

Westinghouse Non-Proprietary Class 3

Enclosure 3 to WOG-05-546

Westinghouse Owners Group

Non-Proprietary Version

**Presentation Material for November 17, 2005 NRC
Meeting Regarding CROSSFLOW Ultrasonic Flow
Measurement System**

CROSSFLOW Ultrasonic Flow Measurement System

**Utility Implementation Update
November 17, 2005**



Agenda

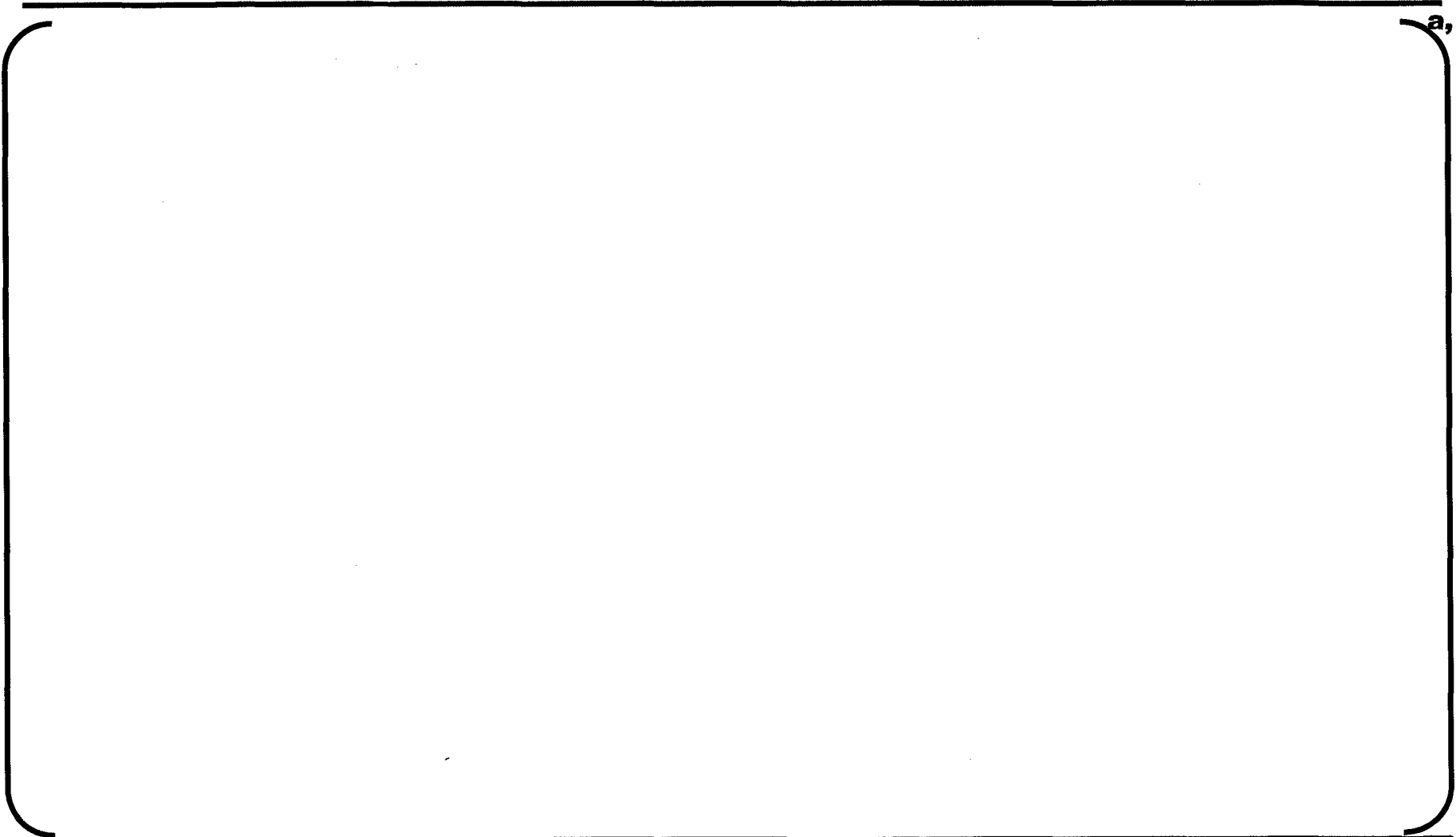
(November 17, 2005)

- **Vendor/Utility Responsibility Transition - CROSSFLOW Design, Installation, Validation and Implementation**
- **Utility Processes for Implementing and Operating CROSSFLOW Consistent with the Design/Licensing Basis**
- **WOG CTF User Guidelines**
- **Utility Implementation/Operational Experience Presentation**
- **Open Discussion**

Responsibilities for CROSSFLOW Design, Implementation and Transition Process

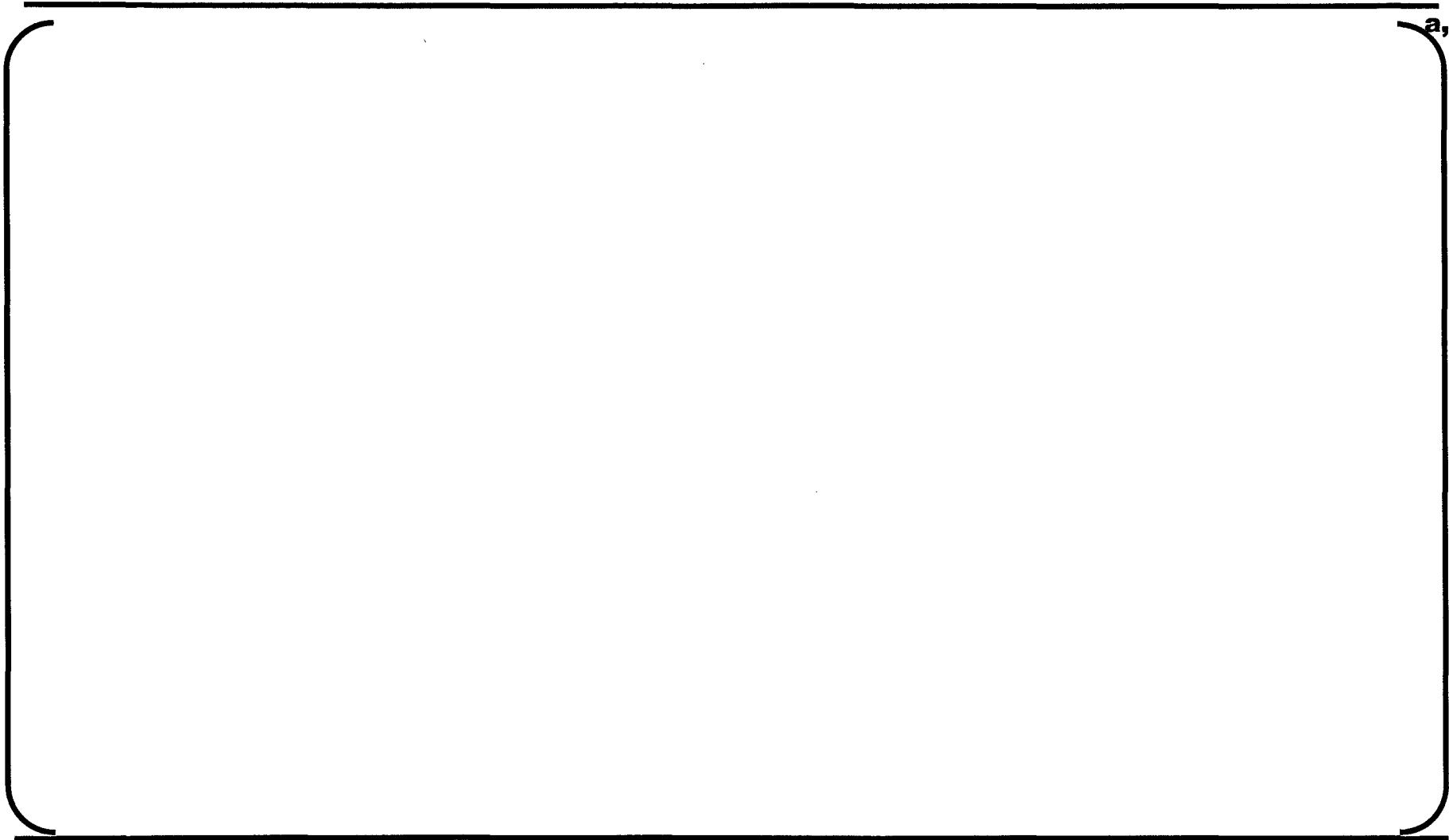


WOG CROSSFLOW Task Force Organization of Issues Process

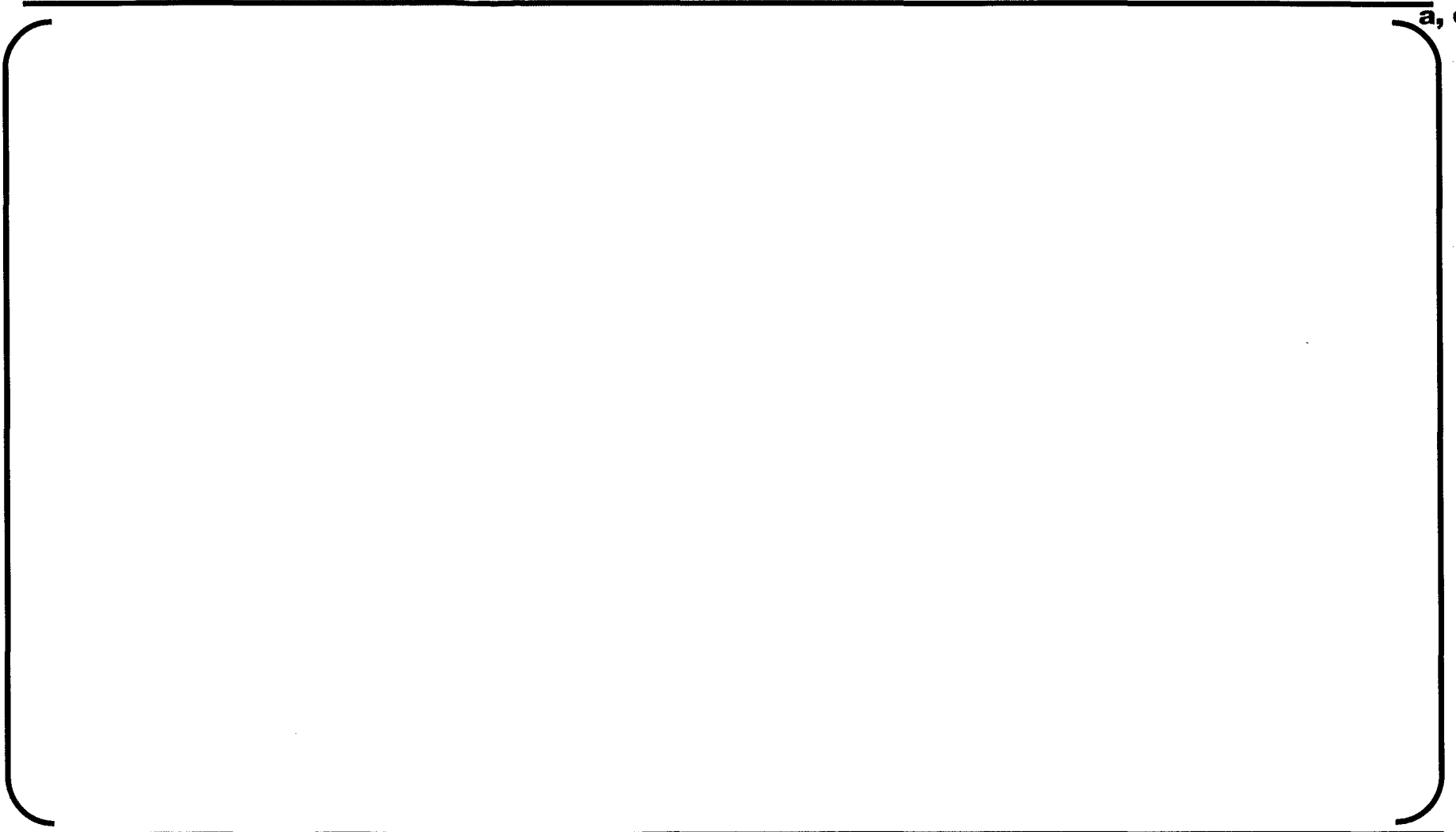


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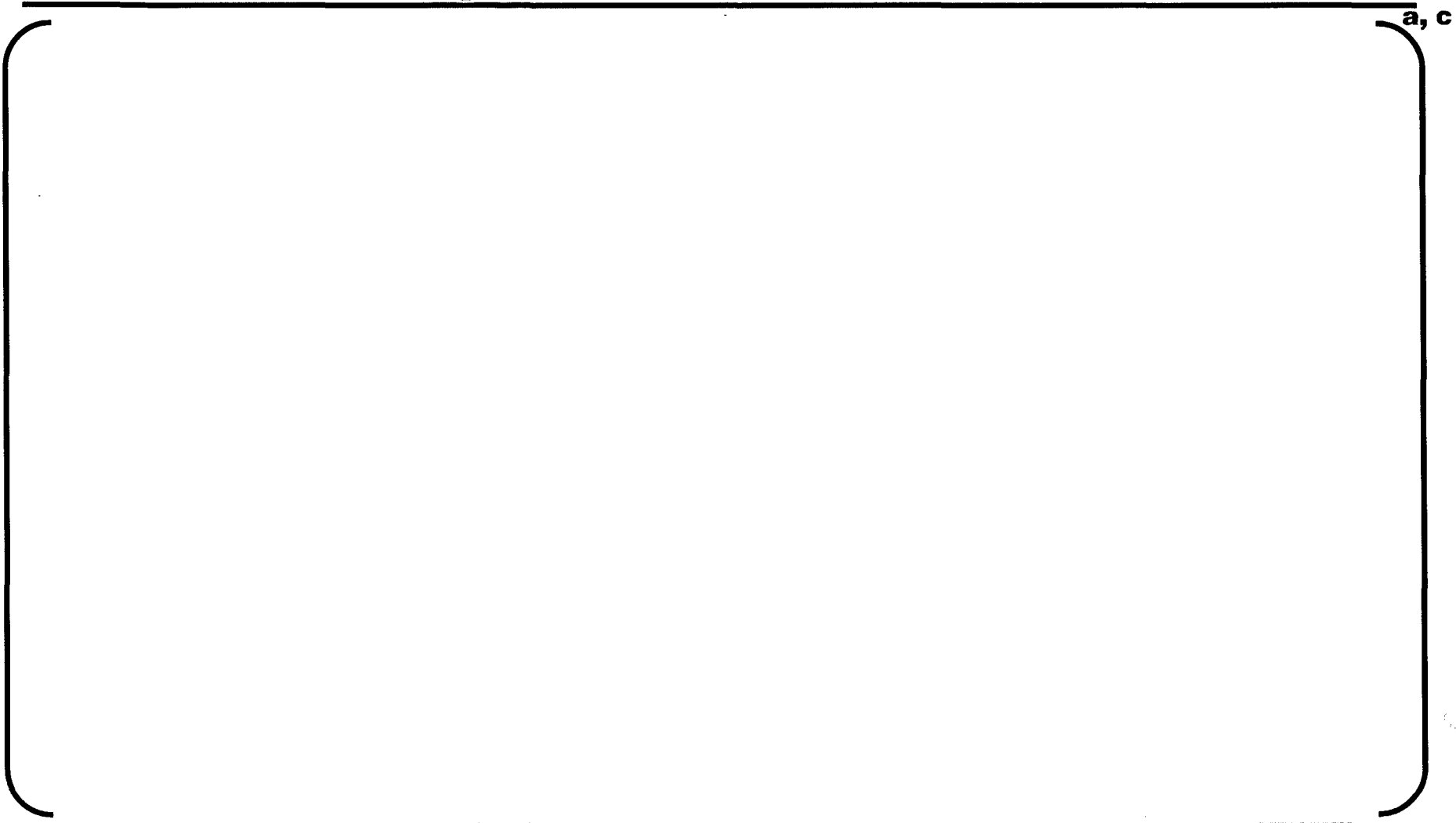
CROSSFLOW Implementation Process



Utility CROSSFLOW Implementation and Operations Processes



Utility **CROSSFLOW** Implementation and Operations Processes



WOG CTF User Guidelines



CROSSFLOW Status Update

• WOG CROSSFLOW Task Force Participants

- SNC – Hatch 1 & 2
- Exelon – Byron 1 & 2, Braidwood 1 & 2, Dresden, LaSalle
- OPPD – Ft. Calhoun
- NMC – Palisades
- DOM – Kewaunee
- PSEG – Salem 1 & 2, Hope Creek
- STP – South Texas 1 & 2
- SCE – San Onofre 2 & 3
- PGE – Diablo Canyon 1 & 2
- Constellation – Calvert Cliffs 1 & 2

WOG CROSSFLOW Task Force User Guidelines

- The WOG CROSSFLOW Task Force User Guidelines are:

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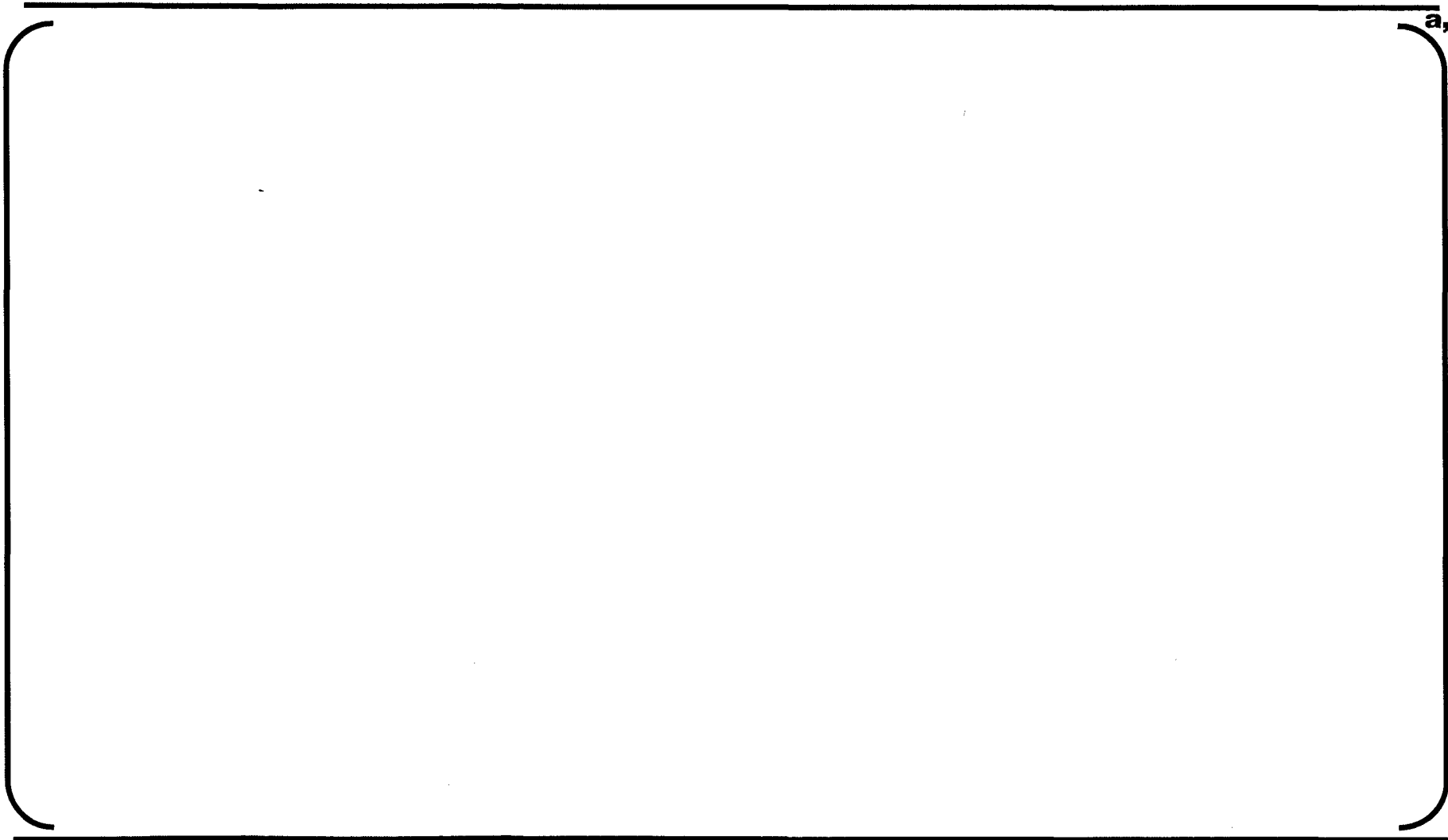
WOG CROSSFLOW Task Force User Guidelines

- The WOG CROSSFLOW Task Force User Guidelines are not:

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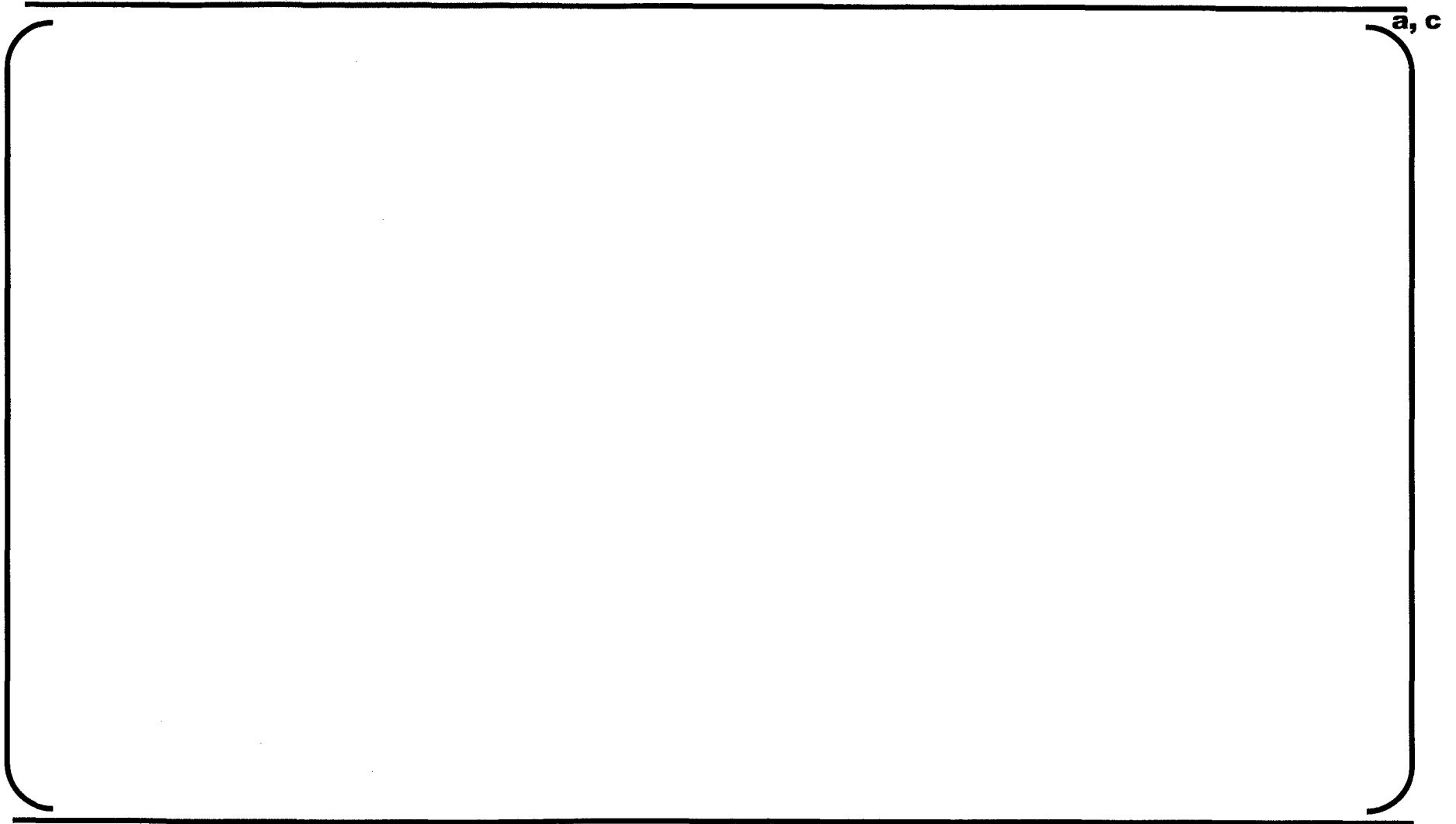


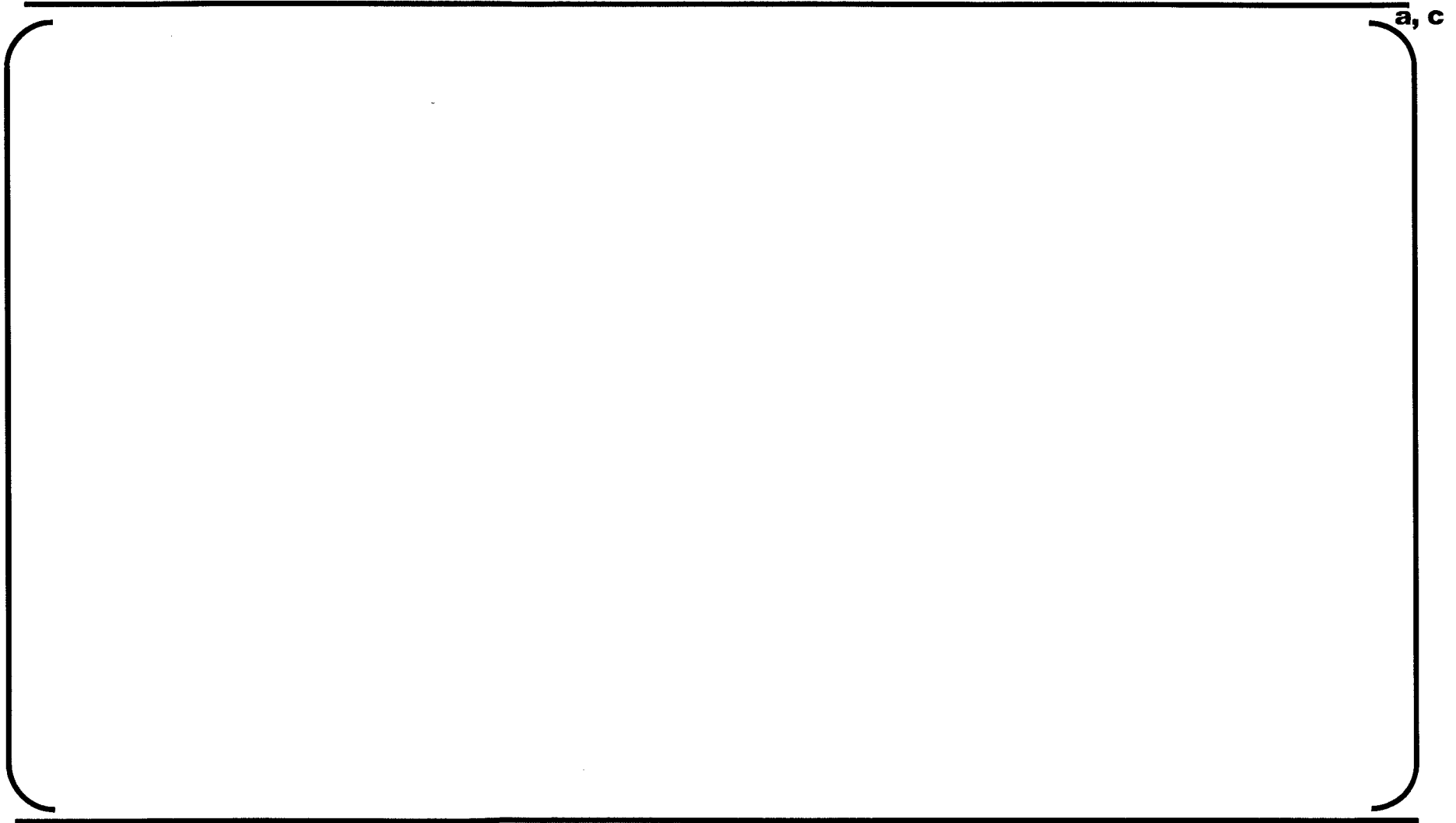
WOG CROSSFLOW Task Force User Guidelines



CROSSFLOW Guidelines Troubleshooting Chart







CROSSFLOW Installation at Calvert Cliffs Units 1 & 2

November 17, 2005



Background

- Tracer tests on Calvert Cliffs 1 & 2 were performed to compare measured feedwater flow to the CROSSFLOW system
- Results indicate that CROSSFLOW may have been providing a non-conservative flow indication

Actions Taken

- CROSSFLOW venturi correction factors were removed on September 12th
- Two additional meters were installed upstream and downstream of the “reference” meter to check for flow stability
- A computational fluid dynamics (CFD) analysis was performed to study the hydraulic interactions between the outlet of the flow control valve and the 12 upstream meter

Summary of Results

Chemical Tracer Flow Measurements

- Measurements performed on all four loops
- Results consistent with venturi measurements and fouling expectations

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Summary of Results

CROSSFLOW Meter Conclusions From Chemical Tracer Flow Measurements

- The original installation assumed:
 - The upstream reference meter was considered to be a standard installation
 - The downstream meters were calibrated using the upstream meter
- Observations from the tracer test:
 - Indicate that the 12 upstream reference meter is not correct
- Conclusion:
 - The downstream meters must be calibrated by another method

Summary of Results

Flow Stability at Loop 12 Upstream Location

- The three meter readings were similar indicating that the profile appeared to be symmetrical
- Could not confirm axial profile stability nor detect the presence of swirl due to close proximity of the meters

Summary of Results

Flow Stability at Loop 12 Upstream Location

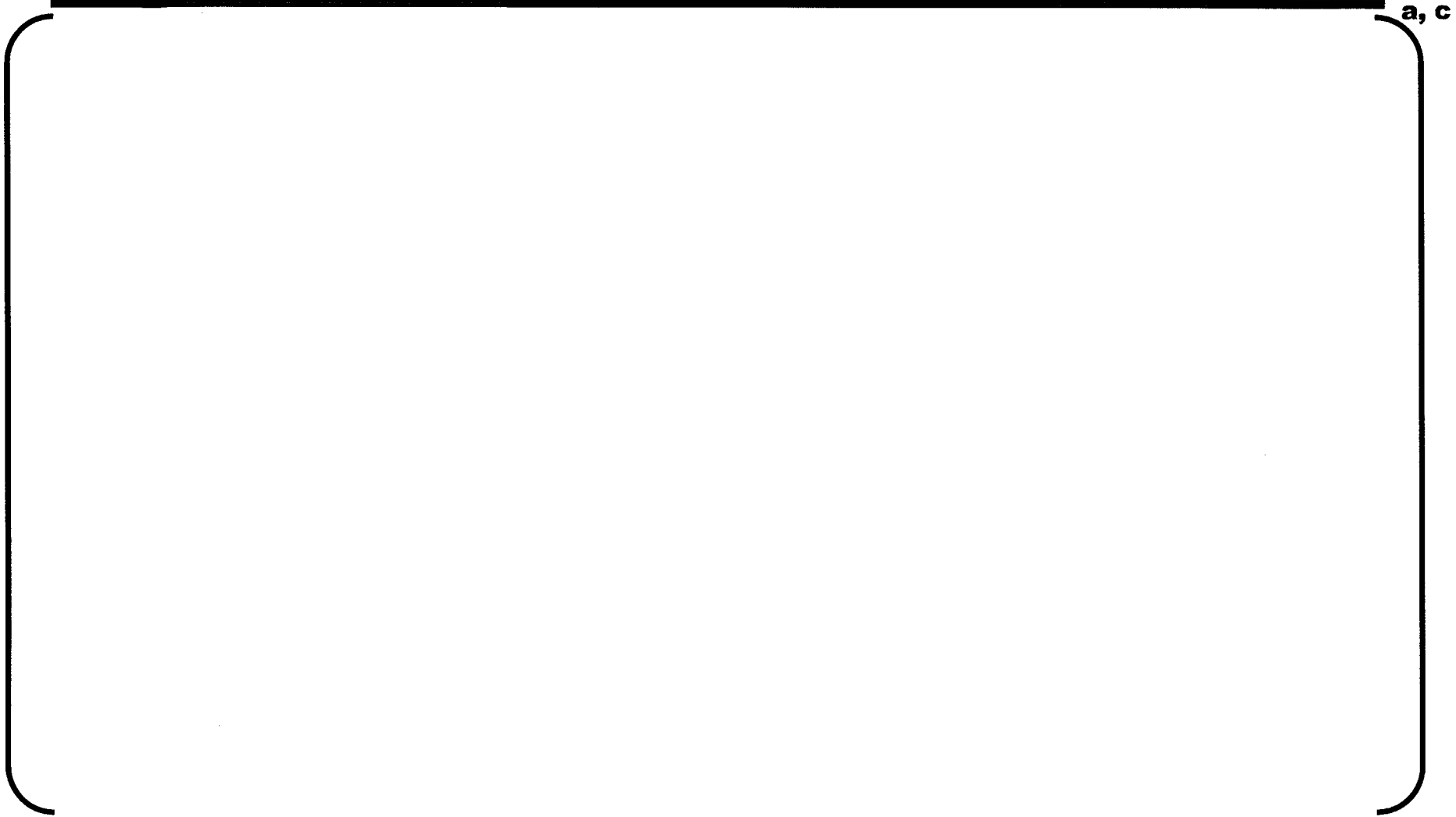
- CFD Analysis showed the presence of strong swirl and flow profile distortion due to the effect of the feedwater control valve and upstream piping geometry

CFD Analysis

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CFD Analysis at Downstream Elbow (With Control Valve)



CFD Analysis at Downstream Elbow (Without control valve)

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Impact of Control Valve on Flow Profile

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Conclusions

- The tracer tests are in good agreement with the plant venturis
- The accuracy of the loop 12 upstream reference meter has been adversely affected by upstream flow disturbances
- The loop 12 upstream location can not be utilized for an in-situ calibration

Unit 1 Piping and Bracket Location

② Loop 11

