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UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Presentation to the ACRS Subcommittee

Safety Review of the
Vogtle Early Site Permit Application

Presented by

Christian Araguas, Project Manager

NRO/DNRL/NWE1

October 24, 2007

Purpose

- Brief the Subcommittee on the status of the staff's safety review of the Vogtle early site permit (ESP) application
- Support the Subcommittee's review of the application and subsequent interim letter from the ACRS to the Commission
- Address the Subcommittee's questions

Meeting Agenda

- Schedule Milestones
- Vogtle ESP Application
- Key Review Areas / Open Items
- Review of Geology, Seismology and Geo-technical Engineering
- Review of Radiological Consequences of Design Basis Accidents (DBAs)
- Safety Evaluation Report (SER) Conclusions
- Presentation Conclusion
- Discussion / Questions

Completed Milestones

- Received Vogtle ESP Application - 8/15/2006
- Acceptance Review Completed - 9/19/2006
- Inspections / Site Audits:
  - Quality Assurance - 8/2006
  - Emergency Planning - 10/2006
  - Hazards & Security - 11/2006
  - Meteorology - 12/2006
  - Hydrology, Geology, Health Physics - 1/2007
- RAIs issued to the Applicant - 3/15/2007
- SER with Open Items issued - 8/30/2007
- Responses to Open Items Received - 10/15/2007

Remaining Milestones

- ACRS Full Committee Meeting – 11/1/2007
- ACRS Interim Letter Assumed – 11/2007
- Advanced SER with no Open Items due to ACRS – 5/16/2008
- ACRS Full Committee Meeting – 6/2008
- ACRS Final Letter Assumed – 7/2008
- Final SER issuance – 8/6/2008
- Mandatory Hearing – Spring 2009
- Commission Decision Assumed – Summer 2009

Principal Contributors

- Demography/Geography/Site Hazards: Rao Tammara
- Meteorology: Joseph Hoch, Brad Harvey
- Hydrology: Goutam Bagchi, Hosung Ahn, Kenneth See
  - Support from PNNL
- Geology/Seismology/Geo-Tech Engineering: Clifford Munson, Yong Li, Gerry Stirewalt, Sarah Gonzalez, Thomas Cheng, Laurel Bauer, Tomeka Terry, Weijun Wang, Meralis Plaza-Toledo, Zahira Cruz-Perez
  - Support from USGS and BNL

Principal Contributors

- Radialogical Effluent Release Dose Consequences from Normal Operation: Steven Schaffer, Jean-Claude Dehmel
- Emergency Planning: Bruce Musico, Daniel Barss, Robert Moody
  - Support from FEMA and PNNL
- Physical Security: Marc Brooks, Al Tardiff
- Radiological Consequence Analysis: Michelle Hart
- Quality Assurance: Milton Concepcion-Robles

Vogtle ESP Application

- Proposed ESP site located in eastern Burke County, GA (26 miles southeast of Augusta, GA)
- Adjacent to and west of existing VEGP Units 1 and 2
- ESP applicant, SNC, submitted application on behalf of 4 co-owners: Georgia Power Company, Oglethorpe Power Corporation, Municipal Electric Authority of Georgia, and the City of Dalton, GA
- Application for ESP is for two additional reactors

Vogtle ESP Application

- SNC referenced the Westinghouse AP1000 Certified Design in its Application
- SNC requests permit approval for 20 year term
- SNC seeks approval for limited work authorization (LWA-1, LWA-2) activities
- SNC seeks approval for complete and integrated emergency plans with ITAAC as part of ESP

Vogtle ESP Application

- LWA-1 Request
  - Submitted with Original Application
  - Covers site preparation activities such as excavation for facility structures, construction of service facilities, installation of temporary construction support facilities, and construction or expansion of non-safety related SSCs
- LWA-2 Request
  - Submitted August 16, 2007
  - Covers placement of engineered backfill including retaining walls, preparation of nuclear island foundations (mudmats, waterproofing, rebar, foundation embedments)
    - SRP Section 2.5.4, “Stability of Subsurface Materials and Foundations
    - SRP Section 3.8.5, “Foundations”
    - SRP Section 17.5, “QA Program Description for Design Certification, Early Site Permits and New License Applicants”
    - Fitness for Duty for Construction Activities

Key Review Areas

2.1 Geography and Demography

- Site Location and Description
  - Coordinates, site boundaries, orientation of principal plant structures, location of highways, railroads, waterways that traverse the exclusion area
- Exclusion Area Authority and Control
  - Legal authority, control of activities unrelated to plant operation, arrangements for traffic control
- Population Distribution
  - Current and future population projections, characteristics of the LPZ, population center distance, and population density

Key Review Areas

2.2 Nearby Industrial, Transportation, and Military Facilities

- Identification of Potential Hazards in Site Vicinity
  - Maps of site and nearby significant facilities and transportation routes
  - Description of facilities, products, materials, and number of people employed
  - Description of pipelines, highways, waterways, railroads and airports
  - Projections of industrial growth

Key Review Areas

- Evaluation of Potential Accidents

  Design-Basis Events: Accidents that a probability of occurrence on the order of magnitude of 10^{-7} per year or greater and potential consequences exceeding 10 CFR 100 dose guidelines

  - Explosions and Flammable Vapor Clouds - Truck Traffic, Pipelines, Mining Facilities, Waterway Traffic, Railroad Traffic
  - Release of Hazardous Chemicals - Transportation Accidents, Major Depots, Storage Areas, Onsite Storage Tanks
  - Fires – Transportation Accidents, Industrial Storage Facilities, Onsite Storage, Forest
  - Radiological Hazards – SRS, VEGP Units 1 and 2

Key Review Areas

2.3 Meteorology

- Involves site specific information such as:
  - regional climatology
  - local meteorology
  - onsite meteorological measurements program
  - short-term atmospheric dispersion estimates for accidental releases
  - long-term dispersion estimates for routine releases

Key Review Areas

- Meteorological Site Characteristics
  - The applicant identified meteorological site characteristics related to:
    - Climatic extremes and severe weather
    - Atmospheric dispersion (accident & routine releases)

Key Review Areas

- Climatic Site Characteristics
  - Extreme Wind
  - Tornado
  - Precipitation (for Roof Design)
  - Ambient Design Temperature
    - Generic
    - AP1000 Specific

Key Review Areas

- Atmospheric Dispersion Site Characteristics
  - Short-Term Dispersion Estimates for Accident Releases
    - EAB and LPZ χ/Q Values
  - Long-Term Dispersion Estimates for Routine Releases
    - EAB, Nearest Resident, Nearest Meat Animal, Nearest Vegetable Garden

Key Review Areas

- Meteorological Open Items
  - Provide a justification for using a 30-year period of record (1966 to 1995) to define the AP1000 maximum safety design temperatures. The staff believes these temperatures should be based on a 100-year return interval. (Open Item 2.3-1)

Key Review Areas

3.5.1.6 Aircraft Hazards

The plant design should consider that aircraft accidents that could lead to radiological consequences in excess of the exposure guidelines of 10 CFR 50.34(a)(1) with a probability of occurrence greater than an order of magnitude of 10^{-7} per year

- Federal airways, holding patterns, or approach patterns should be at least 2 statute miles away
- Military installation or any airspace usage (ex. bombing ranges) should be at least 20 miles from site
- All airports should be at least 5 miles from site
- All airports should have projected operations less than:
  - $500d^2$ for airports within 5 to 10 miles
  - $1000d^2$ for airports outside of 10 miles

Key Review Areas

Chapter 11 - Doses from Routine Liquid and Gaseous Effluent Releases

- Staff performed the following review and analysis:
  - Confirmed liquid and gaseous effluent releases
  - Confirmed appropriate exposure pathways
  - Confirmed the use of appropriate liquid dilution, and atmospheric dispersion/deposition
  - Confirmed the use of appropriate land usage parameters
  - Verified Applicant's calculated doses using NRC recommended models
  - Performed an independent dose assessment for liquid pathways showing the applicants doses to be conservative

Key Review Areas

- Doses from Routine Liquid and Gaseous Effluent Releases and Comparison to Regulatory Criteria

Regulation	Type of Effluent	Pathway	Organ	Regulatory Limit (mrem/yr per unit)	Applicant SAR (mrem/yr per unit)	NRC SER (mrem/yr per unit)
10 CFR 50, Appendix I	Liquid	all	total body	3	0.017	0.001
		all	any organ	10	0.021	0.012
	Gaseous	all	total body	5	0.56	0.56
		all	skin	15	2.2	2.2
	Ioiodine & Particulate	all	any organ	15	5.9	5.9
	Gaseous	γ air dose	n/a	10 mrad	0.67 mrad	0.67 mrad
		β air dose	n/a	20 mrad	2.8 mrad	2.8 mrad
40 CFR 190	all	all	total body	25 per site	2.4 (4 units)	2.4 (4 units)
	all	all	thyroid	75 per site	12 (4 units)	12 (4 units)
	all	all	other organs	25 per site	8.9 (4 units)	8.9 (4 units)

Key Review Areas

13.3 Emergency Planning

- Complete and Integrated Emergency Plan
  - Submitted by SNC as part of ESP application
  - Agency Certifications (E-plans are practicable and they will participate)
  - Complete and integrated plan provides *reasonable assurance* that adequate protective measures can and will be taken in the event of a radiological emergency

Key Review Areas

- NRC Review
  - 10 CFR 50.47 and Appendix E to Part 50
  - NUREG-0654/FEMA-REP-1(including Suppl. 2)
  - SRP Section 13.3, “Emergency Planning
  - SRP Table 14.3.10-1 (EP ITAAC)
- Federal Emergency Management Agency (FEMA) Review
  - FEMA Headquarters and Region IV Atlanta Office
  - 44 CFR 350 and REP program guidance
  - NUREG-0654/FEMA-REP-1(including Suppl. 2)
  - Exercise demonstrates adequacy of offsite procedures (ITAAC)

Key Review Areas

- Offsite State/Local Jurisdictions
  - State of Georgia
  - Burke County
  - State of South Carolina
  - Aiken County
  - Allendale County
  - Barnwell County

Key Review Areas

- Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)
  - First use of EP ITAAC under 10 CFR Part 52 review
  - SECY-05-197 and SRM (Generic EP ITAAC)
  - NUREG-0800 (SRP Table 14.2.10-1)
  - ESP/COL applicant proposes site-specific ITAAC

Key Review Areas

- Emergency Action Levels (EALs)
  - NEI 99-01 (LWRs) – NRC endorsement ongoing
  - NEI 07-01 (passive, advance LWRs) – NRC endorsement ongoing
  - Vogtle EALs based on NEI 07-01 – awaiting NEI 07-01 review
  - ITAAC will reflect some construction dependent EALs

Key Review Areas

- Open Items
  - 13.3-4: The review and acceptance of the application's EALs for Units 3 and 4
  - 13.3-10: Discuss whether State and local agencies have reviewed the new ETE and provided comments, and discuss the resolution of those comments

Key Review Areas

13.6 Physical Security

Need to determine whether site characteristics are such that adequate security plans and measures can be developed

- Consideration for :
  - Pedestrian And Vehicular Land Approaches
  - Railroad and Water Approaches
  - Potential “high-ground” Adversary Advantage Areas
  - Integrated Response Provisions
  - Nearby Road Transportation Routes

Key Review Areas

Chapter 17: ESP Quality Assurance Measures

Verify that the ESP application included within the scope of its QA program activities that would affect the capability of systems, structures, and components (SSCs) important to safety.

- Inspection completed in August 2006:
  - Review of NDQAM/plans/implementing procedures of applicant and major contractors.
  - Review of data collection, analyses, and evaluation methodologies, including site characterization.
- In-office Technical Review completed in January 2007 :
  - Verify that the applicant adequately applied the guidance in Section 17.1.1 to demonstrate the integrity and reliability of data that were obtained during ESP activities.
  - The applicant utilized NEI 06-14A, "Quality Assurance Program Description (QAPD)," as template for the NDQAM.
- Submittal of revised NDQAM on August 2007 to include LWA activities within the scope of ESP.

Key Review Areas

Section 2.4: Hydrologic Engineering

- Floods
  - SER Section 2.4.2: Local flooding
  - SER Section 2.4.3: Flooding in rivers and streams
  - SER Section 2.4.4: Dam failures
  - SER Section 2.4.5: Storm surges and seiche
  - SER Section 2.4.6: Tsunami
  - SER Section 2.4.7: Ice-induced flooding
  - SER Section 2.4.8: Canals and reservoirs
  - SER Section 2.4.9: Channel diversion
  - SER Section 2.4.10: Flooding protection requirements

Key Review Areas

- Low water
  - SER Section 2.4.11: Low water considerations
- Groundwater
  - SER Section 2.4.12: Groundwater use
  - SER Section 2.4.13: Release of radionuclides in ground and surface waters

Key Review Areas

- Section 2.4.2: Floods
  - Independently estimated and verified local intense precipitation; specified as a site characteristic
- Section 2.4.3: Probable Maximum Flood (PMF) on Streams and Rivers
  - Independently estimated PMF using bounding approach; verified applicant's conclusion that the site is dry during PMF in Savannah River
- Section 2.4.4: Potential Dam Failures
  - Verified applicant's analysis; verified site is dry during dam break flood
- Section 2.4.5: Probable Maximum Surge and Seiche Flooding
  - Verified applicant's analysis; staff's independent bounding estimate concluded site will remain dry
- Section 2.4.6: Probable Maximum Tsunami Hazards
  - Hierarchical review; staff concluded that a probable maximum tsunami near the mouth of the Savanna River will not reach site grade
- Section 2.4.7: Ice Effects
  - Using historical data from 9 stations, staff concluded ice formation is unlikely

Key Review Areas

- Section 2.4.8: Cooling Water Canals and Reservoirs
  - No safety-related canals or reservoirs as a source for cooling water are proposed since VEGP Units 3 and 4 will not rely on any external water source for safety-related cooling water
  - Staff determined that a design parameter is needed related to initial filling and occasional makeup purposes, leading to **Open Item 2.4-1**
    - Staff identified Permit Condition 2.4.8-1 stating that VEGP Units 3 and 4 will not rely on any external water source for safety-related cooling water other than initial filling and occasional make-up water
    - Alternatively, the applicant may propose a design parameter related to safety-related water use stating that no safety-related water is required for the proposed plants at the VEGP site other than initial filling and occasional make-up water
- Section 2.4.9: Channel Diversion
  - VEGP Units 3 and 4 will not rely on any external water source for safety-related cooling water
  - Combined with staff-proposed Permit Condition 2.4.8-1, diversion of the Savannah River away from the site will not affect safe operation of the units
  - Staff determined it is unlikely Savannah River could divert into the site

Key Review Areas

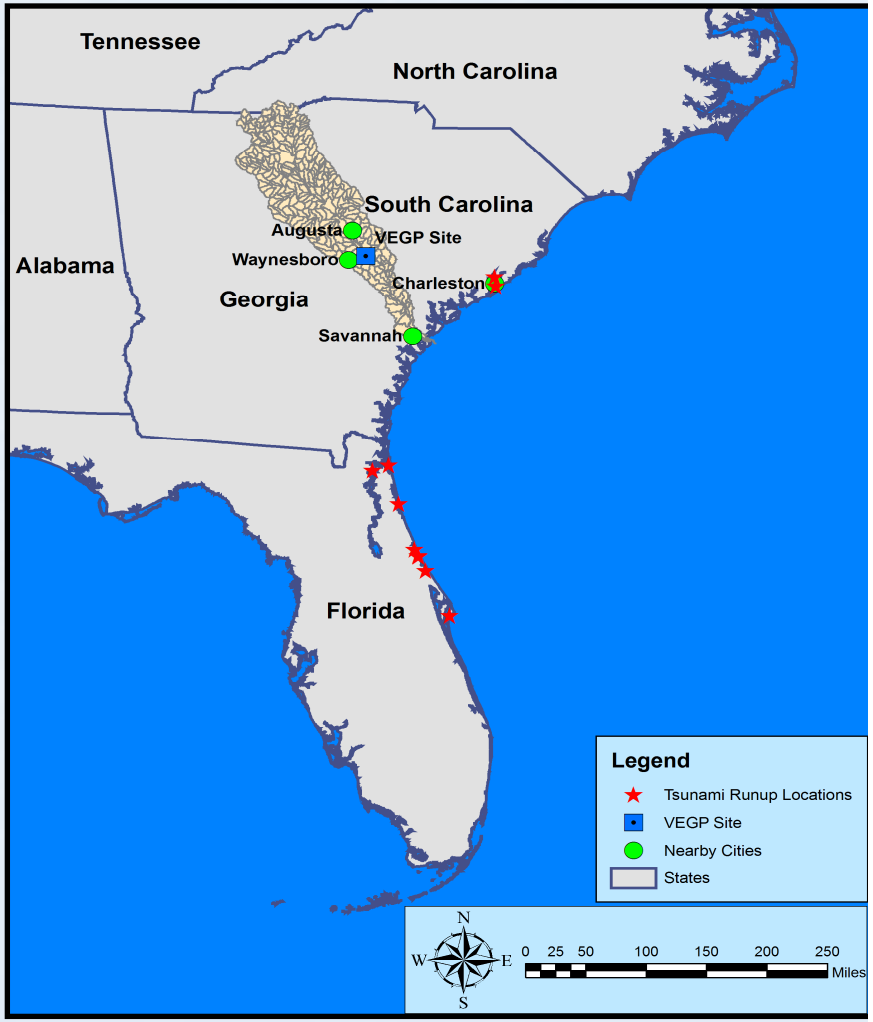
- Section 2.4.10: Flooding Protection Requirements
  - Not needed for a safety-related SSC if its entrances and openings are located above the proposed site grade of 220 feet MSL
  - Site drainage system will be designed such that all safety-related SSC would be safe from flooding from local intense precipitation
- Section 2.4.11: Low Water Considerations
  - Combined with staff-proposed Permit Condition 2.4.8-1, safety-related SSC will not be affected by low water conditions in Savannah River
- Section 2.4.12: Groundwater
  - Staff reviewed groundwater characteristics and data provided by the applicant
  - Staff determined that applicant should provide an improved and complete description of the current and future local hydrological conditions, including alternate conceptual models, to demonstrate that the design bases related to groundwater-induced loadings on subsurface portions of safety-related SSCs would not be exceeded; alternatively, the applicant can provide design parameters for buoyancy evaluation of the plant structures – **Open Item 2.4-2**

Key Review Areas

- Section 2.4.13: Accidental Releases of Radioactive Liquid Effluents In Ground And Surface Waters
  - Transport of radioactive liquid effluent is a combinatorial problem with multiple possible environmental pathways – the pathway with the most severe release consequence is of interest for site suitability determination
  - Uncertainty due to spatially and temporally varying characteristics
  - Existing hydrology of the site does not necessarily represent the future hydrology; substantial change to the post-construction landscape and hydrologic features may lead to changes in distribution of recharge and the underlying water table and, therefore, changes to the groundwater pathway
  - Applicant described a single groundwater pathway to the northwest towards Mallard Pond; staff did not concur with dilution data and release points
  - Staff determined that alternate conceptual models exist that may lead to migration of radioactive liquid effluent (1) to the west and through Daniels Branch, eventually to the southeast and (2) to the east toward the Savannah River through the Tertiary aquifer because of communication between the Water Table and the Tertiary aquifers
  - An adequate number of combinations of release locations and feasible pathways has not been considered – **Open Item 2.4-3**

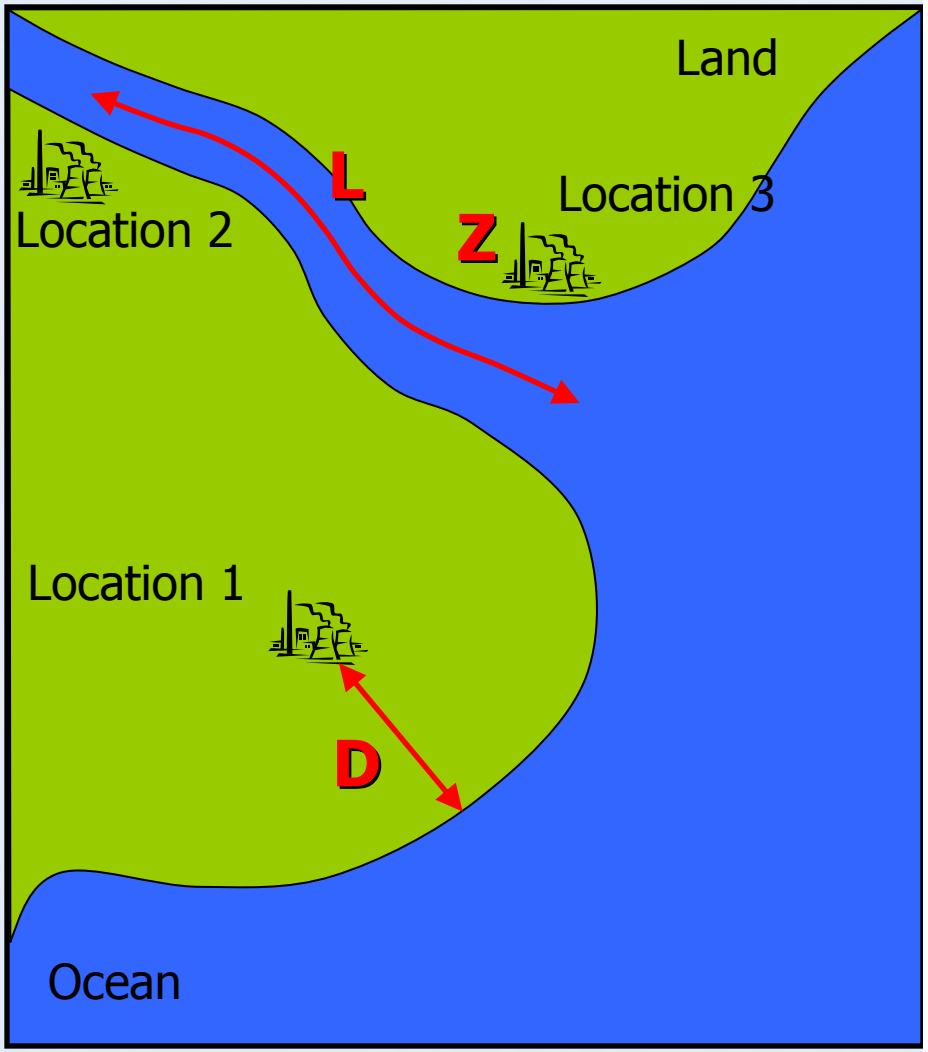
Key Review Areas

- Vogtle ESP Tsunami Assessment
  - Hierarchical review approach
    - step 1: regional screening
    - step 2: site screening
    - step 3: comprehensive tsunami hazard assessment (THA)
  - step 1: regional screening
    - Historical tsunami runup information from National Geophysical Data Center (NGDC)
    - Existing tsunami runup events north and south of the Savannah River Estuary
    - Actual runup heights missing in the NGDC database; Charleston runup less than 1 ft; estimated runup on east coast of 10 ft from 1755 Lisbon earthquake and tsunami
    - The Savannah River Estuary is subject to tsunami events



Key Review Areas

- step 2: site screening
  - The DLZ rule
    - D: horizontal distance,
      L: longitudinal distance along river or stream from estuary, and
      Z: elevation of the site
  - The Vogle ESP site: 100 mi inland from the coast, approximately 150 river miles from the estuary, and at an elevation of 220 ft MSL
  - A tsunami would need to inundate 100 mi inland and run up to 220 ft MSL, and a tidal bore would need to travel 150 mi upstream and reach 220 ft MSL
  - In US, tidal bores occur in Cook Inlet, Alaska
- step 3: comprehensive THA
  - Not needed



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Safety Conclusions from the Review of the Vogtle Early Site Permit Application

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Christian Araguas, Project Manager

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October 24, 2007

SER Conclusions

- SER defers general regulatory conclusion regarding site safety and suitability to FSER after open items addressed
- Some conclusions from individual sections without open items:
  - Applicant has provided appropriate quality assurance measures equivalent to those in 10 CFR Part 50 Appendix B
  - Demonstrated that radiological effluent release limits associated with normal operation from the type of facility proposed to be located at the site can be met for any individual located offsite (10 CFR 100.21(c)(1))

SER Conclusions

- Radiological dose consequences of postulated accidents meet the criteria set forth in 10 CFR 50.34(a)(1) for the type of facility proposed to be located at the site (10 CFR 100.21(c)(2)
- Potential Hazards associated with nearby transportation routes, industrial and military facilities pose no undue risk to facility that might be constructed on the site (10 CFR 100.21(e)
- Site characteristics are such that adequate security plans and measures can be developed (10 CFR 100.21(f))

Presentation Conclusion

- SER with Open Items Issued 8/30/07
  - 40 Open Items
  - 2 Permit Conditions
  - 19 COL Action Items
- Open Item Responses Received 10/15/07
- Reviewing Supplemental Information for Approval of LWA-2
- Next Interaction with ACRS 6/2008 on FSER (tentative)