitment to making a project work.

Although expansion of highway capacity is difficult, it is far from impossible. State highway agencies all around the country have been busy quietly adding capacity in the past 20 years by building extra lanes in the grass medians of freeways. There is only a certain amount more of that kind of building that can be done. Building extra outside lanes is generally far more expensive and controversial, because it usually requires extra land or elaborate walling, reconstruction of ramps, and the like.

In Los Angeles, state highway officials have looked at double decking some of the most congested freeways but have rejected the idea as too expensive. They are right to reject that proposal, as there is no market in highway service to tell them whether people are prepared to pay the cost of the extra capacity.

In outer areas there is often an even greater need to expand capacity because both residential and commercial development are heavily concentrated at the edges. Many cities are having to build outer beltways because the original beltways are among the most overloaded and difficult-to- enlarge highways. Designed originally as bypasses for interstate or through traffic, they have become giant local distributors with new downtowns and smaller commercial centers concentrated around their exit ramps and interchanges with other freeways. Building outer beltways or other major "edge" highways is clearly a high priority if those new urban areas are to be economically viable and livable places. New beltways will relieve congestion on the old beltways and overcrowded rural roads, allow more bypass options for interstate traffic, and provide development opportunities at interchanges. In many cases they improve

airport accessibility. Examples are the eastern (US-301) and western (US-15/VA-234) bypasses of Washington, D.C., the Foothill & Eastern Transportation Corridors in Orange County, California, SR-125-S in San Diego, the Mid-State Tollway in Central Valley, California, the E-470 beltway in Denver, I-355/FAP-340 west of Chicago, new east-west highways north of Dallas, the Eastern Beltway and Holland E-W Expressway in Orlando, and the Northwest Hillsboro Expressway in Tampa.

Such freeways are likely to enormously enhance real estate values for some distance around their interchanges. Although state highway agencies cannot legally trade on the enhanced land value of interchange locations, the value enhancement of a new highway provides a major invitation to corruption. But a private highway developer can publicly solicit right-of-way donations, contributions to the cost of interchanges, and investment moneys from landowners who stand to benefit. There is no reason why development highways should not be combined with land development in one enterprise so that a highway builder could buy land around proposed interchanges and benefit from the enhanced land value as well as from tolls. America's transcontinental railroads were built as much with the money to be made from developing land obtained along their routes as with fare and freight revenues. Edge-area freeways can undoubtedly be built sooner and cheaper, and with less scandal, by private enterprise than by state highway agencies.

Opportunity for Free Marketeers

Advocates of free-market solutions have a great political opportunity to get into the problem-solving business and win wide political support in the mid-1990s by advocating and organizing a solution for traffic congestion on our urban freeways. That solution consists of progressive privatization of major highway service funded by time- flexible toll pricing and concession rights, combined with the phaseout of gasoline and diesel taxes and the federal and state highway agencies that live off them. Privatizing highways progressively and creating markets in highway service will make it possible to use resources more efficiently and to build as much highway capacity as people are willing to pay for.

The politics is right--people are properly distrustful of large state bureaucracies that live off taxation, and they demand lower taxes. The state highway agencies have largely given up on providing new service.

The technology is right--tolls no longer mean inefficient congestion-creating toll plazas collecting quarters like beggars; tolls can now be collected through small, cheap transponder tags, attached to a sun visor or windshield, that hold a prepaid stored value that gets debited by radio signal while the motorist drives by at highway speed.

The economics is right--the costs of congestion are a huge and growing burden not only on the peace of mind of commuters but also on the economy that depends heavily on free-flowing transportation of goods and services. And once the highway system is shown to be paying its way with tolls instead of from the public purse, it will be easier to argue for ending government subsidies for mass transit, the costs of which are strangling our big cities.

The alternative to privatization and a market solution is not the status quo but growing government control in the form of mandated employee trip reduction planning, which forces businesses, under threat of fines, to coerce their employees into riding in carpools, vans, and buses and using high-occupancy vehicle (HOV) lanes. Government officials deliberately engineer highway congestion to force more mass transit use.

Private Toll Roads

There is a real chance that moderate, pragmatic Democrats may embrace parts of the market agenda. Indeed, to some extent they are already stealing a march on free marketeers under the rubric of "public-private partnerships." This paper goes into some detail on private enterprise highway projects that are under way because the media have badly neglected those important developments.[20]

Washington State

The most comprehensive moves toward a highway market are in Washington State, where a Democratic administration is working under 1993 legislation (SHB 1006) to finalize private franchises for highway and some transit-related

operations involving over $3 billion worth of transportation investments in the Seattle-Everett-Tacoma metropolitan area (population 2.7 million). Project proposals that have been approved by the state Department of Transportation include tolling and private-sector enlargement and management of the Tacoma Narrows Bridge, renovation and environmental improvement of the SR-520 Evergreen Point floating bridge and approach roads and structures, a private franchise for 23 park-and-ride facilities, two completely new private suburban fringe toll roads (one to be built by a nonprofit organization, the other by a for-profit company), and the phased privatization of the entire 135 miles of freeways in the greater Seattle metropolitan area.

In December 1994 United Infrastructure Company (UIC), a partnership of Peter Kiewit Sons, Inc., a major highway-building company based in Omaha, Nebraska, and Bechtel Enterprises, Inc., of San Francisco, was completing the details of a franchise agreement with the Washington State Department of Transportation covering the whole freeway system of the area. Phase one will do away with 105 lane- miles of exclusive HOV lanes. The diamond HOV signs used to designate lanes reserved for buses, vans, and carpools will have dollar signs painted on them, indicating the opportunity for drivers of single-occupant vehicles (SOVs), or two- occupant vehicles in the case of HOV-3, to buy into the formerly HOV-only lanes. Robert Poole, president of the Reason Foundation and one of the earliest proponents of privatization, has popularized the term "HOT lanes"--high- occupancy-free, toll-for-others lanes. The HOT-lane tolls will be set by the principle of congestion pricing: they will be flexible to allow surplus capacity in the HOV lanes to be used by SOVs but not let in enough SOVs to slow traffic below a free-flowing 40 to 50 mph. Both public policy and commercial necessity will demand that toll pricing be set so that the fare lanes offer free-flowing conditions.

In phase two, 166 lane-miles of new HOT lanes will be funded, a $900 million project. About half of that improvement will be fairly simple construction in medians, but the other half involves quite difficult right-of-way acquisition, rebuilding of interchanges, and new ramps. Phases three and four are being described as options--possible future additions if the first two phases are financially and politically successful. Phase three would convert the free lanes of the area's 135 miles of freeways into fare lanes, offering a choice between free- flowing fare lanes and stop-and-go traffic in free lanes. In phase four, all highway lanes would be tolled. There would be no more free rides anywhere on the freeway system of the Seattle metropolitan area.

UIC and the state of Washington hope to have HOV lanes converted to fare lanes within a couple of years and to have 166 miles of new lanes well on the way to completion by the turn of the century. Those actions could lay the political and financial groundwork, as officials see it, for the introduction of a completely tolled system between 2000 and 2010.[21]

California

Republicans have not been utterly inactive. Under Gov. George Deukmejian in California they gained passage of a law (AB-680) allowing the California Department of Transportation (Caltrans) to solicit private-sector bids to build and operate toll roads. No state money is permitted to be used for either construction or operation (though local government money is permissible), tolls are not subject to regulation, and the state guarantees no toll-free improvements within a competitive corridor on either side of the route for the 30-year period of the franchise. Maximum rates of return ranging between 17 percent and 25 percent are negotiated. For two of four projects approved, no land acquisition is required.

In California the private highway developers thought they would be more exposed to the excesses of tort liability if they owned the facilities they were building, so they lobbied, successfully, to have the state law written so that they could transfer title to the state immediately after construction. Instead of the European and Virginia model of build, operate, transfer (BOT), California has BTO. At the end of the 30-year franchise, the private firms' rights to operate the toll roads cease.

Figure 1
California Projects
[Map Omitted]

Construction is under way on the first of the AB-680 projects (see Figure 1), which is due to open for business before

the end of 1995. The $125 million project in Orange County (in the southeastern part of the Los Angeles area) involves construction of four new highway lanes 10 miles long inside the median of Riverside Freeway. Called SR-91, that heavily congested eight-mile link is between the bedroom communities of Riverside County on the eastern end and Orange County and Los Angeles to the west. Fees for using the privately built inner lanes, known as the SR-91 Express Lanes, will be collected by debiting by radio signal motorists' prepaid accounts through a calculator-sized transponder stuck on the windshield. There will not be any tollbooth at which to stop.

To justify the name "Express Lanes" and guarantee a smooth-flowing 50 mph ride, the project will apply congestion pricing. Programmable toll rate signs at the entryway to the separate express lanes will announce tolls of from about $0.25 to $2.50, depending on available capacity, according to the project's finance director Steven George. Congestion pricing is an idea long touted by transportation economists as the key to breaking gridlock, but this project is the first implementation of the concept on a daily basis anywhere in the world. (The French got in first with weekend congestion pricing on their A-1 motorway, where variable toll rates on Sundays are used to smooth traffic flows home to Paris from weekend trips in the countryside.) SR-91 Express Lanes already has its customers--the drivers of 250,000 vehicles a day who are twiddling their thumbs and their radio dials in the stop-and-go traffic on the free lanes of the congested freeway. The freeway, which follows the canyon of the Santa Ana River, is the only roadway through the Chino Hills for many miles on either side.

"SR-91 will make money right away," says Barry P. Gold, who helped arrange most of the financing for the project while at Citibank. The project is based on $65 million in 14-year variable rate bank loans from two French banks, BNP and Socicte Generale, and Citibank. CIGNA insurance of Hartford, Connecticut, provided $35 million in longer term (24 years) money, and the $20 million equity holder is California Private Transportation Company (CPTC), a limited partnership led by Peter Kiewit Sons, Inc. The other partners are the French toll road company Cofiroute, which will run the toll collections, and the local road- building firm Granite Construction, Inc., which is building the project.

Investors are justified in seeing the possibility of high returns on projects like SR-91 Express Lanes, because there is no dearth of customers, according to Gerald Pfeffer, the man in charge of CPTC's SR-91 Express Lanes project and also managing director of UIC, which is negotiating two franchises in Washington State.

Some observers think CPTC will have early trouble managing congestion pricing, at least until the company gains experience and makes corrections. Bunching of cars entering the system could easily trigger excessive toll increases that would leave excessive gaps. The developers think they have those problems licked with computer simulations, but it remains to be seen how well they have anticipated real-world fluctuations in traffic due to different perceptions of price and travel time.

SR-91 Express Lanes was sold politically in southern California with the argument that private financing was the only way to get money to build HOV lanes. Voters had rejected bond issues and a special tax to finance the HOV facility. But under the terms of the CPTC agreement with Caltrans, HOVs get a free ride as long as the overall private operation is covering its debt service. If it is not, the CPTC can introduce a toll for HOVs, though it has to be discounted from the SOV toll. So there is tension between Caltrans's political desire to maximize HOV traffic on the SR-91 Express Lanes and CPTC's commercial desire to maximize tolled traffic. As HOVs increase, the operator could have a small and considerably fluctuating volume of revenue-earning SOVs.

A prolonged deep recession in California could conceivably reduce commuting sufficiently to make the tolled lanes superfluous, though that seems unlikely. By the end of the decade, an Orange County toll road, the Eastern Transportation Corridor, should be completed off SR-91 to the south of the eastern end of the SR-91 Express Lanes by the Riverside County line. That new roadway should reduce traffic on SR-91 by providing a more direct link between Riverside County and Irvine and other parts of southern Orange County and San Diego, although that is another uncertainty with which the project will have to cope in five or six years. In 10 or 20 years, a possible threat to a project like the SR-91 Express Lanes could be mass transit that actually works. A mass transit project is contemplated for north of SR-91. A more real threat may be telecommuting and home- or near-home-based work becoming widespread enough to alleviate rush-hour congestion. And there is always the possibility of unreasonable and arbitrary changes in the rules under which the project operates as governments and political pressures change.

So a private road like the SR-91 Express Lanes has very substantial downside risks, especially in the longer term. In the short term it may make money hand over fist and bring down upon itself utility-style regulation, which could dry up the risk capital required for such projects.

Three other private toll roads were approved by California in 1991 along with the SR-91 Express Lanes. Construction will probably start next on SR-125-S, an 11- mile north-south tollway southeast of San Diego and linked to the Otay Mesa Mexico border crossing. The major developer of that project is the Parsons Brinckerhoff Company, a major highway-design firm. The tollway's rationale is about one-third as a gridlock breaker and two-thirds as a development road. The San Ysidro-Tijuana border crossing is heavily congested, and the Otay Mesa crossing was built a couple of years ago to relieve that congestion. But only poor local roads run out of Otay Mesa, and they feed directly into the congested I-5 and I-805 freeways through San Diego. SR-125-S would provide a high-quality highway out of Otay Mesa, bypassing southern San Diego and providing an important new leg to the area freeway system. San Diego is spreading east from the coast, and major developers are ready to build subdivisions. So SR-125-S is part North American Free Trade Agreement infrastructure and part suburban development road.

Finding an acceptable right-of-way at the northern end of SR-125-S is a problem. Either a couple of dozen houses have to be acquired and demolished or the highway builder has to go into a small section of wild ground and tangle with the endangered species bureaucracies of the EPA and the Fish and Wildlife Service. At the time of this writing, it looks as though some beetle and bird habitats are more difficult to acquire than human habitats, so the highway will probably go through houses if it goes.

Carl Williams, assistant secretary of Caltrans and the official in charge of the AB-680 program, says SR-125-S is a sure money maker if the right-of-way can be gotten. He says the developer has so many groups wanting to invest in SR-125-S that he was asked to cease referring prospects to the principal.

Carl Williams foresees a start next on California's third private road, SR-57-S. That road is to be 10 miles of cars-only lanes elevated over the Santa Ana River flood channel, a largely concrete drain that runs through well- established suburbs and light commercial areas. Earlier efforts by the state to build a road at ground level met with overwhelming local opposition. The developers, a partnership of the Perot Group and Greiner Engineering, Inc., both of Dallas, hope to prefabricate the superstructure with standardized components, but that will be expensive--about $700 million. Surrounding freeways and arterial roads are horribly congested, so the project is a classic gridlock buster, with a multitude of customers waiting in traffic jams. The project faces some opposition from householders nearby, and it remains to be seen if they will be satisfied with sound barriers and landscaping, or how much weight their objections will carry. The major financial problem is the cost of bridging so that the flood channel underneath will not be disturbed.

A fourth private project approved by Caltrans is the Mid-State Tollway on the eastern fringe of the San Francis- co-Oakland area, roughly between I-680 and I-5. It is designed to relieve I-580, a major eastward freeway out of the southern Bay Area through the Diablo Range, and to provide a freeway from San Jose and the southern Bay Area to the Central Valley that stretches between Livermore and Antioch and is undergoing residential development.

As originally conceived, the Mid-State Tollway would have continued north of Antioch over the Sacramento River to bypass Oakland and Berkeley and provide an alternative to I- 680. But the project has produced a maelstrom of opposition. Unlike the situation in southern California where local jurisdictions support new highway projects, they generally oppose them in the Bay Area. Bay Area Rapid Transit, the electric rail system, is being expanded toward the Central Valley, so mass transit enthusiasts say the Mid- State Tollway is superfluous. The developers have already abandoned the northern, most expensive, leg of the project, and the odds seem to be heavily against much of the project's proceeding in the present political climate.

Virginia

In Virginia former Democratic governor Douglas Wilder was key to securing the passage of legislation that allowed the first modern era private toll road (from Dulles Airport to Leesburg in Loudon County) to get under way. At the time of this writing, the Dulles Greenway toll road is about three-quarters built and is due to open on September 29, 1995. A $325 million project, it is 14 miles of four-lane divided freeway through largely undeveloped countryside on

the western fringe of the Washington metropolitan area. It will end at a small beltway around the pretty, historic town of Leesburg (population 19,000).

The area is quite ritzy real estate, northern Virginia "hunt country," not far from the Blue Ridge Mountains. It is an attractively broken landscape of farms, many now boarding horses for riders from the Washington area, between small treed hills. Interestingly, environmentalists and local officials have supported the project as a central element of a growth strategy for the county, which provides for future development to be concentrated in the Dulles-Leesburg corridor on the theory that that strategy will take development pressure off the western part of the county, which the plan intends should be kept rural. The project was supported by the powerful Piedmont Environmental Council, the group that played a large role in running a planned Disney theme park out of northern Virginia in 1994. The developers spent several million dollars satisfying environmentalists' requests, building a specially long-spanned bridge over the Goose Creek reservoir to avoid piers in the water, developing a new wetlands larger than required by the EPA and the Army Corps of Engineers, and committing themselves to a landscaping plan that will justify the name "Greenway."

Reagan administration transit chief Ralph Stanley was the project's first chief executive, and he is credited with lobbying successfully for enabling legislation in Richmond and successfully thwarting opposition from the Virginia Department of Transportation. But Stanley was unlucky with his timing. He was ready to go with the project just as the savings-and-loan crisis and a major real estate recession hit in 1991. Stanley and Goldman Sachs, his financial consultant, could not tie down financing, and there were two abortive attempts at closing in the summers of 1991 and 1992.

The major investor that Stanley had attracted to the Dulles tollway project was Magalen Bryant, a wealthy local woman whose money comes largely from the Dover Corporation, a tire and gas pump manufacturer. She saw millions of dollars of her money going for nothing, so she pushed Stanley out and put her son, Michael Crane, in as CEO of a new holding group, Toll Road Investors Partnership (TRIP) II. That partnership broke with Goldman Sachs and went to a local firm, C.C. Pace Resources, Inc., of Fairfax, Virginia, which has specialized in novel financing for cogeneration plants and gas pipelines.

Banks would not lend for longer than about 12 years, and the project needed much longer term debt. (Because the project has to create its own traffic, it will take some years to cover operating costs, let alone debt service.) The project got rated BBB--investment grade, but barely. After many disappointments, three insurance companies--CIGNA Investments, Inc., Prudential Power Funding Associates, and John Hancock Mutual Life Insurance Company--finally came to the closing party in September 1993 with $258 million in 32.5-year and 29-year fixed-rate loans. And a bank group consisting of Barclay's, Nation's, and Deutsche provided construction financing and a $40 million revolving credit facility, but only after the three equity partners--Shenandoah, Bryant's family company; Autostrade SpA, an Italian toll road company; and Brown & Root, road builders in Houston--added $40 million of "standby equity" to the similar- sized cash equity they had contributed up front. Bryant, one of the driving forces behind the project from the beginning, wound up putting several tens of millions of her family assets at risk. Though he says the family is keen to do other projects, Crane says there is no way they would ever do a private highway again on the Dulles road terms, because getting that road to construction was such a protracted and cripplingly expensive business. (The project was seven years in development, and preconstruction costs were $68 million.)[22]

Robert Martinez, the new secretary of transportation in Virginia, says he would not put anyone through what Bryant and Crane were put through to get the Dulles road going.[23] Gov. George Allen's administration is supporting a bill to exempt future private highway projects from utility- style regulation (the Dulles project has to get permission for toll rate increases). Virginia proposes to concentrate permitting in one agency.

The Dulles Greenway group certainly moved fast once it got its financial act together. Under the direction of Charles Williams, a former Army Corps of Engineers general, construction work has been hectic. Through the worst of the extreme winter of 199394 workers toiled in double shifts. Sixteen months into the job they are nearly three-quarters done with a splendid roadway that winds gently through pretty Virginia countryside and may open a year ahead of schedule.

Development highways that must build their own traffic, such as the Dulles Greenway and SR-125-S, are inherently a longer term proposition than are congestion relievers, such as SR-91-S and SR-57-S. The Dulles Greenway business plan has the operation in the red until 2004. But 10 or 15 years from now, when it is realistic to think that the Dulles-Leesburg corridor will be fully developed, the private road will be heavily used. There are not many other roads. Leesburg Pike, the main highway in the area, has 10 traffic lights in less than 10 miles. Moreover, the private tollway is being built as an extension of the successful state-operated Dulles Toll Road that is connected to the Capital Beltway (I-495) and to I-66, an expressway connection to downtown Washington. The Dulles Toll Road group has based its financial plan on models of real estate development and traffic in the entire Washington metropolitan area and projects annual toll revenues of $100 million by 2008, $200 million by 2025, and nearly $300 million by 2036 when the 40-year franchise ends.

History of Toll Roads

The modern toll road is a revival of an old idea. In the early days of the Republic private turnpikes provided the main means of intercity transportation. They were a considerable business. By some estimates half the total number of corporations formed in the first half of the 19th century were tollway companies. According to Jose Gomez- Ibanez and John Meyer of Harvard University, at least 10,000 miles of private toll roads were built in the first 60 years of the Republic.[24]

The only alternative at the time was the corvÇe, a system of forced labor under which all able-bodied local persons, except those with special and controversial exemptions, were legally required to present themselves for road work on a declared number of days--usually three or four-- each year. People did not see why they should have to labor to build a road to be used free by distant travelers or commercial freight carriers. And of course they also thought they had better things to do with their energies, so they resisted the corvÇe.

The toll road was a lesser evil, though the franchises and their administration were subject to controversy, political pressure, and changing rules. But local merchants, landowners, and farmers financed several thousand turnpikes (some, for example in Pennsylvania and Virginia, received government subsidies). Investors knew that political interventions could ruin turnpikes as self-contained businesses, so subscription to the stock of turnpikes was not made on strictly investment grounds. Many stock buyers wanted to influence the routes of turnpikes to their own benefit. For example, the records of the Brandonville Turnpike Company in Virginia show that on June 6, 1847, E. Brooke pledged $75 for stock "if it [the proposed turnpike] goes within 10 yards in front of my house."[25] Others were subjected to strong local peer pressure to subscribe.[26]

This argument for toll roads was made by Elkanah Watson in Commonplace Book of 1795: "No tax can operate so fair and so easy, as that of paying a turnpike (toll), since every person is 'taxed' in proportion to the benefit he derives from a good road, and all strangers and travelers are made equally tributary to its support. What can be more just?"[27]

The old 20-mile Leesburg Pike, a couple of miles north of the under-construction Dulles Greenway toll road, was incorporated in 1809 and opened in 1820 after capital expenditures of some $84,000. The high year for tolls was 1822 when $5,475 was collected; after that the tolls went slowly downhill to $1,361 in 1838. Wages for tollkeepers (there were three) were $150 a year, and the treasurer took 2 percent of tolls. There was a fifth full-time employee, a superintendent, from 1820 until 1838, when he was let go as an economy measure. The president, a part-timer, made do with $100. (There is no record of an environmental officer on staff or any consultants' or lawyers' fees.) The Leesburg Pike paid dividends totaling only $9,109 in all the 27 years it operated.

A small minority of turnpikes gave their investors a good return on their capital. Governments were fickle, accommodating pressures to exempt various classes of travelers from tolls or to give them special rates (the mail service, for example). Cheaters wore tracks around tollgates, and competing technology--the steam railroad--supplanted the dirt pikes, at least for long-haul transportation.

Statist political trends prevented a revival of privately run turnpikes earlier this century. The Granger and populist movements were strong in the early years of the automobile and gained support for "lifting farmers out of the mud" with untolled rural roads financed by the federal Department of Agriculture. The American Automobile Association, founded in 1902, was anti-toll from the beginning and favored the gas tax.

In the 1920s the Federal Bureau of Public Roads was established. It successfully pushed the notions that a national network of roads was needed and that only government funding would ensure development.[28] The modern freeway, especially suited to tolling because of its limited access and egress points, was not conceived until the 1930s. That coincided with the Great Depression's discrediting of capitalism and its celebration of the state, as seen in the New Deal and the government activism it spawned. In Germany Hitler presided over the use of state funds to build an unmatched national network of freeways (autobahns), which had a major military function. In New York City, Robert Moses, the great city government entrepreneur, pressed government money into a system of freeways to supplement the early parkways (essentially low-speed, limited-dimension freeways of a high aesthetic standard in a parklike setting, which drew on the inspired park designs of Frederick Law Olmstead). New York's Central Park incorporated in the 1870s some of the grade separation features of a freeway in the design of carriageways for horse-drawn vehicles and walking paths.

Lake Shore Drive in downtown Chicago, which opened to traffic in 1933, is described as the first superhighway that discarded the pastoral setting of the parkway for the unapologetic utilitarianism of a mass car-movement system. The idea of grade separation and ramps probably drew on the elaborate iron-trussed elevated structures of 19th-century railroads and trolleys in an urban setting. There had also been a few elevated bicycle path structures, even an elevated bicycle tollway connecting Pasadena and downtown Los Angeles in 1910.

In 1937 a metropolitan network of freeways, or "motorways," was first proposed in Los Angeles. (A city engineer and the Automobile Club of Southern California supported the idea.) The first freeways in Los Angeles were built in 1938-40--the Arroyo Seco (later renamed the Pasadena Freeway) and a one-mile piece of the Hollywood Freeway. Their funding came from a patchwork of government sources, including the federal Works Progress Administration, city funds, and the first gas taxes, which were imposed by local governments. The next Los Angeles freeways were funded by the federal government under the National Strategic System of Roads umbrella, which ensured priority in allocations of supplies of steel and cement.[29] During and after World War II the political climate in the country was favorable to government initiatives in roads.

The State Turnpikes

The first freeways to be tolled by a state highway department were Connecticut's Merritt and Wilbur Cross Parkways in 1937.[30] Various state turnpike authorities were formed in the war years, following the example of the Pennsylvania Turnpike, the first stretch of which opened in 1940, which used the right-of-way and works of "Vanderbilt's Folly"--an uncompleted set of tunnels and embankments from the abandoned New York Central's south Pennsylvania railroad. The idea for the Pennsylvania Turnpike, the first of the big cross-state turnpikes, was credited to William Sutherland of the Pennsylvania Motor Truck Association and Victor Lequoc, an employee of the State Planning Agency, whose role was to garner the maximum federal anti-depression money by coming up with projects that would impress the federal government.[31] Those government-owned business corporations pioneered the earliest sections of the interstate highway system and financed some 2,100 miles of tolled freeways between 1940 and 1956 when the Federal-Aid Highway Act introduced a federal gasoline tax to finance a highway trust fund out of which the feds would fund 90 percent of the cost of new interstate freeways. That act grandfathered the existing toll roads into the interstate system, meaning that they got convenient connections with the new untolled freeways plus nice federal interstate shield signs.

However, the 1956 act banned any new tolls on interstates. In a spectacular misuse of economic modeling, the U.S. Bureau of Public Roads had purported earlier to analyze the feasibility of toll financing and had estimated that only 172 miles out of an initial 14,336-mile interstate system could be supported by tolls.[32] Defense and economic arguments were advanced for the gas-tax-financed system that built about 36,000 miles of free roadways in the next 20 years. Two thousand five hundred miles of new toll roads were built by state turnpike authorities during that period, either extensions of preexisting toll roads or, in Florida, Oklahoma, and Kentucky, freeways that local politicians could not get put on the interstate map and funded by the feds. Tolled mileage peaked in 1975 at 4,400 miles. In the late 1960s de-tolling became common. Toll plazas were nuisancesome sites of stops and queuing that seemed an anomaly on an otherwise high-speed highway, so it was generally popular for politicians to promise to get rid of tolls. Moreover, the states could get federal grants for reconstruction and improvement of the grandfathered toll roads only

by de-tolling them. By 1990 there were 42,000 miles of nontolled interstate freeways, 9,500 miles of state-financed nontolled freeways, and 4,100 miles of turnpike.[33]

The tide began to turn in favor of tolled roads in the 1980s as resistance grew to new state taxes and federal gas tax money was increasingly unavailable for any new freeways. The feds' money was now being used almost entirely to rebuild existing roads, for transit, or as general revenue. Short of money from the state budget, Virginia's Department of Transportation in 1983 used bonds to build that state's first automobile-era tollway from the Washington Beltway to Dulles Airport. The lanes were located on either side of the federal government's existing airport-passengers-only four-lane freeway. The Illinois Toll Highway Authority was building new toll roads on the western fringe of the Chicago area, and toll roads were being built at a rapid rate by the state turnpike authority in Oklahoma. In 1993 the "Okie turnpike" became the first toll agency to use modern electronic toll collection throughout a complete tollway system.

In two states, counties sponsored turnpike agencies. In Colorado, several counties formed the E-470 Authority to build a beltway around Denver; in Orange County, California, the Transportation Corridor Agencies were created to build turnpikes that the feds and the state said they could not finance. Those agencies have $2 billion worth of turnpikes under construction. In Florida the state turnpike, run out of the Department of Transportation, has nine turnpike projects under way, and nontoll highway construction in that state has virtually ceased. In Pennsylvania the only new freeway construction under way is extensions of the state Turnpike Commission's network. It may be that the age of "free" roads is passing and that most new highways will be financed with bonds secured by future tolls. In those circumstances the question is no longer tolled roads or untolled roads, but whether toll roads should be built by the private sector or by government turnpike agencies.

State Turnpikes Subservient to Politics

The state turnpike agencies are a step in the right direction in that they are clearly closer to the marketplace than are the state highway departments. State turnpikes are major repositories of highway management expertise and, according to Gerald Pfeffer of UIC, several of them are "extremely well managed."[34] They have major disadvantages, however. As government-owned entities, their policies are politically determined. They have shown no interest in time-variable pricing, which is an essential tool for combating peak-hour congestion and for attaining efficient use of highway infrastructure. Consider what has happened in the New York area, which is perfectly set up geographically for the implementation of congestion pricing policies. The major bridges, tunnels, and traffic arteries are run by state toll agencies--the Port Authority, the Triborough Bridge Authority, the New York Thruway Authority, and the New Jersey Turnpike. None of those agencies has ever proposed a rational profit-maximizing price policy of the kind a private operator would insist upon. Such a policy, as implemented on SR-91 Express Lanes, would call for premium prices in rush hours, because that would benefit the company by maximizing profits and customers by offering free-flow conditions.

New York's various toll and turnpike agencies, however, have consistently followed the perverse policy of offering deep discounts (up to 50 percent off) to purchasers of multiple tokens and coupons--predominantly rush-hour patrons. New York State agencies' pricing policies in effect provide rush-hour concessions and aggravate congestion. The agencies do that, not because their officers are stupid or malicious, but because they take orders from politicians, and politicians are usually responsive to small organized interest groups and demagoguery. Anti-congestion pricing has been discussed and proposed interminably in New York, but no public official has displayed the courage to talk any sense on the issue. Mayor Beame claimed that such tolls would "make a ghost town" of New York, and in 1991 when the Triborough Bridge Authority proposed to reduce its commuter discount from 33 percent to 10 percent, then governor Mario Cuomo, pandering to protesters, ordered the price of multiple-coupon purchases rolled back to provide a 50 percent discount.[35]

The San Francisco Bay Area is also ideally configured for tolls and congestion pricing. Seven major bridges dominate its highway system, each already tolled and all ideally suited for congestion pricing. The most traveled and heavily congested, the San Francisco-Oakland Bay Bridge (usually just called the Bay Bridge), 10 lanes that carry 250,000 vehicles per day, has been proposed for congestion pricing since the 1970s.[36] Nine hours a day the congestion on the approaches to the Bay Bridge is classified under FHwA standards as Level of Service (LOS) D (second worst) or worse. The Bay Area Metropolitan Transportation Commission has accepted a federal grant for a trial of a peak-hour

toll ($3), but the scheme still needs state legislative support, which has so far not been forthcoming.

HOT Not HOV

In southern California the situation is slightly more promising. San Diego and Los Angeles have been trying to cope with stop-and-go traffic on freeways by installing "ramp meters"--traffic signals on entry ramps programmed to limit the inflow of vehicles from local streets. The ramp controls can be used to keep more vehicles from entering when free-flow conditions are jeopardized. They provide data and experience that will be valuable in introducing congestion pricing. But whereas congestion pricing presents motorists with the full costs of their travel and encourages them to either pay those costs or travel by transit or carpool or drive off-peak, the ramp meters merely move the congestion off the freeways and onto their approaches. According to John Duve, transport specialist at the San Diego Association of Governments, the effectiveness of metering is compromised by the need to prevent gridlock on the approaches and backups onto local streets.[37] San Diego is the closest of any government entity in the United States to trying congestion pricing. It is scheduled to start work shortly on a buy-in toll system for solo drivers on eight miles of an existing two-lane, reversible-direction HOV section of its largest freeway, I-15. In 1995 monthly passes will be sold that will give solo drivers the right to join the free-flowing traffic in the HOV-2 lanes, and in 1996 the introduction of transponders and radio signal tolling is planned. The object is to use pricing to choke off SOVs whenever LOS B is threatened. That is about a car every 200 yards, on average. And by law San Diego is required to use the revenues to subsidize expensive light rail transit. (The law has a little wiggle room in specifying "light rail equivalent.") In the vast LA area with the country's largest system of freeways, there is unfortunately no stirring of reform.

There is enormous opportunity for entrepreneurship in highways--for example in catering to the special needs of truckers with liberalized width, height, and weight limits, and to car drivers by providing car-only lanes and real-time information about congestion, parking space availability, and commercial services. There is a plethora of new technologies being developed under the title "intelligent transportation" systems--gadgets to produce a map on a digital display in your car, to tell you what nearby services are available, and to tell you by synthetic voice where to turn. And smart weapons guidance technology from satellites and space-miniaturized sensors is being commercialized so that a variety of driver controls will soon be marketed to help the driver, or take over some car controls. Greyhound buses already carry collision avoidance radars, and on special lanes in California cars are being "hooked up" with the lead driver pulling a "train" of following cars by radio signals and computerized engine controls. Of a thousand such systems, perhaps 950 will be no more than gee whiz stories for Popular Science. But some will certainly find their way into use. Many will require that highways be adapted with special flyovers, ramps, and barriers, and that will require entrepreneurial profit-seeking management of the highways.

In general, the bureaucratic mindset has difficulty coping with multiple use, so bureaucrats insist that HOV lanes be kept "uncontaminated" by solo drivers, even though almost everywhere, almost all the time, HOV lanes are extraordinarily wasteful, operating far below capacity. They also generate a political problem in that drivers in stop-and-start conditions on regular freeway lanes get infuriated by seeing an underutilized HOV lane next to them. They start breaking the rules and driving illegally in the HOV lanes, generating major enforcement problems, and they generate political pressure to liberalize entry rules. The obvious way to maximize HOV lane use, and make money, is to allow solo drivers (or sub-HOV vehicles) to "buy in" to HOV lanes with a variable toll. The purpose of the HOV lanes-- encouragement of carpooling--can be maintained by allowing toll-paying vehicles up to the point where they begin to fill the lane to capacity. Raising prices can prevent the concertina effect of successive backups and crawls. Gerald Pfeffer's California Private Transportation Company is gambling that on SR-91 Express Lanes the SOV buy-ins will pay for the road and also for the free rides of the HOVs. Variable pricing will also be a go/no-go issue for the investors in SR-57-S over the Santa Ana River channel in Orange County.

Vegetarianism for Wolves

Maybe urging bureaucrats and politicians to set economically rational prices is like advocating vegetarianism to wolves. It just is not in their nature. Bureaucrats talk about orderly systems, not maximizing resource use. Politicians talk about fairness, not efficiency. Both kinds of officials tend to defer to those with a large concentrated interest at stake rather than the larger constituency of people with dispersed interests. The market offers a better prospect than government for furthering the general public interest. Transport service companies in a competitive environment will

be forced by the needs of their owners and creditors to charge pretty much what the market will bear, which happens to be about what will maximize the efficiency of the system. They will not survive if they offer gridlock. They will strive to match supply and demand, or "clear" markets, as economists say. When they have an underworked asset they will strive to drum up some revenue and use it. And if they happen to make superprofits for a while, that will generate the revenue and attract the capital for an expansion of capacity.

Well before the Orange County treasurer's disastrous speculations on interest yields culminated in bankruptcy, Gordon J. Fielding of the Economics Department at the University of California, Irvine, wrote that Orange County's decision to build $2 billion of county toll roads while rejecting the politically difficult issue of time-variable tolling had doomed those highway projects to financial failure and default on bonds.[38] Yet the private CPTC's experiment with variable pricing on SR-91 may prove FDR right: "The only thing we have to fear is fear itself."

Time-variable pricing is accepted elsewhere. Everyone's long distance telephone service involves high tolls per minute during the business day, medium tolls in the evenings, and low tolls when most people sleep. Customers accept that as a way of encouraging fuller use of the spare capacity available out of business hours. Ski resorts and hotels offer large discounts out of season to attract business rather than close up completely. Airlines offer discounted trips for travelers who stay over Saturday nights to reduce overloading on Fridays and to avoid having idle planes on Sundays. Truckers and railroad companies offer special deals when they have equipment to move that would otherwise go empty. There is no logical reason why variable pricing should not apply to highway tolls, too. Indeed, the case is much stronger precisely because urban highway demand is so heavily peaked and capacity expansion is extremely costly. As demand increases, so does throughput, but at a certain volume (usually termed "capacity," or approximately 2,000 vehicles per hour in a freeway lane) a peak is reached and addition of extra demand causes so much slowing that throughput declines.

Two leading transport economists recently wrote, "Traffic congestion is a classic externality, especially pervasive and important in urban areas. The theoretical and empirical relationships governing it have been thoroughly studied. As a result there is a consensus among urban economists, and a growing proportion of other urban and transportation analysts, as to the first-best policies to deal with it: namely some form of (anti-) congestion pricing. Disagreement centers on the practicability and political feasibility."[39] There is legitimate resistance to tolls if they are seen as just another way to raise money. There is potentially a large amount of money in highway tolls. Kenneth Small of the University of California, Irvine, estimates that there is at least as much in congestion pricing revenues as in congestion costs--around $50 billion a year, just about enough to offset the $40 billion raised in federal and state gasoline and diesel fuel taxes and the $10 billion in state registration revenues.[40] Small makes an interesting case for deploying congestion tolls in a package that would compensate losers, finance alternative peak-hour transit, and generally smooth the way politically for reform. John Kain of Harvard sees the perception of tolls as taxes as the overwhelming obstacle. "This obstacle to congestion pricing ought to be removed by returning all congestion price revenues, net of collection costs, to taxpayers in the form of a highly visible tax rebate."[41] Another way to achieve that result would be for governments to progressively privatize their highways, phase down their gas tax and registration fees, and phase out their highway departments. That could be done in many different ways: by calling for bids, by putting sections of highway up for sale, by selling conditional franchises to build and operate.

One objection likely to be raised is that the facilities will be monopolistic. The degree of monopoly will vary with the alternatives available. Part of the process of tolling major highways will be restricting through traffic on untolled local access streets, first so that the business is not lost from the highway and second so that local neighborhoods are not gridlocked with toll evaders. So some element of "monopoly" will be a necessary part of any project. I asked Small to comment on how a monopoly highway owner's pricing would compare to an economist's concept of what is socially optimal. He replied,

> In the absence of regulatory or public relations constraints, the profit-maximizing owner of a private highway will charge a form of congestion pricing (as recommended to public highway agencies). The price would be higher at congested times and places; the only difference from "optimal" congestion pricing is that the markup is applied to the short-run marginal cost in each period. This markup, like that applied by a monopolist in any market, is inversely related to the elasticity of demand during the time period in question. The markup serves to extract additional benefits of the highway from travelers, which in some

circumstances may be necessary for the road to be built in the first place. The private owner has an incentive to extract these benefits in a manner involving the least inefficiency, since it is in the owner's interest to reduce demand as little as possible consistent with good congestion management.[42]

Regulation is the routine procedure where there is private monopoly power. In California the four private highways approved so far cope with the monopoly objection with a negotiated ceiling rate of return on capital that is written into their franchise agreements with the state. In Virginia the Dulles Greenway group applied for the right to build and operate the highway and was eventually granted that right on condition that, as do utilities, it get state approval for toll increases. It may be preferable to establish standardized ground rules and call for competitive bids. The more negotiation there is with an already selected franchisee operator, the more room there is for special favors, which will generate public suspicion of the legitimacy of the arrangements.

Public-Private Partnerships?

The emerging private highway industry does not propose anything as bold as general privatization. Entrepreneurs do not want to bite off more than they can chew. And they see themselves at the mercy of federal, state, and local officials so they do not want to appear to be a threat to government agencies. They say, "There's plenty of work for both of us." Most people in the emerging private highway business really mean it when they characterize what they propose as private-public partnership. And some want a mix of government and private funds.

While it might be regarded as dogmatic to suggest that mixing government moneys and investment funds always be ruled out, proposals for such mixing need to be regarded with great suspicion. The main objective, after all, is to develop a truly free market in highway service, and that requires that only those projects that are seen by investors as promising a reasonable prospect of making a return on total investment be built. Projects that would not fly without subsidy usually should not fly. And the mixing of public and private funds in any area usually looks--and often is--crooked. The Wall Street Journal recently said of that problem, "The whole universe of public-private development projects and of special agencies, a network that New York's William Stern once called the 'insider commercial party,' should trouble any fiscally concerned citizen."[43]

As a general rule, private highway projects should be financed entirely with private money. Perhaps a valid exception might be made for government financing of some of the costs of doing government-required studies and acquiring government permits. In California some government money is going for environmental impact and other studies that have to be done before the prospective investors know whether they will be able to proceed. The SR-91 Express Lanes project cost over $7 million in studies, lawyers' and consultants' fees, and staff time and three years before it came to closing. The franchise agreement is a 155-page book. Carl Williams agrees that the state's first private projects (four franchise agreements were signed in 1991) were awfully difficult to negotiate. "It was a moon launch," he says. "The next ones will be like falling off a log because of the pattern achieved with the existing agreements."[44] Dulles Greenway cost $50 million and took seven years before ground was broken.

As long as there are "free" roads--and the possibility of new and upgraded untolled roads built by state highway agencies--investors will be wary about private toll roads, according to one institutional investment officer who has looked closely at about a dozen major private highway proposals.[45] It is a bit as if the government financed most of the nation's housing out of taxes and charged no rents. It would be hard for private builders and landlords to compete except in small niche markets neglected by the government. And as long as the state elephant roamed free, they would be concerned that it might wander past and crush them.

So there is a case for radicalism--for legislating that government will get out of highways and phase down the taxes that currently support them. Henceforth they will be funded by investors charging tolls and subject to competition. With a real marketplace in highway provision, we will have a test of what users are prepared to pay and a mechanism for persuading commuters and other travelers to adapt their travel patterns to make fuller use of spare off-peak highway space. The threat of creeping gridlock will be averted.

Notes

[1] Transportation Research Board, Curbing Gridlock: Peak- Period Fees to Relieve Traffic Congestion, Special

Report 242, 2 vols. (Washington: National Academy of Sciences Press, 1994), Executive Summary, vol. 1, p. 2. Cited here after as Curbing Grislock.

[2] David L. Schrank, Shawn M. Turner, and Timothy J. Lomax, Trends in Urban Roadway Congestion--1982 to 1991, 2 vols. (College Station: Texas Transportation Institute, 1994).

There are regional differences in terminology. What are called freeways in the West are expressways, interstates, turnpikes, or parkways in the East. The Federal Highway Administration tries to satisfy both sides of the country by using the composite term "freeway/expressway" to describe those most elaborate of roadways, which have under passes and overpasses for crossing traffic, high-speed merge and diverge lanes and ramps, and controlled access (no individual property frontages). What are called expressways in the West are multilane highways with a median in the middle dividing the traffic flows, but they have traffic signals or Stop signs to mitigate conflict with crossing traffic. The FHwA calls those roads arterials.

[3] Ibid., vol. 2, p. 15, and vol. 1, p. 34.

[4] Ibid., vol. 1, pp. xvi, xvii.

[5] Ibid., vol. 1, p. 1.

[6] Transportation Research Board, vol. 1, p. 51.

[7] Schrank et al., vol. 2, p. 8.

[8] Derived from Schrank et al., vol. 2, p. 8.

[9] Charles A. Lave, "The Mass Transit Panacea and Other Fallacies about Energy," Atlantic Monthly, October 1979.

[10] Joel Garreau, Edge City: Life on the New Frontier (New York: Anchor Books, 1991).

[11] Coldwell Banker, "Office Vacancy Index of the United States," New York, January 31, 1989.

[12] Charles Lockwood, "Cities on the Edge," Wall Street Journal, December 21, 1994.

[13] Anthony Downs, Stuck in Traffic: Coping with Peak-Hour Traffic Congestion (Washington: Brookings Institution, 1992), p. 20.

[14] Ibid., p. 10.

[15] Schrank et al., vol. 2, p. 118.

[16] Numbers are derived from ibid., vol. 1, pp. xv, 21.

[17] Ibid., vol. 1, p. 21.

[18] Toll road financier Barry P. Gold of Citibank and Lehman Brothers drew the comparison between highways and nuclear power plants in a telephone interview, October 1994.

[19] See, for example, Leo Marx, The Machine in the Garden (New York: Oxford University Press, 1964); Richard Lillard, Eden in Jeopardy: The Southern California Experience (New York: Knopf, 1966); A. Q. Mowbray, Road to Ruin: A Critical View of the Federal Highway Program (Philadelphia: Lippin- cott, 1968); Helen Leavitt, Superhighway, Superhoax (New York: Doubleday, 1970); John Burby, The Great American Motion Sickness: Or Why You Can't Get There from Here (Boston: Little Brown, 1971); Judith Jackson, Man and the Automobile: A Twentieth Century Love Affair (New York: McGraw Hill, 1979); J. Allen Whitt, Urban Elites and Mass Transportation (Princeton, N.J.: Princeton University Press, 1982); Julian Pettifer and Nigel Turner, Automania: Man and the Motor Car (New York: Little Brown and Company, 1984); John G. Mitchell, "30 Years on Ike's Autobahns," Audubon,

November 1986; James J. MacKenzie et al., "The Going Rate: What It Really Costs to Drive," World Resources Institute, Washington, 1992; Stephen B. Goddard, Getting There: The Epic Struggle between Road and Rail in the American Century (New York: Basic Books, 1994); and various publications of the Campaign for New Transportation Priorities, the World watch Institute, and other environmentalist organizations.

[20] The following account was developed in several weeks of telephone interviews and visits and from various press materials, papers, and reports. The newsletter Public Works Financing, published by William Reinhardt of Westfield, New Jersey, provides especially thorough coverage of these issues. Carl Williams, privatization chief at the California Department of Transportation, generously provided back ground papers, and Gerald Pfeffer of California Private Transportation Company and United Infrastructure Company gave me much time on the telephone. The Reason Foundation has produced a solid set of papers on various aspects of highway privatization, and the International Bridge, Tunnel & Turnpike Association, a trade association of tollsters, has a most helpful research officer.

[21] Interviews with Gerald Pfeffer of Kiewit/UIC and Bob Cowan, Washington Department of Transportation. November 1994.

[22] Business plan filed with the Virginia State Corporations Commission.

[23] Telephone interview with Robert Martinez, November 1994.

[24] Jose Gomez-Ibanez and John R. Meyer, "Private Toll Roads in the United States," Report prepared for the U.S. Depart ment of Transportation, 1991.

[25] Robert Flemming Hunter, "The Turnpike Movement in Virginia 1816-1860" (Ph.D. diss., Columbia University, 1957), p. 33.

[26] Daniel B. Klein and John Majewski, University of California at Irvine, are the premier economic historians of turnpikes, and this section draws heavily on their writings. See Daniel B. Klein, "The Voluntary Provision of Public Goods? The Turnpike Companies of Early America," Economic Inquiry, October 1990, pp. 788-812; and Daniel B. Klein and John Majewski, "Economy, Community and Law: The Turnpike Movement in New York, 1797-1845," Law and Society Review 26, no. 3 (1992): 469-512.

[27] Quoted in ibid., p. 481.

[28] Bruce E. Seely, Building the American Highway System: Engineers as Policymakers (Philadelphia: Temple University Press, 1987).

[29] David Brodsly, L.A. Freeway: An Appreciative Essay (Berkeley: University of California Press, 1981).

[30] Gomez-Ibanez and Meyer, p. 4.

[31] Dan Cupper, The Pennsylvania Turnpike: A History (Leba- non, Pa.: Applied Arts Publishers, 1990).

[32] Gomez-Ibanez and Meyer, p. 6.

[33] Ibid., p. 7.

[34] Telephone interview with Gerald Pfeffer, November 1994.

[35] Jeffrey Zupan, "The New York Region: First in Tolls, Last in Road Pricing," in Curbing Gridlock, vol. 2, p. 203.

[36] T. Keeler and K. Small, "Optimal Peak-Load Pricing on Urban Expressways," Journal of Political Economy 85, no. 1 (1977).

[37] Telephone interview with John Duve, November 1994.

[38] Gordon J. Fielding, "Private Tollroads: Acceptability of Congestion Pricing in Southern California," in Curbing Grid lock, vol. 2, p. 403.

[39] Kenneth A. Small and Jose A. Gomez-Ibanez, "Road Pricing for Congestion Management," paper presented at conference on Alternative Strategies for Managing Externalities, Lincoln Institute of Land Policy, Cambridge, Mass., September 30 1994.

[40] Kenneth Small, "Using Revenues from Congestion Pricing," Transportation 19 (1992): 370.

[41] John Kain, "Impacts of Congestion Pricing," in Curbing Gridlock, vol. 2, p. 503.

[42] Fax answer, dated January 2, 1995, to author's question.

[43] "Mammoth Munis," editorial, Wall Street Journal, December 23, 1994, p. A10.

[44] Interview with Carl Williams, October 1994.

[45] Telephone interview with Marie L. Fioramonti, senior vice president with Prudential Insurance, November 1994.