

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of

TENNESSEE VALLEY AUTHORITY

(Clinch River Nuclear Site Early Site Permit  
Application)

Docket No. 52-047-ESP

**ORDER**  
**(Setting Deadline for Proposed Transcript Corrections)**

The Commission held an evidentiary hearing on August 14, 2019, at its Rockville, Maryland headquarters to receive testimony and exhibits in the uncontested portion of the captioned proceeding. The hearing transcript is appended to this Order. Pursuant to my authority under 10 C.F.R. § 2.346(a) and (j), the parties may file any proposed transcript corrections no later than **August 26, 2019**. The parties may coordinate their responses and file a joint set of corrections.

IT IS SO ORDERED.

For the Commission

**NRC SEAL**

**/RA/**

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Annette L. Vietti-Cook  
Secretary of the Commission

Dated at Rockville, Maryland,  
this 19<sup>th</sup> day of August, 2019.

# **Official Transcript of Proceedings**

## **NUCLEAR REGULATORY COMMISSION**

Title:                   Hearing RE Early Site Permit for  
                              the Clinch River Nuclear Site

Docket Number:     (n/a)

Location:             Rockville, Maryland

Date:                 Wednesday, August 14, 2019

Work Order No.:     NRC-0494

Pages 1-183

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

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COMMISSION HEARING ON EARLY SITE PERMIT FOR THE CLINCH  
RIVER NUCLEAR SITE: SECTION 189A. OF THE ATOMIC ENERGY  
ACT PROCEEDING

+ + + + +

WEDNESDAY,

AUGUST 14, 2019

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Commission met in the Commissioners'  
Hearing Room at the Nuclear Regulatory Commission, One  
White Flint North, 11555 Rockville Pike, at 9:00 a.m.,  
Kristine L. Svinicki, Chairman, presiding.

COMMISSION MEMBERS:

KRISTINE L. SVINICKI, Chairman

JEFF BARAN, Commissioner

ANNIE CAPUTO, Commissioner

DAVID A. WRIGHT, Commissioner

ALSO PRESENT:

ANNETTE VIETTI-COOK, Secretary of the Commission

MARIAN ZOBLER, General Counsel

## NRC STAFF:

FRED BROWN, Director, Office of New Reactors (NRO)

ANNA BRADFORD, Deputy Director, DLSE, NRO

TAMSEN DOZIER, Project Manager, NRO

KENNETH ERWIN, Branch Chief, NRO

ALLEN FETTER, Senior Project Manager, NRO

MICHELLE HART, Senior Reactor Engineer, NRO

BRUCE MUSICO, Senior Emergency Preparedness

Specialist, NSIR

MICHAEL SCOTT, Director, Division of Preparedness

and Response, NSIR

MICHAEL SPENCER, Office of General Counsel

MALLECIA SUTTON, Senior Project Manager, NRO

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ALSO PRESENT:

RYAN DREKE, Counsel for TVA

JOHN HOLCOMB, Manager, Small Modular Reactor  
Engineering, TVA

RUTH HORTON, Program Manager, Environmental Support,  
TVA

WALLY JUSTICE, Nuclear Consultant, Small Modular  
Reactor Engineering, TVA

ARCHIE MANOHARAN, Senior Program Manager, Site  
Nuclear Licensing, TVA

JEFF PERRY, Senior Project Manager, TVA

JOE SHEA, Vice President, Regulatory Affairs and  
Support Services, TVA

DAN STOUT, Director, Nuclear Technology Innovation,  
TVA

ALEX YOUNG, Mechanical Engineer, Design, TVA

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## C-O-N-T-E-N-T-S

Opening Remarks, Swearing in of Witnesses and Admission  
of Exhibits

Kristine Svinicki.....6

## Overview (TVA)

Joe Shea.....16

Dan Stout.....21

Commission Q&amp;A.....29

## Overview (NRC Staff)

Frederick Brown.....39

Anna Bradford.....45

Commission Q&amp;A.....56

## Safety Panel:

Applicant

Archie Manoharan.....64

Alex Young.....70

Staff

Allen Fetter.....74

Mallecia Sutton.....77

Bruce Musico.....79

Michelle Hart.....82

Michael Scott.....92

Commissioner Q&amp;A.....100

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## Environmental Panel (TVA)

Jeff Perry.....146

Ruth Horton.....147

Tamsen Dozier.....153

Kenneth Erwin.....159

## Environmental Panel (NRC Staff)

Tamsen Dozier.....168

Commission Q&amp;A.....169

Closing Statement by Applicant.....170

Closing Statement by Staff.....180

Commission Q&amp;A and Closing Statements.....184

Adjourn.....193

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P-R-O-C-E-E-D-I-N-G-S

8:58 a.m.

CHAIRMAN SVINICKI: Again, good morning and welcome everyone to this morning's mandatory hearing which we will now call to order.

I want to welcome the applicant, the Tennessee Valley Authority, or TVA as I'm sure they'll be referred to throughout the day. I want to welcome also the NRC staff, members of the public in the room with us and those who are observing the web cast of today's proceedings remotely.

The Commission convenes today to conduct an evidentiary hearing on TVA's application for an early site permit to determine the suitability of the Clinch River Nuclear Site in Oak Ridge, Tennessee for one or more small modular reactors.

The early site permit, if approved, would resolve a number of environmental, emergency planning and siting issues, but would not authorize the construction or operation of any reactors. That would require one or more separate and subsequent licensing actions which would also be subject to a hearing.

As we begin this morning I would like to acknowledge the presence of our federal partners from the Federal Emergency Management Agency including Dr.

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Michael Casey who is director of the Technological Hazards Division.

We thank you, Dr. Casey, and FEMA for your written comments which we received on July 8th regarding the NRC's consideration of emergency planning zones in this proceeding. Although today's hearing does not include an opportunity for presentations beyond those from the parties, which are TVA and the NRC staff, we will be considering the FEMA comments carefully. They have been entered as a part of the docket of this hearing and we encourage FEMA to continue working with the NRC staff. If after listening today FEMA would like to supplement or clarify its earlier written statement in this case, it may certainly provide a supplemental letter to which the parties would have an opportunity to respond and the Commission would have an opportunity to take under consideration again.

I will now look up and look up at our FEMA visitors. Thank you very much for being here today.

I had an opportunity to say hello and good morning to you separately.

This hearing is required under Section 189A of the Atomic Energy Act of 1954, as amended. The Commission also will be reviewing the adequacy of the NRC staff's environmental impact analysis under the

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National Environmental Policy Act of 1969, or NEPA.

The general order of the hearing is as follows: First, I will address procedural matters associated with the swearing in of witnesses and the admission into the record of the parties' exhibits. TVA and the NRC staff will then provide testimony in witness panels that provide an overview of the application as well as address safety and environmental issues associated with the NRC staff's review with Commission questions following each panel.

The Commission expects to issue a decision after the hearing promptly with due regard to the complexity of the issues after it makes the following necessary findings:

On the safety side the Commission will determine, one, whether the applicable standards and requirements of the Atomic Energy Act and the Commission's regulations, specifically those in 10 CFR Section 52.24, have been met.

Second, whether any required notifications to other agencies or bodies have been duly made.

Third, whether there is reasonable assurance that the site is in conformity with the provisions of the Atomic Energy Act and the NRC's regulations.

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Fourth, whether the applicant is technically qualified to engage in the activities authorized.

And fifth, whether issuance of the permit would be inimical to the common defense and security or to the health and safety of the public.

On the environmental side under 10 CFR 51.105A, the Commission will first determine whether the requirements of the National Environmental Policy Act, Section 1022A, C and E, and the applicable regulations in 10 CFR Part 51 have been met.

Second, independently consider the final balance among the conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken.

Third, determine after weighing the environmental, economic, technical and other benefits against environmental and other costs and considering reasonable alternatives whether the early site permit should on the basis of the environmental review be issued, denied or appropriately conditioned.

And finally, fourth, determine whether the NEPA review conducted by the NRC staff has been adequate.

Today's meeting is open to observation by

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the public. We do not anticipate the need to close the meeting to discuss non-public information. If a party believes that the response to a question may require reference to non-public information, then that party should answer the question to the extent practicable with information in the publicly-available record and file any non-public response promptly after the hearing on the non-public docket.

Let me now ask my fellow Commissioners whether they have any opening remarks.

(No audible response.)

CHAIRMAN SVINICKI: Hearing none, I will now proceed with the swearing in of witnesses and I will begin with the Tennessee Valley Authority.

Would the counsel for TVA please introduce yourself?

MR. DREKE: I'm Ryan Dreke with TVA's Office of General Counsel.

CHAIRMAN SVINICKI: Thank you. Would you please read the names of TVA's witnesses?

Each witness should stand as her or his name is read and please remain standing.

Please proceed.

MR. DREKE: Joseph Shea, Daniel Stout, John Holcomb, Walter Lee, Archie Manoharan, Michael

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Alex Young, Walter Justice, Jeffrey Perry, and Ruth Horton.

CHAIRMAN SVINICKI: Thank you very much.

So for all the witnesses, would you please raise your right hand while I read the oath?

Do you swear or affirm that the testimony you will provide in this proceeding is the truth, the whole truth and nothing but the truth?

ALL: I do.

CHAIRMAN SVINICKI: Thank you. Is there anyone who did not answer in the affirmative?

(No audible response.)

CHAIRMAN SVINICKI: Okay. Hearing not, you may put your hands down and you may retake your seats. Thank you.

Staff counsel, are there any objections to including the witness list as part of the record?

MR. SPENCER: No objections.

CHAIRMAN SVINICKI: Thank you. In the absence of objections the witness list is admitted into the record.

Next we will turn to TVA's exhibits. Counsel for TVA, are there any changes to your previously submitted exhibit list?

MR. DREKE: No, there are not.

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CHAIRMAN SVINICKI: Please read the range of numbers of the exhibits to be admitted.

MR. DREKE: TVA-001 to TVA-015.

CHAIRMAN SVINICKI: Is there a motion to admit the exhibits into the record?

MR. DREKE: Yes, there is.

CHAIRMAN SVINICKI: Staff counsel, are there any objections to the admission of the exhibits and the exhibit list as part of the record?

MR. SPENCER: No objections.

CHAIRMAN SVINICKI: In the absence of objections the exhibits and exhibit list are admitted into the record.

We will now turn to the same process with the NRC staff starting with the presentation of witnesses.

Counsel for the NRC staff, would you please introduce yourself?

MR. SPENCER: I'm Michael Spencer, counsel for the NRC staff.

CHAIRMAN SVINICKI: Would you please read the names of the staff's witnesses? And as you do, would each NRC witness please stand as her or his name is read and remain standing?

MR. SPENCER : Joseph Anderson, Daniel

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Barss, Anna Bradford, Frederick Brown, Luisette Candelario, Allen Fetter, Joseph Giacinto, Michelle Hart, David Heeszal, Patricia Milligan, Bruce Musico, Judy Petrucelli, Michael Scott, Mallecia Sutton, Jenise Thompson, Jennifer Davis, Peyton Doub, Tamsen Dozier, Kenneth Erwin, Jessica Kratchman, Phillip Meyer, and Donald Palmrose.

CHAIRMAN SVINICKI: Thank you. And it's very convenient that the NRC staff witnesses are all off here in the seats to my left.

So I would ask each of you to raise your right hands.

Do you swear or affirm that the testimony you will provide in this proceeding is the truth, the whole truth and nothing but the truth?

ALL: I do.

CHAIRMAN SVINICKI: You may lower your hands. Are there any NRC witnesses who did not take the oath or answer in the affirmative?

(No audible response.)

CHAIRMAN SVINICKI: Hearing none, thank you. You may retake your seats.

Counsel for TVA, are there any objections to including the witness list as part of the record?

MR. DREKE: TVA has no objection.

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CHAIRMAN SVINICKI: In the absence of objections the witness list is admitted into the record.

We will now turn to the staff exhibits. Counsel for the NRC staff, are there any changes to your previously submitted exhibit list?

MR. SPENCER: No changes.

CHAIRMAN SVINICKI: Please read the range of numbers of the exhibits to be admitted.

MR. SPENCER: NRC-001 to NRC-018.

CHAIRMAN SVINICKI: Is there a motion to admit the exhibits into the record?

MR. SPENCER: Yes.

CHAIRMAN SVINICKI: Counsel for TVA, are there any objections to the admission of the exhibits and the exhibit list into the record?

MR. SPENCER: TVA has no objections.

CHAIRMAN SVINICKI: In the absence of objections the exhibits and exhibit list are admitted into the record.

We will now turn to our first panel presentation. Counsel, thank you very much and you may re-take your previous seats.

And I would ask the staff witnesses -- or no, that's not how we're doing it. Sorry. Our first presentation is TVA providing an overview of its

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application, but the Office of the Secretary will clear some of the name plates here at the table. Yes?

MS. VIETTI-COOK: Well, they will come up after this.

CHAIRMAN SVINICKI: Okay. All right. Thank you very much.

The NRC staff witnesses will join us after the TVA presentation.

So for our first presentation, again TVA will provide an overview of its application. And after each overview panel we will have a round of questions from the Commissioners. For the two subsequent presentations, the Safety Panel and the Environmental Panel, first TVA and then the staff will testify followed by an opportunity for the Commission to pose questions to both parties.

The Commissioner will have an opportunity to bank their time as they see fit throughout the day to focus on particular questions or areas of focus. And we will rotate the order of questioning by members of the Commission throughout the day.

I remind the witnesses of this panel and other panels who will appear before us that they remain under oath and that the Commission is generally familiar with the prehearing filings and it is not necessary

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to repeat that testimony.

So now I will ask the TVA presenters in the order that they've established to please proceed. And prior to presenting for the first time would you please introduce yourselves briefly? Thank you.

MR. SHEA: Good morning, Chairman Svinicki, Commissioner Baran, Commissioner Caputo and Commissioner Wright. My name is Joe Shea and I am Vice President for Regulatory Affairs and Support Services for the Tennessee Valley Authority.

I'm pleased to appear before you today regarding TVA's application for an early site permit for the Clinch River site in Roane County, Tennessee.

With me at the table today are Dan Stout, Director of Nuclear Technology Innovation, and John Holcomb, Small Modular Reactor Engineering Manager.

To open I would like to talk briefly about TVA and set the stage for discussion of the early site permit application for the Clinch River site.

Slide 2. TVA is a corporate agency and instrumentality of the United States Government established by the Tennessee Valley Authority Act of 1933. This federal statute stated that TVA's primary missions are to improve the navigability and to provide for the flood control of the Tennessee River, to provide

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for reforestation and the proper use of marginal lands in the Tennessee Valley, to provide for the agricultural and industrial development of the valley, and to provide for the national defense by the creation of a corporation for the operation of certain government properties. In short, TVA's mission is to improve the quality of life in the valley through the integrated management of the region's resources.

In proposing the TVA in 1933, Franklin D. Roosevelt asked Congress to create a corporation clothed with the power of government, but possessed of the flexibility and initiative of a private enterprise.

TVA is fully self-financed and funds virtually all operations through electricity sales and power system bond financing. TVA sets rates as low as feasible and reinvests net income in power sales and to power system improvements, economic development and environmental stewardship.

Next slide, please. TVA's mission to provide low-cost reliable power to the people of the valley is an enduring one. TVA serves that mission in the context of today's strategic imperatives, namely balancing power rates and debt such that TVA can maintain low rates while living within its means and

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managing the trade-off between optimizing the value of our asset portfolio and being responsible stewards of the valley's environmental and natural resources.

To achieve the mission within those strategic imperatives TVA focuses on the key areas of energy, environmental stewardship, and economic development.

Slide 4. With regard to energy, TVA serves approximately 10 million citizens living in parts of seven states in an area covering approximately 80,000 square miles. As an energy provider TVA uses a network of over 16,000 miles of transmission lines to provide power to a series of 154 local power companies who distribute power directly to individual customers. TVA also transmits power to 58 directly-served large customers.

In addition, TVA also purchases a portion of power supply from third-party operators under long-term power purchase agreements. Today TVA's generation portfolio is approximately 39 percent nuclear, 21 percent coal, 26 percent natural gas, 10 percent hydro, 3 percent wind and solar, and 1 percent energy efficiency.

Next slide, please. Environmental stewardship is an important part of TVA's mission of service. TVA is committed to protecting the valley's

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natural resources as well as its historical and cultural heritage. TVA manages the Tennessee River to provide multiple benefits to the people that it serves and to ensure that the region will always be a safe, healthy and beautiful place to live, work and play. That includes monitoring the health of the region's reservoirs, rivers and streams, promoting clean marinas and clean boating, and taking good care of approximately 293 acres of reservoir land, 11,000 miles of shoreline, and more than 80 public recreation areas. TVA's management of the river also helps maintains navigation, provides water supply for about 5 million people in the region, and provides a reliable 652-mile river navigation channel from Knoxville, Tennessee to Paducah, Kentucky.

Next slide, please. TVA is also committed to limiting the environmental impact of its operation.

To protect air quality TVA has invested more than \$7 billion to reduce nitrogen and sulfur dioxide emissions from its coal-fired plants. TVA has in recent years decommissioned some of its oldest, least efficient coal-fired units and increased power generation from cleaner resources. These include the 21st Century's first new nuclear unit at Watts Bar and more natural gas units. TVA is moving toward generating and

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purchasing more renewable energy. In fact, in 2017 renewables, including conventional hydro production, constituted approximately 13 percent of our energy portfolio and contributed in part to a 47 percent reduction in carbon dioxide emissions compared to 2005 levels.

Slide 7, please. Economic development is a cornerstone of TVA's mission to make life better for valley residents. Last year in partnership with state and local groups TVA helped attract or retain more than 65,000 jobs and more than \$11.3 billion in capital investment across the Tennessee Valley Region. TVA helped our economic development partners by hosting workshops, sharing in-depth technical and economic data, providing grants, and supporting business incubators. In recognition of these efforts, in 2018 *Site Selection* magazine ranked TVA among North America's 10 best utilities for economic development for the 13th year in a row.

And now I'd like to introduce Dan Stout who will discuss in more details TVA's efforts to date regarding the pursuit of an early site permit for a small modular reactor at the Clinch River site.

Dan?

MR. STOUT: Good morning, Chairman

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Svinicki and Commissioners Baran and Caputo and Wright.

I'm very pleased to be here today regarding the Tennessee Valley Authority's application for an early site permit at the Clinch River site in Oak Ridge, Tennessee.

I'd like to start by recognizing the significant work put forth by the Nuclear Regulatory Commission staff in reviewing our application and the diligent work of all the TVA employees and contractors supporting the review. The NRC has completed a thorough review and analyzing site safety, environmental protection and plans for coping with emergencies consistent with the NRC mandate to protect the public health and safety.

The purpose of our application is to determine the suitability of the site for deployment and operation of two or more small modular reactors, which I'll refer to as SMRs. SMRs are nuclear reactors that are 300 megawatts electric or less, enabling more factory fabrication and less construction at the site.

As a next generation nuclear technology the designs considered incorporate improved safety and increased operational flexibility. SMRs support TVA's technology innovation mission and are consistent with our vision to be one of the nation's leaders in cleaner

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low-cost energy.

SMRs would use a small fraction of land as compared to other clean energy sources and could re-power retired fossil fuel sites. Although expected to usually operate as baseload generation, SMRs are designed to be capable of varying output to match electricity demand, enabling integration with intermittent renewables. Underground construction provides enhanced safety and security. Most SMR designs rely heavily on passive safety, meaning that they can safely shut down, self-cool with no operator action or electrical power and no additional water for extended durations.

SMR designs have accident source terms that are expected to be several orders of magnitude lower than large light water reactors which results in reduced accident consequences and lower doses. Accordingly, SMRs have the potential for reduced emergency planning zones and correspondingly lower costs.

Next slide, please. TVA has been evaluating small modular reactors for about 10 years.

Work initially was focused on a construction permit for B&W, later BWXT's mPower reactor design, with site characterization work starting in 2010, but B&W reduced its pace and eventually ceased development in 2014.

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TVA shifted to pursuing a technology-neutral, early site permit application using a plant parameter envelope with an appropriately sized emergency planning zone.

The plant parameter envelope was informed by the four U.S. light water reactor designs under development at that time: mPower, Holtec, NuScale and Westinghouse. Based on very preliminary evaluation TVA had confidence that a two-mile emergency planning zone would accommodate all of the SMR designs being considered and that at least one would be able to demonstrate the ability to meet site mandatory requirements. Archie and Alex will get into detail on this in the Safety Panel.

TVA established four key objectives for the SMR program: (1) to demonstrate that power generated by SMRs could be used for addressing critical energy security issues; and (2) to demonstrate that SMR technology can assist federal facilities with meeting carbon reduction objectives; (3) to demonstrate SMR design features that lead to improved safety; and (4) to demonstrate that SMR power generating facilities can be deployed in an incremental fashion to better meet the power generation needs of a service area.

These objectives informed the site

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selection process leading to identification of four candidate sites, one on Redstone Arsenal and three on or near the Oak Ridge Reservation. The Clinch River site was determined to be the preferred site.

Next slide, please. Because it was disturbed in the 1970s and 1980s by the Department of Energy's Clinch River Breeder Reactor Program, there would be less environmental impact from SMR deployment on this preferred site as compared to the other candidate sites.

The Clinch River site is located on the Clinch River arm of the Watts Bar Reservoir and is within the City of Oak Ridge in Roane County, Tennessee. The site is a 935-acre portion of the 1,200-acre parcel of TVA-managed reservoir land. The land is owned by the United States of America and is managed by TVA as an agency of the Federal Government. It is a neighbor to the Department of Energy's Oak Ridge Reservation, a current TVA customer. Existing 500 and 161-kilovolt transmission lines cut through the site making transmission connection relatively easy.

Although the Clinch River Breeder Reactor Project ended in the 1980s without being completed some basic infrastructure such as roads and stormwater retention structures were built and remain. The Oak

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Ridge area provides strong community support and an abundant and skilled workforce.

Next slide, please. The TVA early site permit application itself consists of a site safety analysis report, environmental report, two distinct major features emergency plans, and the associated exemptions. TVA drafted the early site permit application and its constituent plant parameter envelope based upon NRC-endorsed NEI 10-01 guidance with margin added to specific parameters.

TVA's early site permit application assumes a maximum of 800 megawatts thermal for each individual reactor unit and a maximum of 2,420 megawatts thermal for the site. The early site permit application also assumes two or more reactor units are deployed. A plant parameter envelope approach is conservative and flexible, allowing for a variety of reactor designs, design updates and providing flexibility for future business options and decisions.

Next slide, please. This slide illustrates the regulator bases for the development of the early site permit application. The regulatory bases consist of various Commission regulations, standard review plans, regulatory guides, review standards, and requirements of the Atomic Energy Act

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of 1954, as amended.

Next slide, please. The NRC commenced the review of the early site permit application in the beginning of 2017. The application was originally submitted -- was originally submitted had about 8,000 pages supported by 80,000 pages of technical information.

One of the highlights I'd like to point out is the efficient use of audits. The staff did a good job preparing for the audits listing out all of their question, all their information needs well in advance of the audits. As a result, TVA was able to prepare responses to all of the information needs in advance so that when face-to-face discussions took place between the staff and the TVA subject matter experts, there was meaningful discussion on the challenges leading to clarity regarding the resolution of open issues. Further, with clarity of open issues TVA voluntarily supplemented the application avoiding the need to use the RAI process in many cases.

Both NRC staff and TVA identified issues early and promptly addressed them by applying each agency's resources efficiently. By the end of the audits and application supplements issues had been resolved. Accordingly, instead of dealing with

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hundreds of RAIs, the total was about a dozen. Many of these review process successes resulted from very frequent clear and candid communication at both the staff and the management levels.

Next slide, please. Prior to TVA's submission of the early site permit application to NRC in May of 2016 the NRC and TVA were involved in a number of preapplication interactions including site visits, alternative site visits, preapplication readiness review. Following acceptance the NRC performed four major audits during the spring and summer of 2017 supporting hydrology, groundwater, seismic, geotech, environmental and a comprehensive four-month emergency preparedness audit that began in the fall of 2017.

In the summer of 2018 audits supporting meteorology and health physics were conducted along with a supplemental emergency preparedness audit. Additionally, the NRC conducted a detailed QA inspection covering Chapter 17.5 of the SSAR.

Next slide, please. The NRC review officially began the first week of January in 2017. The top line of this chart shows the application updates and revisions.

The second area shows the safety review with audits and RAIs in 2017, ACRS meetings in 2018,

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and the final Safety Evaluation Report in June of this year.

The next area is the environmental review with the Notice of Intent Scoping meeting and audits in early 2017. The draft Environmental Impact Statement was issued in April 2018 and the final Environmental Impact Statement in April of this year, with the last area being the hearing. In July 2018 all contentions were dismissed or denied and the Atomic Safety and Licensing Board terminated, hence we are here today for the mandatory hearing.

Next slide, please. In summary, SMRs have the potential to provide a resilient and reliable energy source with advanced safety features that can benefit the nuclear industry and help achieve multiple Federal Government objectives. TVA and NRC staff support the Clinch River site as suitable for future construction and operation of SMRs based on rigorous evaluations and resulting conclusion that the applicable standards and requirements of the Atomic Energy Act and Commission regulations are satisfied. TVA has the operational experience and technical qualifications to engage in any NRC-authorized activities at the Clinch River site and a staff of nuclear professionals will ensure safe, reliable and environmentally-sound

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construction and operation of SMRs should TVA make a decision to do so.

The early site permit application, NRC staff's final Safety Evaluation Report and final Environmental Impact Statement fully support the NRC findings required for issuance of the early site permit application. NRC staff have concluded that issuance of the early site permit for the Clinch River will not be inimical to the common defense and security or health and safety of the public. Thank you.

CHAIRMAN SVINICKI: Thank you very much for that presentation. I will be recognized first for the TVA Overview Panel for questions, so let me begin.

The first question is one of clarification.

And if the audio-visual folks can be putting back up TVA's slide 10, which is an aerial view of the Clinch River site. You mentioned -- and of course for those of us who have been around nuclear issues for a while, the Clinch River Breeder Reactor Project is rather legendary, but you mentioned that as a result of that project the site has some level of disturbance. And it's more my eyesight than any fault of the photo. You mentioned that roads are there and some drainage.

Could you just describe specifically, is

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that the extent of what we see here, because I know the site had some development. Looks like there's some areas where the vegetation is disturbed there as well.

I just -- I can't see very clearly. Are there are structures on the site?

MR. STOUT: So the structures you can see near the center: a small parking lot and two trailers for work and a trailer for core borings, there is a road, kind of an inner loop --

CHAIRMAN SVINICKI: Yes.

MR. STOUT: -- that was there that we have improved slightly for the purpose of conducting additional site characterization. There's a circle on the -- more on like the toe of the boot. That's where the meteorology tower was located.

CHAIRMAN SVINICKI: Okay. Thank you.

MR. STOUT: And you can see a right-of-way for power line cutting from the west to the east at the top. That's the 500-kilovolt transmission line. And going from the southeast to the north, that's a 161-kilovolt transmission line.

Stormwater retention is very difficult to see on this, but there are several stormwater retention areas on the site.

CHAIRMAN SVINICKI: Okay. Thank you.

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And I assume this is a relatively recent photo. This is not a historic photo.

MR. STOUT: Yes.

CHAIRMAN SVINICKI: Okay. Thank you very much.

Shifting a little bit now, you mentioned that in 2014 TVA shifted to -- its approach to a technology-neutral application. Were there some central factors that contributed with your decision to do that? You mentioned that there were generally kind of four SMRs under development at the time. Could you describe at a high level what the pivot in thinking was there?

MR. STOUT: TVA was very interested in the attributes of the small modular reactors, and advanced reactors, in terms of smaller cost increments, more flexibility in terms of operation, but at that time in 2014 there were no applications in -- submitted to the Nuclear Regulatory Commission. So the level of information was very preliminary. It was even more preliminary for the advanced reactor developers at that time. And TVA was considering the schedule and the timeline for advanced reactor community's development plans and focused on light water reactor SMRs to form the basis behind the plant parameter envelope that was

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established.

Now the plant parameter envelope is the basis and TVA can consider reactors that fit within that, whether they be light water or non-light water.

CHAIRMAN SVINICKI: Thank you for that. And my final question is you noted the minimal number of requests for additional information. If I understood you correctly on slide 14, you attributed some of that limited number of RAIs to the extensive pre-submittal engagement that went on between TVA and the NRC staff.

Were there any topical areas that were particularly emphasized in your pre-submittal engagement with the NRC staff or would you characterize that the nature of the benefit of that was just familiarizing the staff with your overall approach?

MR. STOUT: So preapplication engagement did focus a lot on emergency planning as well as environmental aspects. Was effective at achieving alignment and clarity on the content of the application, but the primary benefit came associated with the audits.

And it was the information needs in advance of the audits, identifying all of the comments and information needs that the staff had as they entered into the audit.

And TVA had enough time to prepare in advance the -- not

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only a response to the staff, but to draft language within an application supplement and see if any of the issues were addressed by a solution, and that led to the constructive dialogue during the audit. And then rather than wait for a request for additional information, we could supplement the application soon after the audit and obviate the need for an RAI.

CHAIRMAN SVINICKI: Thank you very much for that.

Now I will recognize Commissioner Baran for his questions. Thank you.

COMMISSIONER BARAN: Thanks.

Well, thank you for your presentations. I don't have any questions for this panel, so I'll reserve my time.

CHAIRMAN SVINICKI: Thank you very much.

Next we will turn very quickly then to Commissioner Caputo.

Please proceed.

COMMISSIONER CAPUTO: Good morning. I would like to start with sort of a high-level question about your pursuit of small reactors and the multiple designs that you have considered.

So you anticipate a level of safety inherent in these designs that surpasses existing

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reactors. Could you just describe that in a little more detail, please?

MR. STOUT: Sure. There are design features that improve safety, things such as underground construction, substantially more cooling water present in the reactor. These are designs that are post-9/11. They can take into account features, security by design and they lead to slower accident progression. They lead to fewer accidents, fewer components that are being relied on for safety so that there are less safety systems. And so there are fewer accidents. The accidents happen slower allowing for more time for response.

MR. SHEA: And I think that reflects the current generation of designers taking into account the Commission's expectation that advanced designs will be inherently safer at the plant level and then thus allowing for the margins to public health and safety to be really enhanced in the design itself.

COMMISSIONER CAPUTO: Okay. Thank you.

In conducting a review like this the NRC interacts with a wide range of federal, state, tribal and local governments and agencies, some in a formal role and some in a consulting role. Would you please describe some of TVA's outreach to state, tribal, and

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local government and agencies?

MR. STOUT: Yes, TVA had multiple interactions at the state, tribal and local levels, not only with elected officials, but also with local residents. There were opportunities for local elected officials, government agencies to review sections that were relevant to the application.

We also conducted some public outreach. One example, we sent letters to neighbors of the site and invited them to a barbecue. And we gave them tours of the site. We had a room set up with visual images. And we got to hear concerns of the locals that can be factored into design of a future facility.

COMMISSIONER CAPUTO: Thank you. One last quick question. So you discuss the use of audits and how that led to some improvement in efficiency of the review. I assume all of the material that was provided to the staff was made publicly available on the record?

MR. STOUT: Yes.

COMMISSIONER CAPUTO: Okay. Thank you.

CHAIRMAN SVINICKI: Thank you very much, Commissioner Caputo.

Next we will recognize Commission Wright.

Please proceed.

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COMMISSIONER WRIGHT: Thank you very much.

Good morning. Thank you for your presentations. So the NRC has issued five early site permits. So when you were preparing the application did you look to the other early site permits to kind of look to gain some efficiencies? And if so, could you share maybe a couple with me?

MR. STOUT: Yes, PSEG was the most recent early site permit application before ours, and so we had benchmarking trips with PSEG staff. We involved them in a readiness review in advance of our application and we reviewed other ESPs. And so we did our best to address all issues that were addressed in all the prior applications prior to submittal.

COMMISSIONER WRIGHT: Thank you. So if the early site permit is issued, are there some factors that may affect your decision I guess to apply for a construction permit or a combined license referencing this ESP in the future?

MR. SHEA: Well, certainly as we prepared the application we put together the approach with the emergency planning, and in large part to -- as an initiative to recognize that future advanced designs with inherently safer by-design elements to them might provide a basis for changes in the structures around

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emergency planning.

And in -- with a focus on the bottom line of protecting public health and safety assured through those defense-in-depth mechanisms we certainly looked for the opportunity to address issues like future O&M costs associated with the entire operation, and certainly emergency planning is an element of that, again looking to ensure that through all of those barriers public health and safety is assured.

COMMISSIONER WRIGHT: So do you have any idea or any sense of when you might make those decisions and --

MR. STOUT: So TVA recently issued an Integrated Resource Plan and it contained an element that TVA will continue to evaluate emerging nuclear technologies including SMRs as part of our technology innovation efforts. The demand for power over the next couple of decades is relatively flat. There will be some retirements anticipated and the need for some additional generation.

Alternatives such as combined- cycle gas and solar appear to be more cost-competitive than small modular reactors at this point, however, our Integrated Resource Plan did recognize that we have an interested customer in the Department of Energy and that there's

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the potential that the Department could partner with TVA in a manner that would share in the costs and risks of initial deployment.

COMMISSIONER WRIGHT: Thank you. My last question for you is going to be -- so are there any NRC actions or decisions out there that may affect your decision?

MR. SHEA: Well, certainly as we're looking at the design certification application that's pending we're watching carefully the issues that are novel that are being reviewed by the staff and in some cases brought to the Commission's attention to understand will that proposed design achieve all that it's intended to in terms of both safety improvement, but also construction, operation, cost improvements as well and looking at the totality of that. And that will absolutely inform our decision about that technology and other similar new technologies.

COMMISSIONER WRIGHT: Thank you so much.

CHAIRMAN SVINICKI: Thank you, Commissioner Wright. And, again, my thanks to the TVA witnesses on this particular panel. I will now ask the NRC overview panel witnesses to take their seats with us here at the table.

In this panel, the staff will provide an

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overview of the NRC staff review of the application and a summary of their regulatory findings.

And as they take their seats, I will ask each of them before speaking to please introduce themselves. And I will begin with Mr. Fred Brown. Fred, please proceed.

MR. BROWN: Frederick Brown. Thank you, Chairman. Good morning, Chairman and Commissioners.

If we could have Slide 2, please. As I have indicated, I am Fred Brown, the director of the Office of New Reactors. And with me on this panel is Anna Bradford, who is the permanent deputy director and currently the acting director of our Division of Licensing, Siting and Environmental Analysis.

On behalf of the NRC staff that reviewed the early site permit application for the Clinch River Nuclear Site, we are pleased to address the Commission at this mandatory hearing.

The team here today will present the results of the staff's review of the application for the early site permit, or ESP, at the Clinch River Nuclear Site in Oak Ridge, Tennessee. And as you know and just heard the application was submitted to the NRC by the Tennessee Valley Authority, or TVA.

The staff's final Safety Evaluation

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Report, or SER, was completed in June of 2019, and the final Environmental Impact Statement, or final EIS, was completed in April of 2019.

These documents are the culmination of a two and a half year review effort by the staff and represent the results of coordinated activities and efforts by scientists, engineers, attorneys and administrative professionals from multiple offices within the Agency as well as the efforts of other agencies and our contractors.

Within the NRC, the main offices that contributed to the review include the Office of Nuclear Security and Incident Response, which reviewed the emergency preparedness and security areas.

The Office of the General Counsel reviewed the SER and the EIS. The Advisory Committee on Reactor Safeguards, or ACRS, reviewed and reported on the safety aspects of the application in accordance with 10 CFR 52.23. In addition, the NRC Region II office supported public meetings in the community near the Clinch River Nuclear Site.

The U.S. Army Corps of Engineers and the Department of Homeland Security also contributed to the review. Specifically, the Corps of Engineers was a cooperating agency in the environmental review. And,

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as the Chairman pointed out at the beginning of this morning's hearing, the Federal Emergency Management Agency was consulted regarding emergency planning.

Slide 3, please. For this panel, I will give an overview of the ESP application, and Ms. Bradford will summarize the staff's safety review and findings as well as giving an overview of the environmental review and findings.

After that, I will close out the presentation with an overview of the panel presentations that follow us.

Slide 4, please. In May of 2016, TVA submitted an application for an ESP at the Clinch River Nuclear Site. Following interactions with the NRC staff, TVA provided supplemental information in support of that application.

Consistent with NRC guidance, the NRC staff completed its acceptance review to determine whether the ESP application as supplemented contained sufficient technical information in scope and depth to allow the NRC staff to conduct its detailed safety and environmental reviews within a predictable time frame.

The staff determined in December of 2016 that the application with the supplemental information

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was sufficient for docketing and issued a Federal Register notice to that effect on January 12, 2017.

During the review, the staff has expended approximately 40,000 hours on the safety and environmental reviews associated with this ESP and our contractors, working in collaboration with us, devoted approximately 6,000 additional hours to support the environmental and safety reviews.

This effort has involved over 72 engineers, scientists, technical specialists and attorneys. During this time, the staff conducted 12 public meetings and public conference calls in support of the ESP application as was mentioned by the previous panel.

The applicant responded to 13 requests for additional information comprising 51 staff questions and 12 of those RAIs were associated with the safety review, one with the environmental review.

In addition, the staff considered over 2,500 letters and emails containing comments on the draft Environmental Impact Statement. The review of this application was a very thorough effort and was focused on protecting public health, safety and the environment.

Slide 5, please. The ESP application specifically proposes that the duration of the permit

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before a 20 year term, as allowed by 10 CFR 52.26(a).

The ESP application is unique in that rather than using the standard 10 mile plume exposure pathway emergency planning zone, or EPZ, TVA proposed first a plume exposure pathway EPZ sizing methodology, second, two major features emergency plans, one plan for a site boundary plume exposure pathway EPZ and a second plan for an approximately two mile radius plume exposure pathway EPZ, and third, the associated exemption request associated with those EPZ plans.

The specific analysis that was performed in reviewing these unique details will be discussed in detail in the safety review panel that follows.

The ESP application request does not request approval of a specific plume exposure pathway EPZ size at this time. Instead a future combined license or construction permit applicant referencing the ESP would use the sizing methodology to determine the plume exposure pathway EPZ size that is appropriate for the selected reactor technology.

Slide 6, please. If the ESP is issued, the NRC would be approving the Clinch River Nuclear Site as a suitable site for the potential construction and operation of two or more small modular reactors that are bounded by the specified plant parameter

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envelope.

As the Chairman indicated, an ESP does not authorize actual construction or operation of a nuclear power plant. I will now turn the presentation over to Anna Bradford.

MS. BRADFORD: Next slide, please. Thank you, Fred, and good morning, Chairman Svinicki and Commissioners. As Fred mentioned, I am the acting director of the Division of Licensing, Siting and Environmental Analysis in the Office of New Reactors.

And the safety review evaluated the characteristics of the proposed site, the plant perimeter envelope, or PPE, the major features emergency plans and the plume exposure pathway EPZ size methodology for use by a future combined license or construction permit applicant.

Next slide, please. TVA has not selected a specific reactor designed for this site. To approve an ESP site without a selected reactor technology, an ESP applicant can propose a PPE with values that bound a variety of reactor technologies rather than one specific technology.

The PPE represents a surrogate nuclear plant for the purposes of evaluating an ESP application.

TVA's plant perimeter envelope was developed based

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on four potential small modular reactor, or SMR, designs.

The safety panel will discuss in more detail the development of the PPE.

TVA's PPE assumes the construction and operation of two or more SMRs at the Clinch River Nuclear Site with a combined maximum nuclear generating capacity of 2,420 megawatts thermal or 800 megawatts electric.

Next slide, please. A combined license or construction permit application referencing an ESP would identify a specific technology. During the combined license or construction permit review, the PPE values and the ESP would be compared to those of the selected technology.

If the design characteristics of the selected technology exceed the bounding ESP PPE values, additional reviews would be conducted to ensure that the site remains suitable from a safety and environmental standpoint for construction and operation of the selected technology.

Next slide, please. The ACRS examined the staff safety review of the ESP application. Between May and November of 2018, the staff presented its results in four subcommittee meetings. The staff

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presented the results of the safety review to the ACRS full committee in December 2018.

Following the full committee meeting, the ACRS issued a report in January 2019 concluding that there is reasonable assurance that SMRs with design characteristics that fall within the PPE, used by TVA in its ESP application, can be built and operated at the Clinch River Nuclear Site without undue risk to public health and safety.

This ACRS report recommended issuance of the Clinch River Nuclear Site ESP. And the staff issued the final Safety Evaluation Report on June 14, 2019.

Next slide, please. The staff prepared SECY-19-0064 dated June 21, 2019, to support this mandatory hearing. In that paper, the staff summarized the basis to support a Commission determination that the staff's reviews were adequate to support the findings necessary to support the findings necessary to support the ESP.

The required safety and environmental findings are in 10 CFR 52.24(a), and I will now summarize the staff's basis supporting each finding.

First, the applicable standards and requirements of the Atomic Energy Act of 1954, as amended, and the Commission's regulations have been

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met.

The staff reviewed and evaluated the application against the applicable criteria in the Commission's regulations.

Second, any required notifications to other agencies or bodies, including Federal Register notices, have been duly made as documented in SECY-19-0064.

Third, there is reasonable assurance that the site is in conformity with the provisions of the AEA and the Commission's regulations. The staff concluded that all applicable site-related regulatory requirements were satisfied and that the site characteristics in the ESP application are acceptable.

Next slide, please. Fourth, the applicant is technically qualified to engage in the activities authorized. The technical qualifications of the applicant are summarized in the SECY paper and in Chapter 1 of the FSER.

Fifth, issuance of the permit will not be inimical to the common defense and security or to the health and safety of the public. The staff largely bases this conclusion on the applicant's compliance with the pertinent regulations. Also, as stated in the SECY paper, the staff is not aware of any information

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presenting any locality concerns.

And sixth, the findings required by Subpart A of 10 CFR Part 51 have been made.

Finally, the staff did not address the findings in 10 CFR 52.24(a)(5) and (a)(7). These findings are not applicable to the Clinch River review because first, TVA did not propose inspections, test analyses and acceptance criteria as permitted by 10 CFR 52.17(b)(3). And, second, TVA did not request a limited work authorization under 10 CFR 52.17(c).

Now I will be discussing the environmental review and provide an overview of the process we used in conducting the review, the draft summary record of decision and the staff's recommendation as a result of that review.

I will also discuss the findings that need to be made under 10 CFR 51.105 before the permit can be granted.

Next slide, please. The NRC's proposed action related to the TVA application is the issuance of an ESP for the Clinch River Nuclear site approving the site as suitable for the future construction and operation of two or more SMRs with characteristics that fall within the PPE.

As Fred stated earlier, an ESP does not

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authorize construction and operation of a nuclear power plant. However, the ESP site suitability determination requires the consideration of the environmental impacts from construction operation at the proposed and alternative sites.

Therefore, the staff prepared an Environmental Impact Statement, or EIS, for the Clinch River Nuclear Site ESP application. The EIS was prepared in accordance with the National Environmental Policy Act of 1969, or NEPA, and 10 CFR Part 51.

The U.S. Army Corps of Engineers Nashville District, or the Corps, participated with the staff as a cooperating agency in preparing the EIS under the terms of a Memorandum of Understanding between the NRC and the Corps for the review of nuclear power plant applications.

As a member of the environmental review team, the Corps participated in site visits and in the development of the draft EIS and final EIS.

Next slide, please. This diagram outlines the environmental review process for preparing an EIS for an early site permit. TVA submitted an environmental report as part of its ESP application and subsequently submitted supplemental information leading up to the docketing of the application.

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The staff conducted a scoping process, including a scoping meeting near the site. During the scoping period, the staff contacted federal, state and local agencies, along with federal recognized Indian tribes, to solicit comments.

During its preparation of the draft EIS, the staff received additional information from TVA as a result of audits and public meetings. The staff also used independent sources in its analyses.

A draft EIS was issued in April 2017 for a 75 day public comment period. Two public meetings were also held near the site during the comment period.

The staff also met with tribes and other federal and local agencies regarding their comments and questions on the draft EIS. Over 2,500 letters and emails containing comments were received on the draft EIS, the vast majority of which were form letters through the website of two environmental advocacy groups.

Comments on the draft EIS were considered in preparing the final EIS, which was issued in April 2019. The comments and the responses are included in Appendix E of the final EIS.

As stated in the final EIS, the staff's recommendation related to the environmental aspects

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of the proposed action is that the ESP should be issued.

The staff based its recommendation on the ESP application and environmental report, consultation with federal, state, tribal and local agencies, the review team's independent review, the consideration of public comments received on the environmental review and the assessment summarized in the EIS, including the potential mitigation measures identified in the ER and the EIS.

This recommendation also rests on the staff determination that none of the alternative sites assessed as obviously superior to the Clinch River Nuclear Site.

Next slide, please. Per 10 CFR 51.50(b)(2), an environmental report for an early site permit does not need to include an assessment of the benefit or cost of the proposed action, including need for power, or a consideration of alternative energy sources.

As TVA did not address these topics in its application per 10 CFR 51.75(b), the EIS also did not address these topics.

If a future combined license or construction permit application references the ESP, the ER and EIS for that application would address these

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topics.

Next slide, please. The staff included a draft summary record of decision as a reference in SECY-19-0064. This document states the decision being made, identifies all alternatives considered in reaching the decision and discusses the preferences among those alternatives.

The draft summary record of decision also states whether the Commission has taken all practicable measures within its jurisdiction to avoid or minimize environmental harm from the alternative selected.

Next slide, please. This slide and the next lists the environmental findings pursuant to 10 CFR 51.105(a) that the Commission must make to support the issuance of the ESP for the Clinch River Nuclear Site.

The staff believes that the scope of the environmental review, the methods used to conduct the review and the conclusions reached in the EIS are sufficient to support a positive Commission determination regarding these findings.

For the first finding, in accordance with NEPA Section 1022A, the staff's environmental review uses systematic interdisciplinary approach to integrate information from many fields, including the

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natural and social sciences as well as the environmental sciences.

In accordance with NEPA Section 1022C, the EIS for the Clinch River Nuclear Site ESP addresses the environmental impact of the proposed action, any unavoidable adverse environmental affects, alternatives to the proposed action, the relationship between local, short-term uses of the environment and the maintenance and enhancement of long-term productivity and any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented.

Also, as documented in correspondence presented in Appendix F of the EIS, the staff met the requirement in NEPA 1022C that it consult with and obtain comments from other federal agencies with jurisdiction by law or special expertise.

In accordance with NEPA Section 1022E, the staff concludes that Chapter 9 of the final EIS demonstrates that the staff adequately considered alternatives to the proposed action. The alternatives considered in the EIS include the no action alternative, site alternatives and system design alternatives.

For all these reasons, the staff's review also comports with NRC's requirements in Subpart A of

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10 CFR Part 51. The staff concludes that the environmental findings in the EIS constitute the hard look required by NEPA and have reasonable support in logic and fact.

For the second required finding by 10 CFR 51.105(a), the staff considered the final balance among conflicting factors for site suitability in the staff's comparison of alternative sites.

The staff found that none of the alternative sites considered were environmentally preferable to the Clinch River Nuclear Site.

Next slide, please. As previously stated, TVA was not required to, and did not, address the balance of benefits and costs in the ESP application. Accordingly, the EIS also did not address the balance of benefits and costs as provided by 10 CFR 51.75(b).

Should the NRC issue this ESP for the Clinch River Nuclear Site and a construction permit or combined license application that references the ESP is submitted, these matters will be considered in the EIS prepared in connection with that application.

In the final EIS, the staff considered reasonable alternatives to the proposed action and determined that none were obviously superior. Based on that analysis, the staff recommends that the ESP

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be issued.

For the fourth finding under 10 CFR 51.105(a), the staff believes that the Commission will be able to find after this hearing that the NEPA review performed by the staff has been adequate.

As will be discussed in more detail during the environmental panel later today, the staff performed a thorough and complete environmental review, sufficient to meet the requirements of NEPA and adequate to inform the Commission's action on the request for the ESP.

Thank you. And I will now return the presentation back to Fred.

MR. BROWN: Thank you, Anna. Slide 19, please. During this hearing, the staff will be presenting information on the issues listed in this table.

During the safety panel, the staff will present an overview of its safety review and discuss the TVA EPZ sizing methodology and associated exemptions.

The environmental panel will provide a summary of the process for developing the EIS, the identification and analysis of alternatives, a summary of the environmental impacts at the preferred site and

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the conclusions and recommendations in the final EIS.

This concludes the staff's opening remarks, and we are prepared to respond to any questions. Thank you.

CHAIRMAN SVINICKI: Mr. Brown, Ms. Bradford, thank you very much for your presentations. We will begin the questions for this panel with Commissioner Baran.

COMMISSIONER BARAN: Thank you both. I'll continue to reserve my time for the subsequent panels you mentioned. Thanks.

CHAIRMAN SVINICKI: Thank you. And with that, we recognize Commissioner Caputo.

COMMISSIONER CAPUTO: And I just have one quick question. TVA opted to defer consideration for the need for power in evaluation of energy alternatives.

Since they haven't stated an intent to pursue a license immediately or construction in the near-term, this is unusual to defer the consideration of need for power and energy alternatives given that those may change with the passage of time. Correct?

MS. BRADFORD: I'm sorry. Did you ask if it is unusual?

COMMISSIONER CAPUTO: Unusual.

MS. BRADFORD: It's not unusual for an ESP

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applicant that doesn't plan to build right away. It's not unusual --

COMMISSIONER CAPUTO: Great.

MS. BRADFORD: -- to defer a consideration of those issues to COL states.

COMMISSIONER CAPUTO: Okay. Thank you. That was my only question.

CHAIRMAN SVINICKI: Thank you. Commissioner Wright.

COMMISSIONER WRIGHT: Good morning. Thank you for your presentations. In the first panel you heard me ask about, you know, the efficiencies that possibly could have been gained by looking at the previous ESPs that have been issued.

Did you do the same thing? Did you go through that process? And if you did, did you find some efficiencies that were gained and could you share them with me?

MS. BRADFORD: Sure. I think one thing was that we had several staff that had previously worked on ESPs that also worked on this ESP. So obviously they brought that experience and they were familiar with what we had done in previous ESPs.

And we were able to say, hey, here's one way we can do something different or one way that worked

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really well last time or didn't work so well and apply that now. So I think definitely just in a practical way we learned from that.

We're also going to do a lessons learned review of this ESP. Once it's completed, actually we were waiting until after this mandatory hearing to see how everything goes so we can go back and look at the entire process and see -- make sure we understand what went well, what didn't, why were we able to be a little bit ahead of schedule and make sure that that's documented for future reviews.

COMMISSIONER WRIGHT: Thank you. Fred, by the time -- if this ESP is issued and then they apply for a construction permit or whatever, the merger will have happened. And if that does happen, do you anticipate any knowledge management issues or internal challenges due to the merger for staffing or anything like that?

MR. BROWN: So in relation to the general turnover and staff, generational turnover, we do have a challenge in front of us. And we've worked to mitigate that.

The leadership team that would be responsible for this functional area will have a great deal of continuity, Robert Taylor, Anna Bradford and

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at the branch chief level and the new Center of Expertise for Environmental Reviews for the environmental part. And it's part of what the transition team, the reunification team, is working on for continuity of individual staff reviewer and supervisor work in the future.

So it is a challenge, and we believe we're mitigating that challenge effectively.

COMMISSIONER WRIGHT: Okay. Thank you.

CHAIRMAN SVINICKI: Well, I have a couple of questions, but Fred, I wanted to reflect on your long involvement in many of the new reactor activities under Part 52, which is new in an NRC sense, kind of a new regulation. And there are certain provisions that have not even yet gone through our proof of concept.

Of course, the Vogtle construction, the construction of Vogtle Units 3 and 4 continues. But there are some regulatory provisions that we will be doing for the first time even though this regulation has been on our books for quite some time. And I know you've had a very direct and substantive involvement over the last years in working through a lot of this.

As a result, I think you and I may have a special place in our heart for what we call the Part 52 lessons learned activity and the rulemaking there.

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I know that Anna responded that there will be a lessons learned specifically for this Clint River ESP review.

But there is a broader set of lessons learned as we move through Part 52 that the Agency, I make no presumption about activity levels in the future, but our culture is that when we learn lessons and we want to manage that knowledge for our successors and make certain that if we learned fundamental things about that regulation that could improve upon it, that we want to put those in place.

This wasn't an SMR related technology. Were there any uniquenesses, Fred, that you think came out of this Clint River ESP review that would have a unique place in the Part 52 lessons learned rulemaking that we may ultimately do or was it basically validation of the same fortification of the same issues and lessons we've been learning?

MR. BROWN: So I do think in terms of the Part 52 rulemaking, we did solicit from TVA their prospectus on lessons learned.

And the Commission will soon receive a paper that lays out all of the proposed changes to Part 50 and 52, which should, in my view, reflect improved opportunity to provide reasonable assurance of adequate protection in an open, transparent, predictable,

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reliable way with clarity of expectation. The Commission should get that in the very near-term.

I do also think that in terms of the self-assessment that Anna mentioned that you referred to, we, as an office, fundamentally need to look at in 2007 when we set up systems for the number of draft safety evaluations that we prepare, how we prepare them, how we review them, how we engage with ACRS, it was done in an environment where there would be 22 concurrent projects.

And the fidelity of not missing anything was critically important. I don't believe we focused on efficiency. And I believe we have an opportunity with this lesson learned to re-evaluate our internal processes as well as the rules that govern these reviews going forward. And that should benefit any future COL applicant under Part 52 or CPL applicant.

CHAIRMAN SVINICKI: Well, thank you for that. I look forward to any of the staff's recommendations in that regard. And I thank you for the care and attention.

You know, I think there are things we do in the course of our career that we do for posterity in our successors. So I appreciate, Fred, your and your whole team's focus on this issue of making sure

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that we take the opportunity to enshrine the knowledge we have not just in the rulemaking as I proposed but in office processes and procedures. So thank you for that.

And with that, I thank this panel. And we are scheduled now for a break. We're a little bit ahead of schedule so I am going to use my discretion to give us 10 whole minutes.

We will reconvene at 10:20. There's going to be excitement on my side of the table. So please be back in the room prepared at about 20 minutes after.

Thank you.

(Whereupon, the above-entitled matter went off the record at 10:11 a.m. and resumed at 10:23 a.m.)

CHAIRMAN SVINICKI: Well, thank you everyone for reconvening so promptly. I call the hearing back to order.

Now we will conduct what we are terming the safety panel. The parties will address relevant sections of the application and the final safety evaluation report.

With particular focus on the proposed exemptions from certain emergency planning requirements and the risk informed dose-based and consequence-oriented methodology for determining the

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appropriate plume exposure pathway emergency planning zone at the Clinch River site.

In terms of the witnesses for this panel, we will begin with the TVA witnesses. I would ask you to proceed.

And prior to presenting, please introduce yourself. And particularly, if you have not presented on an earlier panel. So, would the TVA panel please proceed?

MS. MANOHARAN: Good morning, Chairman, and Commissioners. I'm Archie Manoharan, I'm TVA licensing engineer.

Today Alex Young and I'll be presenting the emergency preparedness information in the ESP for the Clinch River site.

Next slide please. Three parts of the ESPA describe the emergency preparedness approach for SMR at the Clinch River site.

Slide 18 shows these three parts in the structure of my presentation today. Starting with the big picture, Part 5 of the application describes two distinct major features emergency plans.

Part 5A describes the major features emergency plan for a site boundary plume exposure pathway emergency planning zone. And Part 5B describes

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the major features emergency plan for a two-mile plume exposure pathway emergency planning zone.

As a reactor technology has not yet been selected, only major features emergency plan, with the information available during the ESP development have been described.

TVA will include SMR design specific information in a future application to create a complete and integrated emergency plan.

TVA developed two emergency plans for two reasons. First, TVA expects that the four SMR designs that inform the plant parameter envelope, PPE, would meet the applicable dose criteria requirements at the two-mile distance.

And at least one design is expected to meet the applicable dose criteria requirements at the site boundary distance.

Second, to optimize licensing review and provide potential options for a future application. Both plans are based on the generic part of the TVA nuclear power radiological emergency plan, which is approved by the NRC and currently used for the TVA nuclear fleet.

Once TVA selects a reactor technology, it will evaluate the appropriate EPZ size based on the

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distance at which the regulatory dose criteria are met.

If the dose criteria are met at the site boundary, the information in Part 5A will be used to develop a complete and integrated emergency plan.

If the dose criteria are met at two-mile EPZ distance, then the information in Part 5B will be used to develop a complete and integrated emergency plan.

It is important to note that the ESPA does not determine a final EPZ size for the Clinch River site. This information will be provided in a future application.

TVA submitted a set of exemption requests in the ESPA as the emergency plans in Part 5 deviate from the NRCs current ten-mile emergency planning zone requirements. These exemption requests are described in Part 6 of the application.

One set of exemption requests support the site boundary information in Part 5A. And the others support two-mile information in Part 5B.

Part 2 of the ESPA describes and establishes the technical basis for the emergency preparedness approach. In section 13.3, a dose base consequence-oriented methodology for determining the appropriate size of a plume exposure pathway EPZ size

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for SMR is described.

Next slide please. TVA is committed to protecting public safety and health. For the Clinch River site, TVA will maintain agreements with surrounding emergency response agencies and support organizations and continue to work with state and local governments and support organizations to ensure the emergency preparedness capabilities are commensurate with the potential risk to the public.

During the ESPA development, TVA reached out to the local counties and cities to discuss the unique emergency preparedness approach. As a result of these numerous discussions, letters of support from the state of Tennessee, Roane County, Anderson County and city of Oak Ridge were received. These letters were subsequently submitted to the NRC to support the review of the ESPA.

Next slide please. The figure on Slide 20 shows, in red, the site boundary EPZ for the Clinch River site.

If TVA selects SMR technology that meets the regulatory dose criteria at the site boundary distance, a future application would use information in Part 5A to develop a complete and integrated emergency plan for NRC's review.

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Next slide please. The figure on Slide 21 shows the exact size and configuration of the two-mile EPZ for Clinch River site.

The blue circle shows a two-mile radius from the center of the site and the red is the actual two-mile EPZ boundary. TVA developed this boundary based on local emergency needs and capabilities.

It accounts for conditions such as demography, topography, planned characteristics and access routes. It TVA selects an SMR technology that meets the regulatory dose criteria at the two-mile distance, a future application would use part 5B information to develop a complete and integrated plan for the NRC's review.

Next slide please. As noted earlier, Part 6 of the ESPA describes TVA's EPZ related exemption requests. For the two-mile EPZ emergency plan, the approach is similar to a ten-mile EPZ in that we recognize a formal offsite plants and support from offsite response organizations will be required.

Therefore, only a request to deviate from the ten-mile EPZ size is being requested. For the site boundary EPZ, in addition to the request to deviate from the ten-mile EPZ size requirement, exemptions from various elements of a formal offsite emergency plan,

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requirements for evacuation time estimates and certain elements of offsite exercises are being requested.

If these exemption requests are granted, they could be used in a future application referencing a specific SMR technology, as long as the selected technology demonstrates the regulatory dose criteria are met at site boundary or two-mile distance.

In either case, TVA would confirm that there would be no radiological consequences outside the EPZ from any credible events in excess of the dose criteria consistent with the risk informed dose-based methodology.

Next slide please. Part 2 of the ESPA describes a risk informed dose-based consequence-oriented methodology for determining an appropriate plume exposure pathway EPZ size.

The approach takes into consideration various SMR safety and design advancements. For example, SMR, as compared to large light water reactors, have smaller cores, their source terms are expected to be several magnitudes lower, which results in reduced accident consequences.

SMRs are also expected to have several magnitudes reduced, likelihood of accidents and much slower accident progressions. Which gives more time

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to take mitigative actions if needed.

The dose-based methodology is consistent with a NUREG-0396 approach. And if approved, will be implemented in a future application to determine the plume exposure pathway EPZ size for the Clinch River site.

Similar to the analysis in NUREG-0396, the methodology determines the EPZ size based on dose consequences analysis for a spectrum of potential accidents, including design basis and severe accidents. And has the same dose criteria as NUREG-0396.

I will now turn over the presentation to Alex, who will discuss the technical criteria of the EPZ sizing methodology, and the example analysis conducted to demonstrate the methodology.

MR. YOUNG: Thank you, Archie. Next slide please. My name is Alex Young, design engineer for Tennessee Valley Authority.

The EPZ sizing methodology is broken down into three technical criteria. The first refer to as Criteria Alpha. Is that the EPZ should encompass those areas in which projected dose from design basis accidents could exceed the EPA early phase protective action guide of one rem TEDE.

The second criteria, referred to as

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Criteria B, is that the EPZ should encompass those areas in which consequences of less severe core melt accidents could exceed the EPA early-phase PAG. Less severe core melt accidents include intact containment, beyond design basis accident scenarios with a main core damage frequency greater than one times ten to the negative six or one in one million per reactor year.

The third criteria, referred to as Criteria Charlie, is that the EPZ should be of sufficient size to provide for substantial reduction and early severe health effects in the event of more severe core melt accidents. More severe core melt accident scenarios include postulated containment failure or bypass accidents, with a main core damage frequency greater than one times ten to the negative seventh or one in ten million per reactor year.

To provide insurance of substantial reduction early health defects, the conditional probability of those exceeding 200 rem whole body for more severe core melt accidents, is less than one times ten to the negative third or one in 1,000.

Next slide please. To respond to staff RAIs, an example analysis demonstrating the technical criteria was developed. The example analysis is a design specific analysis based on the potential

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deployment of a NuScale power plant at the Clinch River site.

This example analysis demonstrates that TVA can implement the risk informed dose-based consequence-oriented methodology used in the ESPA and that TVA anticipates at least one design considered within the PPE meets the criteria for both EPA early phase PAGs and the substantial reduction early health effects with margin.

Next slide please. Here on this slide I'll briefly discuss the EPZ plant parameter. As a result of staff RAIs and audits, a need for a plant parameter was communicated to ensure the exemption requests are applied appropriately in the future.

This plant parameter is similar to those documented in the Chapter 2 of the site safety analysis report. In that, in a future application, it will have to be evaluated to ensure that the selected design is bounded by the plant parameters established in the ESPA.

In a future application, to apply the EPZ exemptions, TVA would compare source terms from selected SMR designs to those established in the EPZ plant parameter.

To establish an EPZ plant parameter, TVA developed a composite four-day atmospheric release

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source term with margin. This allowed TVA to account for various SMR designs and accident types and the total four-day release that the EPA early phase PAG doses are based on. Back to Archie.

MS. MANOHARAN: Thank you, Alex. Next slide please.

This last slide is an overview of the emergency preparedness information described in TVA's ESPA for the Clinch River site. In Part 5, TVA requests that NRC approve the major features emergency plan for site boundary and two-mile EPZ.

A future application would include the remaining elements of either the site boundary or two-mile EPZ to develop a complete and integrated emergency plan. If the selected technology does not meet the dose criteria at site boundary or two-mile, then TVA would need to develop a new emergency plan.

Part 6 requests the NRC grant the exemptions to support the site boundary and two-mile EPZ major features emergency plan.

Part 2 describes TVA's risk informed dose-based methodology for determining the appropriate plume exposure pathway EPZ size, which takes into account the safety and design advancements of the SMR designs considered within the PPE.

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TVA seeks NRC's approval to use this methodology for a design specific implementation in a future application. That concludes TVA's safety panel presentation. Thank you for your time today.

CHAIRMAN SVINICKI: Thank you very much to the TVA witnesses. I will now call the NRC Staff safety panel witnesses to please occupy the seats behind their name cards.

And proceed, when they are ready, in the order that they've agreed to. And again, this is just the uniqueness of the room setup that they have to be called mid-panel like this, but thank you.

MR. FETTER: Slide 2 please. Good morning, Chairman and Commissioners. My name is Allen Fetter, senior project manager. And with me is Ms. Mallecia Sutton, also senior project manager from the Office of New Reactors.

With us is Bruce Musico, senior emergency preparedness specialist from the Office of Nuclear Security and Incident Response, or NSIR.

Michelle Hart, senior reactor engineer from the Office of New Reactors.

And Mike Scott, the director of the division of preparedness and response in NSIR.

We will briefly describe the ESP review

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process, including the concept of plant parameter envelope, or PPE, and summarize the results of the Staff safety review.

We also discuss the staff's review of emergency planning, plume exposure pathway, EPZ sizing methodology and the associated exemption request.

Slide 3 please. As discussed in the overview panel, the Applicant used a PPE to bound the characteristics of the plant that might be located at the site. The Staff used this information to support the safety review.

TVA's PPE is based on construction and operation of two or more small module reactors, or SMRs, at the Clinch River Nuclear site. Where a single unit may not exceed 800 megawatts thermal for the reactor core. And the total capacity for the site is not to exceed 2,420 megawatts thermal or 800 megawatts electric.

Slide 4 please. In the development of the PPE, an applicant typically draws data from a number of plant technologies under consideration to construct the bounding envelope. It is important to note that when issuing the permit, the NRC approves the PPE rather than a specific technology that the PPE was drawn from.

As such, any plant technology that can be

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demonstrated to be bounded by the PPE is suitable for use in a combined license or construction permit application. In TVA's case, they used preliminary information. The four SMR designs are indicated on this slide. Or the slide that was up there.

Slide 5 please. A combined license or construction permit application then incorporates the ESP by reference, must identify the chosen SMR technology for the Clinch River Nuclear site, address COL action items and permit conditions, and provide other information necessary to support combined license or construction permit issuance.

Slide 6 please. The Staff's safety review included five audits and one inspection, 12 requests for additional information comprising 50 questions.

The final safety evaluation report included 41 COL action items and seven permit conditions.

Slide 7 please. The Staff reviewed the following technical areas, seismology, geology, hydrology, meteorology, geography, demography, which includes population distribution, site hazards evaluation, radiological effluent releases, radiological dose consequences, emergency preparedness, security plan feasibility and quality

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assurance.

I will now turn the presentation over to Ms. Mallecia Sutton.

MS. SUTTON: Thank you, Allen. Good morning. My name is Mallecia Sutton. As Allen said, I'm a senior project manager in the Office of New Reactors.

The Staff proposes to include seven permit conditions that would require actions from the combined license construction permit applicant referencing the EPS.

Permit conditions one and two relate to potential facility hazards. Permit conditions three and four relates to site investigation and improvement activities associated with the excavation and safety related structures.

Permit condition five and six relate to emergency planning. Permit condition seven provides that references in the ESP SSAR, to the terms combined license, combined license applicant or combined license application, will include and apply to a construction permit, construction permit applicant and construction permit application respectively, unless the content indicates otherwise.

Next slide please. Slide 9. Based upon

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the Staff review, the Staff made the following conclusions.

First, the ESP application satisfies applicable regulations. Second, issuance of the ESP will not be inimical to the common defense and security to the public health and safety.

Next slide please. Slide 10. Third, two or more SMRs can be safely cited on the Clinch River Nuclear site if they, one, have design characteristics following within the design parameters for the site.

Two, have site parameters following within the site characteristics for the site. And three, meet the ESP terms and conditions.

Next, Bruce Musico, Michelle Hart and I will discuss the staff's review of the emergency planning, the plume exposure path rate, EPZ size and methodology and associate exemptions request.

Michael Scott will discuss our interactions with the Federal Emergency Management Agency, FEMA.

Next slide please. The TVA ESP application is unique in its approach to emergency planning. In that it proposes a methodology to determine the appropriate plume explosion path for EPZ for a particular site.

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TVA is risk informed, dose-based and consequence-oriented approach is consistent with the current emergency planning framework. The NRC is not being asked to approve a specific EPZ size at this time.

A combined license or construction permit applicant referencing the ESP were used in methodology to determine the appropriate plume explosion pathway EPZ size.

There are also exemption requests associated with the TVA's proposal to deviate from the current ten-mile plume explosion pathway EPZ requirement.

In the safety evaluation report, the Staff found that TVA's methodology and associated exemption requests are acceptable. Now, we'll turn the presentation to Bruce.

MR. MUSICO: Thank you. Good morning. My name is Bruce Musico and I'm a senior emergency preparedness specialist in NSIR. I and Michelle Hart reviewed the emergency planning information in the ESP application.

Can I have Slide 12 please. This slide shows the three key areas of review associated with emergency planning. They include, first, the two major features, emergency plans that TVA requested us to

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review and approve.

Second, the 25 exemptions, which are associated with the two major features, emergency plans, and third, a plume exposure pathway EPZ sizing methodology, which would be used in the combined license or construction permit application to determine the size of the EPZ for the Clinch River Nuclear site.

Slide 13 please. Part 5 of the ESP application included two major features and emergency plans. Both of which consists of limit aspects of the proposed onsite emergency plan for the Clinch River Nuclear site.

The first plan, ESP application Part 5A, reflects the site boundary plume exposure pathway EPZ.

While the second plan, EPZ application 5B reflects a two-mile plume exposure pathway EPZ.

The two-miles is measured from the center point of the site. The two-mile EPZ emergency plan also includes an evacuation time estimate, or ETE. Which characterizes evacuation from the two-mile EPZ area surrounding the site.

A combined license or a construction permit applicant referencing the ESP would use one of these major features emergency plans. The selection of which depends on the outcome of the combined license or

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construction permit applicants EPZ sizing analysis.

Slide 14 please. In Part 6 of the ESP application, TVA provided two sets of requested exemptions from NRC's emergency planning requirements.

These exemptions applied to both major features and emergency plans and reflected the associated plume exposure pathway EPZs.

For the major feature emergency plan that could be used in connection with the two-mile plume exposure pathway EPZ, TVA requested only two exemptions from the requirements in 10 CFR 50.33(g) and 10 CFR 50.47(c) (2), that the plume exposure pathway EPZ, for nuclear power plants, consist of an area about ten-miles in radius. All of the remaining EPA requirements for a nuclear reactor site would still apply to it.

For the major feature emergency plan that could be used in connection with the site boundary plume exposure pathway EPZ, TVA requested 25 exemptions from NRC EPA requirements. These include two exemptions from the ten-mile plume exposure pathway EPZ requirement in, again, 10 CFR 50.33(g) and 50.47(c) (2), along with 23 additional exemptions from various parts of 10 CFR 50.47 and Appendix E, to 10 CFR part 50.

These additional exemptions deal with such offsite emergency planning areas as state and local

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emergency plans, public alert and notification and evacuation time estimate and offsite emergency preparedness exercises.

Acceptability of the requested exemptions depends on the acceptability of TVA's proposed plume exposure pathway EPZ size methodology. Michelle Hart will now address the Staff's review of this methodology.

MS. HART: Next slide please. Thank you, Bruce. Good morning, my name is Michelle Hart and I'm a senior reactor engineer in the Office of New Reactors.

I evaluated TVA's proposed methodology for EPZ sizing for the plume exposure pathway. Which I will call the EPZ sizing methodology for short.

In the following presentation I will discuss two related topics. First, TVA's EPZ sizing methodology and second, a related permit condition.

For the EPZ sizing methodology I will describe general features of the analysis method and the supporting technical criteria. Then I will describe the dose criteria used to determine the plume exposure pathway EPZ size. And finally, I will describe the basis for the Staff's review and finding.

Next slide please. Slide 16. The Staff has not previously evaluated a plume exposure pathway EPZ sizing methodology for a specific power reactor

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site as a part of a licensing application.

While there is no applicable guidance for EPZ sizing on a site-by-site basis, there is guidance on performing accident consequence analysis that is generally applicable. Such as Reg Guide 1.183 for design basis accident dose analyses.

To help in its determination of the proposed methodologies acceptability, the Staff looked at the technical basis for the current regulations in 10 CFR Part 50 that require a plume exposure pathway EPZ of about ten-miles in radius for power reactors.

This technical basis is provided in staff technical report NUREG-0396, which describes the considerations used, including analysis of the potential offsite consequences of a range of accidents for large light water reactors.

The general concept that SMRs may propose a site-specific EPZ size has been previously approved by the Commission. The Staff's intent to develop a technology neutral dose-based consequence-oriented emergency planning and preparedness framework for SMRs, including EPZ size, was described in SECY 110152.

The Staff requirements memorandum for SECY 150077, which provided Commission approval for the Staff to initiate a rulemaking on emergency planning

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for SMRs and other new technologies, directed that the Staff be prepared to the adapt of an approach, to EPZs, for SMRs under existing exemption processes in parallel with its rulemaking efforts.

Next slide please. There are three technical criteria that TVA use to develop the EPZ sizing methodology.

TVA based these three technical criteria on the discussion in NUREG-0396. The first criterion is that the plume exposure pathway, EPZ, should encompass those areas in which the projected dose from design basis accidents could exceed the environment protection agency, or EPA, early phase protective action guide, or PAG, that would indicate that early protective actions be taken to protect the public health and safety.

The second criterion is that the plume exposure pathway, EPZ, should encompass those areas in which the consequences of less severe core melt accidents could exceed the EPA early phase PAG.

Next slide please. The third criterion is that the plume exposure pathway, EPZ, should be of sufficient size to provide for substantial reduction and early health effects in the event of more severe core melt accidents.

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Next slide please. Slide 19. Now I will describe the steps in TVA'S methodology for determining the plume exposure pathway EPZ size.

TVA'S application describes the methodology that a combined license or a construction permit applicant would use, along with the chosen design specific accident release information, to provide the technical basis for the final plume exposure pathway EPZ size, for the Clinch River Nuclear site.

In the first step, the applicant would select the appropriate site and design specific accident scenarios to determine the consequences of accidents. For the evaluation of design basis accident consequences, the methodology uses the bounding design basis accident, which is the design basis accident in either the combined license or construction permit application, that has a release to the environment that results in the highest doses at the exclusionary boundary and low population zone.

The site and design specific probabilistic risk assessment, or PRA, will be used to categorize the severe accident scenarios by frequency, for use in the EPZ size determination.

The severe accident scenarios are separated into two categories. The more probable, less

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severe core melt accidents within intake containment are in one category.

The less probable, more severe core melt accidents with postulated containment failure or bypass, are in the other category.

Next slide please. In the second step, the applicant would determine the source term radionuclide releases to the atmosphere as a function of time for the selected accident scenarios.

Step 3 is the calculation of dose consequences at a distance from the plant. And the final step is to determine the appropriate plume exposure pathway EPZ size that meets the dose criteria.

I will describe the dose criteria next.

Next slide please. Slide 21. The dose criteria relate to dose to an individual from exposure to the airborne plume during its passage into groundshine.

As a predictive model, the analysis uses the average atmospheric dispersion characteristics for the site. For the design basis accidents and the more probable less severe core melt accident categories, the dose criterion is one rem total effective dose equivalent from an exposure duration of 96 hours.

This dose quantity is at the lower end of

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the dose range given in the EPA PAG manual as a protective action guide for such early protective actions as evacuation and sheltering of the public.

For the less probable, more severe core melt accidents category, those with containment failure or bypass, the dose criterion used to verified substantial reduction in early health effects, is that the conditional probability is less than ten to the negative three per reactor year of it exceeding an acute dose of 200 rem whole body from a 24 hour exposure, beyond the outer boundary of the plume exposure pathway EPZ.

Next slide please. The staff found that the features of TVA's EPZ sizing methodology are consistent with the features of the analysis described in NUREG-0396. Which is the technical basis for the current ten-mile EPZ size requirement for power reactors.

Similar to what was done in NUREG-0396, TVA's methodology considers a range of accidents, performs accident consequence analyses to determine dose to an individual at distance and then determines an area outside of which early protective actions are not likely to be necessary to protect the public from radiological releases.

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Finally, TVA's technical criteria are essentially the same as the criteria used in NUREG-0396.

Next slide please. A plume exposure pathway, EPZ, determined by the proposed methodology will maintain the same level of radiation protection in the environs of the Clinch River Nuclear site. In other words, dose savings to members of the public.

That is provided by the regulatory requirement of a plume exposure pathway EPZ of about ten-miles in radius for large light water reactors. Based on this review, the Staff concludes that TVA's proposed methodology for determination of a site-specific plume exposure pathway EPZ size is reasonable and consistent with the analyses that form the technical basis for the current regulatory requirements.

Next slide please. Slide 24. Now I move to a different but related topic. The permit condition related to the combined license or construction permit, applicants use of the requested emergency planning and exemptions.

Permit condition five requires that the combined license or construction permit applicant to demonstrate that the design specific accident release source term used in the EPZ sizing analysis is bounded

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by the non-design specific source term developed by TVA and included in permit condition five.

Next slide please. The accident release source term is a bounding four-day integrated release that meets TVA's EPZ sizing methodology dose criteria at the site boundary.

The source term for the permit condition envelops potential SMR designs that may be selected for the combined license or construction permit application. This is the same general idea as the ESP plant parameter envelope for design basis accidents.

The combined license or construction permit applicant must satisfy permit condition five to use the emergency planning exemptions if granted in the ESP. Unless a variance is requested and approved.

Now I turn the presentation back to Bruce, to discuss the Staff's review of the exemption request.

MR. MUSICO: Thank you, Michelle. Slide 26 please. The review of the exemption request is governed by 10 CFR 50.12, which states in part that the Commission may grant exemptions from the requirements of the regulations, which are authorized by law, will not present an undue risk to the public health and safety and are consistent with the common

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defense and security.

In addition, the Commission will not consider granting an exemption unless special circumstances are present.

Slide 27 please. The staff determined that the request exemptions are not contrary to the Atomic Energy Act or other legal requirements. The staff also determined that the requested exemptions will not present an undue risk to the public health and safety and are consistent with the common defense and security.

TVA's methodology maintains the same level of protection that is dose savings, surrounding the Clinch River Nuclear site as that which currently exists at the ten-mile plume exposure EPZ, excuse me, ten-mile plume exposure pathway EPZ for large light water reactors. Also, the requested exemptions present no security issues.

Slide 28 please. For TVA's requested exemptions, the applicable special circumstance is in 10 CFR 50.12(a)(2)(ii), which states in part that application of the regulation in the particular circumstances is not necessary to achieve the underlying purpose of the rule.

The staff reviewed all of the requested

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exemptions against this standard and agrees with TVA that the special circumstance in 10 CFR 50.12(a)(2)(ii) applies to the requested exemptions.

Slide 29 please. As a result of the detailed review of the requested exemptions, the staff finds that the establishment of a plume exposure pathway EPZ, in a combined license or construction permit application, will maintain the same level of protection that is dose savings surrounding the Clinch River Nuclear site, as that which currently exists at the ten-mile plume exposure pathway EPZ for large light water reactors.

As such, TVA's approach will serve the same underlying purpose as the current regulations, with regard to public health and safety. Therefore, special circumstances are present in all criteria for the proposed exemptions are satisfied.

I will now turn the presentation over to Michael Scott.

MR. SCOTT: Good morning. I'm Mike Scott, the director of the division of preparedness and response in NSIR.

In that position I am the primary senior management interface with FEMA's technical hazards division which is the part of FEMA most closely involved

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in consultation in NRC's licensing actions with potential emergency planning implications.

Over the next few slides I will address the NRC Staffs interactions with FEMA on the Clinch River ESP application and review. The NRC coordinated its review of the ESP application with FEMA, pursuant to the requirements of 10 CFR 52.17 and 52.18. And the most recent memorandum of understanding between FEMA and the NRC.

Slide 31 please. FEMA's review of the ESP application was limited because, first, the ESP application did not include any offsite emergency plans. Although it did include an evacuation time estimate for the two-mile plume exposure pathway EPZ that could be used to support development of those plans if the two-mile plume exposure pathway EPZ is justified at the combined license stage.

Second, both major features of emergency plans only address limited aspects of the proposed onsite emergency plans for the Clinch River Nuclear site. The limited extent of the areas reviewed in the ESP application for the emergency plans is permitted by the major features approached in our regulations.

Slide 32 please. In its January 24th, 2018 letter, FEMA provided the NRC its findings associated

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with its review of the TVA ESP application. The findings addressed the two application areas that required FEMA's review, consisting of first, whether there are significant impediments to the development of emergency plan and, second, the major features of the emergency plan.

For the first finding, FEMA stated that it did not identify any physical characteristics of the proposed Clinch River Nuclear site that could pose a significant impediment to the development of emergency plans. Including evacuation from the proposed two-mile plume exposure pathway EPZ.

Slide 33 please. For the second finding, FEMA stated that the boundary established for the proposed two-mile plume exposure pathway EPZ, was established relative to local emergency response needs and capabilities, as they are effected by such conditions as demography, topography, land characteristics, access routes and jurisdictional boundaries.

FEMA added that it had worked with the Tennessee emergency management agency to come to this determination.

Slide 34 please. In its January 24th, 2018 letter, FEMA also stated in part that its findings do

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not endorse or determine the adequacy of a proposed two-mile plume exposure pathway EPZ for the Clinch River site.

FEMA stated in its January 28th, and more recent July 2019 letter, that as the licensing process moves forward, FEMA looks forward to providing continued consultative support to the NRC, including during a future combined license application review.

Slide 35 please. Valuing FEMA's perspective on emergency planning for SMRs and being aware of some differing views, the NRC Staff suggested that FEMA provide written comments. They did so in a letter dated July 8th, 2019.

The letter expressed concerns about the approach to EPZ sizing contained in TVA's ESP application and accepted by the NRC Staff.

Slide 36 please. The NRC Staff's views on the concerns expressed by FEMA are provided in the Staff's responses to questions posed by the Commission. The Staff also plans to respond to FEMA.

The issues raised by FEMA represent differing perspectives on emergency planning that have arisen in the last several years and not just on this licensing action. The Staff has held numerous interactions with FEMA to attempt to reach accord.

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Some progress has been made, but some differences remain. The Staff's differences with FEMA on this action focus in large part on the degree of reliance the Staff proposes to place on risk assessment in support of decision making for emergency preparedness. And on the extent to which planning includes worst-case scenarios.

The NRC regulations are risk informed, not focused on the worst conceivable case. Said another way, the NRC's regulatory framework is founded on safety objectives that require the risk of nuclear energy to be very small, not zero.

The risk assessment that supports emergency planning includes a wide spectrum of initiating scenarios. The dose outcome, and input to EPZ sizing for human induced events that we evaluate, is similar to the outcomes of other events.

The Staff's approach to the EPZ sizing review suits the protection to the risk, which factors in probability as well as consequence. For the TVA application, the Staff's approach to the EPA sizing review is consistent with the approach taken when the EPZ regulations were developed.

Slide 37 please. FEMA's letter states that local authorities must determine offsite

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radiological emergency planning requirements.

The NRC Staff values and sought the views of our government partners on this licensing action and has involved, and will involve, local authorities on emergency planning in the context of the rules that govern emergency planning.

But EPZ sizing is ultimately based on an assessment of the nuclear risk. The NRC is tasked with making such assessments and determining what the appropriate requirement should be.

That said, the NRC Staff does not object to licensees working with state and local authorities to develop capabilities beyond those that we require.

FEMA and the NRC Staff disagree on the use of the EPA PAGs in support of EPZ sizing.

The 2017 update to the PAG manual states "the size of the EPZ is based on the maximum distance at which a PAG might be exceeded." This is exactly how the NRC proposes to use the PAGs to determine EPZ sizing in a risk informed manner.

FEMA's letter indicates that FEMA believes that the NRC Staff assumes a massive immediate and coordinated federal response absent formal offsite radiological emergency planning. However, the NRC Staff doesn't assume a rapid and coordinated response.

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Rather, it would be highly unlikely that such a response would be needed for the slowly developing and relatively low-level hazard posed by the type of facility that could demonstrate the PAGs would not be exceeded offsite.

A site boundary EPZ, in such circumstances, is analogous to the approach to emergency planning for other facilities posing very small offsite risk, including non-power reactors.

To summarize this discussion, the NRC Staff respects FEMA in their role as our partner in emergency response. We actively sought their views on subjects under discussion today.

As is clear, we don't agree on the approach to EPZ sizing. The NRC Staff has considered FEMA's views carefully, but we believe that the Staff's conclusions on EPZ sizing, as presented today, appropriately align the protection to the risk and are consistent with Commission direction on risk informing NRC's activities.

Slide 38 please. In addition to discussing these matters extensively with FEMA, and in addition to public meetings held on the EPS licensing action, the NRC Staff has reached out to, and sought views of, numerous stakeholders on EPZ sizing for SMRs.

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For example, we held two meetings with the Tennessee emergency management agency. And we encourage that agency to share their views by letter, which they have done.

The Staff has also met with a conference on radiation control program directors, the national emergency management association and the federal radiological preparedness coordinating committee, to inform those organizations of the Staff's work on the emergency planning subjects presented today and to hear their views.

I will now turn the presentation back to Mallecia.

MS. SUTTON: Thank you, Mike. Next slide please. If the EPS is issued, the Applicant will have approval, with conditions, on TVA's plume exposure pathway for EPZ size methodology, the two major features emergency plans and 25 request exemptions to emergency planning requirements.

Next slide please. Slide 40. A combined license of construction permit applicant that incorporates, by reference, the ESP, must demonstrate the implementation of TVA's plume exposure pathway for EPZ size methodology, using the design specific input for the chosen SMR technology supports either the site

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boundary EPZ or the two-mile EPZ. And satisfies the permit condition for use of the emergency planning exemptions.

In addition, with respect to emergency planning, the combined license of construction permit application must address the 16 COL action items, must satisfy the two permit conditions and must provide any other emergency planning information necessary for issuance of the combined license of construction permit.

Next slide please. Slide 41. The Staff concludes that TVA has presented an acceptable methodology for determining the size of the plume exposure path for EPZ, for the Clinch River Nuclear site because the methodology is consistent with the technical bases for the current ten-mile plume exposure pathway for EPZ size requirement for power reactors.

Slide 42 please. The Staff also concludes that the two major features emergency plans provided in the ESP application meet the applicable requirements of 10 CFR 50.47 and Appendix E, to 10 CFR Part 50.

And finally, the Staff concludes that the exemption request are acceptable because they are authorized by law, would not present an undue risk to the public health and safety, are consistent with the

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common defense and security and special circumstances are present.

With that, the Staff's presentation for the safety panel is complete. We're happy to take any questions you may have. Thank you.

CHAIRMAN SVINICKI: Well thank you to the NRC witnesses on the safety panel. Again, we will have Commissioner questions now.

And I appreciate the NRC witness's cooperation, if a question is being answered by the TVA witness directly behind you, if you can help by shifting to one side or another. And I appreciate your indulgence in that.

And we will begin the questions for this panel with Commissioner Caputo.

COMMISSIONER CAPUTO: Good morning. Thank you all for being here.

I think the majority of my questions are probably going to be directed at Michael, and perhaps Bruce, but I'll start with Michael.

So, you've already stated the emergency planning zone sizing methodology described in the FSER uses the same technical criteria and provides the same level of protection as the ten-mile EPZ does for existing large light water reactors.

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Our Advisory Committee on Reactor Safeguards, with their significant severe accident expertise, concurred with these conclusions, correct?

MR. SCOTT: That is correct.

COMMISSIONER CAPUTO: Thank you. And TVA's methodology uses the same EPZ rational as in NUREG-0396 based on "a full spectrum of accidents and corresponding consequences tempered by probability considerations," correct?

MR. SCOTT: That's also correct.

COMMISSIONER CAPUTO: I'm going to quote from the Staff's response to one of the pre-hearing questions. "After September 11th, 2001, the NRC conducted vulnerability studies that revealed that the timing and magnitude of releases related to hostile action would be no more severe than in other accident sequences considered in the emergency preparedness basis.

For credible attack sequences, the initiating event may change how the accident starts, including terrorists, insider threats, cyber, et cetera, but it does not change the source term, how fast the fuel melts or potential offsite consequences."

So, the full spectrum of threats is encompassed in the EP basis by accounting for a range

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of accident scenarios, including those with the shortest timing and the largest magnitude, correct?

MR. SCOTT: That's correct.

COMMISSIONER CAPUTO: Also, in response to the pre-hearing questions, the Staff noted, "if a COL or CP applicant demonstrates that a site boundary plume exposure pathway EPZ is justified, however, then the need for offsite actions would be highly unlikely."

And by highly unlikely, we mean an accident scenario that has a likelihood of less than a million years, correct?

MR. SCOTT: That's correct.

COMMISSIONER CAPUTO: So if a highly unlikely release of radioactive material, and once again quoting the Staff, "of a highly unlikely release of radioactive material occurs, an offsite response is necessary, the NRC Staff acknowledges that such a response would occur in the context of an all hazards framework, consistent with how such a release would currently be handled for NRC licensees other than power reactors," correct?

MR. SCOTT: That's correct.

COMMISSIONER CAPUTO: And, Michael, you already stated earlier that the NRC did not rely on offsite response actions from local or federal response

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teams in its analysis?

MR. SCOTT: That's correct, Commissioner.

COMMISSIONER CAPUTO: FEMA's comprehensive preparedness guide entitled, "developing and maintaining emergency operations plans states, planning considers all hazards and threats while causes of emergencies can vary greatly, many of the effects do not."

The guide also recognizes that while each hazards characteristics are different, the general task for conducting an evacuation and shelter operations are the same.

So, to be clear, to the extent that the NRC would rely on an all hazards approach to planning would be in the context of accident scenarios with a likelihood of less than one in a million years and that the public would be adequately protected existing emergency response plans, correct?

MR. SCOTT: Essentially that's correct. I'd just like to add that the Staff based its conclusions on evaluation of the method that the licensee, or the applicant, proposes with regard to comparison of the offsite doses with the EPA PAGs.

And that, therefore our reasonable assurance finding, from based on that, and not about

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any assumptions about the effectiveness of all hazards planning.

COMMISSIONER CAPUTO: Okay.

MR. SCOTT: I just want to make sure that's clear.

COMMISSIONER CAPUTO: Okay, thank you. In response, once again, to pre-hearing questions, the Staff provided some insights on the history of the EPZ concept.

"The EPZ concept was developed in response to a request by the conference of radiation control program directors in 1976 to establish bounds on planning so that offsite response organizations could understand the extent of necessary planning for cases where doses exceed the protection action guides, and protective actions are thus required.

If the offsite doses do not exceed the PAGs, then no specific protective actions would be necessary and offsite planning would therefore not be necessary.

The NRC and EPA both support this use of the PAG method as a threshold, as documented by the joint NRC EPA taskforce in the NRCs NUREG-0396 and EPA's companion document 520. As well as in the 1992 EPA manual of protective action guides and protective actions for nuclear incidents."

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So, just to continue, the EPA's 2017 update to the PAG manual states, "the size of the EPZ is based on the maximum distance at which a PAG might be exceeded." The manual also states, "when dose projections are at levels less than one rem over the first four-days, evacuation is not recommended due to the associated risks of moving large numbers of people."

So, just to summarize, the NRC and EPA work together to develop the EPZ concept using the EPA PAGs to set an EPZ distance recognizing the appropriate balance between the risk of exposure and the risks associated with evacuations. Is that accurate?

MR. SCOTT: I believe that is accurate, yes.

COMMISSIONER CAPUTO: Another point of clarification. We don't use EPA PAGs to establish an acceptable level of risk for normal, non-emergency conditions. We have separated more conservative standards for normal operation, correct?

MR. SCOTT: Correct.

COMMISSIONER CAPUTO: All right. And I'm going to shift gears to a separate question on flooding.

According to TVA's flooding analyses, the probable maximum flood level at the Clinch River site would be [REDACTED] feet mean sea level. That the

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planned finished grade elevation of the Clinch River site is [REDACTED] feet higher than the maximum water elevation.

Given this significant margin, would safety related structure systems and components be susceptible to flooding or is this considered a dry site?

MS. SUTTON: Hi, my name is Mallecia Sutton. So the height, so for the evaluation and the hydrology, the system would be safe. If you need more technical information, I can have Joe Giacinto, the hydrologist, come to the stand.

COMMISSIONER CAPUTO: Okay --

MS. SUTTON: Okay.

COMMISSIONER CAPUTO: -- thank you.

MS. SUTTON: You're welcome.

CHAIRMAN SVINICKI: I guess would the NRC witness please come to the podium?

And while you're making your way there, if when you reach the podium, could you please introduce yourself?

And would you please verify that you have been sworn and are reflected on the witness list?

MR. GIACINTO: Hi, my name is Joe Giacinto, Office of New Reactors and I have been sworn in.

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CHAIRMAN SVINICKI: Thank you. Do you need the question to be repeated for you?

MR. GIACINTO: Please. Yes.

COMMISSIONER CAPUTO: According to TVA's flooding analyses, the probable maximum flood level at the Clinch River site would be [REDACTED] feet mean sea level. And that the planned finished grade elevation of the Clinch River site is [REDACTED] feet higher than the maximum water elevation.

So given this significant margin, would safety related structure systems and components still be susceptible to flooding or is this considered a dry site?

MR. GIACINTO: It would be considered a dry site at this point. Yes.

COMMISSIONER CAPUTO: And so, what does that entail?

MR. GIACINTO: Well, a dry site indicates that there is no danger from flooding. And so, given the large margin of the site above the Clinch River, which is about 80 feet above the Clinch River normal water level, and the height that the site above the maximum flood level, which is over [REDACTED] feet. That would be considered a dry site.

COMMISSIONER CAPUTO: Okay, thank you.

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And sorry, one more, one last question.

For Michael. During the NRC's interactions with FEMA on this application, or on the reactor EPZ rulemaking that's ongoing, did FEMA representatives offer any technical basis that would call into question the NRC Staff's conclusions regarding the safety of SMRs and the methodology for corresponding EPZ size?

MR. SCOTT: None that I'm aware of.

COMMISSIONER CAPUTO: Okay, thank you. I have no further questions.

COMMISSIONER CAPUTO: Thank you, Commissioner Caputo. Next we will recognize Commissioner Wright. Please proceed.

COMMISSIONER WRIGHT: Good morning. Yes, it's still morning.

So I'm going to ask a question that's going to be for both panels, so we'll, I guess, first jump in, whoever wants to do it.

So, I'm interested in hearing about the interactions and discussions that the Staff and TVA had regarding the proposed permanent conditions. How did those discussions go, do you feel you engaged on the subject earlier enough in the process here?

And I guess, did the draft conditions

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evolve based on these discussions?

MR. FETTER: So hi, this is Allen Fetter.

The Staff were writing their individual SEC sections and they used what they considered their own engineering and technical judgment to develop permanent conditions, what they thought would be important to address for the COL.

And those were not done in a vacuum, those were presented to management, and also discussed with TVA before the SE's were issued.

COMMISSIONER WRIGHT: Any comment?

MR. STOUT: And TVA was made aware of the permit conditions and we understood them. We see that a future application can meet those requirements.

On occasion it appears that the permit conditions are already existing regulatory requirements, however, there is no impediment to us meeting them.

COMMISSIONER WRIGHT: Were there any proposed conditions that were removed during the discussions that had been there previous? Or earlier?

MS. SUTTON: Yes. So, after we presented some of the permit conditions to TVA and discussion with the Staff, some of the permit conditions were removed or revised, appropriately.

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COMMISSIONER WRIGHT: Okay. Anything specific we'd be interested in knowing about?

MS. SUTTON: Not at this time. Well, we've had fruitful discussions with the Staff and management and management, there is a lot of proposed conditions and permit conditions that we proposed.

Some of the management, before even the applicant saw them, asked us to go back to look through the regulatory basis and then we revised them, removed them or made appropriate changes. So there was nothing that was glaring that we thought was necessary moving forward. That wasn't presented now.

COMMISSIONER WRIGHT: Okay. I'm going to stay with the NRC Staff here with the next couple of questions.

So, were there any unexpected challenges that you encountered during your safety review of the ESP application, and if there were, can you maybe briefly tell me how you overcame those challenges?

MS. SUTTON: As stated in our presentation, de novo issue of evaluating the EPZ size methodology was a challenge for the staff. We worked together with our counterpart, NSIR, came up with a process to evaluate the deviation from the current ten-mile EPZ and how the Staff will provide the

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technical basis to justify if the exemptions could be approved and granted per the Commissions regulations.

And so, as we went through the process and got management input and guidance, we felt like we were able to provide the necessary, meet their necessary regulations to say that the exemptions could be granted.

COMMISSIONER WRIGHT: So, considering, I guess, exemptions that maybe have been previously granted from the general requirement of that ten-mile EPZ, can you describe to me where maybe you've done that before?

And how were those circumstances maybe different or similar in this case?

MR. SCOTT: So, I'll address that if I could. So, the rules do allow for reactors that are smaller or, in the case of the high temperature gas coolant reactor, setting the EPZ size on a case-by-case basis.

So that's already written in there. And there were several very small reactors sometime back that had five mile EPZ. Those are since decommissioned. And there was of course a Fort St. Vrain HTGR that also had a five mile EPZ.

So, it has been done in the past for different type power reactors. They weren't by

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exemption though, to my understanding, because it was in the rules.

COMMISSIONER WRIGHT: Okay, very good. Thank you.

CHAIRMAN SVINICKI: Well, let me add my thanks again for all the presentations. A number of subject matter areas have been covered already.

Maybe this is a kind of broad, and for any TVA witness whose appropriate, but if the exemptions that are sought were granted, and again, the Staff has recommended approval of the EPZ sizing methodology, so assuming that all of that were put in place and assuming, there's a lot of ifs with this question, assuming that TVA came back in with a request for a construction permit or a COL application, would it be the planning to continue to have some measure of coordination with offsite emergency response and municipal and local officials, and if so, could you give a general description of what that kind of coordination offsite might look like? I realize this is a bit speculative.

MR. STOUT: Yes, it is our intent to continue to communicate and coordinate with the state and the local emergency preparedness officials. We're also a neighbor to the Department of Energy.

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They have emergency planning. Our site is in their emergency planning zone. So there would be offsite coordination on the appropriate emergency plant preparedness response for any type of application going forward. Whether it meets site boundary or it meets two-mile.

CHAIRMAN SVINICKI: Thank you. And although Commissioner Wright's question was not directed to the TVA witnesses, are you aware, was there any study of the historic five mile EPZs for say Fort St. Vrain or maybe Big Rock Point, I think was another that had a smaller EPZ, did that history form any foundation for your proposal or was it at least studied?

MR. STOUT: We did consider all the past precedence, but we chose a unique approach and a specific dose-based methodology thinking that that's in the best interest of TVA and the country as we go forward and take advantage of the improvements in our tools and analysis capabilities.

CHAIRMAN SVINICKI: Thank you. And I appreciate you mentioning the advances and modeling in simulation some of which this very proudly developed right there at Oak Ridge, near you. So they have a lot of computational tools that are available to modern applicants, such as yourself, that were not

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historically available.

I wanted to turn now, I think this is for TVA, but I'll have a variation of this question for the NRC Staff as well. And it is in the consideration of alternative citing.

I know that there is a lot already in the record. The staff witnessed, Ms. Bradford testified that in the Staff's view, none of the alternative sites, to the Clinch River site, were obviously superior in the environmental context.

Just as an aside, she mentioned that none of the other sites were environmentally preferable. I know this is the safety panel but I just thought I'd mention, those are the Staff's kind of parallel conclusions there in validating the Clinch River site.

Those are obviously pretty high bars. Obviously superior means they're not kind of neck-and-neck, but could one of the TVA witnesses give me any sense of what were the dispositive, what were the highest most major contributors to finalizing around the Clinch River site, in comparison to the alternatives that you looked at?

MR. STOUT: There is the environmental considerations that you just mentioned. But also on a technical side, there was an excavation performed

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for the Clinch River Breeder Reactor.

And we were able to use that information.

And --

CHAIRMAN SVINICKI: In in-site characterization, you had that available to you?

MR. STOUT: Absolutely. And so that informed us on the suitability at the site in particular. So, we had less uncertainty as it relates to the geotechnical.

CHAIRMAN SVINICKI: Okay. And I would note though, it's always kind of a give and take in life because now some of that site disturbance of course would be factors that you would have to characterize more fully if you went forward with a COL application.

Staff noted in response to some pre-hearing questions that there are some things not yet established about the extent of some of those things. And so, I know part of the answer for both the Staff and for the Applicant are that there would be a fuller characterization of those excavations and their effects on any particular proposal to locate a facility there.

Just a thought, I would note that as well.

And I think, so, I guess for the Staff, the variation on that question is, in terms of no other sites being obviously superior, where there factors you weighed?

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I don't know if you have any request for additional information regarding this. Is there anything that comes to mind?

MR. FETTER: This is more in the area of the environmental review.

CHAIRMAN SVINICKI: Okay, sure.

MS. SUTTON: But just to ask you a question. There is no additional --

CHAIRMAN SVINICKI: But from the safety and the --

MS. SUTTON: There is no additional environment RAIs associated with the --

CHAIRMAN SVINICKI: Okay.

MS. SUTTON: And there was none on the safety side.

CHAIRMAN SVINICKI: The safety side either, okay.

MS. SUTTON: Okay. Yes.

CHAIRMAN SVINICKI: I think, again, the cite, alternative citing always has two prongs. Safety, which tends not to be the largest set of considerations, and the environmental as well, which I will pursue this with the next panel.

And with that, that concludes my questions for this panel and I turn it over to Commissioner Baran.

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COMMISSIONER BARAN: Thank you. Well, thank you all for your hard work on this review. I have some questions on emergency preparedness.

These questions, I think, are all for the NRC Staff, but you all can decide who wants to chime in on any given question.

I guess just to briefly summarize, I think where we are. As part of the early site permit the NRC Staff recommends approving TVA's methodology for determining plume exposure pathway emergency planning zone, or EPZ size, for the Clinch River site.

The early site permit wouldn't establish a specific EPZ at this time. Instead, the staff recommends issuing exemptions now that could result in a two-mile or site boundary EPZ for the site if a combined license or construction permit is later issued.

To be clear, the regulations say that the EPZ should extend about ten-miles out from the site, but the exemptions would allow the EPZ to stop at two-miles or at the boundary of the site, as long as the dose criteria are met. Is that right?

MR. SCOTT: That's correct.

COMMISSIONER BARAN: The dose criteria come from EPA's protection action guides, or PAGs as

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we've heard. The methodology results in a EPZ large enough to encompass the areas where the projected dose from design basis accidents could exceed one rem.

Does this essentially adopt the methodology of the NRC Staff's draft proposed rule for emergency preparedness for small module reactors, which is currently pending before the Commission?

MR. SCOTT: So, the approach taken in this licensing action is similar to that in the rule.

COMMISSIONER BARAN: Is there any difference between this approach and the approach in the rule?

MR. SCOTT: I am not aware of any substantive differences with regard to plume exposure pathway EPZs --

COMMISSIONER BARAN: Okay.

MR. SCOTT: -- because the rule addresses ingestion pathway and this action does not because the Applicant chose not to go there.

COMMISSIONER BARAN: Okay.

MR. SCOTT: Can I just interject one thing, I wanted to add to my answer --

COMMISSIONER BARAN: Sure.

MR. SCOTT: -- to your previous question?

COMMISSIONER BARAN: Yes.

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MR. SCOTT: So as what, I think your remarks refer to it, but I want to make sure mine did as well. So we're not in the EPS stage approving any EPZ. Not two-miles from outside boundary, nothing.

What we're proposing to approve is the method that could lead to that at the combined license stage.

COMMISSIONER BARAN: Right. Under this methodology, the quantitative dose formula determines the size of the EPZ, right?

So using the small type step formula you plug in factors that someone discussed on earlier slides, which is the reactors design features and characteristics, the source term, the site conditions, exposure and dose estimates.

And the formula spits out EPZ size, is that how it works?

MS. HART: The methodology results in dose distance that you would use then to determine if the EPZ size is supported.

COMMISSIONER BARAN: That sounds like a purely quantitative risk-based determination rather than a risk informed decision that accounts for expert judgement, defense-in-depth or public confidence. Is this a purely risk-based methodology for determining

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the EPZ size?

MR. SCOTT: As you know, the NRC licenses a large variety of facilities, from very large reactors down to individual sources. And most of those facilities don't require offsite planning.

So, at some point in the hazard spectrum, a decision needs to be made that the formal offsite radiological emergency planning is not needed anymore.

And so, the Applicant proposes, and the Staff proposes, to accept that an appropriate place to draw that line to where the offsite formal planning is not needed anymore is when the EPA PAGs will not be exceeded offsite.

And Staff believes that is consistent with the Commission's guidance on risk informing EPZ sizing.

It's consistent with the earlier, the EPA PAG discussion that we had earlier. It's also consistent --

COMMISSIONER BARAN: My question is a little different than that.

MR. SCOTT: Okay.

COMMISSIONER BARAN: My question is, is the methodology itself risk informed or is it risk-based?

MR. SCOTT: We believe it is risk informed.

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Do you want to add to that?

MS. HART: There is consideration on certainty and on consideration of defense-in-depth in the methodology. Of course, it's not been practiced yet. It would be evaluated in the implementation.

COMMISSIONER BARAN: Well, is anyone exercising any judgment about how large the EPZ should be or is it a mathematical calculation? Under the --

MS. HART: As far as the methodology itself it just determines the distance at which the EPA PAG is maybe exceeded. And also evaluates the substantial reduction in early health effects for those very severe accidents.

COMMISSIONER BARAN: This seems to be a significant departure from how NRC has always approach emergency preparedness. When NRC established the ten-mile EPZ for the existing fleet of large light water reactors, it wasn't based on the likelihood of an accident occurring.

In 1978 NUREG-0396, which has been cited several times today as being consistent with a proposed methodology, stated that "emergency planning is not based on quantified probabilities of incidents or accidents, but on the public perception of the problem, what can be done to protect health and safety."

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In the 1986 safety goal policy statement the Commission said that emergency response capabilities are mandated to provide additional defense-in-depth, protection to the surrounding populations.

When the agency was working through advance reactor issues in 1993, the NRC Staff wrote that it views the inclusion of emergency preparedness by advance reactor licensees as an essential element. The NRC's defense-in-depth philosophy.

Four years later, now in the late '90s, the Staff emphasized the importance of getting the buy in and acceptance of federal state and local emergency response agencies, for any emergency response changes relating to new potentially safer reactor designs.

Is the Staff throwing all that out the window with this proposed methodology and these proposed exemptions?

MR. SCOTT: So, I don't believe so. In the sense that if an Applicant cannot show that their facility is a particularly low hazard facility, akin to what we've licensed in the past without site boundary EPZ, without offsite emergency planning, then they will not get the offsite, the site boundary EPZ. So we believe it's consistent with past practice.

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Again, this is a different type of facility then some of those that have been considered earlier.

A very low risk facility.

COMMISSIONER BARAN: Well, with the site boundary EPZ, there would be no dedicated offsite radiological emergency planning, right?

So that element of defense-in-depth would be dropped completely?

MR. SCOTT: The Staff acknowledges that for site boundary EPZ case, if an offsite emergency response was needed, it would be in the context of all hazards planning.

COMMISSIONER BARAN: I want to ask about FEMA's views, as you all did a good job I think discussing those during your presentation. FEMA has a key role in determining whether the emergency planning for nuclear power plant site is adequate.

Under NRC's regulations, no early site permit can be issued unless the NRC makes a finding that the major features of the emergency plan meet the regulatory requirements. And NRC is supposed to base its finding on FEMA's determinations as to whether the onsite and offsite emergency plans are adequate and whether there is reasonable assurance that they can be implemented.

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In fact, under our regulations, in any NRC licensing proceeding a FEMA finding will constitute a rebuttable presumption on questions of adequacy and implementation capability. FEMA has this prominent role in our licensing process because of its undisputed expertise in this area. They are the federal emergency management agency after all.

In its August 11th, 2017 letter to NRC, FEMA says that it "did not review or analyze the feasibility of a site boundary EPZ for Clinch River."

Did the Staff ask FEMA to review the proposed major features of the site boundary EPZ emergency plan?

MR. SCOTT: No, we did not because given what the Applicant submitted, there was no scope for FEMA to review that particular piece. Now they --

COMMISSIONER BARAN: It wasn't required that FEMA review it?

MR. SCOTT: That's correct.

COMMISSIONER BARAN: But you still could have asked for FEMA's views and recommendations, right?

MR. SCOTT: Well, in effect we did ask for FEMA's views and they provided them in their July 8th, 2019 letter.

COMMISSIONER BARAN: But not onsite

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boundary EPZ only on a two-mile EPZ?

MR. SCOTT: We sought FEMA's views on all aspects of this action. Now, there's a separate, there's a difference between a consultation required by the rules and good practice of reaching out to our partner and asking for their views on these matters.

And so, although FEMA's views on site boundary EPZ were not required because offsite planning would not be required, we sought their views. And those are reflected in that July 8th, 2019 letter.

COMMISSIONER BARAN: Okay. And FEMA more formally reviewed the two-mile EPZ plan. In the August 27 letter FEMA stated, "FEMA cannot support any determination that a two-mile EPZ is adequate for their Clinch River Nuclear site at this time."

Two years later, FEMA's position hadn't changed. In a July 8th, 2019 letter, FEMA explained that it "does not currently endorse the establishment of a site boundary plume exposure pathway EPZ or a two-mile plume exposure pathway EPZ for any small modular reactor or other new technology, absent the integration of the full spectrum of threats and their associated impacts into the accident analyses and the probabilistic risk analysis."

So to be clear, as we sit here today, FEMA

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does not support a site boundary EPZ or a two-mile EPZ for Clinch River, is that right?

MR. SCOTT: Based on their July 8th, 2019 letter, I believe that's correct.

COMMISSIONER BARAN: Okay. And FEMA disagrees with the NRC staff position that the applications EPZ size methodology is acceptable?

MR. SCOTT: I don't believe that they put it in their letter that way, but you quoted text from their letter that expresses some level of disagreement, given where we are.

COMMISSIONER BARAN: Okay. I want to ask about some of FEMA's specific concerns, based on their letters, I think FEMA is clearly concerned that design basis accidents aren't the only thing that could go wrong in a nuclear power plant.

And they want a future licensee, as well as state and local emergency responders, to be ready for low probability, high consequence events.

The Staff's proposed risk methodology for determining EPZ size doesn't factor in security risks, does it?

MR. SCOTT: Yes, it does, in a sense. And we talked about that earlier that for security risks within the full spectrum that we consider, that has

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been evaluated.

And the way that type of accident would play out in terms of offsite release would be very similar to other initiators.

COMMISSIONER BARAN: Well, and this follows up, I guess on what Commissioner Caputo was asking about earlier. After 9/11, the NRC Staff reviewed the emergency planning for nuclear power plants in light of potential hostile actions and concluded that the emergency planning basis remained valid.

But that conclusion was based on their being a ten-mile EPZ with dedicated radiological emergency planning, wasn't it?

MR. SCOTT: So, the presence or absence of a ten-mile EPZ does not reflect the security outcome of an event. For example, even if a site boundary EPZ is approved, the Applicant is required to establish and maintain communication capabilities with offsite response people. Security type people who would respond to a security event.

And, again, from an EPA perspective, the Staff sees a little difference in how these events would play out.

COMMISSIONER BARAN: But in terms of the

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post-9/11, when the Staff looked at, in light of 9/11, the events of that day, when the Staff looked at our emergency planning and said, is this adequate or does this need to be updated for potential hostile actions, the Staff's conclusion that it did not need to be updated was based on a ten-mile EPZ with dedicated emergency planning, right? Dedicated radiological emergency planning.

MR. SCOTT: Again, I'm not aware that the Staff's considerations on that subject considered ten-mile EPZ in particular. I'd be happy to look into that and get back to you to verify that answer. That's my understanding of the situation.

COMMISSIONER BARAN: Okay. If Clinch River ended up with a site boundary EPZ, as we've said, then no dedicated offsite radiological emergency planning would be required, emergency responders would be left with all hazards planned, as you mentioned.

FEMA's concern that all hazards planning is not adequate for these types of emergencies. In FEMA's July 8th, 2019 letter to NRC FEMA states, "radiological emergency planning is not sufficiently addressed within the all hazards framework. Radiological emergency planning is unique.

In a worst-case scenario, our offsite

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response organizations could be challenged to effectively protect the health and safety of the public, using an ad hoc emergency planning construct."

That's pretty strong stuff. FEMA goes on to say that advance planning, such as provided by an EPZ reduces the complexity of the decision making process during an incident. And FEMA states, we which to stress that the proven best way to ensure offsite readiness is to develop, exercise and assess offsite response, organization, radiological capabilities, as it now done throughout the offsite EPZ.

Does the Staff believe that all hazards planning would be just as effective as dedicated radiological emergency planning in an actual radiological emergency?

MR. SCOTT: As I said in the testimony, the Staff reached its conclusions based on the comparison of the Applicant's proposed methods with the EPA PAGs.

We did not make any particular assumption about the effectiveness of the all hazards plan. We just don't believe that any facility that can demonstrate a source term low enough to support a site boundary EPZ.

The situation, the question of the

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effectiveness of all hazards response would not come into play because the situation would not occur that would require that.

COMMISSIONER BARAN: Okay. Well, separate from your findings, what is the Staff's view on this, is all hazards planning just as effective as dedicated radiological emergency planning?

MR. SCOTT: There is documentation out there that the Staff is aware of that supports that offsite authorities will take needed actions when required in various context.

We can provide you those references if you're interested in those, Commissioner.

COMMISSIONER BARAN: Yes, but that's not really answering my question. There's dedicated radiological hazards planning, which is currently required for the existing fleet, there is something else, which is all hazards planning, plans for all kinds of different hazards not just radiological, it's not focused on radiological.

Does the Staff believe that all hazards planning is just as effective in an actual radiological emergency planning as dedicated radiological emergency planning?

MR. SCOTT: So, if I might, I'd like to

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call upon a member of the NRC Staff to provide additional response to that question.

CHAIRMAN SVINICKI: Is this one --

MR. SCOTT: Patricia Milligan.

CHAIRMAN SVINICKI: -- one of the NRC witnesses?

MR. SCOTT: Yes.

CHAIRMAN SVINICKI: Yes, would you please come --

MR. SCOTT: Trish Milligan.

CHAIRMAN SVINICKI: And just for completeness for the transcript, would you state your name and just confirm that you were sworn in earlier this morning?

MS. MILLIGAN: Yes. My name is Patricia Milligan and I work for Mike Scott in the Office of NSIR. And yes, I was sworn in.

So, to your question --

COMMISSIONER BARAN: Yes.

MS. MILLIGAN: -- just to recap really quickly, again for me, sir?

MR. SCOTT: Sure. Does the Staff believe that all hazards planning would be just as effective as dedicated radiological emergency planning in an actual radiological emergency?

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MS. MILLIGAN: That's an interesting question. If you look at --

COMMISSIONER BARAN: I thought so, thanks.

MS. MILLIGAN: Yes, it is.

(Laughter.)

MS. MILLIGAN: If you look at FEMA's guidance, which is called CPG 101, developing and maintaining emergency operations plans, they don't call out radiological planning as separate. Indeed, part of this guidance addresses radiological hazards.

What FEMA does in this particular guidance is suggest that if you are ever in a community where there's a radiological plan, you include this in your all hazards planning.

So, to answer your question, I think this particular guidance would say, yes, they believe that it's all part of all hazards. And indeed, in FEMA's guidance, which is CPG 101 right here.

They say that while there is uniqueness hazards, and clearly a chlorine gas release is very different from a radiological release, it is very different than a natural gas release. We know that.

But there are so many commonalities in response.

That was also addressed to NUREG-0396 where the taskforce there recognized that the response is

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very similar in many types of events. A train derailment with chlorine gas, that sorts of things. Evacuation and sheltering is common to all hazards.

COMMISSIONER BARAN: Well, the reason I'm asking this specific question is, it seems to be central to the concern that FEMA is stating in their letter when they say radiological emergency planning is not sufficiently addressed within the all hazards framework.

And I'm trying to understand, does the NRC staff disagree with that?

I mean, FEMA is saying they don't think all hazards is good enough and the Staff's response is what?

MR. SCOTT: The Staff's response is that the effectiveness of that offsite capability is not central to the determinations we made here. Again, once the hazard is low enough, then you don't need that capability.

And that's been demonstrated in NRC licensing practice, for example, for research reactors for many years.

COMMISSIONER BARAN: But on a couple different slides, and in various documents that are part of this docket, the NRC Staff has made a finding

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that the proposed methodology maintains the same level of protection as a ten-mile EPZ.

MS. HART: And let me clarify.

COMMISSIONER BARAN: If dedicated radiological emergency planning is superior to all hazards planning, I don't understand how the NRC Staff could make that determination.

If a site boundary EPZ does not have dedicated radiological emergency planning and two-mile or ten-mile EPZ does, what's the basis of concluding that those offer equal protection --

MR. SCOTT: Different level of hazard.

COMMISSIONER BARAN: Say it again?

MR. SCOTT: Different level of hazard. Again, I mean, we wouldn't propose a ten-mile EPZ for research reactor, we don't have those because the hazard is lower.

In effect, you have to draw the line somewhere. The Staff believes that drawing it at the site boundary, if the facility will support that, is supportive of protection of public health and safety without the need for formal offsite radiological emergency preparedness.

COMMISSIONER BARAN: Is the NRC Staff finding that the proposed methodology maintains the

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same level of protection as a ten-mile EPZ necessary for the issuance of the EPZ exemptions?

MR. SCOTT: It's consistent with it. I'd have to think about whether it's absolutely necessary. I would, we'll think about that question.

COMMISSIONER BARAN: Okay. Let me ask a slightly different issue about a slightly different issue.

Is there anything about the logic of the proposed methodology that couldn't be applied to the existing fleet of large light water reactors?

MR. SCOTT: If they would need to be, it would need to be considered under potential exemptions to 10 CFR Part 50 because the existing rules wouldn't permit it.

COMMISSIONER BARAN: Existing rules don't permit it here either, we're talking about exemptions.

So my question is, is there anything about the logic of the methodology that couldn't be applied to the existing large light water reactor fleet?

MR. SCOTT: No. So an applicant, or a licensee, could come in and ask for exemptions and the Staff would consider those.

COMMISSIONER BARAN: If an existing nuclear power plant ran the numbers through this

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methodology and found that an eight mile or a five mile EPZ would meet the dose criteria, what would be the basis for NRC concluding that the plant should keep a ten-mile EPZ?

MR. SCOTT: We have to consider that application when it came in, Commissioner. Obviously we didn't get that kind of application in this case.

And we haven't gone there because an applicant has not come in and requested that.

COMMISSIONER BARAN: Well, I wanted to understand what the implications would be if this methodology were applied to the existing fleet of large light water reactors.

And to figure that out, the Commission asked pre-hearing Question 22. And the Staff responded that it didn't have sufficient information to apply the proposed methodology to operating units.

To be clear, the staff has no idea how this methodology would impact the EPZ size of currently operating plants if were applied to them? Is that right?

MS. HART: We have not done any scoping analyses or anything like that to determine. I think the severe accident information is the information that we don't have in-house to be able to do that effectively

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at this time.

COMMISSIONER BARAN: Isn't that something we want to know before setting this precedent?

MS. HART: This is a specific exemption for this specific site and so, it --

COMMISSIONER BARAN: The methodology that is acknowledged doesn't really confine itself to this site or to small modular reactors.

MR. SCOTT: So the Staff proposes to make this decision based on the information put in front of us with regard to whether it's protective of public health and safety. And that's the basis of the conclusion that we reached.

COMMISSIONER BARAN: To issue the EPA exemptions, NRC would need to find that there were special circumstances. In its application, TVA stated that special circumstance exist at Clinch River because the enhanced safety features and the design of SMR significantly enhance nuclear safety and provide considerable additional confidence in the protection of public health and safety.

Did the NRC Staff rely on that rationale to find that special circumstances are present here?

MS. HART: The Staff acknowledges that statement, and we did ask TVA to provide additional

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information, like what kind of things that they were talking about. And they did respond, an RAI response with that information.

However, our determination is made on the methodology itself in that it would be evaluated at the time with specific information for the specific reactor at the time of the COL or CP application.

COMMISSIONER BARAN: Well, we don't know what reactor design would be used at the site, and the NRC hasn't yet approved or determined the safety of any of the reactor designs that were used to set up the plant parameter envelope.

How could the staff conclude that there are special circumstances based on the assumed safety features of an unknown, unapproved design?

MS. HART: The special circumstances determination was not only based on that information, the special circumstances were based on the fact that there is a methodology that would be used by the COL or the CP applicant to determine an area outside of which protective, early protective actions may not have to be taken.

COMMISSIONER BARAN: So, to make a special circumstance is fine and its based purely on the methodology here, it's not based on any presumed

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characteristics of, safety characteristics of small module reactors?

MS. HART: Because we cannot verify those presumed characteristics at this time.

COMMISSIONER BARAN: If the ESP is issued, as currently proposed, would SMR construction at Clinch River need to have the specific attributes assumed in the Staff safety evaluation report in order to get the EPZ exemption?

MS. HART: So, what they would have to do is use the TVA sizing methodology to show that their EPZ size is supported, that they choose. And also meet permit condition five, the source term that's in that.

So, the specific discussion about slower and smaller cores, they don't need to specifically provide findings for that. Those statements.

COMMISSIONER BARAN: So permit condition five just focuses on source terms size, not these other attributes of small --

MS. HART: Correct.

COMMISSIONER BARAN: -- reactors?

Okay. I'm just trying to figure out whether this is, kind of a circular reasoning situation where the reason you can go down potentially a two-mile or site boundary EPZ is that SMRs are so much safer

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and the hazards are so much lower.

We don't know what SMR would actually be placed there, we don't know what the design would look like. Nothing has been approved by NRC, yet we're depending on some presumption about what that SMR would be to decide now that special circumstances exist to issue an exemption. Am I missing something?

MS. SUTTON: Okay, so the bounding parameters of the PPEs, 2,420 megawatts thermal. So, for any design that fits within that parameter, so the Staff is just not making a blanket statement that justifies size methodology, they are the PPE limits that COL or the CP applicant has to meet to be able to use the exemption request.

And also, they have to meet the permit condition five. There's all these parameters that are put in place for the COL or the CP applicant to meet.

So, I think -- so, keep in mind that it's not just like carving this one piece out, it's the totality of other information the Staff use as we evaluated TVA's request to come up with a parameters.

But it's based on the 2,420 megawatt thermal and how to, it doesn't matter what reactor it is, what the source term is, it has to fit within those boundaries for the PPE construct.

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COMMISSIONER BARAN: Okay. In response to pre-hearing Question 18, the Staff stated that depending on the plant design, multiple reactor accidents, multiple reactor accidents for multiple module designs may or may not be included in the spectrum of accidents used for the plume exposure pathway EPZ size determination.

Why wouldn't we consider the cumulative risks of multiple modules when setting EPZ size? Is that a basic lesson of Fukushima?

MS. HART: So, in general, the GDCs that would be used would prevent common cause failures and multiple unit accidents. And so, looking at their PRA that they would provide at the time, and the information on the plants at the time a determination would made, whether multiple module or multiple unit accidents, would be a credible event to include in the EPZ size methodology.

COMMISSIONER BARAN: My understanding is that we need to make a determination on whether to approve the proposed EPZ methodology now rather than waiting until a combined license or construction permit application, because this early site permit could not be issued at all with the EPZ exemptions, and that's because the application didn't address a ten-mile EPZ.

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So the application depends on EPZ exemptions being issued.

Is there any legal barrier to the Commission approving only the exemptions for a two-mile EPZ at this stage? And not the exemptions for a site boundary EPZ.

MR. SCOTT: There's no legal barrier to it. The Staff looked at that. Should you approve two-miles and not the site boundary.

And, again, we're talking about methodology here.

COMMISSIONER BARAN: Yes.

MR. SCOTT: Then the application would need to be revised. It could be approved but with a revised application. Because the application requests all of this.

So if the Commission, our understanding is that if the Commission were to choose to give it only part of it, then the application would have to be revised to reflect that. The part that's actually going to be approved by the Commission.

COMMISSIONER BARAN: The record of decision and the permit couldn't just specify which parts were being granted and which parts weren't?

MR. SCOTT: OGC advises us that the

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application would have to be revised.

MS. SUTTON: So, based on the Staff's review, based on our regulations, the Staff has to review what has been presented to them. So what was presented to the Staff was a exemption request looking at the size and methodology for approval.

So the Staff evaluation and findings are based on what was presented to us in application. So if the Commission chooses to carve out a piece of the application, then the application would have to be amended so the Staff can provide their findings to the Commission so they can make a decision.

COMMISSIONER BARAN: Hmm.

MS. SUTTON: So, right now we are looking at an entire application as it was presented, for the Staff evaluation.

COMMISSIONER BARAN: Okay. Well, that might be more of a post-hearing question to delve more into that, I probably don't have time to do that today.

MS. SUTTON: Okay.

COMMISSIONER BARAN: It sounds like it's maybe a fairly complex legal question. But I'll stop there. Thank you.

MS. SUTTON: Okay. You're very welcome.

CHAIRMAN SVINICKI: Thank you very much.

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And since we will pivot aware from safety after this, and a lot of ground was covered, I don't have anything additional for this panel to use any more of my time, but do either of my colleagues?

Or with that, we're up against lunch hour, so that works well. And we are just slightly ahead of schedule, but I would prefer, for purposes of the webcast, to reconvene at the previously established time, which means we would recess now for two hours for lunch and reconvene at 2:00 p.m.

Thank you. And I will see those who need to come back this afternoon, later this afternoon. Thank you.

(Whereupon, the above-entitled matter went off the record at 12:01 p.m. and resumed at 2:00 p.m.)

CHAIRMAN SVINICKI: Well, good afternoon everyone. I call the hearing to order once again.

We will now conduct what we term the Environmental Panel. The parties will address the environmental review performed in connection with the early site permit application, including relevant sections of the final environmental impact statement.

I just remind the witnesses that they remain under oath. And that the Commission is familiar in general with all the pre-hearing filings.

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We're going to begin the Environmental Panel with the TVA witnesses. Please proceed, and prior to presenting, please introduce yourself. Thank you.

MR. PERRY: Good afternoon Chairman and Commissioners. I am Jeff Perry, TVA Senior Project Manager with the Clinch River Site, SMR Project.

Today Ruth Horton and I, TVA Program Manager for Environmental Support and I will be presenting the environmental information and the early site permit application for the Clinch River Site.

TVA is responsible for a wide variety of environmental management services in the TVA power service area, which it undertakes in accordance with the mandate of the TVA Act.

In order to implement a comprehensive environmental management approach, TVA works with numerous state and federal agencies in its seven state region. TVA's environmental responsibilities include management of the rivers and reservoirs, public land and shoreline, and provision of recreation opportunities in the Tennessee River Water Shed. Next slide, please.

As you heard earlier, TVA's ESPA had addressed the site suitability for potential

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construction and operation of an SMR. And is based on a plant parameter envelop approach.

When preparing the environmental report, Part Three of the ESPA, TVA developed a set of bounding values to use in determining potential environmental impacts. TVA used the approaches and methods contained in NRC regulatory guidance to analyze the environmental impacts of potential SMR deployment at the site as required by 10 CFR Part 51.

NRC's final environment impact statement for issuing an early site permit was published in April 2019, consistent with the National Environmental Policy Act. Should TVA decide to pursue further licensing and deployment of SMRs at the site, we have performed our own environmental review as a part of that decision making process.

Now I'd like to turn the remainder of the presentation over to Ruth Horton, who will discuss the content of the environmental report.

MS. HORTON: Good afternoon. My name is Ruth Horton, Environmental Program Manager for the early site permit application development.

To analyze environmental impacts required by 10 CFR 51 and the National Environmental Policy Act, TVA used the approaches and methods contained in the

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body of the NRC regulatory guidance listed on this slide.

NUREG 1555 was the primary guidance used to inform the content of our environmental report. Next slide, please.

The TVA site selection process conducted in accordance with the EPRI siting guide and NUREG 1555 first bounded the project's region of interest as TVA's power service area due to limitations stated in the TVA Act.

TVA identified six large federal direct served customers in the power service area as the potential candidate areas shown here. The regional screening process then eliminated four of the six areas, leaving the Oak Ridge Reservation and Redstone Arsenal as the two candidate areas that best satisfied the siting criteria.

Fifteen potential sites were identified between the two candidate areas. The next level of screening further narrowed the list of 15 potential sites down to three sites on or near the Oak Ridge Reservation, and one site on the Red Stone Arsenal for consideration as alternative sites in the ESPA.

None of the alternative sites were determined to be environmentally preferable to the

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proposed Clinch River site. Therefore, TVA identified the Clinch River site as preferred. Next slide, please.

The Clinch River site is located on the Clinch River arm of the Watts Bar Reservoir. And is within the City of Oak Ridge in Roane County, Tennessee.

It is a 935-acre parcel of TVA land adjacent to the U.S. Department of Energy's Oak Ridge Reservation. In addition to the Clinch River site, a 196-acre area adjacent to the site entrance could be disturbed for access improvements.

The site was previously characterized in past studies performed in the 1970s and 1980s when it was the location of the proposed and later cancelled Clinch River Breeder Reactor Project.

As noted earlier today, existing transmission lines and some basic infrastructure such as roads and storm water retention structures, remain from the site's previous use.

Although the Atomic Safety and Licensing Board issued a limited work authorization in May 1983, the Breeder Reactor was never built. And the site is not currently used for power generation. Next slide, please.

Having selected it as the preferred site,

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TVA undertook a comprehensive environmental review of the Clinch River site. TVA worked closely with the Tennessee Department of Environment and Conservation and the State Historic Preservation Officer within the Tennessee Historical Commission, federally recognized Indian Tribes, the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, and other stakeholders in preparing the environmental report.

In doing so, TVA was able to leverage numerous existing agreements and relationships, to ensure a thorough and comprehensive approach. For example, TVA has established protocols with state -- with the State Historic Preservation Offices from each of the seven states that make up the TVA power service area.

For the Clinch River SMR project, TVA established a programmatic agreement with the Tennessee State Historic Preservation Office for management of the resources on the Clinch River site, through the completion of plant construction.

TVA also currently maintains relationships with each of the federally recognized Indian Tribes that have been identified as having an interest in the TVA power service area.

These ongoing relationships, which

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encompass all TVA activities, ensure a thorough and comprehensive approach to the management of these cultural and historic tribal resources. Next slide, please.

TVA's environmental review of the direct, indirect, and cumulative impacts of the proposed project in onsite and offsite areas potentially affected by the project, identified no critical habitats. Most of the impacts were determined to be small, because they either would not be detectable, or would be minor.

Two areas showed small to moderate impacts.

These areas are socioeconomic impacts, primarily from increased traffic during construction, and stresses on public infrastructure during both construction and operations. And cultural resources, because potentially eligible archeological sites and the Melton Hill Dam immediately upstream of the site, which is listed on the National Register of Historic Places, maybe impacted by construction. Next slide, please.

In order to complete the various environmental and cultural resource reviews, and analysis required for the relevant portions of the ESPA, TVA communicated and interacted frequently with the NRC staff. These multiple interactions, which

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included site visits, public meetings, a readiness review, an environmental audit, were critical to the integrity of the process and its results.

NRC staff issued its final EIS for the Clinch River site in April 2019. TVA's own environmental review process, as briefly described today, and set forth in detail within the ESPA, supports the NRC staff's conclusions and recommendation that the NRC issue an early site permit for the Clinch River site.

This concludes our presentation.

CHAIRMAN SVINICKI: Thank you to the TVA witnesses for this panel. I will now ask the NRC staff witnesses for the Environmental Panel to please come and occupy the chairs behind their name tents.

And then please proceed in the order in which you've decided amongst yourselves to begin. I'll continue to talk while you open your binders. And not have awkward silence.

(Laughter)

CHAIRMAN SVINICKI: And while you pour yourself water.

(Laughter)

CHAIRMAN SVINICKI: Having a cold myself, I have sympathy for that. Okay. All right, please

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proceed.

MS. DOZIER: Good afternoon  
Commissioners.

CHAIRMAN SVINICKI: Oh, there you go.

MS. DOZIER: We can go ahead and move to  
slide two, please. My name is Tamsen Dozier from the  
Division of Licensing, Siting, and Environmental  
Analysis of the Office of New Reactors.

I managed the environmental review of the  
TVA's application for an ESP at the Clinch River Nuclear  
Site. With me today is Kenneth Erwin, the Chief of  
the Environmental Review Branch, in the same division.

On behalf of the Environmental Review Team,  
Ken and I will present to you this afternoon a summary  
of the process used for developing the environmental  
impact statement, or EIS, the identification and  
analysis of alternatives, a summary of the  
environmental impacts at the proposed site, any  
additional notable information regarding the review,  
and the conclusions and recommendations presented in  
the final EIS. Next slide, please.

As was stated in this morning's overview  
panel, the proposed federal action for TVA's  
application is the issuance of an ESP for approval of  
the Clinch River nuclear site as suitable for the future

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demonstration of the construction and operation of two or more SMRs that fall within the PPE.

The purpose and need for the NRC's proposed action of issuing an ESP is the early resolution of the environmental and site safety issues. The purpose and need for the Agency's action is further informed by the Applicant's purpose and need for the project.

The National Environmental Policy Act, or NEPA, requires federal agencies to use a systematic approach to consider environmental impacts of major agency decisions. The NRC has determined that issuance of an early site permit is a major federal action that requires an EIS.

In addition, the staff's environmental review addresses requirements of the Endangered Species Act, the National Historic Preservation Act, and other environmental statutes.

Detailed guidance for conducting the environmental review is found in NUREG 1555, the Environmental Standard Review Plan, and in numerous regulatory guides and interim staff guidance documents.

Next slide, please.

TVA anticipates the use of two or more SMRs at the site with a maximum total electrical output of eight hundred megawatts electric to demonstrate the

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capability of small modular reactor technology.

Reactor design features that were considered by the staff and their environmental impact analysis are described by the PPE presented by TVA, and evaluated by the staff.

The primary source of cooling water would be the Clinch River arm of the Watts Bar Reservoir. And TVA proposes using mechanical draft cooling towers to dissipate heat to the atmosphere.

Chapter Three of the EIS fully describes other elements of TVA's proposed project, which would be expected to have an interface with the environment, including transmission lines, and information regarding planned building activities.

TVA has proposed several objectives for their proposed demonstration project. The only TVA project objective that was considered by the review team in its generation of alternatives, was the objective to provide reliable power to a mission critical DOE or DoD facility.

Other TVA objectives for future demonstration of SMR technology were not considered at the ESP stage, because the necessary design information was not yet available, or the objective was related to a review area which TVA has chosen to

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defer to the COL or CP review.

Ken Erwin will provide additional discussion regarding the factors considered in the generation of alternatives, a bit later in this panel.

Next slide, please.

As we heard from TVA earlier today, the Clinch River nuclear site, located ten miles south of the Oak Ridge urban center comprises 935 acres. And is not currently used for power generation.

The site is the location of the now terminated Clinch River Breeder Reactor Project. And had been partially developed for that project.

Ground disturbance had affected approximately 240 acres before the project was terminated in 1983. The disturbance was redressed. And the site has not been noticeably disturbed in the interim. Next slide, please.

To prepare the EIS, we assembled a team of environmental experts with backgrounds in the necessary scientific and technical disciplines to conduct a review. The NRC contracted with Pacific Northwest National Laboratory to assist in preparing the EIS.

If a COL or CP is submitted, the permits from the Corps of Engineers maybe necessary to perform

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activities that affect water bodies. The Nashville district of the Corps therefore is a cooperating agency with the NRC on this review to verify that the information presented in the EIS is adequate to support a Department of the Army permit application should TVA submit such an application at a future date.

The NRC staff, its contractors, and staff from the Corps make up the environmental review team. Next slide, please.

The environmental review team followed a systematic approach to evaluate the impacts expected to occur at the proposed and alternative sites as a result of building and operating two or more SMRs. The NRC published a notice of intent to prepare an EIS in the Federal Register in April 2017, which initiated a 60 day scoping period.

The NRC staff conducted two public meetings near the proposed site. In addition to comments captured from those meetings, the NRC staff received an additional 74 pieces of correspondence with comments during the scoping period, which were considered in the preparation of the draft EIS.

In conducting its environmental review, the review team carried out independent analysis and evaluations based on information provided by the

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Applicant, which included supplemental or clarifying information submitted during the review in response to interactions during one full scope environmental audit and public meetings.

The review team made visits to the proposed and alternative sites. And interviewed stakeholders near the area, including but not limited to, community organizations and local governments.

The NRC staff consulted with federal, state, and local authorities, including the U.S. Fish and Wildlife Service, the Tennessee Historical Commission, and several federally recognized Indian Tribes. The review team also used information from independent sources in developing the draft EIS, which was issued in April 2018.

During the 75 day comment period, the NRC staff held two public meetings in Kingston, Tennessee to present its preliminary findings and accept comments on its draft document. Approximately 115 people attended these public meetings.

In addition to oral comments at the public meetings, the NRC received over 25 hundred letters and emails containing written comments. Comments received were considered in preparing the final EIS, which was issued in April of this year. Appendix E of the final

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EIS describes how comments received on the draft EIS were dispositioned.

I will now turn to Ken Erwin, who will present a summary of the staff's environmental evaluations and the various resource areas that we considered in this review.

MR. ERWIN: Thank you Tammy and good afternoon everyone. As Tammy mentioned, my name is Kenneth Erwin. I'm the Branch Chief of the Environmental Technical Review Branch in the Office of New Reactors. Next slide, please.

The staff evaluated, in detail, reasonable alternatives that could meet the purpose and need of the proposed project. The staff evaluated the no action alternative, alternative sites, and alternative system designs.

The Applicant chose not to evaluate energy alternatives in its environmental review for this early site permit, which is permitted by regulation. Therefore, the NRC staff did not evaluate energy alternatives in its environmental impact statement.

If TVA applies for a future license, the environmental review of that application would include an assessment of energy alternatives. Next slide, please.

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The purpose and need for an early site permit is the early resolution of issues. It is informed by the Applicant's purpose and need, specifically TVA's objective to demonstrate the capability of SMR technology to provide reliable power on or near a mission critical facility.

There would be no environmental impacts associated with not issuing the ESP. However, this would not accomplish any of the intended benefits either. Next slide, please.

This slide shows the process for identifying alternative sites. The process starts by defining and identifying a region of interest, in this case, TVA's power service area.

Next, candidate areas within a region of interest were selected by applying exclusionary criteria based on TVA's project objective to provide reliable power to a mission critical DoD or DOE facility.

This resulted in six candidate areas, which were then evaluated using criteria that might make the licensing and permitting of SMRs impractical, which as cooling water availability and proximity to targeted customers. As a result, four of these candidate areas were eliminated.

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Next, possible alternative sites were identified within the two remaining areas, using criteria such as land availability and land use plans. This resulted in four alternative sites for evaluation.

The NRC staff evaluated the methodology TVA used in selecting the alternative sites. And then evaluated the environmental impacts that would result if two or more SMRs were constructed and operated at each of the four alternative sites. Next slide, please.

The candidate areas and alternative sites are shown on this figure. Ultimately, three candidate areas were selected from the Oak Ridge Reservation, including TVA's proposed site, and one additional candidate site was selected from the Department of Defense Red Stone Arsenal site.

These sites are circled in black on the figure shown. In this figure, the three sites on Oak Ridge are within the one circle in the upper right of the figure. Next slide, please.

The review team concluded that TVA employed a reasonable process consistent with the NRC guidance in the SRP to identify and consider potential alternative sites in the region. The review team visited each of the alternative sites, including the

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proposed site to gather information.

The review team then compared the environmental impacts at each alternative site, with the proposed site. While there were slight differences in impacts to various resource areas between the site and the alternative sites, none of the alternative sites were environmentally preferable to the proposed site.

The review team also evaluated design alternatives, including alternative intake and discharge designs, alternative heat dissipation systems, and alternative circulating water supply systems.

The alternative system designs evaluated were either obviously unsuitable or were not environmentally preferable to the proposed design. Next slide, please.

Many resource areas at the proposed site were studied and assigned an impact level by the staff subject matter experts. This slide illustrates physical resource areas commonly analyzed in an environmental review.

For a small impact, the effects are not detectable or too small to destabilize or noticeably alter any important attributes of the resource. For a moderate impact, the effect is sufficient to alter

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noticeably, but not destabilize important attributes of the resource.

And for an impact to be considered large, the effect must be clearly noticeable and sufficient to destabilize important attributes of the resource.

In addition, the staff evaluated postulated acts and impacts to the environment for three different emergency planning zone boundary assumptions, the site boundary, the two mile, and ten mile, and determined that the difference between exposure levels from all three distances were similar.

These analyses were based on the exemption requests and current regulations. Next slide, please.

This slide shows the impact associated with the proposed project on each resource area where the impact was small or none. As you can see, many resource areas were small or none. Next slide, please.

This slide shows the resource areas with moderate or large impacts associated with the proposed project. In its evaluation of these potential impacts, the review team relied on TVA's compliance with mitigation measures and controls that would limit adverse environmental impacts including one, compliance with applicable federal, state, and local laws, ordinances, and regulations.

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Two, compliance with other applicable requirements of permits or licenses required. Three, compliance with existing TVA processes and procedures.

Four, incorporation of environmental requirements in construction contracts. And five, identification of environmental resources and potential impacts during the ESP process and TVA's environmental report.

Next, I will discuss the staff's findings in two areas that were moderate too large. Next slide, please.

Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of undertakings on historic properties that are listed or eligible for listing on the National Register of Historic Places.

If historic and cultural resources are present, staff determines that resource's eligibility for listing in consultation with the State Historic Preservation Office, American Indian Tribes that attach cultural and religious significance to historic properties, and other interested parties.

The NRC coordinated its Section 106 consultation through NEPA pursuant to 36 CFR 800.8. The EIS contains NEPA conclusions and NHPA Section 106

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conclusions.

The NRC consulted with 20 American Indian Tribes, the Tennessee Historical Commission, and the Advisory Council on Historic Preservation. Next slide, please.

The staff concluded that the combined impact from construction and preconstruction activities would be moderate too large.

However, preconstruction activities are not regulated by the NRC, and constitute the primary contribution to this impact determination. Impacts from NRC authorized construction would be small.

While preconstruction impacts are not within the NRC's regulatory authority, NRC staff reviewed TVA's NHPA Section 106 compliance activities.

As a federal land managing agency, TVA has section -- NHPA Section 106 compliance requirements.

Accordingly, TVA initiated its NHPA Section 106 consultation with the Tennessee Historical Commission and Tribes, and executed a programmatic agreement that outlines the potential adverse effects to an unknown number of registered eligible properties and sites. Because specific project plans have not been finalized, the PA describes TVA's ongoing NHPA Section 106 compliance process.

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Staff concluded that there would be no effect on historic properties from NRC authorized construction activities, because any impacts on historic properties are primarily associated with preconstruction activities, and wouldn't be subject to TVA's PA.

The staff's NEPA conclusion determined that impacts from NRC authorized construction activities and operation and maintenance related activities would be small, and would be subject to TVA's cultural resource management practices. Next slide, please.

TVA conducted a traffic impact analysis to determine traffic impacts around the site. This study analyzed deterioration of the level of service on roads and intersections in Roane County, and indicated that without mitigation, traffic around the site would deteriorate at four intersections near the site for an extended period of time when construction employment was at or near its peak levels.

During this time, traffic delays could exceed 15 minutes at some intersections during workday commuting hours. With mitigation, the review team expects the local impact on traffic would be reduced, but adverse impacts would still be noticeable.

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These delays could require commuters to temporarily adapt to deteriorated conditions during peak construction employment. Next slide, please.

Cumulative impacts result when the environmental effects associated with the proposed project are added to the effects associated with past, present, and near future projects. These impacts can result from the combination of effects that might have been individually minor, but become collectively noticeable when affecting the same resource over time.

The staff evaluated the direct and indirect impacts from the project in Chapter Four and Five of the EIS, and the cumulative impacts in Chapter Seven to the resources from past, present, and future projects in the same region.

The cumulative analysis did not change the impacts to most resources. For some resource areas, the impacts increased from small to moderate due to past activities.

Cumulative impacts were also evaluated for each alternative site. The review team concluded that cumulative impacts for each alternative site were generally comparable.

And that no site is clearly preferable to another from an environmental perspective. In such

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a case, the proposed site prevails, because none of the alternatives is clearly environmentally preferable.

I will now turn the presentation back over to Tammy Dozier.

MS. DOZIER: Thank you Ken. Next slide, please. If an ESP is issued, and a future applicant references the ESP for the Clinch River site, a supplemental EIS will be prepared.

A supplement to the ESP EIS will include an evaluation of all issues deferred from the ESP, such as an assessment of energy alternatives, benefits and costs, and any issues not resolved in the ESP FEIS such as the evaluation of severe accident mitigation design alternatives, which is design specific, and an evaluation of water treatment alternatives.

The supplement to the ESP FEIS would also include an analysis of the issues that were resolved in this proceeding, for which new and significant information is identified during the future review. Next slide, please.

Chapter Ten of the EIS presents the NRC staff's conclusions regarding the environmental impacts at the proposed and alternative sites.

To summarize the staff findings, the staff

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concluded that the environmental impacts would be small for most resource areas. And that none of the environmental alternative sites would be environmentally preferable. Next slide, please.

For the reasons stated today in our presentation, the staff recommendation related to the environmental aspects of the proposed action is that the ESP should be issued. That concludes our presentation.

CHAIRMAN SVINICKI: Well thank you very much to the NRC witnesses for those presentations for this Environmental Panel. We will begin the questions with Commissioner Wright.

COMMISSIONER WRIGHT: Thank you. Thank you for your presentations.

This question I'm going to ask probably both TVA and the staff. So, one unique aspect of this proceeding is that TVA has its own National Historic Preservation Act Section 106 requirements. And that's not normally the case for our applicants and licensees.

And I understand TVA has executed its own programmatic assessment or agreement with Tennessee, with the Tennessee Historical Commission, and with the tribes. And this agreement's going to govern the process by which TVA will comply with Section 106 for

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the project.

So, to TVA, have you encountered any difficulties with your Section 106 consultation efforts so far? And, if so, how did you deal with these challenges?

MS. HORTON: No. We work with the Tennessee SHPO routinely, on a daily basis, and this programmatic agreement arrangement there was some back and forth. But we worked out all the details. And it's been pretty routine.

COMMISSIONER WRIGHT: Well, good.

Then I get back to the staff. Has this unique circumstance or arrangement impacted the staff's environmental review?

MR. ERWIN: Thank you for the question.

The staff did a very extensive consultation process. We consulted with 20 American Indian tribes, the Tennessee Historical Commission, and other interested parties. And I think it was very extensive and it did not impact the review in any negative manner.

COMMISSIONER WRIGHT: Okay, very good.

Thank you, that's all I have.

CHAIRMAN SVINICKI: Thank you very much again for your presentations.

This is a fairly general question for the

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NRC staff witnesses. Does the approach regarding the plant parameter envelope, what are the uniquenesses that that poses for the environmental review? We explored that quite a bit with the safety panel, but what are the dimensions of that that pose any novelty for you in moving forward on your environmental review?

MS. DOZIER: So, the plant parameter envelope from an environmental standpoint is not just the PD. So, the PPE, if you look at it, it basically defines the reactor. But there are other components of the project that are described in Chapter 3 of the environmental report and in the EIS, so, all of that together, PPE and the other project descriptions.

We did not have any -- the project design itself did not present any challenge. There were not design-specific challenges for the staff. It doesn't much matter if it's a PPE or an actual design.

CHAIRMAN SVINICKI: Thank you for that response.

And as has been referenced previously, the Applicant deferred its assessments of the need for power particularly. But out of that would have grown an assessment of the benefits of the proposed action. And so the staff, in Section 10.2 of the final EIS, discusses the relationship between the short-term uses

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and kind of the long-term productivity of natural resources and other assets.

How did the staff approach that? Not, and again, there's nothing deficient about differing on the need for power and that assessment, but how did you approach reaching your conclusions in Section 10.2?

MS. DOZIER: So, in Section 10.2 the difference between the short-term use and the long-term productivity there were two ways we could have approached it. And we, the staff chose because you postulate a -- the building and operation activities in order to reach impact determinations, we postulated that those would occur for that balance. And then we evaluated and looked at it.

So, there are aspects of the assuming that there's, you know, the need for, for the project does come into that. But that's the approach that the staff chose to take.

CHAIRMAN SVINICKI: Okay. Thank you for that.

And then I had posed to the safety panel from the attributes that they look at did they have any reflections on the consideration of alternative sites? Or, were there any kind of close calls there? And I was reminded that that comes more squarely into

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play for the environmental review, although there can be technical attributes of the site that would make it preferable to host the project.

But is there anything? You talked about it a bit, actually, in your presentation already, but were there any kind of unique pros and cons you raised regarding alternative sites that TVA looked at?

MR. ERWIN: Yes. So, the staff did look. It's main criteria was proximity to its federal customers, to a DoD or DOE facility. I believe TVA looked at other factors related to, like, contiguous land masses of 120 acres, seismology, population density, availability of cooling water, things of that nature.

CHAIRMAN SVINICKI: Okay. But it sounds like, again, Ms. Bradford offered the staff's conclusion that none of the alternative sites was environmentally preferable.

MR. ERWIN: That's correct.

CHAIRMAN SVINICKI: Okay. Thank you for that.

I think that those are the questions that I have for this panel. And next we will hear from Commissioner Baran.

COMMISSIONER BARAN: But only briefly.

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Well, thank you for your presentations. They were all very informative, both sets of panelists, so I don't have any questions.

CHAIRMAN SVINICKI: Thank you.

Commissioner Caputo.

COMMISSIONER CAPUTO: At this point, at this point I think I really only have one on karst.

So, in the FSER the staff cites the Applicant's statement that "for future combined license application a detailed geologic mapping and subsurface exploration program would be implemented to characterize these excavations for safety-related structures at the Clinch River site with regard to presence or absence of karst features."

So, to put that, I think, a little closer to layman's terms, the staff found that while the Applicant provided a description of the local geological hazards as part of the application, the issue of karst features will be thoroughly evaluated at the COL stage.

Why is it appropriate to defer any detailed evaluation of karst features until the COL?

MS. DOZIER: So, did you say you were reading from the EIS that says that or the SAR?

COMMISSIONER CAPUTO: It says FSER.

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MS. DOZIER: FSER, okay. Okay, so that was the safety evaluation. However, we did look at karst in that.

So, the EIS does do a description of geology for the purposes of the groundwater measurement. Okay.

So, so karst is a feature that we do look, and so we do heavily look at that for purposes of groundwater.

So, since that is a -- would then be a groundwater question for us I will then defer that to our hydrologist Phil Meyer.

CHAIRMAN SVINICKI: Yes, as you're making your way to the microphone I would just remind you to please state your name, and please confirm that you were sworn in earlier this morning.

MS. DOZIER: And maybe possibly repeat the question since it is from the FSER, it's not something we're as familiar with as the EIS.

COMMISSIONER CAPUTO: So, the question is --

CHAIRMAN SVINICKI: Well, just can you state your name and confirm?

MR. MEYER: Yes. My name is Phillip Meyer. I am a hydrologist at Pacific Northwest National Laboratory. And I have been sworn in.

CHAIRMAN SVINICKI: Thank you.

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COMMISSIONER CAPUTO: Thank you. So, the question is just that while there is a description of the geologic hazards in the application, a detailed review of karst features is going to be deferred until a license application stage. Why is that appropriate?

MR. MEYER: So, I won't address the safety issues or specific safety issues related to the nature of the subsurface.

From the environmental perspective we look at the effects of, the potential effects of karst on the reaction of the excavation and g-water, and the excavation to potential transport or other water users that might be affected by, say, dewatering of the excavation.

So, because the subsurface is unknown to some extent, you can only do so much investigation, but once the site is excavated, more will be revealed.

And in the EIS we talk about how TVA has potentially options to mitigate effects of the potential karst features or fractures that might affect the flow.

They have chances to mitigate that during the excavation from the environmental impacts. And also, they can do monitoring so the extent of the impacts of, say, dewatering on that would be, they would be able to assess that during the excavation.

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So, these are some things that come up during the construction that you can't, you can't know until you actually do that.

COMMISSIONER CAPUTO: Okay.

MR. MEYER: But I would suggest that if you want, if you want the perspective of the geotechnical perspective on safety of the structures, which I think is what that comment or that statement addresses, you should ask someone from safety review.

COMMISSIONER CAPUTO: Okay. But the description of karst that was in the application was adequate for you to make your findings with regard to groundwater?

MR. MEYER: From the environmental perspective, yes.

COMMISSIONER CAPUTO: Okay. Thank you.

CHAIRMAN SVINICKI: Well, thank you very much. Again, I thank all of the witnesses from this panel. I will, again, speak slowly while the tables are reset for the closing statements.

We will now recognize each party to the proceeding for the purpose of making a closing statement. And we're going to begin with TVA.

And we are slowly resetting the room here, so I'll just pause while we have time to get the

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appropriate presenters to each of the tables.

(Pause.)

CHAIRMAN SVINICKI: Again, we'll begin with TVA's closing statement. So, Mr. Shea or Mr. Stout, please proceed.

CLOSING STATEMENT ON BEHALF OF APPLICANT

MR. SHEA: Thank you, Commissioners, for the time and effort that you put forth in preparing for and conducting the hearing today. We appreciate the insights and the questions. And we'll ensure that any follow-up information that you may want is addressed properly.

I would like to recognize the work done by the NRC staff. I believe this hearing has validated the exhaustive review done by the staff, and enables the Commission to confirm the staff's safety and environmental findings.

We agree with the staff's conclusion that the TVA early site permit application provides a reasonable assurance of adequate protection for public health and safety, and that the environmental considerations have been addressed, and that the Commission has the information necessary to make the required findings for the issuance of the Clinch River early site permit.

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I'd also like to recognize the professionalism and thoroughness of the TVA team in preparing a quality application, addressing the information needs, and addressing open items required for the staff to complete the ESPA review. TVA, along with its contractors, invested several hundred thousand staff hours to prepare the application and to complete the review.

An early site permit assesses a site's suitability for potential construction and operation of a small modular reactor, and provides TVA the ability to continue its mission of technology innovation by engaging in new nuclear technologies development.

The ability to potentially demonstrate new nuclear technology is important to TVA and important to both the nuclear industry and the nation. The issuance of the early site permit is the next step to demonstrate that small modular reactors and other new nuclear technologies at the Clinch River site are viable options for future generations.

TVA will make a final decision on new nuclear generation at the Clinch River site in the future based on, among other factors, economics, and the viability and maturity of new nuclear advanced technologies.

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Commissioners, thank you again for your efforts. Welcome any further questions you may have.

And we look forward to a Commission vote and a permit issuance in the near future. Thank you.

CHAIRMAN SVINICKI: Thank you very much.

I now recognize the NRC staff for any closing statement they would like to make. Fred.

CLOSING STATEMENT ON BEHALF OF NRC STAFF

MR. BROWN: Thank you, Chairman and Commissioners. For the record, my name is Fred Brown. And with me on this panel is Anna Bradford.

Through our SECY paper supporting this mandatory hearing, our final safety evaluation report, our final environmental impact statement, and our presentations today, we've provided an adequate basis for making the necessary findings set forth in 10 C.F.R. 52.94 and 10 C.F.R. 51.105 to support the issuance of an early site permit for the Clinch River nuclear site.

Our review of the Clinch River nuclear site ESP application has been thorough and complete. The ACRS agrees with our conclusion that the early site permit for the Clinch River nuclear site should be approved.

I would like to revise and clarify two statements the staff made during the safety panel.

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First, the proposed exemptions for the plume exposure pathway EPZ depend on TVA's sizing methodology, the dose criteria, and permit condition 5. The proposed exemptions do not rely on the values in the PPE.

Secondly, in response to a question of whether the NRC could issue an ESP approving exemptions associated with the 2-mile EPZ but not a site boundary EPZ, the staff stated that the ESP could be issued but only after the application is revised to remove those portions associated with a site boundary EPZ.

While that is one way to proceed, the Commission could also issue an ESP that specifically identifies the portions of the application that are not being approved. This would be a complex undertaking, and the ESP would need to be very specific regarding the portions of the application that would not be approved but could be done.

Additionally, we will review the transcript and provide additional information on the record where we've committed to do so. I would like to take one minute at the -- here at the closing to discuss our use of the words "source term" during the panels today and in our written response to questions.

We often refer to source term as though

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it was a intrinsic value that's associated with a reactor's power level. And that's not the case. A better descriptor for the amount of radioactive material tied to power level would be core inventory where you can draw a comparison to the size of a reactor and its power level.

When we referred to source term, however, we were really referring to the output of a very detailed, and thorough, and specific analysis about a potential reactor design that could be sited under the methodology at the Clinch River site. And it would be a very thorough review that goes beyond the licensing requirements for design basis accidents. It's very broad in scope, as described in the TVA analysis, to evaluate what could go wrong with a reactor, how likely it would be and, if it did happen, what portion of the core inventory would be in a free form, how much core damage there would be and how much of the core inventory would be available.

It then goes on to evaluate how much of that core inventory would be released to the environment. And then that, that's the second step.

The third step then is a determination of what the associated dose offsite would be.

So, when we talk about source term it's

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not a value that's universal to any reactor of any type.

It's a very specific value that's the result of a thorough, rigorous evaluation under the TVA proposed methodology that then allows us to draw conclusions that we would then compare as we've discussed extensively with the emergency planning zone basis of the agency over the years.

I hope that clarified our intent in the use of those two terms. We very much appreciate the opportunity to present to you to today. And this concludes the staff's presentation.

CHAIRMAN SVINICKI: Well, thank you for both of those closing statements and, in the case of the staff, for those clarification points that were just addressed.

Before we proceed to close, Commissioner closing remarks and then some procedural matters at the end, I would ask if my colleagues have any last questions that they would like to pose based on that?

(No response.)

CHAIRMAN SVINICKI: Okay, hearing none, I now would like to recognize folks for their actual closing remarks. That was just questions on the closing statements and other things.

So, are there closing, I would recognize

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folks for closing statements? Commissioner Baran.

COMMISSIONER BARAN: Sure. I just want to briefly thank the NRC staff for all of your hard work throughout their review of this application. And I want to thank all of today's participants for your thorough preparation for this important hearing. We appreciate it.

This is I think the ninth uncontested hearing we've had during my time on the Commission. I'd like to first state I thought today's hearing adds a lot of value to the agency's decision making process. So, thank you.

CHAIRMAN SVINICKI: Thank you very much.

Commissioner Caputo, closing remarks and thoughts.

COMMISSIONER CAPUTO: So I do have some closing remarks and thoughts. And I guess, sorry, a little too quick, I think, for me to our path.

I do have one question. In reflecting on this morning's conversations about sort of the precedential nature of reviewing TVA's methodology for a setting in a site EPZ, one question I have for you, I think in the staff's response to prehearing questions there was a reflection made that the methodology is consistent with previous Commission decision making.

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Is there anything you can add to provide a little more context around that?

MS. BRADFORD: Yes. We believe it's consistent for several reasons.

One is the rule language itself already provides exceptions to the EPZ size for gas-cooled reactors as well as smaller reactors. So, in our mind that implies that a different EPZ size could be appropriate even for power reactors.

But more recently we have been communicating with the Commission since at least 2011 about our thoughts on this type of approach. We sent an information paper up in 2011 that talked about, since SMRs at that time were becoming more an area of interest for the industry. We sent up an information paper talking about moving towards a consequence-oriented dose-based approach for EPZ size. That was an information paper, so we did not hear back from the Commission on that.

But we did in 2014 then send up a paper about performance-based EP framework in general for reactors. And the SRM we received back from that did indicate that, yes, the staff should considering moving towards a performance-based EP framework. And it even specifically noted that there might be potential

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benefit for SMRs specifically for performance-based EP framework.

And then most recently in 2015, as I'm sure you know, we sent up a paper asking for the Commission's approval to start that EPZ rulemaking for SMRs and other nuclear technologies. And we mentioned in there that this would be an approach that would be considered in that rulemaking.

And the SRM, again as you know, that came back from the Commission told us to go ahead and proceed with that.

So, in our mind it's consistent with previous direction and communication from the Commission.

COMMISSIONER CAPUTO: So, recognizing that what we're dealing with today is the staff's review of a particular set of questions and their conclusions based on that review, there is a precedential nature to it.

MS. BRADFORD: Yes.

COMMISSIONER CAPUTO: And I want to sort of reflect on that a little bit.

In particular, as the agency strives for transformation and to increase our use of risk information to be more risk informed, this strikes me

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as one of those opportunities. And, you know, we'll deal with this in a fuller scope in the rulemaking.

But my own thoughts are that if applicants come to us with technologies that represent a significant improvement in safety, perhaps orders of magnitude in the case of advanced reactors, it seems to me only right and appropriate that we would consider those lower risk profiles in the context of setting an EPZ.

To give them, to require the same, same size of an EPZ given a distinctly lower risk profile I think would specifically not be risk-informed. And so that I think I would just leave as a statement.

I also want to add my compliments to the level of the staff's work in this review.

And I think for me one of the defining moments is to have a debate about risk, the measure of 10 to the minus 6th, 10 to the minus 7th, I think here at the NRC perhaps we get used to sort of the technical nature of these discussions, and the computer modeling, and using these numbers, but I do think it's an amazing reflection of the capability of the staff, the tools at their disposal, advanced computer modeling, that allows a measure of rigor, that allows us to calculate risk to that level of refinement.

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And just to put that in context, I want to mention something I found courtesy of NASA and Jet Propulsion Laboratory with regard to asteroid impact.

This is a little bit of a sidebar. But I just want to put this in the context of the risk that we're evaluating here.

An asteroid impact large enough to degrade the global climate, leading to widespread crop failure and loss of life, such global environmental catastrophes which place the entire population of the Earth at risk, are estimated to take place several times per million years on average.

So, we are literally when we have a debate about the appropriate structure for emergency preparedness, whether it's an all hazards approach, or whether it's tailored for a radiation release, we are literally talking about a level of protection for the public that exceeds an asteroid impact that could destroy the planet.

So, I just want to sort of put that in context, that it's really to me I think amazing that our staff is capable of that level of rigor and has that expertise. And I think it really makes me proud to be part of this agency.

So, please, thank your team.

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CHAIRMAN SVINICKI: Thank you,  
Commissioner.

Commissioner Wright.

COMMISSIONER WRIGHT: That's a tough one  
to follow.

(Laughter.)

COMMISSIONER WRIGHT: That was very good.

I don't have a lot to say except thank you.

I mean, I know the staff and the people behind the  
scenes that are helping to put it together, I mean,  
they've put in hours after hours of prep. And it  
doesn't go unrecognized by the commissioners here.  
And, you know, I do thank you.

The same thing goes for TVA and for the  
support team that you have as well. The interaction  
between TVA and our staff has been good, and it shows  
with the quality of the work product.

And just from my perspective I just want  
to say thank you, and leave it there.

CHAIRMAN SVINICKI: Well, thank you very  
much.

For myself, in terms of closing remarks  
and reflections I would note I didn't do a count,  
Commissioner Baran, so I've only got, I've got a few  
more of these under my belt than you, but not really

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that many. But, still, that's a significant number that have been done. And I don't know that I could have been confident that in my time here I would still be present when the Commission for these mandatory hearings was looking at something that would at least possibly encompass a small modular reactor or some much more advanced technology.

So, I was part, as Ms. Bradford mentioned, of receiving papers in 2008, I think going back to a scoping of some of the novel issues that we thought as an agency we would confront for small modular and advanced technologies. Emergency planning was definitely on that list of issues.

In 2011 the staff began to become a little bit more particularized in terms of its approach to that particular issue. But, you know, even going back prior to that, the Commission that preceded me and others knew that there would be novelty. And I think it's just reflective of anything that evolves.

And, certainly, when technology evolves it's generally really exciting. I was on my iPhone before I came down here. And we've got colleagues at the Federal Communication Commission that have dealt with a lot of evolving technology and how to right-size the regulatory framework. But, in general, if the

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technology as it evolves has to carry on its back the legacy of all the previous versions of the same technology it's really difficult for it to really move forward in any kind of timely or exciting way.

You know, if we had to carry around mobile phones that had spiral cords that came out of the bottom just in case the mobile signal wasn't available and we wanted to plug it into the wall, it would look a lot different than what we have today.

So, the staff is now in the trenches doing this hard work of confronting this novelty. So, I do want to compliment you all on that. And just for the continued meticulousness which you bring to this.

The discussion on RAIs earlier and the number, it was noteworthy to me. And I would tell TVA that the staff doesn't do that to do favors for anybody.

So, I want to compliment you and your team in terms of the professionalism of presenting a complete application, of defending it through this process, because the staff makes you earn every, every inch of the way. They are here and they have embraced our mission of safety, environmental protection, and security in a very, very solid way. So, you earned every bit of whatever way, you know, fewer questions or whatever it is.

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And I appreciate the feedback on the process because I think the audits were used regarding this review in a very, very efficient, effective way by the NRC staff. And, obviously, responded to in a very thorough way by TVA as the applicant.

So, again, I just want to thank everyone for the efforts that got us here today.

And so, as I move into a few procedural matters of, certainly of interest to the parties here in closing, and for the information of the parties, the deadline for responses to any post-hearing questions will be August 28th, 2019, unless the Commission directs otherwise.

The Secretary plans to issue an order with post-hearing questions, if there are any, by August 21st, 2019.

The deadline for transcript corrections will be August 26th, 2019.

The Secretary plans to issue an order requesting proposed transcript corrections by August 19th.

As I mentioned this morning, the Commission expects to issue a final decision promptly, but with due regard to the complexity of the issues.

With that, the hearing is adjourned.

**NEAL R. GROSS**

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Thank you.

(Whereupon, the above-entitled matter went  
off the record at 2:58 p.m.)

**NEAL R. GROSS**

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
TENNESSEE VALLEY AUTHORITY	)	
	)	Docket No. 52-047-ESP
(Early Site Permit Application	)	
for Clinch River Nuclear Site)	)	
	)	
(Mandatory Hearing)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **ORDER (Setting Deadline for Proposed Transcript Corrections)** have been served upon the following persons by Electronic Information Exchange.

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Dated at Rockville, Maryland,  
this 19<sup>th</sup> day of August, 2019

[Original signed by Herald M. Speiser ]  
Office of the Secretary of the Commission