WCAP-17503, WCAP-17504

Pre-submittal Presentation

December 14, 2011

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Westinghouse

Agenda

❏ Safety Brief

❏ Introductions

❏ Overview

❏ **WCAP-17503** - Westinghouse Generic Setpoint Control Program Recommendations

❏ **WCAP-17504** - Westinghouse Generic Setpoint Methodology

❏ Summary

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Overview

❑ December 2010, TSTF-493 Workshop

    ❑ NRC discussion of Option B requirements

    ❑ Westinghouse presentation of Process Flow Diagram

❑ June 2011, ISA Committee Meetings

    ❑ NRC/Westinghouse discussion of setpoint methodology

    ❑ Identification of desire for generic WCAPs on setpoint methodology and setpoint control program

❑ July 2011, NRC/Westinghouse Meeting

    ❑ Reinforcement of desire for generic WCAPs

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WCAP-17503

# Westinghouse Generic Setpoint Control Program Recommendations

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WCAP-17503 Westinghouse SCP Recommendations

- ❑ Addresses each of the blocks of the Westinghouse SCP Process Flow Diagram initially presented at the December 2010 TSTF-493 Workshop and discussed at the July 2011 NRC/Westinghouse meeting.

- ❑ Identifies Westinghouse recommendations for a plant specific SCP and provides linkage with Westinghouse setpoint methodology assumptions.

WCAP-17503 Westinghouse SCP Recommendations
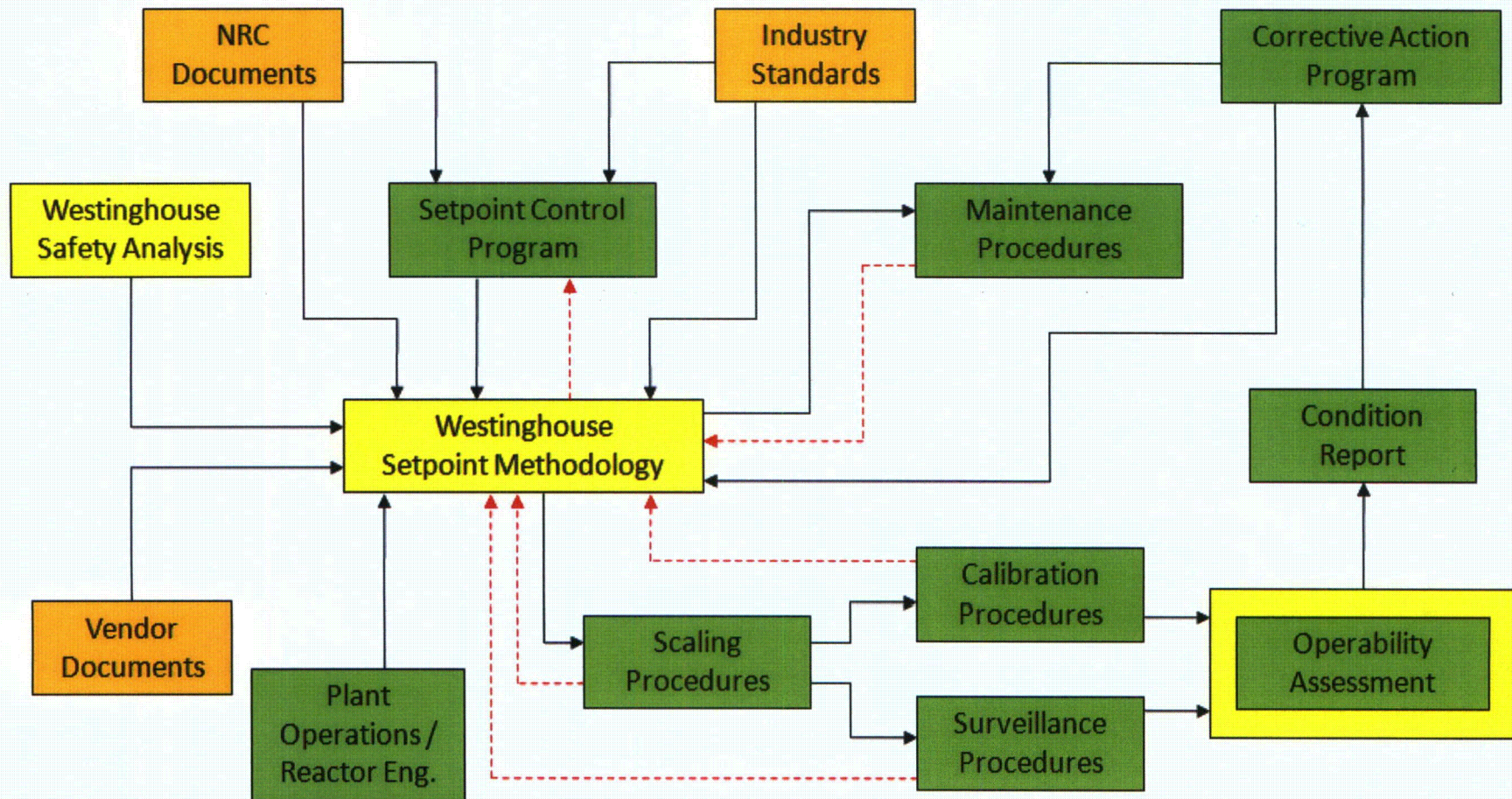
WCAP-17503 Westinghouse SCP Recommendations

❑ Industry Documents Evaluated

❑ ISA Documents

- 67.04.01-2006   RP67.04.02-2010

- TR67.04.09-2005   51.1-1979 (R1993)

- 67.06.01-2002

❑ IEEE Standards

- 279-1971   338-2006

- 498-1990   603-2009

❑ TSTF-493 Rev. 4

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WCAP-17503 Westinghouse SCP Recommendations

❏ NRC Documents Evaluated

    ❏ RG 1.105 Rev 3

    ❏ RG 1.97

    ❏ BTP 7-12 Rev. 5

    ❏ ISG-08

    ❏ GL 91-04

    ❏ RIS 2006 -17

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WCAP-17503 Westinghouse SCP Recommendations

❑ Examples of Vendor Documents:

❑ Cameron/Barton 764 d/p Transmitter User Manual

❑ Ultra/Weed N-E11 & N-E13 Transmitter Spec Sheet

❑ Rosemount 1154 H Transmitter Reference Manual

❑ Ultra/Weed DTN2010 Transmitter Spec Sheet

❑ Fluke 8845A/8846A Multimeter User Manual

❑ Keithley 2002 Multimeter User Manual

❑ Heise 901A/901B Pressure Indicator Operation Manual

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WCAP-17503 Westinghouse SCP Recommendations

❑ Examples of Plant Documents to be Addressed:

  ❑ Scaling Procedures/Calculations

  ❑ Calibration Procedures

  ❑ Surveillance Procedures

  ❑ Corrective Action Program

  ❑ Maintenance Procedures

  ❑ Change Control Process

  ❑ Administrative Controls

❑ Plant Safety Analyses

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WCAP-17503 Westinghouse SCP Recommendations

❑ Assumptions of Westinghouse Setpoint Methodology With Respect to Instrumentation Testing:

  ❑ Qualification Testing

$$\begin{bmatrix} & & \end{bmatrix}^{a,c}$$

  ❑ Calibration and Surveillance Testing

WCAP-17503 Westinghouse SCP Recommendations

☐Westinghouse Calibration and Drift Data Evaluation Process

a,c

WCAP-17503 Westinghouse SCP Recommendations

❑ Westinghouse Instrument Operability Criteria

  ❑ Described in detail in WCAP-17504

  - Process Rack

    - $\pm AFT = \pm ALT = \pm RCA$

  - Transmitter

    - Within $\pm ALT$

    - Within $\pm AFT$

    - Outside $\pm AFT$

WCAP-17503 Westinghouse SCP Recommendations

❑ Outputs of the Westinghouse Setpoint Methodology

   ❑ Scaling Procedures/Calculations

   ❑ Calibration & Surveillance Procedures

   ❑ Maintenance Procedures

   ❑ Safety Analyses (negative margin correction)

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WCAP-17503 Westinghouse SCP Recommendations

❑ Appendix A – BTP 7-12 Acceptance Criteria

  ❑ Addresses each of the items listed in the Acceptance Criteria section of BTP 7-12 Rev. 5

$$\begin{bmatrix} & & \end{bmatrix}^{a,c}$$

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WCAP-17503 Westinghouse SCP Recommendations

❏ Appendix B – BTP 7-12 Review Procedures

   ❏ Addresses each of the items listed in the Review Procedures section of BTP 7-12 Rev. 5

$$\begin{bmatrix} & & \end{bmatrix}^{a,c}$$

WCAP-17503 Westinghouse SCP Recommendations

❑ Summary

   ❑ WCAP addresses each block of the Westinghouse Setpoint Control Program Process Flow Diagram

   ❑ Provides recommendations for what should be included in a plant specific SCP

   ❑ Is designed to be used in parallel with WCAP-17504, Westinghouse Setpoint Methodology

   ❑ Appendices [   ]^{a,c} addresses each requirement of BTP 7-12 Acceptance Criteria and Review Procedures

WCAP-17504

Westinghouse Generic Setpoint Methodology

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WCAP-17504 Westinghouse Setpoint Methodology

❑ Overview

    ❑ 4 - Main Sections

        1.   Basic algorithm and term identification

        2.   Definitions and example calculations

           •   Protection function

           •   Control function

           •   Indication

        3.   Calibration and drift evaluation process

        4.   Application of Setpoint Methodology

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WCAP-17504 Westinghouse Setpoint Methodology

❏ Basic algorithm is SRSS

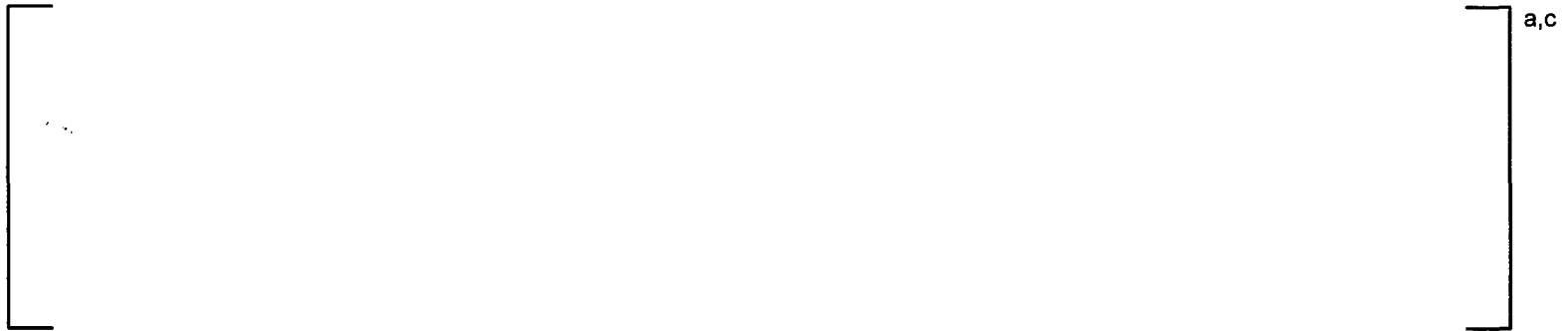❏ Current algorithm in use since 1997

❏ Protection Functions:

$$\text{CSA}_{\text{PROT}} = \left\{ \sqrt{\begin{array}{l} \text{PMA}^2 + \text{PEA}^2 + \text{SRA}^2 + (\text{SMTE} + \text{SD})^2 + (\text{SMTE} + \text{SCA})^2 + \\ \text{SPE}^2 + \text{STE}^2 + (\text{RMTE} + \text{RD})^2 + (\text{RMTE} + \text{RCA})^2 + \text{RTE}^2 \end{array}} \right\} + \text{EA} + \text{Bias}$$

❏ Control Functions:

a,c

WCAP-17504 Westinghouse Setpoint Methodology

❑ Indication:

$$\left[\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \right]^{a,c}$$

WCAP-17504 Westinghouse Setpoint Methodology

❑ Key Points for Uncertainty Algorithm

❑ SMTE is dependent with SCA and SD

❑ RMTE is dependent with RCA and RD

$$\left[\right]^{a,c}$$

❑ Bias terms are one direction with a known magnitude

- Typically a result of calibration or drift evaluations or PMA terms

$$\left[\right]^{a,c}$$

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WCAP-17504 Westinghouse Setpoint Methodology

❏ Statistical Basis

    ❏ 95/95 Two-sided

        ■ Protection Functions

        ■ Control Functions (ITDP/RTDP, [   ] a,c

[   ] a,c

WCAP-17504 Westinghouse Setpoint Methodology

☐ **Environmental Allowance Terms (Transmitters)**

　☐ Temperature

　　▪ Vendor specs note "±" suggesting that effect can be indicated higher than actual or indicated lower than actual

$$\left[\qquad\qquad\qquad\qquad\qquad\qquad \right]^{a,c}$$

　　▪ Suggests the more appropriate treatment is as a limit of error

　☐ Radiation

　　▪ Characteristics are very similar to those exhibited for temperature

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❑ Environmental Allowance Terms – (Transmitter)

   ❑ Seismic

$$\left[\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \right]^{a,c}$$

     ❑ Suggests the more appropriate treatment is as a limit of error

$$\left[\qquad\qquad\qquad\qquad\qquad\qquad\qquad \right]^{a,c}$$

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WCAP-17504 Westinghouse Setpoint Methodology

❏Environmental Allowance Terms (Process Racks)

    ❏ Temperature

        [   ] a,c

    ❏ Radiation

        [   ] a,c

    ❏ Seismic

        ⌈   ⌉ a,c

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WCAP-17504 Westinghouse Setpoint Methodology

Setpoint Parameter Relationship Diagram (Increasing Function)

SAL = Safety Analysis Limit

TA = Total Allowance

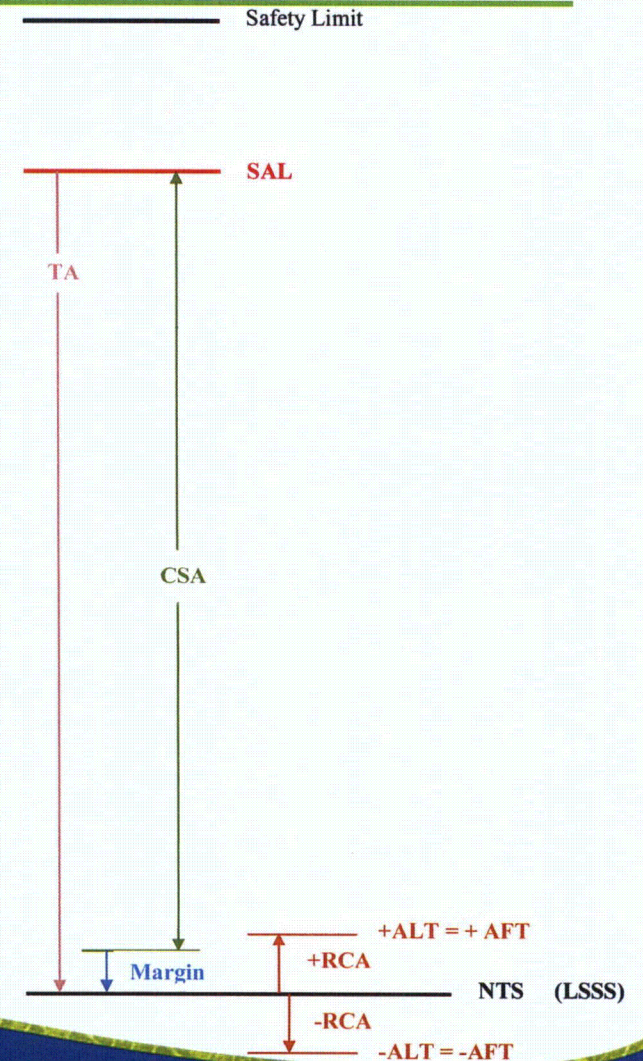CSA = Channel Statistical Allowance

NTS = Nominal Trip Setpoint

RCA = Rack Calibration Allowance

ALT = As Left Tolerance

AFT = As Found Tolerance

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❑AFT

$$\Bigg[\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad \Bigg]^{a,c}$$

WCAP-17504 Westinghouse Setpoint Methodology

❏ ALT

$$\begin{bmatrix} & & \end{bmatrix}^{a,c}$$

WCAP-17504 Westinghouse Setpoint Methodology

❑ Example Tables Contain:

❑ Breakdown of instrument uncertainties

❑ CSA calculation

❑ SAL, NTS (Protection) $\lceil$ $\rceil$ a,c

❑ TA calculation

❑ Margin

❑ Transmitter ALT, AFT limits

❑ Process Rack ALT, AFT limits

❑ Example Scaling information for Transmitter, Process Racks, Controller, Indication (as applicable)

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WCAP-17504 Westinghouse Setpoint Methodology

❑Westinghouse Calibration and Drift Evaluation Process

❑ Input Data

a,c

WCAP-17504 Westinghouse Setpoint Methodology

❏Data Validity

$$\begin{bmatrix} & & \\ & \cdot\cdot & \\ & & \\ & & \end{bmatrix}^{a,c}$$

❏Probability/Confidence Level

  ❏ 95/95

    ▪ RTS/ESFAS

$$\begin{bmatrix} & \\ & \end{bmatrix}^{a,c}$$

$$\begin{bmatrix} & & \\ & & \\ & & \\ & & \\ & & \end{bmatrix}^{a,c}$$

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WCAP-17504 Westinghouse Setpoint Methodology

❑ Basic approach (deterministic) of calculating drift magnitude is based on GL 91-04

    ❑ WCAP-13870 Rev. 1 – Indian Point 2 – 24 Month Fuel Cycle

    ❑ WCAP-14646 Rev. 1 – Diablo Canyon – 24 Month Fuel Cycle

    ❑ WCAP-15001 Rev. 0 – Indian Point 3 – 24 Month Fuel Cycle

❑ Same method as used to justify Indian Point 2 one time surveillance extension of 37 months

❑ NRC Approved

    ❑ Indian Point 2 - 24 Month fuel cycles

    ❑ Indian Point 3 - 24 Month fuel cycles

    ❑ Indian Point 2 – One time 37 Month surveillance extension

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WCAP-17504 Westinghouse Setpoint Methodology

a,c

WCAP-17504 Westinghouse Setpoint Methodology

a,c

WCAP-17504 Westinghouse Setpoint Methodology

a,c

WCAP-17504 Westinghouse Setpoint Methodology

a,c

WCAP-17504 Westinghouse Setpoint Methodology

❑ Drift Determination

a,c

WCAP-17504 Westinghouse Setpoint Methodology

a,c

WCAP-17504 Westinghouse Setpoint Methodology

a,c

WCAP-17504 Westinghouse Setpoint Methodology

a,c

WCAP-17504 Westinghouse Setpoint Methodology

**Westinghouse Calibration
and Drift Data Evaluation
Process Diagram**

a,c

WCAP-17504 Westinghouse Setpoint Methodology

❑ Application of Westinghouse Setpoint Methodology

   ❑ 7- Basic Assumptions

        1.   Instrument techs drive RCA towards 0 error

        2.   RCA $\begin{bmatrix} & \end{bmatrix}^{a,c}$

        3.   RD $\begin{bmatrix} & \end{bmatrix}^{a,c}$

        4.   Process racks are verified/functionally tested as a string or loop

        5.   Instrument techs drive SCA towards 0 error

        6.   SCA $\begin{bmatrix} & \end{bmatrix}^{a,c}$

        7.   SD $\begin{bmatrix} & \end{bmatrix}^{a,c}$

    * surveillance interval (currently a nominal 18 or 24 months)

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WCAP-17504 Westinghouse Setpoint Methodology

❏ Trend Evaluations look at the following

$$\Bigg]^{a,c}$$
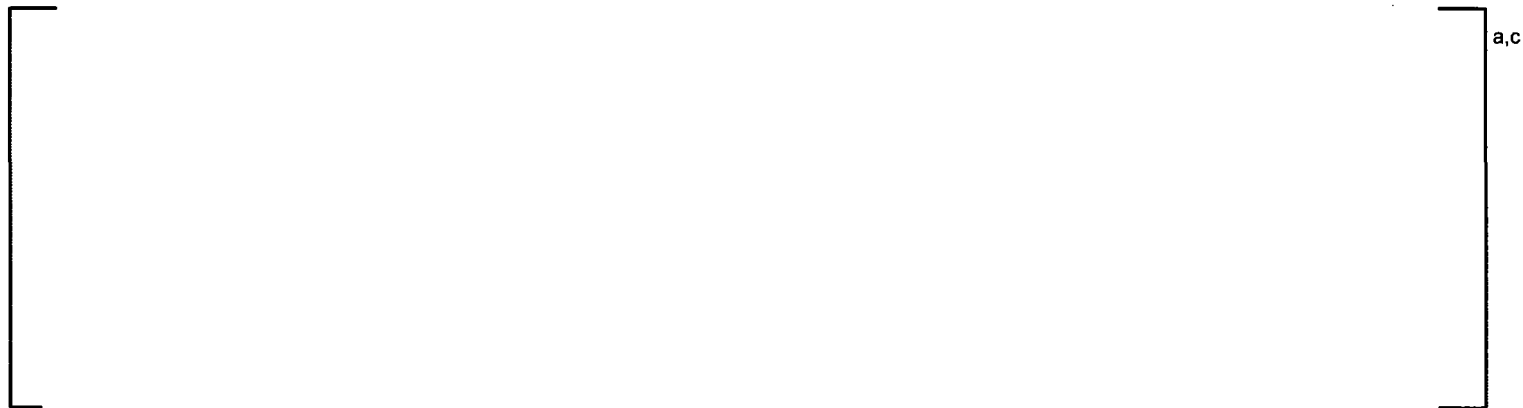
❏ Ability to calibrate is first indication of operability

❏ Drift magnitude is second indication of operability

❏ $\Big[\qquad \Big]^{a,c}$

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WCAP-17504 Westinghouse Setpoint Methodology

❏ Summary

❏ Basic algorithm is an SRSS

❏ 95/95 two-sided for protection functions, $\left[\right]$ a,c

$$\left[\right]^{a,c}$$

❏ Process Racks: ±AFT = ±ALT = ±RCA

- AFT and ALT are performance based

❏ Transmitters: ±AFT = ±SD, ±ALT = ±SCA

- AFT and ALT are performance based

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WCAP-17504 Westinghouse Setpoint Methodology

❑Calibration and Drift evaluation processes $[$

$]$ a,c

a,c
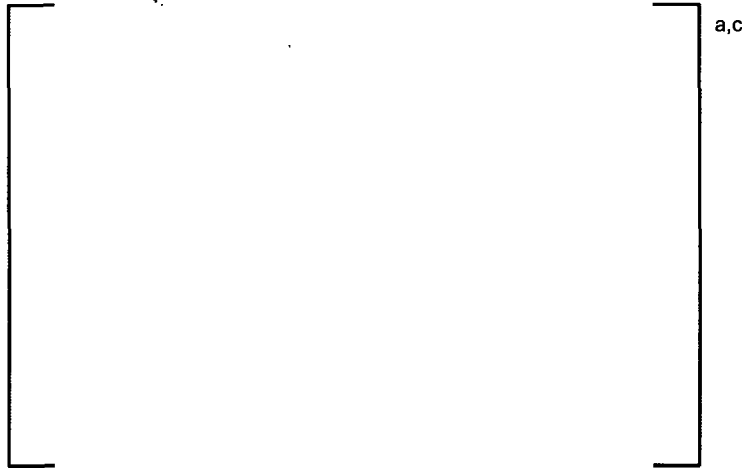
❑Trending/evaluation process $[$

$]$ a,c (currently a nominal 18 or 24 months)

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WCAP-17504 Westinghouse Setpoint Methodology

❏ Appendix A – BTP 7-12 Acceptance Criteria

  ❏ Addresses each of the items listed in the Acceptance Criteria section of BTP 7-12 Rev. 5

$$\begin{bmatrix} & \end{bmatrix}^{a,c}$$

WCAP-17504 Westinghouse Setpoint Methodology

❏ Appendix B – BTP 7-12 Review Procedures

   ❏ Addresses each of the items listed in the Review Procedures section of BTP 7-12 Rev. 5

$$\left[\right]^{a,c}$$

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SUMMARY

- ❑ Generated two WCAPs to address TSTF-493 Option B
  - ❑ WCAP-17503 Westinghouse Generic Setpoint Control Program Recommendations
  - ❑ WCAP-17504 Westinghouse Generic Setpoint Methodology
- ❑ WCAP-17503 used in conjunction with WCAP-17504
- ❑ WCAP-17504 can stand alone

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SUMMARY

❑ Each WCAP addresses BTP 7-12 Rev 5

   ❑ Acceptance Criteria section in Appendix A

   ❑ Review Procedures section in Appendix B

a,c