GAO

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

160141

Resources, Community, and
Economic Development Division

B-279118

February 25, 1998

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

Subject: Federal Electricity: Retail Competition Could Create Savings for the Department of Defense

The federal government is the largest consumer of electricity in the United States, and the Department of Defense (DOD) has the largest dollar share of this consumption. For fiscal year 1996, DOD reported expenditures of $1.2 billion on domestic consumption of 23.4 billion kilowatt-hours (kWh) of electricity at an average price of 4.9 cents per kWh.[1] Electricity restructuring, at the retail level–which is being implemented or discussed in all 50 states and the District of Columbia and is being considered by the Congress–is expected to allow retail customers, including DOD, to purchase electricity in a competitive market, much as customers now can choose among different long-distance telephone providers. Buying electricity on a competitive basis is expected to lower the price of electricity paid by retail consumers.

[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). Dollars amounts are in constant fiscal year 1996 dollars.

160141

As requested, we evaluated whether DOD could realize savings[2] if, as expected, lower prices result from retail competition in the electricity market. In September 1997,[3] we estimated possible savings over fiscal years 1998-2015 for the entire federal government. For this report, we used the same methodology as in the earlier report but limited our estimate to DOD only, updated DOD's fiscal year 1995 data to 1996, extended our saving estimates through 2020,[4] and made other appropriate adjustments that we believe more closely reflect the specific circumstances affecting DOD's electricity usage and cost. (See enc. I for a detailed discussion of the savings estimates in our September 1997 report and of our current methodology.) Unless otherwise stated, all dollar estimates represent 1996 present values and are based on fiscal years 1998 through 2020.

In summary, we estimate that the Department of Defense could cumulatively save from about $190 million to $3.60 billion during the 23-year period from fiscal years 1998 through 2020 if it purchased the baseline quantities of electricity--that is, the same quantities of electricity it would have purchased without retail competition. While retail competition in the electricity industry would create savings for the Department, the actual amount of the savings is highly uncertain, as can be seen from our wide range of estimates. This uncertainty occurs primarily because projections for electricity prices varied widely. We note that over time lower electricity prices would likely encourage the Department to switch from using more expensive sources of energy--from fuel oil for heating to electricity for heat pumps, for instance.[5] Over time, such switching could lead to greater savings for the Department than we estimate but to a smaller decrease in spending on electricity. To take into account the increase in purchases of electricity because of lower prices from retail competition, we estimate that the Department's spending on electricity could

---

[2]As used in this report, the term "savings" is the difference between what we estimate DOD would spend on future quantities of electricity and what it would spend if it could purchase the same quantities of electricity at lower prices because of retail competition. (See enc. I for a more technical definition.) However, the term "savings" does not necessarily represent the potential reductions that would be calculated by the Congressional Budget Office in its estimation of the government's costs from lower electricity prices.

[3]Federal Electricity: Retail Competition Could Create Government Savings (GAO/RCED-97-244, Sept. 30, 1997).

[4]We extended our estimate to coincide with EIA's extension of its forecast of electricity prices to 2020, which it made in its Annual Energy Outlook 1998.

[5]Energy includes electricity and other fuels, such as natural gas, coal, and fuel oil.

cumulatively decrease by about $130 million to $2.59 billion during this same period (or about 28 percent less than our savings estimate).

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.[6] In 1992, the Congress enacted the Energy Policy Act, which, among other things, promotes market competition in the wholesale electricity industry--that is, 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. As of January 1998, all 50 states and the District of Columbia had considered reforming their retail markets, according to the National Regulatory Research Institute and records obtained from state regulatory agencies.[7] At that time, at least 16 states had actually implemented plans to restructure the industry by enacting legislation or by adopting final orders.[8] Currently, a number of bills to restructure the retail electricity industry to promote a more efficient and market-driven industry are before the Congress.

Several governmental efforts are likely to decrease future energy consumption at DOD. Like all other federal agencies, DOD is currently working under Executive Order 12902 to cut energy use in its buildings by 30 percent from 1985 levels by 2005. Agencies are also required by law to implement all energy conservation measures that will pay for themselves in less than 10 years. In addition, under the Secretary of Defense's November 1997 "Defense Reform Initiative," DOD plans to eliminate unneeded infrastructure by (1) closing or realigning a number of military bases in 2001 and 2005; (2) consolidating, restructuring, and regionalizing many of its support agencies to achieve economies of scale; and (3) privatizing most utility systems, including those that provide electricity.

---

[6]We note that the markets for the transmission and distribution of electricity are likely to remain regulated for the foreseeable future while the market for the generation of electricity is being restructured.

[7]The National Regulatory Research Institute was established by the National Association of Regulatory Utility Commissioners to provide research, education, and technical services to the state regulatory commissions.

[8]The 10 states that had enacted legislation to restructure their retail markets were California, Illinois, Maine, Massachusetts, Montana, Nevada, New Hampshire, Oklahoma, Pennsylvania, and Rhode Island. The six states that had adopted final orders, without enacting legislation, were Arizona, Michigan, New Jersey, New York, Texas, and Vermont.

SAVINGS IN ELECTRICITY SPENDING COULD RESULT FOR DOD FROM RETAIL COMPETITION

Using published forecasts of electricity prices under retail competition, we modeled DOD's electricity purchases; we estimate that DOD could cumulatively save from about $190 million to $3.60 billion during the 23-year period, fiscal years 1998 through 2020, if it purchased the baseline quantities of electricity–that is, the quantities of electricity it would have purchased without retail competition. We note that our wide range of estimated savings 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 DOD. In particular, the electricity price projections from the forecast sources we used in our analyses varied widely, even within the same customer class, such as industrial. Furthermore, both our estimated baseline quantities and the quantities under retail competition reflect the uncertainties about the effects of nonprice factors on DOD's electricity purchases. For example, plans to reduce the size of DOD under the Secretary of Defense's November 1997 Defense Reform Initiative would likely result in DOD's using less electricity in the future, and the effects of these plans are incorporated into two of our three projections of quantities. (Enc. I presents a more detailed discussion of the uncertainties surrounding our estimated range.)

However, the decline DOD would experience in spending for electricity by purchasing electricity at lower rates because of retail competition could be less than its overall savings. In a competitive retail market for electricity, the reduction in DOD's spending for electricity would be less than its estimated savings if DOD's usage were to increase above the baseline quantities assumed in our estimated savings range. As electricity prices from retail competition decline below the baseline prices, DOD's usage could 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.

Lower electricity prices would encourage DOD to switch, over the long run, from more expensive sources, such as from fuel oil for heat to electricity for heat pumps, thus decreasing its overall spending on energy. Over time, such switching could lead to greater savings for DOD than we estimate but to a smaller decrease in spending on electricity. To take into account the increase in purchases of electricity because of lower prices from retail competition, we estimate that DOD's spending on electricity could cumulatively decrease by about $130 million to $2.59 billion during fiscal years 1998 through 2020 (or about 28 percent less, on average, than our savings estimate).

CONCLUSIONS

While future prices for electricity are expected to be lower for DOD, 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 DOD could receive substantial financial benefits if it could purchase its electricity on a competitive basis. However, uncertainties associated with the restructuring of the retail electric power industry could affect the magnitude of these benefits.

AGENCY COMMENTS AND OUR EVALUATION

We provided a draft of this report to DOD for its review and comment. In commenting on our draft, DOD generally agreed with the results of our analysis and stated that our evaluation seems to include the significant variables important to determining any potential savings to DOD from lower electricity prices resulting from retail competition in the electricity market. DOD also stated that an estimate of savings within a more narrow range than we provided would have been more helpful. However, DOD stated that such an estimate may be difficult to develop because of the dynamic nature of the industry and the environment affecting electricity restructuring. Careful monitoring of this dynamic situation may allow a more definitive estimate of savings in the future.

We agree that a more narrow range of estimated savings would have been more helpful. However, because of the substantial uncertainty surrounding the variables affecting any estimate of future savings from retail competition, we believe that our wide range of estimated savings is appropriate, reflecting this uncertainty.

SCOPE AND METHODOLOGY

We conducted our work from November 1997 through January 1998 in accordance with generally accepted government auditing standards. To evaluate whether DOD could realize savings if lower prices result from retail competition in the electricity market, we estimated the quantities of electricity that DOD would have purchased without retail competition and the corresponding prices it would have paid during fiscal years 1998 through 2020. 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 applied these results to project DOD's prices under retail competition. These lower prices were multiplied by our baseline estimates of DOD's projected quantities of electricity in the absence of retail competition. (See enc. I for a detailed discussion of our objectives, scope, and methodology.)

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 Defense, the Secretary of Energy, and the Administrator of the Energy Information Administration. 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 were Peg Reese, Michael S. Sagalow, and Daniel G. Williams.

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

Enclosure

BACKGROUND ON EARLIER WORK AND OBJECTIVES, SCOPE, AND METHODOLOGY

We evaluated whether the Department of Defense (DOD) could realize savings[1] if lower prices in the electricity market result from retail competition, as is expected. 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 DOD would likely have purchased without retail competition and (2) decline in DOD's spending on electricity that would likely occur with lower prices resulting from retail competition to purchase our baseline quantities plus the additional quantities above our baseline that DOD would likely purchase because competitive prices decline more than baseline, or noncompetitive, prices.[2] We note that under both the competitive and noncompetitive scenarios, electricity prices would fall, but the decline could be significantly more under retail competition. In addition, our analyses apply only to the restructuring of the market for the generation of electricity. Transmission and distribution markets for electricity would likely still be regulated.

---

[1]As used in this report, the term "savings" is the difference between what we estimate DOD would spend on future quantities of electricity and what it would spend if it could purchase the same quantities of electricity at lower prices because of retail competition. (Later in this enclosure we provide a more technical definition.) However, the term "savings" does not necessarily represent the potential reductions that would be calculated by the Congressional Budget Office in its estimation of the government's costs from lower electricity prices.

[2]We use the term "competitive" to mean the electricity prices under a fully restructured electric power industry resulting in average electricity prices that approach long-run marginal costs. "Fully restructured" is used to mean that all 50 states have implemented retail competition. We use the term "noncompetitive" to mean the electricity prices under existing circumstances, i.e., a partial but not a full shift towards electricity market restructuring. Cost reductions are assumed to result from competitive pressures in both the wholesale and retail markets for electricity, including the effects of specific restructuring plans in regions that have announced such plans. These pressures will lower average costs and prices somewhat, but not to the extent that would be achieved under a full restructuring of the industry.

BACKGROUND ON EARLIER WORK

In our September 1997 report,[3] we evaluated whether the entire federal government could realize savings if lower prices in the electricity market result from retail competition. We reported that retail competition in the electricity industry would create savings for the entire government; however, the actual amount of savings was highly uncertain. Using the same methodology as we used in this report, we estimated 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 most of the same uncertainties that we mention later in this enclosure. We also reported that holding all nonprice 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 when purchases were held at the baseline quantities. Adjusting our savings estimate to reflect this case, we estimated 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.

UNCERTAINTIES IN ESTIMATING SAVINGS AND DECLINES IN SPENDING

We estimated ranges for the savings and spending declines to illustrate the uncertainty of the ranges used in our assumptions for the key factors used in making these estimates. We used ranges for the assumptions because no factor is known with certainty. Nevertheless, our estimates of savings and of spending declines could be below or above our estimated ranges because they are subject to substantial uncertainty over, among other things, the (1) future structure and pace of implementing retail competition in the United States, (2) quantities of electricity that DOD would purchase with and without retail competition, and (3) prices that DOD would pay with and without retail competition.

---

[3]Federal Electricity: Retail Competition Could Create Government Savings (GAO/RCED-97-244, Sept. 30, 1997).

[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.

Four Key Factors Explain Wide Range In Estimating Savings And Spending Declines

To reflect the large uncertainty surrounding the introduction of retail competition, we used various assumptions for four key factors used to estimate savings and spending declines.[5] Furthermore, by using various estimates for each of the four factors, we avoid a bias of our estimates in favor of any one factor assumption.

The first factor accounts for differences in the estimates of competitive prices for electricity. We use the estimates of competitive prices from three different published sources--(1) DRI/McGraw-Hill (DRI),[6] (2) the Gas Research Institute (GRI),[7] and (3)

---

[5]Using the four unknown factors results in 27 different point estimates each for savings and for spending declines. Our savings and spending declines ranges simply take the highest and lowest of these point estimates.

[6]DRI/McGraw-Hill, World Energy Service: U.S. Outlook (Fall 1997). In 8 of 92 cases, DOD's prices, which were based on DRI's competitive prices, were slightly higher than DOD's prices, which were based on the Energy Information Administration's (EIA) noncompetitive prices, indicating a negative benefit because of retail competition. We believe that it is not unusual for some inconsistencies such as these to occur because DRI and EIA are different forecasters and use different energy assumptions in their respective models. However, it is widely believed that introducing competition in the retail electricity market will lower average prices for consumers (below any baseline forecast); therefore, for these cases, we lowered DOD's price, which was based on DRI's price, to equal DOD's price, which was based on EIA's price.

[7]Gas Research Institute, GRI Baseline Projection of U.S. Energy Supply and Demand To 2015, 1998 Edition (Aug 1997). GRI's forecast of future electricity prices extended only through 2015, while our analyses continue through 2020. Therefore, we used a hybrid projection based on (1) GRI's projections through 2015 and (2) our projections from 2016 to 2020, which assume that GRI's prices in 2015 would change at the same rates as do DRI's forecast prices over this same period.

In 7 of 92 cases, DOD's prices, which were based on GRI's competitive prices, were slightly higher than DOD's prices, which were based on EIA's noncompetitive prices, indicating a negative benefit because of retail competition. We believe that it is not unusual for some inconsistencies such as these to occur because GRI and EIA are different forecasters and use different energy assumptions in their respective models. However, it is widely believed that introducing competition in the retail electricity market will lower average prices for consumers (below any baseline forecast); therefore, for these cases, we lowered DOD's price, which was based on GRI's price, to equal DOD's

Citizens For A Sound Economy Foundation (CSE).[8] In some cases, competitive prices among these sources varied significantly, which explains much of the wide ranges in our estimates of savings and of spending declines. For example, DRI's and GRI's projected competitive average prices in 2015 were about 33 percent and 31 percent higher, respectively, than CSE's projected average price; and for industrial prices, DRI's price was about 24 percent above GRI's price.[9]

The second factor accounts for differences in prices among different types of electricity consumers. Price estimates for different customer classes also help explain much of the wide ranges in our estimates of savings and of spending declines. Depending on certain characteristics of the consumer's facilities, the Department of Energy's Energy Information Agency (EIA) assigns retail consumers to one of three customer classes--residential, commercial, or industrial. In addition, EIA aggregates these classes to form a fourth class--average. Our analyses used price forecasts for all four types of retail consumers because DOD's facilities vary widely and are scattered among the first three customer classes.

The third factor accounts for the effects of nonprice factors on the quantities of electricity used by DOD. We assume a growth range represented by three cases: (1) an annual growth rate of 0.5 percent, (2) an annual decline rate of 0.5 percent, and (3) an annual decline rate of 1.5 percent. (Later in this enclosure we explain our reasons for selecting these cases.)

The fourth factor accounts for the price elasticity of electricity demand; that is, the degree to which the quantity demanded responds to price changes. The estimates for elasticity are not self-evident. Therefore, to capture a range of reasonable possibilities, we used 12 different rates: A short short-run, a long short-run, and a long run rate for each of the four customer classes.[10] The third and fourth factors explain less of the wide ranges in our estimates of savings and of spending declines than do the first two factors.

---

price, which was based on EIA's price.

[8]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).

[9]We used CSE's price analyses only for average prices.

[10]We define the short short-run to be reached 2000, the long short-run in 2005, and the long run in 2013.

(Later in this enclosure we present a more detailed discussion of each of these four factors affecting our estimates of savings and of spending declines.)

ESTIMATING SAVINGS AND SPENDING DECLINES

In making the savings estimate, we (1) developed a baseline representing the projections of DOD's annual demand (both the prices paid and the quantities consumed) for electricity under existing circumstances, that is, without retail competition; (2) subtracted from this baseline the projections of lower DOD spending for electricity on baseline quantities, but with the lower prices that could result from retail competition;[11] and (3) discounted the resulting stream of future annual dollar savings over the 23-year period 1998-2020 to obtain its 1996 present values, that is, its value in discounted 1996 constant dollars.[12] To estimate the spending declines, we used the above procedure for estimating savings, with the lower prices that could result from retail competition, but took into account the baseline quantities purchased plus the purchase of additional quantities of electricity, which would likely result as competitive prices fall below noncompetitive baseline prices.[13] That is, DOD could be thought of as "spending" some of its savings to buy more electricity.[14]

---

[11]Annual savings are defined as the noncompetitive price minus the competitive price, multiplied by our baseline quantity (the quantity of electricity that would likely be purchased under the noncompetitive price scenario).

[12]We use a real (i.e., inflation-adjusted) discount rate of 3.3 percent. This rate is based on a 30-year federal government bond nominal rate of 5.9 percent (the approximate rate when our analysis was performed), minus an assumed average annual inflation rate of 2.6 percent over the period 1998 through 2020. The inflation rate used was based on the annual percentage change in the gross domestic product implicit deflator of 2.6 percent forecasted over the period 2000 to 2015 by WEFA in its fourth quarter 1997 U.S. Long-term Economic Outlook (Vol 1). We assumed a constant inflation rate of 2.6 percent from 2016 to 2020. A real, rather than a nominal, discount rate is used because our data are already in 1996 constant dollars.

[13]The annual decline in DOD'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.

[14]We have defined both our savings and the declines in spending as relative to a baseline for prices, quantities, and dollar spending. This allows us to estimate how much less DOD would spend than it would otherwise have spent over future years–isolating the effect of retail competition on spending. It is also possible to define both the savings and

Estimating Baseline Prices and Quantities

To estimate the baseline prices DOD would pay for electricity for fiscal years 1998 through 2020, we (1) obtained from DOD its 1996 data on actual domestic electricity expenditures in dollars and in kilowatt hours (kWh), for a 1996 average price of about 4.9 cents per kWh, and (2) projected future DOD prices on the basis of the rate of decline in prices for the Annual Energy Outlook 1998 (AEO98) reference case contained in EIA's report entitled Annual Energy Outlook 1998 With Projections To 2020. We did not assess the reliability of the data obtained from DOD or verify their accuracy. We also did not assess the basis for the EIA price projections used to construct the baseline. However, we did discuss with DOD officials the steps taken to validate their data.

EIA's AEO98 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) supplier preparation for, but not the actual implementation of, full 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 DOD's average base price in 1996 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.

To estimate baseline quantities of electricity used by DOD for fiscal years 1998 through 2020, we (1) started with fiscal year 1996 data--the most recent data available--on actual electricity kWh usage by DOD and (2) projected future DOD consumption on the basis of both nonprice and price factors. The nonprice factors reflect both the general consumption trends governmentwide and DOD's specific plans to use less energy in the future. The extent to which DOD's future usage of electricity increases or decreases overall depends upon future prices as well as upon nonprice factors affecting demand. As with any commodity, as its price decreases, the quantity purchased will increase, and as its price increases, the quantity purchased will decrease, all other factors affecting demand remaining constant. Nonprice factors that might increase future demand are, for example, the increased use of electric heat pumps and the increased use of electrical thermal storage devices that would allow water to be chilled at night using off-peak, and presumably less expensive, electric power. Nonprice factors that might decrease future

---

the declines in DOD's spending as relative to a base year (e.g., 1996) price rather than to baseline prices. However, we did not choose these definitions because they would include increased savings and declines in DOD's spending that are not attributable to retail competition. This is because these increases would have occurred even without retail competition.