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FEDERAL ELECTRICITY

Retail Competition Could Create Government Savings

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The federal government is the largest consumer of electricity in the United States, spending about $2.8 billion in fiscal year 1995 for the approximately 50 billion kilowatt-hours (kWh) of electricity it used domestically, at an average price of 5.6 cents per kWh.[1] Electricity restructuring, which is now being implemented or discussed in many states and in the Congress, would allow most retail customers, including the federal government, to purchase electricity in a competitive market, much as customers now choose among different long-distance telephone providers. Many of these various regulatory reforms to restructure the electricity industry share the common goal of bringing competition to the electricity market by guaranteeing customers a choice of service providers.

As requested, we evaluated whether the federal government could realize savings[2] if, as expected, lower prices result from retail competition in the electricity market. To do this, we estimated the quantities of electricity the federal government would have purchased without retail competition and the prices it would have paid during 1998 through 2015. This projection of prices and quantities is known as our baseline projection.

To estimate possible savings, we used the results of several published forecasts of the extent to which retail competition is expected to reduce electricity prices, and we applied these results to our baseline estimates of the government's projected spending for electricity. Unless otherwise stated, all dollar estimates represent 1996 present values and are based on the period 1998 through 2015.[3] We note that secondary effects—that is, the ripple effects of lower electricity prices on the economy—could be substantial and result in even greater savings to the federal government. For example, declining electricity prices could result in greater economic growth, leading to increased tax revenues; they also could result in lower

[1]A watt is the basic unit used to measure electricity. A kilowatt is 1,000 watts. A kilowatt-hour is equal to 1 kilowatt of power applied for 1 hour. The average household in the United States uses about 10,000 kWh of electricity annually, according to the Department of Energy's Energy Information Administration (EIA). In our March 1997 report entitled Energy Consumption: Federal Agencies' Electricity Use and Cost (GAO/RCED-97-97R, Mar. 21, 1997), we provided usage and cost data across federal agencies. For this report, we revised the fiscal year 1995 data to reflect only that portion that would be affected by retail competition and converted the data to constant 1996 dollars.

[2]As used in this report, the term "savings" does not represent the budgetary savings that might be realized annually in the federal budget from lower electricity costs.

[3]We limited our estimates of these discounted future savings through 2015 because EIA's projections of electricity prices, which we needed to develop our estimates, do not go beyond 2015.

inflation rates, leading to smaller increases in federal spending for those programs with benefit levels that are adjusted for inflation. (App. I contains a more detailed discussion of our methodology.)

Results in Brief

Retail competition in the electricity industry would create savings for the government; however, the actual amount of savings is highly uncertain. Using published forecasts of electricity prices under competition, we modeled the federal government's electricity purchases and estimate that the government could cumulatively save from $1 billion to slightly over $8 billion during the 18-year period from 1998 through 2015 if it purchased the baseline quantities of electricity—that is, the quantities of electricity it would have purchased without retail competition. Our wide range of estimates reflects, among other things, the substantial uncertainty surrounding the future pace of the implementation of retail competition in the United States and the prices paid and quantities purchased by the government. We note that our estimated baseline quantities reflect the effects of uncertainty over non-price factors, such as federal mandates for energy efficiency, on the government's electricity purchases. Nevertheless, holding these other factors constant, we believe that falling electricity prices would likely cause the government to buy more electricity than the baseline quantities simply because the price would have declined more under competition.[4] When this happens, the government could be thought of as "spending" some of its savings (when purchasing the baseline quantities) to buy more electricity. As a result, the government's spending on electricity might not fall by as much as its savings if purchases were held at the baseline quantities. Adjusting our savings estimate to reflect this case, we estimate that federal spending on electricity could cumulatively decrease by $0.6 billion to $6.5 billion during the same 18-year period—that is, 1998 through 2015—because of the decline in prices resulting from retail competition.

Background

Federal and state governments are actively considering regulatory reforms to restructure the electricity industry—an industry with total assets worth about $500 billion and net revenues of over $200 billion annually.[5] In 1992, the Congress enacted the Energy Policy Act, which, among other things,

[4]In stating that falling electricity prices would likely cause the government to buy more electricity, we are implicitly holding constant all other factors that could affect the government's electricity purchases, such as the size of the government. In so doing, we are able to analyze and discuss the sole effect of lower prices resulting from retail competition on the government's spending for electricity.

[5]The markets for the transmission and distribution of electricity are likely to remain regulated for the foreseeable future.

promotes market competition in the wholesale electricity industry. (The wholesale electricity industry is comprised of intermediaries such as electric utilities that resell electricity to their retail customers.) In addition, under the act, the states may pursue their own reforms in the retail electricity market. Currently, a number of bills to restructure the retail electricity industry to promote a more efficient and market-driven industry are before the Congress.

Forty-nine states have considered reforming their retail electricity markets, and 13 states have implemented plans to restructure the industry, either by enacting legislation or by issuing comprehensive regulatory orders.[6] For example, in California, where a plan is furthest along, competitive electricity markets and consumer choice are scheduled to begin in 1998. California's plan calls for a rate cut of no less than 10 percent for all small customers by January 1, 1998. The plan also calls for the full recovery of utilities' stranded costs over a 10-year period.[7] However, not all states' plans call for the full recovery of stranded costs. For example, the New Hampshire plan calls for all customers to have retail choice by January 1, 1998 (with a possible delay until July 1, 1998 or later); utilities will be allowed to recover only some of their stranded costs. The full recovery of stranded costs is unlikely because, as the plan points out, the primary goal of restructuring is to lower electricity rates.

During their deliberations, the Congress and the states are discussing the numerous potential benefits of electricity restructuring in order to bring about retail competition. These potential benefits include, among other things, (1) increased competition, (2) lower prices, (3) lower operating costs for business, (4) smaller regional differences in costs, (5) more jobs, (6) more reliable service, and (7) a cleaner environment.

[6]The 13 states are Arizona, California, Maine, Massachusetts, Montana, Nevada, New Hampshire, New Jersey, New York, Oklahoma, Pennsylvania, Rhode Island, and Vermont.

[7]Stranded costs are investments or assets owned by regulated electric utilities that are not likely to be competitive in a restructured marketplace. For example, some utilities own nuclear power plants that have very high operating costs, and these plants are not likely to be competitive in the new retail market. In addition, such power plants often have high debt levels. Estimates of these stranded costs vary widely, from a low of roughly $10 billion to a high of about $500 billion. The California plan calls for the recovery of stranded costs through a non-bypassable competitive transition charge. (Non-bypassable means that the charge will be imposed in such a way that consumers cannot avoid paying it, whether they stay with their current utility or choose a new supplier.)

Government Savings in Electricity Spending Could Result From Retail Competition

If the federal government could purchase its electricity on a competitive basis, we estimate that it could cumulatively save from $1.0 billion to $8.2 billion during the 18-year period from 1998 through 2015 if it purchased the baseline quantities of electricity—that is, the quantities of electricity it would have purchased without retail competition. We note that the average annual savings in 1998 through 2015 range from a low of about $60 million to a high of about $460 million. We further note, however, that our estimates could be below or above this range and are subject to, among other things, substantial uncertainty over the (1) future pace of implementing retail competition in the United States, (2) extent to which competition would reduce electricity prices for the government, (3) quantities of electricity that the government would have purchased and of the prices that it would have paid without retail competition, and (4) prices for electricity that the government would pay with retail competition. In addition, our estimated baseline quantities reflect the effects of uncertainty over non-price factors, such as federal mandates to increase energy efficiency.

Nevertheless, falling electricity prices would likely cause the federal government to buy more than the baseline quantities simply because the prices would have declined more under competition.[8] As a result, the government's spending on electricity would not fall by as much as its overall savings. If the government buys more than the estimated baseline quantities of electricity because of lower prices, we estimate that the government's spending on electricity could cumulatively decrease by $0.6 billion to $6.5 billion during the same 18-year period, that is, 1998 through 2015, because of the decline in prices resulting from retail competition. We note that the average annual declines in spending in 1998 through 2015 range from a low of about $30 million to a high of about $360 million.

To estimate the level of savings, we used our baseline for the government's future spending on electricity. We developed this baseline using the projections of (1) future prices published by the Department of Energy's Energy Information Administration (EIA)[9] for electricity under existing

[8]The price of electricity is one of many factors that influence the amount of electricity that the government purchases. Other factors include, for example, the size of the government, the prices and availability of alternative forms of energy, and the existence of any federal mandates that require federal agencies to use less energy or that in some way affect electricity usage. These other factors can change at the same time that electricity prices change, making it difficult to identify the separate effect of any one factor. By stating that falling electricity prices would likely cause the government to buy more electricity, we are implicitly holding constant these other factors to allow us to analyze solely the effect of the expected lower electricity prices resulting from retail competition.

[9]These projections are contained in EIA's report entitled Annual Energy Outlook 1997 With Projections To 2015 (Washington, D.C.: Dec. 1996).

circumstances, that is, assuming no prevailing retail competition and (2) the government's baseline usage for three different growth cases. We then subtracted from this baseline the projections of lower government spending for electricity using the baseline usage multiplied by the competitive prices. We used three competitive pricing projections: those reported by DRI/McGraw-Hill (DRI),[10] the Gas Research Institute (GRI),[11] and Citizens For A Sound Economy Foundation (CSE).[12] Finally, we discounted the resulting stream of future annual dollar savings to determine the present value of these savings. (A more detailed discussion of our methodology is contained in app. I.)

In developing our baseline of the federal government's projected electricity usage, we started with the quantity of kWh the government used domestically in fiscal year 1995, the latest year for which data were available. We adjusted this quantity by factors that can both increase and decrease the quantity of electricity. Increases in usage are likely because even without the introduction of retail competition, future electricity prices are expected to fall, according to EIA's projections, and the government as a consumer will tend to buy more of a product—even electricity—if the cost of the product declines. On the other hand, factors unrelated to the price of electricity could result in a net decrease in electricity usage. For example, current federal mandates that require federal agencies to implement energy efficiency measures and possible future efforts to downsize these agencies could decrease the government's electricity usage, offsetting, for example, the increased usage from the greater use of computers. Thus, the net effect of these non-price factors could be to lower the federal government's usage of electricity.

Other types of uncertainty are also associated with any estimates of the federal government's savings on spending for electricity. The estimates of electricity prices under retail competition vary widely, depending on the key assumptions used in making the estimates and the applicability of the estimates to the federal sector. For example, we used published estimates of the extent to which retail competition would decrease electricity prices

[10]DRI/McGraw-Hill, World Energy Service: U.S. Outlook (Spring 1997).

[11]Gas Research Institute, GRI Baseline Projection of U.S. Energy Supply and Demand To 2015, 1997 Edition (Mar. 1997).

[12]Michael T. Maloney and Robert E. McCormick with Raymond D. Sauer, Customer Choice, Consumer Value: An Analysis of Retail Competition in America's Electric Industry. Prepared for and published by Citizens For A Sound Economy Foundation (Washington, D.C.: 1996).

for specific customer classes,[13] but the government's electricity usage is spread among all classes. Therefore, simply taking the results of any one of these classes to determine the government's savings may overstate or understate these savings.[14] Moreover, because the government generally pays a relatively low price for the electricity it currently buys,[15] the actual savings from retail competition may be less than they would be for other customers and therefore are more likely to be at the lower end of our range of estimates.

Furthermore, the recovery of stranded costs could affect prices under retail competition. For example, DRI's and GRI's price projections under retail competition include the recovery of large amounts of stranded costs that are passed on to consumers through higher electricity rates, while CSE's price projections include none. We found that CSE's estimates resulted in the greatest savings in the government's spending. While we realize that other significant factors also affect the amount of the price declines that would result from retail competition, we believe that the assumption that stranded costs will be recovered is an important factor that helps to explain to some degree the differences in the estimates of the savings. (App. II contains a more detailed discussion of the results of our simulation analyses of electricity savings.)

In a competitive retail market for electricity, the reduction in federal spending for electricity would be less than the government's estimated savings if federal usage were to increase above the baseline quantities. As electricity prices declined below the baseline prices, federal usage would likely increase in response to this additional decline in prices. Thus, spending would decrease less than it would have if usage had remained at the baseline quantities. We estimate that the government's spending on electricity could cumulatively decrease by $0.6 billion to $6.5 billion during 1998 through 2015 (or about 23 percent less, on average, than the decline in spending if the quantities purchased were held at our baseline) because of the decline in prices resulting from retail competition.[16] We note that

[13]EIA assigns retail consumers to one of three customer classes—residential, commercial, or industrial—depending on certain characteristics of the consumers' facilities. In addition, the classes are aggregated to form a fourth class—average. Because the federal government's facilities vary widely, these facilities are scattered among the first three different classes.

[14]App. II provides simulation analyses that estimate a range of savings to the government using all four customer classes.

[15]In fiscal year 1995, the federal government paid, on average, 5.6 cents per kWh, while the average retail price was 7.3 cents per kWh (prices in constant 1996 dollars).

[16]To estimate the increase in the quantities of electricity that would be purchased because of the further decline in prices brought about by retail competition, we used the estimates of price elasticity—the degree to which the quantity purchased responds to price changes—obtained from (1) a discussion with an EIA official and (2) the CSE study.

the average annual declines in spending during 1998 through 2015 range from a low of about $30 million to a high of about $360 million.

We note that this estimate is subject to the same uncertainties as in our estimate of savings. Furthermore, this estimate is subject to the same uncertainty as the baseline about the extent to which the government would likely increase its usage of electricity simply because of lower prices—in this instance, lower competitive prices. (App. II presents a more detailed discussion of the results of our analysis of price effects.)

Conclusions

While future prices for electricity are expected to be lower for the federal government, even under the current regulatory structure, the restructuring of the electricity industry in order to foster retail competition is likely to result in even lower prices. Our analysis shows that the federal government would be likely to receive substantial financial benefits if it had the ability to purchase its electricity on a competitive basis. However, there are uncertainties that would affect the magnitude of these benefits.

Agency Comments and Our Evaluation

We provided a draft of this report to DOE for its review and comment. DOE stated that our report appears to fairly assess the major issues that affect federal electricity use and identifies the great uncertainty in the economic environment within which the federal government buys electricity. In addition, DOE said that our analytical approach appears sound in terms of answering the narrow question of how much the federal government could save on electricity expenditures in a restructured environment, and that our range of savings appears reasonable given the large uncertainties surrounding the timing of the advent of retail competition and the treatment of stranded costs. DOE also stated that federal agencies are currently working under Executive Order 12902, which requires a reduction in energy usage by 2005. We note that we included such possible reductions in electricity usage in calculating our savings estimates. In commenting on the secondary effects of lower electricity prices on economic growth and inflation, DOE stated that our discussion appears to be stated with excessive caution. In addition, DOE said that some assessment of the relative magnitude of the effects on the federal budget through reduced inflation compared with the effects resulting from changes in federal electricity costs might be of great interest to readers of this report. We recognize the potential importance of reduced inflation and other secondary effects on the federal budget, and as we stated in the draft report, these effects could be substantial and result in even greater savings

to the federal government. However, for this review, we concentrated our efforts on quantifying the direct effect of lower electricity prices on federal expenditures, and while we agree that some assessment of the magnitude of these secondary effects would be useful, we did not explicitly estimate their magnitude. DOE's complete response is presented in appendix III.

We conducted our work from May 1997 through September 1997 in accordance with generally accepted government auditing standards. As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to the Secretary of Energy, the Administrator of the Energy Information Administration, and the Secretary of Defense. We will also make copies available to others on request.

If you or your staff have any questions concerning this report, please call me at (202) 512-3841. Major contributors to this report are listed in appendix IV.

Susan D. Kladiva
Acting Associate Director, Energy,
Resources, and Science Issues

Congressional Requesters

The Honorable Thomas J. Bliley, Jr.
Chairman, Committee on Commerce
House of Representatives

The Honorable Dan Schaefer
Chairman, Subcommittee on Energy and Power
Committee on Commerce
House of Representatives

The Honorable James M. Inhofe
Chairman
The Honorable Charles S. Robb
Ranking Minority Member
Readiness Subcommittee
Committee on Armed Services
United States Senate

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Abbreviations

CSE	Citizens For A Sound Economy Foundation
DOD	Department of Defense
DOE	Department of Energy
EIA	Energy Information Administration
FEMP	Office of Federal Energy Management Programs
GRI	Gas Research Institute
kWh	kilowatt-hours

Objectives, Scope, and Methodology

We evaluated whether the federal government could realize savings[1] if lower prices in the electricity market result from retail competition, as is expected. In making this savings estimate, we developed a baseline representing the projections of government spending for electricity purchased without retail competition. We subtracted from this baseline the projections of spending for electricity that are based on these same quantities but with lower electricity prices resulting from retail competition. In addition, we estimated the government's decline in spending, which is less than its savings because the quantities purchased will increase further than in the baseline as competitive prices fall below baseline prices. In estimating savings and the decline in spending, we did not develop our own model to estimate the extent to which retail competition is expected to reduce electricity prices for retail customers. Instead, we applied the results of several published forecasts to our model of the government's projected spending for electricity. In addition, our analyses apply only to the effects of retail competition on the generation of electricity—transmission and distribution markets for electricity would likely still be regulated.

We note, however, that our savings and spending decline estimates could be below or above our estimated ranges and are subject to major imprecision because of, among other things, the substantial uncertainty over the (1) future structure and pace of implementing retail competition in the United States, (2) quantities of electricity that the government would purchase with and without retail competition, and (3) prices that the government would pay with and without retail competition. In addition, in making these estimates, we calculated ranges because they could more reliably present the uncertainty over these estimates. Moreover, we note that the secondary effects—that is, the ripple effects of lower electricity prices on the economy—could be substantial and result in even greater savings and declines in spending for the federal government.

In estimating the range of possible savings to the federal government, we (1) developed a baseline representing the projections of the federal government's annual demand (both the prices paid and the quantities consumed) for electricity under existing circumstances, that is, without prevailing retail competition; (2) subtracted from the baseline the projections of lower government spending for electricity on baseline quantities, but with the lower prices that could result from retail competition; and (3) discounted the resulting stream of future annual

[1]As used in this report, the term "savings" does not represent the budgetary savings that might be realized annually in the federal budget process from lower electricity costs.

dollar savings over the 18-year period 1998-2015 to determine the 1996 present values. To determine the range of possible declines in spending for the federal government, we used the above procedure for estimating savings, but with the projections of lower government spending for electricity as a result of retail competition based on larger quantities than in the baseline. That is, the government could be thought of as "spending" some of its savings to buy more electricity.

To construct the baseline, we (1) revised the 1995 data on actual federal electricity expenditures obtained from the Department of Energy's (DOE) Office of Federal Energy Management Programs (FEMP)[2] to reflect only that portion of the data affected by retail competition and (2) projected future government prices on the basis of prices for the AEO97 reference case contained in DOE's Energy Information Administration (EIA) report entitled Annual Energy Outlook 1997 With Projections To 2015.[3] We did not assess the reliability of the computer data or verify the accuracy of the FEMP data and the basis for the EIA projections used to construct the baseline. However, we did discuss FEMP's procedures for validating the data submitted by the agencies.

To identify possible savings and the declines in spending associated with the competitive purchase of electricity, we used the price declines projected by DRI/McGraw-Hill (DRI),[4] the Gas Research Institute (GRI),[5] and the Citizens For A Sound Economy Foundation (CSE).[6] We used these competitive pricing projections because they were the only ones we were able to identify that considered the effects of retail competition for all

[2]See Energy Consumption: Federal Agencies' Electricity Use and Cost (GAO/RCED-97-97R, Mar. 21, 1997). We provided FEMP's data on usage and cost across federal agencies. For this report, we revised the fiscal year 1995 data to reflect only that portion that would be affected by retail competition and converted the data to constant 1996 dollars.

[3]The EIA reference case estimates average, residential, commercial, and industrial electricity prices under the assumption of "limited competition." It assumes (1) competitive pressures from the wholesale electricity markets and (2) the more limited "anticipation effects," but not the actual implementation, of full retail competition.

[4]DRI/McGraw-Hill, World Energy Service: U.S. Outlook (Spring 1997).

[5]Gas Research Institute, GRI Baseline Projection of U.S. Energy Supply and Demand To 2015, 1997 Edition (Mar. 1997). We note that GRI's price projection incorporates only some of the details of retail restructuring—those aspects that could be dealt with through their model assumptions. GRI did not deal with those aspects that required a more involved effort, such as methodology updates. Therefore, GRI's electricity price declines can be considered lower than what would otherwise be expected if GRI's projections had assumed full retail restructuring.

[6]Michael T. Maloney and Robert E. McCormick with Raymond D. Sauer, Customer Choice, Consumer Value: An Analysis of Retail Competition in America's Electric Industry. Prepared for and published by Citizens For A Sound Economy Foundation (Washington, D.C.: 1996).

consumers and were not limited to a particular geographic region. We reviewed each study and contacted officials at these organizations to further discuss the results of their analyses. However, we did not verify the accuracy of, or the basis for, these projections, which we used to determine declines in electricity prices resulting from retail competition.

In addition to the above studies, we reviewed the following studies to identify other possible sources to use for our cost savings analysis: a March 1996 Department of Defense report to the Congress, Procurement of Electricity From Most Economical Source; a January 1997 report by the Heritage Foundation, Energizing America: A Blueprint For Deregulating The Electricity Market; a November 1996 report by the Congressional Research Service, Electricity: The Road Toward Restructuring; and a March 1997 DOE presentation on "Electricity Prices in a Restructured Electric Power Industry." Although time constraints did not allow us to include the results of price declines from retail competition estimated by EIA in its August 1997 report, Electricity Prices in a Competitive Environment: Marginal Cost Pricing of Generation Services and Financial Status of Electric Utilities—A Preliminary Analysis Through 2015, we did review the report.

Analyses of Savings and of the Decline in the Government's Spending for Electricity

This appendix provides the detailed results of our analyses to provide a range of estimates of savings to the federal government that might occur if the federal government had the ability to procure its electricity competitively. We note that our analyses apply only to the generation of electricity. Transmission and distribution markets for electricity would likely still be regulated. Specifically, we estimated the (1) savings that would likely occur with lower prices resulting from retail competition to purchase our baseline quantities, that is, the quantities the government would likely have purchased without retail competition and (2) decline in the government's spending that would likely occur with lower prices resulting from retail competition to purchase our baseline quantities plus the additional quantities above our baseline because competitive prices decline more than baseline (noncompetitive) prices.[1] We note that under both the competitive and noncompetitive scenarios, electricity prices would fall, but the decline would be substantially more under retail competition.

In estimating savings and the decline in the government's spending, we did not develop our own model to estimate lower prices from retail competition but used the results of three expert studies and applied their results to project usage and prices for the government. The three studies used were (1) DRI/McGraw-Hill (DRI),[2] (2) GRI,[3] and (3) the Citizens For A Sound Economy Foundation (CSE).[4] We note, however, that any estimates of savings and the decline in the government's spending resulting from retail competition are subject to major imprecision because of, among other things, the high level of uncertainty surrounding the future structure and pace of implementing retail competition in the U.S. electricity industry, the future quantities of and prices for electricity purchased, and the extent to which retail competition reduces electricity prices for the government in particular.

[1]As the term noncompetitive is used here, we mean the electricity generation charges under the "existing circumstances" scenario. That is, retail electricity prices are regulated, but cost reductions are assumed to result from competitive pressures in the wholesale market for electricity, as well as from suppliers' preparations for retail competition.

[2]DRI/McGraw-Hill, World Energy Service: U.S. Outlook (Spring 1997).

[3]Gas Research Institute, GRI Baseline Projection of U.S. Energy Supply and Demand To 2015, 1997 Edition (Mar. 1997). We note that GRI's price projection incorporates only some of the details of retail restructuring—those aspects that could be dealt with through their model assumptions. GRI did not deal with those aspects that require a more involved effort, such as methodology updates. Therefore, GRI's electricity price declines can be considered lower than what would otherwise be expected if GRI's projections had assumed full retail restructuring.

[4]Michael T. Maloney and Robert E. McCormick with Raymond D. Sauer, Customer Choice, Consumer Value: An Analysis of Retail Competition in America's Electric Industry. Prepared for and published by Citizens For A Sound Economy Foundation (Washington, D.C.: 1996).

We estimated for the 18-year period 1998 through 2015, in terms of 1996 present values, (1) the savings that would likely occur from lower electricity prices, because of the implementation of full retail competition, for the purchase of the baseline quantities of electricity under noncompetitive circumstances, that is, under "existing circumstances" and (2) the decline in the government's spending that would likely occur from lower prices because of retail competition, taking into account the baseline quantities purchased plus the purchase of additional quantities of electricity, which would likely result from competitive prices falling below baseline prices. By definition, the decline in the government's spending would be less than its savings because the quantities purchased for the competitive scenario are larger. We have defined both our savings and the decline in spending as relative to a baseline for prices, quantities, and dollar spending. This allows us to estimate how much less the federal government would spend than it would otherwise have spent over future years—isolating the effect of retail competition on spending.[5]

Specifically, for any future year, our estimated savings is defined as the noncompetitive price minus the competitive price, multiplied by the quantity of electricity that would likely be purchased under the noncompetitive price scenario. The decline in the government's spending is defined as the noncompetitive price multiplied by the quantity of electricity that would likely be purchased under the noncompetitive price scenario, minus the competitive price multiplied by the quantity of electricity that would likely be purchased under the competitive price scenario. For either measure, we discounted each of the resulting streams of future savings and declines in spending over these years, and summed each of them over the period 1998-2015 to obtain their 1996 present values, that is, their values in discounted 1996 constant dollars.[6]

[5]It is also possible to define both savings and the decline in the government's spending as relative to a base year (e.g., 1997) price rather than to baseline prices. However, we did not choose these definitions because they would include increased savings and declines in the government's spending that are not attributable to retail competition. This is because these increases would have occurred even without retail competition.

[6]We use a real (i.e., inflation-adjusted) discount rate of 3.8 percent. This rate is based on a 30-year federal government bond nominal rate of 6.5 percent (the approximate rate when our analysis was performed), minus a forecast average annual inflation rate of about 2.7 percent over the period 1998 through 2015. The inflation rate used was the annual percentage change in the gross domestic product implicit deflator from WEFA's first quarter 1997 forecast in its U.S. Long-Term Economic Outlook [Revised] (Vol. 1). A real, rather than a nominal, discount rate is used because our data are already in 1996 constant dollars.

Federal Government Usage and Average Rates in 1995

Using FEMP's fiscal year 1995 data on actual federal electricity usage and cost,[7] we adjusted the data to reflect only that portion that would be affected by retail competition. For example, according to the Department of Defense's (DOD) records, total spending for electricity in fiscal year 1996 includes nondomestic spending of about 25.5 percent of its total spending and electricity usage of about 12.6 percent of its total kilowatt hours (kWh).[8] Because spending on electricity used at facilities outside the United States would not be affected by the restructuring of the electricity industry in the United States, we subtracted this 25.5-percent share from the total 1995 DOD spending; we made a similar adjustment of 12.6 percent for 1995 kWh usage in fiscal year 1995. In addition, we made other appropriate adjustments to FEMP's fiscal year 1995 spending and kWh usage data for other agencies. We converted these adjusted dollar figures to reflect constant 1996 dollars. We then calculated the 1995 average price—that is, the rate in cents per kWh of electricity used by the federal government—by dividing the government's total spending on electricity by its total kWh.

Federal Government kWh Usage Over 1998-2015

The extent to which the federal government's kWh usage of electricity will increase or decrease in future years depends upon its future price as well as upon non-price factors affecting demand. As with any commodity, as its price decreases (increases), the quantity purchased will increase (decrease), all other factors affecting demand remaining constant. Non-price factors that might increase future demand are, for example, the increased use of computers. Non-price factors that might decrease future demand are, for example, the increased use of energy conservation measures and the downsizing of the federal government. In our analyses, we treat the price effect on quantity purchased separately from the non-price effect on quantity. For example, electricity usage in kWh could be increasing because of price reductions yet simultaneously decreasing because of the combined effect of all non-price factors—leading to a net positive or negative overall effect on quantity purchased.

We assume that the quantity of kWh used will increase over the level in the base year (1995) because of the price effects—price is assumed to fall under both the competitive and noncompetitive scenarios. Quantity

[7]FEMP coordinates federal energy efficiency efforts and reports annually to the Congress on federal energy consumption and conservation activities by executive branch agencies. For fiscal year 1995, FEMP's data were for 28 executive branch agencies and did not include the judicial and legislative branch agencies. According to the data provided by legislative branch officials, the legislative and judicial branches' usage is less than 1 percent of the government's electricity usage.

[8]Fiscal year 1996 was the first year DOD collected data on nondomestic usage.

increases more under the competitive scenario because the price falls more. In either scenario, the amount of the increase depends on the estimated demand elasticity for electricity with respect to electricity price.[9] For the quantity effects, because of the non-price factors, we assume a range of three alternatives: (1) an increase of 1 percent per year, (2) a zero percent increase per year (no effect), and (3) a decrease of 1 percent per year. The net effect on total kWh usage is determined by the combined effects of both price and non-price factors.

Federal Government Electricity Prices Over 1998-2015

We did not develop our own model to estimate electricity prices for the federal government in 1998 through 2015 under either the noncompetitive or competitive scenarios. For the noncompetitive scenario, we used EIA's AEO97 reference case, which estimates average, residential, commercial, and industrial electricity prices under the assumption of "limited competition." It assumes (1) competitive pressures from the wholesale electricity markets and (2) supplier preparation for, but not the actual implementation of, retail competition. We believe that this scenario best reflects the extension of the current situation into the future, without any further action by either the states or the federal government with respect to electricity markets. We assumed that the federal government's average base price in 1995 would decline over the forecast period at the same percentage rates as did the EIA forecast prices for the average, residential, commercial, or industrial classes, respectively.

For the competitive scenario, we used the average, residential, commercial, and industrial electricity price estimates from three alternative studies: (1) CSE,[10] (2) DRI, and (3) GRI. We assumed that the federal government's average base price in 1995 would decline over the 1996-2015 period at the same percentage rates as did the CSE, DRI, and GRI forecast prices. The CSE study assumes immediate full retail competition with no recouping of stranded costs by the utilities. The DRI study estimates electricity prices under the assumption of reaching full retail competition in the electricity markets by 2001 and assumes substantial amounts of stranded cost recovery. The GRI study assumes only some of the effects of retail restructuring but also assumes substantial amounts of

[9]This demand elasticity is defined as the percentage change in the quantity demanded divided by the percentage change in its own price, all other factors affecting demand held constant. Because quantity rises as price falls, and vice versa, this elasticity is of a negative sign. Note, however, that higher (lower) elasticity values represent elasticities that are higher (lower) in terms of absolute value.

[10]For CSE, we analyzed the electricity price declines for the "average" customer class only.

stranded cost recovery.[11] Therefore, CSE's forecast prices are generally much lower than those of either DRI or GRI.

Savings and the Decline in the Government's Spending: Simulations—a Range of Estimates

The estimated values for savings and the declines in spending for federal electricity will vary, depending upon a number of assumptions, any one of which may prove in the future to have been inaccurate. We performed simulation analyses to account for at least some of the potential sources of variation and to estimate how much such changes in our assumptions will affect our estimates of savings and declines in spending. Our simulations account for four major causes of variation in our estimates of savings and declines in spending. First, to account for variations in competitive prices, we used the estimates of competitive electricity prices from three sources—DRI, GRI, and CSE. Each source uses (explicitly or implicitly) a different model of the U.S. economy, with different equations and assumed (or model-derived) forecast values for such variables as real gross domestic product, inflation, labor force and productivity growth, interest rates, and perhaps most importantly, natural gas, coal, and petroleum prices.

Second, to account for differences in prices for different types of consumers, we used the percentage declines in the price forecasts for average, residential, commercial, and industrial customers, respectively. Which category the federal government most resembles is subject to debate. Third, to account for the effects of non-price factors on kWh used by the federal government, we assumed a growth range represented by three cases: (1) an annual growth rate of 1 percent, (2) zero annual growth, and (3) an annual decline rate of 1 percent.[12] With these different assumptions, over the 18-year period from 1998 through 2015, this total kWh change because of non-price factors would range from an increase of 19.6 percent to a decrease of 16.5 percent.

[11]Stranded costs are investments or assets owned by regulated electric utilities that are not likely to be competitive in a restructured marketplace. For example, some utilities own nuclear power plants that have very high operating costs, and these plants are not likely to be competitive in the new retail market. In addition, such power plants often have high debt levels. The estimates of these stranded costs vary widely, from a low of roughly $10 billion to a high of about $500 billion. DRI estimates stranded costs at about $247 billion, of which at least 90 percent are recovered from ratepayers through a non-bypassable transmission access charge and a rate surcharge. GRI estimates stranded costs at $100 billion, of which 80 percent is recovered from ratepayers through some type of transmission charge.

[12]To select possible growth ranges to use in our analyses, we used actual growth rates for the federal government over the last 10 years and last 5 years, respectively. According to our March 1997 report entitled, Energy Consumption: Federal Agencies' Electricity Use and Cost, (GAO/RCED-97-97R, Mar. 21, 1997), the annual growth rate was a positive 1 percent over the 10-year fiscal year period 1986-95, and over the last 5 years, a negative 1 percent.

Finally, we needed to account for price elasticity. The estimates for elasticity are also subject to much debate. For the short short-run (assumed to be reached in the year 2000) and the long short-run (assumed to be reached in 2005), for the customer class "average," we used elasticity estimates of –0.05 and –0.15, respectively—elasticity numbers suggested as reasonable by an EIA analyst. For the long-run (assumed to be reached in 2013), for the customer class "average," we used CSE's long-run elasticity estimate of –0.976. We also used CSE's long-run elasticity estimates for the residential, commercial, and industrial customer classes, –0.795, –0.450, and –1.702, respectively.

The elasticity estimates for the three customer classes cited above for the two short-run cases were adjusted up or down from the short-run elasticity estimates for the average customer class by the percentage that their long-run elasticity estimates were above or below the corresponding long-run estimate for the average customer class. Additional simulations that we could have performed include using a series of higher (or lower) sets of elasticity estimates. All other factors being held equal, such simulations would result in higher (or lower) estimated savings.[13] For the decline in the government's spending, the effect is more complex. If the

[13]As elasticity increases (decreases), savings increase (decrease) because of the rise (fall) in the quantity increase that results from the decline in noncompetitive prices. A larger (smaller) quantity increase results from higher (lower) estimates of elasticity. These larger (smaller) increases are multiplied by the difference between the noncompetitive and competitive prices.

elasticities were increased, the spending decline would decrease. If the elasticities were decreased, the spending decline would increase.[14]

We also could have performed many other mix-and-match simulations using average, residential, commercial, or industrial price behavior (percentage declines) with average, residential, commercial, or industrial price elasticities—for a total of 16 different simulations. For example, we believe that a reasonable scenario would be to use the percentage changes in industrial prices with the commercial class elasticities. This is because (1) the government's average base price is already fairly low compared with the average price for retail consumers—the industrial class has the lowest prices—and (2) the government's price elasticities may be low—the commercial class has the lowest elasticities.

Savings and the Decline in the Government's Spending: Estimates

Tables II.1, II.2, and II.3[15] show the cumulative savings estimates, reflecting the kWh usage assumed in our baseline, that is, the noncompetitive price scenario. The estimates for the present value of savings in 1998 through 2015 range from (1) $1.0 billion for the GRI industrial projection, assuming a one-percent yearly decline in usage from non-price factors (table II.3) to (2) $8.2 billion for the CSE average projection, assuming a one-percent yearly increase in usage from

[14]The federal government's decline in spending can be divided into three components. The first two components are the difference between noncompetitive and competitive prices multiplied by, respectively, the base year quantity and the increase in quantity because of non-price factors. The third component is the noncompetitive price multiplied by the increase in quantity because of the decline in noncompetitive prices, minus the competitive price multiplied by the increase in quantity because of the decline in competitive prices.
The sum of the first two components is always positive over the 1998-2015 period since competitive prices are always less than noncompetitive prices. The estimate of elasticity is not included in either of these two components; the estimate of elasticity is included as a multiplicand in the third component. However, the third component is generally negative. Although competitive prices are generally much lower than noncompetitive prices, the increase in quantity because of the decline in competitive prices (compared with its comparable increase because of the decline in noncompetitive prices) is, on a percentage basis, very much larger than is the percentage decrease in competitive price below noncompetitive price.
For example, according to our analysis of the CSE case, in 1998 through 2015, the federal government would purchase about 123 billion kWh more electricity than it would have purchased had its usage remained at the 1995 base year level of about 50 billion kWh over the period. This increase is about 260 percent more than the about 34 billion kWh additional electricity purchased over the period in our baseline compared with the government's usage had that usage remained at the 1995 base year level. This percentage greatly exceeds the percentage decline in competitive prices below baseline prices, resulting in a negative value for the third component.
We then multiply the increase (decrease) factor in the elasticity estimate by this negative-value component—for example, by a factor of 1.5, if elasticity increases by 50 percent and by 0.5, if elasticity decreases by 50 percent. Therefore, if elasticity increases (decreases), the decline in spending decreases (increases).

[15]All savings estimates are given in discounted 1996 constant dollars (billions). The estimates for present value reflect the discounting of the savings in 1998 through 2015 using a real discount rate of 3.8 percent.

non-price factors (table II.1). The average annual values over 1998 through 2015 range from a low of about $60 million to a high of about $460 million.

Table II.1: Savings on Electricity Spending If Fiscal Year 1995 Usage Grows by 1 Percent Annually Because of Non-Price Factors, 1998-2015

Dollars in billions

Studies' estimates for each type of class	Present value (discounted 1996 dollars)
DRI (average)	$5.5
DRI (residential)	6.1
DRI (commercial)	6.4
DRI (industrial)	2.9
GRI (average)	2.3
GRI (residential)	3.1
GRI (commercial)	2.4
GRI (industrial)	1.3
CSE (average)	8.2

Note: Includes quantity increases because of the elasticity effect of lower prices.

Table II.2: Savings on Electricity Spending If Fiscal Year 1995 Usage Grows by Zero Percent Annually Because of Non-Price Factors, 1998-2015

Dollars in billions

Studies' estimates for each type of class	Present value (discounted 1996 dollars)
DRI (average)	$4.9
DRI (residential)	5.5
DRI (commercial)	5.7
DRI (industrial)	2.6
GRI (average)	2.1
GRI (residential)	2.7
GRI (commercial)	2.1
GRI (industrial)	1.1
CSE (average)	7.3

Note: Includes quantity increases because of the elasticity effect of lower prices.

Table II.3: Savings on Electricity Spending If Fiscal Year 1995 Usage Declines by 1 Percent Annually Because of Non-Price Factors, 1998-2015

Dollars in billions

Studies' estimates for each type of class	Present value (discounted 1996 dollars)
DRI (average)	$4.3
DRI (residential)	4.8
DRI (commercial)	5.0
DRI (industrial)	2.3
GRI (average)	1.8
GRI (residential)	2.4
GRI (commercial)	1.9
GRI (industrial)	1.0[a]
CSE (average)	6.4

[a]$1.01 billion, rounded to two decimal places.

Note: Includes quantity increases because of the elasticity effect of lower prices.

Tables II.4, II.5, and II.6[16] show the estimates for the federal government's cumulative decline in spending, reflecting the two kWh usages assumed in our baseline and competitive price scenarios. The estimates for the present value of spending declines in 1998 through 2015 range from (1) $0.6 billion for the GRI industrial projection, assuming a 1-percent yearly decline in usage from non-price factors (table II.6), to (2) $6.5 billion for the CSE average projection, assuming a 1-percent yearly increase in usage from non-price factors (table II.4). The average annual values over 1998 through 2015 range from a low of about $30 million to a high of about $360 million.

[16]All declines in spending estimates are given in discounted 1996 constant dollars (billions). The estimates for present value reflect the discounting of the declines in spending in 1998 through 2015 using a real discount rate of 3.8 percent.

Table II.4: Declines in Electricity Spending If Fiscal Year 1995 Usage Grows by 1 Percent Annually Because of Non-Price Factors, 1998-2015

Dollars in billions

Studies' estimates for each type of class	Present value (discounted 1996 dollars)
DRI (average)	$4.3
DRI (residential)	5.0
DRI (commercial)	5.7
DRI (industrial)	2.0
GRI (average)	1.7
GRI (residential)	2.4
GRI (commercial)	2.1
GRI (industrial)	0.8
CSE (average)	6.5

Note: Includes quantity increases because of the elasticity effect of lower prices.

Table II.5: Declines in Electricity Spending If Fiscal Year 1995 Usage Grows by Zero Percent Annually Because of Non-Price Factors, 1998-2015

Dollars in billions

Studies' estimates for each type of class	Present value (discounted 1996 dollars)
DRI (average)	$3.7
DRI (residential)	4.3
DRI (commercial)	5.0
DRI (industrial)	1.7
GRI (average)	1.4
GRI (residential)	2.1
GRI (commercial)	1.8
GRI (industrial)	0.7
CSE (average)	5.5

Note: Includes quantity increases because of the elasticity effect of lower prices.

Table II.6: Declines in Electricity Spending If Fiscal Year 1995 Usage Declines by 1 Percent Annually Because of Non-Price Factors, 1998-2015

Dollars in billions

Studies' estimates for each type of class	Present value (discounted 1996 dollars)
DRI (average)	$3.1
DRI (residential)	3.7
DRI (commercial)	4.4
DRI (industrial)	1.5
GRI (average)	1.2
GRI (residential)	1.7
GRI (commercial)	1.6
GRI (industrial)	0.6
CSE (average)	4.7

Note: Includes quantity increases because of the elasticity effect of lower prices.

For either savings or the government's decline in spending, tables II.1 through II.6 show that the estimates of CSE are larger than those of DRI, which in turn are larger than those of GRI. For example, in table II.1, the savings estimates for the CSE average customer are $8.2 billion; for the DRI average customer, $5.5 billion; and for the GRI average customer, $2.3 billion. The lower savings estimate for GRI because of its higher price projections reflects, in part, the fact that its modeling methodology did not incorporate all of the aspects of full retail restructuring in the electricity markets.

In addition, tables II.1 through II.6 show that the industrial price behavior assumption yields the smallest savings or decline in spending estimates compared with the estimates for the average, residential, and commercial customer classes. Although the industrial price elasticity assumptions were the highest, the percentage decreases in industrial prices were much less than those for the other customer classes. For example, for DRI, in table II.1, the savings estimates decrease from $6.4 billion for the commercial class to a low of $2.9 billion for the industrial class. The latter result reflects the much smaller percentage declines in forecast prices for the industrial customer.

Tables II.1, II.2, and II.3, for savings, reflect the 1-percent, zero-percent, and minus 1-percent, respectively, annual growth rates in the quantity of electricity used because of non-price factors. Tables II.4, II.5, and II.6, for the decline in spending, reflect the 1-percent, zero-percent, and minus 1-percent, respectively, annual growth rates in the quantity of electricity

used because of non-price factors. As expected, the savings and the decline in spending decrease as the quantity increase is lowered because of non-price factors. For example, for the DRI average customer, in tables II.1 through II.3, the estimates of savings in 1998 through 2015 fall from $5.5 billion (with 1-percent annual growth because of non-price factors) to $4.3 billion (with 1-percent annual decline because of non-price factors). Thus, the less that electricity usage expands from non-price factors, the less will be the savings resulting from the implementation of full retail competition. For the estimates of the decline in spending, shown in tables II.4 through II.6, the effect is the same, with these spending declines falling from $4.3 billion to $3.1 billion.

If the assumed elasticity estimates for the federal government were to decrease by 50 percent, the savings estimates would be smaller, all other factors held constant. For example, the lowest end of our range, $1.01 billion (table II.3) for savings decreases to $0.96 billion (a $0.05 billion decrease). For the decline in spending, the lowest end of our range, $0.6 billion (table II.6) increases to $0.7 billion (a $0.1 billion increase).

If we assume, as a mix-and-match simulation, the industrial sector price reductions, but with the elasticity estimates for the commercial sector that are used in tables II.1 through II.6, our savings estimates are lower because commercial sector elasticities are lower than those of the industrial sector. The estimates for the declines in spending are higher because the elasticities for the commercial sector are lower. The small percentage declines in industrial prices keep both savings and the decline in spending low. For example, for savings, using GRI's forecast for industrial prices and a 1-percent annual decline in usage because of non-price factors, savings are $1.0 billion in table II.3. This number falls to $0.9 billion (a $0.1 billion decrease) using the commercial sector elasticities. For the decline in spending, using GRI's forecast for industrial prices and a 1-percent annual decline in usage because of non-price factors, the decline is $0.6 billion in table II.6. This number rises to $0.8 billion (approximately an $0.2 billion increase) using the commercial sector elasticities.

Comments From the Department of Energy

Department of Energy
Washington, DC 20585

September 18, 1997

To: Susan D. Kladiva
Acting Associate Director
Energy, Resources, and Science Issues
General Accounting Office

From: Marc W. Chupka
Acting Assistant Secretary
Office of Policy and International Affairs

Subject: Comments on Draft Report GAO/RCED-97-244: FEDERAL ELECTRICITY: RETAIL COMPETITION COULD CREATE GOVERNMENT SAVINGS

Thank you for the opportunity to provide comments on your draft report. The report appears to fairly assess the major issues that impact Federal facility electricity use. It also identifies the great uncertainty in the economic environment within which federal facilities buy electricity from a variety of electricity providers. The analytical approach used appears to be sound in terms of answering the narrow question of how much could the Federal government save on electricity expenditures in a deregulated environment. The range of estimates of savings from $1.0 to $8.2 billion appears reasonable given the large uncertainties surrounding the timing of the advent of retail competition and the incorporation (or lack thereof) of stranded costs in the deregulated electric rates.

While the report focuses almost exclusively on electricity costs at Federal facilities, it does note that lower electricity prices could affect the Federal budget through its impact on inflation and economic growth. The favorable effect on inflation appears to be stated with excessive caution. If electricity rates fall due to the introduction of retail competition, as is projected in all of the scenarios presented in the study, the electricity component of standard inflation indices would be directly reduced. There may also be additional indirect effects on consumer and wholesale inflation indices if savings in electricity used to produce other goods and services that embody electricity are partially or fully passed through to prices. While the impact of lower inflation raises many complex issues, some of the extensive research that has been undertaken by Congress and outside experts to examine the impact of changes in inflation measures on Federal expenditure and receipt streams in other contexts could be a source of important insights. Some assessment of the relative magnitude of impacts on the Federal budget through reduced inflation in comparison to those resulting from changes in Federal electricity costs might be of great interest to readers of this report.

Given the report's aim of placing rough bounds on the impact of retail competition on electricity expenditures at Federal facilities, the approach of mapping a wide range of alternative projections of the national average price impacts onto a baseline projection of Federal facilities' electricity

demand appears reasonable. As was discussed in our meeting, a more detailed approach to estimating government savings would utilize additional information regarding the characteristics and location of electricity demand at Federal facilities. For example, the "load shape" of federal electricity demand will likely be one important determinant of the prices that might be available to Federal customers under retail competition. The characteristics and cost structure of the distribution systems on which Federal facilities are located will also affect the final cost of electricity to Federal consumers in a competitive environment. It is widely anticipated that transmission and distribution activities will remain under cost-of-service regulation, possibly using mechanisms that provide incentives for improved performance and cost reduction, even as competition is introduced into retail markets.

Another important element in the analysis of electric energy savings is the potential for significant electric energy reduction to take place to save both energy and money at Federal facilities. Agencies are currently working under Executive Order 12902 to cut energy use by 30% in buildings by 2005 (compared to 1985) and are also required by law to implement all energy conservation measures that have less than a 10 year payback. A recent study by the Department showed that there was a need for more than $500 million in investment in each year to achieve those goals. Recent appropriations have been less than half that amount and imply that agencies would not reach these goals. However, both the Department of Energy and the U.S. Army have begun to issue regional energy savings performance contracts which, when fully in place, will have a combined contract value of over $8 billion. The influx of private sector funding, along with technical and human resources under these contracts will likely deliver energy and cost reductions at a much greater pace than in previous years. Electricity will likely be a target for substantial reduction under these contracts, which would tend to reduce the projected savings associated with restructuring per se. However, it also appears likely that competing retail suppliers of electricity in restructured markets will seek to differentiate their product offerings by bundling electricity with a variety of innovative combinations of energy efficiency services. To the extent that the demand reductions at federal facilities are achieved through such market-driven efficiency efforts, the projected savings due to restructuring could increase from savings projected from a current baseline.

Regardless of savings achievable through restructuring, it will be important to continue Federal efforts to implement cost-effective measures to reduce energy use. The values of $1 to $8.2 billion projected in the range of savings average out to yearly savings of approximately 2 to 17 percent of total Federal electricity costs. Many electric efficiency measures can deliver substantial savings even under the lower electricity rates that are projected in your study to result from widespread retail competition in electricity markets. For example, projects like office lighting retrofits can deliver savings of three to four times what they cost to complete. In a deregulated environment, that savings might be reduced, but significant savings can still be delivered to the taxpayers by continuing to invest in cost-effective energy efficiency measures.

Please feel free to contact me at (202) 586-5800 should you have any questions regarding these comments.

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