

APPENDIX D – RESPONSES TO AGENCY AND PUBLIC COMMENTS

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RESPONSES TO AGENCY AND PUBLIC COMMENTS

The draft supplemental environmental impact statement (DSEIS) was available for public review and comment from November 5, 2010, through December 22, 2010. The document was transmitted to state, federal, and local agencies and federally recognized tribes. It was also available on TVA's website for review. In addition, TVA held a public open house at the SQN Training Center in Soddy-Daisy, Tennessee, on December 2, 2010, where the public had the opportunity to ask questions about the DSEIS and submit comments. This appendix provides TVA's responses to agency and public comments on the DSEIS.

Nine agencies and individuals commented on the DSEIS via mail, email, TVA's web-based comment system, and verbal statements during the 45-day public comment period. TVA received letters from three state and federal agencies. TVA's responses to each agency's comments on the DSEIS follow each agency's letter. Each comment is preceded by a unique identifier that also appears on the copy of the agency's letter. Similar comments expressing a single idea are grouped and addressed with a single response. The order of appearance of these comments is not related to importance. Six individuals provided comments, and the name of an individual may appear in more than one comment, if that individual commented on more than one issue. The actual letters, e-mails, facsimiles, and transcripts of verbal statements have been included in the administrative record.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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December 10, 2010

Ms. Amy Henry
TVA NEPA Compliance
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11D
Knoxville, TN 37902

Subject: EPA NEPA Review Comments on TVA's DSEIS for "Sequoyah
Nuclear Plant Units 1 and 2 License Renewal"; Hamilton County, TN;
CEQ #20100432; ERP #TVA-A06008-TN

Dear Ms. Henry:

The U.S. Environmental Protection Agency (EPA) has reviewed the subject Tennessee Valley Authority (TVA) Draft Supplemental Environmental Impact Statement (DSEIS) in accordance with our responsibilities under Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. In this DSEIS, TVA proposes to renew the operating licenses for Units 1 and 2 of the 2,400-MW Sequoyah Nuclear Plant (SQN) situated on Chickamauga Reservoir in Hamilton County, Tennessee, near the city of Soddy-Daisy. The DSEIS supplements the original 1974 TVA Final EIS (FEIS) for the construction of SQN Units 1 and 2.¹

We appreciate that TVA visited our Atlanta offices to introduce this proposed license renewal project to us on November 18, 2010. Some observations EPA made at this meeting are incorporated in this letter. In a related matter, by letter dated November 8, 2010, EPA has also recently provided NEPA comments on TVA's Integrated Resource Plan (IRP) Draft EIS (DEIS) for generating electricity over the next 20 years. The IRP incorporates SQN as part of TVA's baseline capacity.

Background

The current 40-year terms for the SQN operating licenses will expire on September 17, 2020 for Unit 1 and on September 15, 2021 for Unit 2. If TVA decides to apply for operating license extensions to the Nuclear Regulatory Commission (NRC) to continue operating Units 1 and 2 for an additional 20 years, NRC NEPA documentation on relicensing will also be needed in addition to the current TVA NEPA document. The purpose of the present TVA supplement is to disclose the environmental impacts of the proposed SQN action and its alternatives to the public and the TVA Board of Directors (Board), and to potentially serve as a baseline for NRC's NEPA documentation should the TVA Board decide to go forward with the license renewal.

¹ We appreciate that not only the current but also the original document are available online as reference.

Alternatives

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For a relicensing project, reasonable and feasible alternatives outside continuing the original project – although perhaps in an improved manner – are somewhat limited if the existing facility is still competent and operation can be safely and effectively continued. Although EPA defers to TVA and NRC regarding the safe operational life expectancy of Units 1 and 2 at SQN, decommissioning may only be necessary if there is a concern regarding safety, outdated reactor and other technology issues, or chronic operational problems at SQN.

In addition to renewing the licenses for SQN Unit 1 and 2 (Alternative 1) or to allow existing licenses to lapse and decommissioning these units (No Action: Alternative 2), the DSEIS offers alternatives for capacity replacement (in lieu of renewals) by new nuclear generation (Alt. 2a) or by new natural gas generation (Alt. 2b). Regarding these alternatives, we suggest that new nuclear generation² could have the advantage of assuming a more updated reactor design with passive safety features, while new natural gas generation³ can be expected to produce more emissions than nuclear fuel but less than combusting other fossil fuels. Overall, development of new greenfield or brownfield sites for new nuclear or gas-fired units would have construction environmental impacts, whereas license renewals of the existing SQN units would have no or minimal (expansion or new spent fuel storage building by 2026) construction impacts.

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TVA has identified (pg. S-4) Alternative 1 (license renewal) as its action and preferred alternative in the DSEIS.⁴ To renew the two licenses appears reasonable unless there is a concern regarding safety, outdated reactor and other technology issues, or chronic operational problems at the existing SQN facility. However, if relicensing for another 20 years is pursued, we recommend that the FSEIS discuss means for improving the safety, operation, and environmental compliance/monitoring for SQN Units 1 and 2. While there may essentially not be new construction impacts (e.g., to wetlands) associated with the proposed renewal, improvements to ongoing operational protocols at SQN could conceivably result in a reduction of operational environmental impacts over the next 20-year timeframe. While we understand upgrading is an ongoing (annual) process, the proposed license renewal offers an excellent opportunity for TVA to reassess any existing impacts and mitigating them procedurally and structurally (technology components), where appropriate.

² Such as the AP1000 technology being explored for potential use at the Bellefonte nuclear site (BLN) in Alabama.

³ Such as recently evaluated at the John Sevier Fossil Plant (JSF) in Tennessee.

⁴ EPA appreciates that TVA identified a preferred alternative in the DSEIS as opposed to waiting until the Final SEIS (FSEIS), since public comments can already be provided on this draft preference at the DSEIS stage.

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Environmental Impacts

We offer the following summary comments on the project impacts, with more specific comments provided in the enclosed *Detailed Comments*.

- 657AW * Climate Change: We appreciate TVA's discussion of climate change and GHGs in the DSEIS. As TVA is aware, the Council on Environmental Quality (CEQ) issued draft guidance for public comment on when and how federal agencies must consider GHG emissions and climate change in their proposed action. While this guidance is not yet final (and thus, not required), EPA recommends that the FSEIS explicitly reference the draft guidance, describe the elements of the draft guidance, and to the relevant extent, provide the assessments suggested by the guidance. We furthermore recommend a discussion of best management practices (BMPs) to reduce greenhouse gases (GHGs) and other air emissions during construction (e.g., at the proposed expanded or new waste storage area) and operation of the facility (operation of facility buildings, equipment, and vehicles). Finally, we recommend that TVA's NEPA documents related to the various TVA nuclear plants pursue and present a consistent set of information comparing and contrasting nuclear energy with other energy technologies with regard to lifecycle GHG emissions. Such a consistent presentation should evaluate and make use of all the relevant literature on this subject. 657BC
- 657BD
- 657AX * Air Quality: The DSEIS suggests that other than changes to the onsite spent fuel storage and independent spent fuel storage instillation (ISFSI), no major component updates or refurbishing will be needed to extend the SQN for the 20-year renewal period. If so, we recommend that the FSEIS include a general but more definitive statement (e.g., in the abstract, summary and/or introduction) indicating that TVA believes that no substantive updates or refurbishing is needed for the proposed license renewal. Beyond this general statement, EPA requests that the FSEIS include additional information on climatological and meteorological data, the new SO₂ and NO₂ National Ambient Air Quality Standards (NAAQS), Prevention of Significant Deterioration (PSD) Class II increments, fine particulates (PM_{2.5}) with PM₁₀, potential Hazardous Air Pollutants (HAPs) from SQN, and fuel oil power generation with Alternative 2b. These and other informational requests are more specifically discussed in the enclosed *Detailed Comments*. 657AP
- 657AQ * Environmental Justice (EJ): EPA appreciates – and finds it consistent with Executive Order (EO) 12898 and NEPA perspective – that EJ was considered in the DSEIS. However, results show that SQN apparently is located in a county (Hamilton) that shows a higher minority percentage (23.7%) than the State of Tennessee (19.8%), and is also the county with the highest minority percentage in the state. The FSEIS should determine what the percentage level is for the specific block group (BG) incorporating SQN to determine if it is greater or lesser than the county average. It would also be helpful to include a map depicting the population demographics for the minority clusters that were reported to exist near the SQN facility. 657AR

657AS EPA also recommends that any existing EJ impacts – which may have occurred or are ongoing during the 40-year life of the present project licensing – be described in the FSEIS and offset as part of the prospective relicensing. Moreover, even if no existing EJ impacts exist, the proposed renewal offers an opportunity for TVA to outreach with minorities, low-income populations and other demographics living near SQN.

657AT * *Fisheries*: TVA proposes continued use of the existing open-cycle cooling water system at SQN (with helper mode operation using the cooling towers as needed) as opposed to a closed system.⁵ However, EPA is concerned that the use of an open system for power plant cooling – which constantly requires new in-take water – would entrain considerably more fish eggs and larvae (and other plankton) into the system when compared to a closed or helper mode system. The FSEIS therefore should summarize TVA’s entrainment and impingement studies or estimates that reportedly show that some 90% of the entrained fish eggs and larvae are American shad. Moreover, the FSEIS should discuss if the U.S. Fish and Wildlife Service (FWS) and their state counterparts concur with TVA’s study conclusions. If not, we recommend additional studies designed or approved by these agencies or consideration of using a closed-cycle system, or at least using the helper mode during spawning or other critical fishery periods. Additionally, an open system would presumably have a greater and steady thermal discharge – even if controlled by the limits of the National Pollutant Discharge Elimination System (NPDES) permit – than the occasional thermal discharge of a closed system which could also have a fisheries impact. Overall, EPA will defer to the FWS and state agencies regarding these fishery-effects and their minimization.

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Summary

TVA has identified renewing the operating licenses of SQN Units 1 and 2 as its action and preferred alternative in the DSEIS. Offered alternatives to license renewal are to decommission these units (No Action) or to replace the existing SQN baseload capacity with new TVA nuclear or natural gas units. Environmentally, the decommissioning and license renewal options would offer the least environmental impact, since replacing decommissioned capacity would involve development of a new greenfield or brownfield site with its associated impacts. However, for license renewals, EPA gives deference to TVA and NRC regarding the overall risk of extending the operational life expectancy of Units 1 and 2 at SQN consistent with the operational and safety perspectives of more current designs.

657BE For the FSEIS, EPA has requested additional information on air quality, EJ and fisheries issues, and has provided some recommendations for power plant climate change analyses. As the DSEIS appears to suggest, we recommend that the FSEIS include a general but more definitive statement indicating that TVA believes that no substantive updates or refurbishing (other than the ISFSI facility) is needed for the proposed license renewal. Moreover, even if no refurbishing may be needed, we recommend that the FSEIS discuss potential ways to improve the existing safety, operation, and

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657AT ⁵ The FSEIS should further discuss why TVA apparently prefers an open system at SQN from a water consumption, evaporative loss, energy use, thermal discharge, fisheries, NPDES or other perspective.

environmental compliance/monitoring at SQN Units 1 and 2 for the next 20 years beyond the ongoing annual monitoring and upgrades, since the proposed relicensing offers an excellent opportunity to do so.

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EPA DSEIS Rating

We rate this DEIS as an “EC-2” (i.e., Environmental Concern, additional information requested). That is, we have environmental concerns with extending the operational life of this existing facility and are requesting additional information on how this can be achieved in a manner most productive of the environment.

EPA appreciates the opportunity to review this DSEIS. Should you have questions regarding our comments, please contact Chris Hoberg of my staff at 404/562-9619 or hoberg.chris@epa.gov.

Sincerely,



Heinz J. Mueller, Chief
NEPA Program Office
Office of Policy and Management

Enclosure: *Detailed Comments*

DETAILED COMMENTS

EPA offers the following specific comments on the DSEIS for TVA's consideration in the development of their FSEIS:

Climate Change

* CEQ Draft Guidance on GHG Analysis within NEPA – We appreciate TVA's discussion of climate change and GHGs in the DSEIS. The DSEIS indicates that the majority of the potential carbon dioxide (CO₂) emissions of the proposed relicensing of SQN would be the lifecycle contributions associated with the uranium fuel cycle (Section 3.16.1.2). The DSEIS notes that such emissions primarily result from energy needed to manufacture the nuclear fuel.

On February 18, 2010, the Council on Environmental Quality (CEQ) proposed four steps to modernize and reinvigorate NEPA. In particular, CEQ issued draft guidance for public comment on, among other issues, when and how federal agencies must consider greenhouse gas emissions and climate change in their proposed action.⁶ The draft guidance explains how federal agencies should analyze the environmental impacts of GHG emissions and climate change when they describe the environmental impacts of a proposed action under NEPA. It provides practical tools for agency reporting, including a presumptive threshold of 25,000 metric tons of carbon dioxide equivalent (CO₂e) emissions from the proposed action to trigger a quantitative analysis, and instructs federal agencies how to assess the effects of climate change on the proposed action and their design. The draft guidance does not apply to land and resource management actions and does not propose to regulate GHGs.

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While this guidance is not yet final (and thus, not required), we recommend that the FSEIS explicitly reference the draft guidance, describe the elements of the draft guidance, and to the relevant extent, provide the assessments suggested by the guidance (we acknowledge that the DSEIS provides some of this information; however, we recommend addressing all relevant aspects of the draft CEQ guidance with explicit reference to the Draft CEQ guidance document). Based on your analysis using the draft CEQ guidance, further data collection may be necessary in the future.

EPA also recommends a discussion of BMPs to reduce GHGs and other air emissions during construction (e.g., at the new waste storage area) and operation of the facility (operation of facility buildings, equipment and vehicles). For example, clean energy options such as energy efficiency and renewable energy should be a consideration in the use of construction and maintenance equipment and vehicles. Equipment and vehicles that use conventional petroleum (e.g., diesel) should incorporate clean technologies and fuels to reduce emissions of GHGs and other pollutants, and should adhere to anti-idling policies to the extent possible. Alternate fuel vehicles (e.g., natural gas, electric) are also possibilities.

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⁶ See: <http://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa>.

* Lifecycle CO₂ Emissions (Sec. 3.16.1.2) – The discussion in Section 3.16.1.2 provides a comparison of CO₂ emissions from different types of energy production approaches. The analysis relies on information from the Department of Energy and the World Nuclear Association. Of particular interest is the value cited for indirect emissions of CO₂ associated with nuclear lifecycle emissions (i.e., 21 max to 9 min grams CO₂/kWh). A recent review by Sovacool⁷ of the lifecycle GHG emissions of various energy production technologies reports, for example, a range of 1.4 to 288 g CO₂e/kWh lifecycle emissions for nuclear power, with a mean value of 66 gCO₂/kWh. The range reported in Sovocool is substantially wider and the mean substantially higher than reported in this DSEIS (note that the Sovocool paper is cited in TVA's recent draft Integrated Resource Plan dated September 2010, but not in this DSEIS).

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Sovacool also points out that "...lifecycle analyses for 15 separate distributed generation and renewable energy technologies...found that all but one, solar photovoltaics (PV), emitted much less gCO₂e/kWh than the mean reported for nuclear plants." In contrast, this DSEIS implies that nuclear has lower lifecycle emissions than an array of renewable energy resources (see Table 3-25 of the DSEIS).

We recommend that TVA's NEPA documents related to the various TVA nuclear plants pursue and present a consistent set of information comparing and contrasting nuclear energy with other energy technologies with regard to lifecycle GHG emissions. Such a consistent presentation should evaluate and make use of all the relevant literature on this subject.

* Editorial Comment (Section 3.16.1.2, first paragraph) – We recommend the sentence be modified to read "Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer)."

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Air Quality

* Stand-Alone SEIS: This document is reported to be a supplement to the 1974 Final Environmental Statement Sequoyah Nuclear Plant Units 1 and 2 (TVA 1974). The DSEIS refers to many other documents as can be seen in the list of references provided at the end of each section. Because the underlying basis for most of the information provided in this supplement are contained in these documents, a complete comprehensive review would have to include the information contained in these documents. The need for the underlying information and analyses is most noticed in the *Affected Environment* and *Environmental Consequences* section (Section 3) of this DSEIS. Therefore, it is suggested that all pertinent information and backup analyses needed to understand and evaluate the provided consequences of the proposed license renewal be included in the FSEIS to the extent feasible.

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⁷ Sovacool, BK. Valuing the Greenhouse Gas Emissions for Nuclear Power: A Critical Survey. Energy Policy 36 (2008) 2940 - 2953.

- 657F * Electronic References: If a complete stand-alone SEIS can not be developed for this project, the FSEIS should provided the specific document, section, and page where referenced documentation and analyses can be obtained to support the information provided. If appropriate, the specific NRC docket web location should be provided. One option would be to make the supporting reference documents available in electronic format on the TVA website where the DSEIS is currently posted (<http://www.tva.com/environment/reports/sqn-renewal/index.htm>).
- 657G * Table S-1 Summary of the Environmental Impacts of the Action and No Action Alternatives (pg. S-13): It is suggested that the negative/positive impacts to socio-economic conditions (e.g., employment, schools, taxes, etc.) to the Sequoyah Nuclear Plant (SQN) area be considered in Alternatives 2a and 2b in this table.
- 657H * Section 2.1.1.2. Fossil Fuel Energy Sources (pg. 2-4) and Section 2.1.3. Combination of Alternative Sources (pg. 2-13): Only electrical generation using coal and natural gas were considered as reasonable alternatives to the renewal license of SQN. Higher emissions of NO_x, CO₂ and other pollutants were given as the reason fuel-oil-fired power generation was not considered. The basis for this statement (e.g., table providing representative emission rates for these pollutants by type of fuel) was not provided. It is expected that fuel oil power generation would produce emissions that would be less than or equal to those produced by coal. The basis for eliminating fuel oil as an alternative should be provided in the SEIS or this fossil fuel should be considered as an alternative.
- 657I * Section 2.2.1 Alternate 1 – SQN Units 1 and 2 License Renewal, Action Alternative (pg. 2-14): The preferred alternative of SQN license renewal does not address the possible need for facility component updates and/or refurbishing to extend plant operation for 20 more years. Any needed updates/refurbishing should be identified and their associated environmental consequences and permits/approvals should be addressed in the FSEIS. The DSEIS appears to suggest that other than changes to the onsite spent fuel storage and independent spent fuel storage instillation (ISFSI), no major component updates or refurbishing will be needed to extend the SQN for the 20-year renewal period. If so, we recommend that the FSEIS include a general but more definitive statement indicating that TVA believes that no substantive updates/refurbishing is needed for the proposed license renewal.
- 657J * Section 3.16. Climatology, Meteorology, and Air Quality (pg. 3-129) – The discussion and information provided in this section rely heavily on the analyses and information in the recent (2008) Sequoyah Nuclear Plant Updated Final Safety Analysis Report (FSAR). As noted above, it is suggested that all pertinent information and backup analyses needed to understand, compare, and evaluate the discussions and conclusions on the proposed license renewal and alternates, be included in the FSEIS.
- * Section 3.16.1.1 Regional Climatology (pg. 3-129) – The following comments are associated with the information provided in this section:

- 657K - Supplemental Climatologic Data: The discussion of regional climatology and changes since the initial 1974 FEIS is all text. The text discussion should be supplemented with tables and figures that provide applicable wind roses, frequency distributions, comparisons etc. that would provide the underlying basis for the information provided. The tables and figures will also allow comparisons with previous observations and long-term records, and promote better understanding of the information and conclusions presented.
- Fuel Oil CO₂ Production: For consistency and completeness, Table 3-25 should include CO₂ production from fuel oil electric source. 657L
- * Section 3.16.1.3 Local Meteorology (pg. 3-133) – The following comments are associated with the information provided in this section:
- 657M - Meteorological Data: The goal of this section is to demonstrate that the initial meteorological conditions of the plant site, and engineering plant features based on these conditions, have not changed and will be appropriate for the 20-year renewal period. The addition of summary tables and figures of onsite meteorological records of comparable lengths obtained during the initial 1970s and current 2000s would be valuable for this demonstration.
- Atmospheric Temperature: All the important meteorological parameters for this comparison were identified except atmospheric temperature. 657N
- 657O - Supplemental Meteorological Data: Similar to the previous section on *Regional Climatology*, this discussion should be supplemented with tables and figures that provide applicable wind roses, frequency distributions, comparisons, etc. that would provide the reader with a better understanding of the current meteorological conditions. The tables and figures will also allow comparisons with previous observations and long-term records, and a basis for the evaluation of subsequent dispersion and transport analyses. It is difficult to obtain this understanding from the provided text discussion.
- Atmospheric Stability Data: The provided table of atmospheric stability data is only associated with the most recent meteorological measurements (i.e., 2000-2009). These data should be compared to stabilities obtained from initial SQN measurements in the 1970s. Stability class frequency distributions should be used to show agreement and differences between meteorological data records. The data record comparisons of joint frequency distributions of stability, wind direction, and wind speed would be valuable. 657P
- 657Q - Supplemental Dispersion Data: As discussed in previous sections, the *Dispersion* section (pg. 3-137) discussion should be supplemented with tables and figures that would provide the reader with a better understanding of the initial and current dispersion and transport conditions at SQN.
- Editorial Modifications: On page 3-137, we suggest: (1) replacing “dilution” in the first sentence of this section with “dispersion” and (2) low atmospheric dispersion and low X/Q values are opposites so the last sentence of the first paragraph should read “Low or small X/Q values...”. 657AY
- 657R - Routine/Accident Release Records: The routine release and accident release sections do not compare X/Q calculated values developed using initial plant meteorology with that using the most current onsite record. Only values from the Sequoyah Nuclear Plant Offsite Dose Calculation Manual (ODCM) are provided which are based on 1985-95 meteorological measurements.

657S * Section 3.16.2 Environmental Consequences – Climatology and Meteorology (pg. 3-140) – This section just discusses the consequences of the various alternatives on GHG production and the potential impact of climate change on the operation of SQN and other alternatives during the renewal period. It is suggested that the changes that were noted in the onsite meteorological observations since the 1970s could be used to represent what could be expected during the renewal period.

657T * Section 3.16.3 Affected Environment – Air Quality (pg. 3-142) – The following comments are associated with the information provided in this section:
 - New SO₂ and NO₂ NAAQS: In addition to new and more restrictive ozone and particulate NAAQS, EPA has promulgated new SO₂ and NO₂ NAAQS in 2010. Since the facility has emissions of NO_x and SO_x, it is recommended that this section be revised to include a brief discussion of the new revised SO₂ and NO₂ NAAQS. These ambient air quality standards will have to be considered for all alternatives. These new NAAQS will be more of a permit challenge for new facilities (i.e., Alternatives 2a and 2b). The new restrictive NAAQS may be most challenging for the fossil fuel Alternative 2b.

657V - PSD Class II Increments: The permitting consequences of the PSD Class I area increments were discussed but not PSD Class II increments applicable for areas in proximity to the plants. PSD Class II increments have been promulgated for PM_{2.5} and it is anticipated that they will be promulgated for the new SO₂ and NO₂ NAAQS.

657V - PM₁₀/PM_{2.5}: PM₁₀ is identified as a pollutant of concern throughout this section. Fine particulates (PM_{2.5}) should be included when citing PM₁₀.

657W - Fugitive Emissions: The discussion of fugitive particulate emissions indicates there are no sensitive receptors adversely affected by temporary generated fugitive dust and equipment exhaust. Because people and animals would qualify as such a receptor, it is suggested that this comment be modified or deleted.

657X - HAPs: This section briefly discusses the emissions of criteria air pollutants from the facility and indicates that the plant is classified as a minor source subject to the permitting requirements of the Chattanooga/Hamilton County Air Pollution Control Bureau. However, the DSEIS does not address the potential for HAP emissions from the facility. The Sequoyah Plant is listed in EPA's 2009 Toxic Release Inventory (TRI) database as having air emissions of hydrazine and lead. The emissions of these and any other HAPs should be discussed in the DSEIS.

657Y * Section 3.16.4 Environmental Consequences – Air Quality (pg. 3-146) – The following comments are associated with the information provided in this section:

657Y - Natural-Gas-Fired Turbine Impacts: The statement that the air emissions from a modern natural gas-fired turbine would be small enough that they would operate with a minor impact to air quality should be verified. We note that these facilities would have significant impacts considering the new, more restrictive PM_{2.5} and NO₂ NAAQS and PSD increments.

657Z - Alternative 2b Impacts: The representative emissions provided in Table 3-29 for the combined-cycle operation of Alternative 2b reveals major SO_x, NO_x, CO, PM, and VOC emissions (note: PM_{2.5} emissions are not provided). It appears that “minor” would not be the appropriate classification for ambient impacts from operation of Alternative 2b natural gas-fired plants.

Environmental Justice (EJ)

- 657AA * Scoping – We are pleased to note that the *Socioeconomics* section (3.13) includes EJ information, which was a scoping issue (pg. 1-28). This information is found in section 3.13.3 (*Low-Income and Minority Populations*). For clarity and easier reference, this section could have been entitled *Environmental Justice*.
- 657AB * Executive Order (EO) 12898 – Page 3-100 states that “...TVA is not subject to this executive order...” The scope of the EO applies to any federal agency on the Working Group, and such other agencies as may be designated by the President, that conducts any federal program or activity that substantially affects human health or the environment. Independent agencies are requested to comply with the provisions of this EO. Therefore, we believe that independent federal agencies like TVA and EPA are subject to EO 12898. If TVA retains the conclusion that they are not subject to the EO in the FSEIS, EPA requests that TVA’s rationale for not considering itself an agency subject to the EO be provided in the text or be footnoted. More substantively, however, we appreciate that some EJ information was nevertheless provided for the SQN location regardless of TVA policy.
- 657AC * U.S. Census Data – Overall, Hamilton County shows a higher minority percentage (23.7%) than the state of Tennessee (19.8%), which is also the highest county in the state. The county’s census categories for Blacks represent the greatest minority population difference when compared to the state average, but Asian and American Indian/Alaskan Natives are also present at higher percentages than the state average. The FSEIS should determine what the percentage level is for the specific block group (BG) incorporating SQN to determine if it is greater or lesser than the county average. We also note that minority clusters exist near the SQN facility. It would be helpful to include a map depicting the population demographics in relationship to the project location (i.e., 1, 3, 6 miles from the facility).
- 657AE * EJ Impacts – The DSEIS does not provide adequate baseline information regarding potential for existing EJ issues associated with the facility to make an adequate assessment. For example, the DSEIS indicates that for the license renewal alternative (Alt. 1- page 3-101) the “SQN license renewal would result in no changes in operating employment levels at the plant, and there should be no new impacts to minority and low income populations through this action.” While this is encouraging from a license renewal standpoint, it is unclear in the DSEIS what the existing SQN employment levels are like for minority and/or low-income populations or what the existing impacts may be to EJ populations. EPA recommends that any existing EJ impacts – which may have occurred or are ongoing during the 40-year life of the present project licensing – be described in the FSEIS and offset as part of the prospective relicensing.
- Moreover, even if no existing EJ impacts exist, the proposed renewal offers an opportunity for TVA to do outreach with minorities, low-income populations and other demographics living near SQN. As a part of the proposed license renewal, we recommend that TVA discuss nuclear power impacts with nearby populations relative to

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potential benefits such as job opportunities at SQN or educational possibilities. Periodic dialogue with affected residents regarding the plant should also be provided and the outcome of that dialogue as well as TVA's public involvement process related to specific EJ outreach efforts. Comments and responses to comments should also be summarized in the FSEIS's EJ section.

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Fisheries

Page 1-7 states that "SQN operates in a once-through type cooling, normally called the open mode, for the majority of the year, when the cooling tower lift pumps are bypassed" and "[d]uring certain portions of the year, when thermal limit requirements require it, SQN uses a helper mode cooling tower system." Furthermore, page 1-8 states that "[t]he closed-cycle cooling mode is not currently used but can be utilized if needed." We understand that TVA considers Sequoyah an open mode cooling system that uses a helper mode as needed.

While it is clear that portions of the year do not require operation (or only limited operation) of the cooling towers to liberate reactor heat to the atmosphere, we offer that an open or helper mode operation requires much more intake water than a closed system. This could translate into considerably more plankton mortality (e.g., ichthyoplankton (fish eggs and larvae), mollusc and other larvae, and general zooplankton) being entrained within the cooling water system, as well as fish impingement of juvenile and adult fish on the intake screens.

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Based on our discussions with TVA, it is our understanding that some 90% of the ichthyoplankton entrained at SQN consists of American shad and that the size of various fish populations in Chickamauga Reservoir, which is under TVA regulation, have been consistent and are in good health. The FSEIS should summarize these fish entrainment studies or estimates.⁸ Moreover, unless federal (FWS) and state fish and wildlife counterpart agencies provide concurrence with TVA's entrainment conclusions, we recommend consideration of using the closed-cycle system or greater use of the helper mode. A fallback approach would be to avoiding use of an open system (or helper mode) during known spawning periods and/or varying water intake depth locations to water column depths where eggs and larvae are less prevalent. Additionally, an open system would presumably have a greater and steady thermal discharge – even if controlled by the limits of the NPDES permit – than the occasional thermal discharge of a closed system which could also have a fisheries impact. EPA will defer to the expertise of federal and state fishery agencies regarding final conclusions and recommendations on this matter.

657AG

⁸ For example: 1) were eggs and larvae enumerated and taxonomically identified or estimated and extrapolated; 2) was there seasonal variation with entrainment and impingement numbers; 3) were rare species included in this study; 4) was the study conducted at a time when the plant operating conditions were representative of today's operating conditions and predicted future operating conditions?

Other Comments

657AH * Reactor Design – The FSEIS (e.g., Sec 1.1) should identify the reactor technology used at SQN, which would not change for the preferred license renewal alternative (Alt. 1), and compare it to the other reactor design(s) available (e.g., AP1000) if the SQN licenses are not renewed and a new nuclear plant alternative (Alt. 2a) was selected and constructed. We understand that a “Westinghouse design” is currently being used at SQN. The FSEIS should clarify.

657AI Similarly, if the existing SQN facility would be relicensed (Alt. 1) and used for power generation for an additional 20 years, would this facility and spent fuel storage area be comparable in its ability to withstanding extreme weather events (tornados, hurricanes, etc.) and terrorist attacks (airplane crash landings, etc.) compared to a new facility with today’s design and standards proposed in Alts. 2a and 2b?

657AJ * Current and Extended Operational Period – Page 1-29 suggests that if the current 40-year licenses are renewed for an additional 20 years each, that SQN would have reached the end of its life expectancy and be decommissioned. The FSEIS should verify if this 60-year term is still considered reasonable by the NRC and within the industry, and the potential for yet another license extension at SQN for any term.

657AK * ISFSI – Additional dry cask storage for spent fuel rods (i.e., an independent spent fuel storage installation: ISFSI) will need to be operational by 2026 at Sequoyah if relicensing is selected (pg. 3-180). We understand that impacts of increasing the size of the onsite storage building via a concrete pad should “have only minor impacts” (pg. 3-81) and “to result in minimal disturbance to the environment” (pg. 2-16). In a 2002 Environmental Assessment/Finding of No Significant Impact (EA/FONSI), TVA concluded that construction and operation of the original storage site showed no significant impacts. Page 2-16 also states that: “Previous environmental assessments screened 13 potential sites to locate the current ISFSI storage pad, and a similar evaluation would be performed to choose the new additional storage pad location.”

Because the need for this related action would occur within the proposed relicensing timeframe (construction start-up expected in 2021), we appreciate that this action was included in the present DSEIS, with some discussion of onsite expansion impacts.

657AL We agree that additional NEPA documentation, such as a TVA re-evaluation or a supplemental EA⁹, would be needed before 2021 since that storage need is over ten years from now and regulations and policies could change. Moreover, we understand that the NRC re-licensing of this facility is separate from the NRC re-licensing of Unit 1 and 2, so that separate NEPA documentation is appropriate. In contrast, if re-licensing of Units 1 and 2 is not selected by TVA in the present SEIS, there would be no need to expand the existing storage building or construct a new onsite facility since Units 1 and 2 would stop operation before 2026.

657AL ⁹ EPA requests receipt of a copy of such a NEPA document for review and comment.

- 657AZ In regard to how much additional storage space is needed and within what timeframe, we note that onsite production of tritium for DOE is an option at SQN. Should this be approved and eventuate, a 71% increase in spent fuel would be generated (pg. 3-186). The FSEIS should discuss this in terms of spent fuel storage and possible schedule changes (i.e., would additional storage space already be needed before the projected October 2026 timeframe and 2021 construction startup?).
- 657BA * Radiological Tritium Monitoring – Page 3-34 states that “An additional groundwater evaluation is planned to further bound tritium concentrations vertically.” EPA requests additional discussion on this study in the FSEIS.
- 657BB * Plant Decommissioning – We appreciate that various methods to decommission SQN and the associated radiological/environmental impacts were considered in Section 3.20 of the DSEIS.

U.S. Environmental Protection Agency Comments and TVA Responses

657AM. For a relicensing project, reasonable and feasible alternatives outside continuing the original project — although perhaps in an improved manner — are somewhat limited if the existing facility is still competent and operation can be safely and effectively continued. Although EPA defers to TVA and NRC regarding the safe operational life expectancy of Units 1 and 2 at SQN, decommissioning may only be necessary if there is a concern regarding safety, outdated reactor and other technology issues, or chronic operational problems at SQN.

657AJ. Current and Extended Operational Period — Page 1-29 suggests that if the current 40-year licenses are renewed for an additional 20 years each, that SQN would have reached the end of its life expectancy and be decommissioned. The FSEIS should verify if this 60-year term is still considered reasonable by the NRC and within the industry, and the potential for yet another license extension at SQN for any term.

Response (657AM and 657AJ). The Atomic Energy Act of 1954 (as amended) allows the U.S. Nuclear Regulatory Commission (NRC) to issue licenses for commercial power reactors to operate for up to 40 years. The NRC regulations allow for the renewal of these licenses for up to an additional 20 years beyond the initial licensing period, depending on the outcome of an assessment to determine whether the reactor can continue to operate safely and whether the protection of the environment can be ensured during the 20-year period of extended operation. At this time, the law allows only 40 years for the initial licensing period, plus 20 years for license extension.

657AN. In addition to renewing the licenses for SQN Unit 1 and 2 (Alternative 1) or to allow existing licenses to lapse and decommissioning these units (No Action: Alternative 2), the DSEIS offers alternatives for capacity replacement (in lieu of renewals) by new nuclear generation (Alt. 2a) or by new natural gas generation (Alt. 2b).

Regarding these alternatives, we suggest that new nuclear generation² could have the advantage of assuming a more updated reactor design with passive safety features, while new natural gas generation³ can be expected to produce more emissions than nuclear fuel but less than combusting other fossil fuels. Overall, development of new greenfield or brownfield sites for new nuclear or gas-fired units would have construction environmental impacts, whereas license renewals of the existing SQN units would have no or minimal (expansion or new spent fuel storage building by 2026) construction impacts.

² Such as the AP1000 technology being explored for potential use at the Bellefonte nuclear site (BLN) in Alabama.

³ Such as recently evaluated at the John Sevier Fossil Plant (JSF) in Tennessee.

Response. The SEIS examines the alternative actions of (1) renewing SQN Unit 1 and 2 operating licenses or (2) not renewing the licenses, in which case SQN would cease operating at the end of the current license terms, and capacity would be replaced. Alternatives 2a and 2b are provided as examples of capacity replacement that would occur under the No Action Alternative.

The construction of any new facility would involve impacts to the environment. Operation of a new nuclear plant design would have some advantages over SQN design, but the overall impacts of a new nuclear plant would still be more significant than the continued operation of SQN. TVA agrees that operation of a new natural gas plant would add more pollutants to the air than would continued operation of SQN, but less than alternative fossil fuel generation such as coal or oil.

657AO. TVA has identified (pg. S-4) Alternative 1 (license renewal) as its action and preferred alternative in the DSEIS.⁴ To renew the two licenses appears reasonable unless there is a concern regarding safety, outdated reactor and other technology issues, or chronic operational problems at the existing SQN facility. However, if relicensing for another 20 years is pursued, we recommend that the FSEIS discuss means for improving the safety, operation, and environmental compliance/monitoring for SQN Units 1 and 2. While there may essentially not be new construction impacts (e.g., to wetlands) associated with the proposed renewal, improvements to ongoing operational protocols at SQN could conceivably result in a reduction of operational environmental impacts over the next 20-year timeframe. While we understand upgrading is an ongoing (annual) process, the proposed license renewal offers an excellent opportunity for TVA to reassess any existing impacts and mitigating them procedurally and structurally (technology components), where appropriate.

⁴ EPA appreciates that TVA identified a preferred alternative in the DSEIS as opposed to waiting until the Final SEIS (FSEIS), since public comments can already be provided on this draft preference at the DSEIS stage.

657BF. Moreover, even if no refurbishing may be needed, we recommend that the FSEIS discuss potential ways to improve existing safety, operation, and environmental compliance/monitoring at SQN Units 1 and 2 for the next 20 years beyond ongoing annual monitoring and upgrades, since the proposed relicensing offers an excellent opportunity to do so.

Response (657AO and 657BF). As part of the license extension process, TVA is conducting, for NRC review, a more-detailed safety analysis to ensure that the plant continues meet safety, operation, and environmental safeguards during license renewal period without a significant reduction in a margin of safety. The license renewal program would not require major new construction, alterations, or refurbishment to SQN to maintain consistency with the current licensing basis. TVA has procedures in place and that are revised as needed, for monitoring the environment. Training of personnel in these procedures is an ongoing process. The current programs and procedures are adequate to protect the health and safety of the public and the local environment; however, TVA will continue its efforts to refine procedures as needed. Additionally, see responses to comments 657B, 657BC, and 657AI below, which address TVA's continuing efforts to achieve the highest applicable safety standards and further minimize environmental impacts at TVA facilities, including SQN.

657AW. Climate Change: We appreciate TVA's discussion of climate change and GHGs in the DSEIS. As TVA is aware, the Council on Environmental Quality (CEQ) issued draft guidance for public comment on when and how federal agencies must consider GHG emissions and climate change in their proposed action. While this guidance is not yet final (and thus, not required), EPA recommends that the FSEIS explicitly reference the draft

guidance, describe the elements of the draft guidance, and to the relevant extent, provide the assessments suggested by the guidance.

657A. While this guidance (Council on Environmental Quality Draft Guidance on GHG Analysis within NEPA [February 18, 2010]) is not yet final (and thus, not required), we recommend that the FSEIS explicitly reference the draft guidance, describe the elements of the draft guidance, and to the relevant extent, provide the assessments suggested by the guidance (we acknowledge that the DSEIS provides some of this information; however, we recommend addressing all relevant aspects of the draft CEQ guidance with explicit reference to the Draft CEQ guidance document). Based on your analysis using the draft CEQ guidance, further data collection may be necessary in the future.

See: <http://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa>.

Response (657AW and 657A). A discussion of the new Council on Environmental Quality (CEQ) guidance regarding handling of GHGs and GCC in NEPA documents has been added to FSEIS 3.16.2. Under the referenced CEQ guidance, if a proposed action would be reasonably anticipated to cause direct emissions of 25,000 metric tons or more of CO₂-equivalent GHG emissions on an annual basis, agencies should consider this an indicator that a quantitative and qualitative assessment may be meaningful to decision makers and the public. For long-term actions that have annual direct emissions of less than 25,000 metric tons of CO₂-equivalent, CEQ encourages federal agencies to consider whether the action's long-term emissions should receive similar analysis. CEQ does not propose this as an indicator of a threshold of significant effects, but rather as an indicator of a minimum level of GHG emissions that may warrant some description in the appropriate NEPA analysis for agency actions involving direct emissions of GHGs. SQN does not directly generate 25,000 metric tons of CO₂ equivalent on an annual basis.

657BC. We furthermore recommend a discussion of best management practices (BMPs) to reduce greenhouse gases (GHGs) and other air emissions during construction (e.g., at the proposed expanded or new waste storage area) and operation of the facility (operation of facility buildings, equipment, and vehicles).

657B. EPA also recommends a discussion of BMPs to reduce GHGs and other air emissions during construction (e.g., at the new waste storage area) and operation of the facility (operation of facility buildings, equipment and vehicles). For example, clean energy options such as energy efficiency and renewable energy should be a consideration in the use of construction and maintenance equipment and vehicles. Equipment and vehicles that use conventional petroleum (e.g., diesel) should incorporate clean technologies and fuels to reduce emissions of GHGs and other pollutants, and should adhere to anti-idling policies to the extent possible. Alternate fuel vehicles (e.g., natural gas, electric) are also possibilities.

Response (657BC and 657B). Actively reducing carbon emission through cleaner energy options and energy efficiency initiatives is a central principle in TVA's Environmental Policy¹. To accomplish the greatest benefit, TVA's primary efforts focus upon reducing GHG emissions from its portfolio of generating plants. As noted in the SEIS, increasing the proportion of energy generated by TVA nuclear plants is one of the primary strategies for reducing GHG emissions, as well as increasing the energy produced from non- or low-emitting sources.

Additionally, in accordance with the requirements of Executive Order 13514, TVA developed a Strategic Sustainability Performance Plan² that establishes aggressive goals for reductions of GHG, as well as overall pollution prevention. Among TVA's sustainability initiatives are purchasing energy efficient fleet vehicles, reducing the number of high gas consuming fleet vehicles, and improving the efficiency of fleet vehicle use. TVA is implementing energy-saving improvements in many of its facilities, including SQN. TVA's new building designs incorporate modern energy efficiency technologies. Additionally, TVA is enhancing its sustainable acquisition program (currently, the Green Procurement Plan initiated in 2007) to ensure the purchase of environmentally preferable materials and services. Finally, in the Sustainability Plan, TVA establishes goals for minimizing and diverting municipal solid waste and construction/demolition debris from all facilities and decreasing use of chemicals that increase GHG emissions. These efforts are currently being implemented at SQN and other facilities as opportunities arise.

¹ <http://www.tva.com/environment/policy.htm>

² http://www.tva.gov/abouttva/TVA_Strategic_Sustainability_Performance_Plan_2011.pdf

657BD. Finally, we recommend that TVA's NEPA documents related to the various TVA nuclear plants pursue and present a consistent set of information comparing and contrasting nuclear energy with other energy technologies with regard to lifecycle GHG emissions. Such a consistent presentation should evaluate and make use of all the relevant literature on this subject.

657C. Lifecycle CO₂ Emissions (Sec. 3.16.1.2) — The discussion in Section 3.16.1.2 provides a comparison of CO₂ emissions from different types of energy production approaches. The analysis relies on information from the Department of Energy and the World Nuclear Association. Of particular interest is the value cited for indirect emissions of CO₂ associated with nuclear lifecycle emissions (i.e., 21 max to 9 min grams CO₂/kWh). A recent review by Sovacool⁷ of the lifecycle GHG emissions of various energy production technologies reports, for example, a range of 1.4 to 288 g CO₂e/kWh lifecycle emissions for nuclear power, with a mean value of 66 g CO₂/kWh. The range reported in Sovacool [sic] is substantially wider and the mean substantially higher than reported in this DSEIS (note that the Sovacool [sic] paper is cited in TVA's recent draft Integrated Resource Plan dated March 2011, but not in this DSEIS). Sovacool [sic] also points out that "...lifecycle analyses for 15 separate distributed generation and renewable energy technologies ... found that all but one, solar photovoltaics (PV), emitted much less gCO₂e/kWh than the mean reported for nuclear plants." In contrast, this DSEIS implies that nuclear has lower lifecycle emissions than an array of renewable energy resources (see Table 3-25 of the DSEIS).

We recommend that TVA's NEPA documents related to the various TVA nuclear plants pursue and present a consistent set of information comparing and contrasting nuclear energy with other energy technologies with regard to lifecycle GHG emissions. Such a consistent presentation should evaluate and make use of all the relevant literature on this subject.

⁷ Sovacool, BK. Valuing the Greenhouse Gas Emissions for Nuclear Power: A Critical Survey. *Energy Policy* 36 (2008) 2940 – 2953.

Response (657BD and 657C). Comment noted. TVA strives to present consistent analysis in its NEPA documents. Reference to and a short discussion of the Sovacool paper have been added to FSEIS 3.16.2.

657AX. Air Quality: The DSEIS suggests that other than changes to the onsite spent fuel storage and independent spent fuel storage instillation (ISFSI), no major component updates or refurbishing will be needed to extend the SQN for the 20-year renewal period. If so, we recommend that the FSEIS include a general but more definitive statement (e.g., in the abstract, summary and/or introduction) indicating that TVA believes that no substantive updates or refurbishing is needed for the proposed license renewal.

657BE. As the DSEIS appears to suggest, we recommend that the FSEIS include a general but more definitive statement indicating that TVA believes that no substantive updates or refurbishing (other than the ISFSI facility) is needed for the proposed license renewal.

657I. Section 2.2.1 Alternate 1 — SON Units 1 and 2 License Renewal, Action Alternative 2-14): The preferred alternative of SQN license renewal does not address the possible need for facility component updates and/or refurbishing to extend plant operation for 20 more years. Any needed updates/refurbishing should be identified and their associated environmental consequences and permits/approvals should be addressed in the FSEIS. The DSEIS appears to suggest that other than changes to the onsite spent fuel storage and independent spent fuel storage instillation (ISFSI), no major component updates or refurbishing will be needed to extend the SQN for the 20-year renewal period.

If so, we recommend that the FSEIS include a general but more definitive statement indicating that TVA believes that no substantive updates/refurbishing is needed for the proposed license renewal.

Response (657AX, 657BE, and 657I). The FSEIS abstract and summary sections have been modified to state that the license renewal program would not require major new construction, alterations, or refurbishment to SQN to maintain consistency with the current licensing basis.

657AP. Beyond this general statement, EPA requests that the FSEIS include additional information on climatological and meteorological data, the new SO₂ and NO₂ National Ambient Air Quality Standards (NAAQS), Prevention of Significant Deterioration (PSD) Class II increments, fine particulates (PM_{2.5}) with PM₁₀, potential Hazardous Air Pollutants (HAPs) from SQN, and fuel oil power generation with Alternative 2b.

657H. Section 2.1.1.2. Fossil Fuel Energy Sources (pg. 2-4) and Section 2.1.3. Combination of Alternative Sources (pg. 2-13): Only electrical generation using coal and natural gas were considered as reasonable alternatives to the renewal license of SQN. Higher emissions of NO_x, CO₂ and other pollutants were given as the reason fuel-oil-fired power generation was not considered. The basis for this statement (e.g., table providing representative emission rates for these pollutants by type of fuel) was not provided. It is expected that fuel oil power generation would produce emissions that would be less than or equal to those produced by coal. The basis for eliminating fuel oil as an alternative should be provided in the SEIS or this fossil fuel should be considered as an alternative.

Response (657AP and 657H). Additional information has been added to FSEIS 3.16 to clarify national air quality standards and potential impacts of the Action and

No Action alternatives. Fuel oil power generation is not evaluated in detail in this SEIS. As described in TVA's Integrated Resource Plan, fuel oil-fired generation is not considered an option in TVA's generation plans for the next 20 years, primarily due to emissions of air pollutants. Table 3-25 provides a comparison of emissions from various fuels used to generate electricity, including #6 fuel oil. Additionally, the cost of fuel oil is between 3.5 and 5 times greater (per unit of energy) than natural gas.

657AQ. Environmental Justice (EJ): EPA appreciates — and finds it consistent with Executive Order (EO) 12898 and NEPA perspective — that EJ was considered in the DSEIS. However, results show that SQN apparently is located in a county (Hamilton) that shows a higher minority percentage (23.7%) than the State of Tennessee (19.8%), and is also the county with the highest minority percentage in the state. The FSEIS should determine what the percentage level is for the specific block group (BG) incorporating SQN to determine if it is greater or lesser than the county average.

657AC. U.S. Census Data — Overall, Hamilton County shows a higher minority percentage (23.7%) than the state of Tennessee (19.8%), which is also the highest county in the state. The county's census categories for Blacks represent the greatest minority population difference when compared to the state average, but Asian and American Indian/Alaskan Natives are also present at higher percentages than the state average. The FSEIS should determine what the percentage level is for the specific block group (BG) incorporating SQN to determine if it is greater or lesser than the county average.

Response (657AQ and 657AC). The Sequoyah 2000 Census SF1 Block Group number ID is 470650103012. Within this block group, none of the minority categories had a higher population percentage than the county or state minority percentages. Additionally, according to the 2000 Census SF1 data, Hamilton County (23.7 percent) had a lower minority percentage (Aggregate Category) than nine other Tennessee counties (Davidson – 33.0 percent, Fayette – 37.5 percent, Hardeman – 42.7 percent, Haywood – 53.3 percent, Lake – 33.4 percent, Lauderdale – 36.2 percent, Madison – 34.9 percent, Montgomery – 26.8 percent, and Shelby – 52.7 percent). Therefore, while Hamilton County does have a higher minority percentage compared to the percentage of minorities within the state's population, it is not the county with the highest minority percentage in the state.

Along with revising the SEIS text, the Sequoyah Block Group minority and low-income percentage levels have been added to Table 3-19 U.S. Census Race Category and Low-Income Populations.

657AR. It would also be helpful to include a map depicting the population demographics for the minority clusters that were reported to exist near the SQN facility.

657AD. We also note that minority clusters exist near the SQN facility. It would be helpful to include a map depicting the population demographics in relationship to the project location (i.e., 1, 3, 6 miles from the facility).

Response (657AR and 657AD). FSEIS 3.13.3.1 has been revised to include a map of census block and block groups of interest near SQN. A new figure (Figure 3-13 Minorities Within 6-Mile Radius of SQN) has been added to FSEIS 3.13.3 and is referenced in FSEIS 3.13.3.1.

657AT. Fisheries: TVA proposes continued use of the existing open-cycle cooling water system at SQN (with helper mode operation using the cooling towers as needed) as opposed to a closed system.⁵

⁵ The FSEIS should further discuss why TVA apparently prefers an open system at SQN from a water consumption, evaporative loss, energy use, thermal discharge, fisheries, NPDES or other perspective.

Response. As discussed in the SEIS (FSEIS 3.5.2), impacts to Chickamauga Reservoir fisheries caused by the current cooling regime, are negligible. FSEIS 3.1.2.2 discusses current water use for the plant as compared to the alternative closed-loop system.

Using a closed-cycle system substantially increases water consumption through evaporative loss associated with cooling tower operation. As cooling water is recycled through the cooling system several times, impurities in the water source are concentrated, and although the discharge volume of water is decreased, impurities in the effluent would be concentrated. The thermal plume associated with a once-through regime may decrease if the plant were converted to a closed-cycle regime; however, modeling would be necessary to determine the extent of the chemical plume.

Running the plant in its current design in a closed-mode cooling regime using the single on-site cooling tower for each reactor would require SQN to derate and result in negative economic impacts.

657AG. The FSEIS should summarize these fish entrainment studies or estimates. Moreover, unless federal (FWS) and state fish and wildlife counterpart agencies provide concurrence with TVA's entrainment conclusions, we recommend consideration of using the closed-cycle system or greater use of the helper mode. A fallback approach would be to avoiding use of an open system (or helper mode) during known spawning periods and/or varying water intake depth locations to water column depths where eggs and larvae are less prevalent.

Additionally, an open system would presumably have a greater and steady thermal discharge — even if controlled by the limits of the NPDES permit — than the occasional thermal discharge of a closed system which could also have a fisheries impact. EPA will defer to the expertise of federal and state fishery agencies regarding final conclusions and recommendations on this matter.

657AU. However, EPA is concerned that the use of an open system for power plant cooling — which constantly requires new in-take water — would entrain considerably more fish eggs and larvae (and other plankton) into the system when compared to a closed or helper mode system. The FSEIS therefore should summarize TVA's entrainment and impingement studies or estimates that reportedly show that some 90% of the entrained fish eggs and larvae are American shad.

657AV. Moreover, the FSEIS should discuss if the U.S. Fish and Wildlife Service (FWS) and their state counterparts concur with TVA's study conclusions. If not, we recommend additional studies designed or approved by these agencies or consideration of using a closed-cycle system, or at least using the helper mode during spawning or other critical fishery periods. Additionally, open system would presumably have a greater and steady thermal discharge — even if controlled by the limits of the National Pollutant Discharge

Elimination System (NPDES) permit — than the occasional thermal discharge of a closed system which could also have a fisheries impact. Overall, EPA will defer to the FWS and state agencies regarding these fishery-effects and their minimization.

Response (657AG, 657AU, and 657AV). As stated in FSEIS 3.5.2, based on data collected by TVA, entrainment by SQN does not substantially impact the fish community in Chickamauga Reservoir. TVA regularly coordinates with the U.S. Fish and Wildlife Service (USFWS) and Tennessee Wildlife Resources Agency (TWRA) concerning TVA's power generation operations. In 2010, both agencies were among those given the opportunity to comment on the draft NPDES permit for SQN. Both agencies have examined data TVA has collected to demonstrate no significant impact on fisheries resources in the Chickamauga Reservoir near SQN. Neither the USFWS nor the TWRA has recommended TVA take steps to change water intake and discharge regimes at SQN. The Department of the Interior, of which the USFWS is a part, submitted three comments on the DSEIS (see letter in this appendix), but none expressed concerns about the impacts of SQN operations on aquatic biota via impingement, entrainment, or discharge of heated effluent.

657D. 3.16.1.2, first paragraph. We recommend the sentence be modified to read "Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) lasting for an extended period (decades or longer)."

Response. Comment noted. Changes have been made to FSEIS 3.16.1.2.

657E. Stand-Alone SEIS: This document is reported to be a supplement to the 1974 Final Environmental Statement Sequoyah Nuclear Plant Units 1 and 2 (TVA 1974). The DSEIS refers to many other documents as can be seen in the list of references provided at the end of each section. Because the underlying basis for most of the information provided in this supplement is contained in these documents, a complete comprehensive review would have to include the information contained in these documents. The need for the underlying information and analyses is most noticed in the Affected Environment and Environmental Consequences section (Section 3) of this DSEIS. Therefore, it is suggested that all pertinent information and backup analyses needed to understand and evaluate the provided consequences of the proposed license renewal be included in the FSEIS to the extent feasible.

657F. Electronic References: If a complete stand-alone SEIS cannot be developed for this project, the FSEIS should provided the specific document, section, and page where referenced documentation and analyses can be obtained to support the information provided. If appropriate, the specific NRC docket web location should be provided. One option would be to make the supporting reference documents available in electronic format on the TVA website where the DSEIS is currently posted (<http://www.tva.com/environment/reports/sgn-renewal/index.htm>).

657J. Section 3.16. Climatology, Meteorology, and Air Quality (pg. 3-129) — The discussion and information provided in this section rely heavily on the analyses and information in the recent (2008) Sequoyah Nuclear Plant Updated Final Safety Analysis Report (FSAR). As noted above, it is suggested that all pertinent information and backup analyses needed to understand, compare, and evaluate the discussions and conclusions on the proposed license renewal and alternates, be included in the FSEIS.

Response (657E, 657F, 657J). Relevant data and information from the SQN UFSAR are incorporated into this FSEIS in most instances. Pertinent portions of the SQN UFSAR that provide supplemental background information and are not considered Sensitive Unclassified Non-Safeguards Information will be posted on a webpage for public review.

657G. Table S-1 Summary of the Environmental Impacts of the Action and No Action Alternatives (pg. S-13): It is suggested that the negative/positive impacts to socio-economic conditions (e.g., employment, schools, taxes, etc.) to the Sequoyah Nuclear Plant (SQN) area be considered in Alternatives 2a and 2b in this table.

Response. FSEIS Table S-1 has been revised to clarify potential socioeconomic impacts near SQN under the No Action Alternative.

657K. Section 3.16.1.1 Regional Climatology (pg. 3-129) — Supplemental Climatologic Data: The discussion of regional climatology and changes since the initial 1974 FEIS is all text. The text discussion should be supplemented with tables and figures that provide applicable wind roses, frequency distributions, comparisons etc. that would provide the underlying basis for the information provided. The tables and figures will also allow comparisons with previous observations and long-term records, and promote better understanding of the information and conclusions presented.

657O. Section 3.16.1.3 Local Meteorology (pg. 3-133) — Supplemental Meteorological Data: Similar to the previous section on Regional Climatology, this discussion should be supplemented with tables and figures that provide applicable wind roses, frequency distributions, comparisons, etc. that would provide the reader with a better understanding of the current meteorological conditions. The tables and figures will also allow comparisons with previous observations and long-term records, and a basis for the evaluation of subsequent dispersion and transport analyses. It is difficult to obtain this understanding from the provided text discussion.

Response (657K and 657O). Appendix F — Meteorological Data Summaries has been added to the FSEIS to include data used in making the comparisons discussed in the text. FSEIS 3.16.1.3 has also been revised.

657L. Section 3.16.1.1 Regional Climatology (pg. 3-129) — Fuel Oil CO₂ Production: For consistency and completeness, Table 3-25 should include CO₂ production from fuel oil electric source.

Response. CO₂ production associated with electricity generation powered by fuel oil is presented in Table 3-25. Indirect emissions from fuel oil generation are similar to natural gas indirect emissions due to the exploration, drilling, pipelines, trucking, and processing of fuel oil prior to direct use in a generation facility.

657M. Section 3.16.1.3 Local Meteorology (pg. 3-133) — Meteorological Data: The goal of this section is to demonstrate that the initial meteorological conditions of the plant site, and engineering plant features based on these conditions, have not changed and will be appropriate for the 20-year renewal period. The addition of summary tables and figures of onsite meteorological records of comparable lengths obtained during the initial 1970s and current 2000s would be valuable for this demonstration.

Response. Meteorological data collected at SQN were reviewed to confirm that meteorological patterns measured in the 1970s are consistent with those measured in the 2000s. Comparison between these decades is explained in the text of FSEIS 3.16.1.3. Meteorological data and figures have been added to the SEIS in Appendix F. However, to ensure clarity of the document, care was taken to minimize presentation of extensive datasets in the text.

657N. Section 3.16.1.3 Local Meteorology (pg. 3-133) — Atmospheric Temperature: All the important meteorological parameters for this comparison were identified except atmospheric temperature.

Response. Atmospheric temperature is discussed in the regional climate change subsection of FSEIS 3.16.1.1 and in the severe weather subsection of FSEIS 3.16.1.3. Additional data and information about atmospheric temperature have been added to FSEIS 3.16.1.3, to describe variation in some measures of atmospheric temperature recorded since the construction of SQN.

At a nuclear facility, the water intake and discharge temperatures and the temperature differences for atmospheric dispersion have the greatest impact on the operation of SQN on a daily basis and are of the greatest interest. Atmospheric temperature is monitored continuously but not used on a daily basis to determine operational impacts on SQN, as is other meteorological information.

The temperature extremes of hottest air temperature occurred in 1952 and coldest air temperature occurred in 1985; therefore, temperature data from a single point like the SQN meteorological tower alone cannot accurately provide trends. Regional data were used in FSEIS 3.16.1.1 to address long-term changes in air temperature.

657P. Section 3.16.1.3 Local Meteorology (pg. 3-133) — Atmospheric Stability Data: The provided table of atmospheric stability data is only associated with the most recent meteorological measurements (i.e., 2000-2009). These data should be compared to stabilities obtained from initial SQN measurements in the 1970s. Stability class frequency distributions should be used to show agreement and differences between meteorological data records. The data record comparisons of joint frequency distributions of stability, wind direction, and wind speed would be valuable.

Response. FSEIS 3.16.1.3 has been revised to clarify that historic atmospheric stability measurements were evaluated as part of the analysis in the SEIS. TVA reviewed the maximum X/Q values calculated since 1972. While the maximum X/Q values vary over the years, the current values are consistent with values from 1972. The SEIS provides a summary of the last 10 years as an indication of relative percentages of stability occurrence.

As an operational nuclear facility, SQN is required to provide annual joint frequency distributions to the NRC. The SQN ODCM uses values consistent with all the calculated values and they are conservative. TVA is confident that values used in the current programs are consistent with original values and that all dose information is accurate and conservative.

657Q. Section 3.16.1.3 Local Meteorology (pg. 3-133) — Supplemental Dispersion Data: As discussed in previous sections, the Dispersion section (pg. 3-137) discussion should be

supplemented with tables and figures that would provide the reader with a better understanding of the initial and current dispersion and transport conditions at SQN.

Response. Within the section addressing Dispersion, routine and potential accident release dispersions are explained. Tables 3-27 and 3-28 provide the factors used in calculations of routine and potential accident releases. The initial values of X/Q (the principal factor in dispersion calculations) from the 1970s are not used, because they have been updated over the years. The current values from the period 1986 – 1995 are used to represent the operation of SQN as required by the Offsite Dose Calculation Manual (ODCM). While the current values are consistent with the original values from the 1970s, they have been updated with a larger set of meteorological data (1986 – 1995) whose values are more conservative when used in dose calculations. Meteorological data from the period 1996 – 2010 are not as conservative as the data being used in accordance with the ODCM; therefore, the X/Q values have not been further updated for use in dose calculations. Initial and current dispersion and transport characteristics are similar, and the most conservative values are being used as per the ODCM. Further calculations and technical detail were minimized to improve clarity of the section.

657AY. Section 3.16.1.3 Local Meteorology (pg. 3-133) — Editorial Modifications: On page 3-137, we suggest: (1) replacing "dilution" in the first sentence of this section with "dispersion" and (2) low atmospheric dispersion and low X/Q values are opposites so the last sentence of the first paragraph should read "Low or small X/Q values..."

Response. Comment noted. Changes have been made to FSEIS 3.16.1.3.

657R. Section 3.16.1.3 Local Meteorology (pg. 3-133) — Routine/Accident Release Records: The routine release and accident release sections do not compare X/Q calculated values developed using initial plant meteorology with that using the most current onsite record. Only values from the Sequoyah Nuclear Plant Offsite Dose Calculation Manual (ODCM) are provided which are based on 1985-95 meteorological measurements.

Response. All off-site dose calculations use data and requirements from the ODCM. This is the latest information and must be used to determine the dose values. The initial values of X/Q from the 1970s are not used, because they have been updated over the years. The current values from the period 1986 – 1995 are used to represent the operation of SQN as required by the ODCM. While the current values are consistent with the original values from the 1970s, they have been updated with a larger set of meteorological data from (1986–1995), whose values are more conservative when used in dose calculations. Meteorological data from the period 1996 – 2010 are not as conservative as the data being used in accordance with the ODCM; therefore, the values have not been further updated for use in dose calculations. Initial and current dispersion and transport characteristics are similar, and the most conservative values are being used as per the ODCM.

657S. Section 3.16.2 Environmental Consequences - Climatology and Meteorology (pg. 3-140) — This section just discusses the consequences of the various alternatives on GHG production and the potential impact of climate change on the operation of SQN and other alternatives during the renewal period. It is suggested that the changes that were noted in the onsite meteorological observations since the 1970s could be used to represent what could be expected during the renewal period.

Response. The cited regional study, developed by the Electric Power Research Institute (EPRI) at the request of TVA, best represents what might be expected to occur in the future. The text of the FSEIS indicates that the changes in meteorology and climatology for the brief period of just 20 years would not be significant. See FSEIS 3.16 for this discussion.

657T. Section 3.16.3 Affected Environment — Air Quality (pg. 3-142) — New SO₂ and NO₂ NAAQS: In addition to new and more restrictive ozone and particulate NAAQS, EPA has promulgated new SO₂ and NO₂ NAAQS in 2010. Since the facility has emissions of NO_x and SO_x, it is recommended that this section be revised to include a brief discussion of the new revised SO₂ and NO₂ NAAQS. These ambient air quality standards will have to be considered for all alternatives. These new NAAQS will be more of a permit challenge for new facilities (i.e., Alternatives 2a and 2b). The new restrictive NAAQS may be most challenging for the fossil fuel Alternative 2b.

Response. FSEIS 3.16.3 has been revised to include a table summarizing the current NAAQS standards. TVA agrees that EPA's more stringent national standards will make permitting of new fossil-fueled generating facilities more difficult.

657U. Section 3.16.3 Affected Environment — Air Quality (pg. 3-142) — PSD Class II increments: The permitting consequences of the PSD Class I area increments were discussed but not PSD Class II increments applicable for areas in proximity to the plants. PSD Class II increments have been promulgated for PM_{2.5} and it is anticipated that they will be promulgated for the new SO₂ and NO₂ NAAQS.

Response. Comment noted. FSEIS 3.16.3 has been revised.

657V. Section 3.16.3 Affected Environment — Air Quality (pg. 3-142) — PM₁₀/PM_{2.5}: PM₁₀ is identified as a pollutant of concern throughout this section. Fine particulates (PM_{2.5}) should be included when citing PM 10.

Response. FSEIS 3.16.3 has been revised to address fine particulates (PM_{2.5}) in more detail.

657W. Section 3.16.3 Affected Environment — Air Quality (pg. 3-142) — Fugitive Emissions: The discussion of fugitive particulate emissions indicates there are no sensitive receptors adversely affected by temporary generated fugitive dust and equipment exhaust. Because people and animals would qualify as such a receptor, it is suggested that this comment be modified or deleted.

Response. Comment noted. FSEIS 3.16.3 has been revised.

657X. Section 3.16.3 Affected Environment — Air Quality (pg. 3-142) — HAPs: This section briefly discusses the emissions of criteria air pollutants from the facility and indicates that the plant is classified as a minor source subject to the permitting requirements of the Chattanooga/Hamilton County Air Pollution Control Bureau. However, the DSEIS does not address the potential for HAP emissions from the facility. The Sequoyah Plant is listed in EPA's 2009 Toxic Release Inventory (TRI) database as having air emissions of hydrazine and lead. The emissions of these and any other HAPs should be discussed in the DSEIS.

Response. FSEIS 3.16.2 has been revised to indicate that hydrazine, a corrosion inhibitor used in the cooling water system to control pH and corrosion, is reported to the EPA because a very small fraction is released to the air. Hydrazine is not a significant source of air pollution. Hydrazine is also discussed in the solid waste portion of FSEIS 3.14. Additionally, lead is reported to the EPA as an air pollutant, because a very small fraction of the lead (0.37 pounds/year) used at the SQN practice firing range becomes airborne.

657Y. Section 3.16.4 Environmental Consequences — Air Quality (pg. 3-146) — Natural-Gas-Fired Turbine Impacts: The statement that the air emissions from a modern natural gas-fired turbine would be small enough that they would operate with a minor impact to air quality should be verified. We note that these facilities would have significant impacts considering the new, more restrictive PM_{2.5} and NO₂ NAAQS and PSD increments.

657Z. Section 3.16.4 Environmental Consequences — Air Quality (pg. 3-146) — Alternative 2b Impacts: The representative emissions provided in Table 3-29 for the combined-cycle operation of Alternative 2b reveals major SO_x, NO_x, CO, PM, and VOC emissions (note: PM_{2.5} emissions are not provided). It appears that "minor" would not be the appropriate classification for ambient impacts from operation of Alternative 2b natural gas-fired plants.

Response (657Y and 657Z). Emissions from a new gas-fired plant would be required to meet current regulatory requirements. Air emissions limits would be among the criteria considered when siting a new generating facility. Applicable permitting processes would ensure that national ambient air quality standards are protected. Based on this, TVA concludes that any air quality impacts associated with a new gas-fired plant would meet regulatory requirements and would range from relatively minor to moderate, depending upon the location of the new facility.

Furthermore, a new natural gas-fired plant could be constructed with technology such as selective catalytic reduction designed to reduce emissions of some air pollutants. The facility would be operated to comply with air quality regulations.

657AA. Scoping — We are pleased to note that the Socioeconomics section (3.13) includes EJ information, which was a scoping issue (pg. 1-28). This information is found in section 3.13.3 (Low-Income and Minority Populations). For clarity and easier reference, this section could have been entitled Environmental Justice.

Response. The title has been revised to clarify that environmental justice is addressed in FSEIS 3.13.3.

657AB. Executive Order (EO) 12898 — Page 3-100 states that "...TVA is not subject to this executive order..." The scope of the EO applies to any federal agency on the Working Group, and such other agencies as may be designated by the President, that conducts any federal program or activity that substantially affects human health or the environment.

Independent agencies are requested to comply with the provisions of this EO. Therefore, we believe that independent federal agencies like TVA and EPA are subject to EO 12898.

If TVA retains the conclusion that they are not subject to the EO in the FSEIS, EPA requests that TVA's rationale for not considering itself an agency subject to the EO be

provided in the text or be footnoted. More substantively, however, we appreciate that some EJ information was nevertheless provided for the SQN location regardless of TVA policy.

Response. TVA is not among the agencies specifically noted in Executive Order (EO) 12898, nor is TVA a member of the Interagency Working Group on Environmental Justice that is identified in EO 12898. As recognized in the comment, independent agencies are requested to comply with the provisions of the EO. Therefore, as noted on FSEIS page 3-98, TVA evaluates potential environmental justice impacts as a matter of policy.

657AE. EJ Impacts — The DSEIS does not provide adequate baseline information regarding potential for existing EJ issues associated with the facility to make an adequate assessment. For example, the DSEIS indicates that for the license renewal alternative (Alt. 1- page 3-101) the "SQN license renewal would result in no changes in operating employment levels at the plant, and there should be no new impacts to minority and low income populations through this action." While this is encouraging from a license renewal standpoint, it is unclear in the DSEIS what the existing SQN employment levels are like for minority and/or low-income populations or what the existing impacts may be to EJ populations. EPA recommends that any existing EJ impacts — which may have occurred or are ongoing during the 40-year life of the present project licensing — be described in the FSEIS and offset as part of the prospective relicensing.

657AS. EPA also recommends that any existing EJ impacts — which may have occurred or are ongoing during the 40-year life of the present project licensing — be described in the FSEIS and offset as part of the prospective relicensing. Moreover, even if no existing EJ impacts exist, the proposed renewal offers an opportunity for TVA to outreach with minorities, low-income populations and other demographics living near SQN.

657AF. Moreover, even if no existing EJ impacts exist, the proposed renewal offers an opportunity for TVA to do outreach with minorities, low-income populations and other demographics living near SQN. As a part of the proposed license renewal, we recommend that TVA discuss nuclear power impacts with nearby populations relative to potential benefits such as job opportunities at SQN or educational possibilities. Periodic dialogue with affected residents regarding the plant should also be provided and the outcome of that dialogue as well as TVA's public involvement process related to specific EJ outreach efforts. Comments and responses to comments should also be summarized in the FSEIS's EJ section.

Response (657AE, 657AS, 657AF). In its analysis of current conditions, TVA did not identify any location-dependent, disproportionate high and adverse impacts to minority and low-income populations resulting from operation of SQN. There are beneficial impacts realized, such as taxes paid by TVA and SQN workers. These in turn benefit local public services for the general population, including minority/low-income groups in the community.

As described in FSEIS 3.13.1.2, as of 2010, SQN employed a staff of approximately 1144 permanent and contract employees. Of these, 892 employees, or 78 percent, reside in Hamilton County (approximately 0.3 percent of the county population). Because the staff represents a low percentage of the county population, as stated in Section 1-103 of Executive Order 12898, TVA employment policies and current SQN staffing are not relevant or related to identifying the existence of adverse

human health or environmental effects. Subsequently, it would not be appropriate to include any further employment breakdown in the SEIS. TVA is an Equal Opportunity employer and complies with all applicable laws and regulations regarding equal employment opportunities.
<http://www.tva.com/employment/index.htm>.

TVA believes that, relative to the proposed renewal of SQN operating licenses, evaluating existing EJ impacts which may have occurred during the 40-year life of the present project licensing would be a significant and unnecessary extension of what is normally done to evaluate EJ impacts. There are also a number of reasons why this type of historical study would be difficult (and time consuming) to produce, including:

- U.S. Census hierarchical geographic boundaries and minority/low income data categories have changed for each decennial census (1970, 1980, 1990, and 2000; future release 2010). Because these data are the basis for identifying specific populations, a comparison of identified minority populations from one census to another would be difficult.
- It would be necessary to establish what the human health conditions and the environmental setting were like in the past for the regional population and any identified minority/low-income group to evaluate whether any historical environmental justice impacts have occurred. Comprehensive historical data for all socioeconomic and environmental characteristics would likely not be available for the suggested time frame.

TVA has a number of community outreach programs and policies in place for disseminating information to the public near SQN.

With the release of the SEIS document to the public, community leaders, and media, TVA solicited public comments regarding the proposed action via the Internet and posted mail. Copies of the SEIS were made available in public libraries in Chattanooga, Dayton, and Cleveland, Tennessee. Various media outlets posted notices of the proposed action and notification of the scheduled open house public meeting held at the Sequoyah Training Center on December 2, 2010. Experts were made available to meet and discuss the proposed action with those in attendance, and the ability to comment was made available. TVA made additional efforts to reach minority populations near SQN at the time the FSEIS was released. Representatives from SQN visited an African American community center and church in Soddy-Daisy, Tennessee, to inform the community about ongoing operation of SQN and the availability of the FSEIS.

657AH. Reactor Design — The FSEIS (e.g., Sec 1.1) should identify the reactor technology used at SQN, which would not change for the preferred license renewal alternative (Alt. 1), and compare it to the other reactor design(s) available (e.g., AP1000) if the SQN licenses are not renewed and a new nuclear plant alternative (Alt. 2a) was selected and constructed. We understand that a "Westinghouse design" is currently being used at SQN. The FSEIS should clarify.

Response. As stated on FSEIS page S-3, AP1000 is used as an example. Reactor technology for a new nuclear plant has not been determined. Specific examples of AP1000 technology and related impacts are presented throughout the discussion.

FSEIS 1.1.1 provides a general description of the reactor and plant.

FSEIS 2.2.2.1, under Construction and Operation, discusses the new reactor technologies available and provides references for most of the designs. Because there are so many types, and no decision has been made, use of only the AP1000 provides sufficient comparison information to evaluate the project alternatives.

657AI. Similarly, if the existing SQN facility would be relicensed (Alt. 1) and used for power generation for an additional 20 years, would this facility and spent fuel storage area be comparable in its ability to withstanding extreme weather events (tornados, hurricanes, etc.) and terrorist attacks (airplane crash landings, etc.) compared to a new facility with today's design and standards proposed in Alts. 2a and 2b?

Response. The new nuclear facility design basis to withstand extreme weather conditions is essentially the same as SQN's design basis. There has not been much change over the years. SQN was designed to withstand all types of extreme weather. Design basis improvements for terrorist attacks have been addressed in recent years for all nuclear plants, and requirements for new nuclear facilities have been upgraded even further to demonstrate the ability to withstand airplane crashes. However, the U.S. Nuclear Regulatory Commission (NRC) has made numerous statements as to the safety and security of existing nuclear plants. Section 4.3.5 of the cited NRC document explains terrorism and the relationship to license renewal (www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1850/sr1850_faq_lr.pdf). Spent fuel storage at a new nuclear facility will use the same technology currently available unless a better design is approved in the future.

TVA places a high value on protecting public health and safety, the safety of its employees, and protection of the environment through safe operation of its nuclear facilities. TVA's highest-tier policy, entitled "Commitment to Nuclear Safety," states that "TVA's nuclear power activities are carried out with public health and safety, the protection of its employees, and the environment as paramount considerations." Further, TVA's policy states that "TVA will seek continuous improvement, utilizing the best applicable industry standards to achieve operating excellence."

TVA's nuclear plants are regulated by the NRC which, as the safety regulator for the nation's nuclear industry, is tasked by Congress with ensuring adequate protection of public health and safety. As part of its public mandate, the NRC keeps abreast of safety issues worldwide and revises its regulations and guidance to U.S. nuclear power plant operators to increase margins of safety when necessary. In fulfilling its important role, the NRC ensures that U.S. safety standards reflect the highest level of protection appropriate for each nuclear plant site given the conditions that may affect each site and surrounding area.

In addition, TVA is a member of the Institute for Nuclear Power Operations (INPO) and the World Association of Nuclear Operators (WANO). INPO was established in 1979 by the U.S. nuclear power industry to promote excellence and the highest levels of reliability in the operation of commercial nuclear power plants. WANO was created in 1989 to help nuclear plant operators worldwide achieve the highest possible standards of nuclear safety. Among the most important roles carried out by both INPO and WANO is the systematic gathering, review, and analysis of operating experience at all nuclear power plants, coupled with an industry-wide international

communications network to facilitate the exchange of this information in order to improve performance at each member facility.

Recognizing its own responsibilities and commitments as an owner and operator of three nuclear plants in Tennessee and Alabama, as an NRC licensee, and an active member of INPO and WANO, TVA remains aware of and is affected by nuclear plant operating events worldwide. This includes recent earthquake-and tsunami-related events in Japan. While many of the extraordinary circumstances that led to this tragedy are not applicable to TVA's nuclear facilities, there nonetheless may be prudent improvements and lessons learned to create an even safer operating environment. Because TVA's nuclear facilities are regulated by the NRC, TVA, of course, will implement applicable new regulatory requirements. However, TVA will not await direction from NRC before taking action to identify and address any safety concerns. TVA plants already have additional safety features that would help to respond to conditions confronting several of Japan's reactors, and we have initiated a re-evaluation of our readiness to deal with severe conditions and serious emergencies, including a systematic review of procedures, training, facilities, and equipment at TVA's operating nuclear plants and planned nuclear units. TVA will implement improvements identified internally or through its participation in INPO and WANO that help to ensure TVA's nuclear generation continues to operate reliably and safely.

657AK. ISFSI — Additional dry cask storage for spent fuel rods (i.e., an independent spent fuel storage installation: ISFSI) will need to be operational by 2026 at Sequoyah if relicensing is selected (pg. 3-180). We understand that impacts of increasing the size of the onsite storage building via a concrete pad should "have only minor impacts" (pg. 3-81) and "to result in minimal disturbance to the environment" (pg. 2-16). In a 2002 Environmental Assessment/ Finding of No Significant Impact (EA/FONSI), TVA concluded that construction and operation of the original storage site showed no significant impacts.

657AL. We agree that additional NEPA documentation, such as a TVA re-evaluation or a supplemental EA⁹, would be needed before 2021 since that storage need is over ten years from now and regulations and policies could change. Moreover, we understand that the NRC re-licensing of this facility is separate from the NRC re-licensing of Unit 1 and 2, so that separate NEPA documentation is appropriate.

In contrast, if re-licensing of Units 1 and 2 is not selected by TVA in the present SEIS, there would be no need to expand the existing storage building or construct a new onsite facility since Units 1 and 2 would stop operation before 2026.

⁹ EPA requests receipt of a copy of such a NEPA document for review and comment.

Response (657K and 657L). Prior to expanding the SQN ISFSI, TVA will determine the appropriate level of environmental review based upon site-specific conditions and specific project activities. As part of that environmental review, TVA would follow standard practices for coordinating with state and federal agencies, including the EPA.

657AZ. In regard to how much additional storage space is needed and within what timeframe, we note that onsite production of tritium for DOE is an option at SQN. Should this be approved and eventuate, a 71 percent increase in spent fuel would be generated

(pg. 3-186). The FSEIS should discuss this in terms of spent fuel storage and possible schedule changes (i.e., would additional storage space already be needed before the projected October 2026 timeframe and 2021 construction startup?).

Response. The impacts of tritium production on the quantity of spent fuel generated have been addressed in the 1999 DOE FEIS for tritium production. The DOE FEIS determined the increase in spent fuel and its impacts to be an issue separate from license renewal. Therefore, although the tritium production option is available to SQN, it has no impact on license renewal decisions. Should TVA decide to produce tritium at SQN, spent fuel would continue to be handled and stored on site at SQN. The increase in spent fuel generated would depend upon the number of TPBARs irradiated. Any necessary adjustment in timing of the ISFSI expansion would be assessed prior to the decision to produce tritium at SQN. The impacts of ISFSI expansion would not differ from those already described in the SQN SEIS.

657BA. Radiological Tritium Monitoring — Page 3-34 states that "An additional groundwater evaluation is planned to further bound tritium concentrations vertically." EPA requests additional discussion on this study in the FSEIS.

Response. FSEIS 3.2.1.3 has been revised with additional information regarding studies to evaluate tritium at SQN.

657BB. Plant Decommissioning — We appreciate that various methods to decommission SQN and the associated radiological/environmental impacts were considered in Section 3.20 of the DSEIS.

Response. Comment noted.



United States Department of the Interior

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ER 10/950
9043.1

December 15, 2010

Amy Henry
NEPA Project Manager
Tennessee Valley Authority
400 West Summit Hill Drive, WT 11D
Knoxville, Tennessee 37902

Re: Comments for the Review of the Draft Supplemental Environmental Impact Statement (DSEIS) for the Sequoyah Nuclear Plant Units 1 and 2 License Renewal, Hamilton County, Tennessee

Dear Ms. Henry:

The United States Department of the Interior (Department) has reviewed the DSEIS for the Sequoyah Nuclear Plant Units 1 and 2 License Renewal in Hamilton County, Tennessee. We offer the following comments.

Chapter 3.0 Affected Environment and Environmental Consequences

General

656C

The DEIS identifies several species – aquatic and terrestrial fauna and endangered and threatened species – that inhabit the proposed new construction site and could be adversely impacted from proposed activities. Suggest the Final EIS include a section with proposed mitigation actions for all proposed construction activities and associated transmission lines that could potentially result in significant impacts to terrestrial and aquatic species.

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656A

The DEIS states that the impact to wetlands from proposed construction activities and associated transmission lines would range from minor to substantial, and that a site-specific environmental review would be conducted. Suggest the Final EIS include the site-specific environmental review; an assessment based on the findings; and identify proposed measures to avoid, minimize,

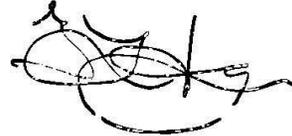
656A | or mitigate impacts. Suggest the review include scientific studies that describe the methods used and success rates of wetland restorations from other similar construction projects.

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656B | The DEIS states that there are no expected substantial impacts on the fish community near the plant. Suggest the Final EIS include an assessment of potential offsite impacts, particularly those associated with any trace elements and industrial chemicals that may be present in the cooling water discharged during regular operation and from planned and accidental discharges.

Thank you for the opportunity to review and comment on the DEIS. If you have questions concerning our comments, please contact Gary LeCain at (303) 236-5050 extension 229 or via email at gdlcain@usgs.gov. I can be reached on (404) 331-4524 or at gregory_hogue@ios.doi.gov.

Sincerely,

A handwritten signature in black ink, appearing to read 'Gregory Hogue', with a stylized flourish at the end.

Gregory Hogue
Regional Environmental Officer

cc: Jerry Ziewitz – FWS
Brenda Johnson – USGS
Dave Vela – NPS
OEPC - Wash

U.S. Department of the Interior Comments and TVA Responses

656C. The DEIS identifies several species — aquatic and terrestrial fauna and endangered and threatened species — that inhabit the proposed new construction site and could be adversely impacted from proposed activities. Suggest the Final EIS include a section with proposed mitigation actions for all proposed construction activities and associated transmission lines that could potentially result in significant impacts to terrestrial and aquatic species.

656A. The DEIS states that the impact to wetlands from proposed construction activities and associated transmission lines would range from minor to substantial, and that a site-specific environmental review would be conducted. Suggest the Final EIS include the site-specific environmental review; an assessment based on the findings; and identify proposed measures to avoid, minimize, or mitigate impacts. Suggest the review include scientific studies that describe the methods used and success rates of wetland restorations from other similar construction projects.

Response (656C and 656A). As described in FSEIS 3.6, common aquatic and terrestrial fauna are present on and near SQN. However, while two federally endangered mussels and one federally threatened plant have been recorded within 6 miles of SQN, FSEIS 3.7.1 states that none of the federally listed species, nor the 11 other state-listed species is present on or adjacent to SQN. Habitat for federally listed and state-listed species is not present on or adjacent to SQN.

Under Alternative 1 — License Renewal, proposed activities would have no effect on listed species or wetland habitat (FSEIS 3.7.2 and 3.4.2, respectively). There are currently no proposed construction sites associated with Alternative 1. No changes to the existing transmission infrastructure would be necessary under Alternative 1. As discussed in the SEIS, the ISFSI would eventually be enlarged to accommodate the increased amount of spent fuel. TVA believes that the ISFSI can be modified without affecting protected species or wetlands. As discussed in the SEIS, an environmental review would be performed prior to any new construction activities to ensure no new issues had developed.

A site to accommodate Alternative 2 would be selected based on system needs, applicable guidance such as NRC Regulatory Guide 4.7, *General Site Suitability Criteria for Nuclear Power Stations* (1998), and TVA procedures, which would include a site-specific environmental review. When planning generating facilities and transmission corridors, TVA uses several criteria to screen sites, including the potential for impacts to wetlands and endangered and threatened species. The environmental review would identify potential impacts to biological resources (FSEIS 2.2.2.1). Mitigation measures would be site and species specific and based on the environmental review.

656B. The DEIS states that there are no expected substantial impacts on the fish community near the plant. Suggest the Final EIS include an assessment of potential offsite impacts, particularly those associated with any trace elements and industrial chemicals that may be present in the cooling water discharged during regular operation and from planned and accidental discharges.

Response. Plant effluent is discharged into Chickamauga Reservoir, which is part of the Tennessee River system. Off-site impacts are possible should trace elements and industrial chemicals be present in toxic concentrations. However, SQN is aware of this potential risk and has standard operating procedures in place to prevent routine and accidental toxic releases. Should an accidental release escape immediate detection, scheduled biomonitoring (voluntarily through TVA's Reservoir Ecological Health monitoring program or regulated by the Clean Water Act) would alert SQN to a problem at which point, mitigation efforts would be undertaken.

A list of types of chemicals currently used in operating plant cooling water systems was included in FSEIS 3.1.4.1. Scale inhibitors, corrosion inhibitors, molluscicides, dehalogenation agents, detoxification agents, and biopenetrants have been approved for use within the facility by the appropriate state and federal regulatory agencies and by qualified TVA personnel that determine the best possible chemicals to use based on site-specific needs.

In accordance with SQN's NPDES permit, a biocide/corrosion treatment plan (B/CTP) annual report was submitted on February 9, 2010, to the Tennessee Department of Environmental Conservation Division of Water Pollution Control. This report provides biomonitoring data from tests conducted during treatments, a summary of all analytical results, the approximate duration in hours of each chemical used, the quantity in pounds of each chemical used, and any minor changes that have occurred in the B/CTP. Based on the analytical and toxicity biomonitoring, the facility maintained compliance with the current NPDES permit in 2010 (FSEIS 3.1.4.1).

Operating SQN has little effect on the chemical composition of the water used for cooling. Comparison of preoperational and post-operational levels of alkalinity as calcium chloride (CaCO₃), nutrients, minerals, and metal concentrations within the reservoir were similar. However, comparisons of intake and discharge water in 1985 revealed measurable differences in sodium, sulfate, and zinc. Although differences were quantifiable, they were not of a magnitude that would change overall water quality, or affect the plant's ability to meet water quality standards, and would not, therefore, reduce habitat quality for reservoir inhabitants. (FSEIS 3.5.2)

Additional sampling in 1988 and 1989 revealed concentrations of aluminum in the diffuser pond that exceed the chronic toxicity level. Lead concentrations also exceeded the chronic toxicity criterion in the diffuser pond in 1989. Whole effluent toxicity analysis was performed to ensure effluent was not toxic to organisms within the reservoir. Most whole effluent toxicity tests failed to identify toxicity. On the few occasions when toxicity was documented, flows in Chickamauga Reservoir were more than sufficient to avoid toxicity in the receiving water. (FSEIS 3.5.2)

Off-site impacts are possible due to accidental discharges. However, SQN has a spill prevention control and countermeasures (SPCC) program for the prevention, management, and cleanup of accidental spills. Adherence to the plan limits the likelihood that oil or chemicals would reach aquatic habitat (FSEIS 3.5.2).

Tennessee water standards are set to ensure that waters do not contain toxic substances whether alone or in combination with other substances that will produce

toxic conditions. The only way to determine the presence of toxic conditions is to monitor effluent with aquatic organisms. SQN follows an NPDES permit that requires routine chronic toxicity assays with *Ceriodaphnia* and fathead minnows to ensure effluent discharged into the reservoir is not toxic.

Because SQN adheres to a rigorous NPDES permit and has programs such as an SPCC and B/CT plans in place, it is unlikely that routine or accidental discharges would measurably degrade water quality in Chickamauga Reservoir.



TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

November 4, 2010

Mr. A. Eric Howard
Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, Tennessee 37902-1499

RE: TVA, DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT, SEQUOYAH
NECLAR PLANT LICENSE,
UNINCORPORATED, HAMILTON COUNTY, TN

Dear Mr. Howard:

At your request, our office has reviewed the above-referenced Draft Supplemental Environmental Impact Statement in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, and in accordance with our previous correspondence, we concur that the project area contains no historic properties eligible for listing in the National Register of Historic Places.

If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.

Your cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jmb

Tennessee Historical Commission Comment and TVA Response

653A. At your request, our office has reviewed the above-referenced Draft Supplemental Environmental Impact Statement in accordance with regulations codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739). Based on the information provided, and in accordance with our previous correspondence, we concur that the project area contains no historic properties eligible for listing in the National Register of Historic Places. If project plans are changed or archaeological remains are discovered during construction, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act. Your cooperation is appreciated.

Response. Concurrence is acknowledged. If project plans are changed or archaeological remains are discovered, the Tennessee Historical Commission will be contacted.

Public Comments and TVA Responses

654A. I. Environmental. Global Warming Impact Study, as part of TVA environmental impact.

.....A. Has TVA done such a study as part of their 'environmental impact study'?

.....1. related to drought conditions which will be brought, have been brought to reactor environments on the Tennessee River i.e. Southeast by increasing Global Warming.

.....a. the amount of water needed by nuclear plants for coolant reduced by global warming drought conditions.

.....1) last summer one of the plants could not operate due to heat of the river water i.e. global warming.

.....2) these conditions, could continue and worsen, thus, disabling nuclear reactors by either lack of water, or river temperatures too hot to operate the reactors (Frank DePinto).

Response. TVA contracted the Electric Power Research Institute (EPRI) to do a study of the effects of climate change on the Tennessee River Valley. In addition, TVA does river operations studies to determine the effects of changes in the river on all the power generators along the Tennessee River. Drought, precipitation, water temperature, and air temperature are all being monitored and studied to ensure SQN can continue to operate within all limits.

As presented in FSEIS 3.1.2, an assessment of potential climate change in the Tennessee Valley suggests that air temperatures could increase 1.4°F (0.8°C) by 2020 and up to 7.2°F (4°C) by the year 2100 for an increase in air temperatures of approximately 3.6°F (2°C) by the end of the 20-year license renewal period (2041) of SQN, and the potential increase in water temperatures in Chickamauga Reservoir could range from 1.0°F (0.5°C) to 2.0°F (1.1°C). Such a temperature rise could impact the operation of both SQN generating units. The facility would have to utilize the helper mode more frequently, and in extreme cases, implement plant derates to maintain compliance with the NPDES permit.

In the operating history of SQN, there has been no need to derate the plant due to thermal limits; the plant is able to meet thermal limits using the existing cooling towers and normal cooling processes.

The comment states that “last summer one of the plants could not operate due to heat of the river water i.e. global warming.” The commenter is probably referring to Browns Ferry Nuclear Plant (BFN), which was derated (i.e., operating at less than maximum levels) for a number of days in summer 2010 (not the entire summer), because of the inability to meet maximum discharge temperature restrictions. This is not indicative of global warming, but is attributable to the design of the plant. The following excerpt from page 1 of the 2010 BFN EA (*Final Environmental Assessment Browns Ferry Nuclear Plant Cooling Towers Addition and Replacements Limestone County, Alabama*) provides further explanation of the situation at BFN:

“BFN currently has six mechanical draft cooling towers. These existing MDCT can only support 69 percent of the heat rejection needs from the three-unit licensed plant. During the hot summer months, this lack of cooling capacity has caused

significant reductions in plant operating power production levels (known as derates), resulting in increased operating costs and lost revenue. During the summer of 2010, derates to below 50 percent power were required at BFN for several days in July and about half of August to meet National Pollutant Discharge Elimination System (NPDES) permit requirements involving maximum allowable water temperature.”

The subsection within FSEIS 3.16.2 titled “Potential for Effects of Climate Change on SQN Operations” presents the potential effects of lack of cooling water or higher water temperatures on the future operation of SQN. Because the duration of license renewal is 20 years, the permanent changes expected in water and air temperature would be very minor. For normal fluctuations in temperature of the water and air, SQN would be expected to continue to operate within all thermal limits.

651A. As a 35.5 year neighbor of the Sequoyah Nuclear Plant living just 1.1 miles from the reactor, I am delighted with the way Tennessee Valley Authority has managed the construction and operation of SNP. There have been no safety concerns on my part during our family's 35.5 years living literally in the shadow of the SNP. Our firstborn was 11 months old when we moved here; our second child was born 16 months later. Due to food allergies, our children drank milk from our goats who were pastured on our land. TVA employees monitor the radiation levels of the grain on which our goats were pastured. As I anticipated, there was no problem with radioactivity in the grass that ultimately produced the milk our children drank. Our kids were healthy as babies and continue to be healthy adults. For 15 years, our water came from a well on our property and we were pleased to drink it until lightning ran in on the pump. At that point, city water was available to us, so we began using city water. We have appreciated the efforts TVA has made to keep the temperature of Chickamauga Lake downstream of SNP at levels for safe for fish and other marine life. Sequoyah Nuclear Plant has contributed to the economic health of the community, metropolitan area, and region for more than 3 decades. I urge the Nuclear Regulatory Commission to extend the license to operate Sequoyah Nuclear Plant for an additional 20 years. Only positive benefits have come from the operation of SNP. The plant is ecologically extremely clean. The nuclear power is reliable. The SNP has been well maintained. Sequoyah Nuclear Plant by all considerations should be able to operate safely and profitably for at least an additional twenty five years beyond its original license designation. I can say this with confidence because I grew up in Oak Ridge, Tn between 1940 and 1958, obtained a M.S. degree in Radiation Biology, and worked at the Biology Division of Oak Ridge National Laboratory during the latter part of the 1960's. (Diane Goins)

Response. Comment noted.

318A. Instead of dedicating time and energy to nuclear power, TVA should research and implement cleaner, alternative energy sources (Erin Ouzts).

Response. TVA has evaluated and continues to evaluate other clean alternative energy sources. Wind and solar facilities are part of TVA's mix of generating sources.

Additional information on TVA's mix of generating technologies is available in Chapter 5 of TVA's recently published Integrated Resource Plan (Final, March 2011).

TVA uses clean, renewable alternative energy sources such as solar and wind where feasible. Clean and renewable energy sources are expected to play a larger role in the overall TVA strategy for power generation in the future.

318B. I would like to voice my opinion that TVA should not renew its licenses to operate Sequoyah Nuclear Plant. There still is no viable long-term storage plan for nuclear waste. This problem continues to be overlooked, but it is a very serious issue that should no longer be ignored. Can we really guarantee that we can safely store this waste into perpetuity? Sure, it may be better than burning coal in the short-term, but is it really better in the long-term if the earth is covered in radioactive waste? (Erin Ouzts)

Response. Since the 1980s, various entities and scientific communities have invested large amounts of time and money to address the long-term permanent storage need for radioactive waste. On the world scale, there are many options to safely store radioactive waste, and the list continues to grow; for example, new reactor designs to burn-up more of the fuel, encapsulation of waste in ceramics, and options for reprocessing and separation of the radioactive waste. New options are not being overlooked, but implementation is being delayed by such things as diverse political opinions as well as the expensive investment to bring some of the new technology to a larger scale.

Radioactive waste is an important consideration for all of the nuclear fields: power reactors, medical uses, and industry. For the purposes of SQN license renewal, the waste issue has been determined to be important, but manageable. As provided in the FSEIS 2.2.1 subsection titled **Waste**, the issue of radioactive waste for SQN falls within the “Waste Confidence” of the Nuclear Regulatory Commission (NRC), and the radioactive waste from this facility can be safely and properly stored far beyond the lifetime of the plant.

The NRC’s Waste Confidence Rule, found in 10 CFR 51.23, and the NRC’s response to this issue states that

“The Commission has made a generic determination that, if necessary, 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 at its spent fuel storage basin or at either onsite or offsite independent spent fuel storage installations. Further, the Commission believes there is reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time.”

“The staff is confident that there will eventually be a licensed high-level waste repository. If the site near Yucca Mountain is eventually found to be unsuitable, alternative sites will be considered. Until a permanent high-level waste repository is operational, the spent nuclear fuel will be safely stored either onsite or at offsite interim storage facilities.” (NRC 2010) U.S. Nuclear Regulatory Commission. Staff Requirements Memorandum. SECY-09-0090 — Final Update of the Commission’s Waste Confidence Decision. September 15, 2010. <http://www.nrc.gov/reading->

rm/doc-collections/commission/srm/meet/2010/m20100915.pdf. Accessed September 30, 2010.

The DOE is ultimately responsible for the spent fuel and is mandated to find a way to permanently dispose of the spent fuel. Until the DOE can take possession, the spent fuel can be safely stored in the ISFSI facilities at SQN.

655A. Do you know if any public health studies have been done for the area around the plant? If they are referenced in the document, where would I find that? (Don Safer)

Response. Although not referenced in the draft SEIS, the National Cancer Institute (NCI) looked at cancer risks in areas surrounding U.S. nuclear facilities and published the results in 1991. Sequoyah Nuclear Plant was included in that report. A fact sheet concerning the NCI report is incorporated in this appendix following the comment responses. Additionally, the Nuclear Regulatory Commission asked the National Research Council and Institute of Medicine to carry out a state-of-the-art study to enable it to update the NCI information.

FSEIS 3.17 describes the radiological environmental monitoring program (REMP) implemented at the plant. The REMP design is based on the regulatory guidance in NRC Regulatory Guide 4.1 and NUREG-1301 and NUREG-1302.

There have been numerous studies performed in the United States, Canada, and Great Britain that found no correlation between nuclear power plants and cancers. The Nuclear Energy Institute (NEI) has a fact sheet summary of these studies posted on its website. The NEI fact sheet can be accessed at <http://www.nei.org/resourcesandstats/documentlibrary/safetyandsecurity/factsheet/safetystudiespublicworkers/?page=2>.

670A. The summary states that TVA wants to support efforts to reduce the greenhouse gas emissions of its generating system. However, renewing this license will do nothing to further reduce greenhouse gases in the TVA system, as it will simply continue any existing emissions now coming from Sequoyah. Discontinuing operation of a coal-fired power plant will definitely reduce emissions, but not continuing ongoing operation of Sequoyah. This cannot be used as a justification to renew the SQN license. Further, SQN itself may not be a significant source of pollutants, but the mining, enriching and transporting the fuel is. Discontinue the nuclear plant operation and all that pollution in the fuel chain and its associated health problems also ends. This is a reason not to relicense and should be corrected in the report in Table 2-1 under air emissions. (Sandra Kurtz, Bellefonte Environmental Sustainability Team)

Response. Pertinent discussion in FSEIS 3.16.2 has been added and clarified. SQN operations currently directly offset about 16 million tons of GHGs that would otherwise most likely be produced annually from coal-fired sources. In order to supply the required power that TVA customers need, TVA must continue to generate electricity. If SQN does not continue to operate, then additional generation will be required from new facilities and increased generation from existing facilities would occur. Among the alternatives in this SEIS, at a minimum in terms of the life-cycle effects, renewal of the SQN license and continued operation of SQN avoids the greenhouse gas emissions that would be generated by the construction and operation of new generating facilities needed to supply power if SQN was not operating, particularly if those new facilities were fossil fueled. Relative savings in

GHG emissions would likely be less in comparison to the natural gas-fired alternative than that for a new nuclear facility.

670B. Ever increasing maintenance requires shutdowns that eventually translate into unreliability. Sixty years of operation for any plant is too long to guarantee safety without replacement of much of the infrastructure itself. Despite the statements in this report about how reliable nuclear power is, we have already seen leakage from old pipes, inadvertent tritium leaks, breakage of supporting struts, crumbling of concrete, and fires from aging electrical wiring not to mention radiation leaks or risk of malfunction that leads to meltdown. (Sandra Kurtz, Bellefonte Environmental Sustainability Team)

Response. The nuclear fleet of plants in the United States and world-wide has actually seen an increase in plant reliability in the last decade or more. SQN current capacity factor is above 90 percent, which is excellent for any type of power facility.

Aging analysis is an extensive process that all nuclear plants undergo continually. For SQN to get a license renewal, it will submit to the NRC an extensive application that addresses the plant components and structures to verify that they indeed can continue to be operated safely.

While there have been a few instances of pipe leaks, these instances are thoroughly evaluated and corrected. The NRC regulation and oversight helps ensure that nuclear plants, including SQN, operate safely with minimal environmental risks.

SQN submits the application for license renewal to the NRC. NRC evaluates the application to ensure SQN can be operated safely during the license renewal period, and the license renewal is approved or rejected, based on NRC guidelines.

670C. Extending SQN operation means more radioactive waste. As is noted in the report, planning for extended onsite storage space will be required. Other designated places for permanent storage are unlikely leaving us with the liability of monitoring and caring for a waste site where the radiation lasts longer than the life of the casks in which it will be stored. I see no consideration of waste legacy and responsibility to future requirements associated with this waste. After decommissioning, who bears responsibility and who pays the cost? (Sandra Kurtz, Bellefonte Environmental Sustainability Team)

Response. The permanent disposal of spent fuel is the responsibility of the U.S. Department of Energy. Currently, spent fuel is being temporarily stored on site in the spent fuel pools and in the ISFSI. The spent fuel can be safely stored in the ISFSI for at least 60 years after SQN is shut down, even after the license renewal period. (NRC 2010) U.S. Nuclear Regulatory Commission. Staff Requirements Memorandum. SECY-09-0090 – Final Update of the Commission's Waste Confidence Decision. September 15, 2010. <http://www.nrc.gov/reading-rm/doc-collections/commission/srm/meet/2010/m20100915.pdf>. Accessed September 30, 2010.

This plan for disposal of spent fuel applies if the SQN plant is decommissioned, unless the Department of Energy takes possession of the spent fuel before decommissioning is completed.

As provided in the FSEIS 2.2.1 subsection entitled **Waste**, the issue of radioactive waste for SQN falls within the “Waste Confidence” of the Nuclear Regulatory Commission, and the radioactive waste from this facility can be safely and properly stored far beyond the lifetime of the plant. Also in FSEIS 2.2.1, the subsection entitled **Uranium Usage and Spent Fuel** provides additional information on spent fuel storage. As mentioned in the DSEIS, the Environmental Assessment entitled, “Environmental Assessment and Finding of No Significant Impact – Independent Spent Fuel Storage Installation Sequoyah Nuclear Plant” is available publicly for additional information on the fuel storage issue.

670D. In this report, there was no consideration of solar and wind power as an alternative action dismissing both as requiring too much land. Working through Generation Partners or other programs, electrons could be collected from numerous rooftops and parking lots across the Tennessee Valley eliminating the need for SQN relicensing or the building of any new power plants. This system could be put in place sooner than 2021 as well. This report says indicates that there is not enough solar output in this area, but Germany relies heavily on solar and is phasing out its nuclear program. Before relicensing SQN this alternative should be seriously considered as a way to avoid the dangers and cost of nuclear power while replacing the same amount of power generation. (Sandra Kurtz, Bellefonte Environmental Sustainability Team)

Response. FSEIS 2.1.1.3 and 2.1.1.4 discuss wind and solar. Land requirements were just one of the reasons wind and solar were not considered feasible alternatives (e.g., 103,000 acres required for a photovoltaic solar project that would provide generating capacity similar to SQN). Availability of wind and solar energy is another major factor in the TVA region. Capacity factors in the 20 to 40 percent range for wind and in the 10 percent range for solar make them very inefficient. Individual home-type solar systems have been studied and are very expensive. Power storage is still in need of further development.

In the SQN SEIS, solar and wind were not identified as feasible alternatives to continuing to operate SQN because those technologies did not meet the criteria established in FSEIS 2.1. Solar, wind, and other renewable sources are incorporated in TVA’s current and future power generation plans — TVA has recently issued the final 2011 Integrated Resource Plan Environmental Impact Statement (IRP EIS). In this IRP EIS Chapter 5, TVA describes the contribution of solar and wind generation capacity to TVA’s overall strategy for meeting the energy needs of the Tennessee Valley.

670E. Table 3-2 shows Ecological Health Indicator measurements for certain parts of the Chickamauga Reservoir, but do not show any direct measurements around SQN itself. Further, we only see averages here when, in fact, it is the extremes that have the most impact on biota. Has there been any measurement of the drift community, its patterns of biodiversity and a comparison of populations in and outside of the thermal plume? Further, are you measuring for radionuclides in fish or benthic macroinvertebrates? This would give us a better picture of direct SQN environmental impacts on aquatic species. (Sandra Kurtz, Bellefonte Environmental Sustainability Team)

Response. In the SEIS, Table 3-2 depicts Ecological Health Indicator measurements for Chickamauga Reservoir. Aquatic biota, including fish, macroinvertebrates, and plankton are discussed in depth in FSEIS 3.5. Both fish and macroinvertebrate communities are sampled at TRM 490.5 (upstream) and 482.0 (downstream) of SQN (Tables 3-11 and 3-12) to detect possible impacts to the biota possibly caused by SQN operation. Plankton studies at the discharge are also included in the section.

Radiological — FSEIS 3.17 provides a discussion of the radiological environmental monitoring program that is being continuously conducted at SQN. All types of organisms and representative plant life are sampled in areas of direct influence from SQN and at control locations. These ongoing program results are reported annually in the Annual Radiological Environmental Operating Reports (AREOR) provided to the NRC, and the program will continue throughout the operational life of the plant. FSEIS Table 3-42 provides the minimum requirements of environmental monitoring such as water, sediments, fish, organisms, garden crops, etc. that are sampled regularly as necessary to cover all potential pathways for people and animals to be impacted by radioactive releases. General results are provided in the FSEIS, and annual reports are available from the NRC.

670F. The report states, “By maintaining radioactive gaseous releases within regulatory limits, the impact to the public would be minor”. However, according to EPA, there is no acceptable dose of radiation. Over the years, the impact of small releases is cumulative. This report has not adequately addressed the health impacts of waste storage and cumulative impacts of radwaste and so-called ‘minor’ impacts. Another 20 years only adds to health concerns for people living nearby. (Sandra Kurtz, Bellefonte Environmental Sustainability Team)

Response. TVA adheres to the as low as reasonably achievable (ALARA) principle. Releases are always within the limits provided in federal regulation and as low as reasonably possible.

The process of radioactivity accumulating over years is an issue that TVA addresses in all procedures and programs. The radiological environmental monitoring program (REMP) assesses for cumulative effects, and none have been detected in the environment surrounding SQN. Radioactive particles are continually undergoing radioactive decay and would be cumulative only over periods within the radioactive half lives and actually would find a maximum value that balances production (deposition) and decay of the particles (known as equilibrium). No radioactive particles have been found in the environment attributable to SQN, and the REMP is in place to find those cumulative impacts if they were to occur. Radioactive particles with extremely long half lives that are highly radiotoxic are not routinely released from SQN.

FSEIS 3.17.1 covers the actual calculated doses from gaseous releases. It discusses the total dose to the entire population within 50 miles of SQN. It also discusses background radiation and the potential exposure pathways for the public.

Doses at the exclusion area boundary as well as doses to hypothetical individual members of the public are also provided.

Discussion of the radiological impact on gaseous influences includes federal regulation and limits under which SQN must operate.

Doses from gaseous releases were provided for the years 2004 – 2008 for gamma air, beta air, total body, skin, child thyroid, and child total body.

Discussion on radiation dose to biota is also provided. The determination has been made that there is no significant impact on the biota surrounding SQN. The REMP monitors for cumulative impacts, and if there is any detection of radioactive materials in the environment, then the programs would be reviewed and release limits changed as directed by NRC or state agencies to protect any biota.

A statement by EPA that there is no acceptable dose of radiation could not be located.

755A. Enjoyed talking with you at the Public Meeting held last evening regarding the Draft Supplemental EIS on Sequoyah Nuclear Plant Units 1 and 2 License Renewal. I appreciate your interest in the concern that I have about whether or not adequate consideration is being given to the potential impact that rail traffic, going to and from the new Volkswagen plant, on the Norfolk Southern line (that bridges the Tennessee River just below Chickamauga Dam and runs through Hixson and Soddy-Daisy) may have on existing emergency evacuation plans for the Hixson and Soddy-Daisy areas. As I mentioned, there are a lot of heavily used “at grade” crossings in those areas: Hamill Road, Old Hixson Pike, Lower Mill Road, Sandwitch Road, West Boy Scout Road, Thrasher Pike, and Harrison Lane at Daisy Dallas Road. The expected super-long length (as much as two miles long) of trains serving the VW plant and perhaps also there being a greater number of trains could cause delays and frustrations on a daily basis for motorists and could potentially create a barrier for residents trying to evacuate in the event of an emergency at Sequoyah or elsewhere in the area. (For example, residents in the D-5 Sector – which includes me - of the Sequoyah evacuation plan are instructed to take “the most direct route from your location to US 27” and the Norfolk Southern railroad is between those residents and US 27.) I hope plans and funding are being put into place by local and state governments to construct overpasses to replace the “at grade” crossings, but I am not aware of any such plans and it seems certain that even if there may be such planning underway, overpasses will not be constructed in time to prevent the traffic problems from occurring, thereby prompting the need to re-examine emergency evacuation plans to take account of the expected change in circumstances.

An article titled “VW rail link chugging along” in the September 17, 2010 edition of the Chattanooga Times Free Press states that 9 of every 10 vehicles assembled at the VW plant (150,000 vehicles, initially and perhaps more later, are expected to be assembled there annually) will leave the plant by rail, using both Norfolk Southern and CSX lines, and that other companies at Enterprise South Industrial Park will also use rail. The article mentions improvements to railroad overpasses and lines in the vicinity of the VW plant, but mentions no such improvements being made or planned on the north side of the river. You can view the article at <http://www.timesfreepress.com/news/2010/sep/17/vw-rail-link-chugging-along/>. A Norwegian company, Wallenius Wilhelmsen Logistics, will ready the vehicles to be loaded onto trains and provide outbound rail yard management at the VW assembly plant. See article at <http://www.timesfreepress.com/news/2010/apr/07/norwegian-firm-to-run-vw-rail-yard/>. An article about the City of Chattanooga closing Noah Reid Road at Shallowford Road mentions that trains servicing the Volkswagen plant could be as much as two miles long. That article can be viewed at <http://www.timesfreepress.com/news/2010/apr/15/road-closed-for-vw-rail/>.

I appreciate your willingness to make some inquiries about this matter and any information that you could pass along to me that would provide some reassurance that the issue has been recognized and is being capably addressed by the proper authorities would be welcome. (Linda Hixon)

Response. TVA has prepared an Emergency Plan that is updated on an annual or biannual basis, taking into account changes in population in the emergency planning zone (EPZ) as well as changes that may have occurred in road construction, new industries, etc. In addition, the Tennessee Emergency Management Agency (TEMA) has responsibility for emergency planning off site of SQN. TVA contacted TEMA concerning this comment and the effect that the new Volkswagen (VW) plant may have on emergency planning for the SQN plant.

TEMA will be performing an update of the SQN Evacuation Time Estimates (ETEs) upon receipt of the 2010 census data. TEMA confirmed that the impact of the VW plant on ETEs for SQN is believed to be minor due to the fact that primary evacuation is the new I-75 exit and the fact that the majority of the VW plant is outside the 10-mile emergency planning zone (EPZ).

Specifically related to any increase in area rail traffic due to the VW plant, TEMA procedurally stops all rail traffic in and around the EPZ upon declaration of a Site Area Emergency classification or above. Rail traffic is cleared prior to the issuance of an evacuation order; therefore, the additional railroad traffic is not an impact on the SQN ETEs.

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No Excess Mortality Risk Found in Counties with Nuclear Facilities

A [National Cancer Institute](#) (NCI) survey published in the *Journal of the American Medical Association*, March 20, 1991, showed no general increased risk of death from [cancer](#) for people living in 107 U.S. counties containing or closely adjacent to 62 nuclear facilities. The facilities in the survey had all begun operation before 1982. Included were 52 commercial nuclear power plants, nine Department of Energy research and weapons plants, and one commercial fuel reprocessing plant. The survey examined deaths from 16 types of cancer, including [leukemia](#). In the counties with nuclear facilities, cancer death rates before and after the startup of the facilities were compared with cancer rates in 292 similar counties without nuclear facilities (control counties).

The NCI survey showed that, in comparison with the control counties, some of the study counties had higher rates of certain cancers and some had lower rates, either before or after the facilities came into service. None of the differences that were observed could be linked with the presence of nuclear facilities. "From the data at hand, there was no convincing evidence of any increased risk of death from any of the cancers we surveyed due to living near nuclear facilities," said John Boice, Sc.D., who was chief of NCI's [Radiation Epidemiology](#) Branch at the time of the survey.

He cautioned, however, that the counties may be too large to detect risks present only in limited areas around the plants. "No study can prove the absence of an effect," said Dr. Boice, "but if any excess cancer risk due to radiation pollution is present in counties with nuclear facilities, the risk is too small to be detected by the methods used."

The survey, conducted by Seymour Jabon, Zdenek Hrubec, Sc.D., B.J. Stone, Ph.D., and Dr. Boice, was begun in 1987 for scientific purposes in response to American public health concerns, and after a British survey of cancer mortality in areas around nuclear installations in the United Kingdom showed an excess of childhood leukemia deaths near some facilities.¹ No increases in total cancer mortality were found in the British study, and other smaller surveys of cancer deaths around nuclear facilities in the United States and the United Kingdom have yielded conflicting results.

The NCI [scientists](#) studied more than 900,000 cancer deaths in the study counties using county mortality records collected from 1950 to 1984. The researchers evaluated changes in mortality rates for 16 types of cancer in these counties from 1950 until each facility began operation and from the start of operation until 1984. For four facilities in two states (Iowa and Connecticut), cancer [incidence](#) data were also available. Data on cancer incidence in these counties resembled the county's mortality data patterns.

For each of the 107 study counties, three counties that had populations similar in income, education, and other socioeconomic factors, but did not have or were not near nuclear facilities, were chosen for comparison. The study and control counties were within the same geographic region and usually within the same state. Over 1.8 million cancer deaths were studied in the control counties.

The numbers of cancer deaths in the study counties and in the control counties were analyzed and compared to determine the relative risk (RR) of dying of cancer for persons living near a nuclear facility. A relative risk of 1.00 means that the risk of dying of cancer was the same in the study and control counties; any number below 1.00 indicates that the overall risk was lower in the study county than in the control county; and any number greater than 1.00 indicates a higher risk in the study county. For example, an RR of 1.04 would indicate that there was a 4 percent higher risk of cancer death in the study county. Conversely, an RR of 0.93 would indicate a 7 percent lower risk in the study county.

For childhood leukemia in children from birth through age 9 years, the overall RR comparing study and control counties before the startup of the nuclear facilities was 1.08; after startup the RR was 1.03. These data indicate that the risk of childhood leukemia in the study counties was slightly greater before startup of the nuclear facilities than after. The risk of dying of childhood cancers other than leukemia increased slightly from an RR of 0.94 before the plants began operation to an RR of 0.99 after the plants began operating.

For leukemia at all ages, the RRs were 1.02 before startup and 0.98 after startup. For other cancer at all ages, the RRs were essentially the same: 1.00 before startup and 1.01 after startup. These results provide

no evidence that the presence of nuclear facilities influenced cancer death rates in the study counties.

**Questions and Answers
National Cancer Institute (NCI) Survey
Cancer Mortality in Populations Living Near Nuclear Facilities**

1. Which nuclear facilities were included in the survey?

Only major nuclear facilities that are or once were in operation and went into service before 1982 were included in the survey. All 52 commercial nuclear power facilities in the United States that started before 1982 were included. A facility may include more than one reactor.

In addition to the commercial nuclear power facilities, nine U.S. Department of Energy (DOE) nuclear installations and one commercial fuel reprocessing plant were included. These facilities do not generate electrical power for commercial use.

Facilities such as small research reactors at universities were not included. See the [Appendix](#) for a complete list of facilities.

2. Why were the DOE facilities included?

In the British study that helped to prompt this survey, an excess of childhood leukemias was found mainly around nuclear installations that were involved in the enrichment, fabrication, and reprocessing of nuclear fuel or research and development of nuclear weapons. The DOE facilities included in the study are similar to these British facilities.

Also, some DOE installations have been operating since 1943, which is longer than any commercial nuclear power plant in the United States. The first commercial nuclear power plant began operation in 1957.

The DOE facilities were evaluated both as part of the total group of nuclear facilities and separately.

3. Which counties were included in the survey?

All counties with a major nuclear facility that is or once was in operation and went into service before 1982 were included in the survey as study counties. Other adjacent counties that contain one-fifth of the land that lies within a 10-mile radius of these facilities were also included as study counties. In total, 107 counties were identified as study counties. See the [Appendix](#) for a complete list.

For each study county, three control counties within the same geographic region that do not have or are not near nuclear facilities were identified for comparison. Control counties were chosen that were the most similar to study counties based on population size and socioeconomic characteristics such as race and income.

4. What were the 16 types of cancer surveyed?

The following 16 types of cancer were surveyed: leukemia; all cancers other than leukemia (as a group); Hodgkin lymphoma; lymphomas other than Hodgkin lymphoma; multiple myeloma; cancers of the digestive organs (as a group and separately), including cancer of the stomach, colon and rectum, and liver; cancer of the trachea, bronchus, and lung; female breast cancer; thyroid cancer; cancer of the bone and joints; bladder cancer; brain and other central nervous system cancer; and other benign or unspecified tumors.

5. Why was childhood leukemia a special focus of the analysis?

The excess risk identified in the British study pertained to leukemia deaths among persons under the age of 25. Leukemia is one of the major cancers induced by high doses of radiation and may occur as soon as 2 years after exposure. Other cancers associated with high-dose radiation may not develop until 10 years after exposure.

Studies have also suggested that children are more sensitive to the cancer-producing effects of radiation than adults. Children may spend more time in and around the home than parents, whose jobs may take them to other areas. They are also more likely to come in close contact with the soil, upon which radioactive releases may have been deposited following discharges from the facilities.

6. Why were cancer deaths (mortality) compared instead of the number of cancer cases that occurred (incidence)?

Although data on cancer incidence (the number of newly diagnosed cases in a given period of time) could provide a more complete evaluation of the possible impact of living near nuclear facilities, cancer incidence data for the entire Nation do not exist. The reporting of county mortality data by state provides nationwide data that can show important geographic and time-related patterns of cancer. In past NCI studies, mortality data have proven useful in developing clues about the causes of cancer and in targeting areas for future research.

Cancer incidence data were available in two states (Iowa and Connecticut) for four facilities. The

cancer registries that provided this information were among those that participate in the NCI Surveillance, Epidemiology, and End Results Program and are of high quality. Survey results using cancer incidence data resembled results using cancer mortality data.

7. Did any individual county or plant have an excess risk of cancer death?

Overall, the risks for childhood leukemia, adult leukemia, and all cancers were about the same in the counties with nuclear installations as in the control counties. The areas around some facilities appeared to have higher risks of leukemia while others had lower risks. Generally, however, the differences are not large and are consistent with the random variations seen when making many comparisons based on geographic data.

The county surrounding the Millstone Power Plant located in New London, Connecticut, had a significant excess of cases of leukemia in children under 10 years of age (shown in incidence statistics) in comparison to its control counties. The RR was 3.04 after startup of the facility. Upon review, the excess risk shown using incidence data arose partly from comparison with significantly low cancer rates in the control counties rather than from a high rate in the study county.

No other excesses of childhood leukemia were found that could be linked to any of the nuclear facilities. Further, three facilities—San Onofre in Orange County and San Diego County, California; Quad Cities in Rock Island County and Whiteside County, Illinois; and Vermont Yankee in Windham County, Vermont—were marked by significant deficits in the RR for leukemia death at 10 to 19 years of age. The RRs were 0.75, 0.24, and 0.09, respectively.

8. Is it possible that "chance" could explain some of the high or low relative risks observed in the survey?

Due to the large scope of the study and the many comparisons made, it could be expected that a number of "statistically significant" increased or decreased RRs would be observed due to chance alone. Further, significant variations in rates might also result from underlying differences in other cancer risk factors that have nothing to do with the presence of nuclear facilities. The prevalence of important risk factors, such as cigarette smoking and diet, might be the cause of many of the observed differences in cancer rates between study and control counties. As expected, comparisons of cancer rates in study and control counties showed substantial variation, but there was no general tendency for cancer rates to be higher after nuclear facilities began operating than before operation began.

9. Did the counties with DOE facilities, individually or as a group, have an increased risk of cancer for the surrounding counties?

The findings for the DOE facilities were similar to those for the electricity-generating plants. There was no overall suggestion of cancer excesses that could be attributed to the presence of the DOE nuclear facilities. The lone commercial fuel reprocessing plant was included in the overall evaluation of DOE facilities.

For these counties, the RRs for childhood leukemia (ages birth to 9 years) were 1.45 before the facilities began operation and 1.06 after opening. For all other childhood cancers, the RRs were 1.06 and 0.95 before and after operation began, respectively. For leukemia at all ages, the RRs were 1.07 before startup and 0.96 after startup. For other cancer at all ages, the RRs were essentially the same, 1.06 before startup and 1.04 after startup.

10. Why was the study based on the county as the geographic unit?

The data for a study based on counties were readily available for the entire United States. NCI and the U.S. Environmental Protection Agency have prepared detailed data on cancer mortality by county since 1950. Population data, which are needed to calculate cancer rates, are also available by county. Thus, the county was the smallest geographic unit for which nationwide data could be quickly evaluated.

11. Have similar county-based studies been valuable in the past?

Yes, surveys using methods that analyze county mortality patterns have been used effectively several times by NCI. Based on findings from NCI "cancer maps" constructed from county mortality statistics, a clustering of lung cancer deaths was seen among residents of counties along the southern Atlantic coast. Across the United States, counties with shipyard industries were found to have elevated rates of lung cancer deaths, particularly in men. Subsequent indepth studies of the high-risk areas linked the excess lung cancer deaths to asbestos and cigarette smoke exposure in shipyards, especially during World War II.

In another study, mortality rates from lung cancer were found to be elevated among men and women living in counties with smelters and refineries that emitted arsenic. A previous NCI study had shown arsenic to cause lung cancer in smelter workers who were heavily exposed to the substance. Further analytical study of counties with smelters showed an elevated risk of lung cancer associated with residential exposure to arsenic released by smelters into the local environment.

The county mortality surveys are often considered a first step toward directing future research

efforts. These surveys also have their limitations. The county may be too large to detect risks present only in limited areas, death certificates are sometimes not accurate regarding the actual cause of death, and exposures to individuals are unknown.

12. Would a study based on smaller geographic units be feasible?

Mortality and population data are not available on a national basis for areas smaller than counties. The data required for studies of small areas, such as cities or neighborhoods, are collected at the state or local level when they are available.

Using the existing county mortality data, the survey took 3 years to complete. A national survey using data for areas smaller than counties would take much longer.

13. Were the study design and results reviewed?

In addition to internal review, the design of the study was evaluated by an expert team of scientists from outside the U.S. Government who also reviewed the entire intramural research program of the Radiation Epidemiology Branch in the Division of Cancer Etiology (DCE), NCI.

Because of the importance of clarifying any potential health hazards associated with living near nuclear facilities, a special advisory group was also established to help evaluate the study results. The advisory group consisted of selected members of DCE's Board of Scientific Counselors as well as other scientists from outside the U.S. Government with expertise in radiation epidemiology.

14. What levels of radiation might be expected from the normal operation of most of the nuclear facilities studied?

Reported radioactive releases from monitored emissions of nuclear facilities in the United States show very low radiation exposure to the surrounding populations. Maximum individual radiation doses from these plants are reported to be less than 5 millirem annually, or less than 5 percent of what is received annually from natural background sources of radiation, such as cosmic rays and radon. Levels this low are believed to be too small to result in detectable harm. However, there have been high releases of radioactive emissions from some facilities, such as the Hanford facility (Benton, Franklin, and Grant Counties, Washington).

It is important to distinguish between a major release of radioactivity from a reactor accident, such as the accident at Chernobyl in the former Soviet Union, and the small amounts of radiation that are likely to be emitted by nuclear facilities under normal operation.

15. Will there be more research on the possible hazards of living near nuclear facilities?

The NCI county mortality survey is only the initial step in evaluating the possible hazards of living near nuclear facilities. The study provides background information that will complement that from other studies being conducted or planned by the Centers for Disease Control and Prevention, various state health departments, and other groups. Information gained from this survey and other ongoing projects will guide future research efforts.

In its consensus statement, the ad hoc advisory committee that reviewed and evaluated this study has also recommended areas for further research.

The complete three-volume report titled *Cancer in Populations Living Near Nuclear Facilities* can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325. The GPO stock number is 017-042-00276-1.

**Appendix
Facilities and Counties Included in the Study**

State	County	Study Facility	Year of Startup
Alabama	Houston	Farley	1977
	Lawrence	Browns Ferry	1973
	Limestone	Browns Ferry	1973
Arkansas	Pope	Arkansas	1974
California	Amador	Rancho Seco	1974
	Humboldt	Humboldt Bay	1963
	Orange	San Onofre	1967
	Sacramento	Rancho Seco	1974
	San Diego	San Onofre	1967
	San Joaquin	Rancho Seco	1974
Colorado	Boulder	Fort St. Vrain	1976
		*Rocky Flats	1953
	Jefferson	*Rocky Flats	1953
	Larimer	Fort St. Vrain	1976

	Weld	Fort St. Vrain	1976
Connecticut	Middlesex	Haddam Neck	1967
	New London	Millstone	1970
Delaware	New Castle	Salem	1976
Florida	Citrus	Crystal River	1977
	Dade	Turkey Point	1972
	St. Lucie	St. Lucie	1976
Georgia	Appling	Hatch	1974
	Burke	*Savannah River	1950
	Early	Farley	1977
	Toombs	Hatch	1974
Idaho	Bingham	*Idaho National Engineering Lab.	1949
	Butte	*Idaho National Engineering Lab.	1949
	Jefferson	*Idaho National Engineering Lab.	1949
Illinois	Grundy	Dresden	1960
	Lake	Zion	1972
	Rock Island	Quad Cities	1972
	Whiteside	Quad Cities	1972
	Will	Dresden	1960
Iowa	Benton	Duane Arnold	1974
	Harrison	Fort Calhoun	1973
	Linn	Duane Arnold	1974
Kentucky	Ballard	*Paducah Gas. Diff.	1950
	McCracken	*Paducah Gas. Diff.	1950
Maine	Lincoln	Maine Yankee	1972
	Sagadahoc	Maine Yankee	1972
Maryland	Calvert	Calvert Cliffs	1974
Massachusetts	Berkshire	Yankee Rowe	1960
	Franklin	Vermont Yankee	1972
	Plymouth	Yankee Rowe Pilgrim	1960 1972
Michigan	Berrien	Cook	1975
	Charlevoix	Big Rock Point	1962
	Emmet	Big Rock Point	1962
	Monroe	Fermi	1963
	Vanburen	Palisades	1971
Minnesota	Goodhue	Prairie Island	1973
	Sherburne	Monticello	1971
	Wright	Monticello	1971
Missouri	Atchinson	Cooper Station	1974
Nebraska	Gage	Hallam	1962
	Lancaster	Hallam	1962
	Nemaha	Cooper Station	1974
	Richardson	Cooper Station	1974
	Washington	Fort Calhoun	1973
New Hampshire	Cheshire	Vermont Yankee	1972
New Jersey	Ocean	Oyster Creek	1969
	Salem	Salem	1976
New York	Cattaraugus	**Nuclear Fuel Services	1966
	Oswego	Nine Mile Point/Fitzpatrick	1969
	Rockland	Indian Point	1962
	Wayne	Ginna	1969
	Westchester	Indian Point	1962
North Carolina	Brunswick	Brunswick	1975
	Gaston	McGuire	1981
	Lincoln	McGuire	1981
	Mecklenburg	McGuire	1981
	Butler	*Fernald *Mound	1951 1947

Ohio	Hamilton	*Fernald	1951
	Montgomery	*Mound	1947
	Ottawa	Davis Besse	1977
	Pike	*Portsmouth Gaseous Diffusion	1952
	Warren	*Mound	1947
Oregon	Columbia	Trojan	1975
Pennsylvania	Beaver	Shippingport/Beaver Valley	1957
	Dauphin	Three Mile Island	1974
	Lancaster	Peach Bottom	1974
	York	Three Mile Island	1974
		Peach Bottom	1974
South Carolina	Aiken	*Savannah River	1950
	Barnwell	*Savannah River	1950
	Chesterfield	Robinson	1970
	Darlington	Robinson	1970
	Oconee	Oconee	1973
	Pickens	Oconee	1973
South Dakota	Lincoln	Pathfinder	1964
	Minnehaha	Pathfinder	1964
Tennessee	Anderson	*Oak Ridge	1943
	Hamilton	Sequoyah	1980
	Roane	*Oak Ridge	1943
Virginia	Caroline	North Anna	1978
	Hanover	North Anna	1978
	Isle of Wright	Surry	1972
	Louisa	North Anna	1978
	Surry	Surry	1972
Vermont	Windham	Vermont Yankee	1972
Washington	Benton	*Hanford	1943
	Cowlitz	Trojan	1975
	Franklin	*Hanford	1943
	Grant	*Hanford	1943
Wisconsin	Kenosha	Zion	1972
	Kewaunee	Kewaunee	1973
		Point Beach	1970
		Kewaunee	1973
	Manitowoc	Point Beach	1970
	Pierce	Prairie Island	1973
Vernon	La Crosse (Genoa)	1967	
West Virginia	Hancock	Shippingport/Beaver Valley	1957

*Department of Energy Facility

**Commercial fuel reprocessing plant

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Related NCI materials and Web pages:

- [Radioactive I-131 from Fallout Web Page](http://www.cancer.gov/cancertopics/causes/i131)
(<http://www.cancer.gov/cancertopics/causes/i131>)

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¹"Cancer Near Nuclear Installations," David Forman, Paula Cook-Mozaffari, Sarah Darby, et al. *Nature*, October 8, 1987.

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