CHAPTER 2

2.0 RESPONSES TO COMMENTS

2.1. Air Quality

2.1.1. Air Quality Impact Assessment

1. DEIS Summary page S-15 and Section 7.6.1 page 179 note that under all alternative strategies, there will likely be a substantial beneficial cumulative impact on regional air quality. Hazardous air pollutants (HAPS) generally have local rather than regional impacts and while regional air quality benefits are important, they should not be used to justify or offset increases in local concentrations of HAPs. (*Commenter: Heinz J. Mueller - EPA*)

Response: While some hazardous air pollutants may have localized impacts rather than regional impacts, reduced generation from coal plants will result in reduced emissions of hazardous air pollutants with beneficial impacts both in the vicinity of those plants and regionally.

2. The air quality analysis in DEIS Chapter 7 focuses on criteria air pollutants and greenhouse gases, with minimal mention of hazardous air pollutants. Given the large emissions of HAPs from TVA facilities, they should be addressed in more detail. (*Commenter: Heinz J. Mueller - EPA*)

Response: Unit-specific information would be necessary to evaluate possible hazardous air pollutant impacts in great detail. In addition, as the preceding comment states, some HAPS could have more localized effects that would require consideration of local terrain and conditions, including site-specific ambient air quality modeling. Analyses at this level are typically done for project- or site-specific actions. While such analyses could provide additional information about HAPs issues, this would not necessarily be very useful at the programmatic level of review and decision making here. As stated in the description of the scenarios, TVA anticipates that EPA will require the installation of Maximum Achievable Control Technology for HAPs at coal-fired power plants. The installation of these controls, as well as the reduction in generation from coal plants, will result in significant reduction in HAPs emissions under all of the alternative strategies evaluated in the IRP. These reductions vary most depending on the number of coal units idled. From a strategic or programmatic perspective, this is what is important for decision-making purposes.

3. While the DEIS describes TVA's emissions of air pollutants, it does not adequately address the effects of the continued emissions of air pollutants that would occur under the alternative strategies. The continued operation of over 10,000 MW of coal-fired generating capacity would result in the continued emissions of large amounts of SO_2, NOx, PM2.5, and hazardous air pollutants for two more decades. (*Commenter: Abigail Dillen - Earthjustice*)

Response: The Environmental Strategic Indicators developed for each of the strategies considered include the total emissions, both from new generation sources and from existing generation sources that remain in operation. The EIS evaluates the environmental impacts of all of the resources included in the Recommended Planning Strategy.

2.1.2. Clean Option (not fossil)

4. Adopt a plan that aggressively develops the Valley's cleaner alternative energy sources, particularly solar, wind and bioenergy resources. Developing these resources will create jobs, strengthen local economies and create a clean, healthier environment for all Valley residents. (*Commenter: Erin Ouzts*)

Response: Comment noted.

2.1.3. NAAQS

5. DEIS pages 70-73 do not discuss the non-attainment status of the Chattanooga and Knoxville areas for PM2.5. (*Commenter: Heinz J. Mueller - EPA*)

Response: The Chattanooga and Knoxville non-attainment areas for PM2.5 are shown in Figure 4-8 of the Draft and Final EISs. The text in the Final EIS has been revised to mention these non-attainment areas.

6. DEIS Summary page S-15 and Section 4.3 page 70 incorrectly state that the only non-attainment area in the TVA region for PM 2.5 is a few counties in the eastern part (Chattanooga and Knoxville). Knoxville is also currently non-attainment for the 1997 8-hr ozone standard, but has clean data and EPA has proposed redesignation to attainment. (*Commenter: Heinz J. Mueller - EPA*)

Response: Comment noted. The text of the Final EIS has been revised to mention the PM2.5 non-attainment area. EPA has proposed the Knoxville ozone non-attainment area be re-designated as attainment, though the action has not yet been finalized.

7. The DEIS page 75 discussion of lead does not mention that Bristol, TN has a violating monitor for the 2008 lead standard. This area will soon be designated non-attainment for lead. (*Commenter: Heinz J. Mueller - EPA*)

Response: The text of the Final EIS has been revised to state that part of Sullivan County, Tennessee, was designated as non-attainment for the 2008 lead standard on November, 16, 2010.

2.2. Alternative Energy / Advanced Generation

2.2.1. Fuel Cells

8. TVA should incorporate the use of fuel cells into its plan. They are efficient, very clean, and provide the benefits of distributed generation and combined heat and power. (*Commenter: Regina Jay*)

Response: TVA recognizes the potential benefits of distributed generation and combined heat and power using sources such as fuel cells. Fuel Cells were evaluated during the IRP options screening process and eliminated from further consideration due to their small scale, current lack of proven, commercial availability, and high cost. TVA will continue to monitor the development of fuel cells and assess them for consideration in future IRPs.

2.2.2. Heat Differential Generators

9. TVA should install secondary heat differential-operated turbines using refrigerants on waste heat streams from existing thermal plants. These systems can operate with about a 10º C temperature differential and are in use with solar ponds and sea water temperature differentials around the world. (*Commenter: Paul Noel - NEC*)

Response: Secondary heat differential-operated turbines refer to technologies such as Ocean Thermal Energy Conversion, or OTEC. The low OTEC temperatures result in low efficiencies and low operating pressures; as a result, plant sizes are much larger than conventional plants of the same generating capacity and capital costs are correspondingly higher. TVA continues to follow waste heat utilization technology, has developed and patented a technology to use low temperature waste heat, and is currently investigating cost effective applications within TVA's system. As these systems become commercially viable they will be considered in future IRP studies.

10. Waste heat recovery is dismissed as a potential energy resource or energy efficiency measure (see DEIS Table 5-1). Recent developments in this area, including organic Rankine cycle methods, are highly efficient and show great potential. We urge TVA to reconsider the inclusion of this resource. (*Commenter: Lawrence Carroll*)

Response: The potential for significant amounts of new generation from waste heat sources is limited. While it was not included as an option that TVA would consider constructing and operating, it is, as stated in DEIS Table 5-1, a potential source of power acquired through power purchase agreements. TVA continues to follow waste heat utilization technology (such as the organic Rankine cycle), has developed and patented a technology to use low temperature waste heat, and is currently investigating cost effective applications within TVA's system. As options become commercially viable they will be considered in future IRP studies.

2.3. Coal

2.3.1. Coal Plant Air Pollutants

11. Although TVA has reduced its emissions of air pollutants by installing improved controls on coal-fired plants, TVA remains a major primary source of sulfur dioxide, nitrous oxides, and small particles. (*Commenter: Michael J. Crosby - TEC/BCAAT*)

Response: Comment noted. All of the strategies under consideration will result in significant reductions of these air pollutants.

12. TVA should commit to reducing the air pollutant emissions at all fossil fuel power plants that are not idled. This would require installing scrubbers and other pollution control systems at all plants by 2015. (*Commenters: Jeff Deal, Sheila Green - NCDA, Chris Pamplin, James Randolph*)

Response: All of the strategies considered in the Final IRP and EIS result in significant long-term reductions of SO_2, NOx, and mercury of about 60% between 2010 and 2015. The primary factors contributing to these emissions declines are the reduced coal-fired generation from idling of coal units and the installation of additional emission control systems on coal units that continue to operate. About half of TVA coal units are presently equipped with FGD and SCR systems. These are the largest units on the TVA system and

are typically operated in base load mode. This proportion will increase in the future as the coal units expected to continue operating are individually evaluated for the need and feasibility of additional emission controls.

2.3.2. Coal Plant Layups/Retirement

13. Reduce reliance on coal-fueled generation as quickly as possible. The use of coal results in adverse economic, environmental, and human health effects. TVA's use of coal also ships billions of dollars out of the Valley to pay for coal. Alternative sources can be developed quickly and cost-effectively. (*Commenters: Lisa Archer, Lain Arubin [sic], Moonis Roger Axley [sic], Lauren B. [sic], M. B. [sic], Paul Bevney [sic], Melissa A. Burt, Margie Buxbaum, Jason Campbell, Mike Chapman - ME/KE, Brenda Chinck [sic], Chris Christie, Mary H. Clarke - TCV, Arqunsia Cornwall, Gary D. [sic], Lacy Damiles [sic], Jeff Deal, April Dixon, Laura Elis, Kathleen Ferris - BEST/CENDIT, Charles Foster, Shanequa Fountain, Robin L. Gerahann [sic], Nancy Givens - WKU/KSES/BGGP, P.N. H. [sic], John Hamilton, Rita Harris - SC, Whitaker M. Haskins, Redel Hesh [sic], Christine Johnson - LSE, Glenda Jordan, Ivan Juny [sic], Sam K. [sic], Sandra Kurtz - BEST, Gloria Lathem-Griffith - MEC, Michael Lussier, Burton Mandrell [sic], Nancy McFadden, J. Michael Meece, Austin Milt, Erin Ouzts, Linda Park, Barbara Peach, Erwin Peritt [sic], W. J. Pruit, Cody R. [sic], James Randolph, Gordon Robinson, Kevin Routan - CGSC, Don Safer - TEC, Grace Safer, Don Scharf, Jack Slede [sic], Michelle Smith, Kathy Stone [sic], Danville and Beverly Sweeton, Gary Verst - SC, B.S. Vick [sic], Chuck Walker, Sue A. & Steven M. Williams, Bruce Wood - BURNT, J. Y. [sic], Louise A. Zeller – BREDL*)

Response: Comment noted. The alternative strategy in the final IRP and EIS that staff is recommending to the TVA Board includes the idling of 2,400 to 4,700 MWs (net dependable capacity) of coal capacity.

14. The draft IRP and EIS do not adequately describe the criteria used to determine which coal plants would be idled. The EIS states that candidate plants generally had “high operating costs and high anticipated environmental compliance costs.“ The environmental compliance issues and their associated costs, however, are not described. Without this information, it is not possible to determine whether the costs were estimated fully and reasonably. (*Commenters: Michelle Bloodworth - ANGA, Frank Rambo - SELC*)

Response: The evaluation of coal units for idling considers nine key elements: operating cost, equivalent forced outage rate (EFOR), transmission impacts, remaining clear air capital, fixed O&M and yearly plant capital, future ash handling costs, fuel flexibility, required capital improvements, and CO_2 intensity. These are described in ‘An Overview and Evaluation of the Fossil Fleet’ presented to the Stakeholder Review Group on June 29, 2010. The presentation is posted on the IRP website. The financial impact on TVA for each of the nine factors was determined for each unit to develop a relative merit ranking. Other qualitative considerations will also be factored into final decisions. These considerations may influence a decision to retire more or fewer units than indicated by the quantitative ranking process. These other considerations include power system reliability, overall portfolio design and diversity, local area considerations, local employment and economic impacts, and age of the units. Additional detailed studies related to fossil unit idling will be performed during the implementation of the selected strategy.

15. TVA has announced that it will idle up to two units at Widows Creek by 2011. Given the age of the other Widows Creek units, how many of them does TVA plan to idle during the IRP planning period? (*Commenter: Thad Huguley - HCG*)

Response: On August 24, 2010 TVA formally announced plans to idle the six small units at Widows Creek. Two units will be idled in FY 2011, and four other units there will be idled between 2011 and 2015. The two largest and newer units, Units 7 and 8, are proposed to continue operating throughout the IRP planning period. Both of these units have selective catalytic reduction (SCR) systems for NOx control and flue gas desulfurization (FGD) scrubbers for SO_2 control.

16. Which coal plants are considered “must run” due to transmission constraints/load pockets? If there are “must run” plants, has TVA performed studies to compare the cost of upgrading the plants with the cost of upgrades to remove the transmission constraints? If so, what are the results of the studies? (*Commenter: W.R. Kendrick*)

Response: TVA has no coal plants that are classified as “must run” due to transmission constraints or load pockets. The effects on the transmission system are an important consideration in TVA’s ongoing studies to determine which coal plants are candidates for idling.

2.3.3. Coal Price and Supply Forecasts

17. Reports have recently been published about a potential 'Peak Coal,' the point at which the maximum extraction of coal is reached and production declines. How will TVA respond if this Peak Coal occurs during the lifespan of the coal facilities considered in the IRP? (*Commenter: Don Richardson - SC*)

Response: TVA monitors developments in coal mining and transportation on an ongoing basis. At this time, available data indicate there are enough economically recoverable coal reserves for all U.S. coal facilities to be operated beyond their current economically useful lives. If this starts to change, TVA’s monitoring should detect this in time to mitigate possible adverse effects. The fact that TVA has a diverse portfolio of generating assets would help TVA make adjustments.

18. While TVA assumes that the future price of natural gas will be volatile, TVA seems to be assuming that the future price of coal will remain relatively stable. This point was reiterated by a TVA staff person at one of the public meetings on the draft IRP. An examination of coal price history shows that while coal prices can remain stable for long periods, they can dramatically increase with the price of oil and natural gas. In 2008, a 128% increase in TVA's coal prices resulted in a rate increase. Since 1972, the ratio of natural gas prices to coal prices has averaged about 2.1. Therefore TVA should consider natural gas and coal to have approximately equal future price volatility. (*Commenter: Mike Chapman - ME/KE*)

Response: TVA updates coal and gas forecasts during each business planning cycle on an annual basis. Forecasts for each fuel are produced with ranges and reflect both current and expected market conditions at the time of each fuel forecast. The next IRP is scheduled to incorporate the latest available information near the 2015 timeframe.

2.3.4. Coal Waste

19. The DEIS does not assess and disclose the risks associated with the disposal of coal waste, including coal ash and scrubber sludge. It also acknowledges the need for additional coal waste storage areas, but does not describe the impacts of these storage areas. (*Commenters: Dana Beasley Brown, Abigail Dillen - Earthjustice, Annette Gomberg*)

Response: Potential environmental impacts from the disposal of coal ash and scrubber sludge include the change in land use and habitat resulting from the construction of the storage areas, particulate emissions during transportation and disposal, impacts to surface waters from suspended solids, metals, and other compounds in runoff, and impacts to groundwater from leaching and infiltration. TVA is taking steps to mitigate these impacts at current and planned coal ash and scrubber sludge disposal areas, as well as working to increase the beneficial reuse of these materials to reduce the volume landfilled. TVA's preferred strategy involves idling a large amount of coal capacity. If this is done, the amount of coal waste that would have to be managed would be substantially reduced.

Cost of Environmental Compliance Upgrades

20. The draft IRP gives little information on the cost of emission controls and other plant upgrades necessary to meet current and anticipated environmental regulations. We are concerned that TVA has not sufficiently analyzed these costs. Several studies suggest that in many cases adding controls to many uncontrolled coal plants is not cost effective. TVA's recent projection of upgrade costs of $4.2 billion over the next decade (in 2009 TVA Form 10-K) is likely an underestimate as it does not include anticipated CO_2 requirements or the proposed Clean Air Transport Rule. (*Commenters: W.R. Kendrick, Lanny Night, Peter Robertson - ANGA*)

Response: All IRP scenarios were designed to conform to likely regulatory requirements, including additional NOx and SO_2 reductions, via requirements like the Clean Air Transport Rule. Similarly, carbon emission reduction requirements and the costs of meeting these requirements were included in all but one IRP scenario. The costs of these emissions reductions (i.e., control equipment) are significant and were a major factor in removing Strategy A from further consideration. Under Strategy A, all of TVA's coal-fired units would have been controlled and would have continued to be operated.

2.3.5. Mountaintop Removal Mining

21. Stop the use of coal mined by mountaintop removal methods. Mountaintop removal mining results in significant adverse environmental impacts. (*Commenters: Lisa Archer, Margie Buxbaum, Jason Campbell, Lawrence Carroll, Jeff Deal, Nancy Givens - WKU/KSES/BGGP, John Hamilton, Nancy McFadden, J. Michael Meece, Linda Park, James Randolph, Don Safer - TEC, Grace Safer, Don Scharf, Fred Stanback, Danville and Beverly Sweeton, Bruce Wood - BURNT, Edward Zuger - CCSC III*)

Response: Comment noted. TVA uses relatively little coal that is produced using mountaintop removal techniques. As shown in Section 3.3 of the FEIS, approximately 1.5% of the coal TVA is purchasing in 2011 is produced in the Central Appalachian mining region by mountaintop removal methods. In 2010, 4% of the coal was mined by mountaintop removal methods. Because of the high BTU and low sulfur content characteristics of the Central Appalachian region coal, it is predominantly burned in TVA's older unscrubbed units. As many of these coal units are idled, the quantity of Central Appalachian region coal, including that produced by mountaintop removal, will decrease.

22. The DEIS does not adequately describe the impacts of coal mining, including mountaintop removal mining. Under all alternative strategies, TVA will use nearly a billion tons of coal over the next 20 years and the mining of this coal will cause widespread impacts. (*Commenter: Abigail Dillen - Earthjustice*)

Response: A detailed description of the impacts of coal mining is beyond the scope of this EIS. The impacts of mountaintop removal mining are described in detail in the citations in Section 7.6.4 of the Final EIS.

2.4. Cost of Power

2.4.1. Cost by Type of Generation

23. What is the current average costs of power to TVA for each type of generation (coal, natural gas, nuclear, hydro, wind, solar, biomass, diesel)? (*Commenter: Russ Land*)

Response: The average cost of power varies depending on unit operating characteristics, utilization, and changes in assumptions regarding fuel prices and availability, among other factors. Often comparisons among generation types are done using a levelized cost of electricity (LCOE) value to provide a more consistent basis for understanding cost differences between technologies. Following are LCOE values in $/MWh for technologies considered in the IRP study: Coal - $125, Nuclear - $71, Gas CC - $120, Gas CT - $250, Wind - $70, Solar - $295, and Biomass - $73.

Purchases from Outside the TVA Region

24. How much did TVA spend for purchases of fuel and power from outside the TVA region last year? (*Commenter: Stephen Levy - TSEA*)

Response: TVA spent $2.7 billion during FY 2010 on fuel and purchased power from sources outside of the TVA service region. About two-thirds of this expense is attributable to coal; these coal purchases were made from 8 different coal-producing states to meet environmental requirements and supply the lowest fuel cost for TVA customers.

25. How much did TVA spend for the disposal of wastes outside the TVA region last year? (*Commenter: Stephen Levy - TSEA*)

Response: During FY 2010, $126,755,000 million was spent for the transport and disposal of coal wastes from Kingston to outside the TVA region.

2.4.2. Rate Equity

26. TVA's recently adopted peak pricing rate structure favors large users and discriminates against heads of households who have relatively little ability to reduce power use during peak periods. These heads of households have also born the brunt of seven rate hikes in the last decade, including one resulting from short-sighted decisions at Browns Ferry Nuclear Plant. These rate policies violate the TVA Act which is supposed to protect households from price gouging. (*Commenter: Laurence T. Britt*)

Response: Both residential and industrial customers were moved off of flat, non-temporal rates and onto rates that were differentiated by time of day and season of the year in order to bring about better alignment between TVA’s production costs and customers’

consumption decisions. Residential customers were provided two rates—one which included time of day and season of the year differentials; another that provided only seasonal differentials (i.e., prices remained flat within the day). In both cases, however, the differentials in rates (daily or seasonally) were very small. While both rates (daily and seasonal) are available at the onset, the seasonal-only rate will go away at some future date leaving all residential customers with a time of day varying rate only. Residential customers should see very little change in rate structure as a result of these actions. In contrast, industrial customers received the same structural changes with two notable exceptions: (1) time of day and season of year differentials are more substantial and (2) their option to elect a seasonally-differentiated-only rate option will remain available for the foreseeable future.

2.5. Distributed Generation

2.5.1. Distributed Natural Gas Generation

27. Promote smaller, local distributed natural gas generation instead of large, centralized natural gas plants. Inexpensive distributed plants can be built with high public acceptance, scaled to commercial and neighborhood needs, and be unobtrusive. They can provide electricity and the waste heat can be used for HVAC and hot water needs. (*Commenter: Paul Noel - NEC*)

Response: TVA did consider several resource options in varying detail that would lend themselves to a distributed generation use such as small gas turbines, microturbines, reciprocating engines and fuels cells. Such energy options could be used by TVA in the future in a dispersed generation mode. TVA anticipates that the next IRP will explore in more detail the merits of those dispersed generation energy options.

2.5.2. End User Generation

28. Are there TVA customers that generate more electricity than they consume and do not have contracts to sell their excess power to TVA? If so, how much excess power do these customers generate? (*Commenter: Russ Land*)

Response: All power generated by a facility enrolled in the Generation Partners program is transmitted to the power grid. TVA does not track the amount of generation customers generate with other facilities and consume for their own use.

2.5.3. Effect of Plan on Economic Development in TVA Region

29. Adopt a plan that maximizes the economic development of the TVA region through creation of clean energy jobs/green jobs. Developing the Valley's energy efficiency and renewable energy resources creates local jobs, supports the clean energy efficiency industries located in the Valley, reduces our monthly power bills and strengthens local economies. (*Commenters: Debra K. Agner, Lisa Archer, Grace Ashford, Brent Bailey - 25X25, Cameron Z. Bennett, Kelvin Butler, Jason Campbell, Torri Dunn, Robyn Galochee [sic], Donald Gilligan - NAESC, Joshua Guthrey, Daniel Joranko - TAP, R.R. Karpsal [sic], Eric Lewis, Selma Marks [sic], Nancy McFadden, John M. Nald [sic], Aesthor Nievons [sic], Paul Noel - NEC, Ann Olsen, Don Safer - TEC, Grace Safer, Don Scharf, Jane L. Shelton, Jack W. Simmons - TVPPA, Jennifer Sneed, Lynn Strickland - PS, Paulrann P. Stocks [sic], Danville and Beverly Sweeton, G.R. W., Chad Watters [sic]*)

Response: Comment noted. In recent years, TVA has experienced great success in the continued growth and development of the clean energy industry. TVA has been an active partner in recruiting major clean energy manufacturing operations to the TVA region, including Wacker-Chemie, Hemlock, and Confluence Solar, all of which are instrumental to the further growth of the Valley's clean energy economy. Additionally, TVA has seen recent exponential growth in the generation of renewable energy in the TVA region through the Generation Partners program and anticipates additional growth through the new Renewable Standard Offer program. The recent increase in EEDR efforts has also resulted in increased local green jobs. These increases are anticipated to continue under most of the planning strategies. At the scale of the total regional economy, however, the differences in total employment and income among the alternative strategies are relatively small, as described in Section 7.6.7 of the Final EIS.

30. Adopt a plan with the least expensive sources of power supply that will result in the least expensive power rates. This will promote a more robust economy and raise the standard of living in the TVA region. (*Commenter: Gray Cassity - BES*)

Response: The goal of the IRP is to produce the least cost plan that finds the best balance of providing competitive rates, delivering reliable power, and meeting our commitment to environmental stewardship. While not resulting in the least expensive possible rates, the recommended strategy finds that best balance and is consistent with TVA continuing to provide low-cost power.

31. Continue the region's leadership in the clean energy jobs sector by helping to create a synergy between local clean energy manufacturing and the production of clean energy through funding or incentivizing the creation of clean energy facilities and the installation of clean energy technologies. (*Commenter: Daniel Joranko - TAP*)

Response: Comment noted. Please see the response to Comment 29.

32. Solar energy is rapidly increasing its role as a major economic driver in the TVA region, particularly in Tennessee. Because of the small amount of solar generation included in the IRP strategies, TVA does not appear to be taking full advantage of the regional solar potential. (*Commenters: Donald L. Audley [sic], Annette Gomberg, Andrew Johnson - TSEIA, Scott Wills - TTCGC*)

Response: IRP planning strategies were developed to test a broad range of business options that TVA could adopt, including renewable additions. New renewables incorporated into the IRP were based on two given portfolios amounts: 2,500 and 3,500 MWs, respectively. These amounts do not represent resource potentials; rather, reasonable deployment schedules for various resource capacities were developed based on cost, technological maturity, regional resource availability, diversified resource portfolio, and anticipated federal legislation/regulation and tax policy factors. TVA recognizes that solar energy potential in the region (and around the world) is largely untapped, not because of limited solar resources, but due to the cost of deployment of solar technology compared to other power generation technologies. Currently, the largest driver of solar energy development in the United States are: (1) state renewable portfolio standards; (2) federal tax grants/credits to subsidize the nation's development of solar energy; and (3) state tax incentives (grants, loans, rebates) to subsidize in-state development of solar energy. With the exception of North Carolina, there are no mandatory state renewable portfolio standards in effect in TVA service territory. There are some state-level incentive programs for solar

energy in the region. More information on these incentives can be found at: http://www.dsireusa.org/. Notably, TVA currently offers significant incentives for deployment of distributed small-scale (less than 200 kW) solar installations and generation through the Generation Partners program. In late 2010, TVA also issued a renewable energy standard offer to purchase renewable energy, including solar, for larger-scale projects from 200 kW to 20 MW. According to data from a Photon International survey of 170 manufacturing companies, the United States manufactured 4.4% of worldwide photovoltaic (PV) cell production in 2009, compared to 5.5% in 2008. Nevertheless, the solar PV market is growing rapidly and there is an opportunity for both new and existing businesses based in the Tennessee Valley to capture an increasing share of the growing worldwide market. Manufacturers of solar components with the lowest costs of production will be in the best position to grow their market share. TVA's vision to produce low-cost and cleaner energy will help to provide a market for regional manufacturers of solar components while also providing the same manufacturers with a competitive edge needed to export their products to other parts of the country and throughout the world.

33. Studies by the University of Tennessee's Bio-based Energy Analysis Group and others have found that increased development of renewable energy in the TVA region would result in significant benefits to the agricultural and forestry sectors and economic development in rural areas. We encourage TVA to develop and utilize local biomass resources. (*Commenters: Brent Bailey - 25X25, Courtney Piper - TBLCEE*)

Response: Comment noted. As described in Section 4.17.4 of the Final EIS, the potential biomass fuel resource in the TVA region is large and TVA agrees that its development in a cost-effective and sustainable manner would benefit the agricultural and forestry sectors and promote economic development in rural areas. Existing and future renewable energy resources will play a role in achieving TVA's vision to become one of the nation's leading providers of low-cost and cleaner energy by 2020. In support of this vision, TVA is continuing to evaluate the best overall opportunities for increasing the use of renewable energy on the TVA system and anticipates revising its analyses of renewables in future IRP updates. TVA currently purchases power generated from local biomass by several regional industries (see Final EIS Section 3.4), and the renewable standard offer issued by TVA in 2010 (see Final EIS Section 3.4) could result in TVA purchasing more energy generated from biomass. The alternative strategies evaluated in the IRP and EIS, including the preferred strategy, include an increase in biomass-fueled generation. TVA recognizes, however, that there are a number of logistical, technical, environmental, and economic issues that must be addressed in order to greatly increase biomass-fueled generation. These issue include: the disseminated nature of biomass and the need for dependable fuel delivery infrastructure; low energy density (energy content per volume of material) and high moisture content when compared to fossil fuels; potential need for specialized fuel processing, fuel handling and boiler feed mechanisms and equipment; high delivered fuel cost (cost per unit of energy) that affects total cost of power delivered with adverse impacts on TVA rates; uncertainty over how biomass will be considered in potential federal policies on renewable energy and carbon emissions; required emission control equipment; and the environmental impacts of acquiring and transporting biomass fuels.

34. The TVA states rank near the bottom on many health and social measures such as infant mortality, obesity, education, literacy and health insurance. TVA's economic development programs do not appear to help those most in need. We question whether this new plan will make a difference. (*Commenter: Bruce Wood - BURNT*)

Response: A number of different factors contribute to the ranking of Tennessee Valley states in the categories identified by the commenter. While TVA is not responsible for any of these categories, it has been charged by Congress with improving the quality of life in the region. It has done this primarily through energizing the Valley, bringing electricity to the Valley's institutions, businesses and homes, and doing so reliably and at affordable prices. This has vastly improved the quality of life in the Valley compared to what it was before TVA did this, especially for those who were and are economically disadvantaged. By continuing to maintain low electricity prices, Valley residents have more income to spend on other things, including the categories identified in this comment. In addition to the benefits resulting from TVA's energy activities, TVA has an active and successful Economic Development program. The goal of this program is to contribute to improving the quality of life in the Valley by helping create and retain quality, high paying jobs and increase capital investment in the business community. By leveraging partnerships with other groups across the Valley including public power distributors, TVA’s directly served customers, heads of Economic Development groups at state, regional, and local levels, local communities, state leaders, and elected officials at all levels, we work to help create an environment of sustainable economic growth.

2.6. Economic Impact Analysis

35. The economic impact analysis of the IRP should be broader than the performance metrics based on the cost of electricity. For example, the EIS describes a likely increase in temperature in coming years. As shown in 2007 and 2010, hotter summer weather reduced base load capacity due to derates. Ratepayers were billed more for this as well as their increased air conditioning load. The cost of reducing carbon emissions is incorporated into some scenarios. The long-term economic benefits of the necessary carbon reductions by TVA, as well as the nation, resulting from reduced power consumption and avoidance of necessary mitigation and adaptation do not appear to included in the economic impact analysis. Please consider a more comprehensive long-term economic impact analysis that considers issues such as this. (*Commenter: Arthur Ruggles*)

Response: The economic impact analysis covers the interactions within the regional economy. The potential effect of climate change is indirectly included in the economic analyses. Taking the air conditioning example mentioned, if air conditioning use increases, TVA’s load and cost would increase which would result in these costs being reflected in the charges to ratepayers. Households would then have less money to spend on other items and businesses would have greater costs to cover in their operations, resulting in additional effects in the economy. These interactions, also known as the multiplier effect, are reflected within the economic model used to calculate the net economic impact.

The IRP study covers a range of assumptions about carbon emissions and loads, including air conditioning loads. The issue of carbon emissions and its possible climatic, economic, and environmental effects involve substantial uncertainty and are largely driven by national and international considerations.

36. While we support the use of the REMI Policy Insight tool for conducting the economic impact analysis, we are concerned about the assumptions and input data that were used. The explanation of its use in the draft IRP lacks detail. Our concerns include the treatment of energy efficiency, compliance costs, in-Valley renewable generation projects. We are also concerned that its use was limited to the most extreme cases which may have biased

TVA's calculation of the economic impact indicator. We recommend that TVA fully describe the inputs and assumptions used in the REMI evaluation and assess the economic impacts of all strategy/scenario combinations. (*Commenter: Sam Gomberg - SACE*)

Response: TVA has provided additional information about the REMI model in the final EIS. The comment supports the use of the REMI model as a “sophisticated tool” for this type of analysis. TVA agrees that customized detail inputs would help when making decisions about competing specific resource options, programs, and projects. This type of detailed analysis has been conducted and presented in the EIS at the project level. In Energy Vision 2020, TVA's 1995 IRP, even though such level of detail was used, the conclusion of the economic impact analysis was that none of the strategies exhibited a significant impact on the TVA region economy. Thus, for the current IRP EIS, the process was to first conduct the analysis at a more aggregate level of detail to determine if any of the strategies exhibited a significant impact on the TVA region economy and/or results different from those of Energy Vision 2020. If significant impacts or results at variance with Energy Vision 2020 were found for any of the strategies, then a more detailed analysis would have been conducted. However, the economic impact analysis for the current IRP exhibited impacts that were not significant to the TVA region economy, consistent with the findings in Energy Vision 2020.

2.7. Editorial Comments

2.7.1. Errors in Draft EIS

37. DEIS Page 172 describes life-cycle GHG emissions of U.S. nuclear plants as “12 to 61 tons CO_2e/GWh with an average of 22.2 tons CO_2e/GWh.” The cited Sovacool (2008) reference reports a range of 1.4 grams of CO_2e per kWh (g CO_2e/kWh) to 288 g CO_2e/kWh, with an average value of 66 m CO_2e/kWh. This correlates to a range of 1.5 to 317 tons CO_2e/GWh, with an average of 73 tons CO_2e/GWh (assuming one ton = 907.185 g). We recommend TVA re-evaluate the literature to ensure the accuracy of the stated range of values. (*Commenter: Heinz J. Mueller - EPA*)

Response: The values from Sovacool (2008) used in describing life-cycle GHG emissions were those listed in Table 4 for plants in the United States. This has been clarified in the text of the Final EIS, which now lists the range and mean for nuclear plants worldwide, as well as the range of 17 to 61 tons CO_2e/GWh and mid-point of 39 tons CO_2e/GWh for U.S. nuclear plants.

38. DEIS Page 176 states that Spath and Mann (2004) calculated an emission rate of -452 CO_2-eq/GWh for a 60 MW direct-fired boiler using wood waste. The mass units for the emissions are not stated. The Spath and Mann report gives a value of -410 g CO_2e/kWh for a 600 MW biomass direct-fired reference case. Please review and confirm the various values, particularly those used for conversions. (*Commenter: Heinz J. Mueller - EPA*)

Response: The omitted mass units should have been tons CO_2-eq/GWh. This omission has been corrected in the Final EIS.

39. DEIS page 203, Section 7.7, the first sentence appears to be a mistake (the adoption of an alternative strategy has no environmental impacts). All realistic alternative strategies will have some environmental impacts. (*Commenter: Heinz J. Mueller - EPA*)

Response: The Final EIS has been revised to note that the action of adopting an alternative strategy does not result in direct environmental impacts. As stated in the EIS, the subsequent actions taken in implementing the alternative strategies do have environmental impacts, some of which may be adverse.

40. DEIS Table 4-9, page 96, omits some fish consumption advisories. These include the Clinch River portion of Norris Reservoir, Hiwassee River embayment of Chickamauga Reservoir, South Holston Lake, Watauga Lake, Cherokee Lake and Douglas Lake. (*Commenter: Bob Alexander*)

Response: The fish consumption advisory table in the Final EIS has been updated to include the listings from advisories issued in 2010 by Alabama, Georgia, and Tennessee.

41. On DEIS page 186, second paragraph, last sentence, last phrase (after the semicolon) seems to be an incomplete statement. (*Commenter: Heinz J. Mueller - EPA*)

Response: This error has been corrected in the Final EIS.

42. On DEIS page 59, the last part of the last sentence of the first paragraph is separated from the remainder of the sentence by an intervening paragraph. (*Commenter: Heinz J. Mueller - EPA*)

Response: This error has been corrected in the Final EIS.

43. On DEIS page S-13, the table key for this summary table could have defined 'EEDR' as 'Energy Efficiency and Demand Response', as defined in the DEIS Glossary, Acronyms and Abbreviations section. (*Commenter: Heinz J. Mueller - EPA*)

Response: EEDR was previously defined as Energy Efficiency and Demand Response in the EIS summary, and the intent of this table key entry is to describe the model input units. This description has been revised in the Final EIS to include 'Energy Efficiency and Demand Response.'

44. On DEIS pages 158-160, the Table 6-5 and 6-6 headings use 'Fossil Layups' while Table 6-4 uses 'Coal Layups'. Is there an intended difference, such as the layup of natural gas plants in addition to coal plants for Strategies C and E? (*Commenter: Heinz J. Mueller - EPA*)

Response: These headings should all have used 'Coal Layups' in order to better describe the types of plants considered for layups. To better align with industry-standard terminology, the term 'layup' has been replaced with 'idle' in the Final IRP and EIS. TVA has no plans to idle any natural gas units.

45. The DEIS Table of Contents (List of Tables) does not include Tables 6-4 to 6-6. (*Commenter: Heinz J. Mueller - EPA*)

Response: This omission has been corrected in the Final EIS.

46. The scientific name for the pink mucket mussel is given as *Obovaria retusa* — the correct name is *Lampsilis abrupta*. (*Commenter: Gregory Hogue - USDI*)

Response: The text of the Final EIS has been revised to correct this error.

2.7.2. Errors in Draft IRP

47. According to the IRP Executive Summary, page 7, TVA held seven public meetings on the IRP. This is an error as TVA is holding these meetings as I submit these comments on the draft IRP. (*Commenter: Laurence T. Britt*)

Response: The seven public meetings mentioned on Draft IRP Executive Summary page 7 were public scoping meetings held during the summer of 2009. TVA held five public meetings in October 2010 to explain and accept comments on the Draft IRP and EIS.

48. Some figures in the IRP contain errors:

Figure 5-8 - Conversion from raw ranking metric (with units) into a unit-less score. Units are still present in the description of the converted (now unit-less) metric.

Figure 6-9 - Inconsistent X-axis labeling with following figures 6-10, 11, and 12. The values on top of the bars do not match the values on the y-axis, and neither the histogram values nor the values displayed on top add up to the 19 portfolios mentioned in the inset. (*Commenter: William K. Rutemeyer*)

Response: For figure 5-8, the values are unit-less and the reference to units should not have been included. In figures 6-9, 10, 11 and 12, the inset boxes contained the correct summary information, but the histogram graphs were not published correctly. The tables and graphs will be revised and included in Appendix A - Draft IRP Process and Results.

49. Under Alternative Strategy E, the added capacity for biomass-fueled generation is stated as 456 MW in the draft EIS and 410 MW in the draft IRP. Please explain this discrepancy. (*Commenter: Sam Gomberg - SACE*)

Response: The 456 MW stated in the EIS for the 3,500 MW Portfolio for Strategy E is correct. It includes 144 MW of co-firing, 117 MW of dedicated biomass PPA's, 170 MW of dedicated biomass conversions, and 30 MW of landfill gas capacity.

2.7.3. Suggestions for Improvement of EIS and/or IRP

50. Both the IRP and EIS would be improved by adding tables describing model outputs in terms of energy generated or saved by resource type. Both draft documents give model outputs in terms of capacity. Adding the generation data information would help in understanding the environmental impacts and the various evaluation metrics. (*Commenter: Sam Gomberg - SACE*)

Response: Energy generated or saved by resource type is shown graphically in Figure 7.1 of the Draft EIS and Final EIS.

51. Consider adding a table to EIS chapter 6 comparing Strategies B, C, and E (*Commenter: Kim Franklin - USCOE*)

Response: A table comparing Strategies B, C, E, and the newly developed R has been added to Final EIS Section 6.4.

52. DEIS Section 7.3.1, Coal-New Facilities, should include a description of additional air pollutants besides CO_2. (*Commenter: Heinz J. Mueller - EPA*)

Response: Anticipated emission rates of air pollutants other than CO_2 from new coal facilities are listed in Table 7-2.

53. Does the CO_2 emissions value given for IGCC with CCS in DEIS Table 7-2, page 169, represent emissions after CCS or prior to CCS? (*Commenter: Heinz J. Mueller - EPA*)

Response: All of the emissions values presented in the EIS for IGCC are for IGCC with CCS. TVA is not considering constructing IGCC plants without CCS.

54. Draft IRP Section 4.2 lists one of the reasons for excluding resource options from consideration as "The resource option is considered part of what private developers or individuals could elect to do as part of their participation in EEDR programs or their development of renewable resource purchase options for TVA consideration, but is not a resource option TVA would implement on its own." This appears to exclude consideration of the Generation Partners program. Please explain how the Generation Partners program is considered in the IRP. (*Commenter: A. Morton Archibald - ASA*)

Response: The renewable generation that is part of Generation Partners is included in the Renewable Generation portfolios considered in the IRP. See, for example, the discussion of new wind and solar facilities in Section 5.4.3 of the EIS.

55. Draft IRP Section 4.3.3.3 makes no mention of the existing TVA Generation Partners program or the potential for rooftop solar PV generation. The potential for rooftop solar in the TVA region is very large and it would benefit the TVA system by increasing distributed generation and offsetting peak demand. (*Commenter: A. Morton Archibald - ASA*)

Response: Draft IRP Section 4.3.3.3 (Final IRP Section 5.2.3.4) does mention the existing Generation Partners program. Additional solar capacity is an important part of the renewable portfolios considered in the IRP. The 2500 MW portfolio includes 100 MW of solar capacity and the 3500 MW portfolio includes 195 MW of solar capacity. Rooftop solar is anticipated to be a large part of these solar capacities.

56. Draft IRP Section 4.3.5 describes the current EEDR programs. Unlike the other types of options, there is no description of the new EEDR programs that we presume TVA will need to meet the EEDR resource goals. Please describe these new programs. (*Commenter: Tami Freedman - CGSC*)

Response: Multiple individual portfolios of EEDR programs were developed for the five strategies evaluated in the IRP process. These portfolios contained programs under development as well as those only in the design stage. Based on the results of the IRP, TVA will now develop definitive designs and implementation plans to accomplish the goals recommended in the IRP. TVA is contracting with a consultant to develop a comprehensive five-year plan to achieve the energy and demand reduction goals identified in the IRP. When those plans are completed, they will be shared.

57. Draft IRP Section 4.3.5 mentions the importance of proper pricing signals, automatic metering and direct load control. There is, however, no explanation of how these will be implemented. Please provide this explanation. (*Commenter: Andy Gershwiler*)

Response: Changes to pricing structures, deployment of advanced metering, and implementation of direct load control programs that must be closely coordinated with power distributors are currently either under development or in process. After necessary further study and design, TVA and distributors would begin implementation of a new wholesale pricing structure in April 2011, with full implementation in 2012. Automated metering options are currently under study by TVA and power distributors, and TVA is funding demonstrations of several advanced metering technologies and load control methodologies, including direct load control, with a variety of power distributors which will inform the development of consistent metering interface protocols and load control policy in the future.

58. Draft IRP Section 5.5.2.1 and Appendix A do not explicitly display the scenarios, as is done in DEIS Section 7.6. This can cause some confusion, particularly when comparing the CO_2 graphs between the IRP (i.e., Figure A-1) and the DEIS (i.e., 7-6). (*Commenter: Heinz J. Mueller - EPA*)

Response: Although similar, the data presented serves two different purposes. The draft IRP Appendix A graphs contain the average values for all 7 scenarios and represent the values used in the scorecard evaluations of each Strategy. The DEIS broke the emissions down into individual scenarios for the purposes of completing environmental reviews of the impacts produced by each portfolio.

59. In the final EIS, please state the percentage of TVA's generating capacity that would be generated by renewables for each strategy. (*Commenter: Heinz J. Mueller - EPA*)

Response: The Final EIS lists the percentage of generating capacity generated by renewable resources in Section 6.4.

60. On DEIS page 61, the first paragraph under Table 4-5 references 'non-combustion uses of fossil fuels in industrial processes.' It would be useful to provide a parenthetical example of such as use. (*Commenter: Heinz J. Mueller - EPA*)

Response: The text of the Final EIS has been revised to include examples of non-combustion uses of fossil fuels.

61. Please clarify whether the air pollutant emissions forecasts are only direct emissions from sources producing electricity or full life-cycle emissions associated with the production of electricity. We encourage TVA to include significant associated indirect emissions in the emissions forecasts. (*Commenter: Heinz J. Mueller - EPA*)

Response: Emission forecasts for air pollutants other than greenhouse gases are for direct emissions from sources producing electricity.

62. Please provide a better explanation for Draft IRP Figure 3-7, Baseline Capacity Portfolio. Is it one of the portfolios under consideration or the continuation of the present business plan? (*Commenter: Russ Land*)

Response: Draft IRP Figure 3-7 represented the continuation of the business plan in place at the time the draft was written. It is quite similar to the resources described in Strategy B.

63. Please provide more detail on the rationale for eliminating Scenarios 4-6. Scenario 5, and possibly Scenario 4, appear highly likely to occur. (*Commenter: Heinz J. Mueller - EPA*)

Response: The portfolios contained in Scenarios 4, 5 and 6 were either identical to or very similar to the portfolios contained in Scenarios 1, 2, 3 and 7. The eliminated scenarios thus provided little to no additional information useful in the evaluation of the planning strategies. TVA has not made any assumptions about the probabilities of any particular scenario occurring.

64. The discussion of EEDR programs in the Draft IRP briefly mentions TVA's long involvement with DSM programs and summarizes some EEDR program development criteria. It does not provide any data on the effectiveness of the past EEDR programs that would help readers in evaluating which of the current and proposed programs will be most effective in participation and load reduction. Please provide this data. (*Commenter: Tami Freedman - CGSC*)

Response: Over the past thirty-five years, TVA's DSM programs have gone through numerous evolutions to match the changing needs of the TVA system, power distributors, and the consumer market. Analysis of the effectiveness of the programs is not as straightforward as a comparison of past performance. Program objectives, standards, and marketing methods have changed radically over the years to match needs enumerated above. Pertinent information from these past efforts was combined with current market assessments by TVA design teams led by experienced staff familiar with the development and execution of past programs. The focus of the EEDR portfolios in the IRP, however, was what works in the current market to meet future system needs. Past program performance will continue to be assessed as TVA develops a plan to proceed based on the overall results of the IRP process.

65. The draft IRP and EIS do not rely on the same assumptions for environmental compliance requirements. The EIS, for example, makes the assumption that scrubbers will be installed by 2015 and that future thermal plants will use closed-cycle cooling. Neither of these assumptions is stated in the IRP. Given this discrepancy, it is not possible to determine whether the IRP strategies and scenarios include the same assumptions as those described in the EIS. (*Commenter: Frank Rambo - SELC*)

Response: Assumptions for environmental compliance requirements for existing and future resource options are described in greater detail in Chapter 7 of the EIS (Environmental Impacts of Supply-Side Resource Options) than in the IRP. The analyses described in both the IRP and EIS rely on the same assumptions.

66. The final EIS should include tables that list the endangered and threatened species and critical habitats identified as occurring in the TVA region (147 listed species and 31 candidates), the 37 listed species identified as occurring in the immediate vicinity of the reservoir system, and the listed species in streams crossed by transmission lines. (*Commenter: Gregory Hogue - USDI*)

Response: Section 4.10 of the Final EIS includes a list of the 24 listed species occurring on or in the immediate vicinity of TVA generating facilities and transmission lines, and includes

citations to the list of the other species occurring in the immediate vicinity of the reservoir system.

67. The Final IRP (and FEIS) should describe why the particular suite of air pollutants (SO_2, NOx, Hg, and CO_2) was selected to represent air pollution issues associated with power generation, while others, such as particulates and methane, were excluded. (*Commenter: Heinz J. Mueller - EPA*)

Response: The suite of pollutants selected as surrogates for air impacts of the IRP strategies represent the pollutants primarily associated with fossil-fueled power generation and air quality concerns, either directly or as precursors. Criteria pollutants are those where EPA has set National Ambient Air Quality Standards (NAAQS), and by focusing on SO_2 and NOx, the IRP is focusing on achieving those standards. In the Valley, fine particulate (PM2.5) and ozone pollution pose the most serious air quality challenges. These both primarily result from other emissions. Emissions of NOx have a major role in ozone formation and SO_2 and NOx emissions can impact fine particulate levels. By evaluating the effect of IRP strategies on these precursor emissions, conclusions can be reached about the potential effect on ozone and PM2.5 levels. Mercury is an air toxic and has become a major focus of air quality concerns. Emerging regulations are expected to require mercury emission reductions at coal-fired facilities. CO_2 is the most abundant man-made GHG, and the one most publicly associated with climate change concerns, though methane has a higher global warming potential. Direct methane emissions from TVA operations, however, are small and they have lesser overall impact. The data on SO_2, NOx, Hg, and CO_2 emissions allowed TVA to address a number of different potential air quality and climate change effects, and provided a reasonable method for evaluation of the IRP strategies.

68. The IRP Executive Summary states the goal '"to become one of the nation's leading providers of low-cost and cleaner energy by 2020." It then fails to define both low-cost energy and clean energy. Without these definitions, it is impossible to determine whether this goal is met. Please define low-cost energy and clean energy. (*Commenter: Laurence T. Britt*)

Response: While TVA thinks the language of this goal reasonably conveys what it means, TVA has further specified that this goal includes being the nation’s leader in improving air quality, the nation’s leader in increased nuclear generation and the Southeast’s leader in increased energy efficiency.

69. The IRP presents nuclear power as a clean energy source with no greenhouse gas emissions. This is incorrect, as nuclear energy can have significant life cycle GHG emissions. (*Commenter: Garry Morgan*)

Response: Comment noted. Direct and life-cycle GHG emissions from all resource options including nuclear, fossil, and renewable generation sources are described in Final EIS Section 7.3.

70. We recommend that Figure 5-2 in the Final IRP include the impact of a changing climate on TVA's ability to provide low-cost reliable energy into the future. This topic is discussed in the EIS but it is not clear if it is considered in the scenario planning. How, for example, will increasing surface temperature affect summer peak demand? (*Commenter: Heinz J. Mueller - EPA*)

Response: Drawing conclusions on climate impacts on a regional scale is very difficult, owing to uncertainties in forecasting climate as well as forecasting the human and natural resource context in which impacts will be experienced. During the preparation of the IRP, TVA contracted with Electric Power Research Institute (EPRI) to prepare a report 'Potential Impact of Climate Change on Natural Resources in the Tennessee Valley Authority Region'. The study concluded that the near-term impacts of changes in climate that might be realized by 2020 are likely to be modest and within the range of existing adaptive capacity, but the impacts will likely become greater by 2050.

2.8. Electric Vehicles

71. According to the press, TVA is constructing and supporting the construction of charging stations for electric vehicles in East Tennessee. No such support for EVs has been announced in the Memphis area. Please explain why Memphis is apparently not part of this initiative. (*Commenter: Mary Ben Heflin*)

Response: Chattanooga, Knoxville, and Nashville are sites included in The EV Project, a DOE sponsored electric vehicle infrastructure project funded under the American Reinvestment and Recovery Act and managed by ECOtality North America. ECOtality received funding to install electric vehicle (EV) charging infrastructure in five markets across the United States to support the launch of the all-electric Nissan LEAF, and the three Tennessee cities constitute one of these markets. TVA is a partner in this ECOtotality project. Although Memphis is not included in this ECOtotality project, Memphis Light, Gas, and Water is participating with TVA and EPRI on research related to EVs and TVA has held several workshops on EVs with MLGW. Additional meetings and workshops in Memphis are planned in the winter and spring of 2011.

72. Promote the adoption of electric vehicles by investing in EV charging stations. (*Commenters: Nancy Givens - WKU/KSES/BGGP, Daniel Joranko - TAP*)

Response: TVA and the Electric Power Research Institute (EPRI) have designed and constructed a solar-assisted electric vehicle charging station, called the SMART Station (Smart Modal Area Recharge Terminal) and plan on building more as part of a research, demonstration and education effort. TVA recognizes electric vehicle infrastructure as a key focus area and a long-term beneficial technology for the Tennessee Valley.

2.9. Endangered and Threatened Species

73. The alternatives have the potential to affect endangered and threatened species and critical habitats. The DEIS, however, does not specifically describe these effects or contain a Biological Assessment of these effects. TVA should consider a programmatic consultation with the Fish and Wildlife Service or describe in greater detail when and how future programmatic and project-specific consultations will occur. (*Commenter: Gregory Hogue - USDI*)

Response: As noted in Final EIS Section 7.2 and elsewhere, TVA will conduct comprehensive assessments of the environmental impacts of proposed action to implement the IRP. These assessments will include evaluation of the potential effects to endangered and threatened species and critical habitats. TVA will, as necessary, consult with the U.S. Fish and Wildlife Service on these potential effects.

2.10. Energy Efficiency and Demand Response

2.10.1. Amount of EEDR Reductions

74. Adopt a plan that makes the Valley a national leader in energy efficiency by committing to a goal of at least 1% annual reductions in energy demand by 2015. Developing EEDR resources will create jobs, strengthen local economies and create a clean, healthier environment for all Valley residents. (*Commenters: Julia Aepping [sic], Lisa Archer, Donald L. Audley [sic], Kris B. [sic], M. Balangen [sic], April Bart, Margie Buxbaum, Dave Bordenkircher, Paul Boring, Deanna Bowden, Jenny Bowers, M. Boyd, Nancy Brannon, Harry E. Bryant, Jessica Buchanan, Paula Bunanek [sic], Melissa A. Burt, Kelvin Butler, Laura C. [sic], Lisa C. [sic], Jason Campbell, Teresa Campbell, Bruce Chicre [sic], James S. Collins, A. M. Conisin [sic], Cliff Corker, Josh M. Cox [sic], Thomas V. Cullen, Lori Curt [sic], H. Dwayne Cutshoul, Lacy Damiles [sic], Erika Davidson, Marge Davis, Roeyn Davis [sic], Courtney Day, I. Drelsecn [sic], Whodong Ebechnop [sic], Patricia Eleand [sic], R. Wray Estes, Peggy Evans, Douglas Felker, Melanie Felker, Heather Finolti, Sarah E. Flower, Vita French, Katherine Gamt [sic], Heather Gapsby [sic], Elizabeth C. Garber, Elizabeth Gazaway [sic], Joel Gearhardt, Danielle Gerhard, Kathy S. Gleeland [sic], Tony Gorton, Karen Gulk [sic], Ava Gunter, Mary Alan Guy [sic], Steven H. [sic], Meredith Hayes, Larry Hendrix, Kristen Hickey, R.M. Hill, Jessica Hill, Chloe Hirst, Steven R. Horton, Katherine Huddleton [sic], Jaun K. Hudson [sic], Lauren Hulson [sic], Cee J. [sic], Rofail H. Jenu, [sic], C. Johnson, Ivan Juny [sic], Barbara Kelly, Chrys Kemp [sic], Sara Keubbing [sic], J. Kewisn [sic], P. Kneuman [sic], Scott Kramer, David Brent Kulovich, Sandra Kurtz, William Kurtz, S. Kurtz, R.C. Last, Gloria Lathem-Griffith - MEC, John M. [sic], Julia Mangrin, Annie Mattson [sic], Nancy McFadden, Ralph McKenzie, Laura K. McKenzie, Paula McLen [sic], Rebecca Meade, Michael Miller [sic], Barbara Mott, Catherine Munay, Lauren N., J. N., Marissa N. [sic], Margaret F. Olson [sic], Janet Osborn, Linda Park, Jon Parker [sic], Erwin Peritt [sic], Kotel Perry, Zaria Person [sic], Norm Plate, Sara F. Plemons, Jennifer Porter, John F. Post, Patricia Post, Keith Rainy [sic], William Reynolds , Arnold C. Ringe [sic], Madeline Rogers, Mercedes Rodriguez, Phillip Roll [sic], Ruth F. Rothe, Kathy S., Tanya S. [sic], Grace Safer, Melinda Sanede [sic], Don Scharf, Feris J. Schlery, Cody Semabayl [sic], Judy Sheffield, Madeline Shelly, V.C. Shriever [sic], Roxanna Shohadaee [sic], Michelle Smith, Jamie K. Stand [sic], Karl Stirs [sic], Carolyn N. Stokes, Henry Stokes, A. Suny [sic], Lauren Szoech, Karen T. [sic], Bill Terry [sic], Andy Todd, Nancy G. Van Vallanburgh, Dorthy W., Jan H. Watson [sic], Mona Whitehead, Dean Whitworth, Paul Wieland, Debbie Williams, R.T. Williams, Sue A. & Steven M. Williams, Adelle Wood, Linda W. Woodcock, Kevin Woods, J. Y. [sic], Edward Zuger III – CCSC)*

Response: Based on estimates of realistic achievable potential using various market participation rates and program delivery mechanisms, TVA examined a range of energy efficiency and demand response portfolios in the IRP process. The EEDR portfolio included in the Recommended Planning Direction is designed to achieve a minimum savings of 3.5 percent by 2015.

75. Adopt a plan that makes the Valley a national leader in energy efficiency by committing to a goal of at least 1.5% annual reductions in energy demand by 2020. Developing EEDR resources will create jobs, strengthen local economies and create a clean, healthier environment for all Valley residents. (*Commenters: Margie Buxbaum, Gloria Lathem-Griffith - MEC, Linda Park, William Reynolds , Don Scharf, Sue A. & Steven M. Williams, Edward Zuger - CCSC III*)

Response: The EEDR portfolio included in the Recommended Planning Direction is designed to achieve a minimum savings of 3.5 percent by 2015. TVA will continue to refine this portfolio and additional savings between 2015 and 2020, when the peak load impact from EEDR is anticipated to be approximately 3,600 MW (see Final IRP Figure 8-14 and Final EIS Table 6.9).

76. Although not stated in the draft IRP or EIS, we are aware from discussions with the Stakeholder Review Group that TVA relied on a March 2010 Electric Power Research Institute (EPRI) report on energy efficiency potential to determine the maximum 7% cumulative energy reduction incorporated in the strategies. The conclusions of this report are overly conservative and contradicted by other studies of the energy efficiency potential in the Southeast. Based on the results of the other studies, we recommend that TVA include annual energy efficiency contributions of at least 1%/year throughout the planning period. (*Commenter: Sam Gomberg - SACE*)

Response: Comment noted. TVA considered the EPRI 'potential' study, but it was not solely used to set the bounds of the EEDR plans included in the IRP study. The EPRI study was an informational checkpoint and formed the basis for the EEDR plan included in Strategy D of the IRP study. It did not, however, limit the EEDR impact levels of the other Strategies. EEDR plans were based on estimates of overall impacts, costs, and participation levels in utility-sponsored programs. TVA did consider other EEDR studies, including specific studies called to its attention in comments. TVA contacted authors of some of the studies, but was unable to segregate the effects of policies, codes, and standards in their estimates. TVA is undertaking another potential study to supplement the work done by EPRI, and it is anticipated that this study will expressly address other relevant studies. This study is expected to be completed by early summer 2011. In future IRP updates, the results of this and other studies will be considered, and TVA anticipates revising EEDR goals in response to these studies and as it gains experience with the success of EEDR programs on its system.

77. By super-insulating our 1970s era homes and installing solar hot water systems, ground source heat pumps, and other super-efficient appliances, we have been able to drastically reduce our power bills. Our actions show that reductions in energy use by more than half are readily achievable by homeowners at modest cost with current technology. We urge TVA to maximize its energy efficiency efforts. The ongoing collaborative work by TVA and Oak Ridge National Laboratory also illustrates the large reductions in energy use achievable in new houses at modest costs. (*Commenters: Jeff Christian - ORNL, Richard & Marian Taschler, Kenneth Wilson*)

Response: TVA acknowledges that significant energy savings can be achieved by implementing multiple energy efficiency measures and TVA has programs promoting this. The EEDR component of the various strategies is designed to implement cost-effective energy efficiency and demand response across the TVA service territory. The EEDR programs include providing information and support to a broad range of potential participants from those who need basic information on how to make elementary improvements to the efficiency of their homes to those who wish to implement multiple advanced improvements to achieve large reductions in their use of electricity.

78. Shelby County, the City of Memphis, and the City of Nashville have all passed resolutions requesting TVA to increase its energy efficiency load reductions by 1% annually

for the next five years. We urge you to achieve at least this level of load reductions. (*Commenters: Kevin Routan - CGSC, Steven Sandheim - SC/TSVC*)

Response: TVA appreciates the support shown by these government bodies and looks forward to their continued support of our energy efficiency and demand response efforts. The EEDR component of the recommended strategy is designed to achieve 3.5% savings over projected sales by FY 2015.

79. The draft IRP and EIS do not describe the results of any study of the energy efficiency potential in the TVA region. Instead, they provide a cursory listing of current and future programs and their environmental impacts. In the absence of such studies, it appears that TVA is underestimating the achievable energy efficiency. TVA must conduct a study of energy efficiency potential and report its results. (*Commenters: Lanny Night, Frank Rambo - SELC*)

Response: TVA developed a range of EEDR portfolios for evaluation in the IRP process. In addition, a study of EEDR potential was done, not to serve as the basis for the portfolios, but as a check of the upper bounds of the estimated energy and demand reductions. The study validated the range of portfolios developed. The intent of the range of portfolios was to identify the performance of various levels of impacts across the range of potential future scenarios. A key consideration of the portfolios developed was their ability to deliver cost-effective efficiency impacts while providing a least cost resource for the power system under a variety of assumed future parameters. TVA plans to conduct new EEDR potential studies to support the development of future EEDR portfolios and implementation plans.

80. The energy efficiency programs in most strategies do not include any increases in energy efficiency beyond 2020. This artificial constraint limits their potential and results in an artificially large capacity gap and a premature commitment to completing Bellefonte Unit One. Other utilities have forecast and achieved longer term EEDR growth. (*Commenters: Sam Gomberg - SACE, Louise Gorenflo - TCSC*)

Response: The leveling off of the growth in EEDR impacts is the result of a focus on existing efficiency technologies and the constraints of finite markets assumed in the IRP strategies. This effect has been noted and will be addressed in future IRP updates. TVA does not anticipate limiting itself to the EEDR programs currently available and expects to revise and add EEDR programs throughout the 20-year planning period. In sensitivity analyses conducted after release of the Draft IRP and EIS, TVA evaluated higher levels of EEDR in order to test the need for future baseload capacity, which could be provided by various resources, including Bellefonte Unit 1. While the timing of additional baseload capacity varied based on the EEDR assumptions, it was not eliminated.

81. The IRP analyses show that TVA can meet most of the increase in energy demand with EEDR. By greatly increasing energy efficiency efforts, TVA would reduce the future environmental impacts resulting from burning coal and from nuclear energy. These energy sources create long-lasting coal ash, nuclear waste, and other pollutants. The biota of the region's rivers suffer from their heat discharges. The protection of our natural resources is affordable and necessary and TVA needs to be a national leader in this protection effort. (*Commenters: Louise Gorenflo - TCSC, Sandra Kurtz - BEST, Nancy McFadden, Gary Verst - SC, Jon Wolfe*)

Response: The amount of new resources identified in the IRP study depends on the particular scenario being considered and any assumptions about resources already available to TVA in each of the planning strategies being evaluated. In low or no growth scenarios, the study indicates that no major additional resources beyond the EEDR and renewable resource portfolios included in certain strategies and resources already under construction would be required. Results for other scenarios indicate that resources in addition to EEDR are required to make up the least cost plan and maintain the appropriate level of system reliability. The Recommended Planning Strategy includes a commitment to a substantial portfolio of EEDR in addition to other clean energy resources, and TVA has committed to continuing to evaluate the performance of EEDR and refine its planning assumptions in keeping with the results of actual experience with program delivery.

82. The projected 7 percent cumulative energy reduction through 2029 under the most aggressive Strategy E, with almost no energy savings between 2020 and 2030, does not address the full potential for the development of EEDR resources. The TVA region is presently among the least energy efficient areas in the nation. Studies by Georgia Tech and Synapse Energy Economics show a much greater potential than TVA seems willing to consider. Similarly, the experience of other utilities and the EEDR industry show that measures by the government, institutional, and commercial sectors can deliver much larger energy savings. (*Commenters: Chris Christie, Abigail Dillen - Earthjustice, Donald Gilligan - NAESC*)

Response: Comment noted. The leveling off of the growth in EEDR reductions is the result of a focus on existing efficiency technologies and the constraints of finite markets assumed in the IRP strategies. This effect has been noted and will be addressed in future IRPs. The end result will likely reflect more consistent continued growth in EEDR reductions through time. As for comparison of the EEDR portfolios with other potential studies, it should be noted that other studies address the effects of changes in policies, codes, and standards not included in the EEDR portfolios in the various IRP Strategies. TVA is continuing to examine new program opportunities and the mix of energy and demand reduction potentials to achieve increases in cost-effective results from program designs.

83. The strategies in the draft IRP contain from 1,400 to 6,000 MW of capacity avoidance through energy efficiency and demand response. These levels appear to have been chosen without adequate input from the local power distributors. Unlike many other utilities, TVA is not fully integrated and is dependent on the distributors for the interface with most customers. Without the involvement of the distributors, TVA's potential for EEDR savings is very limited. (*Commenter: George B. Kitchens - JWEMC*)

Response: Comment noted. TVA agrees that because TVA is primarily a wholesaler of electricity, the success of EEDR programs will require the cooperation of local distributors. TVA's approach to the development of the EEDR portfolios included in the IRP strategies involved construction of multiple detailed program designs. This 'ground up' approach enabled the analyses of individual components as well as the overall portfolios. TVA worked with the Tennessee Valley Public Power Association (TVPPA) Energy Services Committee and individual distributors in the design of these programs as well as the test marketing of some designs. The results of the market tests and the input of distributors and others were incorporated into the EEDR projections assessed in the IRP. TVA staff also relied on the historical performance of existing and past programs to estimate distributor participation levels and end-use consumer potential. All program estimates were

constructed with the assumption that actual program design and implementation would be done in cooperation with local distributors and directly served customers.

84. TVA can quickly achieve much greater energy efficiency by drawing on the experience and expertise of other utilities and commercial energy efficiency program managers. In this manner, TVA can address the challenges of program design and implementation. (*Commenter: Gilligan - NAESC*)

Response: TVA agrees. TVA plans to use consultants to identify best-in-class performance of energy efficiency and demand response efforts throughout the utility industry. Those ideas and lessons learned will be adapted to the unique climate, demographics, and delivery structure of the TVA region and incorporated into the design considerations of the EEDR portfolio going forward.

85. TVA should adopt a comprehensive energy conservation and efficiency program. (*Commenter: Louise A. Zeller - BREDL*)

Response: Comment noted.

86. TVA should commit to achieving a level of energy efficiency equivalent to that of California, the Northeastern U.S., and Western Europe by 2015. As an example, the average residential home would consume no more than 500 kWh per month and would be 33% better insulated. (*Commenters: Jeff Deal, James Randolph*)

Response: The market in the TVA region does not mirror those of California, the Northeastern U.S., or Western Europe nor do those markets reflect the bifurcation of energy delivery that exists in the TVA region with TVA and its distributors. TVA has developed the various EEDR portfolios to implement a broad range of cost-effective energy efficiency and demand response efforts. In the more detailed design process necessary for implementation, TVA is working with a consultant to perform additional assessments of the potential for energy efficiency and demand response in the Valley.

87. TVA should take full advantage of all cost-effective energy efficiency by setting annual energy (GWh and MMTherm) and demand (MW) savings targets based on rigorous analyses of the achievable cost-effective potential and committing to aggressively ramp up programs well beyond the August 2010 commitment. (*Commenter: Luis Martinez - NRDC*)

Response: Comment noted. As described in the IRP, TVA is committing to increased reliance on cost-effective EEDR to meet future energy demands. As experience with the success of specific EEDR programs is gained, TVA anticipates changing its EEDR goals and will address proposed changes in its annual planning cycles and future IRPs. TVA anticipates that changes in goals and programs themselves will not necessarily be limited by the portfolios developed for the IRP analyses and will include designs beyond those contained in the IRP strategies.

88. TVA's modeling efforts artificially limit the amount of energy efficiency included in the portfolios. TVA should model energy efficiency as a resource equal to other potential resources it may deploy to meet demand. The constraints on energy efficiency deployment prevent all of the cost-effective energy efficiency to be utilized in the portfolios. (*Commenters: Sam Gomberg - SACE, Luis Martinez - NRDC, Frank Rambo - SELC*)

Response: As described in the IRP and EIS, the initial modeling used defined amounts of energy and peak demand reductions which spanned an approximate three-fold range across the various strategies. In the modeling conducted following the release of the Draft IRP and EIS (see IRP Section 6.6), the model was allowed to choose various levels of energy and peak demand reductions that spanned most of the previously used three-fold range. As expected from the financial analyses, the higher levels of EEDR implementation provided the lowest cost options. When all of the metrics were considered, modeling results showed little difference between the mid-level and larger EEDR portfolios (see IRP Section 8.2.3). Because of the uncertainties in customer participation and TVA's ability to implement the larger portfolio, the Recommended Planning Direction includes the mid-level EEDR portfolio.

89. We support the plan's emphasis on energy efficiency and demand response and encourage you to aggressively pursue energy efficiency for the residential, commercial, and industrial classes of customers. Industrial efficiency improvements are an important factor in maintaining the region's manufacturing base as energy prices increase. (*Commenter: Leonard K. Peters - KEEC*)

Response: Comment noted. As described in the plan and EIS, TVA has developed, and will continue to develop, programs to increase the energy efficiency of all classes of customers.

90. We support the TVA Board's August 2010 decision to be the Southeastern leader in energy efficiency. To do this will require energy efficiency saving exceeding 1%/year through 2016. Under the most aggressive portfolio, Strategy E, the annual energy efficiency target is 0.7%. The energy efficiency portfolios in the IRP need to be increased beyond the 0.7%/year to meet TVA's new goal, and should continue to increase throughout the planning period. (*Commenters: Louise Gorenflo - TCSC, Sandra Kurtz - BEST*)

Response: The EEDR evaluation in the IRP includes portfolios with cumulative reductions amounting to 3.5% of projected sales in 2015, which matches TVA's renewed vision to demonstrate leadership in increased energy efficiency in the Southeast. This requires TVA to increase its EEDR efforts significantly between now and 2015. TVA will continue to analyze the needs of the TVA system to determine appropriate levels of EEDR beyond achievement of this near-term 2015 goal.

91. What were the energy efficiency and demand response goals (in MW/MWh reductions) that TVA committed to in Energy Vision 2020 and what EEDR reductions were actually achieved prior to TVA's recent reemphasis of EEDR? (*Commenter: Lanny Night*)

Response: The programs outlined in Energy Vision 2020 were projected to have the potential to achieve approximately 2,000 MW of demand reduction by 2010. By 2008, when TVA greatly increased its emphasis on energy efficiency and demand reduction, an estimated 550 MW of demand reduction had been achieved.

92. While we are strong supporters of EEDR, we are concerned that Strategies C and E may be unrealistically aggressive in demand and energy reduction. Each of these strategies reflect demand reductions greater than the total load of the City of Memphis. The draft IRP did not sufficiently address why TVA believes this level of EEDR is realistic, especially since many distributors do not have smart metering in place now nor are they projected to have it in the foreseeable future. Given this situation, we believe the EEDR level in Strategy B is more realistic. (*Commenter: Dana Jeanes - MLGW*)

Response: This comment highlights the substantial uncertainties associated with the actual results of EEDR programs. Largely because of these uncertainties, TVA anticipates revising its EEDR program goals incrementally as experience is gained through the actual implementation of programs. If programs prove more successful or less successful than expected, changes can be considered in future IRP updates. Respecting the specific concerns identified in this comment, while an advanced metering infrastructure is anticipated to be a significant enabler of both the demand reduction and energy efficiency programs embedded in the IRP strategies, it is not essential to the achievement of the majority of the EEDR savings. For example, most of the demand reduction projected in Strategy C results from energy efficiency initiatives in the residential, commercial, and industrial sectors. Much of the anticipated demand reduction from programs categorized as demand response, such as commercial and industrial demand response managed by a third party and voltage regulation (see EIS Section 3.5), is not dependent on advanced metering. Other demand response efforts, such as direct load control, are designed to be closely tied to advance metering, but can be deployed using other methods. Planning for EEDR program implementation will continue to be tied to the actual deployment of advance metering infrastructure within the TVA region. While the speed of advanced metering infrastructure deployment could impact the achievement of some projected EEDR savings, it should not significantly affect the achievement of overall potential energy and demand savings from EEDR efforts.

2.10.2. Behavior-based Programs

93. Encourage participation by distributors in behavior-based EEDR programs by establishing performance incentives that reward distributors for meeting or exceeding energy efficiency targets. Performance incentives are used by state utility commissions to encourage investor-owned utilities to promote customer energy efficiency and provide models for TVA to encourage its distributors to promote energy efficiency. (*Commenter: Jim Kapsis - OPower*)

Response: TVA is examining the most effective methods of addressing power distributor needs and considerations in implementing EEDR programs. This includes behavior-based programs.

94. The TVA EEDR portfolio should include behavior-based programs that motivate consumers to reduce their energy use by comparing their energy use with the energy use of similar neighbors. Experience elsewhere shows these programs deliver measureable and verifiable energy savings at relatively low-cost, have high participation rates, maximize the value of other EEDR programs, and reduce the rebound effect common with some other EEDR programs. (*Commenter: Jim Kapsis - OPower*)

Response: Comment noted. As described in the response to Comment 93, TVA will consider the use of behavior-based programs at the implementation stage.

2.10.3. Building Codes

95. TVA should aggressively promote the establishment of building standards and codes that require new construction and retrofits to meet LEED or passive home standards. (*Commenter: Nancy Givens - WKU/KSES/BGGP*)

Response: TVA acknowledges the effectiveness of enhanced building codes and standards as well as elevated equipment performance standards. The consideration of enhanced building codes, including how TVA can support their creation and enforcement, is an important component in TVA's development of the comprehensive portfolios of EEDR programs to achieve the goals in the IRP strategies. While not a provider or enforcer of codes, TVA will seek opportunities to play a role through measures such as provision of data, education outreach, and incentives.

2.10.4. Cost of EEDR Programs

96. The experience of other states and utilities has shown that investments in energy efficiency and demand response often result in a very high rate of return. TVA's funding for EEDR has been insufficient and should be greatly increased. (*Commenter: Stewart Horn*)

Response: The strategic direction recommended in the IRP supports a significant increase in TVA's EEDR efforts. Specific design of the programs to implement the EEDR portfolio will focus on delivering energy efficiency at the needed levels while managing costs to maintain a positive cost/benefit relationship.

97. While I support energy efficiency programs, I am opposed to compulsory payments by ratepayers to fund them. TVA should provide industrial customers with the ability to opt out of paying for them. (*Commenter: William Cummings - KCC*)

Response: Part of the outcome of the IRP process was that the inclusion of significant levels of EEDR in strategies produced the least cost alternatives over a variety of future scenarios. Recognition of the relationship between costs and benefits for all customer classes is a consideration in the design of plans to implement the EEDR portfolio contained in the Recommended Planning Direction strategy.

2.10.5. Education

98. Education should be a major component of TVA's energy conservation efforts. Target audiences include homeowners, businesses, and government agencies. Many organizations have materials that could help TVA's education efforts. (*Commenters: A. Morton Archibald - ASA, Ann Ercelawn, Kevin Routan - CGSC, Danville and Beverly Sweeton, Scott Wills*)

Response: TVA agrees with the major role education plays in the effective deployment of EEDR. TVA currently has a range of efforts underway to develop and deliver information to all segments of the consumer population (see EIS Section 3.5). In addition, TVA will continue to broaden and enhance its EEDR education efforts through a variety of avenues such as printed materials, online resources, and advertising.

2.10.6. EEDR Leadership

99. Tennessee and other TVA states rank among the lowest states in the United States in energy conservation efforts. Energy awareness is low and examples of energy waste are abundant. TVA should lead efforts to increase energy conservation through aggressive education and marketing. (*Commenters: Mary H. Clarke - TCV, Donald Gilligan - NAESC, Bruce Wood - BURNT*)

Response: Comment noted. TVA recognizes that the potential for increased energy conservation in the TVA region is high and consumer education and marketing are very important components of its EEDR programs.

100. TVA should take the lead in making Tennessee one of the most productive states in the United States. The United States uses twice as much energy to produce a dollar of goods as Europe and Japan, which puts the United States at a competitive disadvantage. Increasing productivity through energy efficiency would make the region more globally competitive and reduce total electricity demand by as much as 34%. (*Commenter: Courtney Piper - TBLCEE*)

Response: TVA currently offers information, advice, and incentives through its EEDR programs for commercial and industrial consumers and will further refine these efforts and develop additional designs as it implements the recommended IRPstrategy. In addition, TVA supports improvements in energy efficiency and productivity through its economic development efforts such as the Valley Investment Initiative. While we have no data to quantify the suggested 34% reduction, program designs for the commercial and industrial sectors strive to maximize cost-effective energy efficiency improvements and support growth of existing Valley industries and development of new ones to maintain a healthy economic environment.

101. We applaud TVA's August 2010 commitment to become the leader in energy efficiency in the Southeast. TVA should lead the region in implementing energy efficiency. Meeting this goal will require a significant increase in energy efficiency programs and infrastructure. Numerous studies have shown that energy efficiency is the cheapest energy resource, both in terms of direct costs and avoided health and environmental costs of other alternatives. Energy efficiency is the cheapest and fastest way to cut pollution while reducing price volatility, hedging against financial risks, increasing customer satisfaction, improving economic productivity, keeping energy dollars local, and creating jobs. (*Commenter: Luis Martinez - NRDC*)

Response: Comment noted.

2.10.7. Financial Incentives

102. TVA should establish loan programs to encourage homeowners and businesses to make energy efficiency upgrades. Loans could be from TVA or through third-party lenders to assure easily accessible sources of low-cost financing. Repayment options would be based on energy savings and could be extended to allow for direct reimbursements to third party lenders by TVA. (*Commenters: A. Morton Archibald - ASA, Courtney Piper - TBLCEE, Danville and Beverly Sweeton*)

Response: Over the last 35 years, TVA has at various times provided loans for energy efficiency upgrades by both residential and commercial consumers. Initially, TVA was the provider of the loan funds, but several years ago realized the advantages of relying on loan professionals to fund and manage the process. Since that time, TVA has engaged third-party banking partners for these functions. In partnership with local power distributors, TVA continues to offer a financing option for participants in the residential heat pump program. The commercial loan program was discontinued several years ago and recent research with commercial and industrial consumers indicated that providing loans was a low priority for that customer segment. Loans will continue to be a tool considered in the design of

future EEDR programs and may be added or expanded based on the identification of need by the particular market sector.

103. TVA should expand its partnerships with state and municipal governments to provide grants for energy efficiency improvements and retrofitting of homes, businesses, and public buildings. (*Commenter: Daniel Joranko - TAP*)

Response: TVA continues to seek willing partners in the government sector to leverage their unique resources and skills. In the last few months, TVA has partnered with state agencies to leverage funding provided by the American Reinvestment and Recovery Act and assist in the delivery of weatherization assistance and rebates for high-efficiency appliances. In addition, TVA has partnered with the state of Tennessee to establish a revolving loan fund through a third-party administrator and is seeking opportunities to expand this effort to other states. These opportunities to leverage resources and skill sets will continue to be important considerations as TVA implements the EEDR portfolio identified in the IRP Recommended Planning Strategy.

104. TVA's support for energy efficiency and demand response has varied greatly over the last 30 years. I am pleased to see that TVA is again promoting EEDR, and TVA should make a long-term commitment to it. The $1,500 Federal tax credit for homeowner energy conservation efforts is scheduled to expire at the end of 2010. If it does expire, TVA should commit to providing the same level of incentives for its customers. (*Commenter: Chris Pamplin*)

Response: The anticipated end of the Federal tax credit created a surge in program participation at the end of 2010, and TVA is working to carry that momentum forward with the recent last-minute extension of the credit. In designing EEDR programs, TVA seeks to create a positive cost/benefit relationship for participants when all aspects of the financial decision are taken into account, including tax credits and subsidies. The overall financial design, however, must also provide the EEDR system impacts on cost-effective basis. Program incentive levels are developed on a program-by-program basis by taking all financial parameters into consideration.

2.10.8. Homeowner Incentives

105. Expand the In-Home Energy Evaluation Program and extend it beyond October, 2010. (*Commenter: Courtney Piper - TBLCEE*)

Response: Part of implementing the recommended IRP strategy includes a thorough assessment of existing programs like the In-Home Energy Evaluation (IHEE) with the intent of identifying opportunities for improvement and expansion. The IHEE program has been well received and almost 17,000 evaluations have been conducted to date. TVA has extended the IHEE program in its current form pending completion of this assessment.

106. Increase support for improving the energy efficiency of the homes of middle-income customers and not just the economically disadvantaged. (*Commenter: Nelson Lingle - RSI, Joanne Logan*)

Response: TVA strives to design all EEDR efforts to provide participation opportunities on a non-discriminatory basis to all Valley consumers. Program portfolios are developed to offer program benefits to all market sectors such as residential, commercial, and industrial

without regard to income levels or size. Consideration is given to ensure that participation does not present significant hardship to any given socioeconomic segment or demographic.

107. The EEDR portfolio described in the draft IRP and EIS does not include support for solar water heating and solar space heating. Both of these technologies can be more economical for homeowners, and in some cases businesses, than solar PV. (*Commenters: Nancy Givens - WKU/KSES/BGGP*)

Response: TVA's development of the EEDR program portfolio to implement the recommended IRP strategy will include an assessment of a wide variety of technologies. If solar water heating and space heating are shown to be cost-effective program options, they may be included in the portfolio. TVA's Generation Partners program already encourages use of solar and other renewables.

108. TVA incentives to improve homeowner's energy efficiency should include the following: (1) incentives for energy efficient appliances; (2) incentives for energy efficient light bulbs, including LED bulbs; and (3) incentives for water heater blankets. TVA should consider including coupons for these incentives that are put into monthly bills. (*Commenter: Margie Buxbaum*)

Response: TVA current energy efficiency programs include these technologies through the weatherization assistance program and energy efficient appliance programs in Tennessee and the distribution of free CFLs in its In-Home Energy Evaluation and Self-Audit programs. TVA anticipates that these technologies will continue to be components of its future EEDR program portfolio.

109. TVA used to provide energy efficient home designs and other information on building super-efficient homes. Please restore this service. (*Commenters: Melanie Felker, Sue A. & Steven M. Williams*)

Response: TVA is working with a variety of partners, such as the Department of Energy, to identify and provide information resources for energy consumers such as designs for near zero energy and other high efficiency homes. TVA recognizes that education efforts that include providing this information on home design and state-of-the-art building techniques and materials is an important potential component of its EEDR portfolio.

2.10.9. Innovation

110. We urge TVA to continually monitor the marketplace and quickly adopt breakthrough technologies to improve energy efficiency. Examples are magnetic induction lamps and wafer LED lighting. TVA should also participate in the research and development of breakthrough EE technologies. (*Commenter: Courtney Piper - TBLCEE*)

Response: TVA's partnership with the Electric Power Research Institute (EPRI) affords access to their research into cutting edge technologies and opportunities for participation in demonstrations and testing in both laboratory settings and field deployments. In addition, TVA participates in numerous organizations and services such as the Consortium for Energy Efficiency, Association of Energy Services Professionals, and E Source that gather and share information on energy efficiency efforts and research around the world. As TVA develops plans to implement the EEDR portfolio in the recommended IRP strategy, it will

lean heavily on these resources to create new programs and improve implemented programs on an ongoing basis.

2.10.10. Lighting

111. Require customers to install outdoor lights that shut off in twilight times. (*Commenter: Ernest Smith*)

Response: TVA's primary approach to energy efficiency is to provide information, advice, incentives, and marketplace promotion rather than mandated requirements. These methods have been successful in the past, and as a wholesale provider of electricity to power distributors who serve the majority of consumers in the Valley, TVA does not dictate end-use policies outside the scope of safety and system integrity. TVA is, however, striving to identify all cost-effective efficiency opportunities and create programs to deliver energy savings beneficial to consumers and rate-payers across the Valley.

2.10.11. Rental Property Incentives

112. My family income is close to the poverty line and we rent an old house with poor energy efficiency. Our power bill is a significant portion of our income. While you have numerous energy efficiency programs focused on homeowners, you offer little that helps a renter. I urge you to consider programs targeting renters such as on-meter financing. (*Commenter: Dana Beasley Brown*)

Response: Promotion of energy efficiency among landlords has been a perennial challenge for all utilities, and it is one of the topics TVA is considering for implementation of the EEDR portfolio in the recommended IRP strategy. One approach under consideration is the creation of a home energy efficiency scorecard that would inform homebuyers and renters of the projected energy usage for homes and apartments similar to the EPA Energy Guide labels on appliances and mileage ratings on cars. This approach would encourage builders, homeowners, and landlords to improve the performance of their properties to make them more competitive in the marketplace. TVA is also considering alternatives for direct support of improvements to the extent possible by tenants such as basic weatherization. Weatherization assistance is currently available through TVA's online energy audit available at www.energyright.com which helps consumers identify improvement opportunities and supplies a free energy savings kit.

2.10.12. Roofing

113. TVA's EEDR programs should support the use of energy-conserving roofing such as Ultra Cool metal roofing. Advanced roofing systems such as this can also be successfully integrated with solar PV and solar thermal systems. (*Commenter: Gerard Heininger - EI*)

Response: TVA is assessing a broad range of technologies and delivery mechanisms for the implementation of the EEDR portfolio in the recommended IRP strategy. Technologies such as energy-conserving roofing, if they provide positive cost/benefit impacts for consumers and can be delivered through cost-effective utility program designs, would be considered for inclusion in the plan.

2.10.13. Weatherization Assistance

114. TVA should increase its weatherization assistance for homes and small businesses. Inadequate weatherization is a major contributor to the TVA region's poor ranking in home energy use. A focus of this assistance should be on low-income households. We applaud TVA's recent assistance with the Recovery and Reinvestment Act-funded state weatherization assistance programs and urge TVA to make weatherization assistance for low-income households a long-term priority. (*Commenters: Lisa Archer, Margie Buxbaum, Jason Campbell, Gloria Lathem-Griffith - MEC, Linda Park, Grace Safer, Don Scharf, Sue A. & Steven M. Williams*)

Response: TVA expects to continue its support of weatherization assistance efforts with state and local governments, which provide the opportunity to leverage available funds in a very cost-effective manner. In addition, TVA is examining the expansion of the weatherization efforts contained in the current In-Home Energy Evaluation, Self Audit, and Heat Pump programs for residential consumers and the Energy Right Solutions for Business program for commercial and industrial consumers.

2.11. Energy Storage

2.11.1. Need for More Energy Storage

115. Add Energy Storage to Strategy E. With its high level of intermittent renewable generation, the performance of Strategy E would be greatly improved with more energy storage, such as pumped hydro. (*Commenters: Nelson Buck, Michael J. Crosby - TEC/BCAAT, Garry Morgan, Don Safer - TEC*)

Response: Additional energy storage has been included in all strategies considered in the final IRP and EIS, except for the Baseline Plan Resource Portfolio.

2.11.2. Pumped Hydro Energy Storage

116. During the public presentations on the draft IRP and EIS, TVA mentioned plans for improving the efficiency of pumped storage facilities. Please describe these efficiency improvements. (*Commenter: Russ Land*)

Response: TVA has completed the modernization of its Raccoon Mountain Pumped Storage Plant, which included the installation of more efficient turbines and new generator stators as well as a variety of other mechanical and electrical equipment upgrades. Several of the alternative strategies considered in the IRP and EIS, including the Recommended Planning Direction strategy, include the construction and operation of a new pumped storage facility. TVA has begun feasibility studies of this facility, which will include additional engineering studies for improving the system design beyond the current state of the art.

117. TVA has an opportunity to greatly increase its pumped storage capacity by rebuilding or replacing generators at its 9 main river dams to give them pumping ability. This could add 8,000 MW of capacity. At Guntersville Dam, for example, turbines with pumping ability and modifications to about 5 miles of the downstream channel could add about 2,000 MW of energy. This would affect the water levels in Guntersville and Wheeler Reservoirs by about 1 foot. If all 9 main river dams were given pump storage ability, it would provide enough storage for several weeks of TVA demand without significant problems. It would also provide critical national peak load improvements needed for integrating intermittent

wind and solar generation. The operation of Raccoon Mountain pumped storage plant could be more effective if coordinated with operation of Nickajack Dam pumped storage. The disruption to system flows would be trivial if not unnoticed. (*Commenter: Paul Noel - NEC*)

Response: The operation of Raccoon Mountain Pumped Storage Plant has always been closely coordinated with the operation of both Nickajack and Chickamauga hydro plants so that there is minimal impact on the Nickajack Reservoir level, which is among the most stable in the TVA hydro system. Conversion of TVA's main river dams to pumped storage operation would require the rebuild of the dams at an exorbitant cost. In addition, the environmental impacts of converting conventional hydro to pumped storage operation could be significant and adversely impact other uses, such as recreation. TVA's experience with Hiwassee Unit 2, which has this capability, provides a good example of the constraints of operating a mainstream dam in a pumped storage mode. A separately designed and constructed pumped storage facility appears to be the most cost-effective and reliable route to follow if additional capacity of this type is added to the TVA system.

118. TVA should build more pumped storage facilities. (*Commenters: Stephen Levy - TSEA, Paul Noel - NEC*)

Response: Comment noted. TVA incorporated and analyzed additional pumped storage capacity into the strategies it evaluated in response to this and similar comments.

119. What would be the cost of constructing and operating another pumped hydro energy storage facility? (*Commenter: Stephen Levy - TSEA*)

Response: Symbiotics LLC estimated in a fall 2010 Utility Industry Infocast that the cost of installed pumped storage capacity currently runs in the $1400-2500/kW range. We estimate that a plant similar to TVA's Raccoon Mountain Pumped Storage Plant (1600 MW capacity) would cost on the order of $4-5 billion. Detailed engineering and an in-depth financial analysis are necessary to pinpoint the actual cost of a new pumped storage facility.

2.11.3. Utility-Scale Battery Storage

120. Utility-scale battery storage, while still experimental, is being implemented by some utilities. During the IRP planning period, it is very likely to be commercially available. The IRP recognizes the need for storage but only considers large centrally located facilities. Distributed battery storage can better match distributed renewable generation. TVA should reconsider its exclusion from full consideration in the plan. (*Commenter: Nelson Buck*)

Response: TVA recognizes the benefits of distributed storage in the integration of intermittent renewable generation. Distributed storage facilities were evaluated during the IRP options screening process, but eliminated from further consideration due to their current lack of proven, commercial availability and high cost. TVA will continue to monitor the development of distributed storage facilities and assess them for consideration in future IRPs. In 2001, TVA began construction of a battery storage facility in Mississippi, its Regenesys plant, but construction was stopped after the company which owned the technology being installed ceased supporting it. TVA is currently testing the use of battery storage in conjunction with photovoltaic generation in electric vehicle charging stations as a method to reduce the impact of vehicle charging on the power system.

2.12. Environmental Impacts

2.12.1. Impacts of Coal and Nuclear Generation

121. Coal and nuclear generation result in unacceptable environmental impacts that persist for generations. These impacts result from coal ash, nuclear waste, and air and water pollutants, including thermal pollution. TVA should become a national leader in protecting our air, water and land resources. (*Commenters: Lisa Archer, Jason Campbell, Joanne Logan, Linda Park, Grace Safer, Maxine Strawder - PCUUF, Gary Verst - SC*)

Response: The impacts of generating electricity from coal and nuclear fuel are summarized in EIS Chapter 7. TVA has recently taken steps to reduce its reliance on coal generation, and the strategies analyzed in the IRP and EIS further reduce this reliance on coal while increasing nuclear generation and generation by other sources with low air pollutants, including CO_2, emissions. The management of nuclear waste continues to be a national debate and efforts are continuing to create a national depository for such waste. In the interim, TVA provides for storage of this waste at its facilities as do other entities which produce such waste. The proportion of generating facilities using open-cycle cooling will also decrease in the future, resulting in reduced thermal impacts to rivers and reservoirs.

122. The continued discharge of millions of gallons of hot water from thermal generating plants into area rivers harms aquatic life. (*Commenter: Margie Buxbaum*)

Response: TVA operates its thermal generating plants within the limits of NPDES permit requirements for thermal discharges. These requirements help ensure that impacts to aquatic life are kept to acceptable levels. TVA also monitors aquatic life downstream of the plants to confirm the impact of its plants on aquatic life. TVA's analyses assume that all future thermal plants will use closed-cycle cooling, which will also result in reduced thermal discharges.

2.12.2. Mitigation of Impacts

123. Other than the mitigation of environmental impacts resulting from compliance with regulations and the selection of less CO_2-intensive generation in the future, the DEIS does not discuss any other types of mitigation activities that could be implemented to further reduce environmental impacts. We recommend that the FEIS discuss the types of mitigation that would be considered when TVA develops projects to implement the resource plan. (*Commenter: Heinz J. Mueller - EPA*)

Response: FInal EIS Section 7.7 contains a discussion of potential mitigation measures.

2.13. Environmental Justice

124. The DEIS does not contain an Environmental Justice determination under Executive Order 12898. The full analysis depends on the details, but a determination at a commensurate level with the rest of the document should be made. (*Commenter: Kim Franklin - USCOE*)

Response: TVA is not subject to this Executive Order, but it does address Environmental Justice as a matter of policy in its NEPA reviews when appropriate. The objective of an Environmental Justice analysis is to determine the potential for activities to impact low-income and minority populations to a greater extent than the population as a whole. This

requires consideration of minority and low-income populations and percentages, a fairly site-specific analysis. That level of analysis is routinely done by TVA when it proposes to implement energy-resource activities. For example, TVA has made Environmental Justice determinations for the generating facilities presently under construction and for the proposed construction and/or completion of both a single nuclear unit at the Bellefonte site (see TVA 2010c) and two AP1000 units at the Bellefonte site (see TVA 2008c). TVA will analyze potential Environmental Justice impacts during the planning of future site-specific implementing actions. TVA works closely with the local power distributors to develop and implement energy efficiency programs targeting all populations in the TVA region. TVA has also assisted state and local agencies in the development and implementation of energy efficiency programs, such as home weatherization assistance, focused on low-income populations.

2.14. Greenhouse Gas Emissions

2.14.1. Impacts of Greenhouse Gas Emissions

125. The DEIS does not adequately describe the climate change impacts that will result from TVA's GHG emissions. As stated in the DEIS and elsewhere, TVA emits over 1% of all United States GHG emissions and is among the largest GHG emission sources. (*Commenters: Abigail Dillen - Earthjustice, Heinz J. Mueller - EPA*)

Response: The role of manmade GHG emissions in and the impacts of climate change continue to be the subject of serious debate, including the capabilities and adequacy of climate change models which are still being developed. It would require substantial speculation and involve substantial uncertainty to assess how TVA's GHG emissions may contribute to climate change effects which are world wide. The Final EIS contains a discussion of TVA's anticipated GHG emissions and how climate change could affect TVA's power system. Under almost all of the strategies evaluated in the IRP, including its recommended strategy, GHG emissions on the TVA system would substantially decline.

126. The Final IRP and FEIS should explicitly reference the draft guidance on analyzing the impacts of GHGs in NEPA assessments that was issued by the Council of Environmental Quality in February 2010. The FEIS should also provide the assessments suggested by the guidance. (*Commenter: Heinz J. Mueller - EPA*)

Response: This guidance is cited in the Final EIS, which also contains a discussion of anticipated GHG emissions and how climate change could affect TVA's power system.

2.14.2. Pricing Greenhouse Gas Emissions

127. In all but one planning scenario considered in the IRP, TVA assumes that federal legislation will result in a carbon price in the near term. Per ton, TVA assumes a cost in each scenario of at least $15 and as high as $27. TVA also assumes that these costs will be in effect no later than 2014 and possibly as early as 2012. Given the results of the November 2, 2010 elections and the fact that the Obama Administration has abandoned cap and trade legislation, IRP modeling assumptions based on carbon pricing are unfounded. (*Commenter: Kipp Coddington - MMCC*)

Response: EPA is proceeding with regulating GHG emissions from coal-fired power plants and TVA does foresee constraints on carbon emissions within the IRP planning horizon.

Admittedly, there is uncertainty over a cap and trade requirement and how carbon emission requirements would affect fossil fuel generation. The IRP scenarios were developed to provide an understanding of how the planning strategies will perform under various conditions by testing ranges of uncertainties, including GHG requirements. A modest range of CO_2 prices ($0/ton to upwards of $27/ton, initially) and differences in timing (2012-2014) were analyzed. These ranges were developed as a proxy for a range of potential GHG emission reduction requirements, given the uncertainty over GHG legislation and regulation. TVA reexamined potential GHG emission reduction requirements when developing the new Scenario 8 and found no need to change the range of requirements described in the original Scenarios 1-7.

128. TVA has assumed a $0 cost estimate for GHG requirements under Scenario 3. This is not reasonable as regulation of GHG emissions is beginning in 2011. The impact of this $0 GHG price assumption is that the potential cost and risk of developing additional GHG-emitting resources, or failing to reduce TVA's current GHG emissions, is artificially reduced. TVA should revise Scenario 3 to include a non-zero, but modest, price on carbon. (*Commenter: Sam Gomberg - SACE*)

Response: The IRP scenarios were developed to evaluate the planning scenarios against a range of potential future conditions, including different levels of GHG emission requirements and different CO_2 prices. Scenario 3 tests a potential future with no GHG emission reduction requirements while the other scenarios test different potential GHG reduction requirements and non-zero CO_2 prices. The GHG regulation that came into existence on January 1, 2011 that affects fossil-fueled power plants applies primarily to new plants, not existing plants.

2.14.3. Quantifying GHG Emissions

129. In the DEIS, lifecycle GHG emissions of various fuels are compared. The lifecycle data for natural gas, however, is not for shale gas, which is likely to be an increasingly important fuel source for TVA. Recent studies suggest lifecycle GHG emissions from shale gas are greater than from other sources of natural gas. The EIS should describe lifecycle GHG emissions from shale gas. (*Commenter: Kipp Coddington - MMCC*)

Response: Comment noted. The lifecycle GHG emissions data for natural gas-fueled generation presented in the DEIS was based on studies of the more traditional natural gas sources. Relatively little information is available on lifecycle GHG emissions from shale gas. Sections 7.3.1 and 7.6.4 of the Final EIS contain a discussion of GHG emissions from shale gas.

130. Related to Draft IRP Figure 7-11 and Strategy D, it is not clear whether the CO_2 footprint for Strategy D includes lifecycle GHG emissions for nuclear energy. As noted in the DEIS, while nuclear power does not directly emit CO_2, there are quantifiable lifecycle CO_2 emissions. We recommend clarifying the magnitude of lifecycle GHG emissions associated with nuclear power in the Final IRP. (*Commenters: Stewart Horn, Heinz J. Mueller - EPA*)

Response: Comment noted. As part of the analysis of the alternative strategies, TVA quantified the direct emissions at the generating sources. Life-cycle emission rates are described for the various generating options.

131. The DEIS does not describe the lifecycle GHG emissions of using liquefied natural gas (LNG). In the event that the anticipated increase in shale gas production is not sustained, TVA may have to use LNG. Lifecycle GHG emissions from LNG are higher than for conventionally sourced natural gas. (*Commenter: Kipp Coddington - MMCC*)

Response: Section 7.3.1 of the EIS notes that life-cycle GHG emissions from the use of liquefied natural gas are greater than those from conventionally sourced domestic natural gas.

2.14.4. Reducing Greenhouse Gas Emissions

132. Adopt a plan that minimizes TVA's impact on climate change by prioritizing reductions in GHG emissions. Developing the Valley's energy efficiency and renewable energy resources can end our dependence on fossil fuels and help protect the Valley's natural treasures and biodiversity. Our way of life depends on TVA taking steps now to minimize its impact on global climate change. (*Commenter: Michael Agceda, R. Apson, Ann Aytenly [sic], David W. Belt, Jason Brown [sic], Charle A. Bucawfal [sic], J. Candien [sic], William F. Farming [sic], Lauren Gearhardt, Ransly Goodheart [sic], Steven Green, Larry Gregory [sic], Megan Hollusam [sic], Missy J. [sic], Gary Jehin [sic], Michael Jones, Robert Lindamood [sic], Joanne Logan, Hannah Long, Mary Masten, W. McGill, Carson McKinney, Mann McQueen [sic], Elaine Montgomery, John P. Oeyal, Cornelia Overton, Wilford M. Past, K. R. [sic], Nancy J. Reans, D. Richardson, Susan Routan, Madeline Shely [sic], Ariel Spioan [sic], Lauren J. Stein, Anne Wael [sic], Luke Waring, T.V. Williams [sic], Astor Williams [sic]*)

Response: Comment noted. The goal of the IRP is to produce the least cost plan that finds the best balance of providing competitive rates, delivering reliable power, and meeting TVA's commitment to environmental stewardship, including GHG reductions. The IRP strategy being recommended to the TVA Board includes idling of coal plants and substantial increases in EEDR and renewable energy resources. These activities should substantially reduce TVA GHG emissions.

133. How is TVA prioritizing carbon emission reduction given that Congress is unlikely to regulate carbon emissions in the next few years and that many in Congress want to prohibit EPA from regulating carbon emissions? (*Commenter: Amy Walls*)

Response: TVA agrees that there is substantial uncertainty regarding legislation regulating carbon emissions, both when and if it is going to be enacted. However, EPA is proceeding to regulate carbon emissions and has announced plans for regulations directed at coal-fired power plants. Under its 2008 Environmental Policy, TVA established the objective of stopping the growth in volume of emissions and reducing the rate of carbon emissions by 2020 by supporting a full slate of reliable, affordable, lower-CO_2 energy-supply opportunities and energy efficiency.

134. In the likely event that life-cycle GHG emissions will be regulated, TVA's plans to replace coal plants with new natural gas plants will not be cost-effective. Most coal plant GHG emissions are during combustion, which would be controlled by CCS. Gas plants have high upstream GHG emissions during gas extraction, processing, and transport which would not be controlled by CCS. Thus for plants with CCS, life-cycle gas plant GHG emissions may be higher than life-cycle coal plant GHG emissions. (*Commenter: Kipp Coddington - MMCC*)

Response: Recent studies by Jaramillo et al. (2007) and NETL (2010) show that GHG emissions from the production, processing, and transport of domestic and liquefied natural gas (LNG) are greater than from the production, processing, and transport of coal. With the inclusion of GHG emissions associated with the generating plant and carbon capture and storage, life-cycle GHG emissions from a domestic gas NGCC plant with CCS are lower than those from both SCPC and IGCC plants with CCS. These sources differ on whether life-cycle emissions from a LNG NGCC plant with CCS are lower than those of coal plants with CCS.

135. The GHG emission reductions under the various scenarios are inadequate. On a per capita basis, TVA's GHG emissions are very high and should be reduced by 90% by 2050. The IRP strategies do not make enough progress towards this goal. As is evident from the text of the draft IRP and EIS, TVA continues to frame its understanding of climate change as a debate and has not adequately addressed the potential for climate change, including extreme weather events, in the TVA region. (*Commenter: Louise Gorenflo - TCSC*)

Response: Compared to TVA's current average direct CO_2 emissions, all of the strategies considered in the IRP represent a significant decrease of CO_2 emissions during the planning horizon of 2010-2029, and many align with proposed legislation such as the American Clean Energy and Security Act's (H.R. 2454) target of 40 percent reduction (from 2005 levels) by 2030. TVA has addressed the potential physical impacts of climate change on the TVA region and is a co-sponsor of the Energy Power Research Institute’s (EPRI) study 'Potential Impacts of Climate Change on Natural Resources in the Tennessee Valley Authority Region,' published in November 2009 that provided information for doing this. The report was based on data from the Fourth Assessment Report of the Interagency Panel on Climate Change published in 2007, and provided information on possible climate change impacts across the TVA service region. This report notes that there is uncertainty about the effects of climate change on the TVA region.

136. The IRP and EIS should analyze energy portfolios that would result in much greater reductions in GHG emissions. At a minimum, an alternative should achieve the 80% GHG reduction by 2050 target established by the American Clean Energy and Security Act (H.R. 2454). (*Commenter: Abigail Dillen - Earthjustice*)

Response: Compared to TVA's current average direct CO_2 emissions, all of the IRP strategies being considered represent a marked and significant emissions decrease during the planning horizon of 2010-2029, and many align with proposed legislation such as the American Clean Energy and Security Act's (H.R. 2454) target of 40% reduction (from 2005 levels) by 2030. TVA expects to continue this trend of achieving deep emission reductions though targets for 2050 would be included in the planning horizon of subsequent IRPs.

137. The likely eventual requirement for CCS on both coal and natural gas-fired power plants favors maintaining existing coal plants instead of constructing new gas-fired plants. Recent studies show that retrofitting coal plants with CCS is more economical than replacing coal plants with new gas plants that are later retrofitted with CCS. (*Commenter: Kipp Coddington - MMCC*)

Response: CCS technology was considered in the IRP analyses. The technology is not currently considered developed at a commercial utility scale; therefore, resource options utilizing CCS were restricted to new IGCC plants beginning operation no sooner than 2025.

At such a time when CCS is considered feasible, any retrofits of coal or gas plants with CCS would be evaluated based on regulatory requirements and cost-effectiveness.

138. TVA is subject to Executive Order 13514 on Federal Sustainability, and thus must reduce GHG emissions by 28 percent by 2020. While direct emissions from electric power production may be excluded from this target where appropriate, the IRP and EIS do not explain why TVA is exempting its entire electrical generating system from this emission reduction requirement. TVA should develop strategies that achieve this 28 percent reduction. (*Commenter: Abigail Dillen - Earthjustice*)

Response: The commenter is correct that the referenced Executive Order specifically exempted direct emissions of GHGs associated with electricity generation from the emission reduction targets. Regulation of emissions from electricity generation is being addressed in other ways, including proposed legislation and EPA regulatory efforts. As required by the executive order, TVA submitted a Sustainability Plan on June 2, 2010, and the Office of Management and Budget approved that plan in August 2010. Consistent with this Executive Order, TVA has established GHG reduction targets of between 17 percent and 21 percent by 2020 compared to a 2008 baseline, depending on the category of emissions. TVA intends to achieve these reductions primarily by (1) improving the energy efficiency of its buildings; (2) improving the reliability and efficiency of its hydro-generation portfolio; (3) reducing solid waste disposal; (4) utilizing higher fuel efficiency standards for new cars and light trucks; and (5) increasing the use of employee telecommuting and employee car-pooling. These are the kinds of activities which are the focus of this Executive Order. While TVA direct emissions are exempted from the Executive Order, compared to TVA's current average direct CO_2 emissions, all of the IRP strategies being considered represent a marked and significant emissions decrease during the planning horizon of 2010-2029 (see Final EIS Section 7.6.2), and many align with proposed legislation such as the American Clean Energy and Security Act's (H.R. 2454) target of 40% reduction (from 2005 levels) by 2030.

2.14.5. Regulating Greenhouse Gas Emissions

139. GHG emissions regulations taking effect in January 2011 will make it difficult to satisfy Prevention of Significant Deterioration requirements for new fossil-fueled generating facilities. TVA does not seem to have adequately accounted for this in its plants to replace existing coal-fired plants (which would not be subject to Prevention of Significant Deterioration (PSD) permitting) with new natural gas-fired plants. (*Commenter: Kipp Coddington - MMCC*)

Response: TVA agrees that EPA's regulation of GHG emissions will make the process of obtaining permits for new fossil-fueled power plants more complicated and difficult. It could similarly affect obtaining permits for major upgrades of existing fossil-fueled plants.

EPA is proceeding with rulemaking for GHG emissions from coal-fired utilities, including regulations that became effective on January 2, 2011 that apply primarily to new plants. TVA has taken account of these regulations, as they apply to new sources, by: 1) designing all IRP scenarios to conform to current and likely regulatory requirements, including PSD, and 2) embedding the costs of compliance with environmental regulations in the cost characteristics of the various resource options considered in the portfolio analyses.

140. TVA assumes that all new coal-fired generating capacity must be equipped for carbon capture and sequestration. TVA does not, however, address the potential requirement for equipping new natural gas-fired generating capacity with CCS. Deploying CCS on both coal and natural gas plants will likely be necessary to meet GHG reduction policy goals. By not considering CCS for future gas plants, TVA is inappropriately penalizing future coal-fired plants. (*Commenter: Kipp Coddington - MMCC*)

Response: There is significant uncertainty about the timing and specifics of future GHG emission reduction requirements and TVA agrees that CCS could be required on future natural gas-fired generating facilities. However, coal-fired plants have been the target of many efforts to regulate GHGs and it seems reasonable to assume that any requirement to use CCS will target coal plants first. As with other assumptions made in order to complete the IRP analyses, TVA will continue to monitor GHG emission reduction requirements and the development of CCS and consider this in future IRPs, if appropriate.

141. While Congress has recently deferred regulating GHGs, their regulation by the Environmental Protection Agency begins in 2011. This presents a financial risk to TVA and its customers. This financial risk should be explained and reflected in the IRP analysis. (*Commenter: Luis Martinez - NRDC*)

Response: Comment noted. EPA is proceeding with regulating GHG emissions from coal-fired utilities, and TVA anticipates constraints on carbon emissions within the IRP planning horizon, although there is uncertainty over how carbon requirements would affect fossil fuel generation. To account for this uncertainty, the IRP scenarios include a modest range of CO_2 prices ($0/ton to upwards of $27/ton, initially) and of the timing of implementation. These ranges were developed as a proxy for a range of CO_2 requirements. Additionally, the financial implications of the IRP strategies are represented by the Present Value of Revenue Requirements (PVRR), which includes the costs of environmental compliance requirements. The PVRR and the associated financial risk metrics thus include the potential costs of regulation of CO_2 and other GHGs.

2.15. Hydroelectric Generation

2.15.1. New Hydroelectric Generation

142. The IRP states there is 1,770 MW of feasible hydropower capacity. Please describe the projects underway or planned to develop this generating capacity. (*Commenter: Garry Morgan*)

Response: The IRP states that about 1,700 MW of feasible small- and low-head hydropower were estimated to be available using the Energy Efficiency and Renewable Energy study prepared by the Department of Energy in 2006. After considering the cost of these projects, TVA is reviewing the possible addition up to 144 MW of combined additional units at existing hydroelectric power plants and existing dams by 2029. This additional capacity was identified as feasible in a recent renewable energy assessment. TVA is also evaluating the option to extend the hydro modernization program (e.g., measures that achieve capacity and efficiency gains at existing hydro power plants) by approximately 90 MW.

2.15.2. Upgrades to Existing Hydro Facilities

143. Instead of building all-new, non-renewable generating facilities, TVA should prioritize upgrades to its existing hydroelectric fleet. TVA has recently neglected these facilities. (*Commenter: Garry Morgan*)

Response: TVA has a Hydro Modernization (HMOD) program to address gaining additional capacity in the existing hydro system. TVA's HMOD program began in 1992 to address reliability issues on aging units and increase capacity and efficiency on some portion of those units. To date, 57 hydro units have been modernized. Those projects have provided peaking capacity gains of 565 MW and average efficiency gains of 4.8 percentage points. The program has exceeded the initial capacity gain expectations by nearly 45%. There are 49 units that have not yet been modernized. Due to the increased age and smaller performance gains of these units, they are being prioritized based on equipment condition and risk to reliability. As each unit is studied for modernization, potential performance gains will be evaluated to determine if the extra expenditure is economically justified and site-specific environmental analyses will be conducted, as appropriate. Projects are ongoing at Nickajack and Watts Bar to modernize an additional three units. Those units are expected to add 11 MW of peaking capacity to the system by the end of 2013.

144. TVA's hydroelectric generation can be greatly increased by upgrading the existing hydro plants. These upgrades should use the very best turbines, super conductors, etc. Wilson Dam could be upgraded to about 3,000 MW capacity, Wheeler to 1,800 MW, and Guntersville to 1,200 MW. The system-wide potential capacity increase is about 8,000 MW. This would greatly increase peak load generating capacity without greatly altering river flows. (*Commenters: Sandra Kurtz - BEST, Paul Noel - NEC*)

Response: The stated 8,000 MW is not achievable utilizing TVA's current system of dams. TVA has a Hydro Modernization (HMOD) program to address gaining additional capacity in the existing hydro system utilizing the current most advanced, best proven available technology. TVA's HMOD program began in 1992 to address reliability issues on aging units and increase capacity and efficiency on some portion of those units. To date, 57 hydro units have been completed. Those projects have provided peaking capacity gains of 565 MW and average efficiency gains of 4.8 percentage points. The program has exceeded the initial capacity gain expectations by nearly 45%. There are 49 units that have not yet been modernized. Due to the increased age and smaller performance gains of these units, they are being prioritized based on equipment condition and risk to reliability. As each unit is studied for modernization, potential performance gains will be evaluated to determine if the extra expenditure is economically justified. Projects are ongoing at Nickajack and Watts Bar to modernize an additional three units. Those units are expected to add 11 MW of peaking capacity to the system by the end of 2013.

2.16. Integrated Resource Planning

2.16.1. Bias for Nuclear Energy

145. The IRP shows a strong bias towards nuclear energy and against the more environmentally friendly and lower cost alternatives of energy efficiency and renewable energy sources. While describing nuclear energy as clean, the IRP fails to address the impacts of mining and producing fuel and disposing of spent fuel. It also fails to address the fact the construction of new nuclear plants cannot be financed without large government subsidies. (*Commenter: William Reynolds*)

Response: TVA's least cost planning approach considers all feasible resource options, including but not limited to, nuclear, energy efficiency, and renewable resources. Cost information for all potential resource options was developed from a range of standard accepted sources and TVA's experience, and does not include bias for or against any resource options. The computer models that TVA used in its IRP evaluations selected nuclear power when it was the lowest cost option for meeting future resource needs. The Recommended Planning Direction strategy is a diverse approach that includes increases in nuclear power, renewables, EEDR, and gas-fueled generation. The description of nuclear energy as clean in the IRP is largely based on the fact that nuclear generation does not result in the direct emission of GHGs or other air pollutants. Other environmental impacts of nuclear and other types of generation are described in the Final EIS. TVA receives no government subsidies for the construction of generating facilities, including nuclear plants.

2.16.2. Cost of Implementing a Strategy

146. The draft IRP acknowledges TVA's $30 billion debt limit. The capital needed to fund the resource plan implementation will require the issuance of new debt or an increase in rates. We are opposed to financing capital improvements from rates collected during the year the costs are incurred. Therefore, an issuance of new debt appears necessary. While the distributors are willing to work with TVA to persuade Congress to increase the debt limit, we do not believe this is the sole solution and urge TVA to work with the distributors to seek additional solutions. (*Commenters: Dana Jeanes - MLGW, George B. Kitchens - JWEMC, Lanny Night, Jack W. Simmons - TVPPA*)

Response: TVA’s primary means of raising capital for major investments are power revenues, bonds and less traditional forms of financing agreements. TVA employs a set of financial guiding principles to guide its use of rates and borrowing, which are consistent with sound utility practice to use financing to build assets, and then collect the cost of construction from consumers who will benefit from the new asset while it is in service. TVA will continue to engage in communication with distributors of TVA power as well as other stakeholders about TVA’s financial flexibility issues.

147. The Draft IRP states that '“a majority of capital expenditures in the short term (prior to 2108) may have to be funded solely from rates.” Please explain what happens in 2018. How will the impact on ratepayers through 2018 differ from that after 2018? (*Commenter: W.R. Kendrick*)

Response: This comment is about the short-term rate metric which does not address debt or rates after 2018. The short-term rate metric provides a representation of the revenue requirements for the period 2011-2018 expressed on a per MWh basis. This metric was developed to focus on the near-term impacts to system cost in recognition of TVA’s current debt cap of $30 billion and the likelihood that a majority of capital expenditures in the short term (prior to 2018) may have to be funded solely from rates. By considering both short-term rates and the present value of revenue requirements, TVA is better able to evaluate the cost implications of the various strategies. Including both short-term and total revenue requirements facilitates a trade-off analysis of alternative resource plans and allows TVA to more explicitly evaluate funding implications, consistent with stakeholder concerns about increasing rate pressures.

148. TVA identified the optimized portfolios as those with the lowest net Present Value of Revenue Requirements (PVRR) subject to a number of constraints, including environmental compliance requirements. However, TVA provides no information on what the requirements are, how TVA will comply with them, and the cost of this compliance. Without this information, it is not possible to determine whether the chosen optimized portfolios are reasonable. The financial risk ranking metrics are also dependent on these undisclosed compliance information. (*Commenter: Frank Rambo - SELC*)

Response: Regulatory compliance costs are an integral part of the assumptions used in the case analysis done for the IRP. These compliance assumptions and the associated costs impact nearly all cost parameters from capital to fuel expenses to maintenance and other fixed costs, and these assumptions and cost impacts vary across the seven scenarios used in the study. In addition, the probability assessment done to assess risk and uncertainty for key study variables includes ranges that encompass alternative regulatory frameworks. A discussion of these key regulatory assumptions and a general description of the relationship among the variables most impacted by those assumptions is included in Chapter 6 of the Final IRP report.

149. We are concerned that TVA did not fully consider the costs associated with GHG emissions and other environmental impacts of each energy source. These costs are often lowest with energy conservation and renewable energy. (*Commenter: Adam Snyder - CA*)

Response: The costs of compliance with both existing and emerging environmental regulations are embedded in the cost characteristics of the various resource options and thus considered in the portfolio analyses. The various scenarios consider a range of potential future environmental regulations (see EIS Table 2-1) and their associated compliance costs. Life-cycle emission analyses of various technologies were also conducted.

150. What are TVA's debt limit and TVA's current debt? Will the cost of the capital needs for implementing a strategy exceed the debt limit? (*Commenter: Chip Estes*)

Response: TVA's current debt limit is $30 billion, and the current debt level is about $26 billion. In the IRP study, debt financing is capped at a planning target of $28 billion to ensure that the debt limit is not exceeded, with any capital needs in excess of the debt cap financed through rate increases.

2.16.3. Disaster Planning

151. How do the scenarios address disaster planning—the potential for very low probability but wide-reaching events such as natural disasters (e.g., weather events, earthquakes), major equipment failure, or human-caused actions that severely cripple power plants or transmission lines? (*Commenters: Charles Jones, Jackie Tipper Posey*)

Response: The IRP study does not explicitly model impacts of disasters or particular site-specific events that may impact the operation of the TVA power system. The potential effects of extreme events, such as those listed in the comment, are considered during the planning and design of components of the power system and may also be included in TVA's normal annual capacity planning process.

Energy Education and Public Relations

152. TVA could increase public involvement in its IRP process by opening its power plants to public tours. Tours can be restored/initiated at nuclear, hydro, coal, gas, and pumped storage plants with no increased threat to facility security. Providing these tours would greatly increase public knowledge and involvement in energy issues. (*Commenter: Paul Noel - NEC*)

Response: Comment noted.

2.16.4. Frequency of Plan Revision

153. Make integrated resource planning an ongoing process with regular public review. This formal revision process should occur on a 3- to 5-year cycle. (*Commenters: Julia Aepping [sic], Michael Agceda, Debra K. Agner, Grace Ashford, R. Apson, Lain Arubin [sic], Donald L. Audley [sic], W. R. Avery [sic], Moonis Roger Axley [sic], Ann Aytenly [sic], Kris B. [sic], Lauren B. [sic], M. B. [sic], M. Balangen [sic], April Bart, Darrell Bawlslin [sic], David D. Beaty, David W. Belt, Cameron Z. Bennett, Mark Betts [sic], Paul Bevney [sic], Dave Bordenkircher, Paul Boring, Deanna Bowden, Jenny Bowers, M. Boyd, Nancy Brannon, Jason Brown [sic], Harry E. Bryant, Charle A. Bucawfal [sic], Jessica Buchanan, Paula Bunanek [sic], Mark A. Burnett, Melissa A. Burt, Kelvin Butler, Marisa J. Butler [sic], Laura C. [sic], Lisa C. [sic], Teresa Campbell, J. Candien [sic], Bruce Chicre [sic], Brenda Chinck [sic], James S. Collins, A. M. Conisin [sic], Cliff Corker, Arqunsia Cornwall, Josh M. Cox [sic], Thomas V. Cullen, Lori Curt [sic], H. Dwayne Cutshoul, Gary D. [sic], Lacy Damiles [sic], Erika Davidson, Marge Davis, Roeyn Davis [sic], Courtney Day, April Dixon, I. Drelsecn [sic], Randy L. Dry [sic], Torri Dunn, Whodong Ebechnop [sic], Patricia Eleand [sic], Laura Elis, Juliana Ericson, R. Wray Estes, Peggy Evans, William F. Farming [sic], Douglas Felker, Melanie Felker, Heather Finolti, Sarah E. Flower, Charles Foster, Shanequa Fountain, Vita French, Robyn Galochee [sic], Katherine Gamt [sic], Heather Gapsby [sic], Elizabeth C. Garber, Elizabeth Gazaway [sic], Lauren Gearhardt, Joel Gearhardt, Robin L. Gerahann [sic], Danielle Gerhard, Kathy S. Gleeland [sic], Sam Gomberg - SACE, Ransly Goodheart [sic], Tony Gorton, Steven Green, Larry Gregory [sic], Karen Gulk [sic], Ava Gunter, Joshua Guthrey, Mary Alan Guy [sic], P.N. H. [sic], Steven H. [sic], Jane C. Hardy, Whitaker M. Haskins, Meredith Hayes, Rick Held, Larry Hendrix, Redel Hesh [sic], Kristen Hickey, R.M. Hill, Jessica Hill, Chloe Hirst, Megan Hollusam [sic], Cathy L. Hook [sic], Steven R. Horton, Katherine Huddleton [sic], Jaun K. Hudson [sic], Lauren Hulson [sic], Cee J. [sic], Missy J. [sic], Dana Jeanes - MLGW, Gary Jehin [sic], Rofail H. Jenu, [sic], C. Johnson, D. K. Johnson [sic], N.D. Johnson [sic], Michael Jones, Glenda Jordan, Raphael Y. Junit [sic], Ivan Juny [sic], Sam K. [sic], R.R. Karpsal [sic], Barbara Kelly, Chrys Kemp [sic], Sara Keubbing [sic], J. Kewisn [sic], P. Kneuman [sic], Scott Kramer, David Brent Kulovich, Sandra Kurtz, William Kurtz, S. Kurtz, R.C. Last, Eric Lewis, Robert Lindamood [sic], Joanne Logan, Hannah Long, John M. [sic], Burton Mandrell [sic], Julia Mangrin, Selma Marks [sic], Luis Martinez - NRDC, Mary Masten, Annie Mattson [sic], Nancy McFadden, W. McGill, Ralph McKenzie, Laura K. McKenzie, Carson McKinney, Paula McLen [sic], Mann McQueen [sic], Rebecca Meade, Laura Miller, Michael Miller [sic], Austin Milt, Karen Monalan [sic], Elaine Montgomery, Barbara Mott, Catherine Munay, Lauren N., J. N., Marissa N. [sic], John M. Nald [sic], Aesthor Nievons [sic], Josh O. [sic], John P. Oeyal, Ann Olsen, Margaret F. Olson [sic], Janet Osborn, Cornelia Overton, Elsa Parker [sic], Jon Parker [sic], Wilford M. Past, Erwin Peritt [sic], Kotel Perry, Zaria Person [sic], Stefan Peter-Contesse, Courtney Piper - TBLCEE, Norm Plate, Sara F. Plemons, Patricia Poat, Jennifer Porter, John F. Post, Justin Post, Patricia Post, Mrs. James S. Powers, W. J. Pruit, Cody R. [sic], K. R. [sic], Keith Rainy [sic], Frank Rambo - SELC, Nancy J. Reans, D. Richardson, Arnold C. Ringe [sic], Gordon Robinson, Madeline*

Rogers, Mercedes Rodriguez, Phillip Roll [sic], Ruth F. Rothe, Susan Routan, Kathy S., Tanya S. [sic], Don Safer - TEC, Melinda Sanede [sic], Feris J. Schlery, Cody Semabayl [sic], Susan Shannon [sic], Judy Sheffield, Madeline Shelly, Jane L. Shelton, Madeline Shely [sic], V.C. Shriever [sic], Roxanna Shohadaee [sic], Jack W. Simmons - TVPPA, Jack Slede [sic], Michelle Smith, Jennifer Sneed, Adam Snyder – CA, Ariel Spioan [sic], Jamie K. Stand [sic], Lauren J. Stein, Karl Stirs [sic], Carolyn N. Stokes, Henry Stokes, Paulrann P. Stocks [sic], Kathy Stone [sic], A. Suny [sic], Lauren Szoech, Karen T. [sic], Bill Terry [sic], Andy Todd, Nancy G. Van Vallanburgh, B.S. Vick [sic], Dorthy W., G.R. W., Anne Wael [sic], Chuck Walker, Paula D. Ward, Luke Waring, Jan H. Watson [sic],Chad Watters [sic], Cassie F. Watts, Mona Whitehead, Dean Whitworth, Paul Wieland, Astor Williams [sic], Debbie Williams, R.T. Williams, T.V. Williams [sic], Adelle Wood, Linda W. Woodcock, Kevin R. Woods, J. Y. [sic], Schean Yearke [sic])

Response: TVA agrees that it is important to update its IRP on a regular basis and has committed to doing this. The next IRP process will begin by 2015 and will include public input.

154. TVA should review the final plan on an annual basis to make necessary adjustments due to changes in the economy, power demand, legislation, and regulations. This annual review does not necessarily have to be a public process. (*Commenter: George B. Kitchens - JWEMC*)

Response: TVA's annual business planning process reviews changes in the economy, power demand, legislation, and regulations. TVA has committed to begin another IRP study no later than 2015.

2.16.5. Incorporation of EEDR into Resource Plan

155. Energy efficiency should be the first resource loaded in the formulation of a portfolio due to its low-cost relative to new generation resources. It is the most cost-effective resource available, can be brought online quickly, does not burden transmission and distribution infrastructure, and has no environmental compliance costs. (*Commenter: Donald Gilligan - NAESC*)

Response: Comment noted. The EEDR portfolios considered in the draft IRP were represented as scheduled transactions in the capacity planning model. This technique gives EEDR a priority over other resource options that might be selected in the planning study by loading the EEDR portfolios first, prior to considering other resource options (except for renewable resources, which were treated in a similar manner).

2.16.6. Need for Power Forecast

156. Please explain the drops in the existing firm capacity occurring in 2013 and in 2021 shown on Draft IRP Figures 1-2 and 3-7. (*Commenter: Nick Crafton*)

Response: The decreases in the existing capacity values shown in both figures are due to the idling of coal units and the expiration of existing power purchase agreements occurring under the Baseline Plan Resource Portfolio.

157. The description of the need for power forecast does not provide enough information. For example, no data or statistical measures of the load forecast are provided. An

unjustifiably high sales growth forecast could lead to overreliance on traditional generation options. TVA should provide a more realistic, better substantiated forecast. (*Commenter: Frank Rambo - SELC*)

Response: The IRP scenario analysis approach used a range of load forecasts to produce a no regrets strategy. Eight different scenarios were evaluated, each with its own load forecast. The range of load forecasts considered is described in Final IRP Figures 4-3, 4-4, and 6-3. Statistical measures of TVA's load forecast accuracy are described in Final IRP Section 4.1.2.

158. The need for power forecast in the high growth Scenario 1 is unrealistically high. There is no historical data to support an annual growth rate of 2% throughout the 20-year planning period. The 1.1% medium growth rate in Scenario 7 is also higher than historical data support. These high rates are based, in part, on assumed correlations with population growth and economic growth rates. Data from other states show that these correlations are, at best, weak. TVA should revise the demand growth rates to a more realistic range of 0% (low), 0.7% (medium), and 1.2% (high). (*Commenter: Sam Gomberg - SACE*)

Response: Scenario 1 was designed to represent an upper bound on the possible capacity needs of the TVA system. This scenario functions as a stress case and shows the most aggressive resource plan (most resource additions) that could be expected to occur on the system, and therefore, provides an appropriate boundary condition for selection of a preferred planning strategy.

2.16.7. Planning Process

159. At its August 20, 2010 meeting, the TVA Board and CEO Kilgore, by voting to adopt the 'TVA Vision' and complete Bellefonte Nuclear Plant Unit 1 in 2018, essentially selected IRP Alternative Strategy C with a high growth scenario. The major differences between the Board's decision and Strategy C are a much lower level of coal plant layups, the addition of small modular nuclear units not addressed in the IRP, and the lack of action on a pumped storage hydroelectric facility. By already making most of the decisions on an IRP strategy, TVA foreclosed the IRP as a public process and left little to be decided in April 2011. (*Commenters: Louise Gorenflo - TCSC, Sandra Kurtz - BEST, Nancy McFadden, Don Safer - TEC, Steven Sandheim - SC/TSVC*)

Response: On August 20, 2010, the TVA Board announced its renewed Vision for TVA. While this was an important pronouncement because it confirmed and sharpened TVA’s existing goals, those goals remain aspirational in nature. The IRP process represents a further refinement and detailing of this strategic direction. In other words, the IRP helps transition aspirational goals to implementation activities. The next step after the IRP is initiating implementation activities which will have their own decisionmaking and analytical processes, including more site-specific environmental reviews when appropriate.

Completion of Bellefonte Unit 1 was not approved by the Board. The Board only approved additional funding for some activities. These activities include initial engineering design, asset preservation and facilities preparation, regulatory framework development and procurement of long-lead components. These activities help preserve completion of this unit as a viable energy option for TVA. It is anticipated that the Board will be asked to do approve completion and operation of the unit in April 2011, taking into account the IRP results.

The major differences between the coal capacity idling announced at the Board meeting and IRP Strategy C are that the Board announcement contained a lower level of coal generation idling; the nine units to be idled lack the environmental controls to necessary to meet higher emission standards and several have among the highest operating costs in TVA's coal fleet. The nine are being idled initially, but are expected to be retired eventually.

As explained in the Final EIS, small modular nuclear units are not considered a resource option in the IRP. They could be an action that helps implement the Vision, but this requires additional decisionmaking and review.

A new pumped storage facility is included in some IRP strategies, including the Recommended Planning Strategy. TVA is conducting more detailed feasibility studies of a new pumped storage facility and has not proposed building such a facility.

160. Because of the Kingston coal ash spill, TVA currently has a problem with its credibility on public safety issues. Safety issues are also a concern for the utility industry in general, as evidenced by the Connecticut combined cycle plant explosion and other recent incidents. While some parts of TVA seem to take safety very seriously, we hope the rest of TVA can rise to this level. How are public safety issues and the related risks addressed in the resource planning process? (*Commenter: Bob Alexander*)

Response: Public safety issues are not explicitly addressed in the IRP study. However, safety considerations are part of the design criteria for all the generating resources considered in the study, and the costs and unit characteristics included in the models reflect that design criterion.

161. Because TVA did not limit opportunities for input to its customers (distributors and directly served customers), the IRP may not be as executable as it otherwise would have been. Much of the public input came from groups or individuals that have no direct customer relationship with TVA. (*Commenter: George B. Kitchens - JWEMC*)

Response: Comment noted. Input from TVA's direct customers of course is very important and TVA sought and obtained that input in several ways. However, as a federal agency with a public mission, it is both necessary and proper to seek input from the entire range of interests in the Tennessee Valley region. In addition, the National Environmental Policy Act requires TVA to use an open public process in EIS processes.

162. How does the planning process evaluate and compare the risk associated with planning, obtaining approvals and financing, and constructing a new generating plant on time and within budget with the risk of achieving planned energy efficiency and demand response reductions? Please describe these risks. (*Commenter: Lanny Night*)

Response: These risk considerations are described in Final IRP Section 8.3.4 - Other Considerations.

163. How was the availability of the draft IRP and EIS advertised to the public? I saw little notice of it in my local media. (*Commenter: Jackie Tipper Posey*)

Response: TVA placed two advertisements in the major newspapers and issued press releases to media in the vicinity of each public meeting. Online advertisements were placed on websites of a major newspaper and television station in the area of each public meeting

as well as other major media markets in the TVA region. TVA also announced the meetings on its website and its Facebook page. Finally, notifications of the availability of the Draft IRP and EIS, along with information on the meetings, were sent to everyone who participated in the project scoping or otherwise asked to be notified of project developments and notice of the availability of the EIS was published in the *Federal Register*.

164. Please explain the process used in determining the generation mix, i.e., does TVA conduct a formal Request for Proposals in which all resource options (including existing) must bid into an RFP? If so, what entity oversees this process? (*Commenter: W.R. Kendrick*)

Response: The process used to identify the least cost resource plans identified in the draft IRP is described in Chapter 5 (Section 5.4). The process does not involve bidding into any RFP, but rather, uses information about the projected costs and performance characteristics of various resource options to develop a least cost 20-year power supply plan based on minimizing total revenue requirements over the study period.

165. The draft IRP and EIS do not provide adequate information on the costs and benefits of various resource options. This includes both, assumed current costs and future cost trends. Absent this information, it is not possible to determine whether TVA has undervalued or overvalued the resource alternatives. (*Commenter: Frank Rambo - SELC*)

Response: The IRP provides data on resource plan cost, financial risks, and strategic considerations that are used to compare planning strategies and thereby inform the decision about the components of a recommended planning strategy. The IRP also provides the details of each resource plan’s unit addition schedule, and the EIS provides a review of the environmental impacts associated with resources selected in these plans. In keeping with industry practice, detailed cost estimates for each candidate resource option and data input to the planning models are not included in the report.

166. The goal of the IRP should be to develop a plan that results in a reliable and economical supply of electricity. This is essential since our economy is so dependent on electricity. (*Commenter: Vic Dura*)

Response: Comment noted. Low-cost and high reliability are among the major goals of the IRP planning process.

167. The public meeting to discuss the draft IRP and EIS that was held in the Memphis area was in an obscure location. Attendance may have been greater if it was in a better known location. (*Commenters: Don Richardson - SC, Kevin Routan - CGSC*)

Response: Comment noted. Both negative and positive responses were received about the meeting locations. Because of the difficulty in finding a location that meets everyone's needs, TVA also conducted webcasts for each meeting to increase opportunities for public participation.

168. The selection of the IRP strategy to be implemented is to be made by the TVA Board of Directors. Because of the importance of this selection decision, it should be delayed until all of the Board members are in place and have served sufficient time to be knowledgeable with TVA operations. (*Commenter: Laurence T. Britt*)

Response: TVA's new Directors were sworn in during October 2010 and have been briefed extensively on the IRP, its recommendations, and its potential impacts. They will have been in place a full six months at the time of their expected April 2011 IRP decision. The terms of TVA's Board members are staggered, and it is likely that TVA will have 'new' Board members frequently in the future. It would be a disservice to the public TVA serves if it continually deferred important decisions because of Board vacancies or new Board members.

169. TVA appears to be concerned about a slow decrease in the system load factor in recent years. This has resulted in higher costs for TVA and hence consumers/ratepayers. One means of increasing the system load factor is by shifting some of the peak load and energy to off-peak hours. We are aware of steps TVA is implementing to do this and these should be better described in the IRP. Please also provide more information on the effects of each strategy on load factor, including how the recent wind power contracts will affect system load power by mostly delivering off-peak power. (*Commenter: Jack W. Simmons - TVPPA*)

Response: Although a smoother load shape (higher load factor) allows units to run more optimally and lower overall costs, the IRP did not evaluate any strategies specifically designed to modify the system load factor. A review of selected scenarios shows that the system continues to exhibit a load factor in the 50-52% range, even when the impacts of the energy efficiency and demand response (EEDR) programs are considered as an adjustment to load. The planning strategies themselves do not impact load factor, which is a measure of the load shape, with the exception of the impacts associated with the EEDR portfolios. The wind power contracts will impact the system dispatch, especially in the low load periods, but those impacts are captured in the plan costs computed as a part of the study.

170. Unlike other types of generation, the amount of renewable generation is a defined input rather than an amount selected by the optimization process. TVA should use sensitivities to determine the optimal amount of renewable energy. We believe this will result in larger amounts of renewable energy. (*Commenter: Jimmy Glotfelty - CLEP*)

Response: During the draft phase of the IRP, five planning strategies were designed to test various aspects of resource decisions that TVA might make in response to different futures. To ensure that sufficient renewable resource options were selected to meaningfully impact the overall resource plan, three different renewable portfolios were developed ranging from 1,500 to 3,500 MW capacity. In the final phase of the IRP, an optimization was performed to assess the preferred level of renewables, as suggested, that should be included with other resources as part of the recommended planning strategy. In the optimization analysis, the model picked the lowest levels of renewables allowed, not higher levels. However, based on stakeholder input, TVA chose to include the mid range of renewables in the Recommended Planning Direction. See Final IRP Sections 6.6, 8.2, and 8.3 for a description of the optimization process and Final IRP Appendix D for a description of the development of the renewable energy portfolios.

171. We support and commend TVA's effort to develop its first integrated resource plan since the 1995 Energy Vision 2020. This planning process, with extensive public involvement, is necessary for TVA to meet the region's future energy demand while fulfilling its statutory mandates while reducing many environmental impacts. (*Commenters: Mark Bishop, Gray Cassity - BES, Michael J. - TEC/BCAAT, Gary Dillard - WRECC, Abigail*

Dillen - Earthjustice, Nancy Givens - WKU/KSES/BGGP, Jimmy Glotfelty - CLEP, Sam Gomberg - SACE, Gerard Heininger - EI, Dana Jeanes - MLGW, Brett R. Kerr - CC, George B. Kitchens - JWEMC, Luis Martinez - NRDC, Garry Morgan, Tom Nelson - DESI, Leonard K. Peters - KEEC, Frank Rambo - SELC, Chris Shugart - PE, Jack W. Simmons - TVPPA, Adam Snyder - CA, Jon Wolfe)

Response: Comment noted.

172. What is the rationale for limiting the Monte Carlo analysis to only 72 iterations? A Monte Carlo analysis typically requires a much larger number of iterations (usually thousands) to develop a stable distribution of values. (*Commenter: Heinz J. Mueller - EPA*)

Response: The technique used in the production costing and financial analysis model is a stratified Monte Carlo method. TVA has conducted tests of this method and determined that 72 iterations is sufficient to accurately represent the probability distribution curve. More than 72 draws are made in the model, but only 72 are retained to populate the sectors of the distribution.

173. While TVA has apparently provided the Stakeholder Review Group with detailed information used during the planning process, much of this information has not been included in the draft IRP or EIS or otherwise shared with the public. We are concerned about this lack of transparency as public disclosure is a central purpose of the National Environmental Act (NEPA). The lack of this information, as also noted in other comments, also makes it difficult to make an informed assessment of the alternatives, including the cost estimates and rationales for choosing model input characteristics. (*Commenter: Frank Rambo - SELC*)

Response: Transparent communication is an important part of the IRP process. The presentations for each of the Stakeholder Review Group meetings were posted on TVA's external web site soon after the meetings so that they could be considered by the general public. These presentations as well as additional information can be found at http://www.tva.com/environment/reports/irp/index.htm.

2.16.8. Planning Scenarios

174. By the end of the planning period, renewable energy may be one of the only types of generation not severely restricted by problems with climate change, pollution, waste disposal, foreign fuel sources, and safety concerns. TVA should consider a scenario that includes two or three times the current 9,400 MW of renewable energy and EEDR to address this situation. (*Commenter: Nelson Buck*)

Response: The scenario planning process being used in the IRP is intended to identify potential resources that can be combined to form a planning strategy. That strategy has a broad directional character that allows for adjustments in terms of composition as future conditions change. The kind of situation described in this comment would be considered in future IRP updates as appropriate.

175. How do the planning scenarios address the likelihood of economic distortion resulting from greatly increased interest rates for a protracted period of time? This would greatly affect financing of TVA construction projects and the ability to inexpensively raise funds. (*Commenter: Charles Jones*)

Response: This type of macroeconomic impact is considered in the design of the scenarios (see Final IRP Figure 6-3). Across the various futures represented by the seven scenarios there are variations in economic assumptions, including higher interest rates. In addition, the probabilistic analysis performed as part of the study also considers swings in key input variables that could represent changes associated with economic fundamentals.

176. The assumptions for the Environmental Outlook uncertainty for many planning scenarios are unreasonably low, need clarification, or both. TVA states that coal plants will require various emission controls by certain years, yet does not provide the necessary detail to support the assumptions. Similarly, TVA does not describe the actual control devices necessary to comply with the 'HAPs MACT.' These unexplained or implausible assumptions minimize the risk and costs associated with carbon-intensive resources, such as coal, and prevent the necessary reasonable comparison of alternatives. (*Commenter: Frank Rambo - SELC*)

Response: As outlined in Chapter 5 of the IRP, specific numerical values or dates for each uncertainty were defined for each of the scenarios. The Environmental Outlook assumptions included: (1) an aggressive EPA regulatory schedule leading to additional compliance requirements and (2) command and control regulations for Hazardous Air Pollutants (HAPs) that drive plant by plant compliance. The timing for installation of emission controls and HAPs requirements were varied across the scenarios to ensure a robust analysis. Drivers for clean air controls, in addition to HAPs, are presumed to be the Transport Rule (once finalized) and the National Ambient Air Quality Standards (NAAQS). The Transport Rule is assumed to replace the Clean Air Interstate Rule with stringent limits for SO_2 and NOx beginning in 2012 and some additional reductions in 2014, coupled with SO_2 and NOX emission limits to be set by state programs to attain NAAQS. HAPs will likely require strict emission rate-based limits on each plant to control mercury, acid gases, and metals.

177. The assumptions for the GHG requirements uncertainty in the Economic Malaise Scenario are unreasonable. Given that EPA is beginning to regulate GHG emissions, the cost of CO_2 emissions will be higher than the assumed $0/ton. These unexplained or implausible assumptions minimize the risk and costs associated with carbon-intensive resources, such as coal, and prevent the necessary reasonable comparison of alternatives. (*Commenter: Frank Rambo - SELC*)

Response: The purpose of the scenarios is to provide a range of potential future conditions that is used to analyze the performance of the planning strategies. The Economic Malaise Scenario describes a future with low growth in power demand and no additional regulatory requirements for emissions and other air pollutants, energy efficiency, or use of renewable energy. The other scenarios consider various levels of new regulatory requirements and a range of costs of CO_2 emissions.

178. The planning scenarios address a relatively narrow set of power demand forecast curves that represent various businesses as usual models and assume a return to historically 'normal' conditions. While this approach is useful, TVA should also use scenarios that consider radically different future conditions such as extreme climate change, rapid increase in fuel costs driven by fuel depletion, long term depression, and the transition from a growth economy to a steady state economy. (*Commenter: Louise Gorenflo - TCSC*)

Response: The scenario planning process used in the IRP study is intended to test a suite of planning strategies against a range of potential future conditions defined by the scenarios. While some scenarios are based on historically normal conditions, others incorporate higher growth (Scenario 1) and markedly lower growth (Scenarios 3 and 6) conditions. The selection of the preferred alternative strategy is largely based on its performance across the range of conditions defined by the scenarios. In future IRPs, TVA will continue to consider a broad range of future conditions, including potentially extreme conditions. The IRP strategic direction approved by the TVA Board for implementation will be subject to tuning through the annual planning process and IRP updates to best position TVA to be successful in its core mission. The scenarios represent various long-term outlooks that help TVA identify the robustness of alternative resource plans. Extreme conditions, such as those identified in this comment, could be part of future sensitivity testing of a recommended planning strategy.

179. There is a real need for seriously dealing with GHG emissions; this should be done sooner rather than later. Your Scenario 6 - Carbon Regulation Creates Economic Downturn is alarming. Please give a more detailed explanation of the assumptions made in defining this scenario. (*Commenter: Steve Pearson - AAFB*)

Response: This scenario was developed based on recommendations of the Stakeholder Review Group. The scenario assumes that stringent CO_2 regulations are passed without a global climate treaty. This results in the cost of electricity being much higher in the United States than in many developing countries. As a result, large multi-national industries move factories and production processes that consume large amounts of electricity from the United States to overseas, resulting in an economic downturn.

180. TVA needs to seriously address and plan for the Game-Changing Technology 'gadget' in Scenario 4. Many of these gadgets already exist in various forms. They will cause a gradual decline in demand for grid-based power over the next 10 to 15 years and a precipitous decline at about 20 years. After 45 years, there will be no demand for grid-based power. (*Commenter: Paul Noel - NEC*)

Response: Comment noted.

2.16.9. Purchased Power

181. The IRP strategies restrict the use of purchased power in meeting TVA's future energy needs. In order to provide the lowest cost and overall best resources for TVA customers, TVA should consider a competitive procurement process that captures all available options in an open, transparent, and fully competitive mechanism. Through this process, all supply options, including existing resources, would be evaluated on an equal basis. (*Commenters: Mike Chapman - ME/KE, Tina Lee - KP, Peter Robertson - ANGA*)

Response: The IRP planning strategies do not restrict the use of purchased power. They instead include an annual limit on maximum power purchases to properly reflect constraints on the transmission network or other operational limits. These constraints are necessary to prevent the planning model from selecting an amount of purchased power that either cannot be reliably delivered or may not be available for the duration of the planning study.

182. There are 16 natural gas-fueled Independent Power Producer plants in or adjacent to the TVA region with about 12,000 MW of capacity. Many of these plants are underutilized.

TVA should consider greater utilization of these facilities in its scenario analysis. These plants could replace aging coal-fired plants at significant cost savings to TVA and provide significant environmental benefits. (*Commenters: Mike Chapman - ME/KE, Peter Robertson - ANGA*)

Response: The IRP study uses both potential purchased power agreements (PPAs) and market power supplies as options in the analyses. The IRP does not attempt to identify specific sources for these options, but presents a quantity of power expected to be available in a projected price range. These details are not disclosed in the IRP in order to protect TVA's ongoing negotiations for power supplied by other producers. PPAs and market power purchases are part of all the planning strategies evaluated in the IRP. Available capacity of independent power producers will continue to be part of TVA's resource mix, and may be part of the strategy that allows higher quantities of existing coal-fired resources to be idled. The details of that strategy will be developed as part of follow-up studies after the conclusion of the IRP.

183. We question the pre-determined limits on the amount of capacity from any single source, particularly purchased power. This is contrary to the plan's goal to "ensure that TVA can meet the demand for electricity on its system in a cost-effective, reliable manner." TVA should avail itself of any and all capacity that is available. Limiting purchased power to 900 MW will not allow rate power to take advantage of the low-cost of purchased power and to avoid the inherent risks with new self-build facilities. (*Commenters: Brett R. Kerr - CC, Tina Lee - KP*)

Response: The purchased power limit of 900 MW identified in the draft IRP report (see Figure 5-12) represents an annual cap on market purchases, not a total cap over the study period. This limit has been set to ensure that the optimization model would not select an unrealistically high level of market purchases in any one year simply because that option happened to be the lowest cost alternative in that year. Specific decisions about purchased power agreements (PPAs) are not being made in the IRP cases, but would be the outcome of more focused analyses of options in response to a solicitation or other assessment of market opportunities.

184. While the draft EIS briefly discusses current power purchase agreements (PPAs), neither the draft IRP or EIS discuss purchased power as a potential future resource other than for a few renewable options. We are particularly concerned that TVA is not addressing the large potential for promoting the development of recycled energy facilities through PPAs. The final IRP and EIS should describe how purchased power was modeled and address the potential for purchasing power from recycled energy facilities. (*Commenter: Sam Gomberg - SACE*)

Response: Purchased power is one of several options considered in the IRP. This option is included in the study in three ways: potential transactions from specific projects are included as options in the model database, market purchases are included as resource options along with the renewable energy purchases also included in the list of possible future resources. The planning strategies evaluated in the IRP are comprised of various combinations of resources selected over a 20-year period, and all strategies include various levels of market purchases throughout the study period. In some scenarios, long-term PPAs are selected as part of the resource mix. To protect TVA's ongoing confidential negotiations regarding additional purchased power supplies, and the forecasts of market power prices, no project or price details have been included in the IRP or EIS. Purchased power is

selected as part of the resource plans based on cost, so the source of that power can be variable. Conventional sources, renewable energy sources, or recycled energy facilities are potential sources of purchased power if the cost of power from those sources is at or below the price used in the model. The IRP does not attempt to identify the composition of sources for any power purchases included in the planning strategies; the selection of specific sources would be the subject of competitive solicitation of offers conducted after the conclusion of the IRP study.

2.16.10. Resource Plan Implementation

185. Constructing and implementing a 'smart grid' distribution system will be essential for successful implementation of some components of the IRP. Much of this must be done by the distributors. TVA should consider financial incentives in the form of payments or credits for the distributors making self-initiated and self-financed smart grid improvements. These improvements are essential to reducing demand that would otherwise be met by building new generating capacity or purchasing off-system power and benefit the whole TVA region. (*Commenter: Jack W. Simmons - TVPPA*)

Response: TVA plans to continue to work closely with the Tennessee Valley Public Power Association (TVPPA) and its individual members to demonstrate the effective deployment of smart grid systems and develop informed policies regarding their widespread use. While not essential to every aspect of energy efficiency implementation, smart grid technology has the potential to play a key role in the accomplishment of cost-effective implementation of some energy efficiency and demand response efforts. TVA is committed to a dialogue with TVPPA and distributors on how smart grid deployment can best be accomplished and will continue to pursue new opportunities to partner with distributors to increase the knowledge base for all concerned.

186. How much flexibility will TVA have in implementing the IRP once it has been completed and the Board approves a strategy? TVA will have to adjust to changing circumstances that will arise in the future. (*Commenter: Amy Walls*)

Response: The alternative strategies described in the IRP provide strategic direction rather than prescribed capacity additions. This approach gives TVA flexibility in implementing the selected strategy and assures that the selected strategy will perform well within the range of the various scenarios. TVA has also committed to updating the IRP at regular intervals, with the first update beginning no later than 2015.

187. Implementation of the IRP will require innovative approaches to selecting and financing power generation. We urge TVA to accelerate its efforts to involve the Seven States Power Corporation in this. Seven States involves the TVA distributors in the financing and ownership of generating facilities. The distributors desire this equity position and a stronger role in planning the future power supply. (*Commenters: Dana Jeanes - MLGW, George B. Kitchens - JWEMC, Jack W. Simmons - TVPPA*)

Response: Comment noted. TVA and Seven States Power Corporation are currently working together to evaluate financing options and opportunities.

188. In order to successfully implement the EEDR portfolio, the TVA distributors will need to install additional infrastructure. The planning, design, installation, and funding of this infrastructure appear to be the responsibility of the distributors. The distributors, however,

need for TVA to coordinate with them on the additional infrastructure system needs and requirements. This is necessary to assure the appropriate system designs, equipment purchases, and installations are completed in time to meet the power system needs. How is TVA coordinating this work by distributors? (*Commenters: Alfred Dyson - DETS, Jack W. Simmons - TVPPA*)

Response: TVA fully recognizes that successful implementation of EEDR initiatives is highly dependent on the cooperation of local power distributors. Since the inception of TVA's EEDR organization and its efforts in EEDR over the last four years, TVA has focused on communication and coordination with power distributors in the design and implementation of programs. This has primarily been through the Tennessee Valley Public Power Association (TVPPA) committee structure and dialogue with individual power distributors. As with programs developed thus far, TVA will continue to seek the involvement of power distributors in design teams and will continue to discuss planning and development issues in the forums afforded by the Rates and Contracts, Energy Services, Technology Applications, and other TVPPA committees. In addition, input from individual distributors will continue to be a key ingredient in the development process.

The timing and development of infrastructure by distributors as well as staffing issues are important considerations in implementing the recommended strategy identified in the IRP process. TVA is engaged in an ongoing dialogue with power distributors to identify the challenges posed and potential solutions. In cooperation with several power distributors across the Valley, TVA is demonstrating a variety of technologies to learn the intricacies of their deployment and operation as well as how to best integrate their use with the operations of both power distributor and TVA delivery systems. Such demonstrations will provide fundamental information on the costs, staff impacts, and other issues associated with wide-scale infrastructure changes that can be shared with the entire power distributor community in the Valley. Given the early stages of these demonstrations, a detailed description of the complete role of power distributors is not feasible in the IRP document, but an attempt to address the overall importance of the power distributors' role will be made.

189. The environmental reviews of project-specific actions taken in implementing the IRP should include assessments of wetlands, surface waters, erosion and sediment control, air emissions, solid and hazardous wastes, biological resources, significant natural communities and geologic sites, and historic and cultural resources. They should also consider pollution prevention techniques, waste minimization and recycling, and other measures to reduce and mitigate potential environmental impacts. (*Commenter: Ellie Irons - VDEC*)

Response: Comment noted. TVA routinely considers these topics in its environmental reviews of specific proposals.

190. The full involvement of the local power distributors is essential for the successful implementation of the new resource plan. This is particularly true for the energy efficiency and demand response programs, time-of-use rate implementation, smart grid initiatives, and integration of electric vehicle charging stations, as the distributors, rather than TVA, are the direct contact with most customers/ratepayers. Although there is some recognition of the role of distributors in the draft IRP, there is a lack of detail on this aspect of implementation. (*Commenters: Robert Kieffer - HES, Jack W. Simmons - TVPPA*)

Response: Comment noted. The commenter is correct in the assessment that full involvement by the distributors of TVA power is essential for the successful implementation of the new resource plan. The final IRP has expanded the recognition of this role of the distributors.

191. We look forward to participating in the project-specific review of future implementing actions. (*Commenter: Karen Anderson-Cordova - GDNR*)

Response: Comment noted. As appropriate, TVA will involve the pertinent federal and state agencies and the general public in the project-specific environmental reviews of future implementing actions.

192. We recognize the importance of EEDR in TVA's resource planning and acknowledge that the TVA region has a large potential for energy conservation. We are concerned, however, with how TVA is addressing the uncertainties in achieving the aggressive demand reduction goals. If the goals are not met, load shedding, contingent supply, and transmission facilities may be needed. The most suitable contingent supply is natural gas generation. (*Commenter: Peter Robertson - ANGA*)

Response: Uncertainty analysis has been a key part of the IRP study, and the risk associated with achieving projected EEDR reductions was a part of that analysis. This risk was analyzed through the stochastics (Monte Carlo simulation) performed as part of the financial cost computed for each of the planning strategies. TVA’s annual planning process will continue to assess the effectiveness of the EEDR portfolio and may recommend hedging strategies to ensure system reliability.

193. We urge TVA to provide more detail about how changes in the selected resource plan/strategy will be made in practice as conditions evolve. One particular aspect of interest to distributors is our understanding that some changes in strategy will be implemented by simply passing costs on to customers through the new Fuel Cost Adjustment provisions. For example, costs of additional purchased power incurred by not meeting EEDR targets would be passed to customers through the fuel cost provisions. Similarly, what would be the effects of existing generating asset performance being lower than expected (as recently occurred with Browns Ferry Nuclear Plant)? (*Commenter: Jack W. Simmons - TVPPA*)

Response: Depending on the level of other assets available, purchased power might be used to make up for limited duration shortfalls in EEDR targets or poor performance by generating facilities. However, the IRP process is designed to minimize the risk of these occurrences by finding the least-cost plan that also has a reasonable level of financial risk as well as non-quantifiable risks. It should be noted that short-term power purchases are also made when there are less expensive resources available from third-party suppliers.

194. We urge TVA to work closely with the distributors through the Tennessee Valley Public Power Association (TVPPA) committee structure to successfully implement the resource plan. The TVPPA committees represent the geographical and size diversity of the distributors as well as both municipal and cooperative distributors. Within the committee process, there must be full, transparent, and effective communication of TVA's operational, financial and strategic planning. (*Commenter: Jack W. Simmons - TVPPA*)
Response: TVA remains committed to working closely with the distributors of TVA power to successfully implement the resource plan. TVA will work with TVPPA through its committee

process to assure full, transparent, and effective communication as implementation plans are developed.

195. While we strongly support the IRP process, we are concerned that the TVA Act does not require the TVA Board of Directors to act in accordance with IRP results. This could impact the effectiveness of the IRP process and result in inconsistent strategic direction. (*Commenter: Sam Gomberg - SACE*)

Response: The commenter is correct that under the TVA Act, the TVA Board of Directors has the authority to set TVA's strategic direction. Consistent with this, the IRP process is structured to present to the TVA Board the results of the IRP process and a recommended strategy. As the ultimate strategic decision maker for TVA, the Board is free to approve that strategy or to adopt some other strategy as long as it is within the borders of the IRP environmental analysis or is preceded by a revised environmental analysis. This is fully consistent with the IRP process and expectations for it.

2.16.11. Sensitivity Testing

196. Does the IRP test sensitivity to likely National Renewable Energy Standards? If so, what assumptions were used in this testing? (*Commenter: Harold Danks - AC*)

Response: The IRP does not explicitly test specific national RES targets, but the design of the scenarios used in the study does reflect some consideration of potential federal legislation about renewable energy standards that was under discussion in Washington in the fall of 2009.

2.16.12. Stakeholder Review Group

197. How were the members of the Stakeholder Review Group selected? The membership includes several statewide organizations. There does not, however, appear to be any representation from the Memphis area. (*Commenter: Alfred Dyson - DETS*)

Response: TVA considered a number of different individuals when identifying possible members of the Stakeholder Review Group with the objective of achieving a balanced cross section of governmental, power distribution, civic, and non-governmental interests. To keep the size of the group manageable, TVA decided that recruiting some members from statewide organizations like TVPPA and the Chamber of Commerce would bring to the Review Group perspectives that would encompass more local viewpoints. Purposefully trying to bring in members from specific locations would have led to concerns about favoring some locations over others absent creating a very large group. TVA did hold two public meetings on the IRP in or near Memphis.

198. Please explain the role of the Stakeholder Review Group in more detail. For example, how deeply were they involved in developing the various scenarios and strategies? (*Commenter: Rita Harris - SC*)

Response: TVA and the Stakeholder Review Group (SRG) met on approximately 16 days in workshops and working sessions over the course of the IRP planning process. TVA presented each step of the process in detail to solicit input and feedback. Particular attention was spent on the scenarios and strategies used in the study. Several of the scenarios were based on suggestions from the SRG. The input and feedback, as well as

challenges made by the SRG, were quite valuable in producing the IRP. Most of the material presented during the SRG meetings and meeting minutes are available at http://www.tva.com/environment/reports/irp/meeting_reports.htm.

199. Will TVA expand its Stakeholder Review Group to include the Technical Director of the Tennessee Solar Energy Association as the advocate for solar energy and energy storage? (*Commenter: Stephen Levy - TSEA*)

Response: The mission of the Stakeholder Review Group will be complete once the IRP is issued in the near future. It is expected that the current group will be dissolved at that time.

2.16.13. Strategy Evaluation Metrics

200. Draft IRP Section 5.5.2.1 and Appendix A, Air Impact (and related DEIS Section 7.6) use CO_2 emissions as a surrogate for emissions of other air pollutants (sulfur dioxide, nitrogen oxides, mercury). Please provide a more detailed discussion of the rationale behind the use of CO_2 as a surrogate. We note that the emissions of these pollutants, as graphed in the DEIS, decrease at different rates. Please also provide more detail on the underlying assumptions used to estimate future emissions. (*Commenters: Heinz J. Mueller - EPA, Sue A. & Steven M. Williams*)

Response: Model results provided data on the production of four emissions: carbon dioxide (CO_2), sulfur dioxides (SO_2), nitrogen oxides (NO_x) and mercury (Hg) by generation source, though it was suspected that evaluating the strategies on the basis of all four emissions would give the same results (i.e. declining emissions trends) as just using CO_2 alone. Emission trend plots were developed to confirm this assumption and CO_2 was used as a surrogate of air emission trends for the IRP evaluation. Additional detail of the environmental metrics can be found in IRP Appendix A. Regarding the difference in emission trend plots, the slopes of the decreases in CO_2 emissions illustrated in Appendix A of the IRP and in Section 7.6 of the EIS do differ from the slopes of decreases in emissions of other air pollutants, as do the proportional amounts of emission decreases. Emission trends charts presented in the IRP and EIS, while correctly showing emissions declines, represent two separate measures. The emission charts shown in Section 7.6 of the EIS are the projected emissions trends for air pollutants (SO_2, NOx, Hg, and CO_2) for specific selected strategies by scenario. For example, SO_2 emission trend lines for Strategy E in Scenario 2 are shown in Final EIS Figure 7-2, while figures provided in Appendix A of the IRP are emission trends using the environmental metric methodology.

201. How would the metric scorecards change if you assumed that GHGs were not legislated or otherwise a concern in the future? Would either Strategy A or D score better? (*Commenter: Nick Crafton*)

Response: If GHG reductions were not required by legislation or a concern going forward, all of the Strategies would perform better, but Strategy A would most likely improve the most. This affect is shown in the scorecard results for Scenario 3, which represented a view of the future that did not include any CO_2 compliance costs.

202. Strategy E scores very close to and slightly lower than Strategy C. How would Strategy E have scored if it had incorporated pumped hydro storage? (*Commenter: Garry Morgan*)

Response: Pumped-storage hydro has a slightly negative impact to the scores of the strategies, mostly due to the resource being a very capital intensive alternative that does not have sufficient quantifiable operating benefits that can be represented in a planning model to fully offset its high construction costs. Therefore, incorporating a pumped storage plant into Strategy E would have a slightly detrimental effect on its scorecard results.

203. The alternative strategies have differing effects on human health due to the varying levels of air pollutants, water pollutants, and solid wastes. Please add a strategic metric that compares the potential human health effects of the various strategies and scenarios. (*Commenter: Dana Beasley Brown*).

Response: Federal environmental standards typically are set at levels protective of human health and are reviewed regularly by EPA to ensure those levels remain appropriate for all populations including sensitive populations. In development of the IRP strategies and scenarios, TVA assumed compliance with regulatory requirements and that this would sufficiently protect human health. Creating a human health impact metric, assuming this could be done without substantial uncertainty, would not serve as a meaningful means of distinguishing among strategies because of this. We recognize, however, that this could be debated and some assert that environmental standards are insufficient, and as such, would also be considering and protecting human health.

204. TVA should add a scorecard metric that addresses residential electrical use intensity. Because much of the future growth in power demand is predicted to come from the residential sector, this metric would address an important factor that is not otherwise adequately measured. (*Commenters: Dana Beasley Brown, Louise Gorenflo - TCSC*)

Response: The scorecard designed for the IRP captured key metrics that relate to the fundamentals of TVA's mission. While the metrics selected do not include a specific measure of residential electric use, the study did evaluate multiple levels of energy efficiency programs which include efficiency improvements in many areas including, but not limited to, residential HVAC, lighting, and improved insulation. The impacts from these programs are captured in the plan costs and risks, along with the strategic metrics that are a part of the scorecard. So the scorecard has an indirect measure of reduced consumption in the residential sector and that impact can be seen in the scorecards.

2.17. IRP Strategies/Alternatives

2.17.1. Amount of EEDR and Renewable Energy Generation

205. I encourage TVA to develop and implement increased energy efficiency efforts and renewable energy production, especially local renewables. This, along with the transition from coal-fueled generation, will result in significant environmental benefits and provide customers with new energy choices and reliable service. (*Commenters: Mary Agee, Brent Bailey - 25X25, Lawrence Carroll, Ty Gorman, Courtney Piper - TBLCEE, Jackie Tipper Posey, Joab D. Silverglade, Sue A. & Steven M. Williams, Louise A. Zeller - BREDL*)

Response: Comment noted. The Recommended Planning Direction strategy includes 3,600 MW of EEDR and 2,500 MW of renewables, a portion of which would be generated in the TVA region. This strategy also includes the idling of up to 4,700 MW of coal generation.

206. I urge TVA to rely on renewable generation, particularly solar and wind, coupled with greatly increased energy conservation and demand management for all future energy needs. These resources will provide cheaper, cleaner, and safer alternatives than coal and nuclear energy. (*Commenters: W. R. Avery [sic], Darrell Bawlslin [sic], David D. Beaty, Mark Betts [sic], Mark A. Burnett, Kelvin Butler, Marisa J. Butler [sic], Lester Dean, Randy L. Dry [sic], Juliana Ericson, Tom Ferguson, Kathleen R. Ferris - BEST/CENDIT, Norman Ferris, Robyn Galochee [sic], Elizabeth C. Garber, Richard Gilbert, Nancy Givens - WKU/KSES/BGGP, Jane C. Hardy, Rick Held, Cathy L. Hook [sic], N.D. Johnson [sic], D. K. Johnson [sic], Raphael Y. Junit [sic], Nancy McFadden, Laura Miller, Karen Monalan [sic], Josh O. [sic], Elsa Parker [sic], Barbara Peach, Stefan Peter-Contesse, Patricia Poat, Justin Post, Mrs. James S. Powers, Don Safer - TEC, Steven Sandheim - SC/TSVC, Susan Shannon [sic], Richard & Marian Taschler, Paula D. Ward, Cassie F. Watts, Kevin R. Woods, Schean Yearke [sic], James E. Zubko*)

Response: Comment noted. Renewable resources and EEDR are part of all the strategies evaluated in the IRP. While these resources do offer benefits to the TVA system in terms of reduced environmental impact, and enable the agency to move closer to its goals regarding cleaner energy sources, by themselves renewables and EEDR cannot offer the low-cost and reliable power TVA is obligated to provide its customers. TVA is continuing to pursue a diversified portfolio that includes these and other resources and will be evaluating an increased role for both EEDR and renewables in future planning studies. See Final IRP Appendices C and D for an explanation of the development of the renewable resources and EEDR portfolios included in the IRP strategies.

2.17.2. Diversity of Generating Sources

207. Natural gas currently represents less than 4% of TVA's generation capacity and this proportion does not change markedly under the proposed strategies. This is a much lower proportion than the current 24% national average. As TVA states, a diversity of fuel sources is desirable. In this context, natural gas is underrepresented in TVA's fuel mix. Increased gas capacity would also provide more reliable back-up capacity to support the increase in intermittent renewable generation capacity. (*Commenter: Peter Robertson - ANGA*)

Response: Including purchased power and short-term market purchases, the majority of which come from gas-fired units, in 2011 natural gas is projected to account for 25% of total capacity and about 31% of capacity by 2029 in the mid-range scenarios studied in the IRP. In addition, gas-fired generation and purchases account for about 8% of energy produced over the same time frame. Natural gas capacity is an option in the IRP and is selected by the models when cost-effective.

208. Under all strategies, including the Diversity Focused Resource Portfolio, the true diversity in power generating resources is lacking. Almost all power will be from coal, nuclear, and natural gas facilities with no more than 4% from renewables. This lack is not consistent with public sentiment and policy or with local private-sector trends in alternative energy production. (*Commenter: Courtney Piper - TBLCEE*)

Response: The diversity of the resource portfolios produced in the IRP is a result of the assumptions on cost and performance of resource options, along with targets related to minimum levels of some key resource types such as renewables and energy efficiency. Overall, the diversity of the resource portfolios, when considering both TVA's existing generating assets and the resources recommended in each planning strategy, achieves a

level sufficient to mitigate the risk of dependency on any one generating source and can be adjusted in response to future developments when the IRP is updated.

209. We encourage TVA to diversify its energy options in order to lessen reliance on fossil fuels, create new economic opportunities, and protect the environment. (*Commenters: Adam Snyder - CA, Gregg Weathers - WRECC*)

Response: Comment noted. All of the alternative strategies reduce reliance on coal-fired generation and the action alternatives/strategies increase the diversity of TVA's generating sources.

210. While I support the use of diverse energy sources, I am concerned about the intermittent generation from solar and wind resources. Does TVA have enough rapid-response backup generating capacity to compensate for the intermittent generation? Natural gas plants can often provide this capacity. (*Commenters: Mike Chapman - ME/KE, Charles Jones*)

Response: TVA's peaking generation is currently sufficient to compensate for variations in the wind power purchases modeled in the IRP. The reserve margin may need to be increased if large amounts of renewables are integrated into the generation portfolio, which could lead to the addition of quick-start generation (generally gas-fired combustion turbine units).

211. While we would prefer that all new capacity additions be from renewable sources, particularly solar, we realize this approach is not realistic. Renewable energy is life-cycle cost effective but has high initial costs and takes time to implement. We believe a balanced generation portfolio with heavy emphasis on renewables and energy conservation is the best approach. (*Commenters: A. Morton Archibald - ASA, Adam Snyder - CA*)

Response: TVA agrees that renewables should play a role in the resource mix, and that implementing these resources into the mix will take time. As these resources gain efficiencies in operations and costs, TVA will continue to evaluate them as part of a balanced portfolio.

2.17.3. Energy Imports

212. Reducing and eventually eliminating imported energy of all types should be a focus of all strategies and scenarios. The United States transfers a significant amount of its wealth to other countries to import energy, and much of our defense spending is to maintain these energy imports. (*Commenter: Eric Lewis*)

Response: Comment noted. TVA does not currently depend on imported fuel for the generation of electricity. New generation options considered in the IRP continue to focus on domestic fuel sources.

2.17.4. General Preferences

213. I support strategies that provide prudent environmental regulation, minimal requirements for renewable generation, increased emphasis on application of smart-grid technologies, and a focus on lowest cost of production. (*Commenter: Tom Martin - WRECC*)

Response: Comment noted.

2.17.5. Opposed to Strategy D - Nuclear Focused Resource Portfolio

214. I oppose Strategy D - Nuclear Focused Resource Portfolio. More nuclear energy would result in unacceptable environmental impacts. (*Commenter: Marcella Green*)

Response: Comment noted. Strategy D was eliminated from further consideration in the Draft IRP and EIS. The amount of nuclear capacity added in the retained Strategy C and in the Recommended Planning Direction is close to that of Strategy D. TVA has and will continue to carefully evaluate the potential environmental impacts of each nuclear capacity addition it may propose.

2.17.6. Prefer Strategies E and C

215. We prefer elements of alternative strategies E and C, with emphasis on E because it maximizes the use of renewable power and the reduction of conventional coal generation. Strategy C is attractive by offering a more diversified generating portfolio, including the IGCC facility which would continue to use domestic coal. Both strategies emphasize diversity in generation, renewables, EEDR, and lower-carbon emitting resources. (*Commenter: Heinz J. Mueller - EPA*)

Response: Comment noted. TVA's preferred alternative is the Recommended Planning Strategy which is more similar to Strategy C than to B or E and has moderate levels of EEDR and renewable generation. Its amount of coal unit idling, 4,000 MW, is greater than that of Strategy C and approaches the amount of Strategy E.

2.17.7. Prefer Strategy E - EEDR and Renewables Focused Resource Portfolio

216. I prefer Strategy E - EEDR and Renewable Focused Resource Portfolio. Relative to other strategies, Strategy E reduces the use of nuclear energy, has the most use of renewable energy, and has the greatest reduction in energy use. (*Commenters: Dana Beasley Brown, Trevor Casey - GES, Michael J. Crosby - TEC/BCAAT, Nancy Givens - WKU/KSES/BGGP, Marcella Green, Sheila Green - NCDA, Gregory Hogue - USDI, Gilbert J. Hough - RSI, Andrew Johnson - TSEIA, Christine Johnson - LSE, Nelson Lingle - RSI, Eric Matravers, Andrew Pitner, Rachel Tuck, Gary Verst - SC, Edward Zubko - GES, Edward Zuger - CCSC III*)

Response: Comment noted.

217. While we prefer Strategy E - EEDR and Renewables Focused Resource Plan, its EEDR target is not aggressive enough. Other utilities are successfully meeting larger EEDR targets. (*Commenter: Michael J. Crosby - TEC/BCAAT*)

Response: While the Recommended Planning Direction strategy includes a lower level of EEDR than included in Strategy E, TVA will continue to develop and implement programs to achieve a Southeast leadership position in EEDR. Goals and targets will be revisited when TVA begins the next IRP study, no later than 2015. See Final IRP Appendix C for a description of the development of TVA's EEDR portfolio.

2.17.8. Range of Reasonable Alternatives/Strategies

218. I urge TVA to analyze a strategy consisting of the following:
- A high level of EEDR
- Idling of 5000 MW of coal capacity
- 3 new 800-MW pumped storage hydro units with solar and wind power units for pumping
- New 890-MW combined cycle natural gas units as needed, including the conversion of Bellefonte to natural gas combined cycle

This strategy would employ more local workers and cost less than new nuclear plants. (*Commenter: Garry Morgan*)

Response: The IRP considered several different planning strategies in multiple scenarios (views of the future), and each of these resulted in the development of a possible power supply plan. While the study did not evaluate the specific combination of resources mentioned in this question, a case was analyzed that considered the idling of about 4,700 MW of coal capacity combined with a substantial energy efficiency portfolio (5,100 MW), a renewable portfolio of about 1,500 MW, one pumped hydro plant and gas-fired units as needed. This case also includes the addition of nuclear units at the Bellefonte site, but does not represent the least cost plan. Eliminating the nuclear units and adding more gas units pumped storage hydro plants would tend to increase the cost of this plan beyond the cases already analyzed due to the added capital investment required, the increased exposure to fuel price risk and carbon penalties, and the uncertainty of additional intermittent resources in the generating mix. The recommended strategy attempts to balance these resource components across the scenarios tested by proposing a more moderate amount of these resources combined with a slightly lower level of idled coal capacity.

219. The IRP and EIS analyze a No-Action Alternative (Strategy B) and two Action Alternatives (Strategies C and E). The differences between Strategies C and E are very small (see DEIS Figure 7-1) and neither differs greatly from Strategy B. No alternative maximizes the potential for sustainable energy resources, particularly the development of renewable generation, EEDR, small-scale distributed generation, or coal plant retirements. Consequently, TVA has failed to analyze a reasonable range of alternatives as required by NEPA. (*Commenter: Abigail Dillen - Earthjustice*)

Response: This comment fails to provide sufficient specificity to be able to model this kind of strategy. The five alternative strategies developed for the Draft IRP and EIS encompass a wide range of resource options and portfolios consistent with the purpose and need of the IRP. This range of alternative strategies was then narrowed to the three analyzed in detail according to the defined evaluation criteria. One of the alternative strategies eliminated from further consideration included the smallest amounts of renewable generation, EEDR, and coal capacity idled. In analyses conducted after release of the Draft IRP and EIS, described in Final IRP Chapter 8, the amount of renewable generation (including small scale distributed renewable generation), EEDR, and coal capacity idled was allowed to vary, rather than treated as defined model inputs. This permitted the model to select higher amounts of the energy resources featured in this comment. The results of these analyses produced an optimized strategy which best meets the purpose and need of the IRP.

220. The IRP and EIS must include an alternative that would entirely eliminate dependence on coal-fired generation by 2030. All of TVA's coal plants are operating beyond their intended life-spans and few units are equipped with the pollution controls necessary for compliance with the Clean Air Act. Most do not use appropriate water treatment systems to

control thermal pollution or the discharge of harmful pollutants such as mercury, arsenic, and selenium. They also discharge ash and scrubber sludge to unlined surface impoundments, some of which are classified as 'high hazard.' The continued operation of most coal capacity under all alternatives also contradicts TVA's stated purpose of sustainable energy production. (*Commenter: Abigail Dillen - Earthjustice*)

Response: The preliminary strategies analyzed in the Draft IRP and EIS considered a maximum of about 7,000 MW of idled coal capacity. After consideration of their financial and strategic metrics, the strategies with the highest and lowest amounts of idled coal capacity were eliminated from further consideration, mostly because of financial impacts. The remaining strategies, as well as the Recommended Planning Direction defined in the Final IRP and EIS, consider a range of 2,400 to 4,700 MW of idled coal capacity. The process used in determining the idled coal capacity in the Recommended Planning Direction is described in Sections 6.5 and 8.3 of the Final IRP. The impacts asserted in this comment were considered in TVA’s environmental analyses.

TVA disagrees with the commenter's assessment of the TVA coal plants. To date, TVA has installed scrubbers on 17 of its coal-fired units and switched to lower-sulfur coals at 41 coal-fired units to reduce SO2 emissions. To reduce NOx emissions, TVA has installed SCRs on 21 of its largest coal-fired units, installed selective non-catalytic reduction systems on two coal-fired units (although TVA is no longer operating one of these systems because of technical challenges), installed High Energy Reagent Technology systems on seven coal-fired units, installed low-NOx burners or low-NOx combustion systems on 47 coal-fired units, and optimized combustion on 10 coal-fired units. TVA has also been operating NOx control equipment year round (except during maintenance periods) since October 2008. To reduce particulate emissions, TVA has equipped all of its coal-fired units with scrubbers, mechanical collectors, electrostatic precipitators, or baghouses. As a result of these actions, emissions of NOx have been reduced by 89 percent below peak 1995 levels, and emissions of SO2 have been reduced by 90 percent below 1977 levels. These actions have also resulted in reduced emissions of hazardous air pollutants, including mercury, at some units.

Additionally, TVA plants are operating in compliance with thermal discharge permits and TVA has announced plans to invest between $1.5 billion and $2.0 billion over an eight to ten year period to convert from wet ash and gypsum storage facilities to dry storage facilities in advance of any regulatory requirement for dry storage. The “high-hazard” classification that TVA identified for some of its impoundments is not related to the integrity of the impoundments or the likelihood of their failure and is not related to facility discharges or emissions. It only signifies that if the impoundment failed the lives of individuals downstream of the dam would be at risk.

Strategy C Is Second Best
221. Strategy C is my second choice for the preferred strategy. Although it does include new nuclear plants, it has a relatively large level of coal plant layups and EEDR. (*Commenter: Gary Verst - SC*)

Response: Comment noted.

2.18. Natural Gas

2.18.1. Availability and Deliverability Risk

222. The draft IRP identifies a risk in the availability and deliverability of natural gas resulting from the finite capacity of the natural gas infrastructure. This risk is described as increasing as natural gas generation capacity increases. We believe this risk is overstated as recent reports show an abundant supply, including a supply close to the TVA region, short drill-to-production time, and large recent increases in delivery and storage capacity. (*Commenters: Michelle Bloodworth - ANGA, Peter Robertson - ANGA*)

Response: Potential risk in natural gas transportation may be offset by a variety of factors including the expansion of interstate and intrastate pipeline systems, increased non-conventional production like shale gas, and utilization of natural gas storage opportunities where needed. The potential for significant production of natural gas from shale plays in non-traditional supply regions and certainly opens the possibility of gas flowing in different directions in the future as opposed to strictly from the Gulf of Mexico to the consuming regions. TVA reviews fuel deliverability for all fuels as well as electricity transmission as needed to ensure a reliable system for serving native load.

2.18.2. Cost of Natural Gas Generation

223. For the $275 million+ currently being spent for the Bellefonte Nuclear Plant Unit 1, TVA could construct a 1,000-MW natural gas-fueled combined cycle generating plant. (*Commenter: Sherman Fox*)

Response: TVA does not believe that a combined cycle plant of the size suggested could be constructed for $275 million. TVA recently finished construction of a 540-MW combined cycle plant at a cost of over $400 million and is currently constructing a 900-MW plant at a forecasted cost of over $800 million. These costs are consistent with industry trends for new combined cycle facilities.

224. Natural gas-fueled generation has significant levelized cost of energy advantages over other baseload generation (e.g., nuclear, integrated gasification combined cycle, and supercritical pulverized coal). Other cost advantages include reduced time, risk, and cost of permitting and construction. It is unclear to us whether all of these factors are fully addressed in the modeling process. (*Commenter: Peter Robertson - ANGA*)

Response: Natural gas units may have certain cost advantages over other resource types, but these resources also have limitations that often do not make them the most economic choice for all generating duty cycles or capacity requirements. The IRP models consider all cost and performance characteristics of each generating technology when selecting which resources are added in a given year of the planning study. See Comment 23 for a comparison of costs of various generating technologies.

2.18.3. Environmental Impacts of Natural Gas-Fueled Generation

225. Gas extraction using hydraulic fracturing (fracking) results in significant risks to water supplies and other environmental impacts. We urge TVA to not use gas extracted by this method. (*Commenters: Nancy Givens - WKU/KSES/BGGP, Nancy McFadden, Kevin Routan - CGSC, Don Safer - TEC, Bruce Wood - BURNT*)

Response: Comment noted. The potential for hydraulic fracturing to affect water supplies and other environmental resources is noted in EIS Section 7.6.4. The magnitude of impacts to water resources is poorly known and is currently the subject of studies by EPA and others.

226. The environmental benefits of natural gas generation relative to coal include greatly reduced CO_2, sulfur dioxide, nitrogen oxide and particulates emissions, no mercury emissions, no ash or gypsum, and reduced wastewater discharges and cooling water use. (*Commenter: Peter Robertson - ANGA*)

Response: Comment noted. The environmental attributes of natural gas-fueled generation are incorporated into the scenario planning input data and the environmental impact analysis.

227. TVA, like other utilities and the natural gas industry, is assuming that there will be a large, low-cost supply of shale gas. The DEIS does not explicitly consider the environmental impacts associated with shale gas production and the draft IRP does not account for the likely future regulatory costs associated with shale gas production. (*Commenter: Kipp Coddington - MMCC*)

Response: TVA evaluates the risks in both supply and demand for natural gas in the future. Supply risks typically include potential restrictions, regulation, or legislation that would either prevent or restrict production or cause production to become more expensive because of environmental concerns. The demand risk considerations include the potential for natural gas growth to continue due to competitive advantages of emission levels and capital requirements compared to other technologies as a whole over time. If utilities increase gas generating capacity by a significant amount, it may have an impact on the demand for natural gas, where if all other factors could be held constant, this would potentially place upward pressure on natural gas prices. These supply and demand risks are reflected in the ranges of natural gas price forecasts included in the various scenarios. Potential environmental impacts associated with shale gas production are discussed in Sections 7.3.1 and 7.6.4 of the Final EIS.

2.18.4. Natural Gas Price and Supply Forecasts

228. Mississippi Gasification, LLC is developing a petcoke-to-Substitute Natural Gas (SNG) facility in Moss Point, Mississippi. This project will produce pipeline-quality SNG from petroleum coke using proven gasification technology and incorporating carbon capture and sequestration. The SNG will be available to utilities in the southeast, including TVA, via existing major interstate natural gas pipelines. We urge TVA to seriously consider purchasing this SNG which will be available in 2015-2016 and can be contracted for 30 years. The price of SNG is de-linked from the natural gas market and is less volatile. Use of SNG would provide TVA with significant long-term savings and a fuel with low criteria pollutant and GHG emissions. (*Commenter: Dexter Cook - MG*)

Response: TVA will consider fuel sources from both within and outside the TVA region as long as the resources meet both reliability and economic needs of the TVA. TVA has a process for reviewing proposals for the sale of power from such facilities as well as an active role in discussions with potential suppliers of power and fuel to the TVA.

229. The draft IRP relies on projections of natural gas prices that appear too high when compared with reference market forecasts. TVA forecasts are based on the NYMEX Henry Hub market price forecast. Other forecast approaches, such as that of Crossborder Energy, use different sampling techniques to reduce volatility. This other approach results in lower price forecasts, particularly after 2020. Because of the importance of natural gas price forecasts in the IRP process, we urge TVA to re-evaluate and better explain its price forecasts. (*Commenter: Sam Gomberg - SACE*)

Response: TVA forecasts natural gas both at the Henry Hub as well as delivered lcoations to facilities which require TVA gas to generate electricity. To address the volatility of the market curves, TVA uses ranges of natural gas forecasts to study plans and recommendations. This addresses both the price forecast as well as the width of the range of prices to allow for robust planning and decision analysis across time. Gas forecasts are updated each year for normal TVA business plans, and the next IRP will also incorporate ranges of natural gas prices as well.

230. The forecast price of natural gas that TVA is using for the 'base case' appears to be $6-8/mmBTU. It is higher for three more scenarios. These costs are higher than forecasts over the next 20 years by EIA, Henry Hub, NYMEX, and EPA, which range up to $6.99. As the highest projected cost from each of these sources is below the mid-range of the TVA base case, we request that TVA revise its model inputs on natural gas prices. (*Commenters: Michelle Bloodworth - ANGA, Peter Robertson - ANGA*)

Response: TVA reviews all of our commodity forecasts in the TVA annual business processes and updates are made wherever new information is available. By incorporating ranges of gas prices (instead of just one deterministic case) TVA evaluates potential impacts of decisions across varying prices for a comprehensive impact. Another IRP will begin in 2015, and assumptions and forecasts will be updated for then-current market conditions as well.

231. TVA appears to be basing its increased future reliance on natural gas-fueled generation, in part, on the natural gas industry and Energy Information Administration (EIA) forecasts of an abundant supply of shale gas. Both the natural gas industry and EIA have a record of overly optimistic supply forecasts. Incorrect forecasts have resulted in construction of gas plants that have never operated and subjected ratepayers to high rate volatility. TVA should reassess its planned increased reliance on abundant natural gas supplies. (*Commenters: Kipp Coddington - MMCC, Jack W. Simmons - TVPPA*)

Response: Potential increased reliance upon natural gas or analysis of closing coal-fired plants is driven by several factors including the up-front capital costs of controls, operating costs, useful remaining plant life, and overall TVA Environmental Strategies. The costs in these analyses involve both fixed and variable costs. Evaluating new capacity for electric generation also requires a comprehensive evaluation of all such variables for both the unit that may be retired as well as the likely replacement generation. In many cases, natural gas generation was the recommended replacement of choice due to a combination of factors that include both fixed and variable costs combined to be the least-cost solution for TVA. TVA gas price forecasts include a variety of factors on both future supply and future demand that acknowledge both uncertainty in future non-conventional gas supplies like shale as well as potential growth in future demand, such as more electric utilities expanding their fleets with natural gas generators.

232. Under all of the alternative strategies, TVA would close coal-fired plants and increase its reliance on natural gas-fired generating capacity. This places TVA customers at significant risk of future increases in the price of natural gas. TVA's natural gas price forecasts seem to be based in part on unproven assumptions that production of shale gas will continue to increase and that its price will be low and stable. TVA should better explain its natural gas price forecasts and the risk of future gas supply and price volatility. (*Commenter: Kipp Coddington - MMCC*)

Response: The recommendation or analysis of closing coal-fired plants would be driven by several factors including the up-front capital costs of controls, operating costs, useful remaining plant life, and overall TVA environmental goals. The costs in these analyses involve both fixed and variable costs. Evaluating new capacity for electric generation also requires a comprehensive evaluation of all such variables for both units that may be retired as well as the likely replacement generation. In many cases, natural gas generation was the recommended replacement of choice due to a combination of factors that include both fixed and variable costs combined to be the least-cost solution for TVA. TVA gas price forecasts include a variety of factors on both future supply and future demand that acknowledge both uncertainty in future non-conventional gas supply like shale as well as potential growth in future demand, such as more electric utilities expanding their fleets with natural gas generators.

233. We question whether TVA's natural gas purchase practices take full advantage of opportunities to mitigate the risk of future price volatility. According to the draft EIS (p. 43) and TVA's 10-K, gas is purchased under contracts with terms of 1 year or less. Longer term purchase contracts could greatly mitigate risks and reduce the future costs of natural gas. (*Commenter: Peter Robertson - ANGA*)

Response: TVA is actively engaged in utilizing a variety of pricing mechanisms, including spot, monthly, seasonal, and multi-year physical and financial transactions for the purpose of limiting the economic risks associated with the price of natural gas. Due to a diversified portfolio of assets, TVA is able to manage all commodity risk in an integrated manner through a comprehensive commodity strategy

2.18.5. Natural Gas-fueled Generation

234. In the charts you display of energy production by type, why is there no minimum percentage for combined cycle and combustion turbines? The minimum should at least be as much as is in the fleet today. (*Commenter: Thad Huguley - HCG*)

Response: The referenced charts portray the energy production from the new resource additions selected by the modeling process in the IRP study. They do not include the generation from TVA’s existing generating facilities, including gas-fired units.

235. In the late 1990s, TVA issued a study showing the feasibility of a 2,000-MW natural gas combined-cycle plant at Bellefonte. While a CC plant this large may not now be feasible there, TVA should build a 890-MW CC plant at Bellefonte instead of the planned nuclear plant. (*Commenter: Garry Morgan*)

Response: The IRP study includes many resource options as candidates for selection in each of the planning strategies being evaluated. Among those options are combined cycle plants in the 900-MW range, and several of those are selected in various scenarios. In most

cases, the IRP does not specify the site at which these new resources would be added, and it does not identify a combined cycle plant at Bellefonte as an option. Completing the nuclear units at Bellefonte also was evaluated in the IRP. The commenter is correct, TVA did evaluate the merits of converting the unfinished nuclear units at Bellefonte relative to other generating technologies, including an NGCC plant. Because there is no natural gas supply on that site, TVA determined that a natural gas pipeline would have to be built to the site ranging in length from 22 to 50 miles. TVA did not proceed with this proposal.

236. Under all of the alternative strategies, natural gas-fueled generation is restricted to no more than 13% of TVA's portfolio in 15 years. Given its abundant, low-cost future supply and role in facilitating buildout of renewable generation, why is natural gas playing such a small role in the future? (*Commenter: Thad Huguley - HCG*)

Response: Gas-fired generation is not restricted in any of the strategies evaluated in the IRP study. Gas units are added when cost-effective in almost all of the scenarios considered in the study, except in those scenarios where there is limited growth. The utilization of these resources depends on the overall resource mix in each case.

237. We support the increased use of natural-gas fueled generation as a cleaner energy source during the period between the shut-down of coal-fired generation and implementation of long-term clean options with emphasis on conservation and renewables. (*Commenters: Stewart Horn, Adam Snyder - CA*)

Response: Comment noted. The Recommended Planning Direction strategy includes the idling of up to 4,700 MW of coal generating capacity, increased natural gas-fueled generation, and increased emphasis on EEDR reductions and renewable generation.

2.19. NEPA Compliance/Adequacy

2.19.1. Cumulative Impacts Assessment

238. The cumulative impacts analysis is inadequate. While this is a programmatic document, the cumulative impacts analysis can be from a commensurate level. (*Commenter: Kim Franklin - USCOE*)

Response: The cumulative impact analysis is appropriate for the proposed action.

2.19.2. Scope of Impact Assessment

239. While we recognize that this is a programmatic DEIS, we request that you address anticipated major changes to commercial navigation traffic patterns on the Tennessee and Cumberland Rivers that are related to energy production. (*Commenter: Kim Franklin - USCOE*)

Response: Aside from the occasional transportation of large components of generating facilities by barge, the major changes to commercial navigation traffic on the Tennessee and Cumberland Rivers would result from the idling of coal generating capacity and the associated reductions in coal delivery by barge. Although none of the coal units identified for idling to date at the Shawnee, Widows Creek, and John Sevier plants receive coal by barge, the future idling of additional coal units could result in an annual reduction of several million tons of coal shipments by barge on the Tennessee River.

240. While we recognize this is a programmatic EIS, please note that Corps of Engineers hydropower operations would still be subject to existing water management plans or these plans would have to be modified, including NEPA coverage, if they are proposed for modification. (*Commenter: Kim Franklin - USCOE*)

Response: Comment noted. Modifications to hydropower facilities not under TVA's control, including USCOE hydropower operations, are not assumed in any of TVA's analyses. Improvements to TVA hydropower facilities were addressed.

241. Will TVA consider the environmental impacts of energy sources where TVA is purchasing from the private sector and use that information in its purchasing decisions? (*Commenter: Kim Franklin - USCOE*)

Response: TVA does consider the environmental impacts of its purchases of energy from specific facilities if TVA's purchase causes the generating facility to be constructed or change operations.

2.20. Nuclear Energy

2.20.1. Amount of Nuclear Generating Capacity

242. Adopt a plan that minimizes the amount or stops the use of nuclear power to meet future energy demand. Nuclear power is expensive, environmentally damaging and dangerous to human health. Use energy efficiency and renewable energy as cheaper, cleaner, and safer alternatives. (*Commenters: Lisa Archer, W. R. Avery [sic], Kent Baake - CES, Darrell Bawlslin [sic], David D. Beaty, Mark Betts [sic], Mark A. Burnett, Ruth Busch, Kelvin Butler, Marisa J. Butler [sic], Jason Campbell, Mary H. Clarke - TCV, Lester Dean, Randy L. Dry [sic], Ann Ercelawn, Juliana Ericson, Tom Ferguson, Kathleen R. Ferris - BEST/CENDIT, Norman Ferris, Robyn Galochee [sic], Elizabeth C. Garber, Nancy Givens - WKU/KSES/BGGP, Marcella Green, Jane C. Hardy, Rita Harris - SC, Rick Held, Cathy L. Hook [sic], Stewart Horn, Christine Johnson - LSE, D. K. Johnson [sic], N.D. Johnson [sic], Raphael Y. Junit [sic], Sandra Kurtz - BEST, Gloria Lathem-Griffith - MEC, Joanne Logan, Nancy McFadden, Laura Miller, Karen Monalan [sic], Josh O. [sic], Linda Park, Elsa Parker [sic], Barbara Peach, Stefan Peter-Contesse, Patricia Poat, Jackie Tipper Posey, Justin Post, Mrs. James S. Powers, Ryan Riddle, Don Safer - TEC, Grace Safer, Steven Sandheim - SC/TSVC, Don Scharf, Susan Shannon [sic], Danville and Beverly Sweeton, Richard & Marian Taschler, Paula D. Ward, Cassie F. Watts, Sue A. & Steven M. Williams, Bruce Wood - BURNT, Kevin R. Woods, Schean Yearke [sic] Louise A. Zeller - BREDL, James E. Zubko, Edward Zuger III - CCSC*)

Response: Modeling sensitivities were performed to determine the impact of a 'no nuclear' strategy. The results were much higher costs due to the elimination of a low-cost option as well as increased risks due to a reduction in portfolio diversity. The potential impacts of nuclear generation have been addressed in this EIS.

243. It appears to be inevitable that TVA is going to build and operate more nuclear plants. Regardless of regulatory requirements, TVA should commit to doing this in a manner that results in the lowest possible environmental impacts and implement a rigorous environmental self-inspection and monitoring program. (*Commenter: Chris Pamplin*)

Response: TVA makes decisions on whether to build and operate nuclear plants only after thorough and detailed evaluation, and in a deliberate manner. The process is open to public comment and participation. One of the major areas for evaluation and public participation is consideration of environmental impacts. The environmental studies related to completion of Bellefonte Unit 1 have demonstrated that the option to complete Unit 1 offers significant environmental benefits and presents fewer environmental impacts than non-nuclear options for providing additional base load generation. Full time environmental professionals are staffed at each of the operating nuclear facilities to provide continuous inspection and monitoring of daily operations and activities.

244. TVA appears to be biased towards nuclear energy in this planning effort. This bias is due to vested interests with the nuclear industry and TVA's past experiences operating nuclear plants. (*Commenters: Stewart Horn, Garry Morgan, Bruce Wood - BURNT*)

Response: TVA is not biased towards nuclear power. The IRP least cost planning effort considers all feasible resource options. Nuclear power is selected by the models where it is the lowest cost option for meeting future resource needs. The recommended IRP strategy is a diverse approach that includes increase in nuclear power, renewables, EEDR and gas generation.

245. I support the proposed increase in nuclear generating capacity. Nuclear energy is clean, reliable, and low-cost in the long run. (*Commenters: William Cummings - KCC, Vic Dura, Annette Gomberg, John Hamilton, Valerie Hargis, Joe Horton, J. Michael Meece*)

Response: Comment noted.

246. With the recent decision to work on completing Bellefonte Unit 1, TVA has prematurely accelerated its nuclear program. The rationale for this recent decision was that the preliminary IRP results indicated a strong likelihood that BFN Unit 1 would be needed to meet demand in 2018 and would facilitate higher levels of coal plant retirements. This need, however, is not supported for several of the scenarios. It is also likely that it could have been met by more aggressive development of renewables and energy efficiency measures. Specific problems with BFN include radioactive releases, lack of longterm spent fuel storage, Karst terrain, high water consumption, need to derate during heat waves, increased debt, and high investment risk. (*Commenters: Sam Gomberg - SACE, Stewart Horn*)

Response: Analysis shows that completing BLN 1 is supported in all scenarios except very low or negative load growth scenarios. Sensitivity modeling analysis was conducted to determine if aggressive development of renewables and/or EEDR would change this finding. This analysis did not change the results or the original conclusions concerning the need for BLN 1. Specific concerns related to BLN were addressed in the project specific SEIS. TVA has not made the decision to complete BLN Unit 1. The TVA Board approved the budget for some activities to help preserve BLN 1 as a viable resource option and its consideration in the IRP.

2.20.2. Bellefonte Nuclear Plant

247. Please explain the status of the proposal to complete a nuclear unit at Bellefonte. What decisions have been made to date, what work on the plant is presently occurring, and what decisions remain to be made? (*Commenter: Robert Campbell*)

Response: The TVA Board authorized funding for Bellefonte 1 for FY 2011 in the amount of $248 million for the purpose of performing preliminary engineering, developing the regulatory licensing basis, and establishing contracts for procurement of components with long lead times. The Board further determined that any decision regarding construction completion would follow the completion of this IRP.

248. TVA has essentially committed to completing Bellefonte Nuclear Plant. This is not the best option because: 1) the design is over 40 years old; 2) the Babcock & Wilcox (B&W) design has had more than its share of problems, i.e., Alloy 600, reactor heads - Davis Bessie, Chrystal River secondary containment problems, Three Mile Island disaster; 3) containment cable issue; 4) the plant is nearly scrapped out; 5) the detailed scoping, estimating, and planning (DSEP) is still incomplete; and 6) unresolved quality control issues brought up by the NRC including radiography and welding. (*Commenter: Sherman Fox*)

Response: TVA extensively studied multiple options for new baseload generation, including nuclear options, before proceeding deliberately in a phased approach with work related to Bellefonte Unit 1. Bellefonte Unit 1 offers the potential to add significant value to customers by avoiding certain costs associated with new construction, despite the fact that much of the equipment may have to be refurbished or replaced. To address the specific concerns raised:

1) The design is based on an evolutionary improvements to many of the reactors operating in the U.S. today and incorporates improvements over earlier B&W designs. Additional design and material improvements will be incorporated if a decision is made to complete the unit.

2) Alloy 600 components in steam generators, the reactor vessel head, and other the plant systems will be replaced or mitigated. Many of the recommended improvements from Three Mile Island lessons learned have already been incorporated in the improved 205 design and TVA plans to incorporate additional improvements if a decision is made to complete the facility. The Crystal River 3 containment delamination event occurred while that unit was safely shut down and an access port was being cut through the containment wall for replacement of its steam generators. That event is being carefully reviewed; however, the Bellefonte units have access hatches suitable for this purpose as part of original design which eliminates the need for cutting into the containment structure.

3) The containment cable failure in 2009 resulted from hydrogen-induced stress corrosion cracking of a coupling between one of the 185 vertical tendons (cable) and its bedrock anchor. This type of failure is not unique in the industry and TVA is evaluating replacing the anchor heads on the tendons with a redesigned component made of improved materials. Bellefonte’s tendons, as well as all other safety structures and components will be thoroughly inspected prior to operation to ensure they will function as designed to protect safety of the public, the plant and employees.

4) The plant is still substantially intact and only limited portions of the plant and equipment were removed during a short investment recovery period.

5) The DSEP was intended to provide a bounding cost and schedule estimate and identify major project risks. It has been completed and accomplished this. Detailed schedules for project completion are developed commensurate with project approvals.

6) Quality assurance issues have been identified as an important project risk and programs are being developed to ensure all quality requirements will be verified as part of completion. Plant quality during construction was considered the best among TVA projects at the time of deferral. Quality records have been maintained.

249. Why is TVA outsourcing development work at Bellefonte Nuclear Plant to a foreign company? This work should be done by local or at least U.S. companies. (*Commenter: Jackie Tipper Posey*)

Response: Virtually all of the commercial nuclear power plants operating today in the U.S. were designed by General Electric, Westinghouse, Combustion Engineering, or Babcock & Wilcox. The Bellefonte plant is a Babcock & Wilcox 205 design. When AREVA was formed in 2001, it acquired the rights to the Babcock & Wilcox 205 design. TVA negotiated a contract with AREVA for work at Bellefonte primarily due to its ownership of the plant's design. Although AREVA's parent corporation is a foreign entity, AREVA is incorporated in Delaware with its operations spread between 41 U.S. locations with substantial facilities in Lynchburg, Virginia and Charlotte, North Carolina. Much of AREVA's work will involve U.S. workers and suppliers.

2.20.3. Cost of Nuclear Power Plants

250. Given the extensive work to be done at Bellefonte Nuclear Plant, I question TVA's estimate that it will cost $1 billion less than building a new plant. The completion of Watts Bar Unit 2 is costing more (and taking longer) that originally estimated. (*Commenter: Sherman Fox*)

Response: TVA has spent several years studying the costs of additional nuclear generation. The process used to estimate the overall costs and schedule has proven successful for Browns Ferry 1 and Watts Bar 2 to date. The completion cost and schedule for Watts Bar 2 are still forecasted to be within the targets established when the project was recommended and approved in 2007. TVA cost estimates for Bellefonte options include benchmarking new nuclear costs against those of other utilities building the same plant design, utilizing TVA's known costs for recovering or completing plants with similar work scope, and utilizing an independent external contractor to evaluate the cost and schedule risk of options for completing existing units and construction of new units.

251. How are the costs of decommissioning nuclear plants and long-term handling of radioactive waste, including spent fuel, addressed in the IRP? (*Commenters: Sandra Kurtz - BEST, Jackie Tipper Posey*)

Response: Projected amounts for these specific costs are included in either the total capital cost or the ongoing operating cost of the nuclear units considered in the IRP.

252. How much will the Bellefonte nuclear plant cost to build? (*Commenters: Chip Estes, W.R. Kendrick*)

Response: The estimated costs of Bellefonte Units 1 and 2 in the IRP cases are about $4500/kW and about $3350/kW, respectively (expressed in 2009 $). These capital costs include allowance for funds used during construction and projected transmission interconnection costs, and the Unit 1 cost includes common facilities shared by both units. In the event that additional units are sited at this location, those future units would use the

different AP1000 technology with a unit cost estimated at $5700/kW in 2009$, including additional transmission interconnection costs and an allowance for funds used during construction.

253. I am concerned about the cost and construction time for nuclear power plants. Watts Bar Nuclear Plant was completed at several time the original time and cost estimates. I hope that these factors are considered in the planning process and that TVA can find more efficient ways of building a nuclear plant. (*Commenter: Chris Christie*)

Response: The original construction cost and schedule for Watts Bar Unit 1, like many nuclear plants constructed during the same timeframe, were significantly exceeded before completion of the plant in 1996. TVA now utilizes a rigorous process called detailed scoping, estimating, and planning (DSEP) prior to the approval of any new nuclear project. The DSEP is intended to thoroughly understand the project scope, cost, schedule and risk. The DSEP process has proved successful for the restart of Browns Ferry 1. To date, the completion of Watts Bar 2 remains within the cost and schedule estimates presented to the TVA Board when the project was approved in 2007.

254. Large nuclear plants suffer from a long cost / short benefit situation. The cost commitment for such plants extends for long after they are decommissioned. (*Commenter: Paul Noel - NEC*)

Response: Comment noted.

255. Nuclear energy is not the most cost-effective source of clean energy. Recent studies have found the delivered cost of nuclear power to the end user as high as $0.1975/kWh. And other utilities such as Constellation have recently cancelled plans for new reactors due to cost concerns. Energy efficiency and renewable energy are more cost-effective long-term solutions. (*Commenters: Garry Morgan, Ricci Phillips - TTCD, Amy Walls, Louise A. Zeller - BREDL*)

Response: TVA's IRP study indicates that a combination of nuclear, energy efficiency and renewable resources, along with some additional gas-fired units, comprises the best performing strategy across the range of scenarios. The cost of power from particular resources depends on many assumptions about fuel prices, unit costs and operating characteristics. Variations in these assumptions can dramatically change the all-in cost calculation. For example, on a levelized cost of electricity basis, TVA projects the cost of a nuclear unit at around $0.070/kWh.

256. Nuclear plants are too expensive, in part because they need to be rebuilt every 25-30 years. (*Commenter: Mary H. Clarke - TCV*)

Response: Nuclear plants are initially licensed by the NRC for 40 years and most are expected to operate much longer than this by renewing the original license to allow for extended operation. As with all types of generating plants, infrastructure must be repaired or replaced over time and the decisions to do so are based on the overall cost of providing reliable electricity to the customers. In nuclear plants, for example, steam generators are replaced when the efficiency of the original equipment declines. Although it costs millions of dollars to replace such components, doing so increases the plant’s efficiency and extends the life of the facility. This makes the best use of existing assets and lowers the overall delivered cost of power over the long term. While components and equipment will often

need replacement, remaining portions of the plant such as the concrete structures are not replaced.

257. One of our concerns about the cost of nuclear power is the liability issue. Although the Price-Anderson Act provides some liability insurance, it would likely be inadequate if a disaster occurs. Similarly, no private companies appear willing to finance nuclear energy without government-backed loan guarantees. (*Commenter: Steven Sandheim - SC/TSVC*)

Response: Under the Price-Anderson Act, nuclear plant licensees are required to maintain financial protection equal to the maximum available amount provided by the private insurance market. A secondary level of insurance is managed by American Nuclear Insurers (ANI) on behalf of the Nuclear Regulatory Commission using what is known as retrospective premiums. Should any loss exceed the primary limit of $375 million, ANI would collect the retrospective premiums due from power reactor operators and administer the disposition of funds. Currently, there are 104 commercial nuclear power reactors in operation in the United States and each is liable for retrospective premiums up to $117.495 million per reactor should the primary limit of liability be exceeded. Effective January 1, 2010, the total amount available for third-party nuclear liability claims in the event of an accident at a commercial nuclear power reactor is approximately $12.6 billion—the largest amount of nuclear liability capacity of any country in the world. Financing development and construction of nuclear projects is unrelated to the Price-Anderson Act. However, TVA does not finance construction and development of nuclear facilities with government-backed loan guarantees.

258. TVA appears to have estimated inappropriately low-costs for the AP1000 nuclear reactor. The levelized cost given to the Stakeholder Review Group (and posted on the IRP project website) is $71/MWh. This is about 30% lower than the cost calculated with the California Energy Commission's (CEC) Cost of Generation Model. We recommend that TVA re-evaluate and better explain its estimated costs for both the AP1000 and the completion of the Bellefonte B&W units. (*Commenter: Sam Gomberg - SACE*)

Response: There is a large discrepancy between the fixed and variable O&M costs in the CEC's Cost of Generation Model and in TVA's model; this discrepancy has a significant impact on the cost of generation. Levelized costs are also highly sensitive to assumptions such as discount rate and capacity factor. TVA has an advantage in discount rate, since its debt costs are much lower than those of other entities which causes less interest during construction to be booked to plant costs and recovered through rates. Further discrepancies in plant capacity and capacity factor leads to fewer MWh in the CEC cost of generation, and therefore also increases the $/MWh cost estimate.

259. What is the expected cost/kW of the potential non-site specific nuclear units? (*Commenter: W.R. Kendrick*)

Response: Non-site specific nuclear units have an expected cost of $3,700/kW to $4,300/kW.

2.20.4. Nuclear fuel cost and availability

260. The cost and availability of fuel for future nuclear plants is going to be a serious problem. World supplies of uranium are limited. The cost is currently depressed by decommissioning nuclear weapons and this will end soon. (*Commenters: Paul Noel - NEC , Jackie Tipper Posey*)

Response: While uranium is a finite resource, there are sufficient identified reserves to supply the projected demand through this century according to a recent study published by MIT titled “The Future of the Nuclear Fuel Cycle”. This supply can be extended even further if recycling of nuclear fuel is expanded as several countries are doing today. The cost of uranium does fluctuate like other commodities, although, historically, the changes in the price of nuclear fuel take place over longer periods of time than those of fossil fuels such as coal, natural gas and petroleum. While future nuclear fuel prices are expected to increase, the fuel costs for nuclear represent a smaller portion of the total generation costs and the impact on the price of electricity when fuel prices change is less for nuclear.

261. TVA is apparently planning to use down-blended weapons-grade uranium to fuel its nuclear plants. Other utilities have considered this and rejected it for cost and other reasons. We urge you to reconsider this. (*Commenter: Kevin Routan - CGSC*)

Response: TVA has been safely using down-blended uranium as fuel for several years at its Browns Ferry nuclear plant. TVA is now evaluating the feasibility of doing something similar using mixed oxide fuel (combination of plutonium and uranium) as part of a program to reduce the U.S. stockpiles of excess weapons-grade materials. Mixed oxide fuel made from recycled nuclear fuel has been safely used in a number of other countries for many years. Mixing plutonium from weapons materials with uranium for use in commercial power plants is expected to offer a safe alternative for disposal of surplus weapons materials. The public is being given an opportunity to comment on this program through a separate environmental impact review process currently being conducted by the Department of Energy. Additional information about this initiative is available at http://nnsa.energy.gov/nepa/spdsupplementaleis.

Nuclear Plant Health and Safety
262. Nuclear plants are likely targets for terrorism. (*Commenter: Tom Ferguson*)

Response: TVA believes that the possibility of a terrorist attack affecting operation of one or more units at the Bellefonte site, or TVA’s operating nuclear plants, is very remote and that postulating potential health and environmental impacts from a terrorist attack involves substantial speculation. Notwithstanding the very remote risk of a terrorist attack affecting operations, TVA increased the level of security readiness, improved physical security measures, and increased its security arrangements with local and federal law enforcement agencies at all of its nuclear generating facilities after the events of September 11, 2001. These additional security measures were taken in response to advisories issued by NRC, and subsequent rule changes which required greater security.
263. Nuclear power plants release radioactive gases and liquids into the environment during normal operations and as a result of accidents. These releases are a threat to human health that is not discussed in the IRP. (*Commenters: Tom Ferguson, Kathleen R. Ferris - BEST/CENDIT*)

Response: Environmental reviews referenced in the IRP that were completed for TVA’s nuclear projects address radiological effects from both normal operations as well as potential accidents associated with nuclear plants. All expected and potential doses are taken into account as part of the safety and environmental reviews that are conducted in advance of any decision to proceed with plant construction and operation by both TVA and the NRC. Radiological releases and dose to plant workers and the public are within the applicable NRC limits and do not present a significant risk to the public or the surrounding environment.

264. The production of plutonium by nuclear plants present a safety and proliferation risk. (*Commenter: Tom Ferguson*)

Response: Nuclear plants are designed to safely use the plutonium produced during operation by the nuclear fuel fission process. Once the fuel is discharged, the plutonium is contained within the used fuel along with the other byproducts of the nuclear process. In addition to the high security in place to protect nuclear plants, the high level of radioactivity associated with used fuel also increases the resistance to proliferation of the plutonium produced in nuclear plants. These highly radioactive fuel assemblies weigh thousands of pounds each making transport difficult and hypothetical theft extremely dangerous. Furthermore, very expensive and sophisticated equipment and a very large quantity of used fuel would be necessary to produce enough plutonium to be useful for proliferation purposes. The Nuclear Regulatory Commission, an independent Federal regulator, imposes stringent security requirements and ensures TVA compliance through close oversight, including on-site inspections.

265. TVA has reported hundreds of 'events' at its nuclear plants since the 1980s. There have also been numerous unplanned shut downs, including the 1975 Browns Ferry fire and more recent fire safety problems. The continued operation of the nuclear plants is not safe. (*Commenters: Tom Ferguson, Kathleen R. Ferris - BEST/CENDIT, Norman Ferris*)

Response: The safe operation of TVA’s nuclear facilities is continuously monitored by independent groups within TVA as well as the NRC. Under the NRC’s reactor oversight process, if the NRC determines that a plant cannot be operated without significant risks to the public or the environment, the operating license for the facility will be revoked. NRC’s most-recent review of all three of TVA’s operating nuclear facilities has determined that they are operating in a manner that allows them to be placed in the category of reactors that the NRC classifies as presenting minimal risk to the public and the environment, and subject to routine monitoring and inspection.

2.20.5. Small Modular Nuclear Units

266. Small modular nuclear units (5 to 100 MW) are practical and offer many advantages over traditional 1000+ MW units. TVA should promote their development. (*Commenter: Paul Noel - NEC*)

Response: TVA is currently investigating a demonstration project utilizing small modular reactors, and this technology is part of the agency's ongoing commitment to research. TVA is currently working with the Department of Energy and Oak Ridge National Labs to evaluate, develop, and build up to six small modular nuclear reactor modules in Oak Ridge, Tennessee.

267. TVA has announced its intention to build a small modular unit nuclear plant. This plant is not incorporated in the IRP strategies which use other resource options to meet the apparent need for power. Please explain how the IRP accommodates small modular nuclear units. (*Commenter: Sandra Kurtz - BEST*)

Response: Small modular nuclear units were not considered in the IRP strategies as they are still in the early stages in terms of maturity and are not widely available. As part of TVA's Technology Innovation mission, TVA has begun studies to determine more detailed

information on cost and schedule for these plants so that they may be considered in future planning.

2.20.6. Spent Nuclear Fuel and Nuclear Waste

268. There is presently no safe, long-term solution to disposing of spent nuclear fuel. The current practice of on-site storage is, at best, a short-term interim solution. (*Commenters: Lisa Archer, Jason Campbell, Lester Dean, Kathleen R. Ferris - BEST/CENDIT, Norman Ferris, Nancy Givens - WKU/KSES/BGGP, Rita Harris - SC, Garry Morgan, Jackie Tipper Posey, Kevin Routan - CGSC, Don Safer - TEC, Grace Safer, Paul Sanderson*)

Response: While there is no current U.S. facility to permanently dispose of spent nuclear fuel, it is being safely stored until a decision regarding final disposition can be made. The NRC has a long-standing position regarding the safety and lack of environmental impact from current spent fuel storage methods, known as the Waste Confidence Decision, and recently completed an update to this position. After a thorough evaluation of the risks associated with the methods currently used to store spent fuel, the NRC concluded that spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 60 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor in a combination of storage in its spent fuel storage basin and at either onsite or offsite independent spent fuel storage installations. Further, the NRC believes there is reasonable assurance that sufficient mined geologic repository capacity will be available to dispose of the commercial high-level radioactive waste and spent fuel generated in any reactor when necessary.

269. TVA should pursue the reprocessing of spent nuclear fuel instead of continuing to rely on the eventual construction of a permanent spent fuel storage facility. Fuel reprocessing would provide additional nuclear fuel and greatly reduce the volume of spent fuel requiring storage. (*Commenter: Alfred G. Orillion - SA*)

Response: TVA supports the establishment of a national policy regarding the recycling of spent (used) nuclear fuel. This is a current topic of discussion in the U.S., and TVA will continue its role of informing that discussion.

270. TVA's nuclear plants currently generate large amounts of low level nuclear waste, and this will increase with the proposed new nuclear plants. Tennessee leads the nation in processing and disposal of Class A, B, and C nuclear wastes, and this is proposed to increase in the future at Oak Ridge and Erwin. Some of this waste eventually enters local landfills. This nuclear waste is not safe and, partly because of it, nuclear energy is not clean. (*Commenters: Don Safer - TEC, Steven Sandheim - SC/TSVC, Sue A. & Steven M. Williams*)

Response: Low level radioactive waste disposal sites are regulated by the NRC. Class A, B and C wastes must be disposed of in such facilities in accordance with all applicable local, State and Federal laws in a manner that will protect the public in the near and long term. TVA’s low level waste storage and disposal activities are and will continue to be conducted in strict accordance with all such requirements. TVA currently ships its Class A low level waste to a facility in Utah. Class B and C wastes are being safely stored onsite in engineered facilities. None of TVA’s low-level radioactive waste is placed in Tennessee landfills, which are not licensed to receive this type of waste.

2.20.7. Thorium Reactors

271. Is TVA considering using thorium reactors to generate electricity? (*Commenter: Russ Land*)

Response: No, not during the 20-year IRP planning period.

2.20.8. Timing of New Nuclear Plants

272. The various IRP portfolios show no new nuclear plants before 2018. Please explain how the 2018 date was determined. (*Commenter: J. Michael Meece*)

Response: This date is based on the time required to complete a nuclear unit and the timing of the forecasted need for new baseload generation. The date also reflects TVA's commitment to gradually reduce the environmental impacts from electrical generation in the Tennessee Valley. Watts Bar Nuclear Plant Unit 2 is scheduled to be completed and generating power by the end of 2012.

273. When is Watts Bar Nuclear Plant scheduled to be completed and generating power? (*Commenter: Alfred Dyson - DETS*)

Response: Watts Bar Unit 2 is scheduled to be completed and generating power by the end of FY2012.

274. When would the potential new units at Bellefonte be completed and generating power? (*Commenter: Alfred Dyson - DETS*)

Response: The portfolios associated with the moderate to high growth scenarios include the completion of Bellefonte Unit 1 between 2018 and 2022 and the completion of Bellefonte Unit 2 between 2020 and 2024. Projected dates for the completion of Bellefonte Unit 3 range from 2024 to 2028. Four of the 20 portfolios include the completion of Bellefonte Unit 4 in 2026 or 2027. TVA expects to conduct additional site-specific environmental reviews if it proposes to proceed with units other than Unit 1 at the Bellefonte site.

2.20.9. Types of New Nuclear Plants

275. A problem in the nuclear industry and TVA's nuclear program is the lack of standardized nuclear plant designs. TVA should use a standardized design for all new nuclear generating plants. (*Commenter: Alfred G. Orillion - SA*)

Response: TVA recognizes that there are many advantages to design standardization. Because TVA has existing assets that have the potential to provide additional generating capacity at a reduced cost, TVA has evaluated both the completion of the existing units at Bellefonte and the construction of new units using the standardized AP1000 design. This evaluation determined that there continues to be value in the partially-completed non-standard Bellefonte units, but beyond these partially constructed units, design standardization is probably the best option for nuclear generation. In order to realize some benefits from standardization even with those facilities where construction has already begun, TVA has standardized its management and procurement practices, as well as procedural requirements to the extent that it is practical.

2.21. Other

2.21.1. Comments Out Of Scope

276. We encourage TVA to do the following:
- Support professional forest management activities on TVA lands to maximize carbon sequestration and use of biomass products to mitigate carbon emissions.
- Provide educational activities and resources to encourage natural resource management, conservation practices that sustain water quality, and energy conservation through strategic urban tree plantings within its regional jurisdiction.
- Support and participate in implementing each Forest Assessment & Resource Strategy within its regional jurisdiction.
(*Commenter: Neil Letson - AFC*)

Response: These activities are outside the scope of the IRP. TVA is, however, addressing them in the Natural Resources Plan available at http://www.tva.com/environment/reports/nrp/index.htm.

2.21.2. General Support for Process

277. The Department appreciates that TVA has formulated alternatives for this DEIS that would
reduce the emissions of air pollutants, including greenhouse gases, from its power supply portfolio. To varying degrees, each of the five alternatives described in the DEIS would increase TVA's reliance on renewable energy sources. Encouraging the timely and responsible
development of renewable energy, while protecting and enhancing the Nation's water, wildlife, and other natural resources, is one of the Department's highest priorities.
(*Commenter: Gregory Hogue - USDI*)

Response: Comment noted.

278. We appreciate your work in the development of the IRP. As you complete it, we urge you to remain focused on the following items: reliability, flexibility, environmental stewardship, and price. All of these items are very important to industrial customers (including international corporations) as well as other types of customers. (*Commenter: Steven Sax*)

Response: Comment noted. Our vision is to be one of the nation's leading providers of low-cost and cleaner energy by 2020. Every initiative that TVA pursues will be linked to the following six focus areas. By accomplishing them, TVA will realize its vision and continue to meet the needs of the people in the Valley. - Low rates - High reliability - Responsibility - Cleaner air - Greater energy efficiency - More nuclear generation

2.21.3. No Comment

279. We have no comments at this time. (*Commenter: Michael J. Hinton - NRCS*)

Response: Comment noted.

2.21.4. No Conflict with Existing or Proposed Activities

280. We have reviewed your proposal and have found no conflict with existing or proposed planning activities. We may wish to comment further at a later time. (*Commenters: Joe W. Barker - SWTDD, Terrence J. Bobrowski - ETDD, Sam H. Edwards - GNRC, Barbara Jackson - GSC*)

Response: Comment noted.

2.21.5. Regulation and Permitting

281. The states where TVA operates do not have adequate regulation and permitting programs to properly oversee TVA's operations. The ash spill at TVA's Kingston Fossil and problems with the New Johnsonville ash landfill are evidence of this deficiency. (*Commenter: Bruce Wood - BURNT*)

Response: TVA energy-related activities are subject to a large number of regulatory requirements and permitting programs and compliance with those requirements is overseen by federal and state regulatory agencies, depending on the program in question. Many federal environmental statutes also allow enforcement by citizens. TVA literally has spent billions of dollars on controls and equipment to be able to comply with applicable requirements and has in place comprehensive processes and procedures to help assure compliance. Respecting the operation of coal ash landfills, EPA is considering whether additional regulation of such facilities is necessary.

Rate Structure
Rates for Low Income Customers
282. Utility bills are among the largest expenses for the already large and growing low income population in the TVA region. Relative to other parts of the country, the energy burden of low income Valley residents is disproportionately large. TVA should work with its distributors to develop a lifeline rate structure with a low-priced small initial block of power for customers meeting income or means requirements. (*Commenter: Louise Gorenflo - TCSC*)

Response: Comment noted.

2.22. Renewable Energy

2.22.1. Amount of Additional Renewable Generation - General

283. According to the draft IRP, the planned expansion of renewable generation, particularly from solar and wind resources, is relatively small. These sources are cleaner and safer than the continued use of coal and increased use of nuclear power, and we urge TVA to aggressively increase the use of renewable generation. (*Commenters: Kent Baake - CES, Mary H. Clarke - TCV, Ann Ercelawn, William Goggin, Rita Harris - SC, Ellie Irons - VDEC, Eric Lewis, Nelson* Lingle - RSI, *Joanne Logan, Lainie Luse, Michael Lussier, Ryan Riddle, Janice Weber, Scott Wills - TTCGC, Jon Wolfe, Edward Zubko - GES*)

Response: Comment noted; as described in the EIS, the environmental impacts of renewable generation on several but not all environmental resources are less than those of coal-fired and nuclear generation. TVA developed two portfolios of renewable additions, a 2,500 MW portfolio incorporated into Strategy C and the Recommended Planning Direction,

and a 3,500 MW portfolio incorporated into Strategy E. See Final IRP Appendix D for a description of their development. These portfolios include reasonable deployment schedules based on cost, technological maturity, regional resource availability, resource diversity, and anticipated federal legislation/regulation and tax policy factors. These factors are continually reviewed for TVA planning efforts, and will be incorporated accordingly to support the anticipated growth in TVA's use of renewable generation.

284. The draft IRP and EIS limit the amount of biomass-fueled generation in the TVA region to a maximum of 456 MW of capacity. The EIS, however, shows a much greater potential that is similar to the results of other studies of the regional biomass potential. Additional analyses by Larson & McGowin and by Southern Alliance for Clean Energy show that TVA could develop at least 1,100 MW of in-Valley biomass generation capacity using readily available low-value woody biomass. A large amount could also be developed using other biomass fuels. (*Commenter: Sam Gomberg - SACE*)

Response: TVA acknowledges that the technical potential to generate power from biomass is much larger than the amounts of biomass additions included in the renewable portfolios. The two renewable portfolios incorporated into Strategies C and E, as well as the Recommended Strategy, contain about 465 MW of additional biomass-fueled capacity. This amount is based on reasonable deployment schedules, factors described in the response to the preceding comment, and factors specific to biomass generation. These biomass-specific factors include: the disseminated nature of biomass and need for reliable and cost-effective fuel procurement and delivery infrastructure; low energy density (energy content per volume of material) and high moisture content of biomass relative to fossil fuels; the need for fuel processing, handling and boiler feed equipment; high fuel cost per unit of energy; and high chlorine and alkali levels in some biomass could adversely affect boiler materials. Significant regulatory uncertainty also exists with respect to the definition of renewable biomass and its eligibility in meeting any future renewable energy and GHG reduction mandates, as well with as the future emission limits (and corresponding emission control equipment and costs) required for producing power from biomass.

285. The draft IRP and EIS limit the development of in-Valley wind resources to 360 MW. This is a small fraction of the wind potential identified in the draft EIS, the 2005 Carson and Raichle study, and a recent NREL study. TVA should reassess the in-Valley wind development potential by either removing the 360 MW constraint used in the modeling or using a much larger fixed model input value. (*Commenters: Sam Gomberg - SACE, J. Michael Meece, Garry Morgan*)

Response: TVA recognizes that the technical development potential for in-Valley wind resources (and most renewable and fossil fuel resources, as well) is much higher than the 360 MW included in the IRP strategies. As with other types of renewable generation, this amount is based on reasonable deployment schedules and consideration of cost, technological maturity, regional resource availability, diversified resource portfolio, and anticipated federal legislation/regulation and tax policy factors. Identification of locations with the greatest wind resource is critical to the development of the in-Valley wind potential. In support of the Department of Energy's Wind Powering America 20% by 2030 program and in partnership with the Tennessee Valley and Eastern Kentucky Wind Working Group, TVA is supporting a wind research study by NREL to identify the best non-ridgetop (i.e., in the middle and western portions of the TVA region) wind resource areas. Following this study, TVA plans to conduct further wind tower measurements at the identified sites to

confirm resource potential, especially at higher elevations (≥100m). These analyses can be pursued to support the next update of the IRP.

286. The focus on the development of renewable generation in the IRP is on large wind projects requiring large infrastructure and land investments. How will TVA support and incorporate the use of energy from small, dispersed renewable generating facilities? (*Commenter: Tom Nelson - DESI*)

Response: TVA currently supports small, dispersed renewable generation (solar, wind and biomass installations with less than 200 kW of capacity) through the Generation Partners program. The power generated through this program is marketed through TVA's related Green Power Switch program. As described in EIS Section 3.4, TVA recently issued a renewable energy standard offer to purchase renewable energy from installations between 200 kW and 20 MW. Wind projects are typically more attractive on a larger scale due to higher energy production levels from commercial scale turbines (typically at least 1.5 MW) and cost declines associated with economies of scale from installing multiple-turbine wind farms. Technologies that are better suited for distributed generation, such as solar, are incorporated into the renewable portfolios considered in the IRP.

287. TVA should commit to producing half of its electricity from renewables by 2025. (*Commenters: Jeff Deal, James Randolph*)

Response: TVA has a goal of providing half of its electricity from non-carbon emitting, clean energy resources, which include conventional hydropower and nuclear, by 2020. TVA believes that a goal of providing half of its energy from renewable resources by 2025—a goal much higher than that in most state renewable portfolio standards—has not been demonstrated to be politically, economically, or technically feasible. One of the major problems with incorporating a significant percentage of renewable energy resources is the intermittent nature of wind and solar resources. The intermittency requires additional, dispatchable, fossil-fuel based generation (e.g., natural gas-fired turbines) and/or additional energy storage capacity to backup the wind and solar when it is not generating power. Despite these obstacles, renewable energy additions will play an important and increasing role in TVA's future energy portfolio.

288. While there are merits to renewable generation, much of it is intermittent. It does not appear possible for TVA to develop enough economical and environmentally acceptable energy storage to rely on renewable generation to provide a large portion of the needed base load capacity. (*Commenter: Vic Dura*)

Response: The IRP does not consider any energy storage options specifically for integration of intermittent renewable resources. However, Strategy C and the Recommended Planning Strategy include an additional pumped-storage hydro facility to provide for energy storage on a system-wide basis.

289. With the relatively small amount of proposed new renewable generating capacity, TVA is missing an opportunity to be a national leader in this area. (*Commenter: Adam Matar*)

Response: The Recommended Planning Direction strategy includes a large increase in renewable generating capacity. While this increase may not make TVA a national leader in renewable generation, TVA will achieve some of the same goals and benefits of renewable

portfolio standards, notably the avoidance of emissions of some GHGs and other air pollutants, through its clean energy generation goal.

2.22.2. Biomass

290. I encourage TVA to use grasses as fuel for generating electricity. Several varieties of grasses, including Giant Miscanthus and switchgrass, are currently available that can produce 20-25 tons/acre with a BTU value close to the BTU value of wood. Unlike wood, grasses harvested in the fall have very low moisture content. Grasses also minimize the carbon debt as they are harvested annually. (*Commenter: Bradley Jackson*)

Response: TVA recognizes native grasses and other energy crops as potential fuels for electric power generation. However, there are a number of logistic, technical, and economic issues that must be resolved. These include: their disseminated nature; low energy density (energy content per volume of material); the need for processing, depending on the generating facility; high cost per unit of energy; and the high chlorine and alkali levels in some grasses which could adversely affect boilers. TVA also has concerns about the use of potentially invasive grasses, such as Giant Miscanthus. TVA acknowledges that the use of grasses may result in less carbon debt and have a better short- and long-term carbon balance than some other biomass fuels, particularly if fertilizer and other energy inputs during their cultivation, harvesting, and transport are low.

291. I oppose your plan to burn forest biomass to generate electricity. Whether classified as whole trees, logging residues, or unmerchantable timber, burning forest biomass will result in deforestation, loss of soil carbon and soil fertility, increased air pollution, and loss of wildlife habitat, native forest ecosystems, and old growth. (*Commenters: Anonymous, Dennis Haldeman, Valerie Hargis, Regina Jay*)

Response: Comment noted. TVA is evaluating several biomass fuel options, as well as potential biomass generating capacities and facility locations. TVA will assess the potential project-specific environmental impacts when it proposes a biomass-fueled generation facility. This assessment will consider sourcing area impacts.

292. In the 1990s, TVA considered and ultimately rejected proposals for barge terminals associated with chip mills which would process whole trees into wood chips for export to global paper manufacturers. TVA recognized the potential for significant impacts to occur from the forest harvesting to supply the chip mills. Other chip mills are currently operating in the TVA region. It now appears that TVA's use of wood biomass fuels would result in many of the same impacts. (*Commenter: Louise Gorenflo - TFC*)

Response: Comment noted. TVA agrees that the use of wood biomass fuels can have many of the same environmental impacts from harvest and transportation as does the use of wood chips for producing pulp and other forest products. TVA has performed fuel availability studies and will perform additional studies of fuel availability and associated environmental impacts as it considers potential biomass projects.

293. In the IRP, TVA states it is conducting fuel availability surveys and assessing the feasibility of converting coal-burning units to biomass units. The IRP does not state how or when the results of these studies will be incorporated into TVA's resource planning. (*Commenter: Courtney Piper - TBLCEE*)

Response: TVA is assessing the potential for existing coal-fired units to be converted to biomass, including Shawnee Fossil Plant Unit 10. A preliminary cost estimate of the conversion was scheduled to be completed in January 2011. If warranted, a detailed fuel availability study and a detailed cost estimate will be prepared in 2011. The decision to convert this or other coal-fired units to biomass will depend on a unit-specific assessment of: (1) direct financial costs/risks along with other impacts related to the environment and economy for a specific biomass conversion project; (2) costs, risks, and other impacts from alternative traditional and non-traditional sources of supply; (3) federal legislation and regulations relating to renewable energy and environmental requirements; and (4) future TVA renewable energy requirements and initiatives. Such a proposal would be subjected to additional environmental review.

294. Instead of burning biomass, TVA should be converting it to synthetic gas and biochar, and then using the biochar as a soil supplement and to sequester carbon. Numerous studies have shown the feasibility of this process. (*Commenter: Erich J. Knight - SG*)

Response: The IRP analysis considered multiple resource options for meeting projected capacity needs. Potential resource options were evaluated with the following criteria: a developed or proven technology, or one that has reasonable prospect of becoming commercially available by 2029; available within the TVA region or importable through market purchases; and reasonably economical and contributes to the reduction of emissions of air pollutants. The conversion of biomass to gas and biochar, in TVA's opinion, does not currently meet all of the necessary criteria.

295. IRP Strategies C and E include a large increase in the use of biomass for generation, most of which is apparently wood. Much of the readily available, inexpensive wood supply is already utilized and TVA would be competing for this resource. This could increase the cost of wood for everyone. (*Commenter: Bradley Jackson*)

Response: Comment noted. TVA is evaluating various biomass technologies and capacities. Based on the technology, capacity, and facility location, different fuel blends and quantities will be required. The associated costs, including those affecting other users of biomass, will be reviewed in detail during the review of any proposed biomass projects.

296. Methane from landfills is a major source of GHG emissions. TVA should work to reduce landfill methane emissions by increasing electrical generation by landfill gas and by promoting increased recycling and composting to reduce the volume of waste entering landfills. (*Commenters: Kevin Routan - CGSC, Bruce Wood - BURNT*)

Response: Currently, TVA periodically co-fires methane from a nearby sewage treatment plant at Allen Fossil Plant and purchases 7.1 MW of landfill gas generation. Increased levels of methane gas generation are included in the IRP renewable portfolios associated with Strategies D and E, as well as the Recommended Planning DIrection. Additionally, TVA supports recycling and sustainability efforts that reduce the volume of waste entering landfills and has committed to reducing its waste generation.

297. Please incorporate the development of Waste-to-Energy plants into your scenarios. The Nashville Thermal Plant and the Gallatin resource recovery plant operated efficiently and cleanly for many years. Studies by EPA have shown the benefits of modern WTE plants include: 1) clean source of steam and power generation; 2) reduced traffic congestion by eliminating long hauls to distant landfills; 3) reduced GHG emissions; 4)

reduced consumption of imported diesel; and 5) reliable steam and electric energy at a reasonable price. (*Commenters: John R. Holladay - LGCRE, John Norton - NE*)

Response: Municipal solid waste (MSW) facility ownership and operation is a niche business model that TVA does not plan to pursue at this time. There is uncertainty associated with future emission standards and emission control requirements from these sources. Additionally, recently proposed federal legislation would require local governments to provide residential recycling services in order for MSW to be considered a renewable energy fuel source. Currently, these recycling practices are not common in the TVA region. However, TVA would, consistent with other power purchase agreements, consider waste-to-energy facilities that were determined to be competitive with forecasted electricity prices at the time those contracts were evaluated, and subject to appropriate environmental review. If this situation changes, TVA would consider this kind of facility in future IRPs.

298. Some of the state agriculture departments and universities in the TVA region have programs to research and assist in the development of biofuels. Is TVA working with these programs? Has TVA considered providing grants to help fund these programs? (*Commenter: Robin Minor*)

Response: TVA is and has been working with some of these programs located in the states TVA serves, but TVA's focus is power generation and not biofuels. TVA is working closely with entities in Kentucky and Tennessee on developing biomass-fueled generation. TVA has also worked with the Mississippi Technology Alliance on biomass projects in the past. Although TVA does not normally provide grants, TVA does fund specific studies and collaborate with others on technology development by providing in-kind labor or facilities.

299. The DEIS does not state the amount of biomass (in particular, the amount of wood/forest biomass) that would be need for the anticipated 500+ MW of biomass generating capacity. (*Commenter: Louise Gorenflo - TFC*)

Response: TVA is evaluating several biomass generation technologies for the 456 MW biomass capacity addition identified in renewable portfolios. Depending on the actual generation technology and capacity, fuel usage will vary. Fuel availability studies have been completed that indicate ample fuel is available for this capacity. Additional fuel availability studies will be conducted as potential biomass projects are studied in more detail.

300. The dismissal of the use of municipal solid waste (MSW) as a fuel source (Draft IRP pp. 73-74) is based on inaccurate assumptions. MSW is recognized as a renewable fuel by EPA, Internal Revenue Service, and numerous statutes and regulations. Waste-to-Energy (WTE) plants result in greater life-cycle reductions in GHGs and other emissions than does TVA's preferred waste alternative, generation from landfill methane. With WTE plants, recycling rates are higher, transportation is reduced, less land is consumed, and 10 times the amount of energy is recovered from a ton of waste. Air emissions from modern WTE plants are lower than landfill emissions. We urge you to incorporate WTE as a future energy resource. (*Commenters: John R. Holladay - LGCRE, Ted Michaels - ERC*)

Response: See response to Comment 297.

301. The draft EIS assigns zero or low CO_2 and lifecycle GHG emissions to the biomass generation options that could use woody biomass as feedstock. This requires the assumption that woody biomass is from wood waste and not whole trees. As not all

biomass is carbon neutral, TVA should better define the types of biomass it proposes to use and, if necessary, analyze their GHG emissions in more detail. (*Commenter: Frank Rambo - SELC*)

Response: Comment noted. TVA is evaluating various biomass technologies and capacities. Based on the technology, capacity, and facility location, different fuel blends and quantities will be required. The associated GHG emissions will be reviewed in detail as potential project studies are completed and additional environmental reviews are conducted.

302. The draft IRP and EIS claim that the use of biomass to generate electricity is carbon neutral. They do not, however, address the full life-cycle emissions of burning biomass or conduct a full accounting of carbon emissions. There is no mention of carbon emissions from indirect land use changes. There is also no mention of the carbon debt resulting from burning trees for fuel - the fact that the large amount of carbon released when trees are burned takes many years to be sequested by forest regrowth. Thus burning trees results in increased carbon emissions over at least the short term. The initial carbon emissions per unit of electricity generated are high relative to fossil fuels. (*Commenters: Louise Gorenflo - TFC, Dennis Haldeman, Louise A. Zeller - BREDL*)

Response: Comment noted. The projected carbon emission estimates of the alternative strategies and portfolios are based on direct anthropogenic emissions and TVA has assumed these emissions are zero, i.e., carbon neutral, for biomass-fueled generation. This approach is supported by industry practice as both The Climate Registry Electric Power Sector Protocol and the IPCC Guidelines for National Greenhouse Gas Inventories currently quantify and report biogenic emissions from the combustion of biomass separately from other emissions. EPA and others, including TVA, recognize the potential for carbon emissions resulting from indirect land use changes due to the use of biomass fuels. In part because of the need for additional research on these emissions, EPA announced on January 12, 2011, that it would defer for three years the application of the preconstruction permitting requirement to biomass and other biogenic C02 emissions. Additional information on carbon emissions from indirect land use changes and the carbon debt has been added to Section 7.3.3 of the Final EIS.

303. The impacts of harvesting trees to fuel the proposed biomass-fueled generating facilities are not described in the DEIS. The proposed 500+ MW of biomass generating capacity from co-firing, boiler conversion, and dedicated facilities could consume a few million tons of wood per year. Supplying this with logging residue, whole trees, and/or wood chips would have significant impacts over large areas. (*Commenter: Louise Gorenflo - TFC*)

Response: Section 7.3.3 of the Final EIS contains a description of the potential impacts of harvesting trees to fuel biomass-fueled generating facilities. Additional environmental reviews that would be conducted for proposed specific biomass facilities would address these kinds of sourcing area impacts.

304. The use of biomass fuels results in the release of harmful air pollutants, including fine particulate matter, sulfur oxides, carbon monoxide, volatile organic compounds, nitrogen oxides, polycyclic aromatic hydrocarbons, dioxin, and other toxic substances. Several medical organizations oppose biomass incineration due to the unacceptable health risks. (*Commenter: Louise Gorenflo - TFC*)

Response: Comment noted. Although air quality problems have been associated with some biomass-fueled generating facilities, including some using municipal solid waste, numerous biomass-fueled generating facilities are operating in compliance with applicable air quality standards.

305. TVA should engage the Valley's forest management community to develop best management practices for the sustainable use of trees for energy while maintaining the diversity and integrity of natural forests. (*Commenter: Louise Gorenflo - TFC*)

Response: Comment noted. TVA will carefully evaluate the potential impacts of the biomass fuel cycle in its assessment of any biomass-fueled generating facilities. This assessment will consider the diversity and integrity of natural forests and the need for additional best management practices specific to fuel acquisition and transportation.

306. TVA should establish a policy that it will not use biomass derived from food sources or that would result in the conversion of cropland used for food production. (*Commenter: Nancy Givens - WKU/KSES/BGGP*)

Response: TVA shares the concern of using biomass derived from food sources and the concern of converting cropland used for food production to grow biomass for electric power generation. These issues will be considered when TVA evaluates the use of use non-waste biomass to generate electricity with a proposed specific biomass facility.

307. TVA should establish a policy to not use garbage, animal waste, or other waste materials as fuels for generating power. (*Commenter: Louise A. Zeller - BREDL*)

Response: Although there is little use of these fuels for generating renewable energy in the TVA region, they are being used successfully and with relatively low environmental impacts elsewhere. TVA is unlikely to use these fuels in TVA-owned facilities in the near future but TVA would consider purchasing power generated by these fuels after appropriate consideration of the facility-specific environmental impacts.

308. We support the increased generation from woody biomass. This will reduce reliance on fossil fuels and reduce the emissions of GHGs and other criteria air pollutants. (*Commenter: Neil Letson - AFC*)

Response: Comment noted. TVA anticipates a sizeable portion of the increased renewable generation that is included in most strategies will be from woody biomass.

309. We urge TVA to establish strong environmental standards for the use and procurement of all wood used to generate electricity. These standards should include procurement from forests with approved management plans, a transparent self-monitoring and reporting process to promote sustainable procurement practices, and wood supply impact assessments based on formal scientific criteria and available for public comment. (*Commenter: Louise Gorenflo - TFC*)

Response: Comment noted. TVA will carefully evaluate these issues in the assessment of any proposed generating facilities that would use wood fuels.

2.22.3. Cost of Renewable Energy

310. How much is TVA paying for a megawatt-hour of wind energy delivered to the TVA system under the recent out-of-region wind power purchase agreements? (*Commenter: Stephen Levy - TSEA*)

Response: Specific contract terms between TVA and power providers are considered restricted information and therefore not publicly released because they contain confidential and proprietary commercial information. The release of this information could harm TVA's competitive position in electric power markets and its ability to negotiate various types of important commercial contracts on favorable terms. However, all new wind contracts were determined to be competitive with forecasted market electricity prices at the time those contracts were evaluated, taking into consideration the anticipated wind power generation profile and the corresponding market prices on an hourly basis.

311. How much is TVA willing to pay for a megawatt-hour of energy from a solar PV facility in the 1-20 megawatt capacity range? (*Commenter: Stephen Levy - TSEA*)

Response: Renewable projects of this size, including solar PV, are subject to the terms of TVA's relatively new Renewables Standard Offer, which currently has a time-weighted average price of 5.611¢/kWh. To learn more about this offer, see www.tva.com/renewablestandardoffer.

312. I am opposed to the use of intermittent renewable generation, especially solar and wind. These sources are too expensive, both in the cost of the power they generate and the cost of backup generating systems and/or storage systems to mitigate their intermittent availability. (*Commenter: Joe Horton*)

Response: TVA is also concerned about the implications of introducing intermittent renewable resources into the power system, especially as these resources are added in increasing proportions. There are four primary challenges associated with intermittent renewables: 1) hours of no output over the entire region; 2) rapid hour-to-hour changes in output; 3) high cost of transmission to deliver energy to load centers; and 4) generation during periods of low demand. In addition, the fact that both wind and sun are intermittent means that these resources have lower capacity factors than traditional baseload resources. They can also strain or cause the need for increased quickly dispatchable backup power, and present other operational challenges in terms of integration into the generation and delivery system. The Federal Energy Regulatory Commission is considering new guidance to improve integration of renewable energy resources and mitigation of operational issues and costs associated with variable energy resources.

313. The draft IRP and EIS do not provide cost estimates for the development of renewable resources in the TVA region. Therefore, we are unable to determine whether the estimates used in the modeling, particularly for solar PV and wind, are too high. Similarly, there is no discussion of forecasted cost trends for renewables. Please provide these cost estimates. The levelized cost estimate for solar PV provided to the Stakeholder Review Group and posted on the IRP website is unreasonably high compared to PV costs elsewhere. (*Commenters: Sam Gomberg - SACE, Jackie Tipper Posey, Frank Rambo - SELC*)

Response: Cost estimates for renewables are based on best available information, but TVA welcomes the opportunity to review additional information. Renewables generally have a

higher cost than traditional capacity at the IRP target levels (2,500 and 3,500 MW). Existing state renewable energy mandates and current state and federal subsidies (e.g., tax incentives) are likely to be the largest drivers of renewable energy development. The scenarios developed for the IRP assume a range of potential future federal renewable energy standards from 0 to 5 percent in 2012 and 30 percent in 2030 of adjusted total retail sales. For the IRP renewables portfolios, lifetime solar costs in the Tennessee Valley were assumed to be about $5,400 per kilowatt of capacity, including all costs (both capital and operating and maintenance). Lifetime wind costs were in the range of $4,500-$4,600 per kW, again including all costs. The costs for energy from in-Valley wind and solar were similar, at about $160/MWh and $170/MWh, respectively. Costs for wind energy from outside the Tennessee Valley were much lower (about $80/MWh), due to substantially stronger and more consistent winds in parts of the Midwest and Great Plains, resulting in much higher capacity factors for wind turbines. (All cost figures are stated in constant 2010 dollars.)

314. TVA is presently paying $0.12/kWh for renewable energy. If TVA greatly increased its use of renewable energy at $0.12/kWh as a replacement for coal-fired or nuclear energy, what would be the effect on consumer rates? (*Commenter: Russ Land*)

Response: This price is paid by TVA's Generation Partners program which purchases power that is resold by TVA's Green Power Switch program. Green Power Switch participants pay a premium for power generated by local renewable resources. This price does not represent the price TVA would otherwise pay in the marketplace for renewable power and is greater than TVA's costs of generating power from some other resources.

315. What is the projected cost/kW for modifying coal units to burn biomass, both through co-firing and conversion for biomass-only firing? (*Commenter: W.R. Kendrick*)

Response: The IRP did not directly assess the option for conversion of existing coal units to co-firing or full operation on biomass fuels. However, these potential conversions are included in the biomass components of the renewable portfolios that were evaluated. The actual cost of unit modifications or conversion is dependent on a number of factors including the unit being converted and the biomass fuel source that would be used. In some of the screening studies completed at the beginning of the IRP process, TVA estimated that a partial conversion to biomass (equivalent to about 20MW of output) for a standard pulverized coal unit could be around $400/kW.

316. While we support the increased generation of electricity from less-polluting sources and increased energy efficiency efforts, we urge caution in committing to large amounts of high-cost and intermittent renewable generation. This could conflict with TVA's mission of low-cost, reliable power. The use of these resources can increase in the future as costs decrease and the power system is better able to accommodate their intermittent generation. (*Commenter: William Cummings - KCC;* Jeannine Hillmer - Praxair)

Response: Comment noted. TVA's vision is to be one of the nation's leading providers of low-cost and cleaner energy by 2020. With the exception of renewable energy purchased through the Generation Partners program, TVA's purchases of renewable energy, as well as renewable generation developed by TVA, are designed to be cost-competitive with forecasted market electricity prices during the time the power is delivered consistent with the obligation to provide low-cost power in the TVA Act.

2.22.4. Development in TVA Region

317. The US is losing its technological lead in innovation in renewable energy. TVA should help reverse this loss by aggressively promoting the development, generation, and use of renewable energy in the TVA region. This can be done by promoting meaningful power purchase agreements for locally generated renewable energy, particularly solar, and encouraging local small businesses in this field. The TVA region states lag behind many states in this area, including several with poorer renewable resources that those of the TVA region. (*Commenters: Navin Rao - Sentinx, Edward Zubko - GES, James E. Zubko*)

Response: TVA is investing in technology innovations for renewable demonstrations and evaluating business models for renewable generation. TVA's renewable generation portfolio, including development of resources within the TVA region, will play a significant role in achieving TVA's vision of being the one of nation's leaders in clean generation. Strategies B and E, as well as the Recommended Planning Direction, include increased renewable generation.

318. TVA is not making a meaningful commitment to developing the Valley's renewable resources, particularly at a utility scale. This is evident because TVA has 1) not conducted the studies necessary to fully define the Valley's renewable; 2) developed strategies that show little difference in the amounts of renewable energy; 3) has not committed significant budget or staff to developing the Valley's renewable resources; and 4) made no mention of renewables in the August 2010 vision announcement. (*Commenters: Sam Gomberg - SACE, Annette Gomberg*)

Response: At the end of 2010, TVA's renewable energy portfolio consisted of over 4,400 MW of renewable energy capacity from both TVA-owned and purchased hydropower and energy generated by wind, solar, wastewater treatment gas, and landfill gas. TVA has secured contracts for more than 1,200 MW of additional renewable energy from wind, solar, biomass and landfill gas. Although not specifically mentioned in the August 2010 vision announcement, these and future renewable additions will play a significant role in achieving TVA's goal of being one of the nation's leading providers of cleaner energy by 2020. TVA has assessed renewable energy potential both in and near the Valley and has committed to developing a significant renewable resource portfolio, along with a commensurate budget and staff. TVA expects to continue to increase its renewable resource portfolio and align future renewable energy plans with TVA's vision, mission, policies and principles. As other commenters point out, however, renewable resources have potential issues that need to be carefully considered, especially at the project- or site-specific level.

319. TVA should adopt a plan that makes a serious commitment to aggressively developing the Valley's renewable energy resources including solar, wind and bioenergy. Developing these resources will create jobs, strengthen local economies and create a clean, healthier environment for all Valley residents. (*Commenter: Julia Aepping [sic], Donald L. Audley [sic], Kris B. [sic], M. Balangen [sic], April Bart, Dave Bordenkircher, Paul Boring, Deanna Bowden, Jenny Bowers, M. Boyd, Nancy Brannon, Harry E. Bryant, Jessica Buchanan, Paula Bunanek [sic], Melissa A. Burt, Kelvin Butler, Laura C. [sic], Lisa C. [sic], Teresa Campbell, Bruce Chicre [sic], James S. Collins, A. M. Conisin [sic], Cliff Corker, Josh M. Cox [sic], Thomas V. Cullen, Lori Curt [sic], H. Dwayne Cutshoul, Lacy Damiles [sic], Erika Davidson, Marge Davis, Roeyn Davis [sic], Courtney Day, I. Drelsecn [sic], Whodong Ebechnop [sic], Patricia Eleand [sic], R. Wray Estes, Peggy Evans, Douglas Felker, Melanie Felker, Heather Finolti, Sarah E. Flower, Vita French, Katherine Gamt [sic],*

Heather Gapsby [sic], Elizabeth C. Garber, Elizabeth Gazaway [sic], Joel Gearhardt, Danielle Gerhard, Kathy S. Gleeland [sic], Tony Gorton, Karen Gulk [sic], Ava Gunter, Mary Alan Guy [sic], Steven H. [sic], Meredith Hayes, Larry Hendrix, Kristen Hickey, R.M. Hill, Jessica Hill, Chloe Hirst, Steven R. Horton, Katherine Huddleton [sic], Jaun K. Hudson [sic], Lauren Hulson [sic], Cee J. [sic], Rofail H. Jenu, [sic], C. Johnson, Ivan Juny [sic], Barbara Kelly, Chrys Kemp [sic], Sara Keubbing [sic], J. Kewisn [sic], P. Kneuman [sic], Scott Kramer, David Brent Kulovich, Sandra Kurtz, William Kurtz, S. Kurtz, R.C. Last, John M. [sic], Julia Mangrin, Annie Mattson [sic], Nancy McFadden, Ralph McKenzie, Laura K. McKenzie, Paula McLen [sic], Rebecca Meade, Michael Miller [sic], Barbara Mott, Catherine Munay, Lauren N., J. N., Marissa N. [sic], Margaret F. Olson [sic], Janet Osborn, Jon Parker [sic], Erwin Peritt [sic], Kotel Perry, Zaria Person [sic], Norm Plate, Sara F. Plemons, Jennifer Porter, John F. Post, Patricia Post, Keith Rainy [sic], Arnold C. Ringe [sic], Madeline Rogers, Mercedes Rodriguez, Phillip Roll [sic], Ruth F. Rothe, Kathy S., Tanya S. [sic], Melinda Sanede [sic], Feris J. Schlery, Cody Semabayl [sic], Judy Sheffield, Madeline Shelly, V.C. Shriever [sic], Roxanna Shohadaee [sic], Michelle Smith, Jamie K. Stand [sic], Karl Stirs [sic], Carolyn N. Stokes, Henry Stokes, A. Suny [sic], Lauren Szoech, Karen T. [sic], Bill Terry [sic], Andy Todd, Nancy G. Van Vallanburgh, Dorthy W., Jan H. Watson [sic], Mona Whitehead, Dean Whitworth, Paul Wieland, Debbie Williams, R.T. Williams, Adelle Wood, Linda W. Woodcock, Kevin Woods, J. Y. [sic])

Response: TVA has announced a renewed vision to become one of the nation's leading providers of low-cost and cleaner energy by 2020. TVA's renewable resource portfolio, including development of resources within the Valley, will play a significant role in achieving this vision, and as such most of the alternative strategies being evaluated in the IRP include an increased reliance on renewable generating resources. Further detail on renewable resources considered within the IRP can be found in Final EIS Section 5.4. Future specific renewable additions would be assessed on cost, technological maturity, regional resource availability, diversified resource portfolio, and anticipated federal legislation/regulation and tax policy factors. Although in-Valley resources are limited by some of these factors, TVA agrees that economic development and the potential for local job growth have been and will continue to be an important consideration in the development of many TVA programs and initiatives. TVA will continue to align future renewable energy plans with TVA's vision, mission, policies and principles.

320. TVA should develop wind and solar generating facilities at the sites of the proposed new pumped hydro facilities. Due to their siting requirements, the pumped storage facilities would likely have good wind and solar resources and the storage facilities could store the renewable energy for delivery during peak demand periods. (*Commenter: Garry Morgan*)

Response: Comment noted. Combining storage with intermittent renewable resources, such as wind or solar, is a good match. Developing a diverse energy portfolio that optimally balances various generation source types (base load, intermediate, and peaking) will be a key component in developing TVA's future energy mix.

321. TVA should establish a Feed-In Tariff (FIT) for renewable energy producers that guarantees a long term fair price for each renewable kWh generated and placed on TVA's grid. (*Commenters: Jeff Deal, James Randolph*)

Response: TVA has recently established a Renewable Energy Standard Offer which guarantees a long term price for renewable energy. A standard offer is very similar to a FIT. For details of the standard offer, see http://www.tva.com/renewablestandardoffer/index.htm.

The Generation Partners contract/purchase agreement also guarantees a fixed price for a 10-year period.

322. TVA should prioritize the use of renewable energy generated in the TVA region over importing renewable energy from elsewhere. This will create local jobs, support local industries, and increase the reliability of the TVA power grid. It will also help TVA meet its mission of improving the quality of life in the TVA region through economic development. (*Commenters: Margie Buxbaum, Mary H. Clarke - TCV, Michael J. Crosby - TEC/BCAAT, Wyldon Fishman - NYSES, Sam Gomberg - SACE, Annette Gomberg, Stewart Horn, Gilbert J. Hough - RSI, Andrew Johnson - TSEIA, Christine Johnson - LSE, Gloria Lathem-Griffith - MEC, Lainie Luse, Linda Park, Leonard K. Peters - KEEC, Ricci Phillips - TTCD, Courtney Piper - TBLCEE, Don Scharf*)

Response: Comment noted. Renewable additions will play a role in achieving TVA's vision to become one of the nation's leading providers of low-cost and cleaner energy by 2020. Future renewable additions are assessed on cost, technological maturity, regional resource availability, resource portfolio diversification, and anticipated federal legislation/regulation and tax policy factors. Although in-Valley resources are limited by some of these factors, TVA agrees that economic development and the potential for local job growth have been and will continue to be an important consideration in the development of many TVA programs and initiatives. TVA will continue to align future renewable energy plans with TVA's vision, mission, policies and principles.

2.22.5. Financing

323. TVA should establish a program to encourage the development of pooled neighborhood investments in distributed solar and other renewable generating facilities. (*Commenter: Ann Ercelawn*)

Response: Neighborhood or community solar projects are becoming very popular around the country and TVA is currently researching different models to promote them. Once TVA determines which models have been the most successful, TVA will consider a partnership to pilot one or more projects in the TVA region.

324. TVA should establish creative financing options for homeowners and businesses to finance the installation of renewable energy generation. These could include loans paid back through power bills and lease arrangements. (*Commenters: A. Morton Archibald - ASA, Nancy Givens - WKU/KSES/BGGP*)

Response: TVA will continue to evaluate the best methods to help consumers finance renewable generation systems. We will leverage the relationships we have with financial institutions and look for partnerships to address consumer needs. One of the methods we implemented in 2010 was to provide a signed tri-party agreement before the customer installed the renewable generation system. This change made it easier for customers to get financing since they had a guaranteed 10-year contract.

325. TVA should increase its financial support for customers to install renewable generation beyond the current $1,000 payment. This amount is too small to be of much significance. TVA should also consider grants for solar hot water heating systems. (*Commenters: Stewart Horn, Chad Ice, Elizabeth Tancig - SC*)

Response: TVA through Generation Partners pays $1,000 to each new participant to offset startup costs and agrees to buy 100% of the green power each system produces. TVA pays the retail electric rate, along with any fuel cost adjustment, plus a 12 cent premium per kilowatt-hour for solar and 3 cents per kilowatt-hour for wind, biomass and hydro. The contract term for TVA to purchase the renewable generation is 10 years providing the customer with credits on their monthly utility bills. As an example, over ten years, TVA would pay over $12,000 for a 4-kW system solar system for a home plus the $1,000 up front incentive. TVA will consider solar hot water heating systems in its development of EEDR programs.

2.22.6. Generation Partners/Green Power Switch Programs

326. Continue and expand the Generation Partners program. (*Commenters: Ruth Busch, Chris Christie, Daniel Joranko - TAP, Jackie Tipper Posey, Kevin Routan - CGSC*)

Response: TVA will continue to support customer owned renewable generation in the Valley through Generation Partners and is committed to refining program elements and processes through continuous improvement efforts to reach even more customers.

327. Do Green Power Switch customers pay for the wind power that TVA is importing from outside the TVA region? (*Commenter: Jackie Tipper Posey*)

Response: No. All renewable energy purchased by Green Power Switch customers is generated in the TVA region.

328. The Generation Partners program has been slow to yield large production increases due to a lack of education about renewable energy; lack of sufficient incentives and creative financing mechanisms; competing media messages against conservation, energy efficiency and renewable energy and for coal and nuclear; and the reluctance of homeowners and businesses to invest during the economic downturn. How is TVA addressing these issues? (*Commenter: Nancy Givens - WKU/KSES/BGGP*)

Response: The Generation Partners program has seen significant growth in the last year after TVA redesigned the incentive structure and contracting process, increased the size of qualifying systems from 50 kW to 200 kW, and added biomass and micro hydro as additional qualifying resources in late 2009. As of December 2010, over 600 projects have been approved for Generation Partners, with a total capacity of over 60 MW. TVA will continue to evaluate possible improvements to support customer-owned renewable generation in the Valley.

329. The IRP strategies do not incorporate the generating resource potential contributed by TVA's Generation Partners program. This successful program is rapidly growing, yet continuing to be considered a pilot by TVA with undefined long-term goals. It, and the associated Green Power Switch program, would grow more rapidly if TVA made a long-term commitment to it and focused it on local jobs and local renewable energy projects. (*Commenter: Annette Gomberg*)

Response: The energy generated by TVA's Generation Partners program is not included in the renewable portfolios evaluated in the IRP. It is instead considered an end-use generation program and included as a component of TVA's EEDR portfolios (see EIS Section 3.5). The commenter is correct in stating that Generation Partners is a pilot

program. However, TVA continues to enroll participants and contract for purchasing energy they generate for 10 years. TVA is working with the local power distributors and others to make Generation Partners an established program.

330. TVA states that it does not participate in net-metering. However, I have a friend who generates his electricity and is paid for electricity he generates but does not consume. Please explain how this works. (*Commenter: Robert Barkley*)

Response: TVA offers Generation Partners through participating power distributors instead of net metering. Generation Partners differs from net metering because consumers are paid for all of their renewable generation, not just any excess that they put back on the grid. TVA pays each new participant in Generation Partners $1,000 to offset startup costs and agrees to buy 100 percent of the green power each system produces. TVA also pays the retail electric rate, along with any fuel cost adjustment, plus a 12-cent premium per kW-hour for solar and 3 cents per kW-hour for wind, biomass and hydro. For more information on Generation Partners go to www.generationpartners.com or contact your local power distributor.

331. What were the projections and actual numbers for Green Power Switch subscribers, amount of green power generated, and amount of green power sold for the last couple years? What are the projections for the current year? (*Commenter: Chris Christie*)

Response: Green Power Switch (GPS) participation has declined annually at a rate of between 5-7 percent over the past two fiscal years. It is forecasted that this trend will continue into FY2011, with only 11,400 participants in the program (~5 percent decline from the previous year) by September 2011. GPS sales have increased by ~7.5 percent each year since 2009, and the current forecast is that sales will increase by another 7 percent in FY2011. Additional information is listed below.

	FY2009 (actual)	FY2010 (actual	FY2011 (projected)
Total GPS customers	12,858	12,019	11,400
Total green power sales	87,306 MWh	93,482 MWh	100,000 MWh

2.22.7. Purchasing Options

332. TVA should adopt a policy that requires distributors to allow customer-owned renewable energy generating systems to connect to the grid and sell excess power back to TVA. This option is presently not available in much of the TVA region. (*Commenter: A. Morton Archibald - ASA*)

Response: TVA's Generation Partners program achieves this. TVA pays each new participant in Generation Partners $1,000 to offset startup costs and agrees to buy all of the renewable energy they generate. TVA pays the standard electric rate, along with any fuel cost adjustment, plus a 12-cent premium for solar and 3 cents per kilowatt hour for wind, biomass and hydro. The participant pays the standard electric rate plus any fuel cost adjustment for the power they consume. There are currently 114 power distributors participating in Generation Partners. As of December 2010, over 600 projects are approved for Generation Partners, totaling over 60 MWs.

333. TVA should adopt an aggressive Feed-In Tariff (FIT) for in-Valley renewable generation. A FIT offers the advantages of only paying for the power delivered, protecting

ratepayers by establishing a stable power purchase price and improving project financing through guaranteed contract terms and reliable revenue streams. The region would also benefit from increased local renewable generation through local employment, increased diversity of the power portfolio, strengthened power grid, and reduced pollution and greenhouse gas emissions. (*Commenter: Wyldon Fishman - NYSES*)

Response: A variant of the FIT is currently being used by TVA's new Renewable Standard Offer program, although in a limited program quantity and with pricing that varies by date and time of delivery but not by generation technology. Details are available at http://www.tva.gov/renewablestandardoffer/. The feed-in tariff and related power acquisition mechanisms will be considered during the development of future renewable energy plans, while recognizing that TVA strives to balance goals related to both low-cost and cleaner energy.

2.22.8. Qualifying Facilities

334. The IRP makes little mention of the future use of energy generated by qualifying facilities as defined by the Public Utility Regulatory Policies Act. What role will these have in TVA's future portfolios and is TVA considering changes that would make future purchases from these facilities easier to implement? (*Commenter: Tom Nelson - DESI*)

Response: Existing qualifying facility agreements are described in Section 3.4 of Final EIS. The requirements to be a qualifying facility are established by law and TVA adheres to these in its treatment of and response to such facilities.

2.22.9. Renewable Energy Potential

335. The alternative strategies contain virtually no additions of renewable energy after 2020. This constraint is unreasonable and artificially skews model results towards non-renewable generating options. (*Commenter: Sam Gomberg - SACE*)

Response: The growth in renewables capacity mostly tapers off after 2020 due to higher cost and/or regulatory uncertainty. Existing state renewable energy mandates and current state and federal subsidies (e.g., tax incentives) continue to be the largest drivers of renewable energy development for the nation. Future state and/or federal mandates, as well as future tax policy, are unknown and will significantly impact future development of renewable energy resources. Additionally, TVA intends to begin preparing another IRP no later than 2015. At that time, renewable portfolio composition and timing will be reevaluated.

336. The draft IRP and EIS fail to consider alternatives that address the full potential for the development of renewable resources in the TVA region. Under Strategy E, which purports to maximize reliance on renewable and EEDR resources, regional wind and solar PV development are each limited to 360 MW. This is a small fraction of the region's potential as described by studies cited in the DEIS, as well as by a recent Navigant Energy Consulting study. The potential for regional biomass energy development is also much greater than the 465 MW assumed in the draft IRP and EIS. Several cited studies, as well as a recent woody biomass inventory by Larson & McGowin, show an additional potential of 6,800 to 12,700 MW of regional renewable generation.
(*Commenters: Abigail Dillen - Earthjustice, Gilbert J. Hough - RSI, Frank Rambo - SELC*)

Response: New renewables incorporated into the IRP were based on two pre-determined portfolios of 2,500 and 3,500 MWs. These amounts do not represent resource potentials, rather reasonable deployment schedules for various resource capacities were developed based on cost, technological maturity, regional resource availability, resource portfolio diversity, and anticipated federal legislation/regulation and tax policy factors. Moreover, it is important to recognize that modest anticipated growth in demand for electricity limits the rate at which new renewable resources can be integrated into the power supply in a cost-effective manner. As this situation changes, TVA anticipates reexamining the merits of renewable resources in future IRP updates.

337. While we support Strategy E, it does not go far enough in taking advantage of the renewable energy potential in the TVA region. This is particularly true for solar energy. The DEIS (pages 128-129) describes a very large regional potential for PV, yet Strategy E only includes 175 MW of PV by 2020. (*Commenters: Gilbert J. Hough - RSI, Andrew Johnson - TSEIA, Rachel Tuck*)

Response: IRP planning strategies were developed to test a broad range of business options that TVA could adopt, including renewable additions. New renewables incorporated into the IRP were based on two pre-determined portfolios amounts of 2,500 and 3,500 MWs respectively. These amounts do not represent resource potentials, rather reasonable deployment schedules for various resource capacities were developed based on cost, technological maturity, regional resource availability, diversified resource portfolio, and anticipated federal legislation/regulation & tax policy factors. Moreover, it is important to recognize that modest anticipated growth in demand for electricty limits the rate at which new renewable resources can be integrated into the power supply in a cost-effective manner. As this situation changes, TVA anticipates reexamining the merits of renewable resources in future IRP updates.

2.22.10. Small and Low Power Hydro

338. Small and low power hydro is a viable, economic option in the TVA region. This option, however, is not considered in the IRP. (*Commenter: Tami Freedman - CGSC*)

Response: The potential for small and low power hydro development is described in Section 5.2.3.1 of the Final IRP and Sections 4.17.3 and 4.17.3 of the Final EIS. Although not explicitly stated in the draft documents, Strategy E - EEDR and Renewables Focused Resource Portfolio included the development of 144 MW of small and low power hydro generating capacity.

2.22.11. Solar Energy

339. A recent report by Navigant Consulting estimates that TVA could integrate much higher penetration level of PV, up to 5,200 MW of capacity, by 2030 with little or no additional infrastructure-related costs. The most aggressive renewable energy portfolio in the draft IRP and EIS (350 MW of PV) only include 7 to 16 percent of this reasonable PV potential. (*Commenters: Lawrence Carroll, Sam Gomberg - SACE, Andrew Johnson - TSEIA*)

Response: IRP planning strategies were developed to test a broad range of business options that TVA could adopt, including renewable additions. New renewables incorporated into the IRP were based on two given portfolios amounts of 2,500 and 3,500 MWs. These

amounts do not represent resource potentials, rather reasonable deployment schedules for various resource capacities were developed based on cost, technological maturity, regional resource availability, diversified resource portfolio, and anticipated federal legislation/regulation and tax policy factors. TVA continues to review additional information as it develops and will be updating our renewable portfolios when the next IRP is developed. That effort is planned to begin no later than 2015.

340. Distributed solar generation facilities have the advantages of balancing local loads and not stressing the entire grid structure. The advantages of this local distributed generation are becoming critical as major transmission lines reach maximum load thresholds, especially during peak demand periods when solar generation is greatest. (*Commenters: A. Morton Archibald - ASA, Courtney Piper - TBLCEE, Kevin Routan - CGSC, Lynn Strickland - PS, Thomas Tripp - BFMC*)

Response: TVA recognizes that there can be advantages to distributed generation. Cost, efficiency, and generation/transmission system impacts must all be considered when comparing distributed and traditional centralized utility generation. Distributed generation can introduce complications in system protection, dispatch, control, and metering, and often does not have the advantages of scale economies associated with centralized generation. TVA currently purchases power from numerous distributed generation facilities through the Generation Partners program and other power purchase agreements and anticipates purchasing power from distributed generation through the new Renewable Standard Offer (see Final EIS Section 3.4).

341. For solar energy, prioritize development of rooftop systems. These reduce building HVAC needs, are rarely shaded, and do not occupy land. Suitable commercial and industrial roof space is abundant in many load areas such as Memphis. (*Commenters: A. Morton Archibald - ASA, Reuben Harris, Jim Mann, Paul Noel - NEC , Kevin Routan - CGSC, Lynn Strickland - PS, Elizabeth Tancig - SC*)

Response: Rooftop systems can be a viable approach to solar energy in the TVA region and suitable roof space is abundant in some areas. The Generation Partners program and new Renewable Standard Offer provide opportunities for rooftop PV systems to be deployed across the TVA region. Although rooftop solar is one approach, there are other PV applications that also warrant consideration, such as ground-mounted PV with one or two-axis tracking capability to increase the conversion of sunlight to electricity.

342. Promote local development of solar energy by establishing standardized liability insurance requirements to enable installers to consistently sell solar systems that make financial sense to customers and installers. These requirements should follow solar industry standards and not require extraneous costs that limit development through the Generation Partners program. (*Commenter: Christine Johnson - LSE*)

Response: While TVA promotes growth of the renewable energy in the Valley through Generation Partners and other programs, each power distributor has the ability to determine their own interconnection requirements, including any liability insurance requirements. TVA provides them with information on industry standards but does not dictate how they run their businesses.

343. The draft IRP and EIS do not adequately assess the potential for solar PV development in the TVA region. While the draft EIS notes a potential for 30,000 MW of

rooftop PV in 2015, a recent report by Southern Alliance for Clean Energy (SACE) shows a potential for about 46,000 MW of solar capacity from both rooftop and ground-mounted systems. Given this available capacity, the strategies should include much larger amounts of solar energy. (*Commenters: Nelson Buck, Ann Ercelawn, Sam Gomberg - SACE, Charles Grotzke, Christine Johnson - LSE, Nelson Lingle - RSI, Jim Mann, Adam Matar, Ricci Phillips - TTCD, Paul Sanderson, Joab D. Silverglade, Fred Stanback*)

Response: The rooftop potential indicated in the EIS is for 2015, while the SACE report extended the date until 2030. Additionally, the EIS projections only discuss rooftop potential and do not include the addition of ground-mounted systems. Both the TVA and SACE analysis use the same NREL report as the basis for their resources potential assumptions and therefore should be viewed as complementary rather than contradictory. Additional amounts of solar PV can be considered in future IRP updates and take advantage of the further development of this technology.

344. The draft IRP does not appear to address the forecast decline in the installed cost of solar PV. Please address this. PV module costs fell by 50 percent during 2009 and are forecast to continue to decrease. The average levelized cost of energy over a 25 year period in Tennessee ranged from $0.23 to $0.12/kWh, depending on system size, and is forecast to decrease to $0.14 to $0.04/kWh by 2013. A recent Navigant Consulting study also forecasts dramatic cost decreases. (*Commenters: Sam Gomberg - SACE, Annette Gomberg, Gilbert J. Hough - RSI, Andrew Johnson - TSEIA, Thomas Tripp - BFMC*)

Response: Although solar PV costs have declined rapidly in recent years, it is still a relatively expensive generation option. Additionally, intermittency and dispatchability concerns are barriers that must be overcome for solar PV to provide a large portion of TVA's power. However, renewable additions, such as solar energy, will play a role as TVA increases the proportion of its generation from non-carbon emitting sources. Additional amounts of solar PV can be considered in future IRP updates and take advantage of the further development of this technology.

345. The IRP strategies do not fully exploit the synergies between peak solar power production and TVA's summer peak load requirements. While the IRP indicates that solar has a capacity factor of 17 percent, the coincident solar production peak enhances its value and its economic potential. TVA should consider more in-region solar generation as an economical peaking power source. (*Commenters: Annette Gomberg, Andrew Johnson - TSEIA, Courtney Piper - TBLCEE, Lynn Strickland - PS, Thomas Tripp - BFMC*)

Response: Although solar PV is more coincident with summer peak in comparison to other renewable sources, such as wind, it is still a relatively expensive generation option.

346. The strategies in the draft IRP do not include the potential use of space-based solar energy. This is an emerging supply source as shown by Pacific Gas & Electric's power purchase agreement with Solaren. It is likely to become commercially available within TVA's 20-year planning period. (*Commenter: Richard McNeil*)

Response: TVA evaluated potential resource options using screening criteria described in Section 5.1 of the FInal IRP and Section 5.2 of the FInal EIS. Based on these criteria, space-based solar energy was not considered to be a viable resource option. As with other potential resource options, TVA will monitor the development and commercial availability of space-based solar energy and reconsider its use in future IRPs.

347. The use of distributed PV systems operated by homeowners and businesses in combination with electric vehicles can be an important part of smart grid systems, with benefits from reducing demand for vehicle charging and providing a source of power storage during peak demand times. How was this factored into the IRP's solar PV portfolios? (*Commenter: Thomas Tripp - BFMC*)

Response: Comment noted. Synergistic relationships which leverage the benefits of various technology options, such as with distributed renewable energy, electric vehicles, and smart grid, will play an increasing role in the development of TVA's renewable energy portfolio and in future integrated resource planning. The IRP renewable portfolios represent reasonably achievable resource potentials while allowing for flexibility in selecting various deployment options.

348. TVA should develop a solar lease program implemented through the distributors where TVA or other developers install solar PV and solar thermal on customers' property. The customers then make monthly payments through their power bills, which include credits for the energy generated. Utilities and developers in much of the country have implemented similar programs. (*Commenters: Tami Freedman - CGSC, Reuben Harris*)

Response: Comment noted. There are many approaches for implementing solar PV and other renewable energy technologies which TVA will consider in the future. The Generation Partners program is the closest current approach to this proposed business model.

349. TVA should more aggressively promote the adoption of customer-owned PV facilities by holding workshops to explain their use and installation. (*Commenter: Alfred G. Orillion - SA*)

Response: TVA promotes education on solar and other renewable energy by sponsoring public events such as tours, conferences, meetings, and home shows throughout the year. TVA also works with local power distributors and environmental groups to support Earth Day events. Generation Partners has an educational video on the website www.generationpartners.com.

350. TVA undervalues solar generation, especially in the Generation Partners and Renewable Standard Offer programs. In each of these, TVA retains the Renewable Energy Credits. The current value of these RECs is roughly equivalent to the premium that TVA pays for the solar energy. At the macroeconomic level, the cost to TVA is negligible. TVA should therefore maximize the production of this low-cost energy. TVA should also consider paying higher premiums as the value of RECs increases in the future. (*Commenter: Andrew Johnson - TSEIA*)

Response: TVA has renewed its vision to help lead the Tennessee Valley region and the nation toward a cleaner and more secure energy future. Renewable energy is one component of a comprehensive strategy to accomplish the vision. TVA's economic criteria are designed to balance TVA's mission of affordable electricity, economic and agricultural development, environmental stewardship, integrated river system management, and technological innovation. Pricing for renewable energy is set in a manner that balances the aspects of this mission. TVA will continue to refine renewable energy efforts just as was recently done in the 2009 redesign of Generation Partners. In this redesign, TVA expanded resources, increased the maximum size of qualifying systems, and created an innovative incentive structure. The incentive structure is designed so that customers get a premium in

addition to the retail rate and fuel cost adjustment. The new Renewable Standard Offer provides developers a long term power purchase contract for renewable projects. TVA has designed flexible renewable energy efforts to meet changing markets and will continue to seek stakeholder input on future plans for renewable energy.

2.22.12. TVA Development of Renewable Generation

351. One of the reasons given in the draft IRP for TVA's reluctance to develop renewable generation is that it does not have the in-house expertise to develop these resources. We question this reasoning as numerous other utilities have successfully used the expertise of consultants and commercial developers to expand their renewable resources. (*Commenter: Sam Gomberg - SACE*)

Response: Comment noted. This statement was an error and has been removed from the Final IRP. TVA has a few hundred employees working in the field of renewable energy (including hydropower), and extensive experience with renewable energy. TVA also collaborates extensively with others (e.g., Electric Power Research Institute, Department of Energy, Oak Ridge National Laboratory) on renewable energy issues.

352. Please better describe the amount of renewable generation that TVA intends to develop and the amount TVA intends to purchase from the marketplace. As a leader among utilities, TVA should also lead in the development of renewables. The current tax incentive situation may change and TVA should be aggressively assisting others in renewable development and in research and development efforts. (*Commenters: Nelson Buck, Robin Minor*)

Response: Due to TVA's current inability to obtain tax incentives or grants, most renewable additions are expected to be through power purchase agreements. The renewable addition portfolios associated with the various alternative strategy are described in Section 5.4.3 of the Final EIS and Appendix D of the Final IRP. These descriptions differentiate TVA-generated and purchased power. The Recommended Planning Direction, with the 2,500 MW renewable portfolio, recommends TVA capitalize on opportunities to make cost-effective renewable additions. As such, the contribution and mix of renewable generation to TVA’s portfolio will continue to be evaluated and will align with TVA's vision, mission, strategies, policies and principles.

353. The Draft IRP (pages 70 and 71) states that TVA does not intend to develop renewable generation (except for upgrades to existing hydroelectric facilities). This position is contrary to the requirement in Executive Order 13514 on Federal Sustainability that agencies “increase agency use of renewable energy and implement renewable energy generation projects on agency property.“ (*Commenter: Abigail Dillen - Earthjustice*)

Response: In addition to development of renewable generation resources on agency property, Executive Order 13514 allows agencies to meet renewable energy objectives through contracted purchases of renewable energy and/or renewable energy credits from generation resources not located on agency property. TVA uses a combination of resources to address Executive Order 13514, including purchases of renewable energy through TVA distributors under the Green Power Switch program and use of renewable energy from modernization of TVA's existing hydroelectric facilities. TVA is also considering options to generate power from biomass at its own facilities. Details of TVA’s renewable energy use can be found at http://www.tva.com/abouttva/energy_management/index.htm.

2.22.13. Wind Energy

354. Develop wind energy with hyperbolic towers on high ridges. These towers are shaped similar to cooling towers and would have contain a horizontal wind turbine. With the higher wind speeds on ridges, they could have an internal wind speed of 125 to 150 mph and generate about 200 MW while producing little noise. (*Commenter: Paul Noel - NEC*)

Response: TVA evaluated potential resource options using screening criteria described in Section 5.1 of the IRP and Section 5.2 of the EIS. Based on these criteria, wind generation with hyperbolic towers was not considered to be a viable resource option. As with other potential resource options, TVA will monitor the development and commercial availability of wind generation with hyperbolic towers and reconsider its use in future IRPs.

355. I understand you propose to build a wind farm on Signal Mountain, which according to wind resource maps has low wind speeds. Your resources would be better spent on solar PV, which is more appropriate for the area and has much less visual impact. (*Commenter: Elizabeth Tancig - SC*)

Response: TVA briefly considered constructing a small windfarm on Signal Mountain near Chattanooga in 1999. This windfarm was instead built on Buffalo Mountain near Oak Ridge, Tennessee. TVA has no plans at this time to construct a windfarm or purchase power from a windfarm on Signal Mountain.

356. Please describe how the anticipated decrease in the cost of wind turbines and improvements in turbine efficiency and capacity factor are considered in the planning process. (*Commenters: Jimmy Glotfelty - CLEP*)

Response: Although wind costs have declined in recent years, other factors such as geographic resource potential, various market drivers, and operations and maintenance costs must be considered. Wind turbines do continue to grow in height, size, and capacity potential, however with these advances also come new potential risks. These risks include increased frequency in equipment failure rates, maintenance cycles, and rises in maintenance labor costs due to safety concerns associate with working on larger scale turbines. These variables are still being understood and analyzed in the wind industry and will likely require further investigation and optimization as turbines continue to grow in size. Due to these uncertainties, cost declines were not strongly considered. Additionally, cost is only one of several factors considered in developing reasonable deployment schedules for the various renewable resource options.

357. The IRP does not address the generation of power by small wind turbines. These are economical options in much of the area. (*Commenter: Tami Freedman - CGSC*)

Response: Small scale wind power is one of the sources of renewable energy that TVA purchases through the Generation Partners program. TVA purchased about 9 MWh of energy from small scale wind in FY2010 and anticipates purchasing more in the future.

358. We agree with the finding in the IRP that wind energy generated outside the TVA region is one of the most abundant and lowest cost sources of renewable energy. Wind energy from the Great Plains, in particular, has a high capacity factor and the main constraint on its availability is the lack of adequate transmission. (*Commenter: Jimmy Glotfelty - CLEP*)

Response: Comment noted. As described in Final EIS Section 7.3.3, TVA anticipates that wind energy generated outside the TVA region will be a major component of its renewable energy portfolio during the IRP planning period.

2.23. Research and Development

359. TVA should increase its support for research and development in clean energy, particularly for the emerging renewable energy manufacturing sector in the region. This is critical to long-term economic expansion. One method is by supporting innovation clusters. (*Commenter: Daniel Joranko - TAP*)

Response: Comment noted. TVA recognizes the importance of research and development in the clean energy sector and invests in research and development of a variety of focus areas to help enable TVA to meet future challenges. These focus areas include many aspects of clean energy in support of TVA's vision to become one of the nation's leading providers of low-cost and cleaner energy by 2020. TVA agrees that economic development and the potential for job growth associated with clean energy, including the renewable energy manufacturing sector, is an important consideration and is one of the focus areas of its economic development efforts.

2.24. Transmission System

2.24.1. New Transmission Facilities

360. Does TVA plan to construct direct current (DC) transmission facilities? (*Commenter: Russ Land*)

Response: In general, DC is not an economic choice for transmission within the TVA system. TVA presently has no plans to construct DC facilities but continues to monitor the technology and economics, and would consider it as an option in some situations.

361. TVA should support the development of long-distance, high-capacity transmission lines to transmit wind energy from the Great Plains to the southeastern US. The high voltage, direct current (HVDC) lines proposed by various companies would allow TVA to import large quantities of wind energy, and to profit by wheeling this power to other utilities. HVDC is a proven technology with high reliability and lower land requirements than alternating current lines of similar capacity. (*Commenters: Jimmy Glotfelty - CLEP, Chris Shugart - PE*)

Response: TVA has recently established contracts for purchase of wind power through existing AC transmission lines. TVA recognizes that long distance high capacity transmission lines could be an important component of transmitting wind energy from the Midwest to the Northeast and Southeast, if that is determined to be a desirable and/or economic goal for its customers. TVA is presently working with several developers in a non-preferential manner to evaluate possibilities for long distance imports through HVDC lines. TVA generally supports these transmission infrastructure upgrades while endorsing no specific projects. The IRP includes consideration of scenarios with large renewable portfolios that would require a new high capacity corridor, within which transmission development proposals might provide a valuable service if economic and other practical issues are favorably resolved. Control of a high volume of variable wind generation and

constructing dedicated transmission in “cross-over” states are significant issues. It is also noted that some of the advantages claimed for HVDC lines may not be realistic.

2.24.2. Reliability and Capacity Upgrades - Existing Facilities

362. How is TVA protecting the transmission and distribution grid from natural and manmade electro-magnetic pulse? (*Commenter: John Poparad*)

Response: TVA continues to monitor the technology and risks associated with geomagnetically induced currents (GIC) from sunspots such as the events in 1989 and 2003, and other sources of electro-magnetic pulse, and contributed to a recent white paper on the subject by EPRI. TVA has replaced many protective relays across the system which may have been susceptible to mis-operation during GIC events. TVA has a number of sensors in its system capable of monitoring GIC. In addition, TVA participates in an on-going North American Electric Reliability Corporation Task Force, and is a member of the Transmission Forum where this topic is considered.

363. TVA should invest in upgrading the transmission grid to reduce transmission losses. (*Commenter: John Hamilton*)

Response: Losses in a transmission grid are unavoidable but are relatively small, typically 2-3% of the power transmitted. Losses in the lower voltage distribution systems that TVA sells power to are typically a few percent higher. While service upgrades to provide additional delivery points for supplying power to distribution systems are typically driven by increased capacity requirements, the selection of the optimum alternative is typically driven by relative loss reductions. For transmission systems, potential line losses are considered when designing transmission lines. Conductors are selected based on a present worth analysis of the cost of losses over the assumed life of the line, to provide the economically optimum solution. This applies to both new transmission lines and upgraded lines. The other major source of losses in a transmission system is the large power transformers. As for transmission lines, potential losses are considered in an economically optimum design process.

364. Upgrades to the existing transmission and distribution systems will be necessary to successfully implement the EEDR portfolio. Please describe how you intend to implement the necessary smart grid technology and associated time of day metering. (*Commenter: Sandra Kurtz - BEST*)

Response: The majority of benefits from smart grid technology are obtained from the lower voltage distribution systems that TVA sells power to. However, there are some benefits available in the transmission system. TVA has worked with EPRI over several years and is currently developing a investigation roadmap for the next 10 years that will consider the following: Location Disturbance Application, Advanced Situational Awareness with Phasor Measurement Units (PMUs), Model Validation with PMUs, FACTS Devices , Universal Transformers, IEC 61850 in Substations, CIM Planning Architecture, CIM Operations Architecture, Common Visualization across Interties, Protection Relays with proven PMU capability, Demand Response packages fully operational, Partial Discharge Sensors, Electric Vehicle Charging, Smartwires Technology , Disturbance Location Software, Data Handling and Analytics, Improved Engineering Specs for Existing Tech, Asset Health Sensing Technologies, and an Oscillation Monitoring Tool. TVA is also partnering with EPRI, TVPPA, and distributors on a Smart Grid roadmap for distribution systems. This roadmap works to develop the business case for distributors to address major future

impacts such as time-of-use rates, meter reading, load control, customer engagement, planning and forecasting, distribution operations and efficiency, and electric transportation. TVA is managing the interaction and gaps between the Transmission and Distribution roadmap efforts. Additionally, TVA is partnering with 19 power distributors on a smart-grid pilot. This pilot is to test demand response products and the different types of smart grid distribution and communication systems needed. TVA has established a Smart Grid Executive Steering Committee to coordinate TVA and distributor evolving smart grid roadmaps. Smartgrid is being considered by TVA for adoption as a technology development focus area.

365. Utilities typically use static ratings for transmission lines based on fixed weather assumptions. These ratings result in underutilization of the system most of the time. The use of Dynamic Line Ratings allows the system operator to better adapt to actual weather conditions and safely increase line transfer capacity by 10 to 30%. Is TVA considering incorporating Dynamic Line Ratings into the IRP as an option for meeting future energy demand and improving environmental, economic, and operating efficiencies? (*Commenter: Rob Lamneck - NEU*)

Response: Dynamic line ratings are not typically used in long term planning processes such as the Integrated Resource Plan since actual weather conditions cannot be predicted accurately. However, one of the main weather conditions which contributes to line ratings is the ambient temperature. TVA already uses a range of ambient temperatures from 0 to 40 degrees Celsius for line ratings. These ratings typically provide additional transmission capacity during winter, spring, and fall when ambient temperatures are cooler.

2.25. Vegetation and Wildlife

366. The final EIS should identify the 30 bird species of conservation concern breeding in the TVA region and describe the potential impacts on them. It should also address impacts to migratory birds in the TVA region. (*Commenter: Gregory Hogue - USDI*)

Response: The Final EIS includes a citation to this list of birds of conservation concern. An analysis of the potential impacts to these birds is beyond the scope of this programmatic EIS and would be addressed as appropriate when specific resources are proposed for development.

2.26. Water Resources

2.26.1. Availability of Cooling Water / Cooling Capacity

367. The availability of cooling water and/or cooling capacity in area rivers will become more limiting if climate trends in air and water temperatures continue to rise. Is there consideration of additional cooling towers to reduce water use and/or thermal discharges? (*Commenter: Kim Franklin - USCOE*)

Response: The IRP did not explicitly consider additional cooling towers for existing plants, but the cost of new units added to the system in each planning strategy does reflect water treatment consistent with expected regulations, including the cost of cooling towers if applicable. Other studies are currently underway at TVA to address the issue of cooling water discharge and river temperatures.

368. With increasing frequency of drought cycles and increasing summer power demand, the cooling capacity of the Tennessee and Cumberland Rivers is exhausted. TVA should therefore reconsider large nuclear and combustion turbine plants that require large volumes of cooling water. (*Commenter: Paul Noel - NEC*)

Response: Generating resources (supply and demand side) considered in the IRP analysis are optimized based on least cost, with costs imbedded for operating expenses, taxes, and debt. Imbedded within these costs are operational and compliance cost considerations for water regulations. All IRP strategies were developed to conform to likely regulatory requirements. As TVA considers regulations specific to hydrothermal discharges, it anticipates hydrothermal releases and plant intakes to require re-focused biological analysis and, in some cases, additional cooling capacity for discharge permit renewals. New constructions would require closed cycle cooling with minimized thermal discharge to the receiving waters.

2.26.2. Water Conservation

369. TVA should support water conservation efforts by its customers. This would reduce demand on dwindling water resources, stimulate the economy, and reduce energy demand. An example of practical water conservation is installation of rainwater collection systems. (*Commenter: Stewart Horn*)

Response: The promotion of water conservation efforts, including rainwater collection systems, is a component of the water resources management activities that TVA is presently considering in the development of the Natural Resource Plan. See http://www.tva.com/environment/reports/nrp/index.htm for more on this plan. TVA agrees that water conservation efforts frequently reduce energy demand.

2.26.3. Water Resources Impact Assessment

370. How much water does TVA consume at each of its nuclear facilities? (*Commenter: Stewart Horn*)
Response: Water consumption by TVA nuclear facilities, as well as by other TVA generating facilities, is described in Final EIS Sections 4.7 and 7.3 (Table 7-1). The projected water consumption for the various alternative strategies is described in Final EIS Sections 7.3 (Table 7-2) and 7.6.3.

371. The DEIS does not adequately describe the impacts to water quality that would result from the continued operation of coal plants. It states that TVA would continue to meet water quality standards through compliance with National Pollution Discharge Elimination System (NPDES) permit requirements. However, it does not address the fact that TVA is not presently meeting water quality standards and that several TVA plants are operating under expired NPDES permits. TVA's effluent discharges, including those resulting from seepage from unlined settling ponds, are presently causing adverse impacts to groundwater and surface water. (*Commenter: Abigail Dillen - Earthjustice*)

Response: State Water Quality Standards consist of designated uses for streams and water quality criteria applicable to those uses. The criteria apply to the in-stream concentration and not at the “end of pipe” for the discharge where mixing and assimilation in the receiving stream occurs. With each NPDES permit renewal application for its fossil plants, TVA submits analytical data for discharges of organic and inorganic compounds. These data

include historical compliance monitoring results and the results of the most recent NPDES permit renewal monitoring. The permit writer uses these data, ambient water quality data, and documented stream flows to analyze the reasonable potential for exceeding the applicable (in-stream) water quality criteria. Based on these analyses, TVA facilities are meeting applicable state water quality criteria including those for heavy metals.

TVA has consistently submitted applications for renewal of the NPDES permits for its power generating facilities no later than 180 days prior to permit expiration as required by state and Federal regulations. 40 CFR Part 122.21(d)(2) states that permittees with a currently effective permit shall submit a new application 180 days before the existing permit expires. 40 CFR Part 122.6 states that the conditions of an expired permit continue in force until the effective date of a new permit that provided the permittee has submitted a timely and complete application for a new permit. While several expired permits have not been yet been renewed, TVA continues to operate in compliance with the terms and conditions of those expired permits as provided for in 40 CFR Part 122.6.

TVA is not aware of any documented impacts to surface waters resulting from its effluent discharges or seepage from unlined settling ponds. TVA routinely performs biological monitoring in the reservoir system including areas in the immediate vicinity of the generating facilities. As discussed above, NPDES permit conditions are established to ensure that discharges to surface waters are restricted as necessary to maintain compliance with applicable water quality standards. Groundwater at TVA fossil plants is monitored regularly, and results are reported to the states. TVA follows all permit requirements for groundwater monitoring and works with state and federal officials to make sure any groundwater issues are properly addressed.

372. The draft IRP and EIS are not consistent in their discussion and assessment of impacts to water resources. The EIS provides an overview of how power generation can affect water resources. Its assessment of impacts to water resources is restricted to water use and water consumption. An environmental strategic metric in the IRP uses heat releases as a proxy for impacts to water resources. While heat releases are important, they are not an adequate proxy for other water resource issues. (*Commenter: Frank Rambo - SELC*)

Response: In developing the criteria for the environmental impact metric, TVA wanted to create a metric representing the trade-offs between energy resources rather than identifying a single resource with “best” environmental performance. The final evaluation criteria relies on some surrogate measures as a proxy for environmental impacts, but when used comparatively with the other attributes provides a reasonable and balanced method for evaluating planning strategies. By considering air, water, and waste in the IRP scorecard, coupled with the broader qualitative discussion of anticipated environmental impacts in the EIS, a robust comparison of the environmental footprint of the planning strategies better informs the selection of the preferred strategy.