

Texas High-Speed Rail: Past, Present, Future

by Hal Cooper, Jr., Ph.D., P.E.

Here are excerpts from Dr. Cooper's paper, "The Past, Present, and Future Development of the Texas Triangle High Speed Rail Project, and the Reasons Why It Did Not Work in the Past, along with What We Can Do to Make It Work in the Future." Footnotes and numerous maps and charts have been omitted. Those seeking more information may contact Dr. Cooper at HalCooper@verizon.net.

Summary

An analysis has been made of a future high-speed rail network of up to 750 miles in length in the Texas Triangle to connect Houston with Dallas and San Antonio to carry passengers and trucks. The high-speed rail passenger service would be electrified and would be generally located on separate tracks, in parallel to the existing freight tracks of common rights-of-way. The proposed high-speed rail system would be designed to carry between 100,000 and 150,000 passengers per day, plus to haul 20,000 to 30,000 trucks per day between cities by parallel railroad. The overall railroad network would have between 600 and 750 trains per day of traffic volume when in full-scale operation, and would have an electric power demand of 600 to 700 megawatts, or 1% of the statewide total generating capacity.

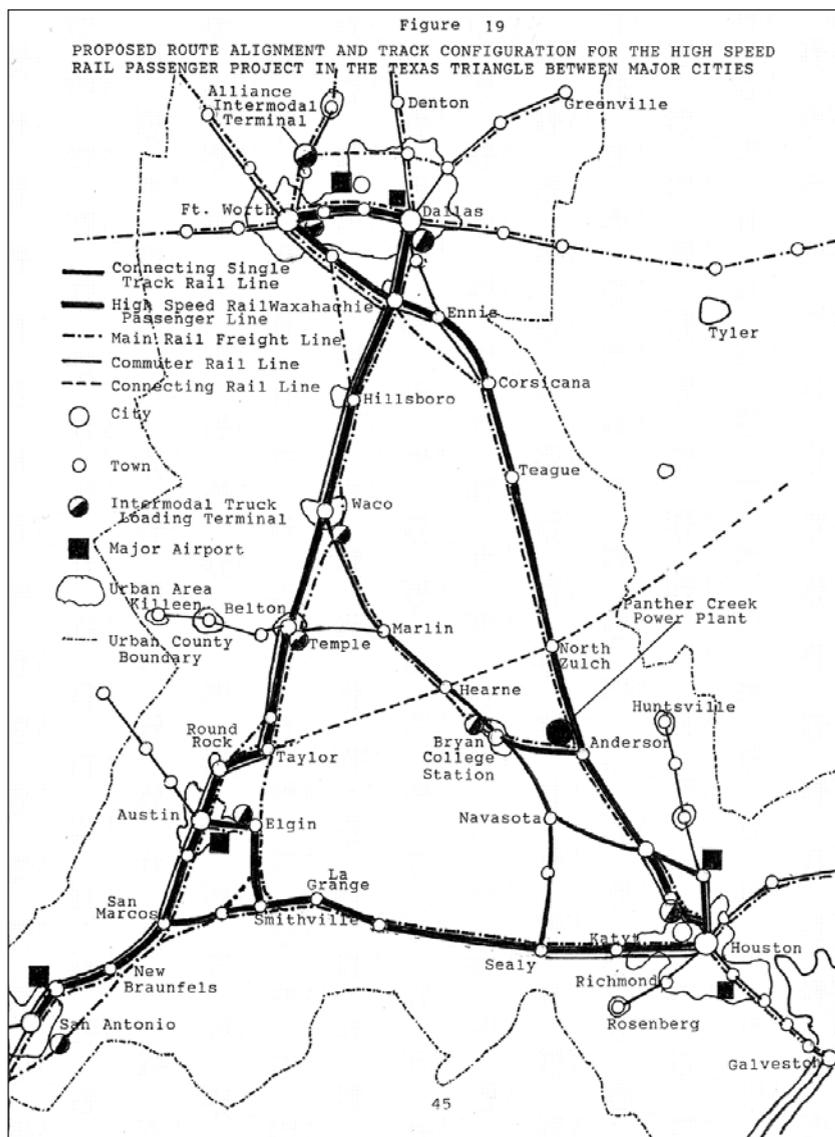
Previous efforts to develop the proposed high-speed rail passenger system in the Texas Triangle, based largely on pri-

vate-sector efforts, have failed to date, for a variety of reasons. There did not appear to be a significant level of support from the State Government in Texas, and there was substantial opposition from a number of interest groups who would have been adversely impacted, including landowners, airlines, real estate developers, and oil-related interests. There was also a noted lack of support from the conventional financial institutions, because of the high degree of creativity required.

The recent rise in the price of oil has made it more attractive to develop high-speed rail in Texas, along with the steadily increasing roadway traffic congestion, along with the deteriorating air service. The greater need for roadway maintenance, along with growing concerns over maintaining compliance with air quality standards and with greenhouse gas emissions impacting climate change, have all acted to create a change in the dynamic favoring high-speed rail.

The growing success and expansion of electric high-speed rail systems in France, Germany, Italy, Spain, England, and elsewhere in Europe points to the necessity of similar projects in the United States. China, Japan, and Korea already have high-speed rail systems in place, while Russia and India are developing existing high-speed rail networks. The Amtrak national rail passenger system is showing steadily rising ridership. The recent announcement by Argentina that it is going

FIGURE 1
Proposed Route for High-Speed Rail in the Texas Triangle



ahead with a high-speed rail system is a first in the Western Hemisphere, while Canada is seriously looking at a similar system. All these developments point to the necessity for Texas to begin serious planning efforts to implement an electrified high-speed rail system in the Texas Triangle to match its decision to begin rail transit systems in Dallas, Houston, and now Austin.

...The Texas State Department of Transportation would be responsible for constructing the required grade separations and other major rail infrastructures. The urban transit authorities would be responsible for building the collocated local commuter and intercity passenger lines. The cities and towns would be responsible for building the needed passenger stations and terminals as public inputs. Intermodal freight com-

panies would be responsible for building the track-loading and -unloading terminals. The electric utility companies would be responsible for the traction electrification components, while the private railway company would be responsible for building the fixed rail line facilities, as well as for purchasing and operating the rolling stock locomotive and cars. The basis then exists for a real public-private partnership to implement the Texas Triangle high-speed rail project.

Project History

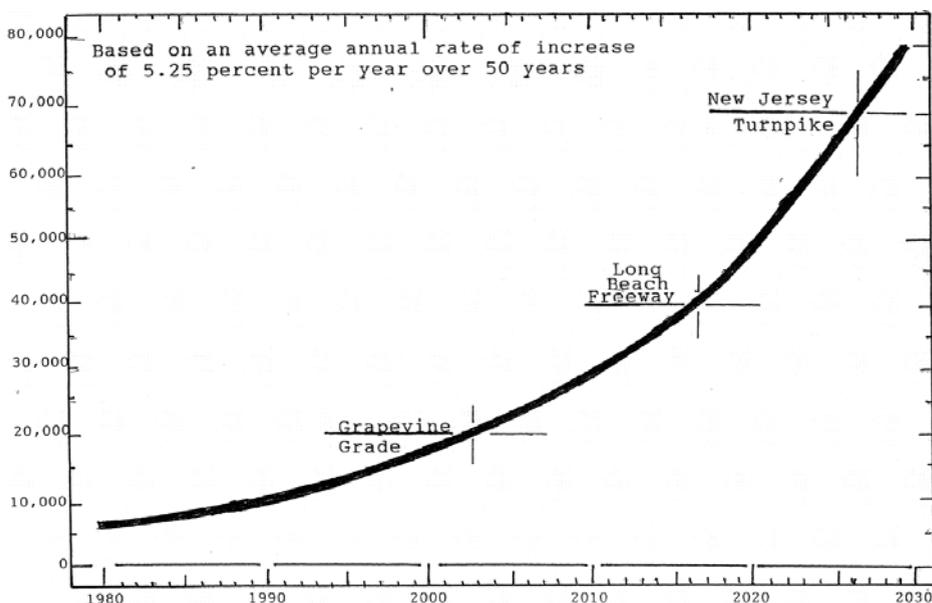
The Texas Triangle high-speed rail passenger project has a long history going back to the 1930s, when the Rock Island Rockets ran with steam power between Houston and Dallas, as a part of a bigger system. The era of major passenger service in Texas was doomed to eventual oblivion by the State's major road construction program, beginning in the late 1940s. The demise of intercity rail passenger service was made even more certain by the passage of the Interstate Highway Act in 1956, with the following construction of the 42,000-mile Interstate Highway System, whose greatest extent is in Texas. The construction of the Interstate Highway System eventually became a threat to railroad freight service, and has led to the late explosive growth in truck traffic we see today. These trends have continued with the passage of the North American Free Trade Agreement in 1994 and by Governor Perry's Trans Texas Corridor project, proposed in 2002, which proposes to build up to 4,000 miles of new transportation corridor.

The odds against continual rail passenger service in Texas and elsewhere were made even greater with the simultaneous rise of the commercial airline industry after World War II, applied in the final blow to long-distance intercity rail passenger service in Texas. The status of the Southwest Airlines in the early 1970s in Texas acted to prevent the continuation of short-distance corridor rail passenger service. Only the formation of the National Railroad Passenger Corporation (Amtrak) in 1971 by the Federal Government prevented the complete demise of rail passenger service in the United States. However, rail passenger service did continue, and has been emphasized in the Northeast Corridor, at the expense of the rest of the country. Eventually, other areas saw the benefits of rail passenger service, so that its rebirth began in California and the Midwest during the 1970s. The Northeastern and Midwestern States, along with California and the Pacific

FIGURE 2

Estimated Increases in Expected Truck Traffic on Interstate 35 Between Austin and Dallas, Texas, in the Absence of Intermodal Diversion of Trucks

(Average Number of Trucks per Day)



Northwest, are developing expanded rail passenger services, which are all experiencing major increases in passenger ridership. The recent rise in the world oil price beginning in 2004 has resulted in major increases in rail passenger ridership, at the expense of air and auto travel, which is limited only by the availability of rail passenger service because of the small size of its network and the relatively limited service frequency.

There were previous proposals to develop high-speed rail systems in California, Florida, Ohio, Illinois, Michigan, and several other states in the late 1970s and early 1980s. None of these projects materialized, but interest has continued, as continuing efforts being made to implement these projects on a more incremental basis have been very successful in the Pacific Northwest and California. However, the only rail service which remotely resembles high-speed operation is between Washington, New York, and Boston, over the 450-mile-long Northeast Corridor, using the Bombardier Acela trains, which are modifications of the French TGV high-speed trains. The Acela trains operate at speeds of up to 135 miles per hour in the Northeast Corridor, with average speeds of 80 to 90 miles per hour over the route...

As a result of the aforementioned efforts and studies, the author formed, in conjunction with four other investors, the Texas Railroad Transportation Company (TRTC) in 1983, as an initial sector effort to develop the high-speed rail passenger project in the Texas Triangle. The author recruited both the French Alstom company and the German Siemens company to

evaluate this project in 1983, which led to discussions with both suppliers. The discussions with the French companies were not successful, for reasons to be discussed later in this paper. However, the discussions with the German companies were productive, which led to an initial agreement to proceed with the initial planning for the project. A series of feasibility and ridership studies were conducted by this company, which showed that the Texas Triangle High Speed Rail passenger project was both technically and economically feasible, and could be built without public funding, as presented at a technical conference in Paris, France in November of 2004 on high-speed rail...

Future Development

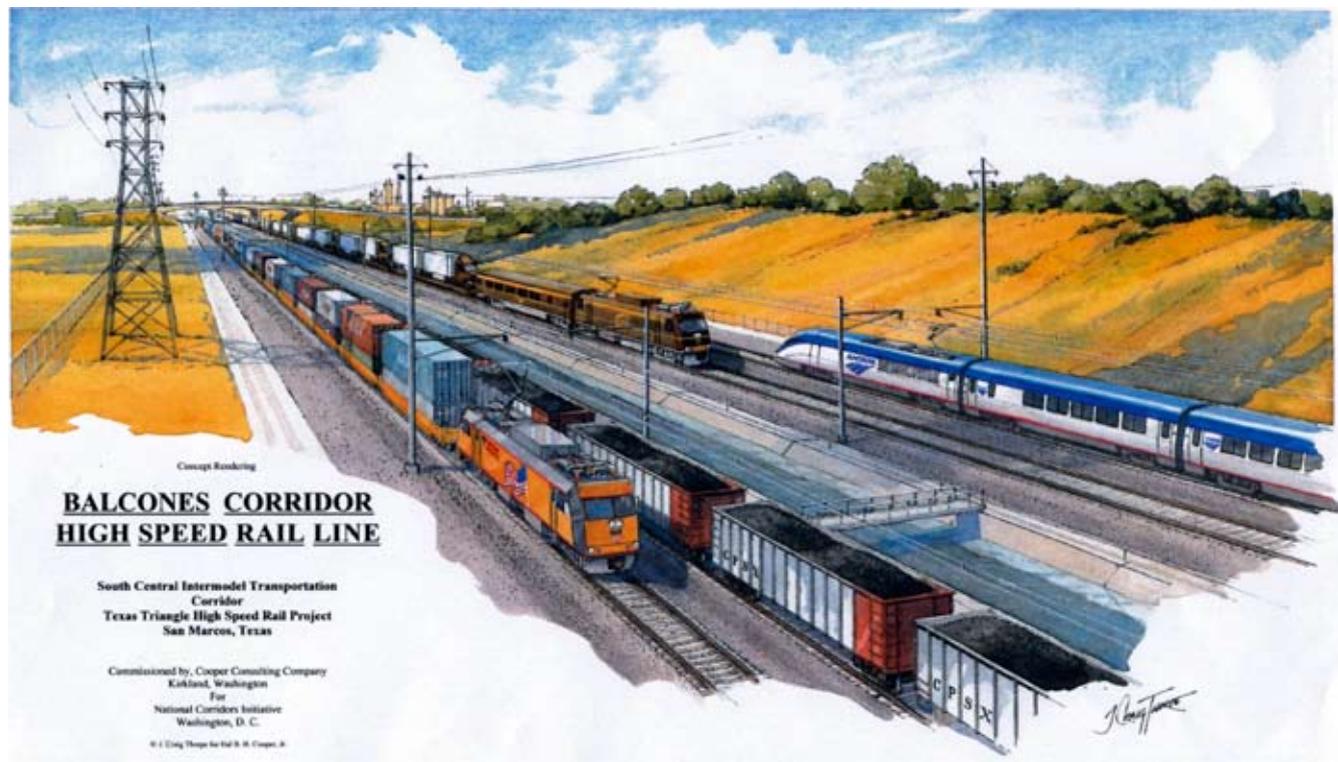
[Some are concerned, Cooper writes, that the proposed “NAFTA Superhighway” would create a “race to the bottom” of the wage

scale, obliterating U.S. national sovereignty and forcing American and Canadian truckers to compete with Mexicans who operate at lower costs and much lower wages, forcing down U.S. wages in a further assault on the middle class.]

There is no possibility of an assault being made on the middle class by racing to the bottom with toll roads, if a major electrified high-speed passenger and freight railroad network is built in the Texas Triangle, over 750 miles in length (Figure 1). This electrified high-speed railroad network of 750 miles in the Texas Triangle could then be expanded into a 4,000 mile network, at least in part elsewhere in Texas, by “rising to the top” for the middle class as an economic goal. It could then indeed become the largest single component of a future 42,000-mile-long electrified high-speed passenger and freight railroad network throughout the United States, to carry passengers and trucks and other freight cargoes...

This new rational high-speed rail system across the United States, comprised of 42,000 miles of routes, would be built primarily along existing railroad lines with double or triple track throughout, with electrification throughout, with joint freight and passenger service. This electrified high-speed railroad network would reduce the need for oil consumption at a time of peakage, as well as reduce air pollution and greenhouse gas emissions. Its implementation would set the stage for a complete renewal of the U.S. economy through a major program of reindustrialization and redevelopment of the entire country, and allow the middle class to prosper and expand, instead of to decline and con-

FIGURE 3



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tract, by “rising to the top” as a far preferable alternative to “racing to the bottom.”...

The electric power demand for the alternative electrified railroad networks in 2000 from projected freight traffic volumes and route distances, is expected to increase to 1,256 megawatts for the minimum case, 1,735 megawatts for the medium case, and 2,251 megawatts for the maximum case. The overall electric-generating capacity at present is approximately 70,000 megawatts, as demand increased at a lower rate than projected. The electric power demand for an overall statewide electrified railroad operation would comprise between 3 and 5% of the State of Texas’s electric generation capacity, as compared to between 1 and 2% for the Texas Triangle alone....

Truck traffic has become an increasing problem in the Texas Triangle, with nearly 20,000 trucks per day along Interstate 35 between San Antonio and Dallas (Figure 2). There are also substantial truck traffic flows of more than 12,000 per day between Houston and Dallas, with more than 8,000 trucks per day between Houston and San Antonio. Truck traffic volumes have been growing especially along the Interstate 35 corridor at a rate of approximately 5.0% per year for some period of time, especially since the passage of the NAFTA trade agreement. If allowed to continue unchecked, truck traffic volumes along the Interstate 35 corridor could approach 50,000 trucks per day between Austin and Dallas after 2020,

as compared to a present truck traffic volume of approximately 20,000 per day.

A concept drawing of the proposed Balcones Corridor high-speed rail line adjacent to the Interstate 35 freeway as an integral part of the South Central Corridor rail line immediately south of San Marcos, Texas is illustrated in Figure 3, by the noted railroad artist J. Craig Thorpe. This illustration shows coal and container trains on the Union Pacific Railroad tracks, along with an intermodal train carrying trucks, and a high-speed passenger train carrying passengers, operating over the other tracks between Austin and San Antonio. The entire railroad line is to be electrified, as well as serving as a major electric transmission line corridor between the major load centers. The two Union Pacific Railroad tracks for conventional freight trains are separated from the high-speed passenger and freight (trucks) train tracks by a water aqueduct channel to transport water supplies for industries, businesses, and homes between cities....

The proposed high-speed rail system in the Texas Triangle, with freight service and commuter rail service included for the entire system, would have an estimated total capital cost of \$17.5 billion for the 950-mile system over a 10- to 15-year total implementation period. For the high-speed rail passenger system alone, the expected capital cost would be expected to be approximately \$11 to \$11.5 billion, or 40% greater than the previous number. The above numbers are ini-

tial approximations only, and would need to be verified through detailed engineering and economic analysis to be conducted. These capital cost figures are based on 2003 cost figures, and would need to be corrected for today's dollar conditions. The estimated capital cost of the project has increased significantly over time, with inflation, so that it is not a wise idea to wait to build it, because material, construction, and labor costs will only increase at a rate of 4 to 5% per year with time....

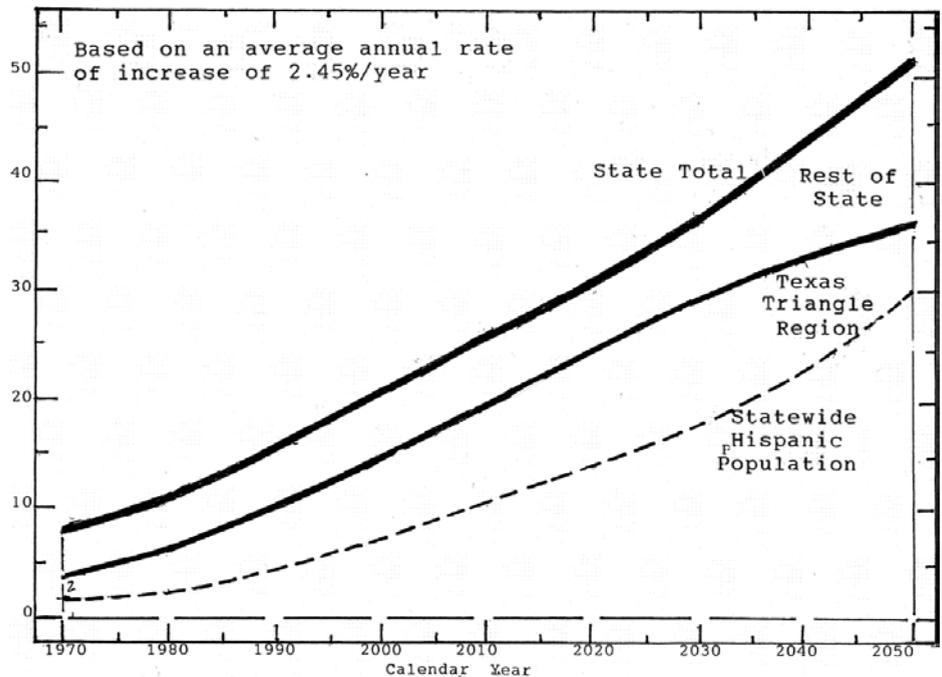
The proposed Texas Triangle high-speed rail passenger project is expected to show significant ridership levels once it begins operation. If the system were to be in full-scale operation in the Houston-Dallas corridor by 2015, it would be with a ridership of 15,000 passengers per day, which would increase to 40,000 per day by 2020 with all three corridors in operation. Overall passenger ridership would be expected to increase to about 100,000 per day by 2030 and to 150,000 per day by 2040 (with a passenger traffic density of 2,000 to 5,000 passengers per day per million population in the Texas Triangle of 30 million people per year.) This level of passenger ridership density is comparable to that of the TGV rail passenger lines in France, of 3,500 to 4,000 per day with similar populations, where a significant portion of the trains are relatively short-distance commuter types.

...The overall system would be designed for a total of 100,000 passengers per day and a truck haul traffic volume of 20,000 trucks per day, when based on a 50% market penetration. When based on an expected future population of 25 million in the greater Texas Triangle region in 2030 to 2035, the average ridership density on a per-capita basis is approximately 4,000 riders per day, per million population. The truck haul traffic density is about 800 intermodal truck hauls per day in the overall Texas Triangle. However, much of this truck haul traffic is long-distance in nature, especially between Laredo and Dallas, with final truck destinations in the Midwest, Northeast, and Southeast, so that either offloading or a larger network would be needed.

The high-speed rail passenger and freight network in the Texas Triangle is expected to have a future train traffic volume of 500 to 600 trains per day. The greatest number of passenger trains will be in the Houston-Dallas corridor, while

FIGURE 4
Expected Increases in Population for the State of Texas and the Texas Triangle (1970-2050)

(Millions of People)



the largest frequency of intermodal truck haul trains will be in the Laredo-San Antonio-Dallas corridor. In all, it is expected that the overall electric demand for the overall high-speed rail network in the Texas Triangle will increase from 150 megawatts at the startup to 600 megawatts when in full-scale operation.

The population of Texas is currently growing at a rate of approximately 2.0 to 2.5% per year (Figure 4). The main portion of the State's population is in the Texas Triangle, with about 16 million out of a total State population of 23 million at present, nearly 70% of the total. The population of Texas is expected to more than double by 2050, from 23 million today to greater than 53 million, by 130% (1.85% per year). The population of the Texas Triangle is expected to increase from 16 million today to 38 million by 2050, by 137% (1.95% per year). In the same time period, the Hispanic population of Texas is expected to increase from 5 million in 1990 to 10 million in 2010 to 19 million in 2030 and 31 million in 2050, or by 245%. The increase in the Hispanic population in Texas will no doubt impact the expected ridership patterns for the high-speed rail system, as well as many other social and economic issues, as Texas gradually becomes an increasingly Hispanic-majority State after 2030. The author has made some preliminary economic projections for the future high-speed rail passenger system in the Texas Triangle between

2015 and 2050, based on the above rider levels and capital costs. The estimated startup capital cost is \$23 billion for a passenger-only system, and \$27 billion including truck hauls in the Dallas-San Antonio corridor only, and \$30 billion for truck hauls in all three corridors. The passenger ridership projections in the operating year of 2035, after 20 years of operation, are a total of 100,000 passengers per day, while the expected truck hauls are 20,000 per day in the overall Texas Triangle.

It is expected that the train traffic volumes will be in the range of 500 to 600 per day, with an expected electric power demand of approximately 600 megawatts. If the freight railroad lines in the Texas Triangle are also electrified, it is expected to add another 1,000 to 1,500 megawatts to the electric power demand. The total increase for the entire State of Texas would be in the range of 3,500 to 5,000 megawatts for the electric power demand if all of the major state rail lines were also electrified, which is 7 to 10% of the present State total generating capacity of 70,000 megawatts...

The economic viability of the Texas Triangle high-speed rail project was evaluated for the separate cases as follows: 1) the high-speed passenger rail service alone; 2) the high-speed passenger rail service plus intermodal truck haul alone; 3) the high-speed rail passenger service plus the intermodal truck haul plus a power plant purchase; 4) the truck haul alone; 5) the high-speed rail passenger service plus the power plant; 6) the operation of the power plant alone.

The power plant in question to be purchased is the existing Big Brown power plant at Fairfield, Texas with 1,130 megawatts where the CEFCO emission control process would be installed for air pollution emission control, plus chemical and fertilizer byproduct recovery and clean transportation fuels production, where the plant burns low-grade Texas lignite coal. The CEFCO Process could also be installed at the JT Dealy and Stark power plants of the San Antonio City Public Service Board in San Antonio, to help maintain compliance with existing ozone air quality standards by substantially reducing the air pollution emissions.

The expected overall performance of the Texas Triangle high-speed rail project is based on comparison of the capital costs, operating costs, debt service, and expected revenues on an annual basis. The revenue and cost profile on an annual basis for the high-speed rail passenger service alone ... shows it making a net profit after 2025 at 10 years after startup...

With the CEFCO Process revenues and income from fertilizer and chemical and transportation fuel byproducts included, the initial operating deficit can be nearly eliminated. The CEFCO Process removes the sulfur oxides, nitrogen oxides, carbon dioxide, mercury vapor, and fire particles from the power plant stack gas. Inclusion of the power plant revenues and income reduces the operating deficit period to between five and six years, and earns all-important interim revenues

TABLE 1
Benefits to the Texas and National Economies from High-Speed Passenger Rail in the Texas Triangle

Specific Benefit	Houston-Dallas Millions \$	Total Triangle Millions \$
Overall Construction Wages	525	1,150
Overall Operation Wages	70	155
Passenger Fare Savings	145	325
Businessmen's Time Savings	135	200
Freight Transport Savings	10	35
Balance-of-Payments Deficit Reduction	75	175
Highway Maintenance	Substantial	Substantial
Highway Congestion Cost Reduction	Substantial	Substantial
State Employee Travel Savings	1	3
Mail Haul Cost Reduction	2	5
Increased Electricity Sales	10	25
Increased Equipment Sales	150	400
Increased Tax Revenues		
Federal Taxes	100	215
State Taxes	60	140
Local Taxes	80	220
Overall Economic Benefits		
Construction Phase	675	1,550
Operation Phase	718	1,658

Notes:

1. Figures are based on 1982 constant dollars.
2. Taken from the Report of the Committee to Study Rail Passenger Service in Texas to the Texas State Legislature House of Representatives, Austin, Texas, Rep. Al Edwards, Chairman, January 1983.

during construction. The CEFCO Process converts these pollutants into usable potassium sulfate and nitrate fertilizers, and produces polyvinyl chloride plastic plus hydrogen gas as byproducts. It also recovers carbon dioxide gas for use in tertiary enhanced oil recovery, and to produce clean transportation fuels such as ethanol, methanol, gasoline, and ethylene.... The total revenues for the project can increase to more than \$5.0 to \$6.0 billion per year for the high-speed passenger service alone.

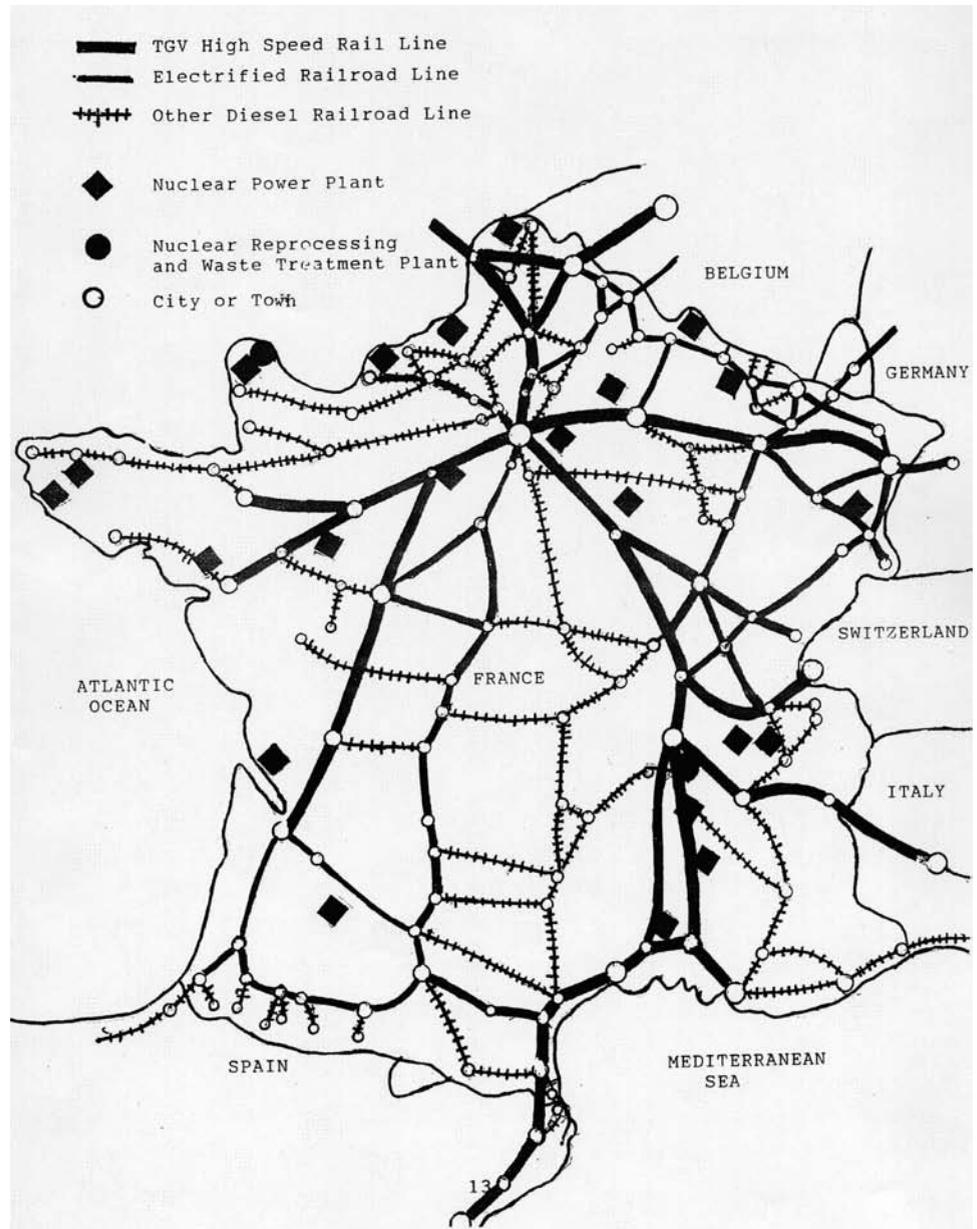
...The highest revenue-generating activity would be for the case of the combined high-speed rail passenger service and intermodal truck haul and power plant operation. When net income is considered, the cases of the truck haul alone in the Dallas-San Antonio corridor, and the truck haul plus power plant, never show an annual operating deficit. The annual operating deficit of \$420 million per year only occurs for a short time with the combined high-speed rail-intermodal truck haul and power plant case, as compared to a prolonged maximum annual deficit of up to \$900 million per year for the high-speed rail system alone. The inclusion of the addi-

tional revenues from the other two corridors, in addition to the Laredo-San Antonio-Dallas corridor, would considerably reduce this initial annual operating deficit.

Expected Benefits

The high-speed rail passenger project in the Texas Triangle is expected to provide numerous economic and other benefits to the State and nation, as shown in **Table 1**. The project will create between 5,000 and 15,000 new direct construction jobs in Texas over a 5- to 15-year period, plus 1,000 to 2,000 direct and indirect jobs once operation begins. Increased direct and indirect revenues to Federal, State, and Local governments of \$60 to \$100 million per year from sales, franchise, income, and property and excise tax receipts will result from the Texas Triangle High Speed Rail Passenger Project, with no net drain in the State or Federal treasuries. It is emphasized that the high-speed rail passenger systems in Europe and Japan and elsewhere are profitable, where the Japanese Shinkansen repaid its original bonds in nine years, while the French TGV line between Paris and Lyon repaid its initial bonds in 11 years. Significant passenger transportation cost savings would result from the project, through reduced fares and shorter transit times. Lower freight transport costs also result from high train speed along common rights-of-way operations, in conjunction with passenger service. Significant petroleum savings would also result from the project, because of its electrification, which will also reduce the national balance-of-payment and merchandise trade deficits because of reduced oil imports from the Middle East and elsewhere. Electrification of railroads is essential for these reductions in petroleum consumption to take place, for the transport of both freight and passengers, and to reduce the national balance-of-payments deficit. In addition to the in-

FIGURE 5
France's TGV High-Speed Rail Line, Other Railroads, and Nuclear Power Plants



creased tax revenue previously mentioned, other specific economic benefits to the Texas State Government will result from the project. There will be a reduction in State employee travel and reduced need for overnight lodging because of faster transit times. Highway maintenance costs could be reduced because of the reduced traffic along the interstate highways as truck movements are diverted from road to rail. In addition, the increased movement of people by train will reduce roadway congestion along the main interstate highways

as well as on surface streets, and also reduce air pollution emissions and roadway maintenance costs, as well as reduce greenhouse gas emissions.

The Texas Triangle High Speed Rail Project will result in significant economic growth in the intercity corridors where rail lines run, and at urban station and terminal locations. Industrial, commercial, and residential real estate development will result from the project, where people will be able to live at extended distances from major urban centers, with easy and fast commuting times. In addition, rural agricultural land can be preserved for farming purposes, by concentrating population development along corridors when existing railroad rights-of-way are utilized in the Texas Triangle, without major disruptions to farms and ranches away from existing railroad lines.

Several areas of possible assistance from the State of Texas may be beneficial to the Texas Triangle High Speed Rail Project. The issuance of revenue bonds under public auspices for construction of highway grade separations (overpasses and underpasses) would benefit the project by providing favorable tax-free financing for a major portion of the project. Joint or total state ownership of the line could alleviate property tax penalties, through the possible creation of State rail passenger transit authorities, as well as provide a source of public bonding capacity. The ability to finance the construction of road-rail grade separations separately from the high-speed rail project itself, could significantly reduce the direct development costs to public or private participants, as a major State of Texas project contribution.

Joint public-private investments in rail facilities such as proposed in Governor Perry's Trans Texas corridor plan would be especially beneficial for those sections of the high-speed passenger railroad lines in urban areas, in lieu of toll roads. The urban areas are generally involved with intercity passenger trains on the same tracks, so that State or Local transit funds utilized for construction of urban segments could be feasible. The operation of commuter trains along the lines under contract of urban transit authorities, using State or local funding, would also be beneficial to the overall Texas Triangle High Speed Rail Project, and particularly to the ridership, by collocation of rail passenger service.

The Federal government can also provide assistance to high-speed rail passenger projects. Most importantly, favorable tax policies in terms of investment credits, safe harbor leasing arrangements, and depreciation allowances can be extremely beneficial in enhancing the attraction, along with grants to assist in feasibility and design studies. Providing Federal funds for grade separation construction would be an extremely valuable contribution to such projects. Assurance of suitable ticket-pricing policies, to provide for competitive responses without requiring quasi-utility status, is also important for high-speed rail transportation to be competitive relative to airlines.

One of the greatest potential benefits of the Texas Tri-

angle High Speed Rail Project lies in its ability to improve air quality, by reducing air pollution emissions from the trains themselves along railroad lines. It is intended that the freight trains, commuter trains, and high-speed passenger trains would all be electrically powered, to eliminate direct emission, with power plant emissions controlled through the use of effective air pollution controls. The diversion of trucks from road to rail would act to reduce the critical emissions of nitrogen oxides from diesel trucks, as the generally limiting reactants in photochemical air pollution formation. . . .

Conclusions

The proposed high-speed rail project in the Texas Triangle has had a long and somewhat checkered history. Earlier efforts to implement this project through the private sector failed for lack of financing, as well as from unrealistic expectations for instantaneous wealth, plus opposition from entrenched real estate, oil, and other interests. While private-sector financing alone in theory can be justified for the Texas Triangle high-speed rail project, in reality it is better conducted as a joint public-private effort. Governor Perry's Trans Texas Corridor plan provides such an opportunity in concept, but route specifics should be realized to favor existing railroad rights-of-way whenever possible, instead of building toll roads.

The Texas Triangle High Speed Rail Project can be completed for \$10 to \$12 billion for the high-speed rail passenger system alone. However, the total capital cost of the overall Texas Triangle rail project would be increased to between \$20 and \$30 billion, when commuter rail and freight rail are included. The hauling of trucks in conjunction with passengers makes the project especially beneficial in terms of its potential revenues and economic benefits. The greatest benefits are in the congestion, highway maintenance costs, and air pollution emissions, during the time when Texas's population is expected to increase from the present 21 to 30 million by 2020, and to as much as 50 million by 2050.

The model of France can be used as a guide for high-speed rail development in Texas, based on their extensive high-speed rail development using primarily nuclear energy for propulsion over the network. The fact that Texas is considering a future high-speed rail passenger system which could use the French TGV as a model is significant (**Figure 5**), where announcements have been made to construct as many as six new nuclear reactors to augment the four reactors already in operation. The recent announcement by the Argentine Government that it is planning to build a new 435-mile-long high-speed rail system between Buenos Aires, Rosario, and Cordova, using the French TGV technology at a cost of \$1.5 billion over a planned three-year construction period, may be just the spark to get Texas to begin moving in the same direction, to develop a badly needed high-speed rail system. . . .