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Re: Comments on the 2015 Tennessee Valley Authority Integrated Resource Plan Supplemental Environmental Impact Statement

The Southern Alliance for Clean Energy, Tennessee Clean Water Network, Earthjustice, Environmental Integrity Project and Sierra Club (hereinafter referred to as Commenters) appreciate the opportunity to comment on the Tennessee Valley Authority (TVA) 2015 Draft Supplemental Environmental Impact Statement (SEIS) for its Integrated Resource Plan (IRP). Our organizations are submitting comments on the Draft IRP individually, which should be considered in the preparation of the Final SEIS as well.

Below, Commenters address the following issues in TVA's Draft SEIS: TVA's failure to include site-specific environmental impact analysis; failure to analyze full environmental impacts of continued coal generation; improper land use requirement assumptions and failure to identify cumulative beneficial environmental impacts for solar generation resources; failure to include full suite of environmental impacts from new

nuclear generation and modifications to existing nuclear units; and improper analysis of water and climate impacts from future generation resource decisions.

I. TVA Failed to Include Site-Specific Impacts Analysis in its Draft SEIS.

The 2011 IRP Environmental Impact Statement (EIS) failed to assess the full suite of adverse impacts from implementation of the IRP in large part because it did not include impacts from future site specific decisions informed by the IRP.[1] To enable a reasoned choice among alternatives for site-specific generation decisions, TVA must assess and disclose with specificity the environmental harms that could be avoided with the aggressive pursuit of clean energy solutions. The EIS is the centerpiece of the NEPA process, and it is the principal tool for ensuring that agencies meet NEPA's substantive and procedural goals. NEPA directs agencies to conduct a public process and prepare a detailed EIS for "every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the human environment."[2] TVA's updated IRP is a major federal action significantly affecting the human environment, and TVA must prepare a new EIS, or include language within the 2015 SEIS that formalizes TVA's intention to complete a full EIS for site-specific generation decisions informed by the 2015 IRP, rather than a mere Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) as TVA has done when making site-specific decisions "tiered" off the 2011 IRP and EIS.

In the context of a site-specific EIS, TVA should identify the specific environmental impacts attributable to the specific facility and evaluate the cost of reducing or eliminating those impacts through use of an alternative included in the IRP SEIS. For example, in the Allen EA and ultimate FONSI, TVA did not quantify specifically the environmental impacts associated with deciding to cut the energy efficiency budget while at the same time building more NGCC capacity than it needed.[3] As raised in our comments on the Allen Draft EA, simply referencing the 2011 IRP EIS

[1] Environmental Impact Statement for TVA's Integrated Resource Plan, March 2011, *available at* http://www.tva.com/environment/reports/irp/archive/pdf/IRP_FEIS_V2_complete.pdf.
[2] NEPA SEIS, (C); 42 U.S.C. §4332(2)(C).
[3] TVA FONSI for Allen Fossil Plant Emission Control Project, August 19, 2014, *available at* http://www.tva.com/environment/reports/allen_emission_controls/ALF%20Emission%20Control%20FONSI%20signed.pdf.

did not fully explain the specific trade-off that TVA chose to make between additional (beyond reliability requirements) capacity at the NGCC plant and other resources (energy efficiency, solar energy).[4] Each time TVA has attempted improperly to tier site-specific EA analysis from the 2011 IRP, Commenters have raised objections to this approach.[5]

The Draft SEIS states that the environmental impacts of the alternative actions "are addressed at a regional level, with some extending to a national or global level" while "[t]he more site-specific effects of actions that are later proposed to implement the IRP will be addressed in subsequent tiered environmental reviews."[6] If a broad programmatic EIS has been prepared already and an agency is considering a specific component of the program, then the agency may "tier" its site-specific EIS or Environmental Assessment to the earlier EIA in order to "eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for discussion."[7] This is accomplished by incorporating earlier statements into the new analyses and focusing only on what has not previously been considered. What TVA has done in practice, however, is to avoid full NEPA analysis on site-specific proposals by citing to the 2011 IRP EIS, which never discussed the environmental impacts of these site-specific decisions.

For example, TVA failed to perform full EIS analysis on the proposal to install a Flue Gas Desulfurization (FGD) scrubber and Selective Catalytic Reduction (SCR) systems on all four units at its Gallatin coal plant and constrained the alternatives analysis in the EA to consider only a difference in placement of the pollution control equipment, citing to analyses of business metrics that set the decision for pollution control retrofit without a complete NEPA EIS analysis of environmental impacts. TVA also cited the 2011 IRP unit rankings and the need for "flexibility" as the reason it did not believe full NEPA EIS analysis was necessary on the proposal to install FGD and SCR systems on Units 1 and 4 at its Shawnee coal plant, even though TVA admitted these two Shawnee

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[4] Joint Comments on Allen Fossil Plant Emission Control Project Draft Environmental Assessment, *available at* http://www.cleanenergy.org/wp-content/uploads/Allen-EA-Comments_080714.pdf.
[5] *See* Joint Comments on Draft Environmental Assessment for Shawnee Fossil Plant Units 1 and 4, available at http://www.cleanenergy.org/wp-content/uploads/SACE_etal_ShawneeEAComments.pdf; Joint Comments on Draft Environmental Assessment for Paradise Units 1 and 2, *available at* http://www.cleanenergy.org/wp-content/uploads/JOINT-DRAFT-PARADISE-EA-Comments-SACE-et-al..pdf; Joint Comments on Draft Environmental Assessment for Gallatin Coal Plant, *available at* http://www.cleanenergy.org/wp-content/uploads/FINAL-GAF-Draft-EA-Comments.pdf.
[6] Draft SEIS at 10.
[7] 40 C.F.R. §1502.20.

units are not needed to meet demand. TVA continued its pattern of improperly tiering environmental analysis of site-specific generation decisions informed by the 2011 IRP for each of its recent, major resource decisions, including its proposals to retire or retrofit the Paradise and Allen coal units and replace them with a combined-cycle plants.

Because TVA has demonstrated its belief that it need not engage in complete NEPA environmental impact analysis for future site-specific analyses for generation decisions informed by its IRP—on the theory that an EIS completed in tandem with the IRP is sufficient to consider site-specific impacts—the SEIS for the 2015 IRP must either include plant-specific information "to provide full and fair discussion of significant environmental impacts and to inform decision makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment"[8] or TVA must engage in a complete NEPA EIS analysis for generation decisions made during implementation of the 2015 IRP.

II. Environmental Impacts of Coal Generation

a. TVA uses improper cost assumptions for carbon dioxide emissions.

While Commenters support TVA's decision to include a range of potential carbon costs, as a federal entity, TVA should have used the Social Cost of Carbon (SCC) as a metric for evaluating climate impacts caused by CO_2 emissions.[9] The SCC is an estimate of the economic damages associated with a small increase in CO_2 emissions, conventionally one metric ton, in a given year.[10] This dollar figure also represents the value of damages avoided for a small emission reduction (*i.e.*, the benefit of a CO_2 reduction).[11] See Figure 1 for the most recent SCC estimates for certain years.

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[8] *Natural Res. Def. Council, Inc. v. Fed. Aviation Admin.*, 564 F.3d 549, 556 (2d Cir. 2009) (internal quotation marks and alteration omitted).

[9] "The SCC is meant to be a comprehensive estimate of climate change damages and includes, among other things, changes in net agricultural productivity, human health, and property damages from increased flood risk." Environmental Protection Agency, Fact Sheet: Social Cost of Carbon, November 2013, *available at* http://www.epa.gov/climatechange/Downloads/EPAactivities/scc-fact-sheet.pdf.

[10] "As noted by the IPCC Fourth Assessment Report, it is 'very likely that [the SCC] underestimates' the damages." *Id.*

[11] U.S. EPA, The Social Cost of Carbon, *available at* http://www.epa.gov/climatechange/EPAactivities/economics/scc.html.

Figure 1: EPA Social Cost of Carbon Costs[12]

Social Cost of CO_2, 2015–2050 [a] (in 2011 Dollars)

	Discount Rate and Statistic			
Year	5% Average	3% Average	2.5% Average	3% 95th percentile
2015	$12	$39	$61	$116
2020	$13	$46	$68	$137
2025	$15	$50	$74	$153
2030	$17	$55	$80	$170
2035	$20	$60	$85	$187
2040	$22	$65	$92	$204
2045	$26	$70	$98	$220
2050	$28	$76	$104	$235

[a] The SCC values are dollar-year and emissions-year specific.

b. The SEIS improperly ignores the environmental impacts of coal ash disposal.

Although TVA uses a metric to measure coal ash generation across the various IRP strategies, the specific environmental impacts of coal ash are not described in the SEIS, despite the fact that the impacts are substantial and that they would vary significantly among alternative strategies. Coal ash already has contaminated the groundwater at every TVA coal plant and will continue to do so, rendering it unsafe to drink for the foreseeable future. TVA's coal plants also contaminate surface water resources through direct, permitted discharges, and through unpermitted seeps and subsurface hydrologic discharges, threatening both human and ecological health. In addition, as EPA indicated in its risk assessment for the recently finalized coal ash rule, TVA's surface impoundments themselves present a direct ecological risk. All of these environmental threats are directly proportional to the amount of ash that TVA generates and disposes of onsite and are also affected by the rate at which TVA closes its coal ash impoundments. Since TVA's strategies envision a wide range of coal ash production over

[12] Technical Support Document, "Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866," Interagency Working Group on Social Cost of Carbon, United States Government, November 2013, *available at* https://www.whitehouse.gov/sites/default/files/omb/assets/inforeg/technical-update-social-cost-of-carbon-for-regulator-impact-analysis.pdf.

the next twenty years, the IRP has a correspondingly wide range of environmental impacts from coal ash. TVA has an obligation to quantify these impacts and consider them as part of the SEIS and as part of the broader IRP process.

c. Groundwater Contamination Concerns

TVA's coal ash disposal areas have contaminated the groundwater at every TVA coal plant with unsafe levels of pollutants that can cause cancer, neurological problems in developing children, and other health problems. As reported by EIP in 2013, the contamination is widespread and severe, with many pollutants exceeding safe drinking water guidelines at each site and multiple pollutants exceeding safe drinking water guidelines by more than ten times.[13]

Table 1, below, is taken from a 2014 update to EIP's 2013 report. The table summarizes a subset of wells where *average* concentrations of several coal ash pollutants exceeded federal health-based guidelines between and 2008 and 2013. Table 1 highlights the following pollutants:

- **Arsenic** has been linked to cancers of the skin, bladder, kidneys and other organs. Average concentrations exceeded the Safe Drinking Water Act Maximum Contaminant Level (MCL) of 10 micrograms per liter (µg/L) at five TVA plants: Allen, Bull Run, Colbert, Cumberland, and Paradise. Three wells at the Colbert plant in Alabama had average arsenic concentrations of 46-64 µg/L, roughly five times the federal MCL. A well downgradient of the active ash pond at Allen in Tennessee has average arsenic levels roughly three times the MCL.
- **Boron** may harm developing fetuses or contribute to testicular atrophy in male children, which is why EPA's Health Advisory recommends a daily limit of no more than 3.0 milligrams per liter (mg/L) of drinking water for young children. Average boron concentrations have exceeded EPA's recommended limit in thirty-two monitoring wells at nine TVA plants. Average concentrations exceeded 10 mg/L, more than three times the health advisory, in one or more wells at the Bull

[13] Environmental Integrity Project, TVA's Toxic Legacy: Groundwater Contaminated by Tennessee Valley Authority Coal Ash (Nov. 2013), *available at* http://www.environmentalintegrity.org/news_reports/documents/20131107_TVAGroundwaterReport_FullDraft_000.pdf.

Run, Cumberland, and John Sevier plants in Tennessee, the Paradise and Shawnee plants in Kentucky, and the Widows Creek plant in Alabama.

- **Cobalt** is associated with blood disease (polycythemia), heart disease, neurological symptoms, and reproductive toxicity. The health-based screening level for cobalt, 6 µg/L, is based on studies showing polycythemia and reduced iodine uptake in humans. Average cobalt concentrations in 22 downgradient wells at 9 TVA plants exceed this level.
- **Manganese** at high doses can cause neurological, developmental, and musculo-skeletal impairments. EPA's Health Advisory recommends limiting lifetime exposure to no more than 0.3 mg/L of drinking water. Forty-nine wells at ten of TVA's eleven plants have average concentrations above this level. Manganese levels averaged more than 100 times the health advisory in one or more wells at the Kingston plant in Tennessee, the Shawnee and Paradise plants in Kentucky, and the Widows Creek plant in Alabama.
- **Molybdenum** has been linked to gout (painful inflammation of the joints). EPA Health Advisories are design to limit lifetime exposure to 40 micrograms per liter; five TVA sites report average molybdenum concentrations at least twice that level. Well 31 at the John Sevier plant had a molybdenum concentration of 2,200 µg/Liter in April 2008, and this was the only measurement on file for several years. TVA finally measured molybdenum in this well again in November 2013, and the concentration had doubled to 4,420 µg/L. The current molybdenum level is more than 100 times higher than the EPA lifetime health advisory.
- **Sulfate** concentrations above 500 mg/L in drinking water can cause diarrhea, and the EPA established a drinking water advisory at this level to protect infants, who are more sensitive to water loss caused by diarrhea. Average sulfate concentrations exceed this level in 28 downgradient wells at 9 TVA plants.

The effects of coal ash on groundwater resources are long-term. EPA predicts that the time when drinking water wells will experience the highest level of contamination from coal ash ponds and landfills will occur between 70 and >10,000 years from now,

depending on pollutants and disposal area characteristics.[14] In other words, the groundwater contamination caused by current coal ash disposal will make aquifers unsafe to drink for generations. This being the case, regardless of whether people are *currently* drinking from these aquifers, TVA must take responsibility for the contamination of an increasingly scarce resource.

[14] EPA, Human and Ecological Risk Assessment of Coal Combustion Residuals (Dec. 2014).

Table 1. Summary of Groundwater Wells in which 2008-2013 Average Concentrations of Selected Pollutants Exceeded Health-Based Guidelines.[15]

Pollutant		**Arsenic** (µg/L)	**Boron** (mg/L)	**Cobalt** (µg/L)	**Manganese** (µg/L)	**Molybdenum** (µg/L)	**Sulfate** (mg/L)
Health-based guideline		10	3	6	0.3	40	500
Allen	# wells	1					
	Mean(s)	29.3					
Bull Run	# wells		2	2	2	3	4
	Mean(s)		3.6 - 15.8	10.0 - 46.3	6.4 - 9.7	41 - 560	745 - 1801
Colbert	# wells	3	3	1	3	7	
	Mean(s)	45.5 - 63.5	3.4 - 3.8	10.0	0.4 - 1.2	47 - 159	
Cumberland	# wells	1	4	1	4	1	3
	Mean(s)	11.6	5.9 - 34.9	6.9	1.2 - 13.5	469	871 - 1305
Gallatin	# wells		4	4	6		5
	Mean(s)		3.5 - 5.6	15.3 - 195	0.5 - 20.1		913 - 4041
John Sevier	# wells		2		3	1	3
	Mean(s)		4.9 - 13.5		2.6 - 4.0	3310	867 - 1365
Johnsonville	# wells		5	4	5		3
	Mean(s)		3.5 - 9.9	16.0 - 52.3	1.1 - 18.5		630 - 1028
Kingston	# wells			2	5		1
	Mean(s)			7.3 - 99.2	1.0 - 176		2967
Paradise	# wells	1	4	5	6		4
	Mean(s)	18.0	3.2 – 25.2	6.8 - 370	2.7 - 61.0		590 - 1900
Shawnee	# wells		7	2	9	1	2
	Mean(s)		4.4 - 19.3	7.4 - 39.0	0.7 - 65.7	476	1052 - 1156
Widows Creek	# wells		1	1	6		3
	Mean(s)		13.0	20.4	0.6 - 31.0		555 - 1105

[15] Table shows mean or range of means for each well or set of wells. Analysis limited to the pollutants shown at wells likely to be affected by coal ash, in which half or more of available sample results exceeded health-based guidelines (*see id*.).

d. Surface Water Contamination Concerns

TVA discharges thousands of pounds of toxic pollutants into rivers and streams each year. According to TVA's website, in 2013 TVA discharged roughly 2,240 pounds of arsenic, 120,321 pounds of barium, 1,610 pounds of chromium, 6,400 pounds of selenium, and 25,410 pounds of vanadium.[16] This is an incomplete list, but it puts the scale of the problem in perspective. And this is only the contamination that TVA discharges through permitted outfalls; contaminated groundwater also enters rivers and streams through seeps and subsurface hydrologic connections. At the Cumberland plant, for example, TVA has ongoing problems with seepage along the west perimeter dike, along the bank of Wells Creek.[17] The ash ponds at the Gallatin plant are so riddled with sinkholes that TVA was initially unable to fill them with wastewater—all of the waste drained through the bottom and into the Cumberland River.[18]

Since many downstream communities use the same rivers as sources of drinking water, and since drinking water utilities cannot or are not required to remove (or even to monitor for) all of the pollutants, these toxic discharges potentially affect the safety of the public and its drinking water. When EPA modeled the instream concentrations of pollutants near coal plants, it estimated that coal ash discharges by themselves would cause one out five receiving streams to exceed Maximum Contaminant Levels.[19]

Coal ash wastewater, which includes several pollutants that bioaccumulate through the food chain, also contaminates fish, making them unsafe to eat. On a national scale, EPA estimates that over 22,000 river miles are unsafe for subsistence fishing due to coal ash discharges.[20] Removing the source of pollution is expected to significantly

[16] These numbers are the sum of plant-specific Toxics Release Inventory values taken from, e.g., TVA, Emissions – Allen Fossil Plant, *available at* http://www.tva.com/environment/air/allen.htm.
[17] *Id*. at 5; Stantec Consulting Services, Inc., *Dry Fly Ash Stack and Gypsum Disposal Complex*, at 8-10 (June, 2010) (identifying seepage studies from 2005 and 2008), *id*. at 29 (describing seepage in 1973-1974), and *id*. at Appendix A (identifying historical documents, some of which concern seepage over the 1973-2005 period).
[18] *See* TVA memorandum, *Gallatin Steam Plant – Ash Disposal Pond – Leakage Problems* (Jan. 25, 1979); *see also* TVA, *Magnitude of Ash Disposal Pond Leakage Problem – Gallatin Steam Plant* (Apr. 1977).
[19] EPA, Environmental Assessment for the Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 5-9 (April 2013).
[20] EPA, Environmental Assessment for the Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 6-46 (April 2013).

reduce the incidence of neurological damage in children whose mothers eat the contaminated fish.[21]

Many coal ash pollutants are also toxic to aquatic animals and plants. Selenium, for example, which readily bioaccumulates, can lead to fish kills and reproductive and developmental toxicity in fish.[22] Selenium is only one among many coal ash pollutants toxic to fish. Other pollutants are also toxic to amphibians, invertebrates, and aquatic vegetation.[23]

e. Coal Ash Impoundments

In its risk assessment for the final coal ash rule, EPA determined that direct exposure to coal ash impoundment water was associated with significant risks for arsenic, aluminum, barium, beryllium, boron, cadmium, chloride, chromium, selenium, and vanadium.[24] Modeled arsenic concentrations were 100 times higher than a level that would be safe for wildlife.[25] As TVA closes coal plants, it will be closing coal ash impoundments, reducing this direct exposure pathway, while leaving legacy coal ash in place in unlined landfills with few safeguards to minimize long-term environmental risk.

The draft SEIS shows that the average annual production of coal ash in 2033 will range between 2 and 3 million tons, depending on strategy.[26] This means that some strategies will be associated with 50% more coal ash production each year than others. It is undeniable that the choices made in the IRP will affect the magnitude of the impact that coal ash has on groundwater and surface water resources.

In one of the few places where the EIS addresses coal ash at all, TVA states that "[a]s CCR management at TVA plants is converted to dry CCR disposal, *and at the plant sites scheduled to cease operations,* TVA anticipates dewatering and capping existing impoundments. These steps will reduce the potential for existing CCR to impact

[21] EPA, Benefit and Cost analysis for the proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point source Category, 2-3 (Apr. 2013).
[22] EPA, Environmental Assessment for the Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 3-3 to 3-11 (April 2013).
[23] *Id.*
[24] EPA, Human and Ecological Risk Assessment of Coal Combustion Residuals, ES-4 (Dec. 2014).
[25] *Id.*
[26] Draft SEIS, Figure 7-12, page 211.

groundwater at the sites."[27] Clearly, TVA is aware of the environmental impacts of coal ash disposal but has failed to provide a meaningful analysis of how the IRP strategies will affect the scale of these impacts. In order to ensure that the SEIS represents a complete view of the IRP, TVA must amend the SEIS to include the significant environmental benefits that would accompany reductions in coal capacity.

III. Land Requirement Assumptions

As pointed out in the SEIS, land requirements for implementing the alternative IRP planning strategies vary more than other quantified environmental resources.[28] The largest contributor to the land requirements variation across Strategies is TVA's assumption that solar photovoltaic (PV) facilities occupy large areas of land relative to their generating capacity. This assumption is due to TVA's modeling of only utility-scale, ground-mounted solar PV technology rather than modeling smaller, distributed solar PV, which can be placed on existing rooftops. Moreover, land impacts from utility-scale solar systems can be minimized by siting them at lower-quality locations such as brownfields, abandoned mining land, or existing transportation and transmission corridors.[29]

Although land use requirements can be mitigated by siting utility-scale solar on lower-quality land, any new generation resource will result in land use impacts. In its NEPA analysis, however, TVA must also consider the benefits of solar generation as compared to alternative forms of generation in its cumulative impact of increased solar generation.[30] Solar power facilities reduce the environmental impacts of combustion used in fossil fuel power generation, such as impacts from greenhouse gases (GHGs) and other hazardous air pollution emissions, including sulfur dioxide, nitrogen oxides, carbon monoxide and volatile organic compounds, which react in the atmosphere and cause smog. In addition to these environmental benefits of increased solar development,

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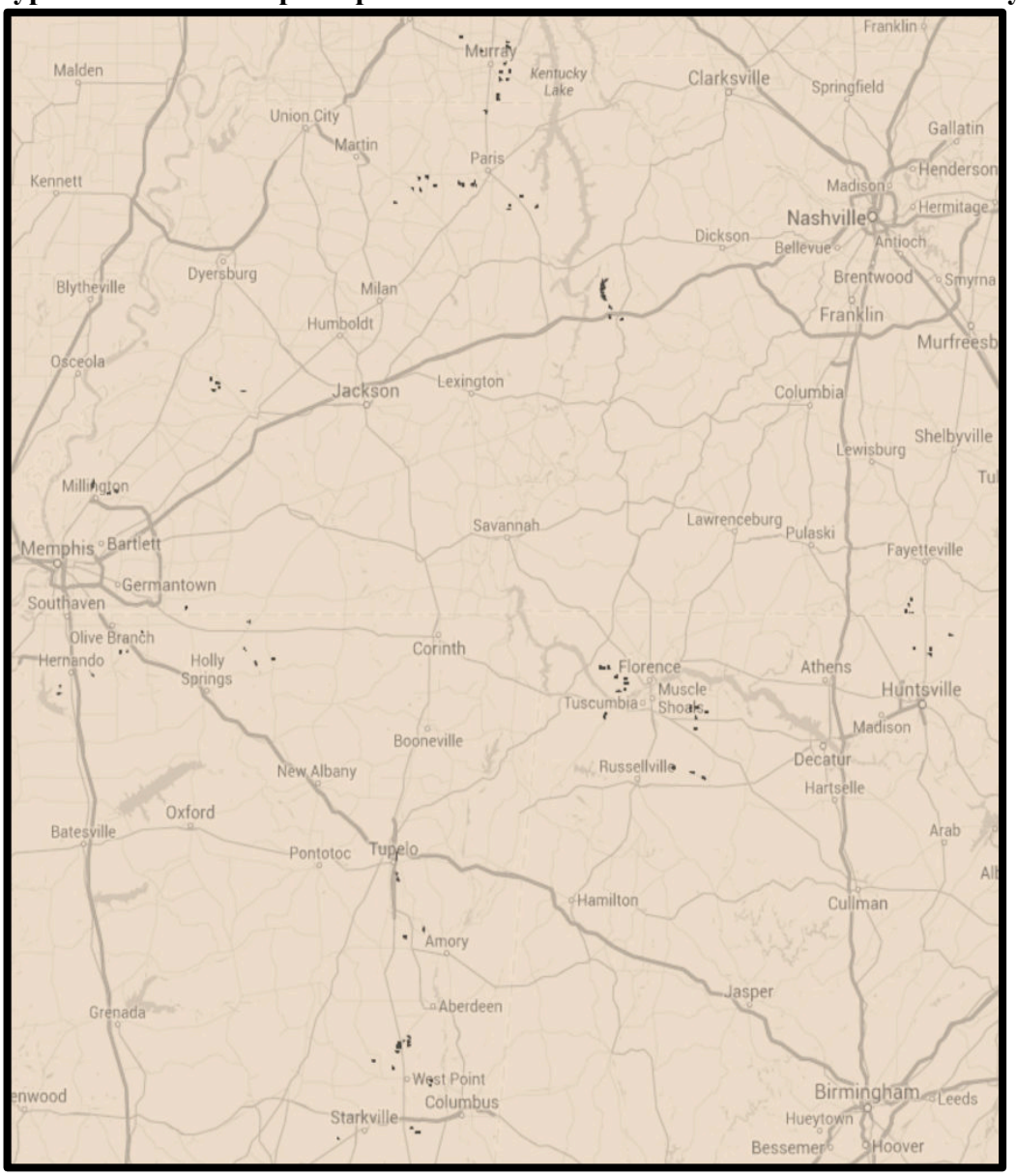
[27] Draft SEIS, 93 (emphasis added).
[28] "Land required for siting the new generating resources in the capacity expansion plans range from about 3,625 acres for the No Action Alternative to about 25,000 acres for Strategy D, 29,000 acres for Strategies A-C, and 56,000 acres for Strategy E." Draft SEIS, p 171.
[29] Renewable Energy at Mining Sites, EPA, *available at* http://www.epa.gov/aml/revital/renewable.htm.
[30] "Considering Cumulative Effects Under the National Environmental Policy Act," Council on Environmental Quality, January 1997, *available at* http://energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-ConsidCumulEffects.pdf.

construction and operation of solar facilities creates both direct and indirect employment opportunities and additional income in the regions where the development occurs.[31]

We urge TVA to place the impacts of solar PV facilities at large scale in context of the region. Based on industry averages, if TVA built 4,000 MW of utility-scale solar without any rooftop installations, we estimate roughly 50 square miles of solar facility ground cover. In Figure 2, SACE has provided a map illustrating the actual land area impacted by a potential distribution of 4,000 MW of utility-scale solar concentrated entirely in the western portion of TVA's service territory. The red shapes (generally appearing as dots which may be difficult to distinguish) represent various solar farms located in a hypothetical development array. As Figure 2 makes evident, while 50 square miles may appear to be a large number, it is less than 0.1% of TVA's service area and would represent a much less consequential impact on the landscape that, for example, the interstate highway system.

[31] "Solar Energy Development Environmental Considerations," *Solar Energy Development Programmatic EIS*, Office of Energy Efficiency and Renewable Energy, Department of Energy, Bureau of Land Management and Department of the Interior, October 2012, *available at* http://solareis.anl.gov/guide/environment/.

Figure 2. 4,000 MW of Utility-Scale Solar
Hypothetical Landscape Impact on Western Portion of TVA Service Territory



(SACE analysis: Dark patches represent land impacted by distributed solar generation.)

IV. Nuclear Energy Concerns in SEIS

a. Spent Nuclear Fuel

The use of enriched uranium fuel and subsequent production of spent nuclear fuel will increase under all of the alternative strategies.[32] In terms of highly radioactive, long-

[32] Draft SEIS, 209, 211.

lived spent nuclear fuel, the draft SEIS states that it will "increase by about 21 percent by 2020 once Watts Bar Unit 2 is operating and the Browns Ferry extended power uprates are completed" and that TVA intends to store this waste on-site, including expanding the use of dry cask storage "until a centralized facility for long-term disposal and/or reprocessing are operating."[33]

The draft SEIS identifies a key problem with relying on nuclear power, "The continued generation of nuclear power will produce nuclear wastes; therefore, a site or sites will have to be devoted to the safe storage of these wastes. Any such site would essentially be irretrievably committed to long-term storage of nuclear waste."[34] The possible significant impacts of this situation, which could include indefinite, long-term storage of waste on-site, have not yet been adequately studied by the U.S. Nuclear Regulatory Commission (NRC) in their Continued Storage Rule. Thus, TVA either must analyze and consider this issues in the Final SEIS or it must acknowledge that this issue has not been addressed adequately in this process and will need to be addressed in any site-specific EA that TVA develops in the future.

b. Existing nuclear

The discussion of the impacts of operating TVA's existing and committed (*i.e.*, Watts Bar Unit 2) nuclear plants in Section 7.2.2 "Nuclear Generation—Existing Facilities" is deficient, in part because it referred to previous EISs and reports[35] that are in part or in whole outdated, such as the 2007 EIS for Watts Bar 2, which was issued prior to the 2011 Fukushima Dai-ich nuclear accident in Japan and the vacating of the NRC's Waste Confidence Rule and subsequent issuance of the Continued Storage Rule.
There is no mention in the draft SEIS of the potential impacts of accidents at TVA's nuclear plants on land and water resources, surrounding communities or the Valley's economy. This should be included in the final SEIS. While the DEIS acknowledges the existence of uncertainties with the management of spent nuclear fuel, it fails to analyze key impacts, noting that "[d]ue to the evolving approach to the long-term disposal of spent fuel, the land required for offsite spent fuel disposal is excluded from this

[33] Draft SEIS, 211.
[34] Draft SEIS, 217.
[35] Draft SEIS, 184.

estimate."[36] Again, TVA either must analyze and consider this issue in the Final SEIS or it must acknowledge that this issue has not been addressed adequately in this process and needs to be addressed in any site-specific EA that TVA develops in the future.

c. New nuclear generation – Browns Ferry EPU

The only new baseload generation added is the extended power uprate (EPU) of the three Browns Ferry nuclear reactors, a component of all alternative strategies.[37] The draft SEIS stated that the main environmental impacts are increased fuel consumption and cooling requirements[38] but failed to identify and analyze the actual water use and consumption requirements from the Tennessee River. The draft SEIS also failed to assess the potential impacts from climate change on the long-term operations of Browns Ferry and what the implications would be of curtailed operations. (See Section IV of these comments for more discussion of this issue). It is premature to come to these conclusions; TVA has not yet even filed a license amendment request (LAR) with the NRC for the EPU. Once again, TVA either must analyze and consider this issue in the Final SEIS or it must acknowledge that this issue has not been addressed adequately in this process and needs to be addressed in any site-specific EA that TVA develops in the future.

d. Other new nuclear generation

Likewise, the discussion of impacts from possible new nuclear generation in Section 7.2.2 is deficient, in many instances relying on outdated information or yet-to-be-conducted analyses. In terms of the completion of one of the long-abandoned Bellefonte reactors, a reactor design that has no operational history here in the U.S., TVA refers to a more than forty year-old document, a 1974 EIS, and another from 2010.[39]

TVA's Environmental Report from 2008 for a combined operation license application to the NRC for the possible construction of AP1000 reactors at the Bellefonte site, a reactor design that has no operational history yet in the world, is already outdated given in part to the extreme cost increases that have occurred with other AP1000 projects

[36] Draft SEIS, p. 185.
[37] Draft SEIS, p. S-17.
[38] Draft SEIS, p. 185.
[39] Draft SEIS, p. 185.

under construction here in the U.S.: Southern Company's Vogtle 3 & 4 reactors in Georgia and SCE&G's V.C. Summer 2 & 3 reactors in South Carolina. Given the NRC has not even conducted an EIS for this proposal, it is not reasonable for TVA to conclude that, "[b]ecause this site contains a partially built, two unit nuclear plant, the impacts of construction of one or two AP1000 nuclear units would likely not be significant."[40] This is especially true given that TVA concedes that that water use and consumption by the potential AP1000 reactors would be relatively a high compared to TVA's other thermoelectric plants.[41]

TVA has not yet filed an early site permit application with the NRC to potentially construct and operate yet-to-be-determined SMR reactor designs, of which there are no reactor design certification applications even before the NRC, at the Clinch River site in Tennessee. It is again unreasonable and highly speculative for TVA to conclude that impacts would be "generally similar to existing nuclear plants and the other new nuclear generation options, but proportionately less due to the lower capacity of the small modular reactor plant."[42]

V. Impacts of Climate Change on Water Resources for Thermal Generation Units.

TVA's current generation fleet is very water-intensive. The use of water for power plant cooling is the largest single water use in the TVA region.[43] In terms of climate change, water will be one of the natural resources most heavily impacted, particularly in the Southeast as water temperatures rise. The draft SEIS identified that the potential effects from climate change on water resources include "increased water temperatures, increased stratification of reservoirs, reduced dissolved oxygen levels, and increased water demand for crop irrigation."[44]

Rising water temperatures due to climate change raise special concerns for thermal generation units that utilize once-through cooling. After this water is used, it is then returned back to the receiving water body at significantly higher temperatures,

[40] Draft SEIS, 185-186.
[41] Draft SEIS, 186.
[42] Draft SEIS, 186.
[43] Draft SEIS, S-16.
[44] Draft SEIS, 204.

resulting in harmful thermal pollution. Due to the impacts of climate change on water temperature and water availability, it will become increasingly likely that TVA will have to curtail operations at certain coal units as water temperatures rise.[45] In fact, TVA's largest coal plant, the Cumberland Fossil Plant, had to curtail operations in 2012 due to increased temperatures in the Cumberland River.[46] Although this topic was raised during IRP Working Group sessions, TVA determined that it would be infeasible to include consideration of continuing climate change in its model and did not include appropriate risk assumptions related to the potential lack of water resources for cooling in its cost assumptions for continued operation of coal-fired power plants.

Modeling indicated that the operation of TVA's generating facilities could be impacted by climate change, including the need to meet higher electricity demand for increased use of air conditioning. As river and reservoir temperatures increase, the ability for TVA's coal and nuclear plants to meet thermal discharge limits could become more difficult, which is of particular concern to nuclear plants.[47] Additionally, the draft SEIS stated that increased air and water temperatures can affect cooling tower operations as increased condenser cooling water temperatures reduces the efficiency of power generation and hotter, more humid air reduces evaporation potential and the performance of cooling towers.[48]

Though the volume of water used by thermal generating facilities (*i.e.*, nuclear, coal-fired, and natural gas-fired facilities), decreases under all alternative strategies, the

[45] For example, based on a 6.3 to 9°F temperature increase, climate change could increase the need for additional electric generating capacity by roughly 10-20% by 2050. This would require hundreds of billions of dollars in additional investment. "Global Climate Change Impacts in the United States" U.S. Global Change Research Program, 2009, *available at* http://nnsa.energy.gov/sites/default/files/nnsa/inlinefiles/karl%20et%20al%202009.pdf.
[46] TVA 2012 10K at 16, *available at* http://www.snl.com/Cache/15350412.pdf?IID=4063363&FID=15350412&O=3&OSID=9 ("Generation at Gallatin Fossil Plant (Gallatin) and Cumberland Fossil Plant (Cumberland) was curtailed during the summer of 2012 because of high river temperatures and the need to comply with thermal permit limits.")
[47] Draft SEIS, 204 ("The NRC also sets safety limits at nuclear plants on the maximum temperature of intake water used in essential auxiliary and emergency cooling systems. When cooling water intake temperatures are high, power plants must reduce power production (derate) or use cooling towers (if available) to reduce the temperature of the discharged water and avoid non-compliance with thermal limits. If intake temperatures reach their limits, NRC requires the plants to shut down. Consequently, elevated water temperatures can reduce thermal generation by causing forced deratings, additional use of cooling towers (which reduces net generation), and/or nuclear plant shutdown.")
[48] Draft SEIS, 204.

greatest decrease is 25 percent for Strategy E - Maximize Renewables.[49] As the draft SEIS stated, "The differences between the alternative strategies in water use are a function of the amount of energy generated by coal and nuclear plants."[50] In terms of water consumption, Strategy E also provides the largest reduction because it displaces the largest amount of thermal generation with less water-intensive renewable generation.[51] Though direct emissions of CO_2 and CO_2 emission rates decrease under all alternative strategies, the greatest reductions are for Strategy D – Maximize Energy Efficiency and E at 50-55% as increasing amounts of energy are provided by energy efficiency and renewable resources.[52]

In Tables 7-1 and 7-2 there are clearly low- or no-carbon, less water-intensive energy choices: renewables such as wind and solar that have no water requirements in comparison to nuclear generation for instance, which is the only baseload resource included in the Draft IRP.[53] It is unclear why there are no water use and consumption figures listed in Table 7-2 for the Browns Ferry Extended Power Uprate (EPU) and small modular reactors (SMRs) as both have water requirements from the Tennessee River, as do all of TVA's nuclear fleet. Especially since, as stated in the draft SEIS, "[t]he Tennessee River Basin, which is about half of the TVA service area, has been described as the most intensively used basin in the conterminous United States."[54] As was also identified that one of the main environmental impacts of the Browns Ferry EPU is the increased cooling requirements.[55] This information must be included in the final SEIS.

In terms of SMRs, though TVA has not yet specified which design(s) may be included in an early site permit application to the NRC, an estimate of water use and consumption for each possible design should be included in the final SEIS. It is not sufficient to state, "A new SMR plant would operate with closed cycle cooling, with relatively low water use rates and relatively high water consumption rates."[56]

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[49] Draft SEIS, Figure 7-6, page 206.
[50] Draft SEIS, 206.
[51] Draft SEIS, Figures 7-8 and 7-9, page 207.
[52] Draft SEIS, 200.
[53] Draft IRP, 91 ("There are no immediate needs for baseload resources beyond the completion of Watts Bar Unit 2 and the Browns Ferry extended power uprates."); *see also* Draft SEIS, Tables 7-1 & 7-2, pages 176-180.
[54] Draft SEIS, 98.
[55] Draft SEIS, p. 185.
[56] Draft SEIS, p. 186.

It does not appear that the draft SEIS fully analyzed how the potential for changes in water temperatures in the Valley could impact TVA's existing and future thermal generation assets. Water bodies in the area are already showing effects of rising water temperatures exacerbated by climate change. The Tennessee River's water temperature rose above 90°F in the vicinity of the Browns Ferry nuclear plant during three of the last seven summers, adversely affecting the plant's operations. High water temperatures have resulted in generation curtailments and investments in technologies to potentially reduce those instances in the future.

The draft SEIS shows that projected trends from climate change models include increases in average temperature and number of days over 95°F and decreases in the number of days below 32°F.[57] Given TVA's reliance on the eventual operation of Watts Bar 2 along with the Browns Ferry EPU (and possibly future SMRs) that all withdraw from and discharge into the Tennessee River, a more thorough analysis is needed of how these assets could be impacted by rising water temperatures due to climate change.

For the reasons outlined above, Commenters assert that TVA's 2015 Draft SEIS is insufficient to comply with NEPA regulations and must be corrected to address the issues laid out above before the TVA Board of Directors approves a final SEIS.

[57] Draft SEIS, p. 204.

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