PES/NPEC SC-4: Working Group 4.6 - Preferred Power Supply
Meeting Minutes for S18-01

New Orleans, LA
January 22, 2018

1. **Welcome and Introduction**
   Chairman Tamatha Womack called the meeting to order at 9:30 AM, January, 22 2018. Discussed the IEEE legal Patent information.

2. **Review of Membership/Attendance**

   The membership roster was reviewed and updated. See Attachment 1 for an updated list of members and guests who were in attendance. 19 of the 24 working group members were present to establish a quorum.

3. **Review of Meeting Minutes and Agenda**
   The 18-01 agenda was reviewed and approved as written unanimously. The agenda is attached as Attachment 2.

   Motion to approve 18-01 Agenda: John Disosway
   Second: Kenn Miller

   The Meeting Minutes for S17-02 were reviewed and approved as written. The meeting minutes of 17-02 will be sent to the webmaster to be uploaded to the website.

   Motion to approve 17-02 Minutes: Tim Lensmire
   Second: Kenn Miller

4. **Action Items**

Item #	Assigned to	Action	Due	Status
16-1	Working Group Members	Review 1792 for possible impacts to frequency descriptions due to effects of NPIRs.	17-02	Retain for future discussion
17-3	Group Leads	Sub Groups evaluate impact of topics to 765. Due mid-November	18-02	In Progress – Sub Groups 1-3 presented. Groups 4 and 5 to present next meeting. Groups 1-3 to send summary material prior to next meeting. All groups to continue to work on scope of work.
17-4	Tamatha Womack / Jason Bellamy	Develop PAR	18-01	Complete

17-5	Jason Bellamy	Send out scope of groups, groups list and contact information to working group	18-01	Complete
18-1	Jason Bellamy	Send out the IEEE Legal Patent Documents, meeting schedule times for upcoming interim discussions (Group Leads to send Tammy time requirements for meeting).	18-02	Assigned

5. Specific Items Related to Standard 765

Relaxation of frequency requirements and will retain action item for future meeting discussions.

PAR for 765 was discussed and a motion to approve the PAR with changes: John Disosway
Second: Gene Poletto

PAR was approved by working group unanimously.

The five sub groups that were developed in 17-02 to for further evaluation of standard 765 discussed the progress they made since 17-02. The subgroups membership is listed below. Along with a summary of the update on their progress. It was recommended that descriptive tables be added prior to figure.

Group 1 – Typical Station Designs

- Lead – Ayodele Ishola-Salawu
- Jason Bellamy
- John Disosway
- Duane Brock

Ayodele Ishola-Salawu presented the research based on plant single lines the main plant categories for typical designs. Each 4.6 working group member will review the draft figures and provide feedback to Ayodele Ishola-Salawu by 18-02 meeting. Was discussed that multiple unit interaction should be covered in upcoming revision.

Group 2 – Additional non-1E equipment that provides 1E function

- Lead – Harvey Leake
- Kevin Littrell

Harvey Leake presented the aspect of non-1E equipment that provides 1E functions. Discussed the balance of requirements that are intended for 1E equipment to non-1E

equipment that they were not intended to be applied to. A white paper is a possible outcome of this group.

Group 3 – GDC 17 requirements in standard

- Lead – Singh Matharu
- Gene Poletto
- Tamatha Womack

Singh Matharu discussed the how the group reviewed the standard and did not find any outliers in the standard from GDC 17. Further discussion and enhancement to the standard to clarify preferred power supplies i.e. FLEX power sources etc. A summary will be submitted for the working group to review prior to 18-02 meeting.

Group 4 – Capacity vs capability & availability

- Lead – Roy Mathew
- Jeff Weibelt
- Roy Lyon
- Tamatha Womack
- Tim Lensmire

Did not present due to time constraints, will be presented in 18-02.

Group 5 – Benefits/Consequences Open Phase

- Lead – Kenn Miller
- Edvin Kovo
- John Minley
- Ayodele Ishola-Salawu
- Singh Matharu

Did not present due to time constraints, will be presented in 18-02.

6. Specific Items Related to Standard 1792

Standard 1792-2017 was published last year. No work on a revision was done during 18-01 meeting.

As with Standard 765, Standard 1792 will have further evaluation for changes associated with relaxing the frequency requirements.

PES/NPEC SC-4: Working Group 4.6 - Preferred Power Supply
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7. General Items/New Business

N/A

8. Next Working Group Meeting

Next formal working group meeting will be held in conjunction with NPEC 18-02 meeting. Team meetings and working group input sessions will be held at satellite location(s) with a webex option for those to who cannot attend. Further information will be sent to the working group members as these meetings are arranged.

9. Meeting Closing Remarks/Adjournment

Meeting adjourned at 11:50 AM.

Motion to Adjourn: Kevin Littrell
Second: Singh Matharu

Attachments

Attachment 1 – Membership

Attachment 2 – Agenda

Attachment 3 – IEEE Patent Slides

Attachment 4 – Group 1 Info

Attachment 5 – Group 2 Info

Attachment 6 – Group 3 Info

ATTACHMENT 1
Attendance/Membership

Member #	Member Name	Email Address	In Attendance
1	Jason Bellamy	jbellamy@enercon.com	Yes
2	Mark Bowman	mdbowman@tva.gov	Yes
3	Duane Brock	dabrock@southernco.com	Yes
4	John Disosway	john.disosway@dom.com	Yes
5	Ken Fleischer	fk700@bellsouth.net	Yes
6	Evan Heacock	evansheacock@dpengineering.com	Yes
7	Steve Hutchins	steven.hutchins@exeloncorp.com	No
8	Ayodele Ishola-Salawu	ayodele.ishola-salawu@fpl.com	Yes
9	Edvin Kozo	edvin.kozo@aps.com	No
10	Harvey Leake	hleake@earthlink.net	Yes
11	Tim Lensmire	timothy.lensmire@nee.com	Yes
12	Kevin Littrell	klittrell@enercon.com	Yes
13	Roy Lyon	lyonengr@gmail.com	No
14	Singh Matharu	gurcharan.matharu@nrc.gov	Yes
15	Kenn Miller	kenn.miller@nrc.gov	Yes
16	John Minley	jeminley@southernco.com	Yes
17	Tania Martinez Navedo	tania.martinez-navedo@nrc.gov	No
18	Gene Poletto	gpoletto@performancepowerservices.com	Yes
19	Gregg Reimers	greim416@gmail.com	Yes
20	Shawn Simon	SimonSM@INPO.org	Yes
21	Tom Solinsky	solinskyt@zhi.com	Yes
22	Sudhir Thakur	sudhir.thakur@exeloncorp.com	No
23	Jeff Weibelt	JBWEIBEL@SOUTHERNCO.COM	Yes
24	Tamatha Womack	tawomack@tva.gov	Yes

Guests in Attendance	Email Address
James Reddy	james.reddy@areva.com
Shinji Kawanago	shinji_kawanago@nseng.mhi.co.jp
Hideki Tanaka	hideki_tanaka@mhi.co.jp
David Runowski	david.runowski@dteenergy.com
Nader Eldeiry	neldeiry@enercon.com
Neal Simmons	neal.simmons@duke-energy.com
Dave Pederson	david.pederson@duke-energy.com
Jim Sharkey	jsharkey@epri.com
Scott Sweat	sweatsm@westinghouse.com
Masashi Sugiyama	masashi.sugiyama.ch@hitachi.com

Attachment 2

PES/NPEC SUBCOMMITTEE 4
WG 4.6
Draft Agenda for 18-01
New Orleans, LA
January 22nd, 2018

1. Welcome and Introductions (Chair)

2. Identification of Members, Review of Membership/Attendance and Quorum (Secretary)

3. Opening Remarks and Approval of Agenda (Chair)

4. Review and Approval of Previous Meeting Minutes (Secretary)

5. Status of Action Items (Secretary)

6. WG Team Lead Summaries -
   Full overview for team 1, 2, and 3 topics and progress update for team 4 and 5 topics
   - Team 1 (Typical Station Designs) - Ayodele Ishola-Salawu
   - Team 2 (Non-1E Equipment with Safety Function) - Harvey Leake
   - Team 3 (GDC 17 Map) - Singh Matharu
   - Team 4 (Capacity/Capability/Availability) - Roy Matthew
   - Team 5 (Open Phase) - Kenn Miller

7. PAR discussion
   Key items uses for development
   - No scope changes
   - Graphics and design figures updated
   - Expand/clarify capacity/capability and availability
   - Determine if open phase items can/need to be added

   Need for project: This standard needs to update PPS design figures and graphics for typical station designs and consider adding clarification for general and specific design criteria. Also, due to recent industry experience, the working group needs to consider incorporation of solution requirements, PPS design considerations, and/or the effects for open phase events.

8. Future Presentations and Suggestions for White Papers

9. New Action Items (Secretary)

10. Next Working Group Meeting (Chair)

11. Closing Remarks/Adjournment (Chair)

Instructions for the WG Chair

The IEEE-SA strongly recommends that at each WG meeting the chair or a designee:

- **Show slides #1 through #4 of this presentation**
- **Advise the WG attendees that:**
  - The IEEE's patent policy is described in Clause 6 of the *IEEE-SA Standards Board Bylaws*;
  - Early identification of patent claims which may be essential for the use of standards under development is strongly encouraged;
  - There may be Essential Patent Claims of which the IEEE is not aware. Additionally, neither the IEEE, the WG, nor the WG chair can ensure the accuracy or completeness of any assurance or whether any such assurance is, in fact, of a Patent Claim that is essential for the use of the standard under development.
- **Instruct the WG Secretary to record in the minutes of the relevant WG meeting:**
  - That the foregoing information was provided and that slides 1 through 4 (and this slide 0, if applicable) were shown;
  - That the chair or designee provided an opportunity for participants to identify patent claim(s)/patent application claim(s) and/or the holder of patent claim(s)/patent application claim(s) of which the participant is personally aware and that may be essential for the use of that standard
  - Any responses that were given, specifically the patent claim(s)/patent application claim(s) and/or the holder of the patent claim(s)/patent application claim(s) that were identified (if any) and by whom.
- The WG Chair shall ensure that a request is made to any identified holders of potential essential patent claim(s) to complete and submit a Letter of Assurance.
- It is recommended that the WG chair review the guidance in *IEEE-SA Standards Board Operations Manual* 6.3.5 and in FAQs 14 and 15 on inclusion of potential Essential Patent Claims by incorporation or by reference.

Note: **WG** includes Working Groups, Task Groups, and other standards-developing committees with a PAR approved by the IEEE-SA Standards Board.

(Optional to be shown)

Participants, Patents, and Duty to Inform

All participants in this meeting have certain obligations under the IEEE-SA Patent Policy.

- **Participants [Note: Quoted text excerpted from IEEE-SA Standards Board Bylaws subclause 6.2]:**
  - **"Shall inform the IEEE (or cause the IEEE to be informed)" of the identity of each "holder of any potential Essential Patent Claims of which they are personally aware" if the claims are owned or controlled by the participant or the entity the participant is from, employed by, or otherwise represents**
  - **"Should inform the IEEE (or cause the IEEE to be informed)" of the identity of "any other holders of potential Essential Patent Claims" (that is, third parties that are not affiliated with the participant, with the participant's employer, or with anyone else that the participant is from or otherwise represents)**
- **The above does not apply if the patent claim is already the subject of an Accepted Letter of Assurance that applies to the proposed standard(s) under consideration by this group**
- **Early identification of holders of potential Essential Patent Claims is strongly encouraged**
- **No duty to perform a patent search**

Patent Related Links

All participants should be familiar with their obligations under the IEEE-SA Policies & Procedures for standards development.

Patent Policy is stated in these sources:

IEEE-SA Standards Boards Bylaws

http://standards.ieee.org/develop/policies/bylaws/sect6-7.html#6

IEEE-SA Standards Board Operations Manual

http://standards.ieee.org/develop/policies/opman/sect6.html#6.3

Material about the patent policy is available at

http://standards.ieee.org/about/sasb/patcom/materials.html

If you have questions, contact the IEEE-SA Standards Board Patent Committee Administrator at patcom@ieee.org or visit http://standards.ieee.org/about/sasb/patcom/index.html

This slide set is available at https://development.standards.ieee.org/myproject/Public/mytools/mob/slideset.ppt

Call for Potentially Essential Patents

- If anyone in this meeting is personally aware of the holder of any patent claims that are potentially essential to implementation of the proposed standard(s) under consideration by this group and that are not already the subject of an Accepted Letter of Assurance:
  - Either speak up now or
  - Provide the chair of this group with the identity of the holder(s) of any and all such claims as soon as possible or
  - Cause an LOA to be submitted

Other Guidelines for IEEE WG Meetings

- **All IEEE-SA standards meetings shall be conducted in compliance with all applicable laws, including antitrust and competition laws.**
  - **Don't discuss the interpretation, validity, or essentiality of patents/patent claims.**
  - **Don't discuss specific license rates, terms, or conditions.**
    - Relative costs, including licensing costs of essential patent claims, of different technical approaches may be discussed in standards development meetings.
      - Technical considerations remain primary focus
  - **Don't discuss or engage in the fixing of product prices, allocation of customers, or division of sales markets.**
  - **Don't discuss the status or substance of ongoing or threatened litigation.**
  - **Don't be silent if inappropriate topics are discussed … do formally object.**

See *IEEE-SA Standards Board Operations Manual*, clause 5.3.10 and "Promoting Competition and Innovation: What You Need to Know about the IEEE Standards Association's Antitrust and Competition Policy" for more details.

Attachment 4

IEEE P765 PROPOSED COMMON US NUCLEAR PLANT AUXILIARY POWER ALIGNMENTS

Presented By:
Ayodele Ishola-Salawu, PhD

A Partial Deliverable for IEEE P765 Sub-Group 1: – Typical Station Designs

Team Members:
Ayodele Ishola-Salawu, PhD (Lead)
Kenneth R. Fleischer, P.E.
Jason Bellamy , P.E.
John Disosway
Duane Brock

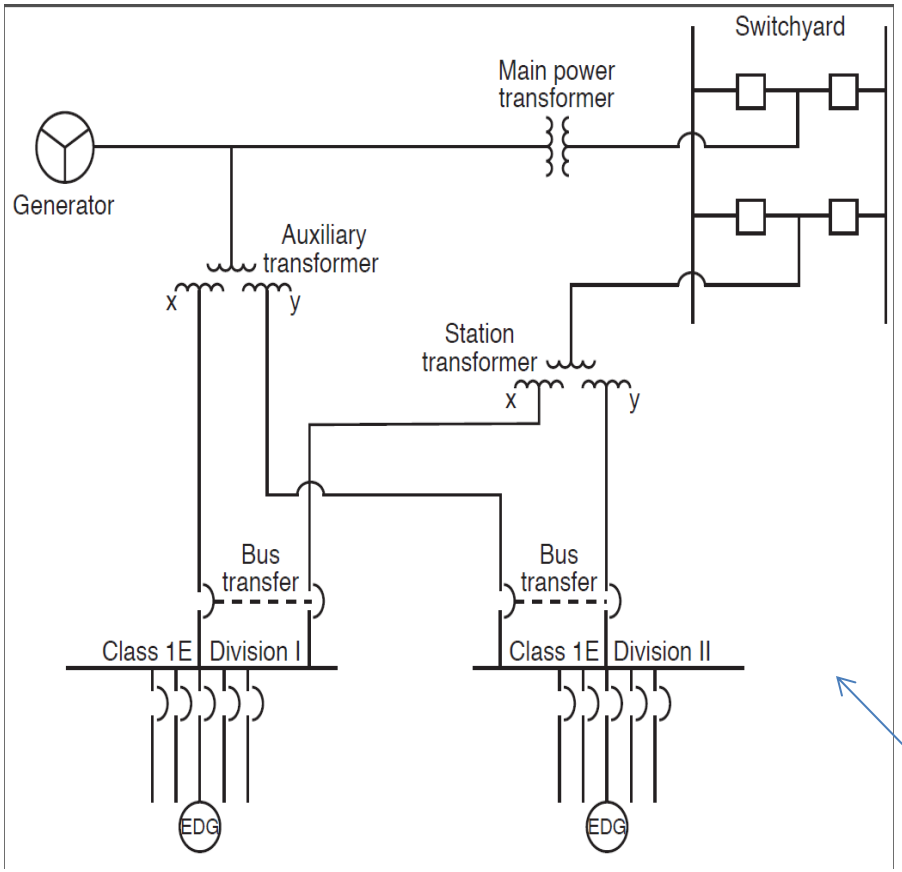
Monday, January 22, 2018

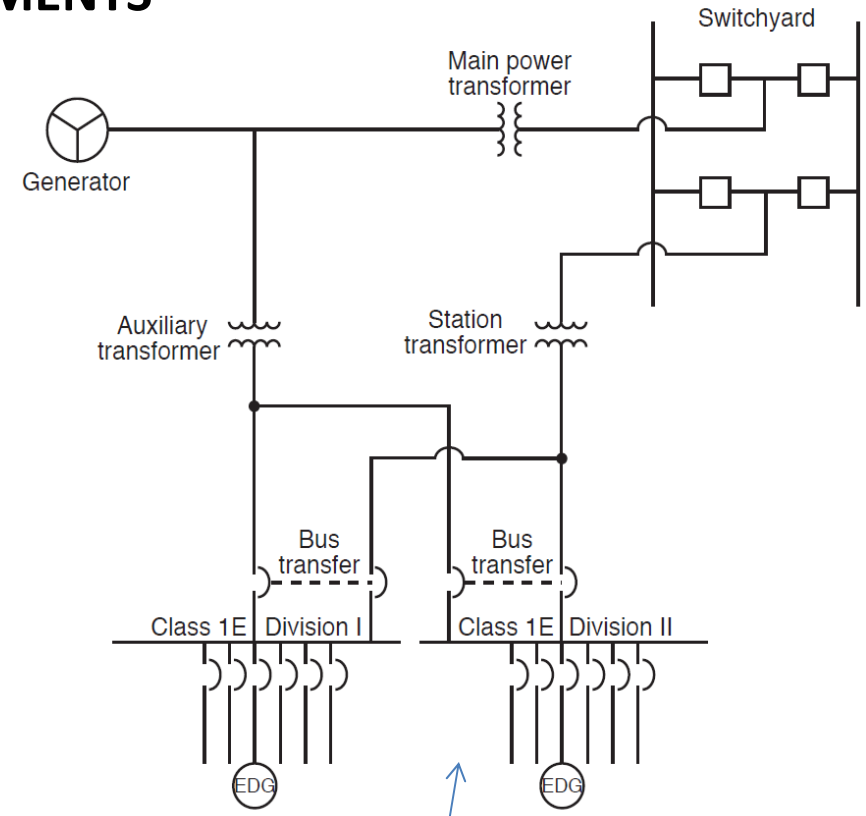
Attachment 4

IEEE P765 PROPOSED COMMON US NUCLEAR PLANT AUXILIARY POWER ALIGNMENTS

TYPE 1 Design:

Both Trains/Divisions of Class 1E Buses fed directly from the auxiliary transformer (AT) during normal operation. GDC-17 offsite power source is station transformer (ST).





Example:
Diablo Canyon 1 & 2 (PGE)

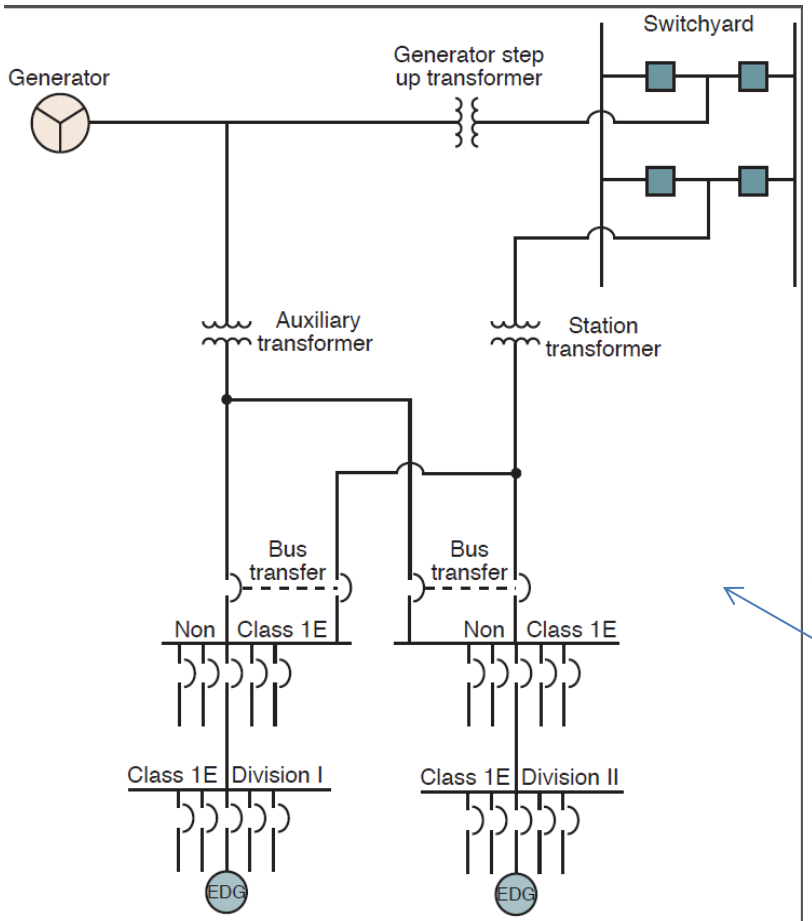
Example:
Turkey Point 3 & 4 (FPL)

Attachment 4

IEEE P765 PROPOSED COMMON US NUCLEAR PLANT AUXILIARY POWER ALIGNMENTS

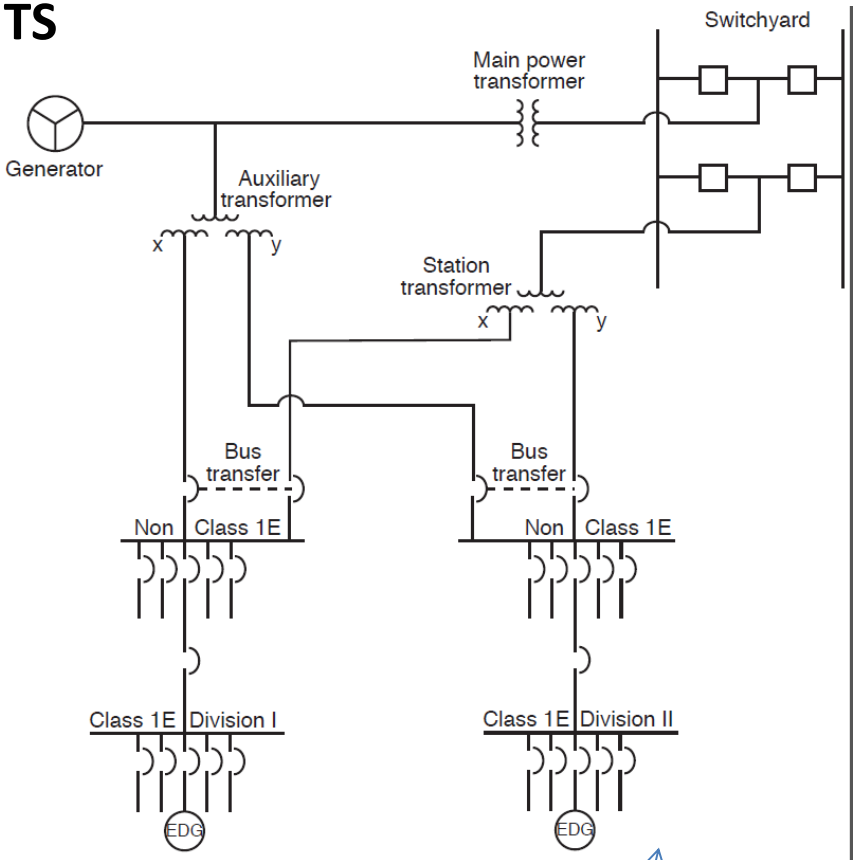
TYPE 2 Design:

Both Trains/Divisions of Class 1E Buses fed (via Non-Class 1E Buses) by the AT during normal operation. The GDC-17 offsite source is the ST.



Examples:

ANO 1 & 2 (Entergy)
Browns Ferry 1 & 2 (TVA)
Brunswick 1 & 2 (Duke)
Davis Besse 1 (FENOC)
Dresden 2 & 3 (Exelon)
Oconee 1, 2, & 3 (Duke)
Palisades 1 (Entergy)



Examples:

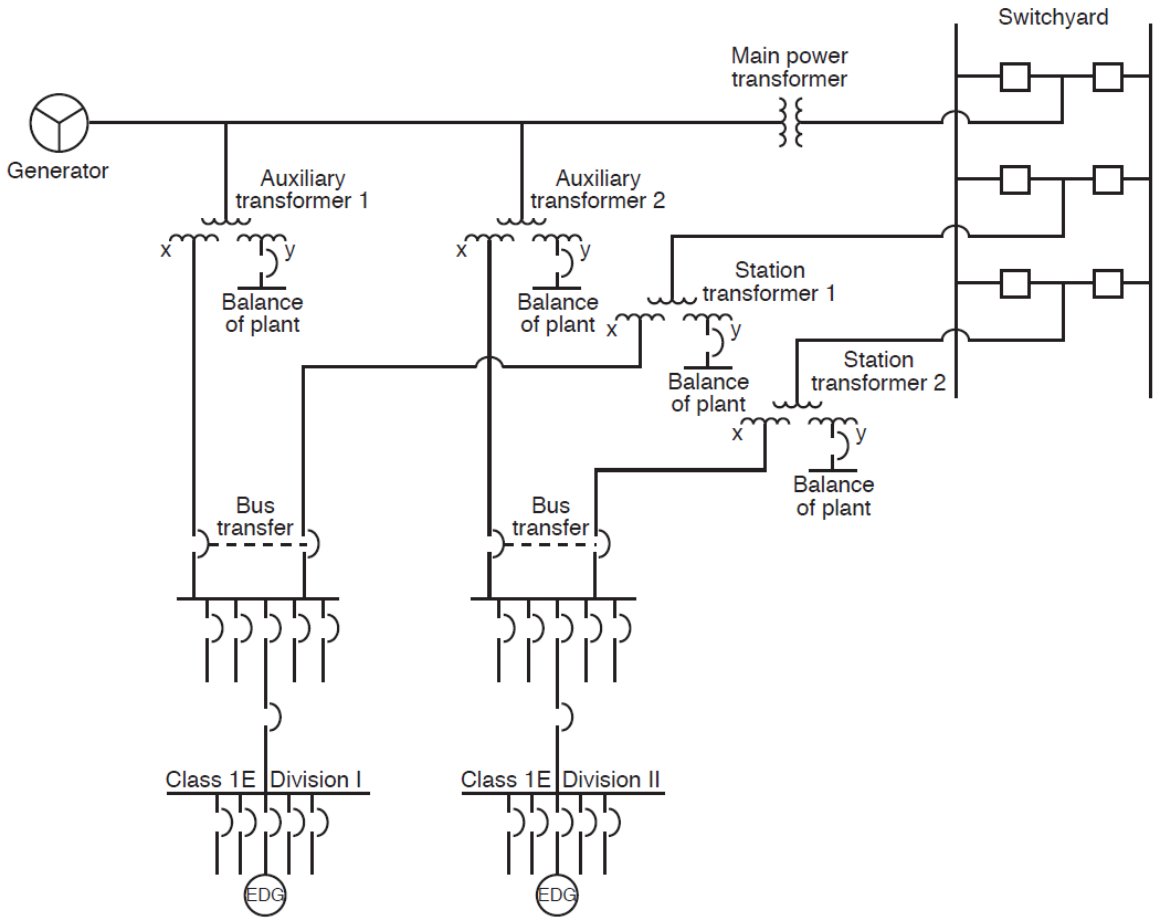
Browns Ferry 3 (TVA)
Davis Besse 1 (FENOC)

Attachment 4

IEEE P765 PROPOSED COMMON US NUCLEAR PLANT AUXILIARY POWER ALIGNMENTS

TYPE 3 Design:

Each Train/Division of Class 1E Bus fed through separate/dedicated AT winding (normal operation) with dedicated ST winding for GDC-17 offsite source



Examples:

Beaver Valley 1 & 2 (FENOC)
Harris 1 (Duke)
Seabrook 1 (FPL)
Sequoyah 1 & 2 (TVA)
St. Lucie 1 & 2 (FPL)
Waterford 1 (Entergy)

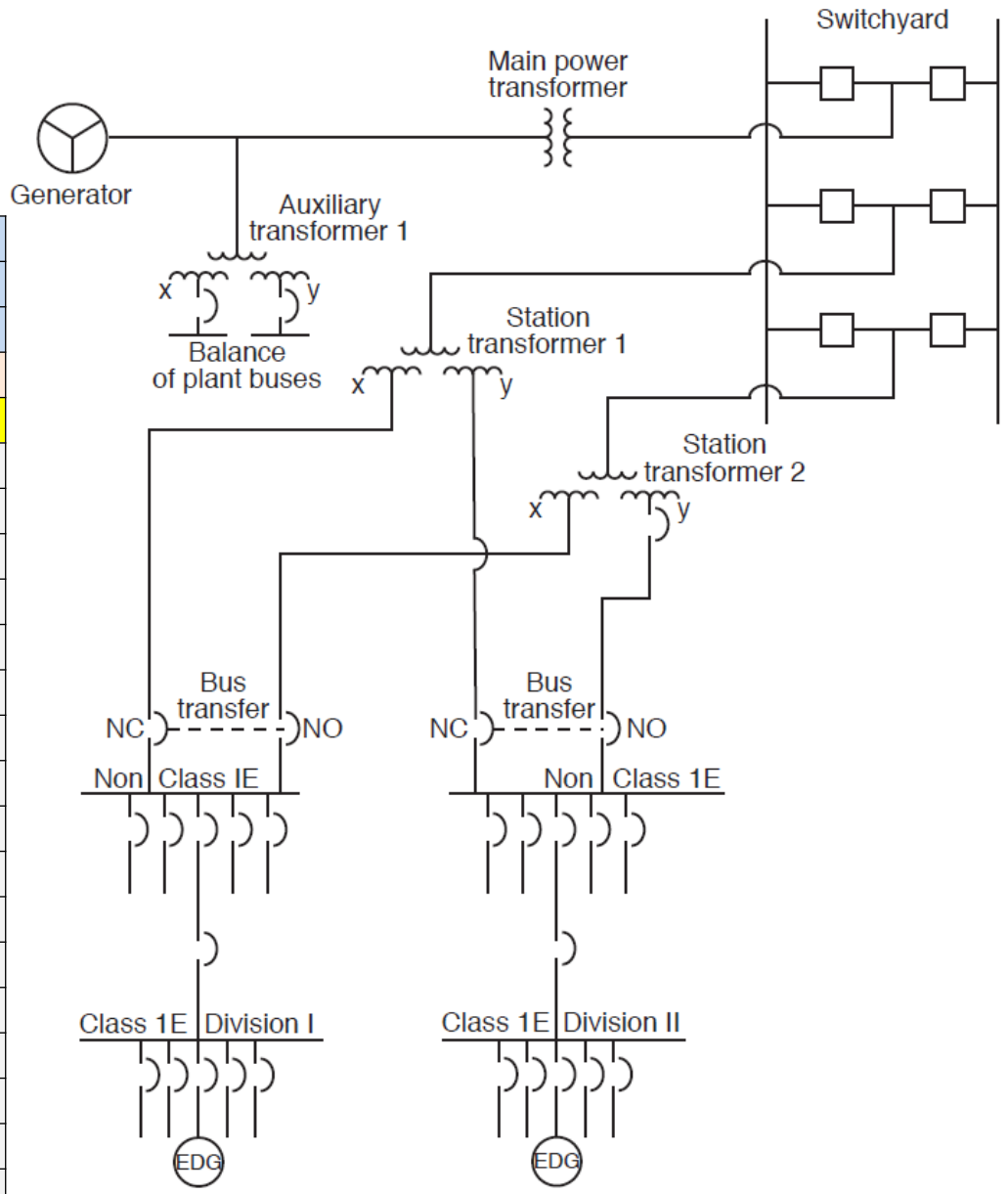
Attachment 4

IEEE P765 PROPOSED COMMON US NUCLEAR PLANT AUXILIARY POWER ALIGNMENTS

TYPE 4 Design:

Class 1E buses permanently fed from off-site power through ST for all modes of operation

Examples		
Company	Plant	Unit
Ameren UE	Callaway	1
APS	Palo Verde	1, 2, & 3
Duke	Robinson	2
Dominion	North Anna	1 &2
Dominion	Surry	1 & 2
Entergy	River Bend	1
Exelon	Clinton	1
Exelon	Ginna	1
Exelon	Limerick	1 & 2
Exelon	Peach Bottom	3 & 4
Exelon	TMI	1
Luminant	Comanche Peak	1 &2
NextEra	Duane Arnold	1
NextEra	Point Beach	1 & 2
PSE&G	Salem	1 & 2
SNOC	Farley	1 & 2
SNOC	Hatch	1 & 2
SNOC	Vogtle	1 & 2
TVA	Watts Bar	1 & 2
WCNOC	Wolf Creek	1
STP	South Texas Project	1 & 2

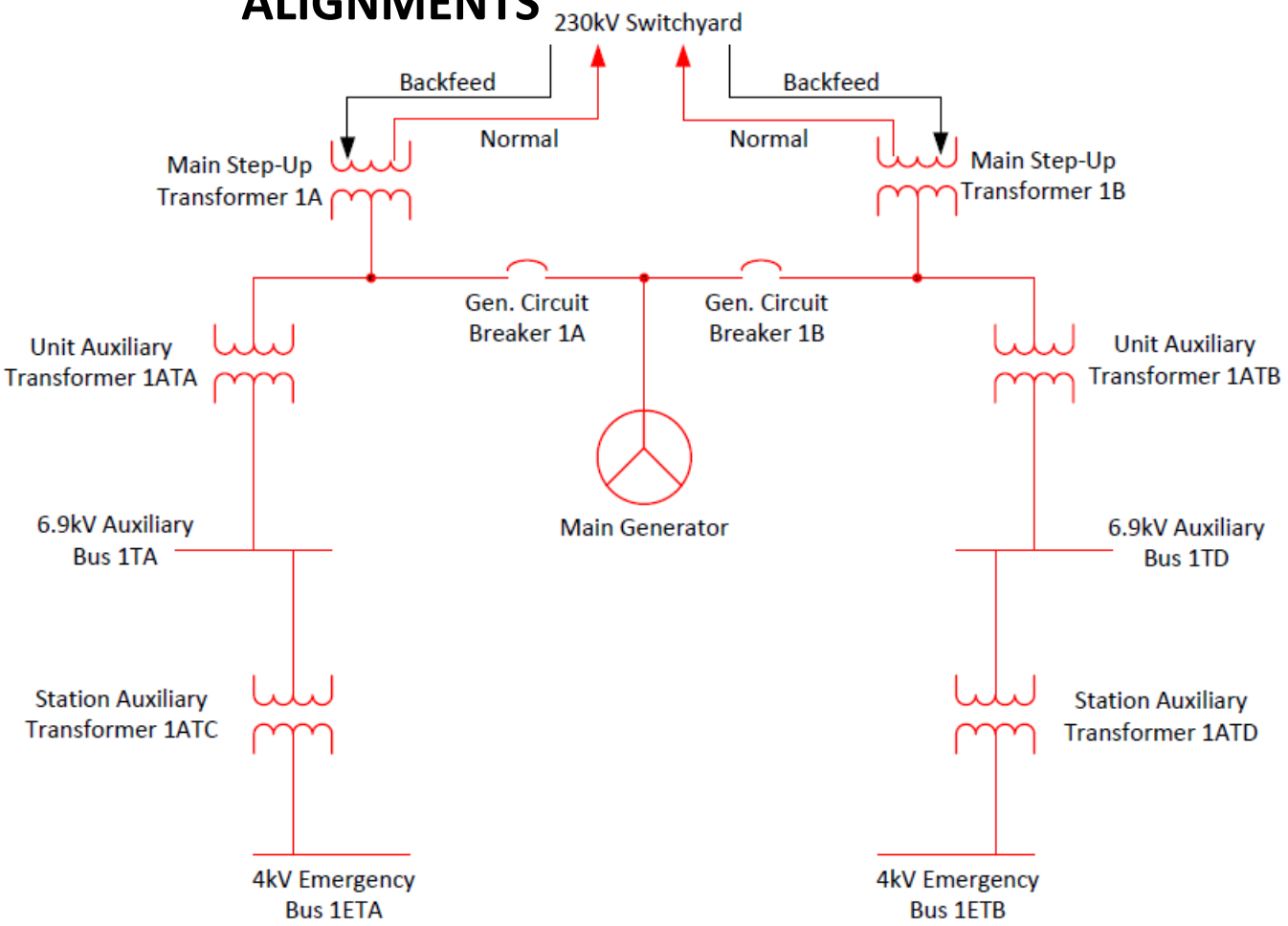


Attachment 4

IEEE P765 PROPOSED COMMON US NUCLEAR PLANT AUXILIARY POWER ALIGNMENTS

TYPE 5 Design:

- Main Generator with two output breakers per train/division. Unit connects to the grid via GSUs.
- Each Non-Class 1E Bus is fed by separate / dedicated ATs .
- Downstream Class 1E buses have separate infeed breakers.
- With Unit out of service, Plant loads fed only via backfeed through the GSUs.



Examples:

Catawba 1 & 2 (Duke)

McGuire 1 & 2 (Duke)

Attachment 4

IEEE P765 PROPOSED COMMON US NUCLEAR PLANT AUXILIARY POWER ALIGNMENTS

References:

1. Station On-Line Diagrams (or representation) from several US Nuclear Stations
2. EPRI Journal 3002011923, Nuclear Station Electrical Distribution Systems and High-energy Arcing Fault Events.
3. IEEE Std 765™-2006, IEEE Standard for Preferred Power Supply (PPS) for Nuclear Power Generating Stations (NPGS)

Non Class-1E Equipment that Provides a Safety Function

Harvey Leake

- 10 CFR 50 Appendix A
  - General Design Criteria
  - Applies to SSCs important to safety
    - I.e., SSCs that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public
    - An SSC does not have to be safety-related to be important to safety
    - There is no NRC definition of "important to safety"
- 10 CFR 50 Appendix B
  - Quality Assurance Criteria
  - Applies to safety-related SSCs
    - Safety-related defined in 10 CFR 50.2

- NUREG-0800
  - Standard Review Plan
  - Section 14.3.6 lists non Class-1E SSCs that provide a safety function
    - Offsite power
    - Containment electrical penetrations for non-Class 1E circuits
    - Alternate AC power source
    - Lighting that needs to be available during accident scenarios and power failures
    - Electrical power for non-safety plant systems that perform signcant safety functions

- Generic Letter 84-01
  - "NRC Use of the Terms 'Important to Safety' and 'Safety Related'"
    - NRC takes a graded approach to SSC safety functions

Criteria

I. Overall Requirements

Criterion 17--Electric power systems.
An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems, and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents.

Comment [TAW1]: Definitions PPS

Comment [TAW2]: 4.4

The onsite electric power supplies, including the batteries, and the onsite electric distribution system, shall have sufficient independence, redundancy, and testability to perform their safety functions assuming a single failure.

Comment [TAW3]: PPS definition

Comment [TAW4]: 4.2, 4.5.b, 4.6

Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights of way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A switchyard common to both circuits is acceptable. Each of these circuits shall be designed to be available in sufficient time following a loss of all onsite alternating current power supplies and the other offsite electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded. One of these circuits shall be designed to be available within a few seconds following a loss-of-coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained.

Comment [TAW5]: 5.1.1

Comment [TAW6]: 4.6

Comment [TAW7]: 4.5

Comment [TAW8]: 4.5.d

Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated by the nuclear power unit, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.

Comment [TAW9]: 5.4.1

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GDC-17:

- Contains the physical requirements for connection of the NPGS to the transmission system (grid)
- Does not infer specific failure of onsite or offsite, just must consider each failing to be able to transfer
- Does have specific requirements of physical connection times to meet accident analysis, only the scenario for transfer requirements.

IEEE 765 vs. GDC-17:

- 765 has more robust requirements than those listed in GDC-17.
- Both documents only provide explicit detail for the physical requirements for connection
- GDC-17 implies provisions to be made for transfer between on-site and off-site
  - safety function of the grid and the on-site power source is to have sufficient capacity and capability to power the loads
  - safety function of the power supply path or PPS is to have sufficient capacity and capability to transfer power from the grid to the safety equipment that is required for anticipated operational occurrences and postulated accidents
  - if safety function of the grid (power source) **or** the PPS pathway cannot be maintained, then the “provisions” made to get to the other source need to be made