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Technical Support Center White Paper

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A. ISSUE STATEMENT

The purpose of this paper is to provide a starting point for discussions within NuStart and the AP1000 Licensing Committee on TSC licensing issues for the AP1000, specifically with regard to the potential for sharing or designating common TSC facilities for multi-unit sites. While this paper describes the planned Vogtle configuration, it is not intended as a proposed standardized arrangement for the industry. TSC location for a specific site may be driven by many site specific factors including the size and design of an existing TSC, site layout, protected area design, distance between units, security considerations, and existing emergency plan conditions.

The Westinghouse AP1000 design as described in the DCD revision 15 provides a location for a TSC within each unit, but does not address how the TSC will be implemented for a two unit site nor does it provide guidance on integration of the AP1000 with existing units. This paper presents some of the options that are available and discusses the approach taken by Southern Nuclear for the Vogtle ESP. Four options are discussed:

Option 1 – Standard Unit TSC
Option 2 – Designated AP1000 TSC
Option 3 – Designated Common TSC
Option 4 – Stand-alone Common TSC

B. BACKGROUND

1) DCD Information
   a) The AP1000 DCD includes a designated TSC for each unit. The TSC includes a single large room (2200 sq ft), four adjacent conference rooms (total of 1200 sq ft), and a kitchen and a restroom (500 sq ft total). Total area for these TSC-related areas is approximately 3400 sq ft (excluding the kitchen and restrooms). Note – floor areas are approximate.
   b) The TSC is mentioned 75 times in the DCD. The location of the TSC is described in the Tier 1 documentation as being "across the hall" from the control room. Tier 2 provides five ITAAC related to the TSC as follows:
      i) Space requirements (75 sq ft x 25 occupants = 1875 sq ft)
      ii) Communication requirements (TSC with MCR, OCR, EOF and NRC).
      iii) Plant parameter retrievability
      iv) Location (across from MCR)
      v) Habitable environment
   c) Most of the Tier 2 references to the TSC are part of the discussion regarding ventilation systems.
   d) The DCD does not describe the emergency functions of the TSC. The COL applicant must provide this information as part of the emergency plan.

2) Vogtle Site

   a) Two existing Westinghouse PWRs with a single shared MCR, TSC and OSC.

   b) EOF for Vogtle is shared facility in Birmingham, Alabama.

   c) Size of TSC is "adequate" for existing units.

   d) Distance between new units and existing units is just under 1500 feet from containment centerline to containment centerline. Distance between new units is 900 feet as measured from containment centerlines. Units are oriented in an end-to-end alignment. See Figure 1.

   e) Vogtle ESP is to be submitted on August 15, 2006 will include a complete Emergency Plan (with ITAAC). The Emergency Plan is a proposed revision to the existing Unit 1&2 Emergency Plan. It includes a description of a common TSC for all four units, including a proposed layout and location. The Emergency Plan also includes a description of a common Emergency Response Organization (ERO) for the site.

   f) Proposed design of the TSC includes the following features (some of these items will not be described until COL:

      i) Location as shown in Figure 1

      ii) Layout as shown in Figure 2. This layout is based on the SNC EOF design.

      iii) TSC will be located underground for shielding.

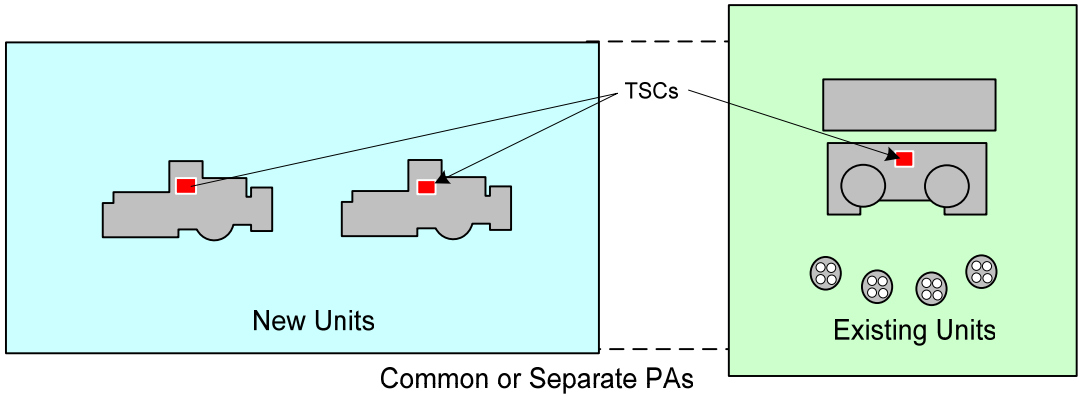
      iv) Ventilation will be provided by a separate filtered ventilation system. The passive features of the AP1000 will not be incorporated into the TSC ventilation design.

      v) Backup ac power will be supplied by a separate standby generator.

   g) The Emergency Plan will also describe the site as having a common single protected area for all four units.

C. OPTIONS

The options discussed on the following pages are for a site with two AP1000 units to be co-located with two existing units. This configuration is more complicated than a greenfield site. The options discussed assume the new units and existing unit(s) are close enough to allow the use of a common TSC. Note that as the distance between the new and existing units increases, the ability to share facilities decreases.



Option 1 – AP1000 Unit-Specific TSCs

This configuration follows the intent of the AP1000 DCD and implements a complete TSC for each unit. This configuration results in three separate TSCs for the example site. The site could implement separate emergency plans for the existing units and the new units, or combine all instructions into a single emergence plan.

There will be at least two Emergency Response Organizations (EROs) designated for the site: one for the existing units and at least one ERO for the AP1000 units. During emergencies affecting only one unit, it is anticipated the emergency plan(s) would activate only the TSC on the affected unit. For non-unit specific events (e.g., loss of all offsite power, certain security events, or weather related conditions) the emergency plan(s) would have to provide logic for determining which TSC(s) will be activated. For some events, all TSCs may need to be activated.

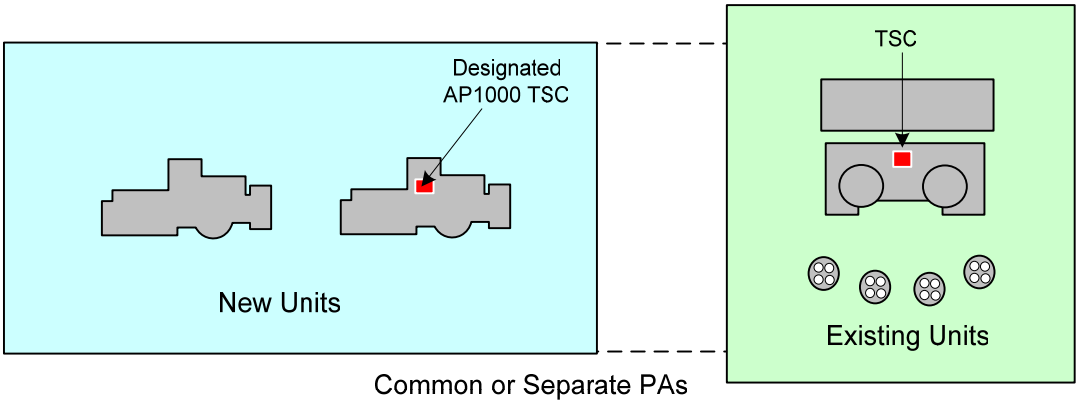
Advantages:

+ Few or no departures from DCD.
+ Lowest construction cost
+ Lowest impact to existing units
+ Shortest distance from MCR to TSC

Disadvantages:

- Response to site events is complicated with significant potential for confusion and "command and control" problems, particularly when more than one TSC are activated.
- Requires the largest site ERO
- Separate emergency drills will have to be scheduled to exercise all EROs and TSCs. This results in either an onerous drill schedule and/or complicated scenarios that involve all facilities.
- Does not address security issues related to a TSC inside unit footprint.

As a variation to Option 1, plant parameters from all units can be routed to all three TSCs. This could allow one TSC to cover multiple units during a site condition that is not specific to a single unit. Design changes required for this would be minimal.



Option 2 – Designated AP1000 TSC

Under this option, the TSC for the first AP1000 unit to go commercial is designated as the TSC for the new units for all events, while the existing units' TSC remains unchanged. This option results in two TSCs for four units. This option is similar to Option 1, except the TSC for the second AP1000 unit would not be used as a TSC.

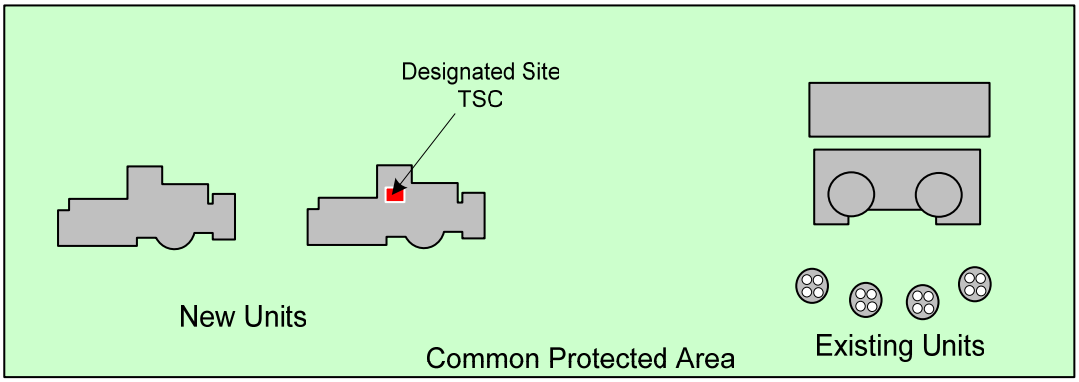
Two EROs would still be required for the site. For a single unit event, the TSC for that unit would be activated. For site events, both TSCs would be activated.

Advantages:

+ Minimal changes to DCD (does require a Tier 1 change for the second AP1000 unit being located physically within the first AP1000 unit.
+ Construction cost similar to Option 1. Minor cost reductions can be realized by only equipping one TSC for the AP1000 units.
+ Impact to existing units similar to Option 1
+ This option can provide some improvement in drill performance by reducing the potential confusion regarding which TSC to activate.

Disadvantages:

- There still exists potential for command and control issues during drills and emergency events.
- Requires two separate EROs
- Requires separate emergency drills for each ERO and TSC. As with Option 1, the drill schedule and/or complexity becomes undesirable.
- Does not address security issues with TSC within the footprint for one unit.



Option 3 - Designated Common TSC

For this option, a single TSC facility is designated as the TSC for the site. This designated TSC could be the TSC for the existing facility or one of the TSCs for the AP1000 units. Plant parameters for all units would be made available in this common TSC.

This option would allow a single ERO for the site. During emergencies on any unit or site emergencies, a single TSC and ERO would be activated.

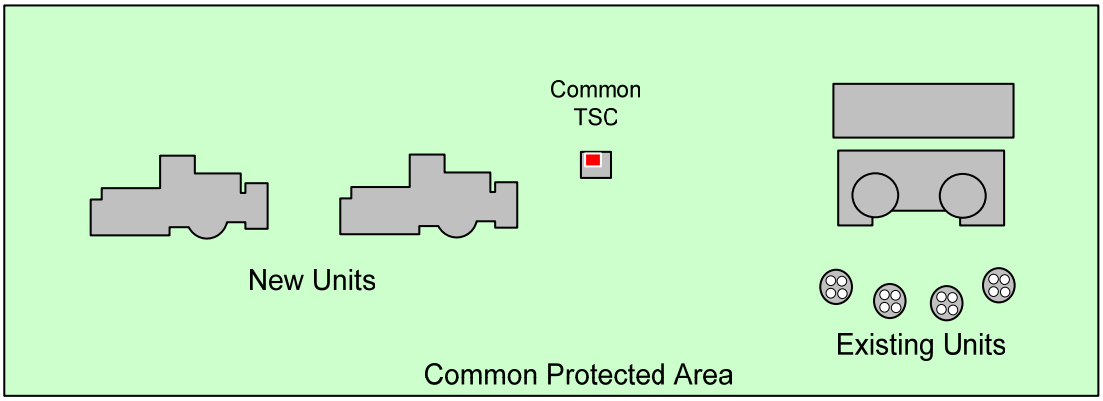
This option probably requires a common protected area for all units, in order to allow minimize travel time from control rooms to TSC. This consideration is tied to the "2 minute" requirement which is no longer considered a hard requirement for new plants.

Advantages:

+ Elimination of command and control issues for site events (with potential for improved drill performance).
+ Lower staffing requirements for ERO
+ Minimized equipment for long term maintenance

Disadvantages:

- Requires departures from the AP1000 DCD, if one of the new AP1000 TSCs is not selected as the designated common TSC. A clarification or minor departure from the DCD may be required even if one AP1000 TSC is supporting both units.
- Some members of the ERO must receive cross-training
- Reduces but does not eliminate the security issue with the TSC within the unit footprint
- Probably requires a common PA due staffing the TSC with personnel from both units



Option 4 – Stand-Alone Common TSC

This option provides a common TSC for the site as a stand-alone facility. This facility could be in an existing onsite building or (as proposed for Vogtle) a new facility.

Advantages:

+ Elimination of command and control issues for drills and emergency events
+ Lower staffing requirements with a single ERO
+ Space requirements for a common TSC that supports four units can be addressed in design of the TSC
+ TSC can be physically separated from the footprint for all units to eliminate security issue.

Disadvantages:

- Higher construction costs
- Distances from control rooms to TSC is increased
- Some members of the ERO must receive cross-training on old and new units
- Additional equipment to procure, maintain and test (diesel generator, ventilation, emergency lighting, etc)
- Probably requires a common PA due staffing the TSC with personnel from both units

D. OTHER CONSIDERATIONS

The decision on TSC configuration affects several other areas of plant construction and operation. These factors should be part of any discussion regarding TSC designation.

- Site layout – distance and physical barriers between units affect the ability to share TSC facilities.
- Site protected area – separate protected areas for new versus existing plants probably eliminates the potential for a common TSC.
- Security design – if a common PA is used for existing and new units, a new CAS and/or SAS may be required. Co-location of the CAS and a common TSC may offer some advantages.

E. CONCLUSIONS

For COLA, the TSC location is a fundamental decision that affects a number of site design issues and plant program topics. Applicants need to consider the effects of TSC location on these site design issues and program topics early in the COLA development process.

Standardization of the TSC layout and location may be difficult to attain within the industry. A site with existing and new units may have significantly different needs than an AP1000 green-field site. Site specific features such as the distance between units and security layout may also drive decisions regarding TSC location. Furthermore, a utility's existing emergency plan agreements or conditions may dictate TSC location and how the new units are integrated with the existing units. This paper is intended as a starting point for industry discussion, and is not intended to provide the Vogtle configuration as an industry standard.

Vogtle has chosen to submit an Emergency Plan as part of the ESP that implements a shared common stand-alone TSC (Option 4). This decision was based on the clear advantages that a stand-alone TSC offers for the Vogtle site with regard to drill performance and emergency response, including:

- Command and control issues associated with multiple TSCs are eliminated. With a single TSC and single ERO, there is no potential for confusion over who the site ED is or which TSC is in control.
- Frequency of drills is minimized. A single drill schedule will meet the requirements for the entire site.
- The complexity of drills is minimized. Drills will only involve one TSC, one set of equipment, and one ERO.
- The TSC can be designed to provide full support of four units. The number of drill participants and observers for Vogtle is expected to be approximately 50. With 75 sq ft assumed for each participant, the needed TSC area is 3750 sq ft.

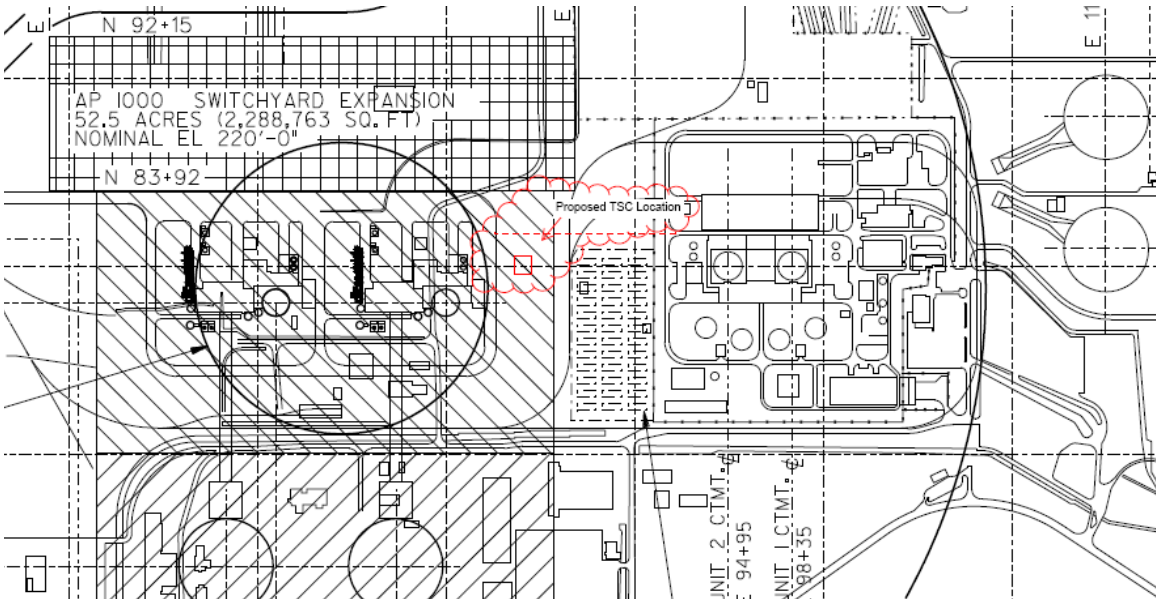


Figure 1 Proposed Vogtle TSC Location

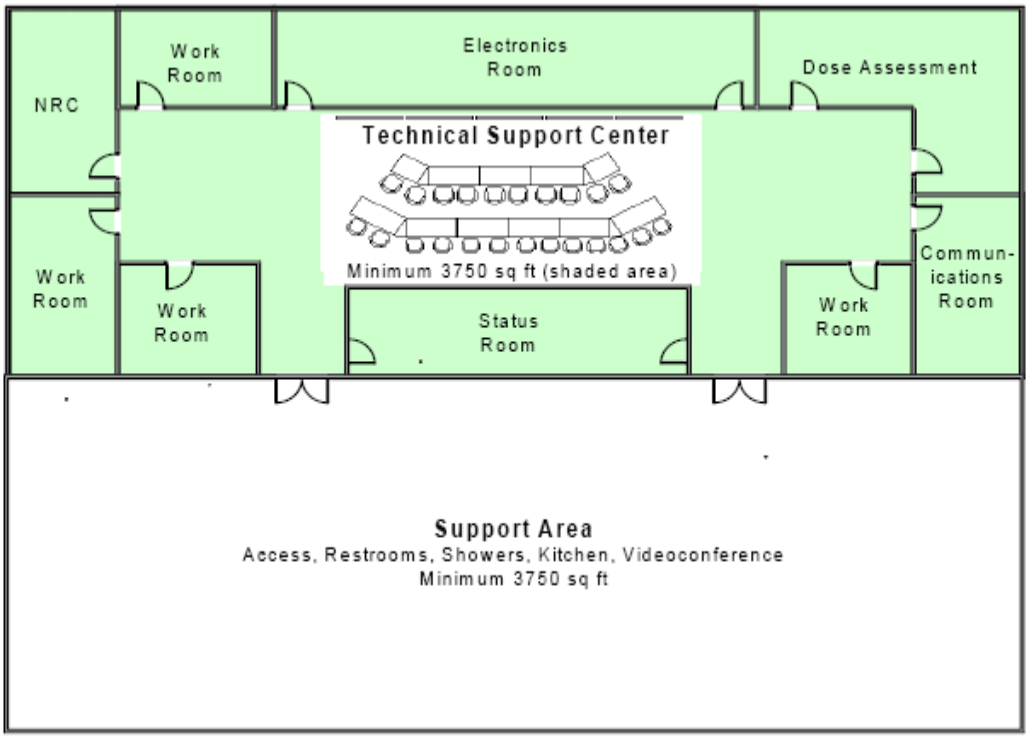


Figure 2. TSC Layout as Proposed in the Vogtle ESP