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 MARTIN,J.B. Region 5, Ofc of the Director

SUBJECT: Provides update of status of control room training simulator.  
 upgrade project.

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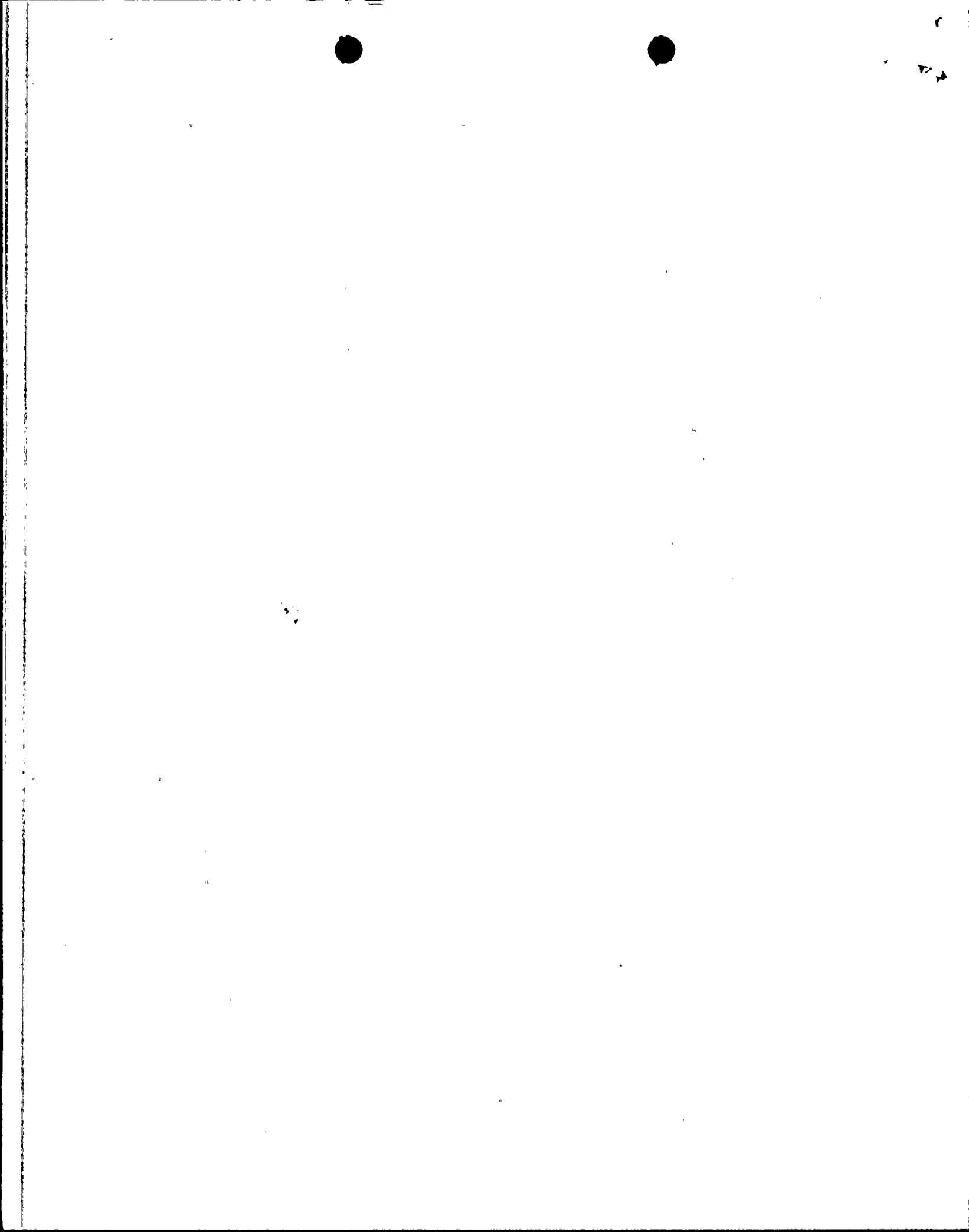
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WILLIAM F. CONWAY  
EXECUTIVE VICE PRESIDENT  
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161-03243-WFC/GEC  
May 22, 1990

05 MAY 1990 10:11

Docket Nos. STN 50-528/529/530

Mr. J. B. Martin  
Regional Administrator, Region V  
U. S. Nuclear Regulatory Commission  
1450 Maria Lane, Suite 210  
Walnut Creek, California 94596-5368

- Reference: (A) Letter from W. F. Conway (APS) to J. B. Martin (NRC Region V) dated October 3, 1989; Subject: Simulator Training Limitations and Simulator Upgrade Schedule
- (B) Letter from B. H. Faulkenberry (NRC Region V) to W. F. Conway (APS) dated December 22, 1989; Subject: NRC Evaluation of Palo Verde Nuclear Generating Station Licensed Operator Requalification Program

Dear Mr. Martin:

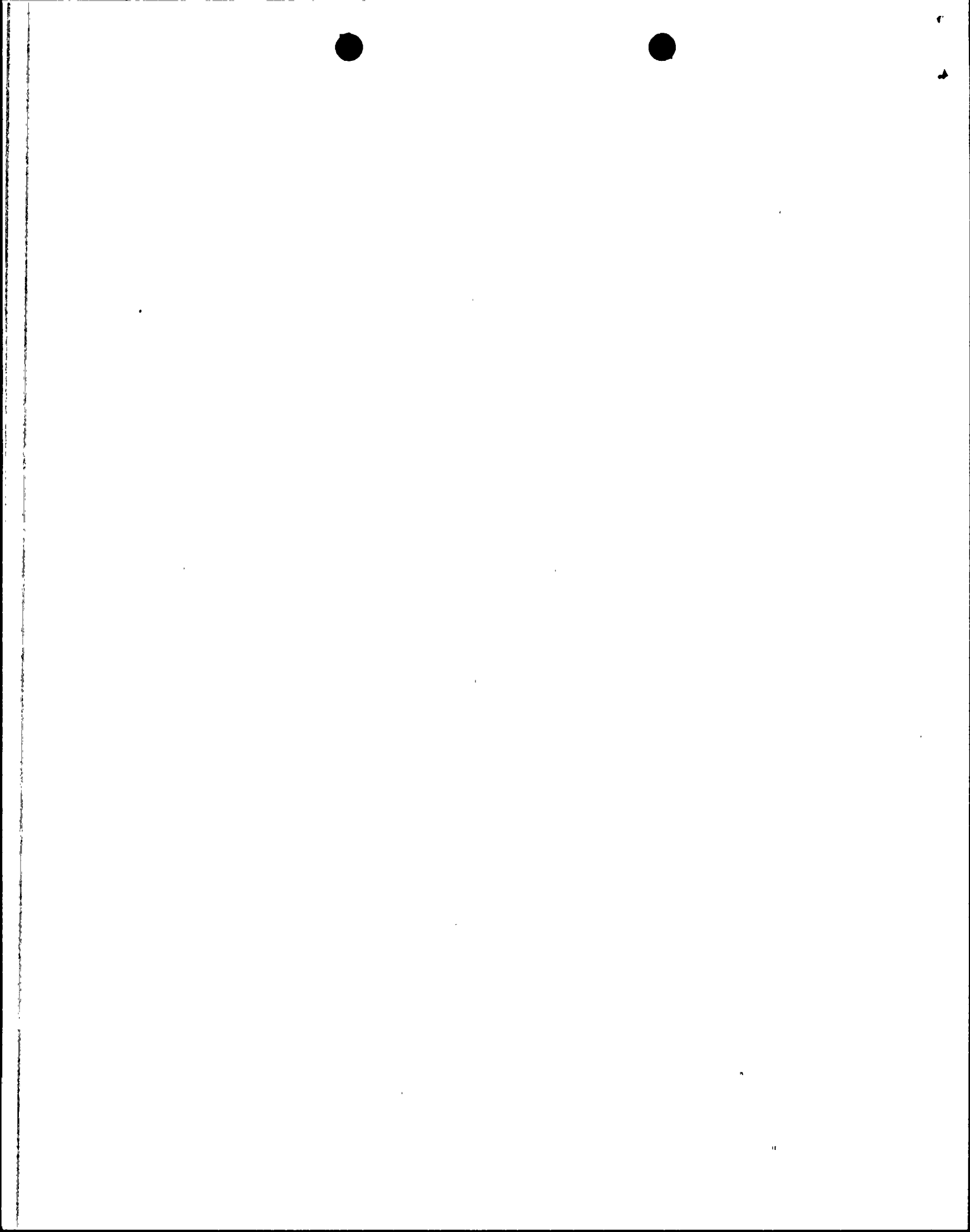
Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Units 1, 2, and 3  
Palo Verde Control Room Training Simulator Upgrade Project - Status Update  
File: 90-001-762; 90-089-220

This letter is being submitted to provide the NRC with a status of the PVNGS Control Room Simulator Upgrade Project. The most recent status was provided in Reference (A).

On September 28, 1989, Arizona Public Service (APS) awarded a Contract to Link-Miles Simulation Corporation (LMSC) to upgrade the Palo Verde Control Room Training Simulator. To accomplish this effort, APS formed the Simulator Upgrade Project Team (the Project). The Project is comprised of APS employees and subcontractors, who provide support and oversee performance of the Project, and employees of LMSC and its subcontractors who perform the upgrade portions of the Project. The Project is comprised of two phases; the Fidelity Phase that provides short-term incremental improvements to the production software used for on-going Operator training and the Certification Phase which includes Simulator software replacement, a new instructor station, and the addition of certain hardware panels. The software improvements developed during the Fidelity Phase will be incrementally integrated into the production software used for Operator Training until installation of the Certification Phase Simulator software is complete. Prior to resuming full-time Operator training after completion of the Project, the Fidelity software will be completely replaced by the Certification software.

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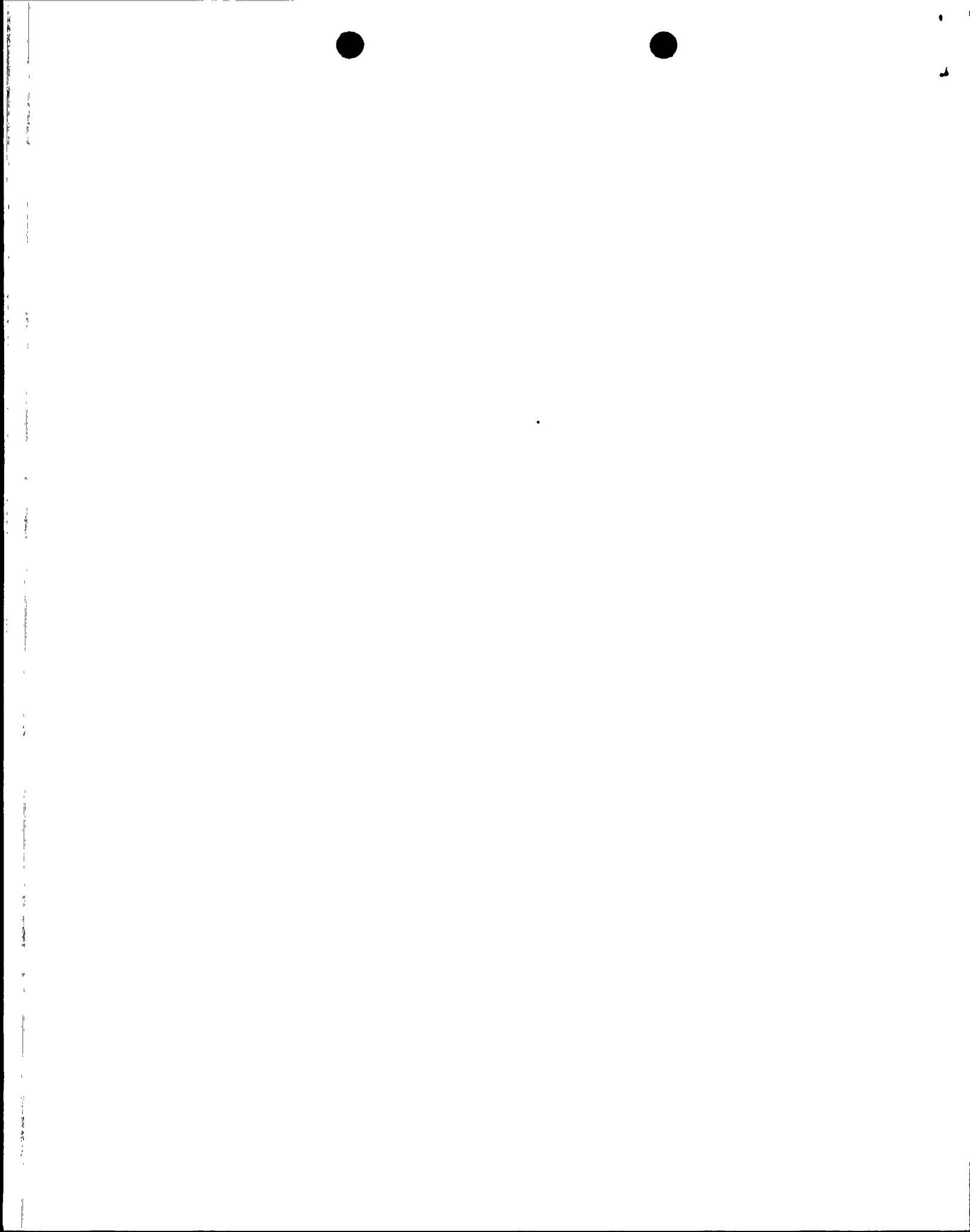
161-03243-WFC/GEC  
May 29, 1990

The Fidelity Phase, as initially defined in the contract with LMSC, was an aggressive approach which required the integration of a significant number of LMSC replacement models with dynamic and logic functions in the Palo Verde Simulator software. The Fidelity Phase includes, in Attachments 5 and 6 of Reference (A), three major Project performance milestones (nos. 2, 3, and 5) on the original Project Schedule (see Attachment A, 09-28-89, Rev. A). These milestones were scheduled to occur on January 26, March 30, and June 29, 1990, respectively. This approach and schedule were premised on effectively integrating the new LMSC software systems with the existing dynamics and logics that had been under development at APS, within the limited time constraints of the Project schedule. As we progressed with the Fidelity Phase, it became evident that we would not be able to accomplish this Phase as it was originally envisioned within the Project schedule.

The reasons for not being able to accomplish the Fidelity scope as it was originally planned are twofold. First, the APS development software which LMSC is using as the basis for the software fidelity improvements required far more modification than had been anticipated when the original Fidelity scope and schedule were established. Secondly, because of the limited amount of simulator time available for Project activities, LMSC did not have sufficient simulator time available to adjust its performance of the Fidelity scope to compensate for the additional work necessary to perform all of the originally planned software modifications within the schedule parameters of the Simulator Upgrade Project.

Rather than continue to pursue a course for the Fidelity Phase which would not improve the production software used for Operator training in a timely manner and which could potentially adversely impact performance of the Certification Phase, APS and LMSC have modified the methodology for performance of the Fidelity Phase. During the initial weeks of the Fidelity Phase, a methodology was developed for modifying the software load to be used in the next training cycle by specifically focusing on improvements to support the scenarios that were to be run during that cycle. This approach is facilitating the APS commitment to improve the simulator fidelity and ongoing operator training. One result of this approach is that the NRC examiner offered generally favorable comments about the progress made on the Simulator during the NRC examinations given the week of March 19, 1990.

The revised Fidelity Phase provides for increased levels of LMSC support for scenario development and involved the incorporation of specific software models which will benefit operator training. The Fidelity improvements and new models were integrated and completed by May 15, 1990. This improved software will be used for operator training for the succeeding cycles. The revision to the Fidelity Phase ensures that APS will continue to meet its commitments to provide improved simulator fidelity and a more focused and effective Operator Training program. In conjunction with this change, the March 30 and June 29 milestones have been redefined to include additional deliverable items to assure adequate Project controls. These milestones are now scheduled for May 15 (status - complete) and June 29 and are noted as milestones 3 and 5, respectively, in the



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May 22, 1990

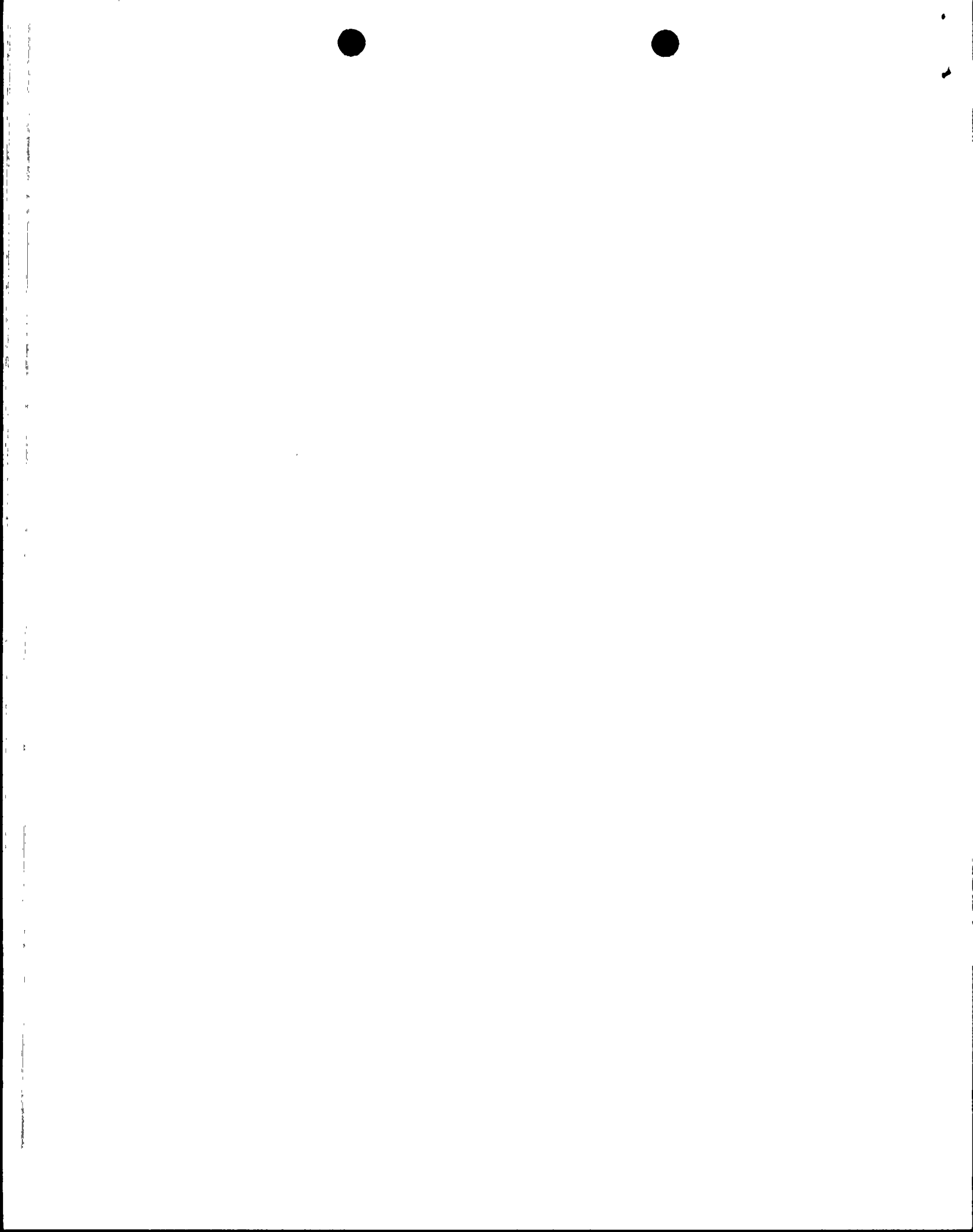
revised Project schedule (see Attachment B, 03-15-90, Rev. B). The additional deliverables received by May 15 were "Revision 1" of the simulated system preliminary design review documents. The additional deliverables due on June 29 are the interim design specifications for the simulated systems.

Simulator users, licensed operators, and management are kept informed of progress in Project activities by periodic advisory notices. Attached for information and review are copies of the three APS Simulator Upgrade Project Operations Advisories which specify improvements made to the production software being used for Operator training. Since the issuance of these Training Advisories, Operator training has shifted to use of the initial release of the production software that was upgraded by LMSC. APS will continue to improve fidelity of the simulator and issue these advisories as the production software continues to improve.

In addition, the malfunctions and anomalous events listed in Enclosure 4 (titled "SIMULATION FACILITY FIDELITY REPORT") to Reference (B) have been addressed and are ready for Training Department use. These include:

- Failure of the steam bypass control system (SBCS) to actuate following a power cutback and take automatic control when required.
- Heater drain pumps do not trip as required on loss of suction.
- The Main Steam Isolation Valves (MSIVs) closure modeling not consistent with units. MSIVs close faster in the simulator.
- Steam Generator Pre Trip - Trip for Low Low Level did not clear after level regained.
- Condenser vacuum spiked low during a loss of suction.
- Pressurizer pressure/level response was not correctly modeled for extended accident condition simulation.
- Steam Generator pressure response; the steam generator repressurizes after it has been blown down to the containment.

The video trend recorder failure which required resetting by the simulator operator appears to be a hardware related spurious failure. The root cause of this failure remains under investigation. In the interim, a software program has been developed to counteract the failure when it occurs.



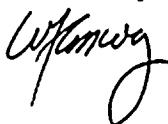


Mr. J. B. Martin  
Regional Administrator, Region V  
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May 22, 1990

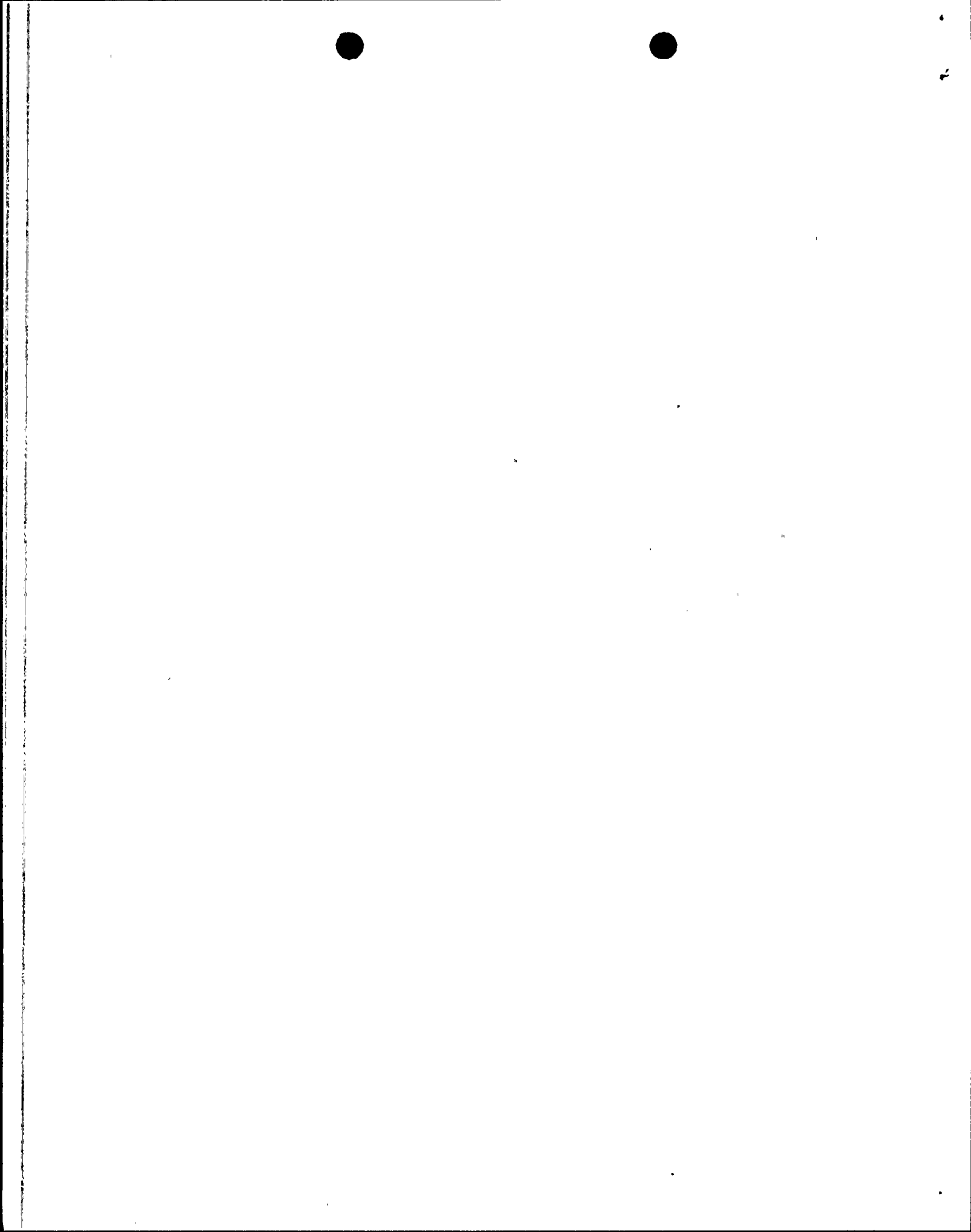
In closing, APS reaffirms our commitment to the successful performance of the Simulator Upgrade Project which will fulfill the goals of improved Operator Training and Simulator performance, and attaining certification of the Palo Verde Simulator by March 26, 1991.

Sincerely,

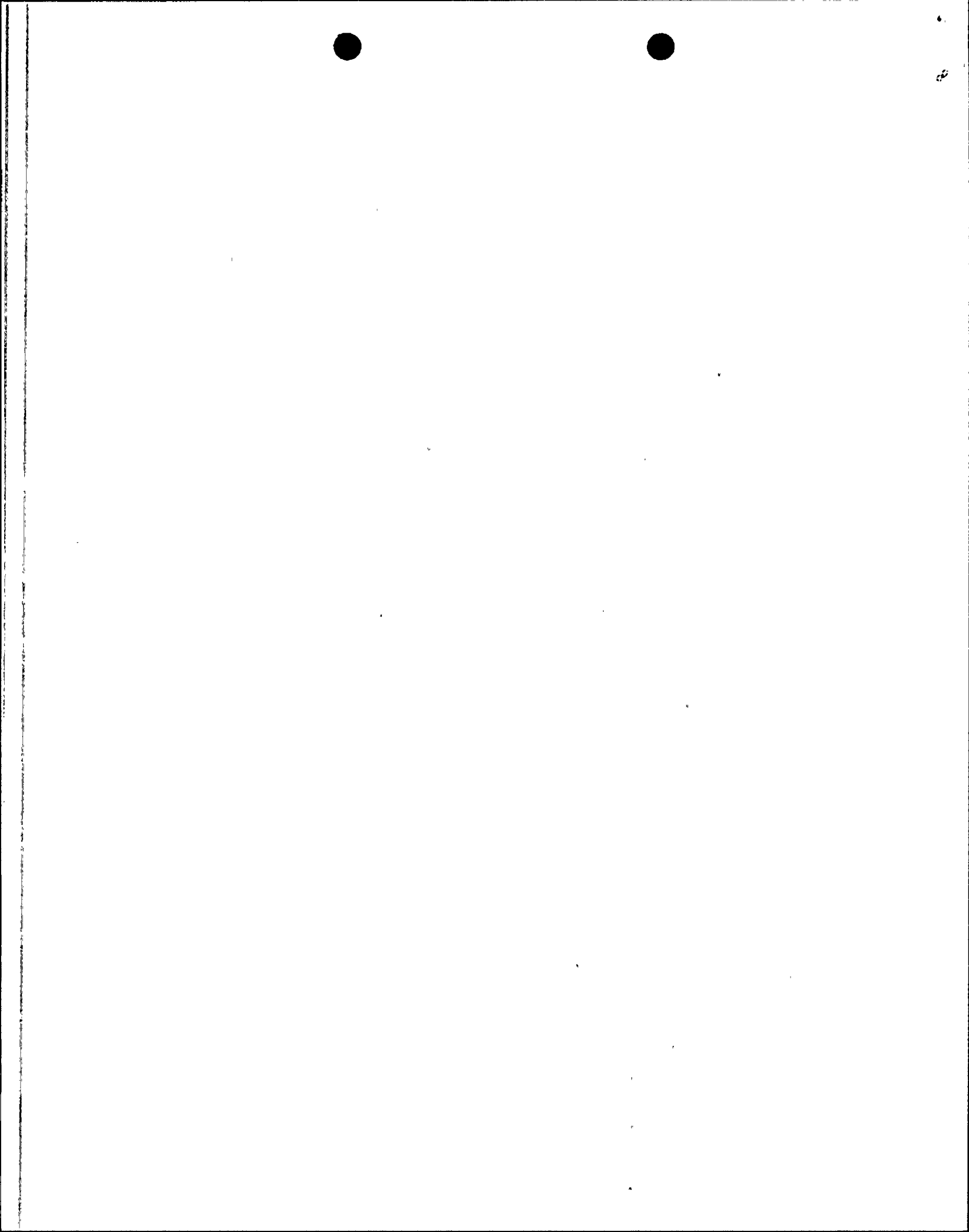


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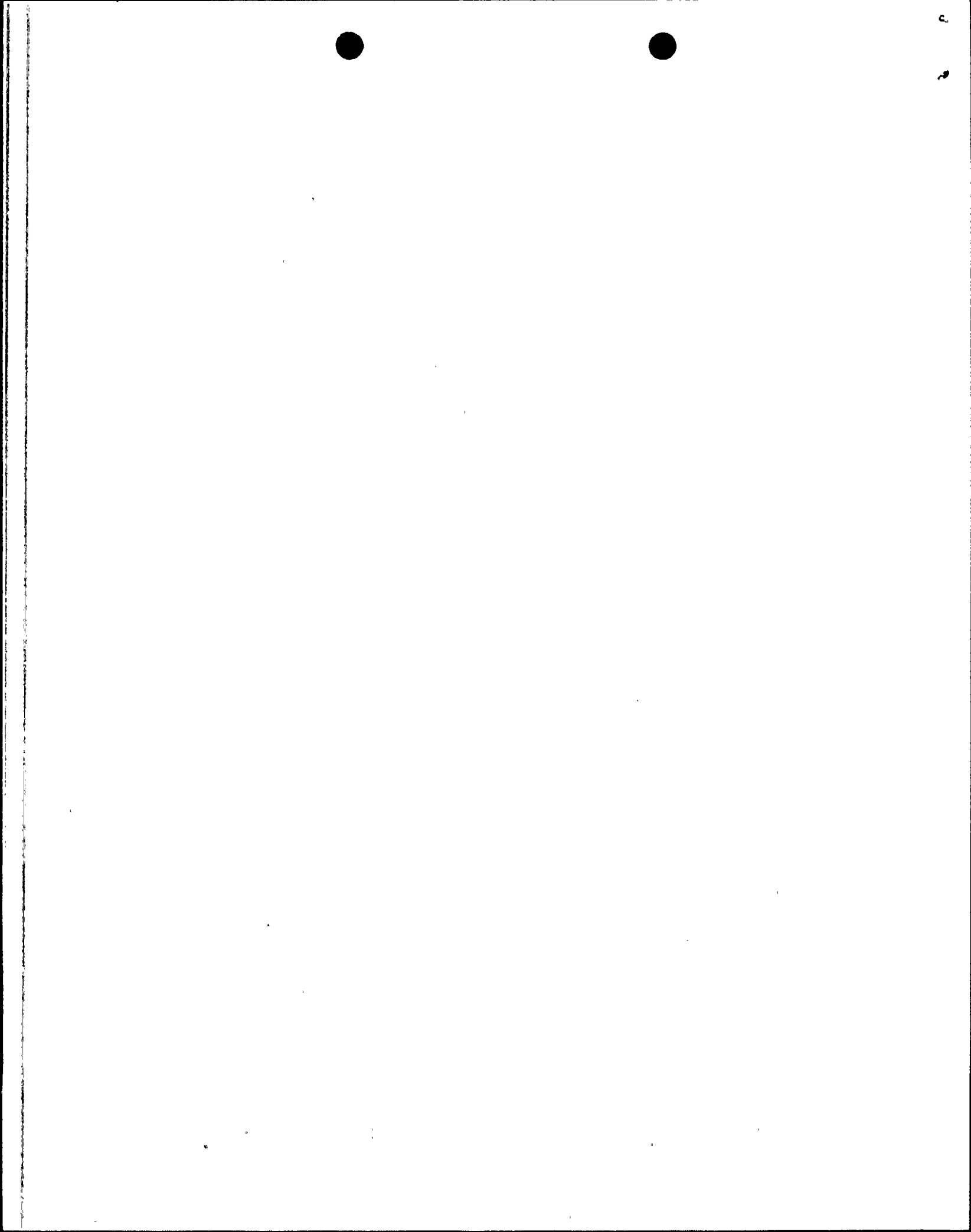
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## \* \* \* PVNGS SIMULATOR UPGRADE PROJECT \* \* \*

## OPERATIONS ADVISORY

No. 1

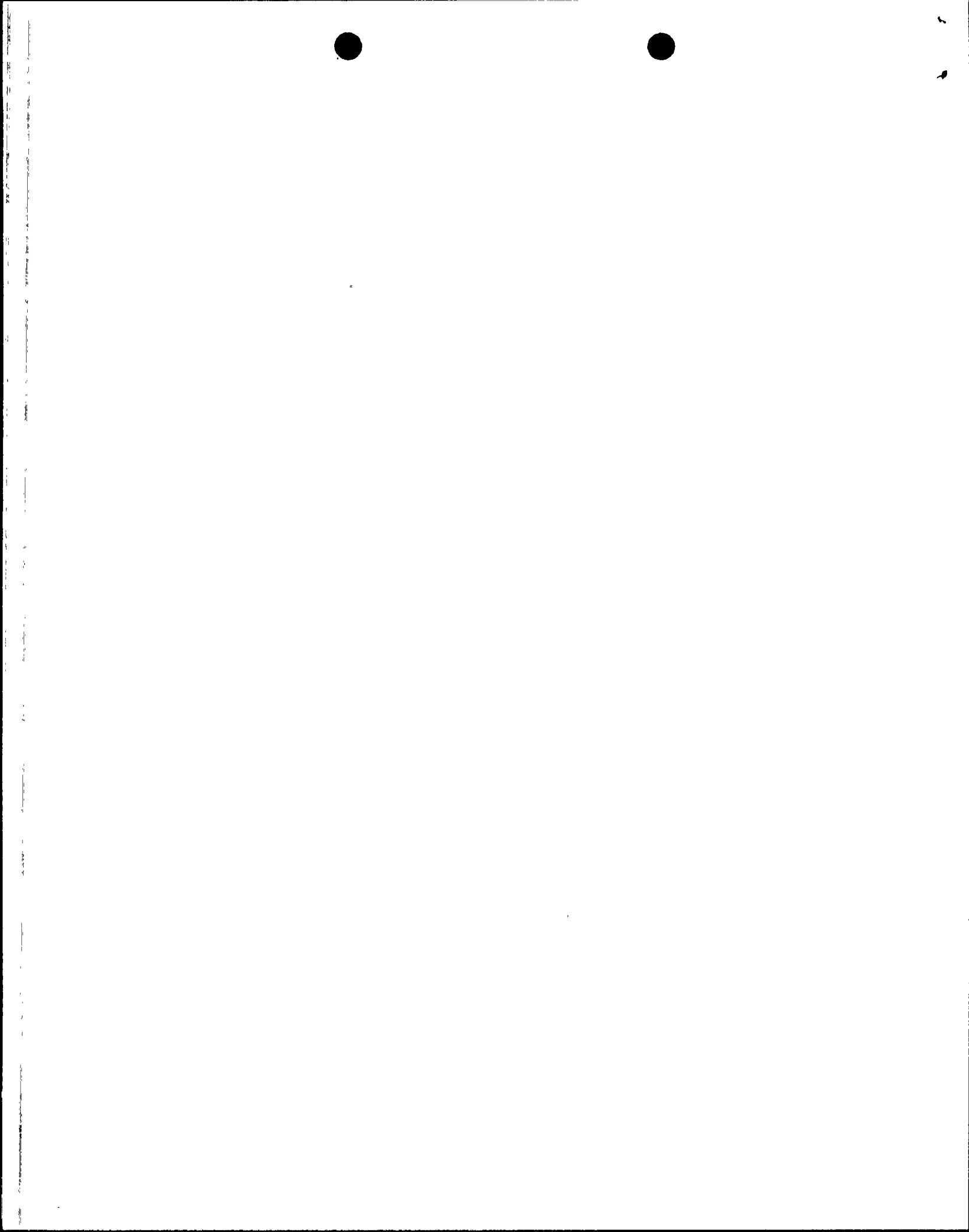
November 13, 1989

Page 1

This is the first "PVNGS Simulator Upgrade Project Operations Advisory" bulletin. These notices will be distributed periodically to keep all licensed personnel informed of changes that are taking place on the Simulator. If you have any questions, suggestions, or comments on these bulletins, please contact Dave Brown, Project Manager at Ext. 1880 or send them to Station 6191.

The following changes to the simulator have been made and will be in place for the next regual cycle:

1. Condenser vacuum now will respond to starting/stopping cooling tower fans.
2. Condenser pressure indicators on B07 now indicate absolute pressure.
3. The following indicators have been adjusted to indicate normal values for these parameters:
  - a. Battery charger voltage and current
  - b. NC pump motor amps
  - c. Main turbine lube oil pressure
  - d. "A" aux. feedwater pump discharge
  - e. DG MVAR's and excitation amps
  - f. NC temperature
  - g. CW pump motor amps
  - h. CD pump motor amps
  - i. TC temperature
  - j. MSR steam flows and pressures
  - k. FW control valve positions at 100% power
4. Remote control feature added which allows for RUN/FREEZE, MALFUNCTION START/STOP and 3 minute BACKTRACK.
5. VCT auto makeup stop setpoint changed to 44% from 38%
6. Instructor's station now has description menu for Snapshots and IC's.
7. CEDMCS high rate auto withdrawal feature is disabled.
8. Turbine load limit potentiometer adjusted to be more sensitive.
9. Fuel building essential AFU suction dampers are aligned to aux. bldg. following SIAS (no SEAS alarm).





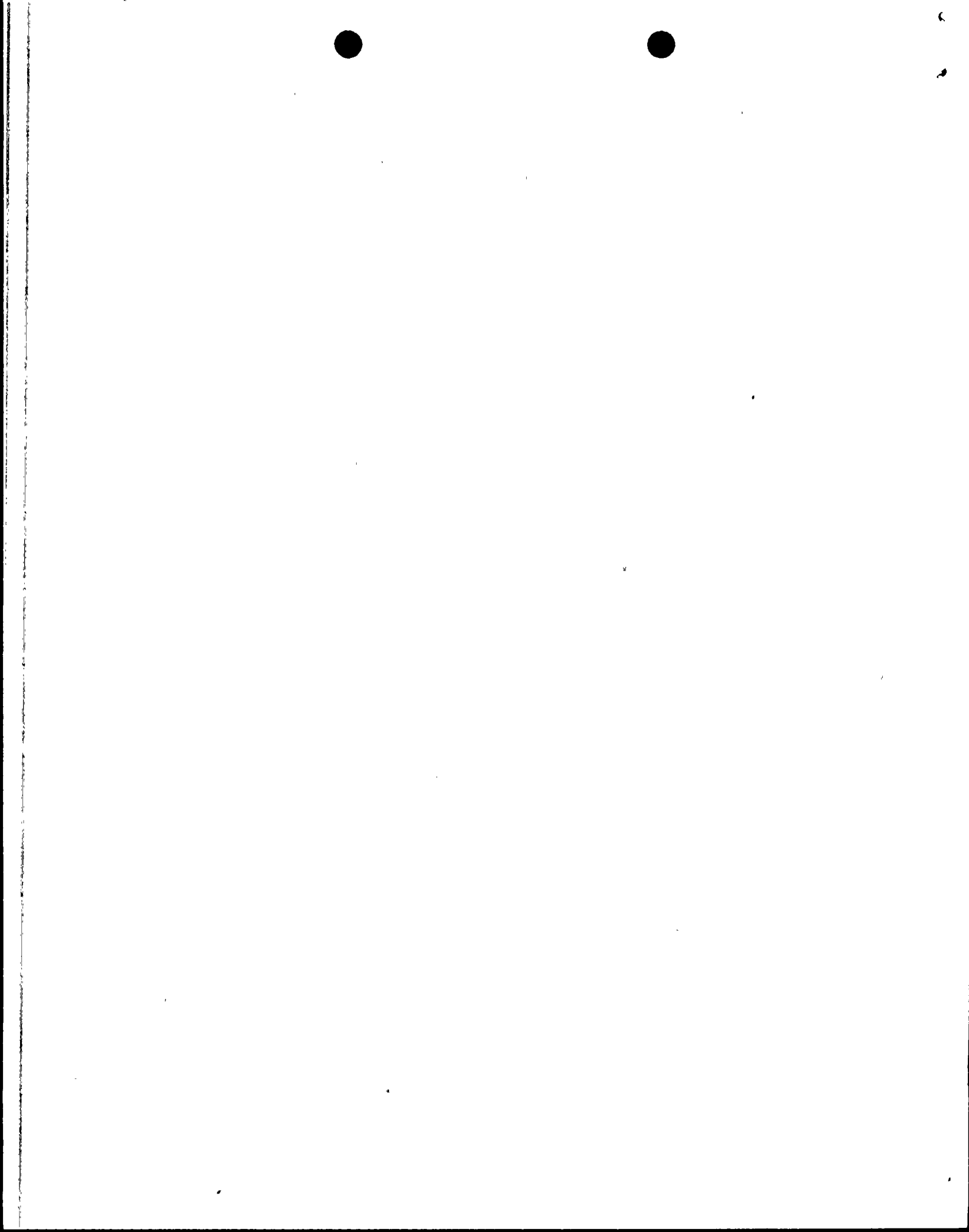
OPERATIONS ADVISORY

No. 1

November 13, 1989

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10. Plant page speaker is disconnected in simulator.
11. Feedpump miniflow valves respond properly after pump is reset.
12. Pressurizer backup heater +3% level deviation interlock now functions.
13. Electrical supply to "B" and "C" normal chillers have been altered to the proper bus.
14. Pressurizer level deviation alarm setpoints corrected.
15. Containment building ACU's auto-start and override features have been altered to work properly.
16. HJ "A" essential isolation dampers and "A" and "B" ESF equipment room essential AHU fans now function properly following SIAS.
17. FW and CD system dynamic models have been replaced and tuned.
18. Feedwater pump turbine minimum speed setpoint corrected.



## \* \* \* PVNGS SIMULATOR UPGRADE PROJECT \* \* \*

## OPERATIONS ADVISORY

No. 2

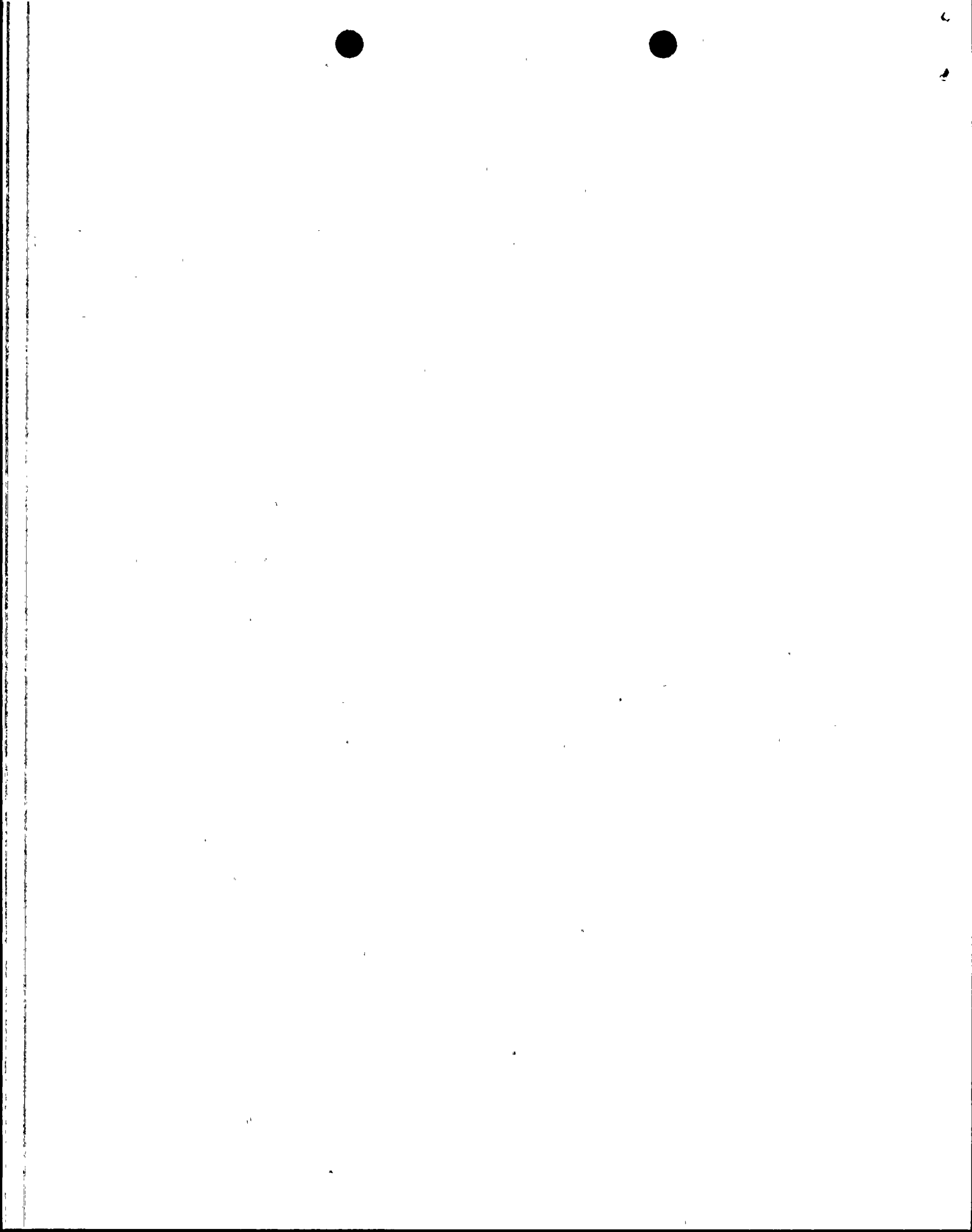
February 15, 1990

Page 1

This is the second "PVNGS Simulator Upgrade Project Operations Advisory" bulletin. These notices will be distributed periodically to keep all licensed personnel informed of changes that are taking place on the Simulator. If you have any questions, suggestions, or comments on these bulletins, please contact Dave Brown, Project Manager at Ext. 1880 or send them to Station 6191.

The following changes have been made to the (15A, 90-01) training load:

1. Corrected logic for Hydrogen analyzers to provide proper controls and indications from B02.
2. Adjusted RWT pressure indication to a realistic nominal value.
3. Rescaled RWT level indicators on B02 to correlate properly with RWT level indications on B03.
4. Corrected logic on EC chillers to cause trip on low EW flow.
5. Adjusted HPSI pumps to provide proper flow indication during hot leg - cold leg injection.
6. Adjusted RCP motor horsepower calculations to more accurately model pump starting torque requirements.
7. Adjusted seal bleed-off flows to indicate realistic values.
8. Corrected the setpoint for the Upper Group Stop for power shaping and shutdown CEA groups. (set to 145")
9. Corrected the simulator PMS database for following alarm points:
  - a. EW pump discharge pressure low
  - b. CEAC deviation alarms
  - c. EW surge tank level and pressure HI-LO
10. Provided capability for the Instructor to adjust indication on RVLMS recorder on B02 from the Instructor's Station.
11. FWPT controller Bias control readjusted to be more sensitive.
12. Corrected HPSI pump LOW FLOW alarm setpoint.
13. Adjusted LPSI pump suction pressure calculation to provide proper discharge pressure indication.



\* \* \* PVNGS SIMULATOR UPGRADE PROJECT \* \* \*

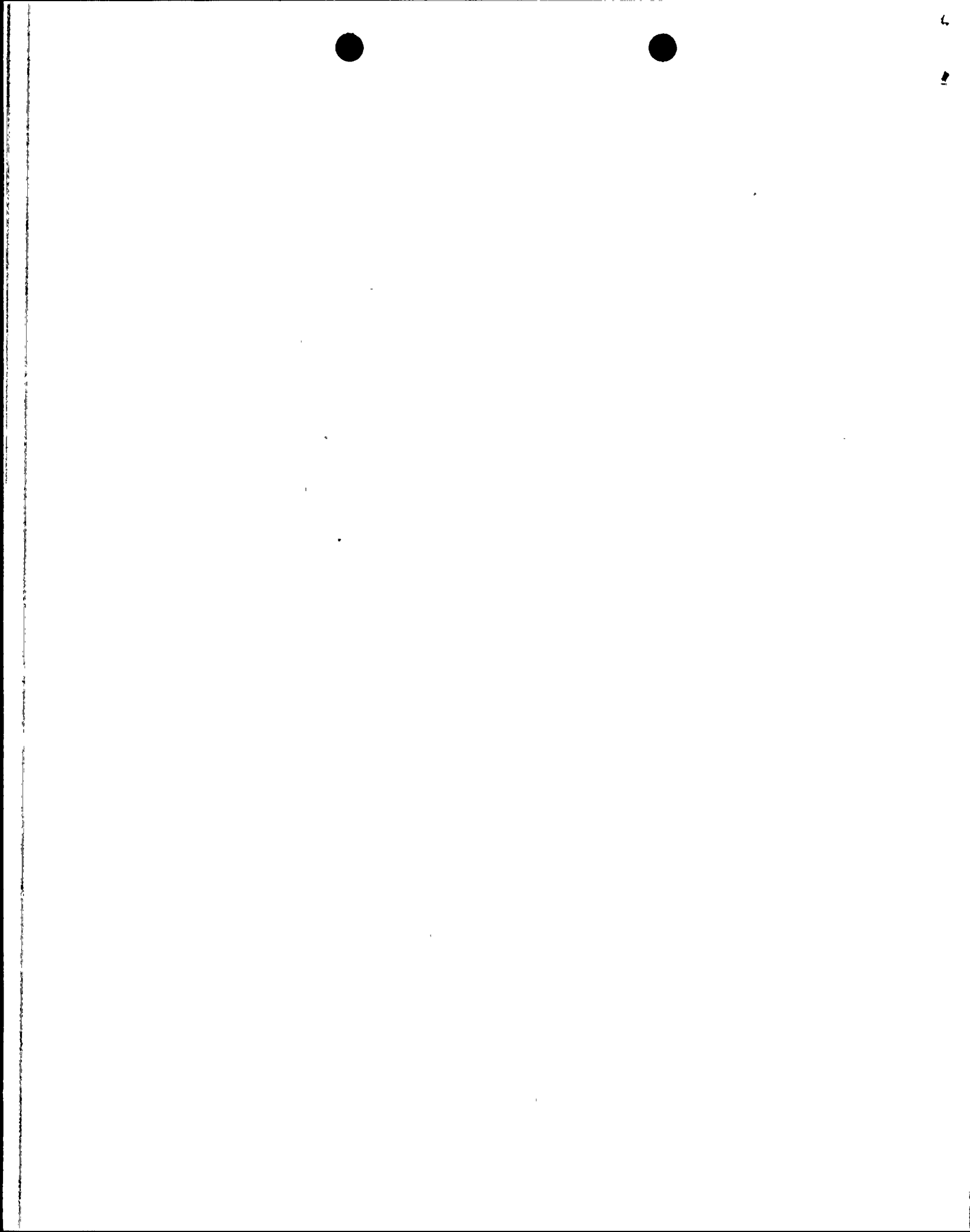
OPERATIONS ADVISORY

No. 2

February 15, 1990

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14. Changed logic on valve SG-HV-46 from a jog valve to an open-close valve.
15. Modified the pressurizer model to give 0% level indication when actual RCS level is below the pressurizer.
16. Corrected RCS model so that heat input from the RCP's is stopped when the RCP's are secured.
17. Modified dropped rod malfunction to give expected alarms and indications.
18. Modified energy balance in the pressurizer to stop mass production in the RCS model. This should provide more accurate balance of charging, letdown and seal bleed-off flows.
19. Changed the stroke time for downcomer control valve bypass valves from 10 to 20 sec.
20. Corrected the RDT LO-LEVEL alarm setpoint from 58% to 52%.
21. Corrected the logic for the interlock between the main turbine turning gear and PL910, PL915, and PL918.



## \* \* \* PVNGS SIMULATOR UPGRADE PROJECT \* \* \*

## OPERATIONS ADVISORY

No. 3

March 29, 1990

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Over the past several months, the Link-Miles Simulator Corporation and APS licensed personnel have been working to tune and debug the Revision 17A simulator software. Their goal has been to improve existing simulator software as much as possible while new Simulator software is under development for the March 1991 certification.

Beginning 3-3-90, License Training has started work developing simulator scenarios on the 17A software. This move to 17A represents a major step in the ongoing process to upgrade simulator performance.

With the cycle starting April 2, 1990 all Operator requal training will be conducted on 17A. Overall, the 17A software performs better than the 15A software during major transients and power maneuvers and has improved modeling of plant logic. The following are some of the 17A features that you may notice during future simulator training.

- a. Enhanced dynamic response to plant transients
- b. Improved thermal coupling between RCS and S/G models
- c. Improved RCP seal package models
- d. Improved containment model response to Steam Line and RCS leaks.
- e. Improved Instructor's Station features
- f. Improved Feedwater and Condensate system models.
- g. More detailed modeling of plant control and instrumentation logic.
- h. Delayed effects of Boration/Dilution

Tuning and debugging of 17A will continue as problems are identified during development and use of simulator training scenarios. As always, all personnel are encouraged to document any observed problems with simulator response on the Work Requests available in the simulator. This will assist the Simulator Support Group in improving the simulator fidelity wherever possible.

