CHAPTER 4

4. ENVIRONMENTAL CONSEQUENCES

4.1 Framework for Environmental Impact Analyses - The Electric Power Industry, Need and Supply, and Sources of Impacts

This section explains how TVA acts in the energy market, and how environmental impacts could be associated with alternative rate structures. The power service area of the Tennessee Valley Authority will continue to need electricity. TVA expects that it will provide all or a substantial portion of that energy in the future. As evaluated and discussed in TVA's Energy Vision 2020 EIS (TVA, 1995), TVA expects to provide this energy by generating it from its own facilities or by buying it from specific energy generators (e.g., independent power producers) or from the general power market.

Potential environmental impacts (for instance to air quality, water quality, or land use) vary with: (1) the decisions made by the users of electricity in the region in response to products, services, and pricing (i.e., the market response in terms of energy demand), and (2) the way in which TVA provides the power and energy in response to those decisions.

The first source of impacts (Figure 4-1) potentially results from the direct and indirect responses by the customer market of end users of electricity. Among many other factors affecting the economic health of the region, different pricing structures for electricity may, all other factors being held constant, induce behavior that leads to creating, maintaining, or eliminating jobs. This occurs through construction of new plants and opening of new businesses, the expansion of existing plants and businesses (either through additional or longer shifts or physical expansion of facilities), or the closing or reducing the output of existing plants and businesses. However, it is not reasonable to assume that all of the other factors that affect such behavior (these business decisions) would or can be held constant. Factors affecting business and the economy change all the time. Thus, predicting business behavioral changes that could result from changing only one business-related factor—here electric power rate structures—involve substantial speculation as TVA's two previous rate-structure EISs found (TVA, 1976; 1980).

The second source of impacts (Figure 4-1) potentially occurs if, in response to restructuring of power rates, energy use increases or decreases to the point that: (1) new generation facilities must be constructed or existing facilities operated more; (2) existing generation facilities are shut down or operated less; or (3) the mix of energy resources changes (e.g., TVA could decide for certain situations it is more economical to generate less power itself and purchase more power from others). With increases or decreases in energy demand, more or less transmission capability (such as more miles of transmission line) may also be needed.

TVA forecasts and analyzes the regional economy by using a system of models and forecasting processes of which the TVA Regional Economic Simulation Model (RESM) and the Regional Economic Model, Inc. (REMI), are an integral part. The forecast process uses over 30 years of historical data taking into account national economic and demographic trends as well as regionally specific conditions. The process incorporates plant announcements and other recent data to capture new and upcoming trends in the forecast. For each of the alternatives, TVA input the alternative rate change proposals

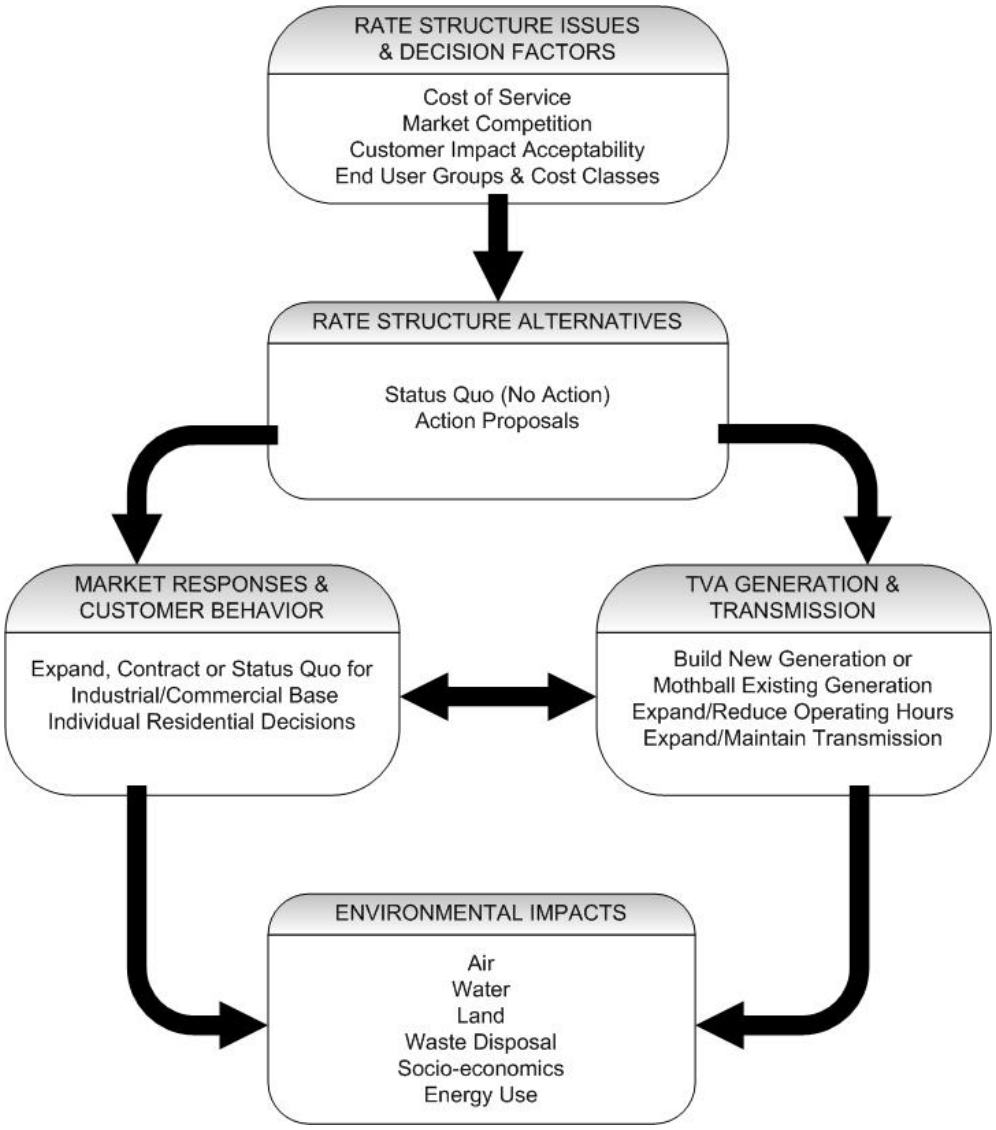

Figure 4-1. Framework for Environmental Impact Analysis

into the REMI model to produce predictions of effects to socioeconomic conditions in the TVA power service area. These models are described in Appendix B. Similarly, the alternatives were run through the TVA Electricity Forecast Model (EFM) to forecast effects on the long-term outlook for energy and peak load demand. The latter model is described in Appendix C. Predicted outputs from these models were then used as a basis for assessing impacts to the other resources of environmental interest.

For the suite of alternative rate structures for pricing of electricity proposed by TVA in consultation with TVA's power distributors, the potentially affected resources include socioeconomics, energy use, air quality, water quality, land use, and production of solid and hazardous waste. These areas also serve as indicators of differences among the rate structure choices in the present EA. Because the magnitude of the direct and cumulative effect of the alternative rate structures is so small, TVA expects that any induced environmental impacts would also be very small, essentially indiscernible. The comprehensive environmental regulatory programs that exist throughout all of the Valley states would further ensure that any resulting environmental impacts are insignificant. Potential impacts to other environmental resource areas are expected to be similar to the potential impacts assessed for these more primary resource areas and also insignificant and indiscernible.

Because expected socioeconomic and environmental impacts are so small and insignificant, TVA has not identified any mitigation measures that may be needed to offset or reduce the level of impacts.

4.2 Socioeconomic Impacts

Employment, Income, and Product - Potential impacts on the economy of the region were evaluated using TVA's regional economic models (Appendix B). For the No Action Alternative, current trends for population, employment, income and the economy of the TVA power service area would be expected to continue with no direct, indirect, or cumulative effects from TVA's proposed action alternatives. The expected direct and indirect impacts from the action alternatives are summarized in Table 4-1. Cumulative impacts are discussed separately. In the Alternative A (base case), there would be no change to the current rate structure, and therefore there would be no impacts to the regional economy from a rate structure change. For all the other alternatives, the impacts on the economy would be positive, but very small. For Alternatives B, C, D, and the Proposed Alternative (Alternative E), total regional product would increase by less than one-tenth of one percent by 2010, and total personal income by lesser amounts. Changes in employment would range from an estimated 600 jobs under Alternatives D and E, up to 1,300 in Alternative C, with Alternative B at 900, slightly less than Alternative C. Population would be impacted even less, with estimated increases ranging from essentially no impact up to 200 persons.

Table 4-1. Summary of Incremental Economic Impacts Increase on Total Gross Regional Product, Employment, Total Personal Income, and Total Population in 2010

	Alternative A (without rate increase)	Alternative B	Alternative C	Alternative D	Alternative E
Total Gross Regional Product	0	$116 million (0.033%)	$146 million (0.042%)	$67 million (0.019%)	$68 million (0.020%)
Employment	0	900 (0.016%)	1,300 (0.023%)	600 (0.010%)	600 (0.010%)
Total Personal Income	0	$34 million (0.012%)	$47 million (0.017%)	$21 million (0.008%)	$23 million (0.008%)
Total Population	0	-- (0.000%)	200 (0.002%)	100 (0.001%)	100 (0.001%)

Note: All dollar figures are 2002 dollars
Source: TVA Regional Economic Models

The increases in employment would be widely distributed across the sectors of the economy (Table 4-2). The expected increases in manufacturing are 500 under both Alternatives B and C, 200 under Alternative D, and 300 under Alternative E. These effects would be spread broadly among the various manufacturing industries, such that none would experience significant increases. Effects of this magnitude are very small and, given the average employment size by plant, are not likely to result in the opening of new plants or even noticeable changes in how existing plants are operated.

The rate reduction structure change proposed for the manufacturing sector is not sufficiently large enough to provide an incentive for manufacturers to move into the TVA region, but it would help offset the negative effects of a more uncompetitive rate structure and could reduce manufacturer flight from the region. The effects would be diffused throughout the region and would likely involve small increases in employment at several different locations. Socioeconomic impacts induced by or attributable to any of the rate change alternatives are expected to be insignificant and basically indiscernible.

The largest increases outside manufacturing would be in services and in wholesale and retail trade. Average establishment sizes in these sectors are small (19 and 15 employees, respectively). Because of the diffused nature of the impacts, few, if any, new facilities are expected to be built. Similar to the manufacturing sector, most of the increase would likely consist of small increases in employment at a number of existing establishments across the power service area. The number of non-farm proprietors is also likely to increase, up to as many as 200 under Alternative C.

Table 4-2. Employment Impacts by Industry for Action Alternatives by 2010

Industry Sector	Average Employment Per Plant	Effects				
		Alternative A (without rate increase)	Alternative B	Alternative C	Alternative D	Alternative E
Construction	10	0	--	--	--	--
Manufacturing:		0	500	500	200	300
Food	127	0	--	--	--	--
Textiles	118	0	100	100	--	--
Apparel	73	0	--	--	--	--
Furniture	103	0	--	--	--	--
Paper	105	0	--	--	--	--
Printing and Publishing	28	0	--	--	--	--
Chemicals	114	0	100	100	--	--
Rubber	86	0	--	--	--	--
Primary Metals	110	0	--	--	--	--
Fabricated Metals	51	0	--	--	--	--
Industrial Machinery	50	0	--	--	--	--
Electronic & Electric Equipment	137	0	--	--	--	--
Transportation and Public Utilities	25	0	--	--	--	--
Wholesale & Retail Trade	15	0	100	200	100	--
Finance, Insurance, and Real Estate	10	0	--	--	--	--
Services	19	0	200	300	100	100
Government	58	0	--	--	--	--
Nonfarm Proprietors	--	0	100	200	100	100
Total*		0	900	1,300	600	600

* Due to rounding error, values for individual Industry Sectors may not add to Total

Households - For the Alternative A (base case), there would be no restructuring and therefore no impacts to households. However, under the other alternatives, households would pay more for the same level of usage as a result of the rate restructuring. The effect would be similar to that of a reduction in income. In all of the action alternatives, the actual price change to residential customers at the retail level would differ from the TVA wholesale firm power price increase. The actual price change to the consumer reflects not only the TVA price change, but also distributor's mark up, custom contracts and non-firm power sales. For Alternative B, the average increase in the household retail cost would be about 1.2 percent, or $9.65 per year for the average residential monthly usage of 1,000 kilowatt hours (currently about $67 per month in the TVA region). This would be less, for example, than three one-hundredths of one percent of Tennessee's 1999 median household income of $36,360. For Alternative C, the increase would be about 2.5 percent, $20.10 per year for 1,000 kilowatt hours per

month, less than six one-hundredths of one percent of the Tennessee median household income. Under Alternative D, the increase would be about 1.1 percent, $8.84 per year, less than three one-hundredths of one percent of the Tennessee median household income. For Alternative E, the increase would be only about 0.8 percent, $6.43 per year, less than two one-hundredths of one percent of the Tennessee median household income. For this degree of change, none of these alternatives would result in significant impacts to households.

Cumulative Impacts to the Economy and Households - The following discussion and analysis also evaluates the potential impacts of the rate structure change in the context of a rate increase, which is a reasonably foreseeable, cumulative action. At the predicted levels of change resulting from any of the action alternatives, potential cumulative impacts to the existing conditions of the economy of the region would be greater than the impacts of a rate structure change without a rate increase but would also be insignificant.

The Economy - Holding all other factors affecting the regional economy static, a rate increase being considered by TVA in addition to the rate restructuring would, by itself, decrease gross regional product by an estimated $348 million, about one-tenth of one percent, by 2010 (Table 4-3). Employment would be decreased by 3,600 jobs, less than one-tenth of one percent, and total personal income would be decreased by $145 million, also less than one-tenth of one percent. Total population would be about 5,900 less than without the increase, also less than one-tenth of one percent.

Considered in combination, the cumulative impact of proposed changes in rate structure and the rate increase would still be negative, but smaller if any of the proposed changes in rate structure were to occur. In other words, the rate structure change would reduce the negative impacts of an upward rate adjustment (increase). In all of the alternatives (B, C, D, and E) in which the rate structure would change, total regional product would be decreased by less than one-tenth of one percent by 2010 in conjunction with an increase in rates, and total personal income by lesser amounts. Changes in employment would range from an estimated 2,300 jobs with implementation of Alternative C up to 3,000 for the Proposed Alternative and Alternative D, less than one-tenth of one percent. Cumulative negative impacts on population would be from 5,700 to 5,900, less than one-tenth of one percent for all alternatives.

Table 4-3. Cumulative Impact of Proposed Rate Increase on Total Gross Regional Product, Employment, Total Personal Income, and Total Population, 2010

Socioeconomic Measure	Combined Impact Proposed Change in Rate Structure and a Rate Increase of 6.1%				
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Total Gross Regional Product	-$348 million (-0.100%)	-$230 million (-0.066%)	-$201 million (-0.058%)	-$281 million (-0.081%)	-$280 million (-0.080%)
Employment	-3,600 (-0.065%)	- 2,700 (-0.049%)	-2,300 (-0.042%)	-3,000 (-0.055%)	-3,000 (-0.055%)
Total Personal Income	-$145 million (-0.052%)	-$110 million (-0.040%)	-$97 million (-0.035%)	-$124 million (-0.045%)	-$122 million (-0.044%)
Total Population	-5,900 (-0.063%)	-5,800 (-0.063%)	-5,700 (-0.061%)	-5,800 (-0.062%)	-5,800 (-0.062%)

Note: All dollar figures are 2002 dollars
Source: TVA Regional Economic Models

The cumulative impacts on employment would also be widely distributed across the sectors of the economy (Table 4-4). Impacts on manufacturing would be essentially zero for Alternatives B and C; for Alternatives D and E, the manufacturing impact would be negative, but very small and would constitute about 10 percent or less of the total employment impact. Cumulatively, the impacts of any of the alternatives would be insignificant, diffused throughout the region, and not likely to result in the opening or closing of any plants. More likely, any impacts would consist of small employment impacts at multiple locations

Non-manufacturing employment impacts would be slightly negative, but small. Trade, services, and government generally would be impacted the most. Average establishment sizes in these sectors are small (15, 19, and 58 employees, respectively), but because of the diffused nature of the impacts, few if any closures are expected to occur. Most of the impact would likely consist of small impacts on employment levels at a number of existing establishments. The number of non-farm proprietors is also likely to be negatively impacted, up to as many as 500 under Alternatives B, D, and E.

Table 4-4. Cumulative Employment Impacts by Industry, 2010 (Proposed Rate Increase With Proposed Change in Rate Structure)

Industry Sector	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Construction	-200	-200	-200	-200	-200
Manufacturing:	-500	--	--	-300	-200
Transportation and Public Utilities	-100	-100	-100	-100	-100
Wholesale & Retail Trade	-900	-800	-700	-800	-900
Finance, Insurance, & Real Estate	-200	-200	-200	-200	-200
Services	-700	-500	-400	-600	-600
Government	-400	-400	-400	-400	-400
Agriculture	--	--	--	--	--
Nonfarm Proprietors	-600	-500	-400	-500	-500
Total*	-3,600	-2,700	-2,300	-3,000	-3,000

* Due to rounding error, values for individual Industry Sectors may not add to Total

Households – In the absence of changes in rate structure (Alternative A), at the retail level households would pay about 4.3 percent more for the same level of usage. The effect would be similar to that of a reduction in income. In all of the alternatives, the actual price change to residential customers at the retail level would differ from the TVA wholesale firm power increase. The actual price change to the consumer reflects not only the TVA price change, but also distributor mark up, custom contracts and nonfirm power sales. This increase would amount to about $34.57 per year on a residential usage of 1,000 kilowatt hours per month, less than one-tenth of one percent of Tennessee's 1999 median household income of $36,360.

With changes in the rate structure, the cumulative effect of combined rate changes and a rate adjustment on households would be greater due to the nature of the proposed changes. The increases in residential rates, including the proposed overall rate increase as well as the changes in structure, would range from 5.2 percent (Alternative E) to 7.0 percent (Alternative C). For Alternative B, the total increase would be 5.6 percent, about $45.02 per year on a residential usage of 1,000 kilowatt hours per month. This would be a little more than one-tenth of one percent of Tennessee's 1999 median household income of $36,360. For Alternative C, the increase would be about $56.28 per year, less than two-tenths of one percent of the Tennessee median household income. With implementation of Alternative D, the average increase would be about $44.22 per year, a little more than one-tenth of one percent of the Tennessee median household income. For Alternative E, the increase would be about $41.81 per year, a little more than one-tenth of one percent of the Tennessee median household income.

Environmental Justice - Employment and income increases would be distributed broadly across the region. Additional jobs created would be filled or layoffs identified by employers following their usual hiring practices. The proposed actions of TVA would not create any disproportionate impacts on disadvantaged populations. Impacts on

household expenditures for electricity would depend largely on household consumption and would not disproportionately affect minority populations. Impacts on low-income populations would not differ from those on other consumers in terms of cost per kWh; however, the increase would be a greater share of the income of those populations.

4.3 Energy Use

The predicted changes to TVA energy sales for the action alternatives between the present and out years are small. That incremental portion of change attributable to impacts from each proposed alternative rate change appears in Table 4-5. A listing of results for energy sales by alternative (case) is shown in Table C-1 of Appendix C. For the No Action Alternative, the conditions and trends for energy use, as stated in the section on Existing Conditions, would be expected to continue. The operating characteristics of TVA's directly served industrial and federal customers are such that, for the most part, their firm power takings are not marginal; therefore, the rate structure was assumed to have no impact on their sales. This assumption is based on historical hourly metered data which demonstrated that most directly served customers operate at loads equal to or greater than their firm contract requirements in all hours. The amount of load that failed this assumption was small, allowing the general assumption of no change in the directly served industrial or federal sectors.

Table 4-5. Change in Total Sales (GWh) of Energy From January 2003 Forecast by Alternative

FY	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
2005	0	322	241	105	242
2010	0	561	434	187	392
2015	0	675	538	235	463
2020	0	755	603	263	504
2025	0	865	690	300	560

The combined effects of changes in residential rates, nonmanufacturing rates, and manufacturing rates on distributor sales are offsetting and result in only minor and insignificant changes to total distributor sales every year for all alternatives. The changes in the residential, nonmanufacturing, and manufacturing sectors were estimated using models designed specifically for each sector. Not surprisingly, the largest annual changes occurred for Alternative B due to the relatively small residential and nonmanufacturing rate increases and larger decrease in the manufacturing rate. For example, Table 4-6 shows the change from each alternative rate structure proposal attributable to each class within the distributor sector for 2010.

Table 4-6. Change in Sales (GWh) by Customer Class for Each Alternative From Base Case for FY 2010 Due to Rate Structure Change

	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E
Residential	0	-267	-571	-352	-175
Non-Manufacturing	0	-112	63	91	-75
Manufacturing	0	940	942	449	642
Total Distributor Change	0	561	434	188	392
Directly-Served Industrials	0	0	0	0	0
Federals and Other	0	0	0	0	0
Total TVA Sales Change	0	561	434	188	392

The largest change in loads from any of the restructuring proposals in 2010 is 0.301 percent. The small size of this number and the potential for only minor, insignificant impacts can be illustrated through several comparisons.

- At TVA's forecast rate of growth of system energy requirements a 0.3 percent increase is equivalent to reaching a given level of load about 2 months sooner out of multiyear period than TVA would without the restructuring. Given that adding new capacity takes several years to bring online, capacity expansion plans would not be changed by this increase.

- A difference of 0.3 percent is less than the level of accuracy of measurement of actual loads.

- A difference of 0.3 percent is less than one-tenth of TVA's average five-year-ahead forecast error of about 4 percent.

- A difference of 0.3 percent is about 100 megawatts on peak in a system of over 30,000 megawatts and much less than the level of generating reserves TVA maintains of about 13 percent.

To respond to this small amount of change, TVA would not have to construct additional generating capacity or transmission facilities, nor require any substantive changes to current TVA operations of existing facilities. Based upon these considerations (i.e., the modeled response for energy demand and the minor effect on TVA generating sources and transmission system), TVA concludes that the impact of any of the alternative rate structure proposals on expansion or operation of energy resources would be minor and insignificant.

4.4 Air Resources

Under the No Action Alternative or "no change" alternative there would be no effect on air pollutant emissions and air quality during the 30-year evaluation period. Of the remaining five alternatives, four alternatives involve rate restructuring (Alternatives B, C,

D and E) without a rate increase, and one alternative involves no restructuring (Alternative A).

As discussed above in the Socioeconomic Impacts section, potential economic changes are expected to be both insignificant and indiscernible. The magnitudes of percent changes in air pollutant emissions across the TVA region would be about the same as the magnitudes for gross regional product. The largest change, about 0.042 percent, is associated with Alternative C, restructuring with equal impact on residential and commercial and 2 percent manufacturing decrease. These changes are so small that associated increases in ambient air pollution levels (air quality) would not be identifiable and all would be insignificant. For the No Action Alternative, the current conditions and trends in air quality for the region, as discussed in Chapter 3 of this EA, are expected to continue.

Cumulative Effects - Considering the combined cumulative effects of both the rate restructuring and a rate adjustment (increase), the Alternative A option with a rate increase is predicted to have an associated small decrease (about 0.10 percent) in gross regional product. The TVA power load for this option would decrease by about 1.3 percent. When considered in combination with the rate adjustment, the restructuring options (Alternatives B, C, D, and E) are also predicted to have small associated decreases (about 0.06 to 0.08 percent) in gross regional product. The changes in TVA power load range from about -0.9 percent to -1.2 percent for these four alternatives. Decreases in emissions of air pollutants would be similar in percent magnitude to the decreases in gross regional product. While all five of these alternatives would be expected to have associated small cumulative improvements in ambient air quality levels, these changes would also not be identifiable. Thus, the cumulative impacts on air quality from all alternatives would also be insignificant.

In summary, as stated in the Energy Use section, changes in consumer demand for energy would be minor and within the current levels of generating reserves maintained by TVA. The alternative with the most potential for adverse impact on air quality is Alternative C without a rate increase, closely followed by Alternative B. The alternative with the most potential for beneficial impact on air quality is Alternative A. However, the difference between these effects is so small that the change would be insignificant and likely unidentifiable.

4.5 Water Resources

The proposed rate structure change could potentially affect water resources through impacts associated with changes in economic activity and those impacts associated with changes in power demand. Increases in regional employment, income, or population can result in increased water demands, construction activities, and wastewater discharges. Likewise, increases in power demand can require additional generation and transmission facilities or longer operation of existing facilities. If the magnitude of such changes was large enough, there could be increased construction, thermal releases, wastewater discharges, or modified hydropower generation. However, as discussed above, expected changes are very small and would be essentially indiscernible.

Impacts to resources can result from the following types of activities associated with changes of sufficient magnitude.

- Construction Activities—Construction of new industrial, commercial, and general development, power-generating, or transmission facilities can involve land clearing, erosion, and the runoff of potential pollutants associated with construction activities. If the construction is near surface waters, bank erosion and sedimentation can increase turbidity, clog small streams, increase nutrient inflows, and threaten aquatic life. Removal of the tree canopy along a stream can increase water temperatures, algal growth, DO depletion, and adverse impacts to aquatic biota.

- Thermal Releases—TVA power plants use large amounts of cooling water that is returned to the river in accordance with state NPDES requirements. Extensive monitoring is conducted to ensure that the discharges do not adversely impact the aquatic environment. In general, these monitoring programs have detected no significant negative effects from the release of heated water from TVA facilities.

- Power Plant Wastewater—Nuclear power plants have noncomplex wastewaters that are subject to various levels of treatment and are usually discharged to surface waters. Coal-fired plants have a variety of liquid waste streams that are treated and released to surface waters. Hydro plants usually have minimal amounts of wastewaters that require substantial treatment. All of these releases are subject to and controlled by NPDES permits. Routine monitoring and periodic toxicity testing are performed on the discharges to ensure that the plant wastes do not contain pollutants or chemicals at deleterious levels that could affect aquatic life.

- Runoff and Air Pollution—Many nonpoint sources of pollution have not been subject to government regulations or control and can contribute a greater pollution load to receiving waters than point sources (Table 3-3). Principal sources of nonpoint pollution are agriculture, including runoff from animal waste and fertilizer, pesticides, and herbicide applications; erosion; mining; and urban runoff. Atmospheric deposition is another potential source of water pollution, particularly in relation to acid rain and fallout or toxic metals.

- Hydro Generation—Peak power demands in the region are often met using hydro generation facilities at dams along the Cumberland and Tennessee Rivers. Changes in the peak demand, or need to supply river flows for cooling water in order to maintain operations of fossil- and nuclear-fueled generating plants, can lead to alterations of the timing of generation patterns, which can potentially affect reservoir and tailwater flows, water quality, and aquatic life.

- Secondary Economic Effects—Increases in regional population, jobs, and income typically result in increased construction, water demands, and wastewater discharges. This places increased demands on the region's water resources and potentially increases pollution loads to receiving waters.

The following discussion of alternatives is structured first with regard to the rate change alone, followed by consideration of the cumulative effects of the rate change combined with a rate increase.

Since no rate change would be implemented under the No Action Alternative (nor under Alternative A), there would be no effects resulting from such an action on existing conditions or trends for water resources of the region.

With implementation of Alternative B, power sales in 2010 are projected to be 0.30 percent more than the base case. This slight increase is not expected to require additional generation or transmission facilities. Any modification to current operational requirements to meet the additional power demand would be minor. The additional demand on cooling water systems and wastewater treatment facilities at existing power plants would be very small and within normal variability and treatment capabilities. Effluent discharges are expected to remain within NPDES limits.

Projected 2010 increases over the No Action Alternative in gross regional product, and total employment, personal income, and population are $116 million (0.033 percent), 900 (0.016 percent), $34 million (0.012 percent), and 0 (0.000 percent), respectively. No significant geographic or industrial redistributions are expected. Since neither a substantive influx of manufacturing activity into the region (Socioeconomic Impacts section), nor an energy demand requiring a TVA response in long-term planning for generating capacity (Energy Use section) would result from this alternative, any effects on water supplies, wastewater treatment facilities, or pollution loads in the region would be very small and insignificant.

The minor projected increases in power sales and economic development could very slightly increase peak energy demands. Since hydropower from area dams is frequently used to meet peak demands, hydro generation patterns could undergo minor alteration. Such a change would typically concentrate the use of water available for power generation toward the time of peak demand, resulting in shorter periods of increased generation and longer periods of low or no generation. Corresponding reservoir releases would be higher during generation with longer periods of minimum flow. These potential effects are expected to be negligible, however, because there will be no change in the daily allocation of water for power generation. The projected impact on power sales is so small that the differences among the alternatives are within the level of accuracy for measurement of actual loads (see Energy Use section).

Under Alternative C, power sales in 2010 are projected to be 0.23 percent more than the base case alternative. Projected 2010 increases over the base case alternative in gross regional product, and total employment, personal income, and population are $146 million (0.042 percent), 1,300 (0.023 percent), $47 million (0.017 percent), and 200 (0.002 percent), respectively. These changes are small and similar to those of Alternative B. Consequently, the potential impact to water resources would be similar to Alternative B and are expected to be insignificant.

Under Alternative D, power sales in 2010 are projected to be 0.10 percent more than the No Action Alternative. Projected 2010 increases over the No Action Alternative in gross regional product, and total employment, personal income, and population are $67 million (0.019 percent), 600 (0.010 percent), $21 million (0.008 percent), and 100 (0.001 percent), respectively. These changes are very small and similar to those of Alternatives B and C. Consequently, the potential impacts to water resources would be similar and also are expected to be insignificant.

Under Alternative E, power sales in 2010 are projected to be 0.21 percent more than the No Action Alternative. Projected 2010 increases over the No Action Alternative in gross regional product, and total employment, personal income, and population are $68 million (0.020 percent), 600 (0.010 percent), $23 million (0.008 percent), and 100 (0.001 percent), respectively. These changes are very small and similar to those of Alternatives B, C, and D. Consequently, the potential impacts to water resources would be similar and also are expected to be insignificant.

Cumulative Impacts - As discussed earlier, TVA is discussing increasing its rates, and a rate increase is considered a foreseeable action for purpose of cumulative impacts. The combination of rate increase and alternatives for rate structure change results in economic conditions and power sales essentially indistinguishable from the existing conditions in the TVA power service area (i.e., within the predictive reliability of the modeling analysis). Thus, no significant cumulative impacts to water resources are expected.

4.6 Land Use

As stated, load demand can increase in response to pricing of electricity. For the No Action Alternative and Alternative A, current usages and land use trends would continue. The predominant sources of land use disturbance that potentially could occur if induced load demand increased sufficiently would be from construction or expansion of industrial facilities, construction or expansion of generating facilities or transmission (particularly at greenfield sites) to support that growth, and need for additional disposal of associated solid or hazardous waste. However, as discussed under the Socioeconomic Impacts section, impacts on employment and on population from any of the alternative rate structures are expected to be very small. Consequently, none of the alternatives are expected to result in the construction of new industrial or commercial facilities, the expansion of existing facilities, or the closing of existing facilities. As described earlier (Energy Use section), the change in energy use predicted for any of the action alternatives is also expected to be very small. These very small changes in energy use are not expected to require the construction of new generating or transmission facilities or even any discernible changes in how existing facilities are operated. Therefore, land use impacts that would be associated with the alternative rate structures are also expected to be insignificant.

If TVA proposes to increase its rates in the future, the cumulative effects of an increase with those of the identified alternative rate structures on land use are also expected to be insignificant for the reasons discussed in the other resource areas and the Socioeconomic Impacts and Energy Use sections above.

4.7 Solid and Hazardous Waste Generation

Potential impacts of the proposed alternatives for modification of the rate structure on solid and hazardous waste generation would accrue from two aspects: (1) changes in generation and handling of solid and hazardous wastes from residential, commercial, and industrial facilities in the affected region, and (2) changes in generation and handling of coal combustion wastes at TVA fossil plants used for power production. However, as discussed in earlier sections, the changes that are expected to result from any of the alternatives are expected to be very small and basically indiscernible. Accordingly, any change to solid and hazardous waste generation and disposal in the TVA region is also expected to be essentially indiscernible and insignificant. This includes any cumulative

impacts that might result if TVA increases its electric power rates in the future and changes its rate structure.

Residential, Commercial, and Industrial Wastes – Solid waste is generated by most activities. Hazardous wastes are primarily byproducts of industrial processes. Because the alternatives basically aid in maintaining the current level of industrial manufacturing in the TVA power service area, rather than induce an influx of new manufacturing (Socioeconomic Impacts section), the proposed rate structure changes, considered alone or in conjunction with a rate increase, would result in only insignificant effects to the generation and handling of residential, commercial, and industrial solid and hazardous wastes in the region. Additionally, the existence of state-administered, RCRA-equivalent programs in the seven states of the TVA power service area, which emphasize waste reduction, recycling, and proper handling and disposal of solid and hazardous wastes, would further ensure that effects from any of the alternatives (including No Action) would be minimal and insignificant.

TVA-generated wastes - Based on the analysis of changes in TVA power generation provided in the Energy Use section of this EA either directly or cumulatively with a rate increase, none of the alternatives considered would likely have a measurable impact on CCB production at TVA's coal-fired plants. Any change would be much less than the existing large fluctuation in CCB production. Therefore, none of the alternatives considered would have a significant impact on regional CCB production and disposal. Neither would the equally trivial and indiscernible effects on hydro or nuclear generation result in additional wastes being generated under any of the alternatives. Similarly, no discernible changes in generation of hazardous waste by TVA facilities would result from any of the alternatives. Consequently, potential impacts from such waste generation would be insignificant.

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