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ABSTRACT

Prompted by the widespread use of the metric system by most major industrial countries of the world, the United States Congress in 1969 initiated the passage of a bill authorizing the research and investigation of metrication to determine the worldwide impact of its use on this country so as to decide which route it should take. Data were obtained from personal interviews with public officials in Kentucky and California, chosen for their representativeness of location, size, and council staff proximity. An analysis of the findings revealed that: (1) the pressure within States to change due to worldwide metrication is limited; (2) there exists no extensive use of the system at present except in laboratories, pharmaceuticals, testing, and some journal reports; (3) contact with foreign countries and their metrically engineered products is small; and (4) more study and planning of the system is needed. States generally do not favor conversion; therefore, any initiation of change to the system will probably come only from pressure exerted from the Federal level. Highway, transportation, and other similar agencies who perform engineering functions will perhaps have the hardest adjustments to make. (SN)

metrication in the states

the council of state governments

METRICATION IN THE STATES

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Foreword

This is a study of the impact on the States of metrication--the process of increasing use of the metric system of measurement. This study is part of a national three-year study on metrication requested by the Congress in 1968, conducted by the National Bureau of Standards.

This study by the Council of State Governments was one of three in the area of state and local government. Similar studies were made covering counties and cities. The project was coordinated for the National Bureau of Standards by the State-County-City Service Center.

Information was obtained from personal interviews with public officials in two States, California and Kentucky. The criteria used in selecting the States surveyed were representativeness of location and size, Council staff proximity, and a desire by the participants on the state, county, city level to choose one State to study on all levels. In the 1970 census, California is listed as the largest State; Kentucky ranks twenty-third. Council staff was available in both States, and California was studied on all levels.

In the conduct of this study a total of 38 officials in California and Kentucky were interviewed. These officials represented the departments of aeronautics, agriculture, commerce, corrections, education, finance and administration, health, highways, mental health, motor transportation, navigation and ocean development, public safety, revenue, and water resources. In addition, representatives from the legislative service agencies and the state universities were interviewed.

The California interviews were conducted and a report written by Richard H. Moran, Counsel, of the Council's San Francisco Office. The Kentucky phase of the project was undertaken by Mrs. Carolyn L. Kenton, Research Associate in the headquarters office, Lexington. Mrs. Kenton also prepared the summary report and made the oral presentation at the NBS Metric

Conference, Washington, D. C., November 17, 1970. The Council's portion of the project was directed by George A. Bell, Director of Research.

The Council gratefully acknowledges the excellent cooperation given by the many state officials who agreed to be interviewed, and by those officials who helped identify the agencies and personnel which could be of assistance. We are most appreciative of their participation in this project.

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E R R A T A

Pages nine and ten are reversed in order.

Please add to Foreword:

This report was prepared for the National Bureau of Standards but does not necessarily reflect the views of the National Bureau of Standards, U. S. Department of Commerce, or any other Federal Government agency.

I Introduction

The metric system of measurement was developed by France in the last part of the eighteenth century. Continental Europe at that time, in contrast to England, had no uniform system of measurement. Weights and measures differed not only from country to country, but even from town to town and trade to trade. The National Assembly of France, feeling the need for uniformity, called upon the French Academy of Sciences to develop "an invariable standard for all measures and all weights."

The metric system was conceived as a measurement system based on units of ten. The units, their multiples and submultiples are interrelated by a factor of ten. A metric measurement system was devised for length, weight and volume.

Adoption of the metric system progressed slowly for the first one hundred years of its existence. However, by 1900 most nations in Europe, Central and South America were using it for thier commercial transactions. Since then the number of countries converting to the metric system has increased greatly. The Soviet Union and China made use of the metric units mandatory following World War II. India and Japan followed in the 1950's. Britain began a ten-year conversion to the metric system in 1965, and within the last three years the remaining major nations of the British Commonwealth, Australia, Canada, and New Zealand have made commitments to metricate. The United States is the only major industrial and commercial country now committed to some other measurement system.

Use of the metric system in the United States has been legal since 1866. In 1893 the Secretary of the Treasury announced that the fundamental standards of length and mass would be the meter and kilogram standards kept in a vault at the Office of Weights and Measures in Washington. All U. S. customary units since that time have been definite ratios of those metric standards.

Several unsuccessful attempts in Congress to convert to the metric system were made during the first thirty years of this century. The recent accelerating expansion of metric usage prompted Congress to pass the Metric Study Law in 1968. It authorized the Secretary of Commerce to conduct a program of investigation, research and survey to determine the impact on this country of the increasing worldwide use of metric units, and to determine what action should be taken. As a consequence the Congress sought information on the present impact of increasing use of the metric system; the future impact assuming that the use or nonuse of the metric system continues as at present, with no coordination among the various sectors of the society; and alternatively, the effect of a coordinated national program to increase the use of the metric system.

The survey of officials in California and Kentucky attempts to answer these questions with respect to major activities in state government.

II Present Status

A. Measurement System Usage

Of the sixteen different administrative areas explored in the two States, all of them used the customary measurement system. Seven of the administrative areas, however, use the metric system in some phase of their operation. These are the divisions of weights and measures in the departments of agriculture, the purchasing offices, the departments of health and mental health, a department of corrections, the departments of highways, the water resources department and the universities. In each of these instances the metric system of measurement is being used in connection with medical and laboratory work. The weights and measures offices maintain a dual measurement system. The metric system is used when the purchasing offices buy pharmaceutical and laboratory supplies and equipment; the health, mental health and corrections departments dispense medicine and manage pharmacies; the highway department maintains materials

laboratories which test composition of materials to determine if they meet specifications; the department of water resources manages a laboratory; and the universities purchase laboratory supplies for the departments who use and teach laboratory work.

No officials interviewed had been involved in recent conversions to metric usage; however, several officials in California anticipated some increased metrication resulting from their recent court ruling on "buy American" regulations. These regulations prohibited the purchase of non-American products. The court ruled them unconstitutional, freeing the State to participate more fully in international purchasing. California officials anticipate future purchases of foreign automobiles and perhaps foreign steel.

The state agencies to a great extent work in response to outside stimulation. Few of them indicated they would initiate a change to the metric system on their own. Should the industries and professional organizations with whom they work change, however, few of the agencies would oppose it. For the most part, the state officials were personally unopposed to a change in their professional areas. The California officials were more enthusiastic about such a change than were the Kentucky officials.

B. Prior Conversion

There have been no areas in state government which have completely converted to the use of the metric system, other than the laboratory and scientific usage discussed previously. Some of the professional organizations such as the National Association of State Departments of Agriculture endorse the principles of the metric system. The American Association of State Highway Officials now publishes its recommended tests and standards for highway materials in both metric and customary units. In California the engineering designs for water resources are beginning to use metric measurements because of their reliance on European design models.

C. Experience with other Countries

Several of the state officials interviewed had lived in metric countries and found the system more rational and, therefore, simpler to use. They were uniformly enthusiastic about conversion to its use, regardless of the problems encountered. Several more officials were aware of the conversion to metric usage by Great Britain and expressed a desire to see an analysis of the problems they encountered before they would urge such a change in the United States.

D. Present and Past Effects of Increasing Metric Usage

The impact of increasing worldwide metrication has had limited effect on state government. Scientific discoveries and professional journals often use the metric system, but these figures can be translated to the customary system for actual implementation. As international commerce increases and the States avail themselves of international products metric usage will increase. However, although the pressures to "buy American" are no longer legal the economic factors preventing foreign purchasing are still present. When no state garages are equipped to handle metrically engineered cars and the necessary metric hand equipment for each mechanic would cost approximately $300 each, the States will be practically forced to purchase customarily engineered equipment or make the conversion slowly.

III Future Implications of Alternative Courses of Action

A. Evolutionary Metrication

State government operates in response to pressures placed upon it by its various constituents. Often those pressures are conflicting, which produces overlapping of services and waste. An unplanned, uncoordinated move toward metrication would increase the conflicting pressures and the waste.

Currently worldwide pressures toward metrication are only weakly felt in the States. This situation will probably not change in the foreseeable future. Only the more basic scientific functions are now performed in the metric measurement system; and although the scientific literature uses metric figures they can be converted into customary terms. Metric language usage is increasing slowly. Professional engineering manuals, for example, are beginning to be published in both systems.

Few state officials foresee any immediate savings which would result from a move toward metrication. Most are willing to accept the change based on its long-range benefits of simplicity of use, and promotion of worldwide trade and understanding if it becomes necessary. However, those most closely associated with the customary system--the engineers, equipment maintenance personnel, construction workers, architects, and personnel engaged in enforcement of standards, physical and financial--could not and would not change unless their respective industries initiated the change.

The costs involved in making these changes in Kentucky ran from $19,000 to change all the field equipment used to check private weights and measures systems in the State, to the initial investment of $300 worth of metric hand tools for each of 500 state highway mechanics. The State itself would have to replace $300,000 worth of its own machine tools. It would cost $250 in Kentucky and $400 in California to have a computer search and printout of all state laws using the customary system. Engineering supervision costs on highway projects would go up an estimated two percent of the total cost of a project during the transition period. These examples do not count the cost of maintaining dual inventories for an undetermined length of time.

The potential cost increase as reflected in increased personnel hours used to effect the change was appalling to several officials. In the context of total state expenditures, the cost impact of conversion would probably be slight.

The agencies with broader administrative duties such as finance and revenue, and those involved with social problems such as commerce, corrections, health, and public safety would not be greatly affected by metrication. Education curriculum and school construction would be affected as would any state public works projects.

B. Planned Metrication

All those interviewed felt the only desirable way to accomplish metrication would be on a planned basis as directed by federal policy. There was almost as much agreement that the most desirable degree of change would be a complete conversion; however, in the process of change it would be necessary to utilize accommodation and adaptation as intermediate steps.

The estimates on optimum time needed to change to metric usage varied greatly. Some functions could be converted within a few months. Weights and measures, finance and administration, health and mental health, public safety, revenue and university curriculum programs would fall in this category. Any area handling equipment or engineering standards would take from one to twenty years to convert if a change is desirable at all.

The Kentucky Department of Aeronautics could change its in-house functions within one year using conversion scales; however, it would take its constituency at lease five years. The California offices of Navigation and Ocean Development, and Water Resources could change within five years.

The weights and measures offices themselves could change in three to four months but it would take the scales in public use five to ten years to be changed. In California the counties support the local compliance inspectors and they would sustain whatever cost was necessary to change. The Department of Education in California replaces its textbooks approximately every six years while in Kentucky the school building program takes two years from inception of the project to its completion. The vocational schools depreciate and rotate their equipment every ten years.

The Kentucky Finance Department could convert in 120 days. The Department of Health could be converted completely in five years. This would include rewriting health regulations and standards as well as changing the computer programming. Mental health officials said they could convert in three months, and saw no advantage in waiting for ten years. It would take the state police six months to retrain their personnel in metric usage.

The laws of Kentucky could be changed in one session by having a secretary type the necessary changes into an omnibus bill. The job would be immeasurably assisted if the appropriate statutes had been identified by using a computer. The policy determinations on what metric standards or language should replace what customary standards would of course, have to be settled in advance.

The departments which would experience greatest difficulty and consequently take the longest transition time would be the highway and motor transportation departments. The Kentucky Motor Transportation Department supervises the intrastate commercial vehicles—trucks, buses and taxis. It also collects the excise taxes imposed on these carriers. The director said it would take eight years to change the department's field equipment to metric usage. The State owns sixty sets of portable weight scales in addition to the stationary highway weight scales, and he estimated it would cost $4000 a set to return them to the factory to be rescaled.

When interviewed, officials in both state highway departments reacted positively to metrication; however, the officials indicated that, in comparison with other state agencies, their departments would sustain the major impact of any change. Their time estimates to affect the change varied from division to division. One planning official estimated a three to five year lead time was necessary for each highway project. Another said some plans drawn ten years ago were just now being let for contract. He added highway plans were considered obsolete after twenty years but were then microfilmed and filed for further reference. The highway construction people said it would probably take them twenty years to fully convert; they would need to retrain their field personnel in addition to purchasing metric equipment. The director illustrated the field problems involved: highway engineers figure distance in feet and decimals of feet while the carpenters on the job figure in fractions of inches. The engineers have been unable to convince the carpenters to change, so the engineers must make a conversion to the carpenters' system in order to supervise them. The construction director said he could foresee the use of three systems during the transition period to metric.

With respect to traffic signs and highway markers, one official stated that Kentucky currently spends one-fourth to one-half million dollars for signs a year. He could give no estimate on cost of a change because the State does not have an inventory of the number of signs currently in use. He pinpointed two problem areas, however. The parkway and interstate highway systems are posted at mile intervals. These posts are used as reference points for emergency vehicles and on police accident reports. He questioned the desirability of spacing these posts metrically. Another problem area revolves around posted speed signs. The statutes specify two general speed limits in the State, sixty and thirty-five miles per hour. Any other posted limit is ordered by a specific local ordinance. He felt each of these would have to be altered to reflect metric usage.

IV CONCLUSION

To summarize, state officials indicated the customary system of measurement is used almost exclusively except in the areas of pharmaceuticals, laboratories and testing. There is little pressure within the States interviewed to change to metric usage. Contact with foreign countries and their metrically engineered products is small. Some professional organizations for state officials are beginning to print reports and standards evaluations in both systems to familiarize their members with the metric system.

The States would rather be reactors than initiators of policy in this area as they consume goods, not manufacture them. They would prefer a planned metrication policy directed on the federal level. At the same time, some officials urged further study of the costs of change and priorities of change; and expressed hope that the federal government would carefully plan for conversion so there would be as little disruption of normal operations as possible.

The impact of metrication within state government would be felt most by highway and transportation agencies, weights and measures agencies and offices within agencies who perform engineering functions.

Few officials foresee immediate savings or advantages to conversion, but most officials were ready to accept the change based on its long-range benefits of simplicity of use, and promotion of worldwide trade and understanding.

One highway equipment division director said it would take at least twelve years to convert to metric usage and dual inventories would have to be carried for at least that length of time. In his opinion, the manufacturers and the federal government should bear the brunt of the expenses incurred as any change of this nature would be most beneficial to them.

The highway materials laboratory and the data processing units would need only three to five years to change and did not wish to see the time prolonged as this would increase the possibilities of error and cost.

The director of the Kentucky Geological Survey said the expense and time involved in converting to metrication would render the project prohibitive and undesirable in his opinion. To illustrate, Kentucky has 90,000 registered oil and gas wells all of which are located by distance in feet from the longitude and latitude coordinates of the State. To remap all roads, buildings, wells and other topographic features in metric units would take a generation.

Each official interviewed preferred his optimum time to a ten year period. However, they all recognized the need for a definite goal to be achieved in reaching metrication. The natural inclination for people without a goal is to postpone the disagreeable task . Many officials urged further study into the costs of conversion and the priorities for change. Some expressed the desire to wait until the "pilot project" in England was completed and the results were in.