

GAO

Report to the Honorable
John J. Duncan, Jr.,
House of Representatives

July 1995

HIGHWAY SIGNS

Conversion to Metric Units Could Be Costly





United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-260979

July 7, 1995

The Honorable John J. Duncan, Jr.
House of Representatives

Dear Mr. Duncan:

The Metric Conversion Act, as amended, requires every federal agency to use the metric system in its procurement, grants, and other business-related activities to the extent economically feasible. Responding to the act, the Federal Highway Administration (FHWA) developed a metric conversion plan and timetable, which included the conversion to metric units of highway signs, such as, speed limit, distance, and clearance, on all of the nation's roads by September 30, 1996. In response to your request, we have (1) determined the status of federal and states' efforts to convert highway signs to metric units and (2) examined the possible costs involved in implementing the conversion.

Results in Brief

On June 27, 1994, FHWA notified the public through a Federal Register notice that the agency had postponed the September 30, 1996, deadline for converting highway signs to metric units until at least after 1996. As a result, most states have deferred their sign conversion activities. FHWA officials told us that converting the signs is still an agency goal but that postponement was necessary for two reasons: recent legislative requirements that prohibited the use of federal-aid highway funds for this activity and negative comments received on FHWA's August 31, 1993, Federal Register notice that requested comments on sign conversion. The comments emphasized the high cost of converting highway signs and raised concerns about how conversion would be financed. Since sign conversion is still a goal, FHWA is continuing with activities to support conversion, such as converting its manual on highway signs into dual units—English and metric.

No comprehensive national estimate of the costs to convert U.S. highway signs to metric units has been developed, and most states have not developed anything beyond very preliminary estimates. One exception, Alabama, developed an average conversion cost of about \$70 per sign in February 1995. If Alabama's estimate is accurate, the cost of converting the approximately 6 million signs on the nation's state and local roads

could amount to about \$420 million.¹ This estimate is very soft, however, because, among other things, FHWA's estimate of the number of signs is a "guesstimate." FHWA has tasked its contractor—Battelle—with developing a more comprehensive, data-driven estimate for various conversion options by January 1996 so that FHWA will have a basis to choose which option to implement. However, there is concern that little data may be available to estimate sign conversions on local roads because inventories of local signs may not exist. Moreover, Battelle will not be including the costs for educating the public about the metric system before the highway signs are converted, which is critical to a safe conversion.

Background

Section 5164 of the Omnibus Trade and Competitiveness Act of 1988 amended the Metric Conversion Act of 1975 and designated the metric system as the preferred system of weights and measurements for U.S. trade and commerce. The major reasons given for converting to metric are international trade competitiveness and ease of use. Since the United States is part of a global economy, the metrication of its manufacturing sector is viewed as an important factor in remaining competitive in world markets. Critics argue that although manufacturing may convert, there seems to be no compelling reason for converting highway signs. The American Association of State Highway and Transportation Officials (AASHTO) has stated that it is difficult to determine that metrication would yield any substantial benefits to the highway industry. Others argue that the metric system is simpler and, once learned, more efficient than English measurement.

Section 5164 establishes a policy that requires each federal agency to use the metric system in its procurements, grants, and other business-related activities to the extent economically feasible by the end of 1992. However, conversion may not be required if it is impractical or if it is likely to cause significant inefficiencies, or loss of markets to U.S. firms. The act requires each federal agency to establish guidelines to carry out the policy. In addition, Executive Order No. 12770, signed in July 1991, requires, among other things, that executive branch departments and agencies formulate a metric transition plan by November 30, 1991.²

¹FHWA was not able to break down the 6 million signs in terms of highway signs and milepost markers. Therefore, our estimate of \$420 million does not factor in Alabama's estimate of \$90 each to replace milepost markers with kilometer posts.

²Metric Conversion: Future Progress Depends Upon Private Sector and Public Support (GAO/RCED-94-23, Jan. 13, 1994). This report provides information on federal agencies' implementation of metric conversion.

The Department of Transportation (DOT) issued its metric conversion plan in 1990 and established policy and administrative procedures for changing to the metric system. DOT required each of its nine agencies to develop a conversion plan and include specific dates for the changeover to metric. In addition, DOT's policy guidance requires that if an agency identifies an area in which metric conversion is deemed to be impractical or inefficient, it can make an exception to the law if the exception is supported by an analysis justifying such action.³ Any requested exception is submitted to the Secretary of Transportation for coordination with the other DOT agencies before approval is given. To date, FHWA has not analyzed any aspects of its proposed metric conversion plan, including converting signs to metric units, to determine if an exception was warranted. Only one of DOT's modal agencies—the Federal Aviation Administration (FAA) has—requested program exceptions to metric conversion.⁴

FHWA's Metric Conversion Plan

FHWA established a metric work group in December 1990 to develop a conversion plan and timetable. The work group proposed a 5-year transition plan with complete metric conversion by September 30, 1996. After this date, all construction contracts advertised for bids for federal lands, highways, and federal-aid construction would have to contain only metric measurements. As a result, highway and bridge contractors, engineers, equipment and materials manufacturers and suppliers, and state and local governments will have to perform their work in metric units or will be ineligible for federal dollars for highway construction projects.⁵

Target dates were set for several key program elements and activities, including converting highway signs, as shown in table 1. By the end of 1995, full conversion is expected for data collection and reporting systems such as the Highway Performance Monitoring System, which collects state-level data on the condition and performance of highways. Furthermore, 39 state departments of transportation will have converted, to metric units, their manuals and procedures that guide highway

³DOT's metric planning guidelines states that where exclusions are claimed, they should be based on quantitative information and contain suitable analytical procedures for determining their practicality or significant inefficiencies. However, there was no further definition of practicality or inefficiency.

⁴In a memo to the Department of Commerce, the Secretary of Transportation noted that FAA programs relating to air traffic control, aircraft certification, and air safety regulations represent exceptions to DOT's plans for conversion to the metric system because by international agreements these systems use nonmetric measures.

⁵FHWA has issued guidance on the granting of exceptions to metric conversion for construction contracts advertised for bids after September 30, 1996. Basically, state exceptions will be granted only to states that have demonstrated a conscientious effort to convert and are committed to the full use of the metric system. State exceptions will be granted on a project-by-project basis.

construction and maintenance. According to FHWA, most state DOTs will meet FHWA's target dates for most elements of metric conversion.

Table 1: FHWA's Metric Transition Timetable

Program elements/activities	Target date	Status
Develop FHWA's metric conversion plan		Approved 10-31-91
Initiate revision of pertinent laws and regulations that serve as barriers to metric conversion		Ongoing
Conversion of FHWA's manuals, documents, and publications	1994	Ongoing
Convert FHWA's data collection and reporting	1995	Ongoing
Newly authorized Federal Lands Highway and Federal-aid construction contracts in metric units only	9-30-96	Ongoing
Standards for highway signs	9-30-96	Postponed until sometime after 1996

Source: FHWA.

Highway Sign Conversion Requirement Deferred

Although FHWA was moving forward on other aspects of converting its highway program to metric, on June 27, 1994, it issued a Federal Register notice apprising the public that the agency had postponed the September 30, 1996, deadline for highway sign conversion until at least after 1996. FHWA officials said that they would establish revised implementation requirements sometime after 1996 and that sign conversion is still an agency goal. The officials said that postponement was necessary because of recent legislative prohibitions on the use of federal-aid highway funds for this activity and because of negative comments received on FHWA's August 31, 1993, Federal Register notice.

During the last 2 fiscal years, the Congress included provisions in DOT's appropriations bills that prohibited the use of federal-aid funds for placing metric signs on our nation's roads. Concerns about the cost of conversion have also led to several other legislative actions. For example, the bill to designate the National Highway System (NHS) introduced in the Senate in February 1995 prohibits DOT from requiring states to convert highway signs to metric.⁶ In the last session of the Congress, the House passed an NHS bill that included a similar provision. While an NHS bill has not been introduced in the House in this session, HR 1173 has been introduced to prohibit the

⁶The NHS, as established in the Intermodal Surface Transportation Efficiency Act of 1991, is to include a network of federal-aid roads of national significance totaling approximately 155,000 miles. The Congress must approve the final NHS network by September 30, 1995.

expenditure of federal funds for constructing or modifying highway signs that are expressed only in metric units. At least one state—Virginia—also passed a law in 1994 that prohibits the use of state funds for converting highway signs to metric units.

Negative responses to FHWA's August 1993 notice also contributed to the agency's postponement of the metric signage requirement. Overall, about 85 percent of the respondents (2,288 out of 2,731) were opposed to converting English measurement signs to metric units. Most respondents cited the cost involved in converting, and a majority said that the funds could be better used to repair roads and bridges. Several local officials commented that the conversion was another federal mandate without thought of how it would be locally financed. Furthermore, several states that responded requested special funding and an education/public information program before implementing metric signage.

Most states have not taken any action to convert their signs to metric units. However, Alabama and Arizona are planning for full conversion of highway signs to metric units. In addition to changing highway signs, such as speed limit and direction signs, to metric units, the Alabama DOT's strategy includes changing milepost markers to kilometer posts. The state DOT has recently received approval from FHWA to use federal-aid funds to install kilometer posts as a reference system to be used for the collection of highway data.⁷ Since this is a reference system and will not replace the milepost markers, FHWA determined that the use of federal-aid funds for the reference system would not violate the prohibition in the fiscal year 1995 appropriations act.

Although FHWA has postponed the requirement for states to convert their highway signs to metric units, it continues to be an agency goal. As such, activities that support sign conversion continue. For example, FHWA is currently converting the Manual on Uniform Traffic Control Devices into dual units—English and metric. This manual provides federal guidance to the states on all aspects of road signs.

Conversion Options Exist

FHWA detailed three options for converting highway signs in an August 31, 1993, Federal Register notice to obtain public comment.

⁷FHWA requires that certain reports and reporting processes be in metric units beginning with fiscal year 1995. The data and information needed to meet the reporting processes are often obtained from field surveys, inventories, and permits. The customary milepost is used to document and locate much of this work. According to FHWA officials, states would gather the data in English units and mathematically convert the data to metric units.

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- Option 1: Replace highway signs through routine maintenance over 4 to 7 years. Some signs would be in metric and some in English until all signs were replaced.
 - Option 2: Convert all highway signs over a 6-month to 1-year period. Priority roads would be converted quickly while other roads would be phased in over a longer period of time.
 - Option 3: Carry out a two-phase transition with dual metric and English measurement signs posted by October 1996 and move to metric-only signs at some time in the future.

Although most respondents opposed conversion, about 15 percent voted for one of DOT's three options for sign conversion. About 70 percent of the 443 respondents supported option 2, about 27 percent supported option 3, and the remaining 3 percent supported option 1. If FHWA requires conversion and federal funds are available, AASHTO's position is that at least a 2-year lead time is needed to plan the highway sign conversion. After the 2-year lead time, AASHTO proposes that FHWA select a 6-month period for the quick conversion of all highway signs and milepost markers, which is similar to option 2. Furthermore, AASHTO's proposal would require that, during this 6-month period, all signs containing English units (distances, speed limits, clearances, weights, etc.) be modified to equivalent metric units.

An official of the American Trucking Association—a lobbying organization for the trucking industry—told us that while it does not have an official position on highway sign conversion, there are safety considerations associated with the conversion options. For example, if all signs are not converted during the same time period, as AASHTO suggests, drivers might be confused when they see a speed limit sign in metric units, then one in English units. FHWA officials told us that, in implementing sign conversion, they hope to minimize the driving public's confusion and safety concerns by suggesting ways that states can call attention to the new metric signs. While no guidelines have been completed, FHWA officials said that one approach they are considering is to put metric units in yellow to differentiate them from the English unit signs drivers are used to. For any option, the American Trucking Association official told us that without a nationwide educational process before the conversion occurs, commercial truck drivers and the general driving public may not be familiar with metric units. This lack of education could result in safety concerns related to speed and also clearance heights on bridges and tunnels.

Alabama has begun to convert its highway signs. In a manner similar to FHWA's option 1, Alabama is replacing highway signs with metric signs through routine maintenance and for other reasons such as construction. However, Alabama plans, unlike option 1, to put an English measure overlay on the signs.⁸ Under this approach, the state believes that it will save money because the signs need to be replaced anyway, and since signs and overlays are fabricated in the state's shop, all the overlays could be made now and would not be affected by the cost of future inflation. Moreover, unlike FHWA's option 1, this approach would also allow for the signs to be changed to metric concurrently over the same short period as overlays are removed or metric unit overlays are added for those English-unit signs that had not been replaced during maintenance.

One open question concerning Alabama's approach is whether the state will remove the overlays and convert to metric if FHWA decides not to require conversion. From a safety standpoint, it may not be prudent for one state to convert and the surrounding states to keep their signs in English units. FHWA officials said that they had not decided on a course of action if conversion were not mandatory and some states converted and others did not.

The Cost of Highway Sign Conversion Could Be Substantial

FHWA has not estimated the nationwide costs of highway sign conversions. However, on the basis of Canada's experience in metric sign conversion as well as the work done to date by Alabama, "ballpark" estimates of about \$334 million and \$420 million can be calculated. In 1977, the Canadian Ministries changed about 241,000 signs (using overlays) on 300,000 miles of highway, which is about the number of highway miles in California and Texas. The conversion took 2 months and cost about \$13.4 million in 1995 U.S. dollars, or \$55.70 per sign (\$6.1 million or \$25.43 per sign in 1977 Canadian dollars). The number of Canadian signs is a fraction of FHWA's estimate that about 6 million signs on the nation's state and local roads would need to be changed. Using Canada's cost data, the United States conversion could cost about \$334 million. However, this estimate could vary depending on the length of implementation and the replacement method chosen.

In 1993, AASHTO issued its "Guide to Metric Conversion." The guide included a case study on Alabama that used information on the number and types of signs from one area of the state to develop conversion cost

⁸Because Alabama's metric signs will have overlays in English units, the driving public will not be using metric speed limits, distances, or other measurements.

estimates.⁹ Initially, Alabama estimated that it would cost \$2.7 million to convert its state highway signs, using the quick-conversion option, to metric units by October 1995. After the initial estimate, Alabama increased its estimate to \$3.8 million (at about \$70 per sign), to include an additional \$1.1 million to install kilometer markers for data collection purposes.¹⁰ Assuming that nationwide conversion costs would be similar to Alabama's, changing the nation's 6 million highway signs on state and local roads could cost about \$420 million. We termed this a ballpark estimate because there are a number of factors that could affect the estimate. For example, the validity of FHWA's estimate of 6 million signs, as well as the mix of signs—large ones, small ones, or milepost markers—could be important in determining costs.

Eight of the nine states that we contacted provided very preliminary cost estimates, ranging from a low of \$1 million to a high of \$20 million, for changing their highway signs on state roads.¹¹ The difference in estimates depends on the method and number of signs for conversion. Because FHWA postponed the conversion, FHWA officials told us that most states have not developed cost estimates. Many states do not have information on the number of signs that they would need to change on local roads or the costs involved. Several state officials noted in the 1993 Federal Register notice that since there are many more miles on local roads than state roads, the sign conversion costs could be quite substantial. According to an FHWA official, about 70 percent (or 2.7 million) of the nation's 3.9 million miles of public roads are classified as local roads.

In January 1995, FHWA hired a contractor—Battelle—to develop national cost estimates for each of the three conversion options (and variations of those options) spelled out in the August 31, 1993, notice. To develop national cost estimates, Battelle plans to use information from state and local jurisdictions that have computerized sign inventories. According to an FHWA official, obtaining information at the local level may be difficult because local road sign inventories may not be maintained. If local inventories are not available, Battelle may have to rely on other methodologies, such as statistical sampling techniques, to provide a basis

⁹Alabama's DOT used information collected from one region of the state on the number and types of signs that need to be converted and extrapolated the numbers for the entire state. The state DOT's field inventory found that 1 out of every 12 signs would need to be changed into metric units on state roads, at an average cost of \$70 per sign. Some signs, such as warning, parking, and regulatory signs, would not have to be changed.

¹⁰This estimate does not include the cost of converting highway signs on local roads.

¹¹The states that we contacted were Alabama, Colorado, Florida, Georgia, Illinois, Indiana, North Carolina, Tennessee, and Virginia. According to FHWA, these states were the furthest along with metric signage. One state—Georgia—had not formulated any estimate for sign conversion.

for estimating costs of changing local road signs to metric. The study is just getting started and is scheduled for completion in January 1996.

Metric Education Is Important But Costs Are Unknown

State and local officials, AASHTO, and an American Trucking Association official all said that an important component to highway sign conversion is public education. Without a more comprehensive national conversion effort that would seek to educate all parts of our society on the metric system, FHWA and state DOTs might have to establish and fund an education program before signs are converted.

According to AASHTO's 1993 "Guide to Metric Conversion," careful planning and a public information campaign are largely credited for Canada's smooth transition to metric units. The public had been prepared for the conversion through displays of the new signs, full-page newspaper advertisements, radio and TV spots, and informational pamphlets. Moreover, since highway sign conversion was just one part of Canada's overall effort to convert the country to the metric system, the program began with several years of close cooperation and careful planning among government agencies.

AASHTO's 1993 guide also states that while public information programs are essential to conversion, a large part of educating the public can be handled better by means other than those at the immediate disposal of the highway agency. The guide points out that the Secretary of Commerce has been given the lead to establish a metric education program, and AASHTO believes that the Subcommittee on Public Education and Awareness, established by the Secretary of Commerce, is a "very appropriate mechanism for conducting a national awareness campaign."

However, our January 1994 report on federal metric conversion activities raises questions about the limited actions that have been taken at the federal level to foster metric education. Furthermore, the report points out that the federal government by itself cannot achieve the goal of metric conversion. The government must depend upon support from its private sector suppliers and from the public; therefore, a national dialogue is critical to defining the next steps in decision-making about a national metric conversion effort.

If the federal government, under the leadership of the Department of Commerce, does not actively lead a nationwide conversion education effort, FHWA and state DOTs would be taking the lead in educating the

public on the metric system. While FHWA is planning for public awareness and education as part of the sign conversion process, being the lead agency for public awareness out of necessity, rather than being part of an overall national conversion education effort, is a very different matter. However, unless FHWA and the state DOTs take the lead, it will be difficult for the driving public to become educated or, at a minimum, aware of the differences between metric and English highway signs. However, FHWA has not required Battelle to determine the cost of educating the driving public under each option.

Conclusions

The Congress designated the metric system as the preferred measurement system in 1988; however, it passed appropriations legislation in 1994 and 1995 that prohibited federal funding of converting highway signs to metric units. As a result, FHWA has postponed requiring states to implement the conversion. The majority of comments on FHWA's conversion options opposed conversion because of the costs. While implementation is on hold, FHWA has an opportunity to revisit the safety and cost implications of highway sign conversion to metric units. Battelle's cost study could provide the information needed for such an assessment.

Canada's experience and Alabama's estimate provide the basis for developing ballpark national estimates to convert highway signs on state and local roads of \$334 million and \$420 million, respectively. FHWA has tasked Battelle with developing a more comprehensive, data-driven estimate for various conversion options. However, there is concern that little data may be available to estimate the cost of converting signs on local roads. Moreover, it is unclear who is responsible for metric education and how it will be paid for.

Recommendations

To help to ensure that the Federal Highway Administration has sufficient information to analyze the implications of the metric conversion of highway signs, we recommend that the Secretary of Transportation direct the Administrator, Federal Highway Administration, to expand the national cost estimate study to include the potential costs of educating the public about converting highway signs to metric units.

Agency Comments

We met with the Chiefs of the Contract Administration and Technical Development Branches, FHWA, and the Assistant for Energy Policy from the Office of the Secretary to obtain their views on a draft of this report. FHWA

disagreed with our proposed recommendation that it expand Battelle's cost estimate study to include potential education costs for sign conversion. FHWA said that it intends to play a role in metric education and that the states could use the material that it develops or build on those materials with an educational plan of their own. Since it is uncertain how education will be handled or how much it will cost nationwide, we continue to believe that developing such an estimate will help to ensure that the cost estimates developed by Battelle will include all potential costs of conversion.

Scope and Methodology

To evaluate the status and costs of converting the nation's highway signs to metric units, we interviewed responsible officials from FHWA, Ontario's Ministry of Transportation, the Transportation Association of Canada, the Transportation Research Board, and AASHTO. We also discussed highway sign conversion and its cost with officials from nine state highway departments—Alabama, Colorado, Florida, Georgia, Illinois, Indiana, North Carolina, Tennessee, and Virginia. These states were identified by FHWA as being the furthest along with metric signage and could provide a range of cost estimates for converting highway signs to metric units.

We also reviewed the laws and regulations pertinent to metric signage, such as the Metric Conversion Act, as amended; FHWA's Metric Conversion plan; Federal Register notices; and DOT's appropriations bills for fiscal years 1994 and 1995. We conducted our review between October 1994 and April 1995 in accordance with generally accepted government auditing standards.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 7 days after the date of this letter. At that time, we will send copies to interested congressional committees; the Secretary of Transportation; the Administrator, Federal Highway Administration; and the Director, Office of Management and Budget. We will also make copies available to others upon request.

If you have any questions concerning this report, I can be reached at (202) 512-2834. Major contributors to this report are listed in appendix I.

Sincerely yours,

A handwritten signature in cursive script that reads "Kenneth M. Mead". The signature is written in black ink and is positioned above the printed name and title.

Kenneth M. Mead
Director, Transportation Issues

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