FENOC

FirstEnergy Nuclear Operating Company

Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, Ohio 43449-9760

Howard W. Bergendahl
Vice President - Nuclear

419-321-8588
Fax: 419-321-8337

License Number NPF-3

Docket Number 50-346

Serial Number 2759

February 27, 2002

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555-0001

Subject: Supplemental Information Regarding License Amendment Application to Increase Allowable Power
(License Amendment Request No. 00-0006; TAC No. MB3280)

Ladies and Gentlemen:

On October 12, 2001, the FirstEnergy Nuclear Operating Company (FENOC) submitted an application for an amendment to the Davis-Besse Nuclear Power Station (DBNPS), Unit Number 1, Operating License Number NPF-3, Appendix A Technical Specifications, regarding a proposed increase in allowable power. The proposed amendment (DBNPS Serial Number 2692) would make the necessary TS changes to allow an increase in the authorized rated thermal power from 2772 MWt to 2817 MWt (approximately 1.63%), based on the use of Caldon Inc. Leading Edge Flow Meter (LEFM) CheckPlus™ System instrumentation to improve the accuracy of the feedwater mass flow input to the plant power calorimetric measurement.

On January 14, 23, and 28, and February 5, 2002, FENOC received informal requests for additional information (RAI) regarding the license amendment application. Enclosure 1 provides the response to these requests. This supplemental information does not affect the conclusion of the license amendment application that the proposed changes do not involve a significant hazards consideration and do not have an adverse effect on nuclear safety.

In order to support the planned operation of the DBNPS at the proposed increased power level following startup from the upcoming Thirteenth Refueling Outage (13RFO), FENOC requests that the NRC staff complete its review and approval of the license amendment application as expeditiously as possible.

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Should you have any questions or require additional information, please contact Mr. David H. Lockwood, Manager - Regulatory Affairs, at (419) 321-8450.

Very truly yours,

MKL

Enclosures

cc: J. E. Dyer, Regional Administrator, NRC Region III
S. P. Sands, NRC/NRR Project Manager
D. J. Shipley, Executive Director, Ohio Emergency Management Agency, State of Ohio (NRC Liaison)
C. S. Thomas, NRC Region III, DB-1 Senior Resident Inspector
Utility Radiological Safety Board

Docket Number 50-346
License Number NPF-3
Serial Number 2759
Enclosure 1

SUPPLEMENTAL INFORMATION

IN SUPPORT OF THE

APPLICATION FOR AMENDMENT

TO

FACILITY OPERATING LICENSE NPF-3

DAVIS-BESSE NUCLEAR POWER STATION

UNIT NUMBER 1

Attached is supplemental information for Davis-Besse Nuclear Power Station (DBNPS), Unit Number 1 Facility Operating License Number NPF-3, License Amendment Request Number 00-0006 (DBNPS Serial Number 2692, dated October 12, 2001).

This information, submitted under cover letter Serial Number 2759, includes a response to the January 14, 23, and 28, and February 5, 2002 informal NRC Requests for Additional Information.

I, Howard W. Bergendahl, state that (1) I am Vice President - Nuclear of the FirstEnergy Nuclear Operating Company, (2) I am duly authorized to execute and file this certification on behalf of the Toledo Edison Company and The Cleveland Electric Illuminating Company, and (3) the statements set forth herein are true and correct to the best of my knowledge, information and belief.

By: HW Bergendahl
Howard W. Bergendahl, Vice President - Nuclear

Affirmed and subscribed before me this 27th day of February, 2002

Yvonne M. Hall
Notary Public, State of Ohio

YVONNE M. HALL
Notary
State of Ohio
My Commission Expires
July 25, 2004

RESPONSE TO REQUESTS FOR ADDITIONAL INFORMATION

REGARDING

LICENSE AMENDMENT REQUEST (LAR) 00-0006

FOR

DAVIS-BESSE NUCLEAR POWER STATION UNIT NUMBER 1

January 14, 2002 NRC Request for Additional Information

Question 1:

Overall

This submittal provides insufficient information concerning transient analyses evaluation. It does not provide clear conclusions, such as the impact of the power uprate parameters on acceptance criteria and their justification for acceptance.

Please provide additional information for the following questions.

DBNPS Response to Question 1:

The responses to each of the individual questions are provided below.

Question 2:

Section 3.4.1 NSSS Design Transients

Table 3-1 lists the NSSS performance parameters for current design conditions, current operation, once through steam generator (OTSG) 0 and 20 % tube plugging parameters.

a. Clarify the intent of OTSG 0 and 20 % tube plugging parameters in this power uprate since the current operation is limited to 8.4 % OTSG tube plugging.

b. Clarify which column of the Table 3-1 the parameters values are used to assess the impact of this power uprate. Confirm that the safety analyses values of these parameters are within Technical Specification limits.

c. Discuss how section 3.4.1 transients are bounded and provide their bases clearly.

d. Provide a copy of FRA-ANP Document No. 18-1149327, "RCS Functional Specifications (DB), Revision 1, May 27, 1993" or send those tables which are appropriate for this section.

<u>DBNPS Response to Question 2:</u>

a. The intent of evaluating the 0% and 20% tube plugging parameters was to ensure that plant operation at the uprated power was bounded. It was not intended to perform all the required analyses to support 20% tube plugging. However, where it was readily accommodated, 20% tube plugging conditions were conservatively evaluated in lieu of 8.4% tube plugging.

b. For the NSSS component evaluations, the most limiting parameters, either those corresponding to 0% plugging or those corresponding to 20% plugging, as appropriate, were evaluated. For example, 20% tube plugging produces the greatest hot leg temperature, whereas 0% tube plugging yields the greatest steam temperature.

   From a safety analysis perspective, the Table 3-1 values are nominal or best-estimate. The safety analyses model the appropriate average temperature, but the total power (core plus Reactor Coolant Pump heat addition) is increased to account for measurement uncertainty, and a lower Reactor Coolant System (RCS) flow is used to maximize the temperature difference across the core. With the boundary conditions set on the primary side, SG secondary conditions are adjusted to preserve the RCS average temperature. These changes, coupled with the other accident-specific conservatisms, ensure that a conservative analysis is performed, from which the Technical Specification limits are determined. All necessary Technical Specification changes as a result of the proposed power uprate were included in the license amendment application.

c. The thermal hydraulic inputs to the primary component structural analyses (including the steam generator) are defined by the RCS Functional Specification design transients. The design transients provide the system and component pressure, temperature, and flow conditions for the normal, upset, emergency, and faulted events.

   Since the uprate will have a negligible effect on the transient response, the effect of the uprate on the design transients is limited to a change in either the initial or final conditions of the transient. As discussed below, the uprated operating conditions will be bounded by the conditions defined by the design transients.

Primary System Design Transient Conditions

The RCS Functional Specification uses the full power T_{hot} and T_{cold} as either the initial or final points for most of the plant transients (i.e., reactor trip, load rejection, turbine trip, rapid depressurization, loss of flow, power change, and loss of main feedwater transients). Exceptions include plant heatups and cooldowns, which end or start at hot shutdown or 8% power conditions.

As shown in Table 3-1, the power uprate increases T_{hot} and decreases T_{cold} and does not have an appreciable effect on RCS flow. However, the predicted T_{hot} and T_{cold} values shown in Table 3-1 for both the 0% and 20% tube plugging cases are bounded by those in the existing RCS Functional Specification.

Steam Generator Design Transient Conditions

The RCS Functional Specification provides values of steam temperature, steam pressure, feedwater temperature, and steam/feedwater flow for the system transients. Each of these parameters and its impact on OTSG performance is discussed below.

The RCS Functional Specification uses a design operational steam temperature of 570 °F. However, the RCS Functional Specification also recognizes that the actual steam generator performance may result in greater temperatures, and uses a maximum steam temperature of approximately 600 °F.

Typical operating steam pressures versus steam flow are also identified in the RCS Functional Specification. These range from 885 psia at no-load to 925 psia at 100% load. Feedwater temperature is also shown as a function of steam flow and ranges between 90 °F and approximately 460 °F over the power range.

Steam/feedwater flow rates of approximately 6.0 Mlbm/hr per steam generator are defined in the RCS Functional Specification for the full load design condition. This flow rate corresponds to the 570 °F design operational steam temperature. Note that these values were used in the fatigue evaluation of the primary components and were not used as inputs to flow induced vibration (FIV) analyses. The FIV analyses used bounding steam and feedwater flow rates and densities.

The power uprate results in an increase in feedwater flow and a small decrease in steam temperature (see Table 3-1). Additional tube plugging results in a further decrease in steam temperature and an increase in feedwater flow. The power uprate feedwater flow at 20% tube plugging is slightly less than the approximately 6 Mlbm/hr design flow shown in the RCS Functional Specification.

While steam temperature decreases with additional tube plugging, the calculated steam temperature at the uprated power and 20% tube plugging is 584.3 °F, which is between the 570 °F and 600 °F values in the RCS Functional Specification.

The desired turbine throttle pressure and the pressure losses in the steam line between the steam generator and throttle valve govern steam generator steam pressure. The power uprate and tube plugging do not directly cause a change in steam pressure. Rather, secondary plant performance optimization can cause changes to the turbine throttle pressure.

Feedwater temperature will be maintained at its current value and thus will remain within the bounds of the existing fatigue analysis.

<u>Injection System Design Transients</u>

Design transients also include injection into the RCS/OTSG due to High Pressure Injection (HPI), Auxiliary Feedwater (AFW), pressurizer spray, core flood tank discharge, and normal makeup. The uprate RCS and OTSG temperatures, which are the boundary conditions for these injection transients, are bounded by the temperatures defined in the RCS Functional Specification.

d. Framatome-ANP Document No. 18-1149327-01, "RCS Functional Specifications (DB), May 27, 1993," is considered highly proprietary to Framatome-ANP and is not available for placement on the docket. However, arrangements can be made for the NRC to view this document at the Framatome offices in Lynchburg or Roslyn, Virginia.

<u>Question 3:</u>

Section 3.10.1 LOCA Related Analyses

a. Please confirm that the generically approved LOCA analyses methodologies currently used for Davis-Besse LOCA analyses continue to apply specifically to this plant by providing a statement that LOCA analyses and its vendor have ongoing processes which assure that LOCA analysis input values for peak cladding temperature-sensitive parameters bound the as-operated plant values for those parameters.

b. What are the calculated LBLOCA and SBLOCA results, per 10 CFR 50.46(b), for Davis-Besse at the uprated power?

c. Discuss the design of the Davis-Besse ECCS switchover from the injection mode to the ECCS sump recirculation mode. What was the decay heat source assumed in the design of the ECCS switchover from the injection mode to the ECCS sump recirculation mode for the present power? Does this assumed heat source change for the uprated power? Is the timing of the switchover affected? Please explain.

d. Boric Acid Accumulation

10 CFR 50.46(b)(5) establishes long-term cooling requirements following a LOCA. One aspect of long-term cooling following a LOCA accident is to ensure boric acid accumulation will not prevent core cooling by applying an acceptable evaluation model (EM) to analysis of boric acid accumulation and to determination of the time available for switchover to hot leg injection. If you have not reanalyzed these topics in support of your power uprate request and you have documented application of a staff-approved EM to these topics, then please provide references to this documentation. If you have reanalyzed these topics in support of your power uprate request or you not have a staff-approved EM, then please provide a complete description of your methodology.

DBNPS Response to Question 3:

a. Framatome-ANP performs Loss-of-Coolant Accident (LOCA) analyses for each new fuel design that is supplied for fuel reloads at the DBNPS. Prior to completing those analyses an Analytical Input Summary (AIS) is prepared to identify the key input parameters that are used in the analysis and the rationale for the values used in the analyses. Peak clad temperature (PCT) sensitive plant parameters such as Core Flood Tank (CFT) initial parameters, pumped Emergency Core Cooling System (ECCS) injection flows, core power level, Reactor Protection System (RPS) trip setpoints, equipment time delays, and containment cooling parameters are included in the AIS. The DBNPS monitors and informs Framatome-ANP of any plant changes for these parameters. Framatome-ANP uses these inputs to calculate the Large Break LOCA (LBLOCA) and Small Break LOCA (SBLOCA) analyses in accordance with the NRC-approved BWNT LOCA Evaluation Model (BAW-10192P-A). Framatome-ANP considers the variations in radial and axial core power peaks, and the initial fuel pin stored energy, and determines the allowed linear heat rate (LHR) limit as a function of core elevation and time in life to ensure that the PCTs are not underpredicted. For SBLOCAs, the spectrum of break sizes and locations are performed using the limiting pumped ECCS injection capacities and CFT parameters given in the AIS. The limiting results from the LBLOCA and SBLOCA analyses are reported to the DBNPS. The summary report also refers to the AIS and gives a list of the key input parameters used in the analyses. The maximum LHR limits are used in the core power distribution analyses to define the acceptable ranges of operation for the plant.

The combination of the LOCA AIS and LOCA summary reports provide a common understanding of the inputs and results that serve as a basis for any required input or reanalysis effort that may be needed as a result of a key parameter change. The DBNPS contacts Framatome-ANP to discuss any plant changes that may necessitate new LOCA analyzes.

The process may best be illustrated through the use of an example. In late 2000, the DBNPS Makeup (MU)/HPI system engineer identified that the sequential HPI flow tests were indicating slight loss of flow margin to the requirements in each subsequent test. The DBNPS requested Framatome-ANP to perform the necessary SBLOCA analyses to justify a 1.5 % decrease in the HPI head flow used in the SBLOCA analyses. The necessary analyses were completed to support a revision to the HPI test acceptance criteria. The new PCTs were summarized in a letter to FirstEnergy and also in a letter to the NRC.

b. The existing LBLOCA and SBLOCA analyses for the DBNPS were analyzed at an error-adjusted core power level of 3025.32 MWt, which significantly bounds the requested Appendix K-related power uprate. Because the LOCA analyses were performed in anticipation of a larger power uprate, no new analyses were needed to support the Appendix K uprate. The LBLOCA PCT was calculated for the Mark-B10K assembly to be 2104 °F at beginning of life, 9.536-ft, at a LHR of 15.5 kW/ft, and including a 2 °F penalty for the Batch 15E M5™ structural assembly. The SBLOCA PCT is 1440 °F, which is for the HPI line break with the 1.5 percent reduction in the HPI head flow curve and includes a 12 °F penalty for the Batch 15E M5™ structural assembly.

c. At the DBNPS, manual operator action is required to make the ECCS switchover from injection from the Borated Water Storage Tank (BWST) to recirculation from the containment emergency sump. This action is triggered when the BWST level reaches a setpoint during the transient. The level setpoint is chosen to allow the operators adequate time to complete the transfer while maintaining adequate NPSH for the ECCS pumps.

The break size of the largest LOCA is sufficient to depressurize the RCS to containment pressure within roughly 20 seconds. The makeup control valves go wide open and the HPI and Low Pressure Injection (LPI) pumps actuate from the low RCS pressure setpoint. The containment pressure increases from the RCS blowdown, causing the spray actuation setpoint to be reached, thereby actuating the containment spray system (CSS) pumps. The BWST draining rate from the makeup, HPI, LPI, and the CSS pumps is maximized by the low RCS pressure. The requested power uprate will incrementally increase the residual core decay heat observed at the time of sump switchover for the limiting LBLOCA. This power level change will not alter the minimum time in the transient that sump switchover occurs, nor will it shorten the time required to complete the transfer. This time is controlled by the BWST inventory and pumped injection flow rates. The minimum time that sump switchover will occur is between 25 and 50 minutes from the initiation of the transient for the LBLOCA, and is dependent upon the ECCS equipment available and the initial BWST liquid inventory.

As the break size decreases, the RCS pressure becomes less responsive to the break energy discharge and more responsive to the residual core decay heat. The ECCS flow from the BWST is reduced because of the higher RCS pressure. The activation of CSS and LPI pumps is delayed and the timing of ECCS switchover becomes more extended. The reduced pumped ECCS flow rates for the smaller LOCA provides additional time for the sump transfer actions. The slightly higher core power may also delay the transfer time by a small amount by keeping RCS pressure marginally higher and reducing the ECCS flow rates. More time is available for the operators to complete the transfer from injection mode to recirculation from the containment emergency sump. Therefore, the small increase in core decay heat will not adversely affect the switchover time or decay heat system requirements at that time.

d. The DBNPS provided details regarding its boric acid precipitation control (BPC) methodology in a request for an exemption from 10 CFR 50 Appendix K (DBNPS Serial No. 2633 dated March 15, 2000). This exemption was in support of a BPC modification that was implemented in the spring of 2000 during the Twelfth Refueling Outage (12RFO). Calculations in support of the BPC modification were performed by Framatome-ANP and were based on an initial power level of 102% of 2772 MWt. The exemption was granted by the NRC (TAC No. MA7831) on May 5, 2000 (DBNPS Log No. 5659). Since the power level used in the BPC analysis envelopes the requested power uprate, no additional calculations were required.

Question 4:

Section 3.10.3 Transient Analyses

In the submittal, it is stated that cycle 14 (the next cycle) is loaded with two different fuels: Mark-B10 and Mark-B10K. This makes the cycle 14 a mixed core. Please provide qualitative and quantitative technical justification demonstrating that the Fuel Centerline Temperature and DNBR limits (as per section 4.2 and 4.4 of the Standard Review Plan, respectively) are still met at the increased power uprate. In addition, since these transients result in changes to the reactor coolant system and faster reactivity insertion rates, please provide the results of the re-analyses, including primary and secondary system pressures, and the magnitude of increased reactivity rates (if any), for the following sub-sections of the submittal:

a. 3.10.3.1 Uncontrolled Control Rod Assembly Group Withdrawal from a Subcritical Condition (Startup Accident).

b. 3.10.3.2 Uncontrolled Control Rod Assembly Group Withdrawal at Power Accident.

c. 3.10.3.3 Control Rod Assembly Misalignment.

d. 3.10.3.16 Control Rod Assembly (CRA) Ejection Accident.

DBNPS Response to Question 4:

The centerline fuel melt limit is determined for each fuel rod design contained in the core for a given cycle as part of the reload licensing analyses. In the case of the DBNPS Cycle 14 core, centerline fuel melt limit calculations will be determined for the UO_2 and the gadolinia fuel using the TACO3 (BAW-10162P-A) and GDTACO (BAW-10184P-A) codes. The respective centerline fuel melt limit behavior for the fuel designs is determined based on a rod power envelope. The impact of the power uprate will be reflected in changes to the absolute linear heat rate predicted for the fuel rods in each fuel design. In light of the relatively small power uprate condition for Cycle 14, the current rod power envelopes are expected to have adequate power margin to accommodate the anticipated rod power changes. If that is the case, the centerline fuel melt limits applicable for Cycle 13 will be applied to Cycle 14 for the same rod design. If the current rod power envelopes do not bound the anticipated rod power changes, then new centerline fuel melt limit assessments are performed.

With respect to the Departure from Nucleate Boiling (DNB) Ratio (DNBR), please refer to the response to Question 11.a below. In this response, a description of the mixed core DNB analysis method as well as the DBNPS-specific DNB transition core penalty for the fuel designs is provided. There is no mixed core penalty for DBNPS Cycle 14.

There are four designs included in the Cycle 14 core: Mark-B8A (a single Mark-B8A fuel assembly, similar to the Mark-B10 design, will be located in the center core location), Mark-B10, Mark-B10K, and Mark-B12 designs. These fuel assemblies are hydraulically similar in the core heated region. There is, however, a slight hydraulic difference in the lower end fitting, due to the implementation of the fine mesh debris resistant lower end fitting in the Mark-B10K and Mark-B12 designs. The other differences between the designs is that the Mark-B10K and Mark-B12 assemblies contain the M5™ fuel cladding and a slightly larger diameter fuel pellet. The Mark-B10 and Mark-B10K fuel types are also included in the current fuel cycle, as described in the Cycle 13 Reload Report, BAW-2368. With full RCS flow, the analyses are not particularly sensitive to small physical differences between these fuel designs because the outside clad dimension is the same between the designs, as is the length of the assembly and the pin pitch. There are no changes to the primary coolant system with respect to the transient response for the accident in question. The key parameters for these analyses are not the initial conditions from which the transient is initiated, but the change imposed by the specific accident. Therefore, the critical parameters for these accidents are the moderator coefficient, the Doppler coefficient, and the reactivity addition rate. Although the reactivity parameters may change from cycle to cycle, the values used in each of the analyses are evaluated for the new fuel cycle to confirm that the analyses reported in the Updated Safety Analysis Report (USAR) remain bounding. The fuel assembly differences, like typical cycle-to-cycle variations, do not cause the cycle-specific reactivity parameters to exceed the limits of the USAR analyses. With respect to the fuel pellet design, the subject analyses contain sufficient conservatism, via the use of a point kinetics solution, to accommodate small differences to the fuel pellet design. As a result, no new analyses are necessary due to the implementation of the Mark-B10K and Mark-B12 fuel designs.

Question 5:

In sub-section 3.10.3.4, Moderator Dilution Accident, it is stated that "conservative reactivity parameters and dilution flow rates are modeled to ensure a bounding calculation." Please provide a list (or a table) of reactivity parameters and flow rates being referred to here, and all the bounding calculations that were performed to demonstrate the conservatism stated in this section.

DBNPS Response to Question 5:

The dilution flow rates used in the moderator dilution accident analyses described in USAR Section 15.2.4, Makeup and Purification System Malfunction, were 70 gpm, 100 gpm, and 500 gpm. The maximum reactivity insertion rate for a dilution accident is proportional to the initial coolant concentration divided by the inverse boron worth. The USAR analysis was based on an initial critical boron concentration of 1407 ppm and an inverse boron worth of 100 ppm/%Δk/k, which yields an insertion factor of 14.07 %Δk/k. Calculations performed for the power uprate (Cycle 14) indicate that there is a small increase in these parameters compared to the Cycle 13 core. The power uprate calculations showed that the initial critical boron concentration increases from 2207 to 2268 ppm, while the inverse boron worth increases from 171 to 174 ppm/%Δk/k. The insertion factor for the power uprate (Cycle 14) is slightly larger than the Cycle 13 value, 13.03 verses 12.91 %Δk/k, respectively. However, because the USAR analyses are more reactive than the cycle-specific conditions, the maximum reactivity change associated with a given dilution rate would also be higher than the cycle-specific calculation. Therefore, the USAR analyses remain bounding. This evaluation is performed for each new fuel cycle.

Question 6:

Since this is a mixed core, please describe the impact of the mixed core penalty and its affect on all the transients and accidents analyses results. Also, demonstrate that all the LOCA and non-transients accidents were analyzed with the most limiting fuel.

DBNPS Response to Question 6:

A discussion of the characteristics of the fuel designs to be implemented during the proposed power uprate is described in the response to Question 11.a. below. The response to

Question 11.a provides the supporting evidence to conclude that the fuel assemblies have compatible hydraulic characteristics.

Linear heat rate (LHR) limits are considered separately for each fuel assembly design to ensure that the requirements of 10 CFR 50.46 are met. Therefore, the limiting fuel type is determined by comparison of the LOCA analyses and evaluations performed for each assembly type. The current DBNPS LOCA analyses show that the fuel assembly design with the highest PCT is the Mark-B10K, with an analyzed PCT of 2102 °F. The DBNPS LOCA Evaluation Model (EM) analyses for the Mark-B10 (and earlier fuel assembly designs that are hydraulically similar), Mark-B10K and Mark-B12 fuel assemblies each model a full core of the desired fuel assembly to provide LHR limits specifically for that assembly. These three fuel assemblies are hydraulically similar in the core heated region. There is a slight hydraulic difference in the lower end fitting, due to the implementation of the fine mesh debris resistant lower end fitting in the Mark-B10K and Mark-B12 designs. Thus, in addition to the LOCA EM analyses, the effect of the Mark-B10K and Mark-B12 debris resistant lower end fittings was specifically evaluated in a mixed-core scenario with the Mark-B10 fuel. Analyses demonstrated that the lower end fitting did not result in sufficient flow differences to necessitate a LOCA mixed-core penalty for the current DBNPS fuel assembly designs. Finally, the four Batch 15E Mark-B10K structural assemblies are different than the other Batch 15 assemblies, in that they have the two uppermost intermediate spacer grids fabricated from M5™ material. These grids have a slightly higher resistance that tends to divert flow from the Batch 15E assemblies into the adjacent fuel assemblies. Thus, in addition to the LOCA EM analyses, the effect of the Mark-B10K and Mark-B12 debris resistant lower end fittings was specifically evaluated in a mixed-core scenario with the Mark-B10 fuel. Thus mixed-core analyses were performed that determined a 2 °F penalty for LBLOCA and a 12 °F penalty for SBLOCA for application to these Batch 15E assemblies. Therefore, the limiting PCT for DBNPS Cycle 14 is 2104 °F considering the Batch 15E M5™ structural assemblies. If further assembly design changes are implemented in future cycles, the potential for additional mixed-core penalties will be evaluated and any resulting penalties will be applied to the LOCA LHR limits or PCTs prior to use in the core power distribution analyses.

A specific mixed core penalty is not applied to the system response for the non-LOCA transients because the key system parameters, i.e., Doppler coefficient, moderator coefficient, and reactivity insertion rates are not affected by the power uprate. With respect to the fuel pellet design differences, the non-LOCA accident analyses utilize a point kinetics solution that is sufficiently conservative to address small deviations to the fuel pellet design. This "generic" system response is used in conjunction with the specific fuel design parameters to determine the limiting design-specific DNBR and Centerline Fuel Melt responses, thus ensuring that the non-LOCA accidents are analyzed with the most limiting fuel.

Question 7:

Section 3.10.3.4 Makeup and Purification System Malfunction (Moderator Dilution) Accident

In this analysis, it is stated that the trip setpoint will be determined by the "ultimate power level." Please clarify whether this approach would cause the trip setpoints to be set lower.

DBNPS Response to Question 7:

The nuclear overpower reactor trip setpoint used in the current accident analyses for the DBNPS is 112% of 2772 MWt, or 3104.64 MWt. Since no system response calculations were performed for the reactivity events with the power uprate, the maximum allowed overpower level must be preserved, i.e., 3104.64 MWt. Expressed in terms of the new rated thermal power, the revised overpower trip setpoint must be reduced proportionally to 3104.64/2817, or 110.2%. This ensures that the analyses presented in the USAR would bound the power uprate when implemented.

For the power uprate, the DBNPS Technical Specification high flux trip setpoint Allowable Value is also being reduced. The methodology for defining the Technical Specification setpoint is outlined in BAW-10179P-A, "Safety Criteria and Methodology for Acceptable Cycle Reload Analysis," with the exception that the heat balance error is being reduced from 2% to 0.37% because of the implementation of the Caldon LEFM CheckPlus™ instrumentation. The new Technical Specification trip setpoint Allowable Value is 104.9% RTP.

Question 8:

Section 3.10.3.5 Loss of Forced Reactor Coolant Flow (Partial, Complete, and Single Reactor Coolant Pump Locked Rotor) Accident

In this analysis, it is stated that this analysis is performed for each new reload, a specific evaluation is not performed for the power uprate condition. This is not acceptable. Perform a new analysis and provide their results for the most limiting case using the power uprate parameters and justify how you meet the acceptance criteria.

DBNPS Response to Question 8:

The intent of the subject statement was to note that the specific DNBR response is addressed as part of the cycle-specific reload, while the RCS response, i.e., power, temperature, pressure, and flow rate, for each event are addressed generically in this report. This approach is viable because the system response and the DNB response are performed in separate calculations. The system response to the loss of coolant flow events generate the transient core exit pressure, core inlet temperature, core inlet flow rate, and core power values. The analyses are performed at the minimum design flow rate versus the minimum DNB flow rate to ensure a conservative pressure and temperature prediction. The core inlet flow is normalized and will not be affected by the proposed power uprate. The core power response is also normalized since the initial core power level in the calculation accounts for the heat balance uncertainty. Because the system response calculation already conservatively accounts for the heat balance error and therefore bounds the power uprate, no new system analysis is specifically required for the proposed power uprate.

The parameters from the system analysis are provided as input to the DNB calculation. The DNB calculation is performed for each new fuel reload to confirm that the DNB acceptance criterion is not violated. The DNB analysis accounts for the fuel design, the appropriate core power level and peaking factors. A scoping calculation was performed for the proposed power uprate and is reported in Section 3.13.2 of Enclosure 1 Attachment 3 of the DBNPS license amendment application. These analyses confirmed that the uprated core will meet all required thermal-hydraulic core protection requirements. The licensing (DNB) calculations for the power uprate are incorporated into the Cycle 14-specific analyses, and will be used in subsequent cycles.

Question 9:

Section 3.10.3.15 Steam Generator Tube Rupture (SGTR) Accident

a. Discuss whether sufficient margin to overfill of the steam generators exists with a constant leak rate of 435 gpm prior to operators take control of the auxiliary flow rate.

b. In this analysis, it is stated that the leak rate calculation for the SGTR analysis is independent of power level based on the analytical method used. Confirm that with power uprate the RCS pressure remains the same. If the RCS pressure is higher than the current analysis, justify your current analysis results or you may require a new analysis.

c. Confirm that the reactor coolant activity restrictions are consistent with the current TS requirements with the power uprate.

DBNPS Response to Question 9:

a. Prior to a reactor trip, the Integrated Control System (ICS) will throttle Main Feedwater (MFW) to the affected OTSG to maintain a constant water level in the steam generator. Following a reactor trip, the ICS reduces MFW flow to both OTSGs to maintain level at the low level control setpoint, while also compensating for the leakage flow to the affected OTSG. At 435 gpm, the leakage rate is insufficient to remove core decay heat, even when combined with the cooling capability of the HPI system. Thus, steaming of both OTSGs is necessary to ensure sufficient decay heat removal. Once diagnosed as an SGTR, the reactor operators are instructed to steam both OTSGs to reduce the RCS temperature. Steaming of the OTSGs continues until the RCS temperature is reduced to a value that is less than the saturation temperature corresponding to the lowest set pressure for the Main Steam Safety Valves (MSSVs). During this phase of the event, the leakage rate is insufficient to cause the affected OTSG level to increase above the ICS control point. At approximately 34 minutes after event initiation, the reactor operators, having reduced the RCS temperature to the desired value, take action to isolate the affected OTSG. The water level of the affected OTSG at this time in the transient is less than or equal to the ICS level control point. Thus, adequate margin exists to overfilling the affected OTSG.

Should MFW not be available, the Auxiliary Feedwater (AFW) Level Control System acts to control the AFW flow rate to maintain a constant level in the OTSGs. The transient progression will remain the same as if the MFW were available. Again, adequate margin exists to overfilling the affected OTSG.

b. The current nominal RCS operating pressure of 2155 psig at the hot leg tap remains unchanged for the power uprate. Therefore, the SGTR leakage rate remains the same.

c. The system response and the offsite dose consequence are performed in separate calculations. Section 3.10.3.15 of Enclosure 1 Attachment 3 of the DBNPS license amendment application specifically relates to the system response for the single tube SGTR event. The radiological consequences for all accidents are addressed in Section 3.12.2 of Enclosure 1 Attachment 3 of the DBNPS license amendment application. The radiological accident analyses are based on 102% of 2772 MWt. Thus, the power uprate, in combination with more accurate measurement of the thermal power level, yields the same maximum thermal power that is currently the basis for source term that is used to assess the accident analyses. Consequently, the current source term and radiological analyses will remain applicable for the requested power uprate.

Question 10:

Section 3.13 Nuclear Fuel Related Issues

a. The future cores of Davis-Besse will include Mark-B10, Mark-B10K, and Mark-B12 fuel designs. Is the Mark-B12 fuel design approved by the staff? Recently, the staff approved a topical report of Mark-B11 fuel assembly design (BAW-10229P-A), and there are plant-specific analyses required for using the Mark-B11 fuel design. Please explain the relationship among between Mark-B11 and Mark-B12 fuel designs.

b. Demonstrate that the structural compatibility will exist for a mixed core of Mark-B10, Mark- B10K, and Mark- B12 under hydraulic, seismic, and LOCA loads.

DBNPS Response to Question 10:

a. The Mark-B10K and Mark-B12 fuel assemblies are an upgrade of the Mark-B10 fuel assembly design. The Mark-B10K design includes 0.430 inch diameter M5™ fuel rod cladding, a debris-filter lower end fitting assembly, and optimized UO_2 and gadolinia fuel rod designs, which allow for increased uranium loading. Four Mark-B10K fuel assemblies, designated "M5™ structural assemblies", are also in operation at the DBNPS. These assemblies utilize M5™ guide tubes in addition to the two uppermost intermediate spacer grids fabricated with M5™. The Mark-B12 design is essentially the same as the Mark-B10 design, except all the Mark-B12 fuel rods and guide tubes are fabricated from M5™ material. The Mark-B12 design also utilizes a 6 leaf cruciform spring, which is an evolutionary optimization of the 8 leaf spring design used on the Mark-B10 and Mark-B10K. The Mark-B8A is an earlier design that includes a coil hold down spring and a skirted lower end grid. Small differences in fuel assembly and fuel rod lengths also distinguish the four designs. Future plans are to introduce M5™ spacer grids on a batch basis as allowed by the NRC approval of BAW-10227P-A (Reference 1).

These designs were implemented in accordance to the criteria specified in 10 CFR 50.59. The Mark-B8A and Mark-B10 product upgrades do not fall in the category requiring NRC approval, as outlined in BAW-10179P-A (Reference 2). The structural evaluations were performed in accordance with the NRC approved topical reports BAW-10133P-A (Reference 3), BAW-10227P-A and BAW-10179P-A to demonstrate the structural compatibility of Mark-B8A, Mark-B10, Mark-B10K and Mark-B12 designs. The documentation of conformance to Standard Review Plan 4.2 (Reference 4), which considers the structural evaluations, is filed with each unique plant application.

The Mark-B11 fuel assembly design, which was approved by the NRC per BAW-10229P-A (Reference 5), incorporates a reduced rod diameter (0.416 inch), flow mixing features on five of six intermediate spacer grid assemblies, and a revised spacer grid restraint system to distribute loads to lower as well as upper end fittings. The Mark-B11 batch fuel assembly design also incorporates M5™ fuel rods and the 6 leaf spring design. Future plans are to introduce M5™ guide tubes and spacer grids on a batch basis as allowed by the NRC approval of BAW-10227P-A.

b. The Mark-B10K and Mark-B12 fuel assemblies have been evaluated for normal operating and faulted conditions per BAW-10179P-A. It was shown that the Mark-B10K and Mark-B12 assemblies are dynamically similar to the Mark-B8A and Mark-B10 fuel assembly structures. The natural frequency changes due to the M5™ structural effects are shown to be less than 5%. The rod diameters are identical, and therefore the difference in clad stiffness is attributed to the small differences between the elastic modulus of the Zircaloy-4 and M5™ material. The change in frequency is negligible and satisfies the NUREG-0800, Standard Review Plan 4.2, Appendix A, Section B.3 (Reference 4) requirements for uncertainty allowances (less than 15%). No factor needs to be applied on resultant faulted condition loads calculated for the Mark-B8A and Mark-B10 fuel assemblies. Therefore, the lateral loads for seismic and LOCA events remain unchanged, and the subsequent fuel assembly component structural margins remain acceptable.

The net hydraulic lift force on the Mark-B10K and Mark-B12 assemblies were assessed at both full core and mixed core conditions per BAW-10179P-A. Implication of these changes in fuel assembly hydraulic lift forces was evaluated for normal operation and faulted conditions. For all conditions, positive margins are maintained and the structural compatibility is shown. Fuel assembly pressure drop differences due to the debris filter lower end fitting were also considered in the fuel assembly flow-induced vibration assessment. The effects were shown to be small. Previous Mark-B tests and operational experience and performance remain applicable.

References

1. BAW-10227P-A, "Evaluation of Advanced Cladding and Structural Material (M5™) in PWR Reactor Fuel," February 2000.

2. BAW-10179P-A, Revision 4, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses," August 2001.

3. BAW-10133P-A, Revision 1, "Mark-C Fuel Assembly LOCA-Seismic Analyses," June 1986.

4. Standard Review Plan, Section 4.2, "Fuel System Design," NUREG-0800, Revision 2, US Nuclear Regulatory Commission, July 1981.

5. BAW-10229P-A, "Mark-B11 Fuel Assembly Design Topical Report," September 1997.

Question 11:

Section 3.13.2 Core Thermal-Hydraulic Design

a. It appears that cycle 14 has a mixed loading of Mark-B10 and Mark-B10K fuel assemblies. Describe the difference between these two fuel assemblies and their approved status. Provide available data to support the statement that fuel assemblies in the cycle 14 core have compatible hydraulic characteristics.

b. Provide detailed justification that the BWC CHF correlation is still valid for Mark-B10 and Mark-B10K including all available data bases to support the approved BWC CHF correlation. Also, describe the mixed core CHF calculation method for cycle 14 operation.

DBNPS Response to Question 11:

a. Fuel Assembly Design Differences

The planned DBNPS Cycle 14 core configuration is predominately composed of the Mark-B10, Mark-B10K, and Mark-B12 fuel assembly designs. All three fuel assembly designs have the following hardware similarities that influence the core hydraulics:

- two inconel end spacer grids,
- six Zircaloy-4 intermediate spacer grids, and
- upper end fitting with a cruciform fuel assembly holddown spring.

The Mark-B8A and Mark-B10 fuel assembly designs contains fuel rods utilizing Zircaloy-4 cladding and end caps. The rod design also uses a long lower end cap that extends from the top of the lower end fitting up into the lower end spacer grid as a debris-resistant feature. Should debris be captured at the lower spacer grid plane, the debris would be mechanically acting upon the solid end cap region.

The Mark-B10K fuel assembly design contains fuel rods utilizing the low corrosion M5™ cladding and end caps. The design also introduces the Trapper™ debris resistant lower end fitting. Instead of relying on capturing debris at the lower end spacer grid, like the Mark-B10 fuel assembly design, the Mark-B10K is designed to capture debris within the Trapper™ lower end fitting using a filter plate. As a result of eliminating the need for a long lower end cap, the fuel stack length was increased by approximately 2.3 inches.

The Mark-B12 fuel assembly design has incorporated further improvements beyond the Mark-B10K such as:

- M5™ control rod guide tubes for reduced corrosion,
- a Zircaloy-4 instrument guide tube with a tapered roll (MONOBLOC™ feature) at the top, and
- replacement of the 8-leaf cruciform fuel assembly holddown spring with a 6-leaf cruciform spring to reduce fuel assembly compressive forces that could contribute to fuel assembly bowing.

The Mark-B12 fuel assembly is hydraulically identical to the Mark-B10K fuel assembly design.

Fuel Assembly Design Approval Status

The approved status of the fuel designs planned for the DBNPS core is based on the combined effect of NRC review of the major analysis tools supporting the fuel designs and the regular Annual Update Meetings held between Framatome and the NRC. Framatome ANP's methodology topical report, BAW-10179P-A (Reference 1), identifies the tools and methods used to support the DBNPS cores. The BWC CHF correlation (Reference 2) and the LYNXT code (Reference 3) have been reviewed and approved for application to the Mark-B 15x15 fuel designs at the DBNPS.

Framatome ANP's 30-year Mark-B fuel design developmental effort has produced numerous design improvements that have been implemented at the B&W-designed 177 fuel assembly plants. These design improvements are based on engineering analyses and supplemented, where necessary, with design testing that utilize the approved reload licensing methodology and criteria specified in BAW-10179P-A and its references. The design improvements have also been acknowledged in the respective Reload Reports for each cycle and have been shared with the NRC during the Annual Update Meetings.

Fuel Assembly Hydraulic Compatibility

All four fuel assembly designs, Mark-B8A, Mark-B10, Mark-B10K, and Mark-B12 use the same intermediate spacer grid designs. As a result, there is a consistent hardware-related hydraulic resistance within the active fuel region of the DBNPS Cycle 14 core.

The hydraulic characteristics of the Mark-B10 fuel assembly design were obtained from a full-scale flow test performed at the Alliance Research Center in the Control Rod Drive Line flow facility at reactor operating temperatures, pressures, and flow rates. This characterization provided pressure drops that yielded hardware form loss coefficients that have been used in engineering analyses. The centrally located Mark-B8A fuel assembly, with a skirted lower end grid and helical hold down spring, is hydraulically similar to the Mark-B10 fuel assembly design.

The hydraulically significant change for the Mark-B10K fuel assembly design is the Trapper™ lower end fitting. Hydraulic tests of the Trapper™ were performed in Framatome's MCTP loop facility located in Le Creusot, France. Theses tests used a short prototype fuel assembly test section that modeled the lower region of the production fuel assembly design – lower support grid pad, lower end fitting, lower end grid, fuel rod segments and instrument/guide tube segments. These tests also provided pressure drops from which lower end fitting form loss coefficients were derived.

Fuel assembly hydraulic compatibility in the DBNPS core was demonstrated by showing that all design criteria are satisfied in the potential transition core configurations. This included examining the impact of core flow redistributions on DNBR predictions, hydraulic lift forces, and mechanical issues such as flow-induced vibration concerns.

The LYNXT code was used to model the DBNPS transition cores. For DNBR predictions, a one-pass transition one-eighth core model containing 64 channels was used. With the limiting fuel assembly located in the center of the core, channels 1 through 36 represented the subchannels within the limiting fuel assembly. Channels 37 through 64 individually represented the remaining fuel assembly locations within the core.

Transition core configurations were selected that examined different fuel designs as the limiting fuel assembly. The remainder of the core was modeled in a manner to bound the potential lateral crossflow out of the limiting fuel assembly, thereby, providing conservative minimum DNBR predictions.

The minimum DNBR predictions for these transition core configurations were compared to minimum DNBR predictions based on a full core of a single fuel assembly design, in this case, a full core of Mark-B10 fuel assemblies. The DNBR record of analysis is typically based on a full core of one fuel design and the transition core penalty, relative to the full core assumption, is explicitly applied against available DNB margin. In the case of the DBNPS, a transition core penalty can be applied against the retained DNB margin of the Thermal Design Limit for the Statistical Core Design methodology described in Reference 4. As discussed in Section 5.1 of Reference 4, the DNBR margin identified between the Thermal Design Limit and the Statistical Design Limit can be used to offset effects not treated in the Statistical Design Limit development such as transition core effects.

DNBR predictions for the various configurations were performed at statepoint conditions that define the pressure-temperature safety limits and the Safety Limit Maximum Allowable Peaking Limits (MAPs). These conditions yielded minimum DNBRs at or near the Thermal Design Limit. Additional DNB predictions were obtained for the limiting Condition II transient as well as the Operating Limit Maximum Allowable Peaking Limits (MAPs).

The minimum DNBR prediction differences between the transition core configurations and the full core configuration were tabulated for the steady-state statepoints and the transient conditions. The DNB transition core penalty is defined as the maximum DNBR difference, where the transition core had the lesser DNBR prediction, for these operating conditions.

For DBNPS Cycle 14, Framatome concluded there was no transition core DNB penalty for the Mark-B10K and Mark-B12 fuel assembly designs even though the Trapper™ end fittings had a higher flow resistance than the end fittings for the Mark-B10 fuel assemblies. This conclusion was attributed to the lower average linear heat rate for the Mark-B10K and

Mark-B12 fuel designs with the longer fuel stack length that offsets the DNBR disadvantage of the flow diversion away from the Trapper™ lower end fittings. It was also concluded that no transition penalty was necessary for the Mark-B10 fuel because a limiting Mark-B10 fuel assembly received more flow during the transition core configurations than during a full core Mark-B10 configuration. Similarly, no transition core penalty was necessary for the Mark-B8A fuel assembly.

The LYNXT code was also used to examine the predicted fuel assembly hydraulic lift forces and lateral crossflow velocities. LYNXT models for these studies contained 29 channels where each channel represented a fuel assembly of the one-eighth core. Again, core configurations were selected that bounded the hydraulic conditions for each fuel assembly design. Adequate fuel assembly holddown capability and acceptable lateral crossflow velocities were predicted for all fuel designs in the Cycle 14 core.

As the DBNPS core proceeds toward becoming a full core of Mark-B12 fuel assemblies, the results of these conservative transition core analyses should remain applicable.

b. BWC CHF Correlation Applicability

The BWC CHF correlation, Reference 2, was developed and approved for the Mark-B series zircaloy intermediate spacer grid design. Over the last 20 years the grid design has only incurred insignificant changes that do not influence the application of the BWC CHF correlation. As a result, no additional CHF data has been obtained for the grid. The only data base for the Mark-B series application of BWC is contained in Reference 2.

The approval for the use of the BWC CHF correlation with the LYNXT code is documented in the LYNXT Safety Evaluation Report in Reference 3. Since there have been no significant design changes in the grid since the CHF tests and the calculational tool, LYNXT, has been approved for providing BWC CHF predictions, the BWC correlation remains valid for the Mark-B8A, Mark-B10, Mark-B10K, and Mark-B12 fuel assembly designs in reload licensing analyses.

Mixed Core CHF Calculation Method

The transition core Critical Heat Flux (CHF) calculation method is described in the response to Question 11a.

References

1. BAW-10179P-A, Revision 4, "Safety Criteria and Methodology for Acceptable Cycle Reload Analyses," August 2001.

2. BAW-10143P-A, "BWC Correlation of Critical Heat Flux," April 1985.

3. BAW-10156-A, Revision 1, "LYNXT Core Transient Thermal-Hydraulic Program," August 1993.

4. BAW-10187P-A, "Statistical Core Design for B&W-Designed 177FA Plants," March 1994.

January 23, 2002 NRC Request for Additional Information

Question 1:

Provide the grid stability analysis performed in May 2000 for power uprate.

DBNPS Response to Question 1:

The requested report is provided in Enclosure 2.

Question 2:

The submittal does not say specifically that no changes to the station blackout coping and mitigation analysis are required due to the 1.63 percent power uprate. Please specify and give the details if any changes would affect the SBO coping capability and mitigation analysis due to the 1.63 percent power uprate.

DBNPS Response to Question 2:

No changes to the station blackout coping and mitigation analysis are required due to the proposed power uprate.

January 28, 2002 NRC Request for Additional Information

In Section 3.1, Approach of Safety Analysis, of Attachment 3 of the Enclosure 1 to the licensee's Amendment Application submittal (Reference), the licensee stated that, generally, no new analytical techniques were used to support the power uprate project. However, for OTSG tubes, the integrity of the tubes, virgin, sleeved or stabilized were re-assessed using the latest techniques.

In Section 3.6.7.2, Attachment 3 of Enclosure 1 to the Amendment Application, the licensee discussed the OTSG flow-induced vibration of the steam generator tubes. The licensee made the following note:

"The following discussion is specific to hardware supplied by B&W/FTI. A review of FIV analysis for plugs and stabilizers supplied by ABB/CE is ongoing and will be completed prior to implementation of the proposed power uprate."

In view of the above, the staff requests the following information:

(a) It is not clear why a separate analysis is being performed by the licensee for plugs and stabilizers supplied by ABB/CE. State whether the method of analysis is the same as that used for hardware supplied by B&W/FTI. Describe the differences if any. Provide the results of analysis for the hardware supplied by ABB/CE.

(b) For B&W/FTI hardware, the licensee stated that the uprate "design" flow rate (and the corresponding flow velocity) was 2% greater than the previous FIV analyzed condition. Therefore, the forcing function on the tubes in the OTSG due to fluid flow increases approximately 4% during full power operation. The licensee further stated that, because the qualification analyses were performed through a span of over 19 years, there were differences in the methodology, the computer codes and the input parameters used that resulted in slightly different results even for the identical hardware.

    In order for the staff to complete its review of this latest technique and the resulting impact on the functional integrity of the steam generator tubes due to power uprate, the staff requests that the licensee submit the B&W/FTI reassessment report for staff review. The staff expects that the report will address the details of the FIV analyses such as, tubes subjected to two-phase flow, vortex shedding, fluid-elastic instability loadings, and turbulence-induced vibrations, and the input parameters used and their justifications, such as stability constant and viscous damping values.

<u>DBNPS Response:</u>

(a) Framatome ANP was originally contracted to evaluate the structural integrity of the B&W OTSG for the Caldon power uprate. One task of this project was to evaluate the B&W/Framatome stabilizers installed in the OTSG for the FIV considerations associated with the Caldon power uprate. This evaluation was performed by assessing the FIV margins associated with each stabilizer design determined from previous FIV analysis and making adjustments to these results in order to obtain the FIV margins associated with the Caldon power uprate. These previous analyses have been performed over the last nineteen years. Since there have been changes in the Connors' constant value over this time period, the FIV margins associated with the original FIV analysis were adjusted to reflect the latest

Connors constant value determined from recent testing. This evaluation was completed and documented. The DBNPS was made aware that this evaluation did not consider the installed ABB/CE stabilizers. At that time, Framatome ANP was unable to evaluate the ABB/CE stabilizer since critical design information for this stabilizer was not available.

The ABB/CE design inputs were subsequently made available to Framatome ANP in order to evaluate the stabilizer for the Caldon power uprate. The FIV techniques and methodologies performed for the ABB/CE stabilizer design were identical to what had been performed in the original FIV analysis and in the Caldon FIV evaluation of the B&W/Framatome stabilizer designs.

The FIV analysis of the ABB/CE stabilizer was documented in a separate calculation. This stabilizer design was determined to not have an adequate stability margin for the power uprate conditions. Thus, these stabilizers will be replaced in the upcoming Thirteenth Refueling Outage (13RFO).

(b) The original FIV analyses of the OTSG virgin tube and the B&W/Framatome stabilizer designs address the damping associated with two phase flows, vortex shedding, fluid-elastic instability loadings, and turbulence-induced vibrations. These documents are considered highly proprietary to Framatome-ANP and are not available for placement on the docket. However, arrangements can be made for the NRC to view these documents at the Framatome offices in Lynchburg or Roslyn, Virginia.

February 5, 2002 NRC Request for Additional Information

Question 1:

Stress Corrosion Cracking of Reactor Internals

Increased power is expected to increase the corrosion rates and speed up degradation of reactor internals. Identify the plant programs that are in place to periodically inspect reactor internals and discuss whether these programs are adequate to manage the projected increase of reactor internals degradation due to stress corrosion cracking (SCC) and primary water stress corrosion cracking (PWSCC).

DBNPS Response to Question 1:

As shown in Table 3-1 of Enclosure 1 Attachment 3 of the DBNPS license amendment application, the proposed power uprate increases T_{hot} by 0.4 - 1.3 °F. The general corrosion rate of RV internals materials (mainly austenitic stainless steels and some nickel-based alloys) is negligible in PWRs and is not considered as a current or potential internals degradation mechanism. An increase of 1.3 °F will not affect the general corrosion rate. Irradiation-assisted stress corrosion cracking (IASCC), stress corrosion cracking (SCC), stress relaxation (SR), and irradiation embrittlement (IE) are the major reactor vessel internals degradation mechanisms identified by license renewal efforts. An increase in temperature usually accelerates these degradations. However, in the temperature range of interest (T_{hot} 606.1 - 607.4 °F), the current understanding of the above mentioned degradations does not indicate any abrupt changes in the aging mechanism or kinetics. An increase of 1.3 °F is not expected to cause significant or detectable acceleration in degradation.

Currently, these issues are addressed by an industry Issues Task Group (ITG) managed by EPRI. The B&WOG also developed a detailed six-year program (1998-2003) to address these issues. In late 2000, the B&WOG completed a formal review of both B&WOG and industry ongoing activities and future plans and established a goal of readying the B&WOG for an inspection of the RV internals and baffle bolts at a B&WOG plant sometime after 2013. PWSCC is a mechanism that affects Alloy 600 components and their welds in the RCS, such as the Alloy 600 CRDM nozzles and the associated J-groove welds. Alloy 600 and its welds have not been used in the RV internals of B&WOG plants.

Question 2:

Flow Assisted Cracking (FAC)

Since the effects of FAC on degradation of carbon steel components are plant specific, the licensee needs to provide a predictive analysis methodology which must include the values of the parameters affecting FAC, such as velocity, and temperature before and after the power uprate (PU) and the corresponding changes in components wear rates due to FAC.

(1) Indicate the degree of compliance with NRC Generic Letter 89-08, "Erosion/Corrosion in Piping." This letter requires that an effective program be implemented to maintain structural integrity of high-energy carbon steel systems. Describe how was this program modified to account for PU. If the computer code used in predicting wall thinning by FAC in this program is a generic code (e.g., CHECWORKS), specify it. However, if the code is plant specific provide its description.

(2) Identify the predicted change of wear rates calculated by the revised code for the components most susceptible to FAC.

(3) Will the PU have significant effect on FAC in balance of plant (BOP) components? What is the value of the change in FAC wear rates?

DBNPS Response to Question 2:

The DBNPS described its programs addressing the concerns raised in NRC Generic Letter 89-08 in a July 14, 1989 letter to the NRC (DBNPS Serial No. 1679). These programs remain in place. As stated in Section 4.1.3 of Enclosure 1 Attachment 3 of the DBNPS license amendment application, Flow-Accelerated Corrosion (FAC) in the piping systems at the DBNPS is modeled using the CHECWORKS computer program.

A new plant heat balance was generated for the proposed power uprate to predict pressure, temperature, mass flow rate, and enthalpy through the secondary plant piping systems. Based upon the new heat balance data, the power uprate is expected to have only a minor effect on wall thinning due to FAC in the balance of plant systems. The DBNPS plans to rerun the CHECWORKS model within 90 days of startup from 13RFO utilizing actual plant heat balance data. The results will be factored into future inspection/pipe replacement plans consistent with the current Corrosion/Erosion Monitoring and Analysis Program (CEMAP).

Docket Number 50-346
License Number NPF-3
Serial Number 2759
Enclosure 2

Grid Stability Study
(162 pages attached)

GE Energy Services

Davis-Besse Stability Study

for

FirstEnergy Corporation

Final Report

May 2000

Power Systems Energy Consulting
General Electric International, Inc.
One River Road
Schenectady, New York 12345 USA

FirstEnergy Corporation
Davis-Besse Stability Study

FINAL REPORT

Principle Contributors:
Kara Clark
Robert Laffen

MAY 2000

Power Systems Energy Consulting
General Electric International, Inc.
One River Road
Schenectady, New York 12345

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TABLE OF CONTENTS

1. INTRODUCTION

FirstEnergy Corporation requested that PSEC perform a transient stability study of the Davis-Besse nuclear power plant for two reasons. First, an updated stability study was desired - the most recent study was several years ago. Second, a turbine-generator uprate is under consideration.

Davis-Besse currently has a maximum gross power output of 942MW, a rating of 1069MVA, and a nominal power factor of 0.88. The power plant design is based on industry standards and regulatory guidelines. The layout includes two electrically independent 345kV sources of off-site power (OSP) for the start-up transformers. The two 345kV circuits are fed from the Davis-Besse 345kV transmission yard. The transmission yard consists of a five-breaker ring with three transmission line exits, two station service busses and one generator position.

For this study, a 10% increase in gross power output was assumed for the uprate. Therefore, an increase in both the rating (1120MVA) and power factor (0.92) were used to increase the power output to 1033MW. The change in power factor also reduced the unit's reactive power capability from approximately 500MVAr to 433MVAr.

It is possible to replace the 67MVAr of generator reactive capability with another reactive power source. Such a var source could be either static (mechanically switched capacitors (MSC)) or dynamic (static compensator (STATCOM), static var compensator (SVC), or synchronous condenser) or a combination. The needs of the system will dictate size, location, and type of source. For this study, the impact of a 67MVAr STATCOM on stability performance was investigated.

This study evaluated the steady-state and transient performance of the FirstEnergy system with both the existing Davis-Besse power level and the uprated power level. A variety of disturbance scenarios were analyzed, including single transmission line outages, single generating unit outages, double transmission line outages, and combined transmission line and generating unit outages.

Both power flow and stability analyses were performed. The power flow analysis identified branch (e.g., transmission line or transformer) loading and bus voltage violations under both normal and contingency (i.e., outage) operating conditions. The stability analysis evaluated both first swing stability and system damping.

Section 2 of this report describes the study approach in detail. Sections 3 and 4 describe the results of the power flow and stability analyses, respectively. Section 5 presents the study conclusions and recommendations.

2. STUDY APPROACH

This study used a relative approach to determine the impact of a possible Davis-Besse station (DBS) uprate on the performance of the FirstEnergy power system. First, system performance with the current plant output (942MW) was determined in order to establish the benchmark, and then system performance with the power uprate (1033MW) was determined and compared to the benchmark. This relative approach removed any ambiguities as to the actual impact of a possible plant uprate since existing criteria violations were identified.

The following sections describe the benchmark system conditions, current and uprated Davis-Besse plant models, as well as the performance criteria and contingency list.

2.1 Benchmark System Conditions

The 1999 summer peak power flow database provided by FirstEnergy was modified to represent the Davis-Besse plant in more detail and to represent a year 2000 load condition in FirstEnergy's service territory. Specifically, the following changes were made:

- The Davis-Besse generator model was moved from the 345kV bus to a new 25kV bus, and a 980MVA generator step-up (GSU) transformer with an impedance of 0.14pu was added between the two buses. The generator gross output is 942MW.
- The 25/13.8kV generator auxiliary transformer, which serves the auxiliary load under normal operating conditions, was modeled as a 69MVA transformer with a 0.063pu impedance (on 26MVA). The auxiliary load in the Davis-Besse plant was represented by a detailed model as shown in *Figure 2-1*.
- Start-up transformers 1 and 2 were modeled as 65MVA transformers with impedances of 0.094pu and 0.093pu (on 39MVA), respectively. These transformers were connected between the Davis-Besse 345kV bus and two new 13.8kV buses. The auxiliary load is transferred from the generator auxiliary transformer to the start-up transformers under fault scenarios that trip the Davis-Besse unit.

- To simulate a year 2000 load condition in the FirstEnergy service territory, the real and reactive power loads in zones 202, 203, 205, and 241 were increased by 3.63%. A corresponding increase in power output at several large generating plants outside ECAR (Shawnee, JA Fitzpatrick, Susquehanna, Browns Ferry) supplies this load.

A one-line diagram of the bulk system illustrating the benchmark pre-contingency power flow results is shown in *Figure 2-2*.

Additional changes were made to the dynamic data to better match the information provided by GE Generator Engineering. Those changes included:

- The representation of the Davis-Besse exciter was changed from an exac3 model to an exac3a model to better represent the maximum field current limiting function in an Alterrex exciter.

The dynamic load model represents real power loads as constant current and reactive power loads as constant impedance. Block diagrams of the dynamic models used to represent the Davis-Besse plant are included in *Appendix A*.

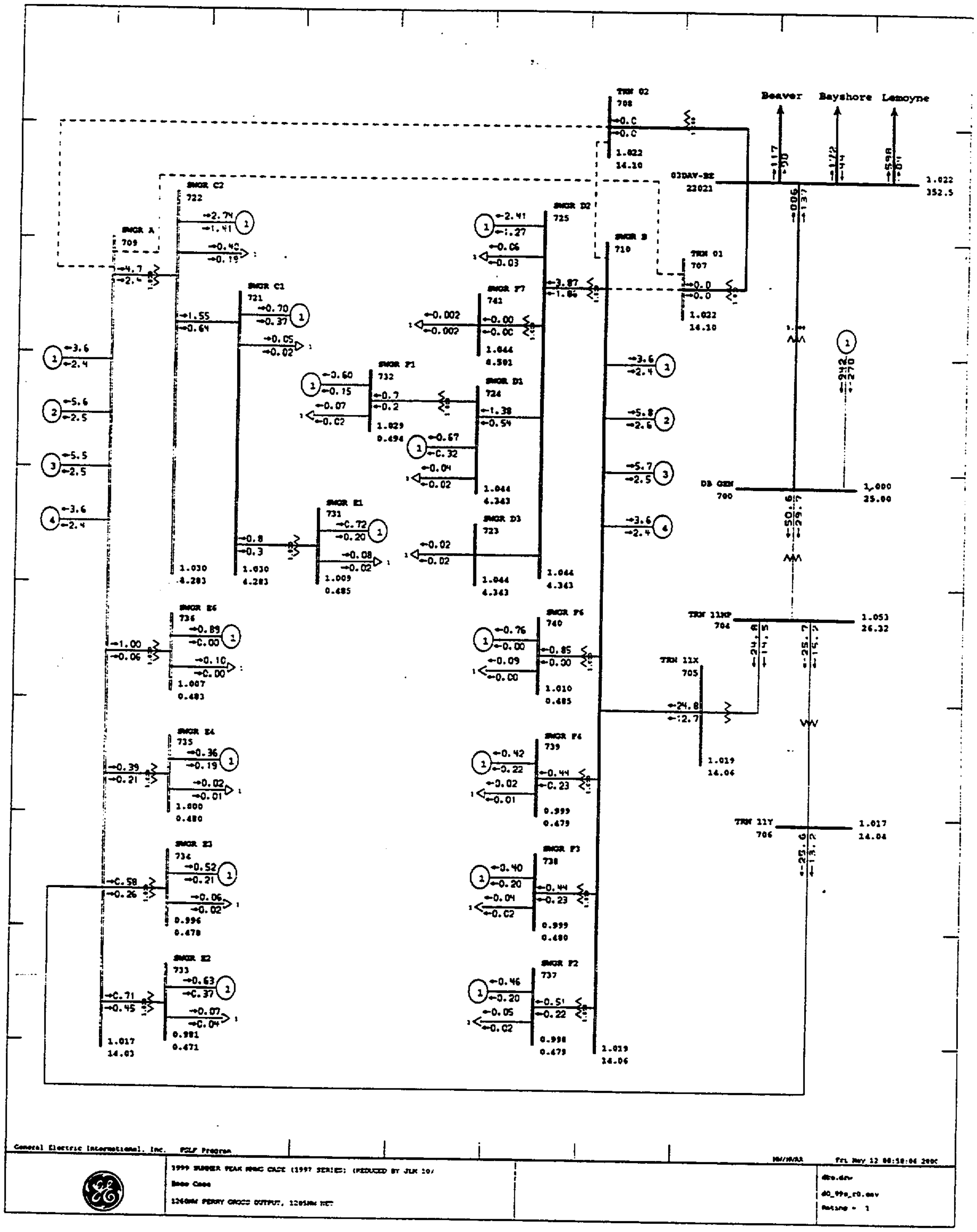


Figure 2-1. Detailed Davis-Besse Station Power Flow Results (942MW).

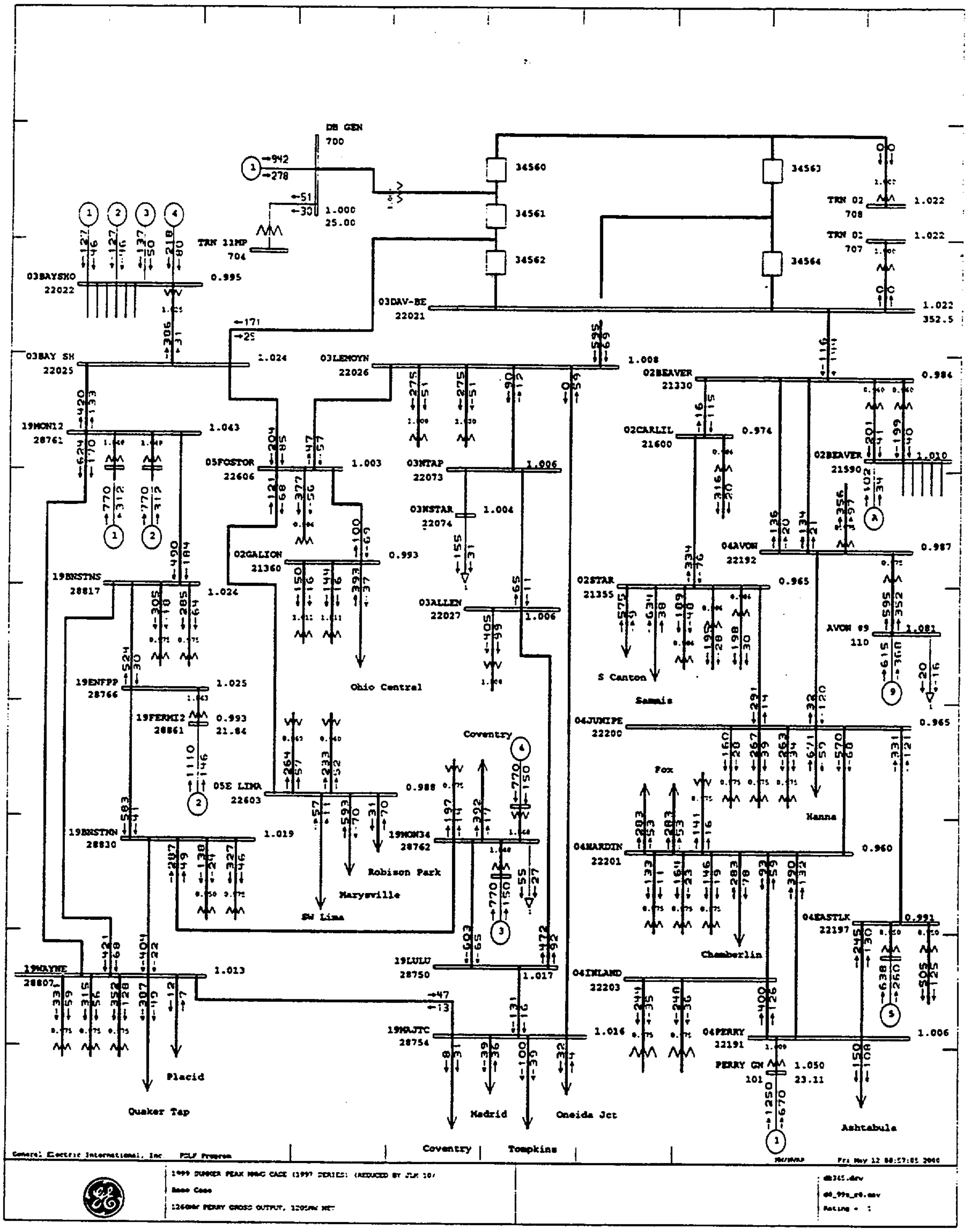


Figure 2-2. Benchmark Power Flow Results (Davis-Besse Output = 942MW).

2.2 Uprated Davis-Besse Plant Scenarios

The assumed plant uprate would increase power output by about 91MW (from 942MW to 1033MW) and reduce the unit's reactive power capability by about 67MVAr (from 500MVAr to 433MVAr). The benchmark power flow was modified to reflect the above changes. One-line diagrams illustrating the power flow results for the Davis-Besse station and the FirstEnergy bulk power system are shown in *Figures 2-3* and *2-4*, respectively.

The uprate includes a rating increase, and therefore changes the dynamic model of the Davis-Besse generator. A block diagram of this model is also included in *Appendix A*.

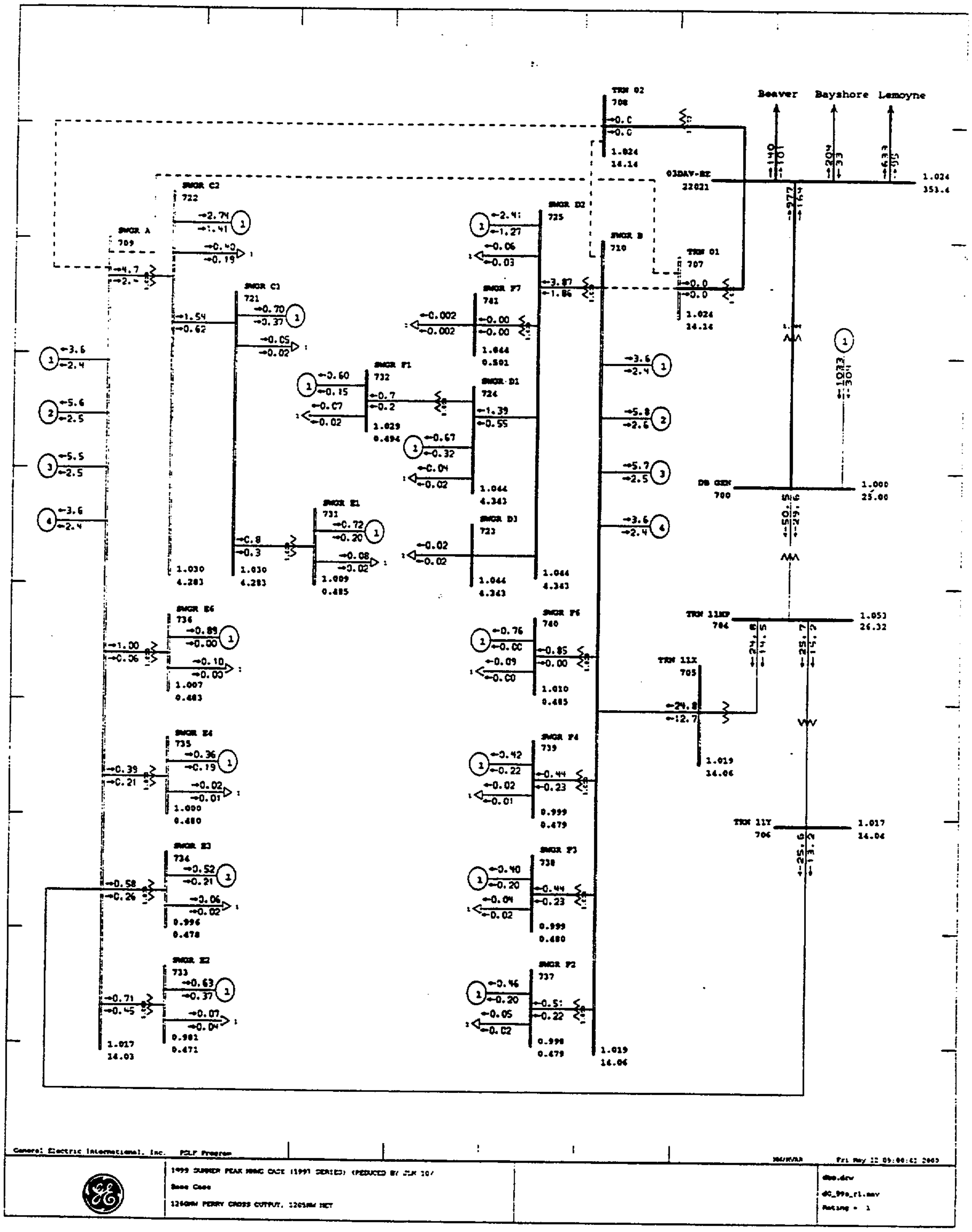


Figure 2-3. Detailed Davis-Besse Station Power Flow Results (1033MW).

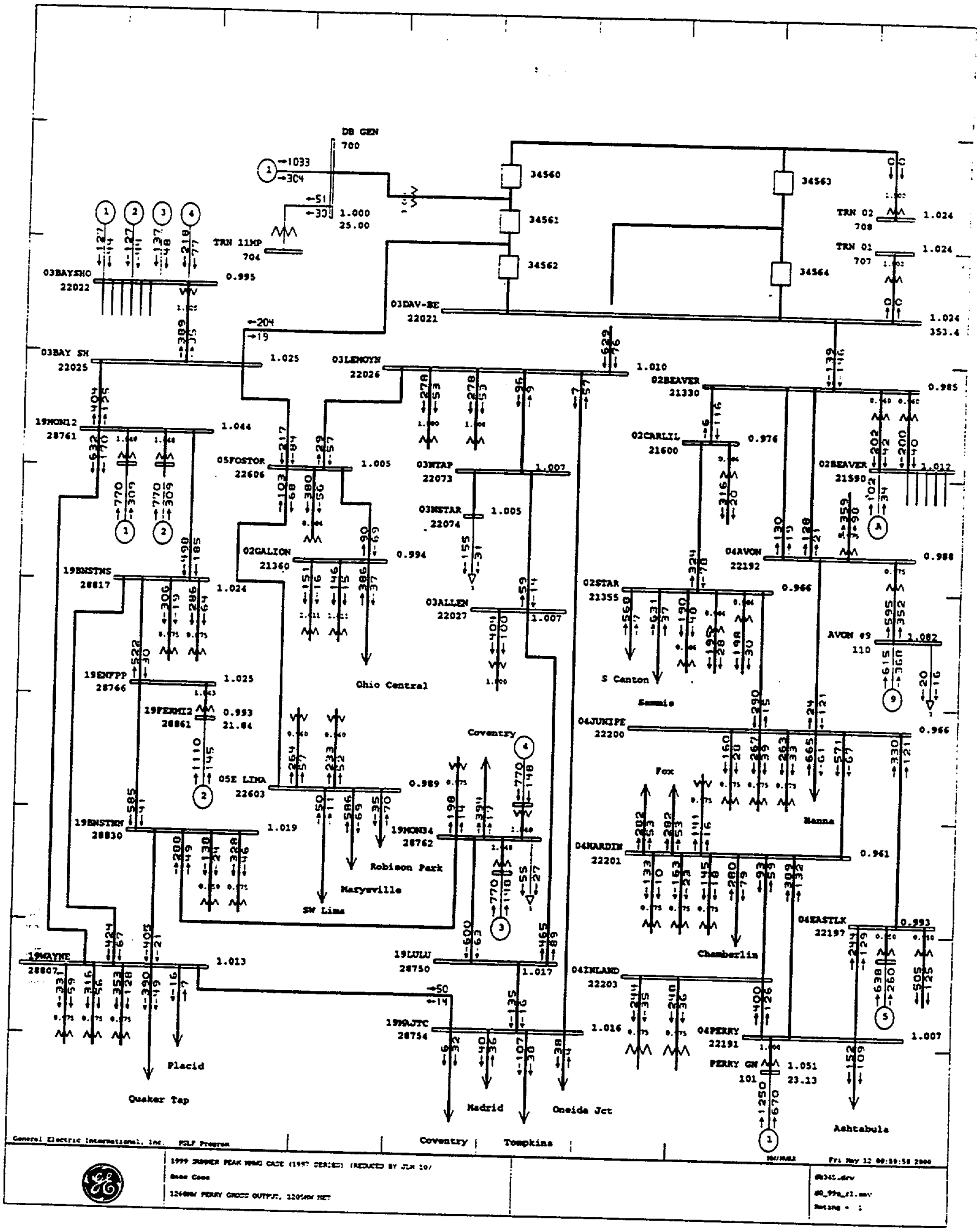


Figure 2-4. Uprate Power Flow Results (Davis-Besse Output = 1033MW).

2.3 Performance Criteria

For the power flow analysis, different thermal, or branch loading, performance criteria were used for normal operation and for contingency operation. Under normal conditions, acceptable branch loadings are less than 100% of the normal continuous summer rating (Rate 1 in the power flow). Under contingency conditions, acceptable branch loadings are less than 100% of the long-term emergency (LTE) summer rating (Rate 2 in the power flow).

Similarly, different voltage performance criteria were used for normal and contingency operation. Under normal conditions, acceptable voltages are greater than 0.95pu and less than 1.05pu, while under contingency conditions, acceptable voltages are greater than 0.90pu and less than 1.05pu.

Impacts due to the uprate will be identified as follows:

- Thermal violations that did not occur in the benchmark system.
- Thermal violations that exceed the benchmark system by at least 3%.
- Voltage violations that did not occur in the benchmark system.
- Voltage violations that exceed the benchmark system by at least 1%.
- Changes in voltage that exceed 10%.

The monitored zone consisted of the zones 5 (PN BULK), 202 (OE), 203 (TE), 204 (CEI), 219 (DECO), 241 (CEI-CPP), 251 (AEP-OP) and 888 (new zone for DBS) in the power flow.

2.4 Contingency List

The contingency list focused on major 345kV outages in the Davis-Besse area, including fault scenarios that result in the outage of a single transmission line, two transmission lines, or one line and one generating unit. Both Davis-Besse and far-end faults were analyzed, as well as both primary clearing and back-up clearing for stuck phases on independent pole breakers. *Table 2-1* shows the list of 14 contingencies used for the stability analysis, with fault clearing times as provided by FirstEnergy.

For the power flow analysis, the list was reduced to 10 by eliminating duplication – i.e., contingencies 1 and 4 are different in the stability analysis but identical in the power flow analysis. The power flow analysis evaluated contingencies 1-3, 7-10, and 12-14. For all generating unit contingencies, an inertial redispatch was performed.

A complete listing and description of the power flow contingencies is included in *Appendix B*.

Table 2-1
Contingency List for Davis-Besse Grid Stability Study

Case	Fault Type and Location				Fault Clearing						
	Type	Name	Voltage	#	Element	From Bus	#	Clear Time	To Bus	#	Clear Time
1	3φ on line	03DAV-BE[1]	345 kV	22021	345kV line	03DAV-BE	22021	4.5 cy (P[2],34561[3],34562)	03BAY SH	22025	4.5 cy (P,34542,34544)
2	3φ on line	03DAV-BE	345 kV	22021	345kV line	03DAV-BE	22021	4.5 cy (P,34563,34564)	03LEMOYN	22026	4.5 cy (P,34501,34502)
3	3φ on line	03DAV-BE	345 kV	22021	345kV line	03DAV-BE	22021	4.5 cy (P,34562,34564)	02BEAVER	21330	4.5 cy (P,115, 88)
4	3φ on line	03BAY SH	345 kV	22025	345kV line	03DAV-BE	22021	22.5 cy (B,34561, 34562)	03BAY SH	22025	4.5 cy (P,34542,34544)
5	3φ on line	03LEMOYN	345 kV	22026	345kV line	03DAV-BE	22021	22.5 cy (B,34563, 34564)	03LEMOYN	22026	4.5 cy (P,34501,34502)
6	3φ on line	02BEAVER	345 kV	21330	345kV line	03DAV-BE	22021	22.5 cy (B,34562, 34564)	02BEAVER	21330	4.5 cy (P,115, 88)
7[4]	3φ on line	03DAV-BE	345 kV	22021	345kV line X MW generator aux load transfer	03DAV-BE	22021	4.5 cy (P,34561,34562) 4.5 cy (P, 34560) 4.5 cy	03BAY SH D-B GEN	22025 170	4.5 cy (P,34542,34544)
8	3φ in CB 34564	03DAV-BE	345 kV	22021	345kV line 345kV line	03DAV-BE	22021	4.5 cy (P,34563) 12 cy (F,B,34562)	03LEMOYN 02BEAVER	22026 21330	4.5 cy (P,34501,34502) 12 cy (B,115, 88)
9	3φ/1φ[5] on line 1φ 34562 fails	03DAV-BE	345 kV	22021	345kV line 345kV line	03DAV-BE	22021	4.5 cy (P,34561) 12 cy (B,34564)	03BAY SH 02BEAVER	22025 21330	4.5 cy (P,34542,34544) 12 cy (B, 115, 88)
10	none				X MW generator aux load transfer	03DAV-BE	22021	(34560,34561)	D-B GEN	170	
11	3φ in GSU	03DAV-BE	345 kV	22021	X MW generator aux load transfer	03DAV-BE	22021	4 cy (P,34560,34561) 4 cy	D-B GEN	170	
12	3φ in GSU	19ENFPP	345 kV	28766	1110 MW generator	19ENFPP	28766	4 cy (P)	19FERMI2	28861	
13	none				345kV line, 345kV line	03BAY SH 03LEMOYN	22025 22026	(34541,34542) (34505,34506)	19MON12 19MAJTC	28761 28754	
14	1φ on 2 lines near Lemoyne	03LEMOYN BYSHFOST	345 kV 345 kV	22026 22605	345kV line 345kV line	03BAY SH 03LEMOYN	22025 22026	4.5 cy (P,34540,34544) 4.5 cy (P,34504,34506)	05FOSTOR 05FOSTOR	22606 22606	4.5 cy (P) 4.5 cy (P)

Notes:

1. Table of bus names in load flow

Substation	Name	Number
Davis-Besse 345kV	03DAV-BE	22021
Bay Shore 345kV	03BAY SH	22025
Lemoyne 345kV	03LEMOYN	22026
Beaver 345kV	02BEAVER	21330
Monroe 345kV	19MON12	28761
Majestic 345kV	19MAJTC	28754
Fostoria 345kV	05FOSTOR	22606
Fermi 345kV	19ENFPP	28766
Fermi 22kV	19FERMI2	28861

2. P = primary clearing, B = backup clearing, F = failure to trip, D = direct transfer trip, cy = cycles
3. Circuit breaker identification number
4. Davis Besse-Lemoyne 345kV line is out-of-service pre-contingency (circuit breakers 34563 and 34564 are open).
5. 345kV breaker (34562) is equipped with independent pole operation (IPO).

3. POWER FLOW ANALYSIS

The purpose of this power flow analysis was to determine the impact a possible Davis-Besse plant uprate on the FirstEnergy system by comparing the relative performance of the system with and without the uprate. There are two basic conditions under which the transmission system must operate: normal, or all-lines-in; and single or double contingency conditions. Both were examined.

The analysis was performed using GEII-PSEC's PSLF program. For pre-contingency solutions, transformer tap and phase shifting transformer angle movement were allowed. For post-contingency solutions, no motion or switching was allowed.

The branch loading performance was compared against appropriate criteria; i.e., normal continuous rating for pre-contingency loading, and long-term emergency rating (LTE) for post-contingency loading. Similarly, the voltage performance was compared to an acceptable normal operating range of 0.95 pu to 1.05 pu, and an acceptable contingency operating range of 0.90 pu to 1.05 pu.

3.1 Pre-contingency Violations

Pre-contingency criteria violations for both the benchmark system and the uprated Davis-Besse plant system are summarized in the following sections.

3.1.1 Benchmark System

Under normal system operating conditions without the uprate, the loading on four branches exceeds their normal continuous rating. A complete list of the benchmark pre-contingency overloads is shown in *Table 3-1*. The first column shows the overload in pu of normal rating (rate 1 in the load flow), the second column shows the affected branch, and the third column shows the nominal voltage level of that branch. A dual entry in the third column indicates that the overloaded branch is a transformer. The fourth, fifth and sixth columns show the real power flow, reactive power flow, and current flow, respectively. The seventh column shows the MVA flow (pu overload times MVA rating), and the final column shows the normal MVA rating.

No pre-contingency voltage violations were observed in the benchmark system.

Table 3-1

Benchmark Pre-Contingency Branch Loading Violations

Loading (pu)	Branch Name	Voltage (kV)	P (MW)	Q (MVAr)	Amps (A)	MVA	MVA Rating
1.02	02DALE-05W CANT	138	-177	-28	791	179	185
1.05	04IVY-04IVYQ14	36/138	-69	-11	1210	70	72
1.07	04NRTHFL-04NFLDQ4	36/138	-49	-7	844	49	49
1.02	05REEDUR-05TORREY	138	-188	-11	813	188	191

3.1.2 1033MW Davis-Besse Plant Uprate

Under normal system operating conditions with the uprate (1033MW), no additional branch overloads were observed. In addition, no pre-contingency voltage violations were observed with the Davis-Besse uprate.

3.2 Post-contingency Violations

Ten contingencies were analyzed to investigate the impact of the uprated Davis-Besse plant on the FirstEnergy system. A description of each contingency is included in *Appendix B*. *Appendix C* contains one-line diagrams of the FirstEnergy system, illustrating the power flow results for all contingencies, with and without the uprate.

Post-contingency criteria violations for both the benchmark system and the uprated Davis-Besse plant study system are summarized in the following sections.

3.2.1 Benchmark System

Without the uprate, loadings on two transformers exceed their LTE ratings. A complete list of the benchmark post-contingency overloads is shown in *Table 3-2*. The first column identifies the contingency that results in the most severe overload on a given branch, the second column shows the pre-contingency loading in pu of normal rating (rate 1 in the load flow), the third column shows the post-contingency loading in pu of LTE rating (rate 2 in the load flow), the fourth column shows the affected branch, and the fifth column shows the nominal voltage level of that branch. A dual entry in the fifth column indicates that the overloaded branch is a transformer. The sixth, seventh, and eighth columns show the post-contingency real power flow, reactive power flow, and current flow, respectively. The ninth column shows the MVA flow (pu post-contingency loading times MVA rating) and the final column shows the LTE MVA rating.

No post-contingency voltage violations were observed in the benchmark system.

Table 3-2
Benchmark Post-Contingency Branch Loading Violations

#	Pre-C Loading (pu)	Post-C Loading (pu)	Branch Name	Voltage (kV)	P (MW)	Q (MVAr)	Amps (A)	MVA	MVA Rating
1	1.06	1.06	02MASURY-02MASURY	138/69	68	19	71	71	67
3	1.03	1.04	02SHNROK-02SHINRO	138/69	67	17	69	69	67

Key to Contingencies:
1: Loss of Davis Besse-Bayshore 345kV Line
3: Loss of Davis Besse Beaver 345kV Line

3.2.2 1033MW Davis-Besse Plant Uprate

With the uprate, no additional branch loading or bus voltage violations were observed under post-contingency conditions.

4. STABILITY ANALYSIS

The stability analysis was designed to evaluate the impact of the possible Davis-Besse plant uprate by focusing on the relative performance of the uprated system in comparison to the existing system. The baseline performance was established by the results of stability simulations with the current level of Davis-Besse power output (942 MW) for the combined 1999/2000 summer peak load conditions (1999 load condition modified to represent year 2000 load in FirstEnergy territory). The relative performance of the Davis-Besse uprate (1033 MW) was then compared to these benchmarks. Another series of stability simulations was performed at the uprated power level with a 67MVAr STATCOM (static compensator) at Davis-Besse to replace the dynamic var capability lost in the uprate. The performance of this system was compared to both benchmark system performance and the performance of the system with the uprate alone.

4.1 1033MW Davis-Besse Plant Uprate

A summary of system performance with and without the uprate and with and without the STATCOM is shown in *Table 4-1*. A complete set of system variables is plotted for each contingency and shown in *Appendix D*. These plots show the system performance with the uprate (1033MW) and the STATCOM as a solid line, the system performance of the uprate (1033MW) alone with a dotted line, and the baseline system (942MW) with a dash-dot line.

Under the 1999/2000 summer peak load condition, the system response for twelve of fourteen contingencies was first-swing stable with well-damped oscillations for all three Davis-Besse scenarios. System response to contingency 4 varied, and all systems were unstable in response to contingency 8.

Contingency 4 is a three-phase fault at the Bayshore 345kV bus, cleared by tripping the Bayshore breakers at 4.5 cycles and the Davis-Besse breakers at 22.5 cycles. For this event, the existing system response is stable but neither of the uprated system responses are stable.

Contingency 8 is a three-phase fault in Davis Besse circuit breaker 34564, cleared by tripping the Davis Besse-Lemoyne 345kV line in 4.5 cycles and the Davis Besse-Beaver 345kV line in 12 cycles. For this event, all three system responses are unstable.

Table 4-1
Transient Stability Analysis Results

Contingency	Existing (Output = 942MW)	Uprate (Output = 1033MW)	Uprate & STATCOM (Output = 1033MW)
1	Stable & Damped	Stable & Damped	Stable & Damped
2	Stable & Damped	Stable & Damped	Stable & Damped
3	Stable & Damped	Stable & Damped	Stable & Damped
4	Stable & Damped	Unstable	Unstable
5	Stable & Damped	Stable & Damped	Stable & Damped
6	Stable & Damped	Stable & Damped	Stable & Damped
7	Stable & Damped	Stable & Damped	Stable & Damped
8	Unstable	Unstable	Unstable
9	Stable & Damped	Stable & Damped	Stable & Damped
10	Stable & Damped	Stable & Damped	Stable & Damped
11	Stable & Damped	Stable & Damped	Stable & Damped
12	Stable & Damped	Stable & Damped	Stable & Damped
13	Stable & Damped	Stable & Damped	Stable & Damped
14	Stable & Damped	Stable & Damped	Stable & Damped

5. CONCLUSIONS AND RECOMMENDATIONS

FirstEnergy Corporation requested that PSEC perform a transient stability study of the Davis-Besse nuclear power plant for two reasons. First, an update of the latest stability study was desired. Second, a turbine-generator uprate is under consideration.

For this study, a 10% increase in gross power output was assumed for the uprate. Therefore, an increase in both the rating (1120MVA) and power factor (0.92) were used to increase the power output to 1033MW. The change in power factor also reduced the unit's reactive power capability from approximately 500MVAr to 433MVAr.

It is possible to replace the 67MVAr of generator reactive capability with another reactive power source. Such a var source could be either static (mechanically switched capacitors (MSC)) or dynamic (static compensator (STATCOM), static var compensator (SVC), or synchronous condenser) or a combination. The needs of the system will dictate size, location, and type of source. For this study, the impact of a 67MVAr STATCOM on stability performance was investigated.

This study evaluated the steady-state and transient performance of the FirstEnergy system with both the existing Davis-Besse power level and the uprated power level. A variety of disturbance scenarios were analyzed, including single transmission line outages, single generating unit outages, double transmission line outages, and combined transmission line and generating unit outages.

Both power flow and stability analyses were performed. The power flow analysis identified branch (e.g., transmission line or transformer) loading and bus voltage violations under both normal and contingency (i.e., outage) operating conditions. The stability analysis evaluated both first swing stability and system damping. Both analyses used a relative performance approach to determine the impact of the plant uprate on the FirstEnergy power system. First, system performance with the current plant output (942 MW) was determined in order to establish the benchmark, and then system performance with the uprate (1033MW) was determined and compared to the benchmark.

The power flow results described in Section 3 show that two lines and two transformers exceed their ratings for the benchmark system under normal system conditions. No additional overloads were observed with the Davis-Besse plant uprated to 1033MW. No pre-contingency voltage violations were observed with either level of Davis-Besse plant output.

The post-contingency power flow analysis showed two transformer overloads in the benchmark system. No post-contingency voltage violations were observed in the benchmark system. No additional branch overloads or voltage violations were observed with the Davis-Besse uprate to 1033MW.

Thus, the power flow analysis indicates that the uprate results in no additional overloads or voltage violations.

The stability analysis compared the performance of the Davis-Besse uprate (1033MW) to benchmark system performance (942MW). Another series of stability simulations was performed at the uprated power level with a 67MVAr STATCOM at Davis-Besse to replace the dynamic var capability lost in the uprate. The performance of this system was compared to both the benchmark system performance and the performance of the system with the uprate alone.

The stability analysis showed that under the 1999/2000 summer peak load condition, the system response for twelve of fourteen contingencies is first-swing stable with well-damped oscillations for all three Davis-Besse scenarios. System response to contingency 4 varied, and all systems were unstable in response to contingency 8.

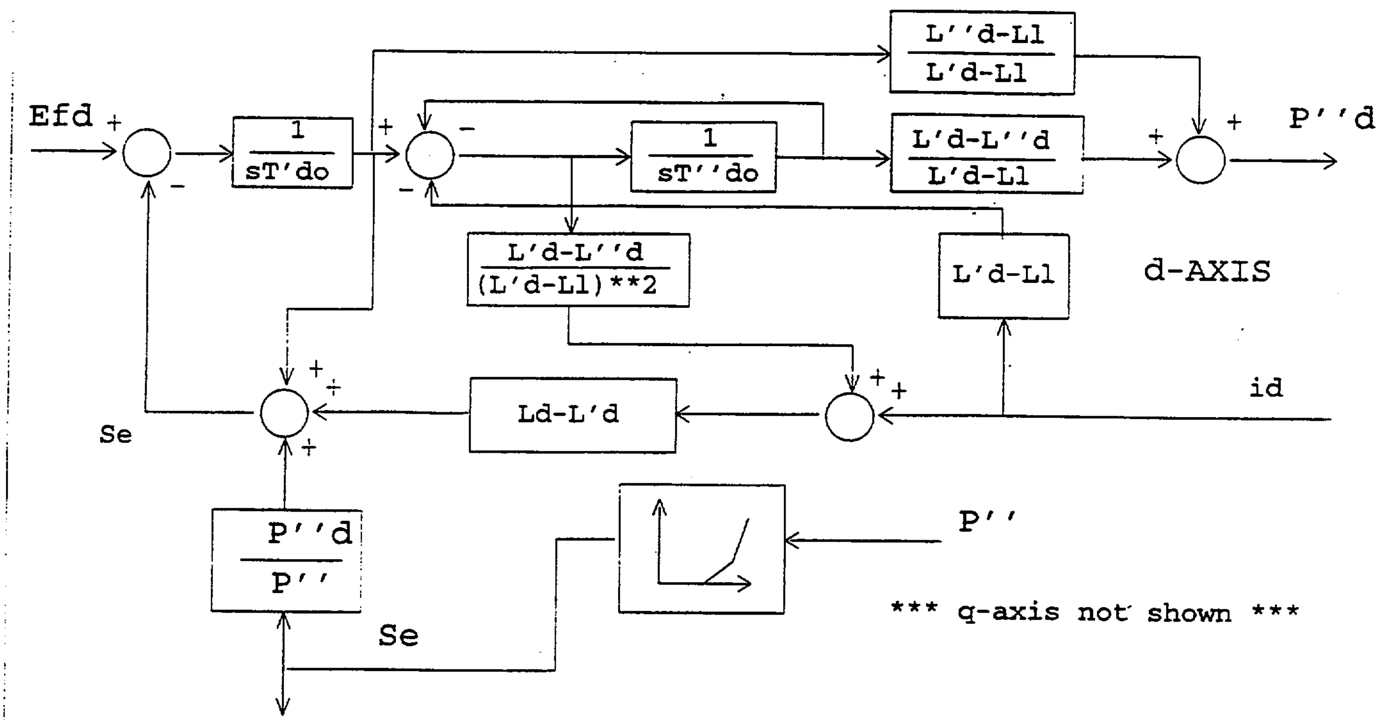
Contingency 4 is a three-phase fault at the Bayshore 345kV bus, cleared by tripping the Bayshore breakers at 4.5 cycles and the Davis-Besse breakers at 22.5 cycles. For this event, the existing system response is stable but neither of the uprated system responses are stable.

Contingency 8 is a three-phase fault in Davis Besse circuit breaker 34564, cleared by tripping the Davis Besse-Lemoyne 345kV line in 4.5 cycles and the Davis Besse-Beaver 345kV line in 12 cycles. For this event, all three system responses are unstable.

Improved system stability may be achieved by the application of a shorter breaker/relay operating time or a larger dynamic reactive power source. While this study used a STATCOM to supply vars, other types of equipment are also potentially suited to this application, such as an SVC or synchronous condenser to supply dynamic var support or mechanically switched capacitors to supply steady-state support. If the Davis-Besse uprate occurs, additional analysis is recommended to determine methods to improve system stability for the above contingencies.

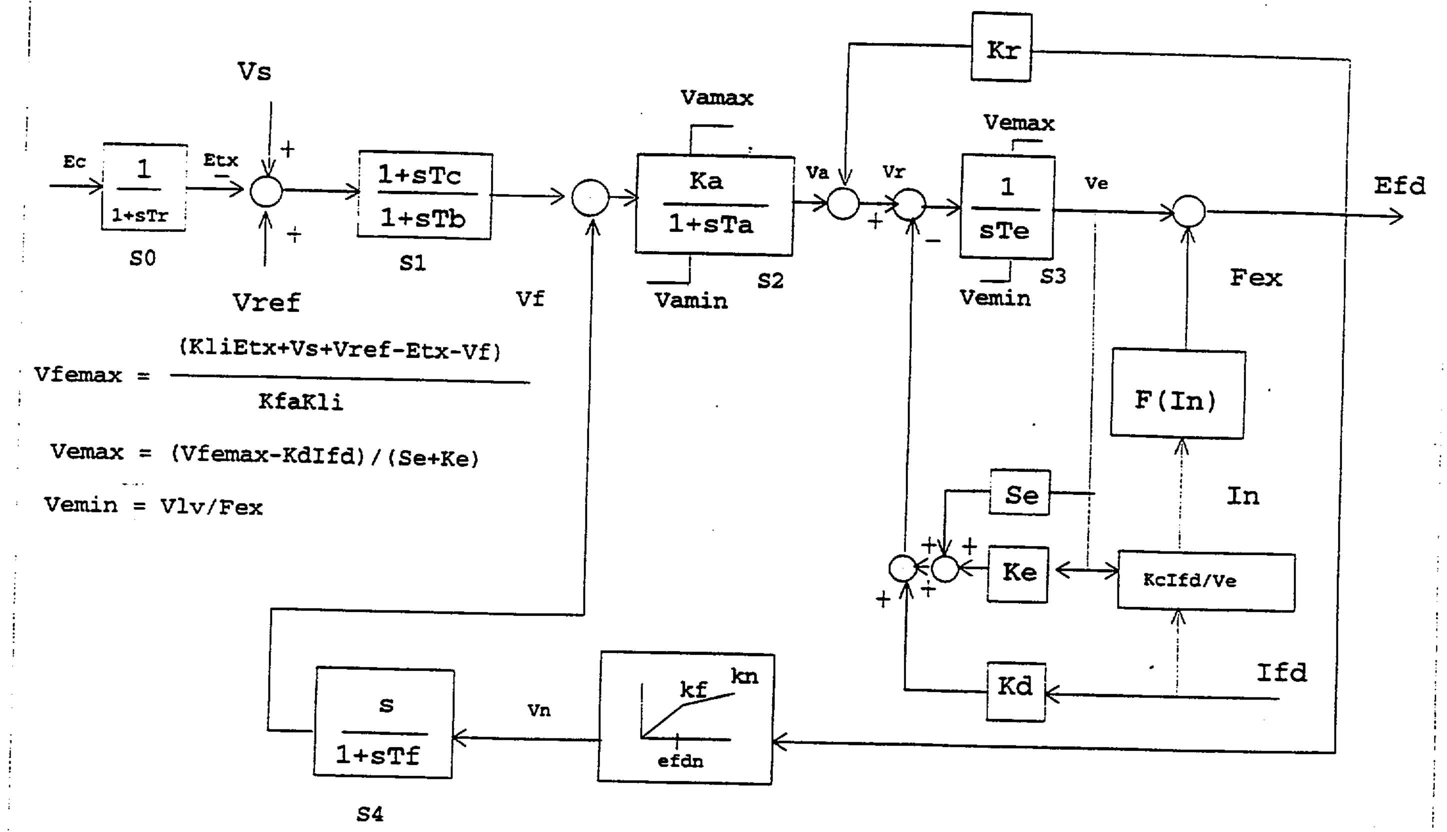
Appendix A
Davis-Besse Plant Dynamic Models

Davis-Besse Plant Model with Power Output = 942MW



Thu Aug 12 09:45:23 1999 genrou 700 DB GEN 25.0 1

ld	1.7900	s12	0.4120
lpd	0.3650	h	3.4300
lppd	0.2800	d	0.0000
lq	1.6800	rcomp	0.0000
lpq	0.5750	xcomp	0.0000
lppq	0.2800	accel	0.0000
ll	0.2150		
ra	0.0044		
tpdo	7.3000		
tppdo	0.0320		
tpqo	0.4100		
tppqo	0.0550		
sl	0.0907		



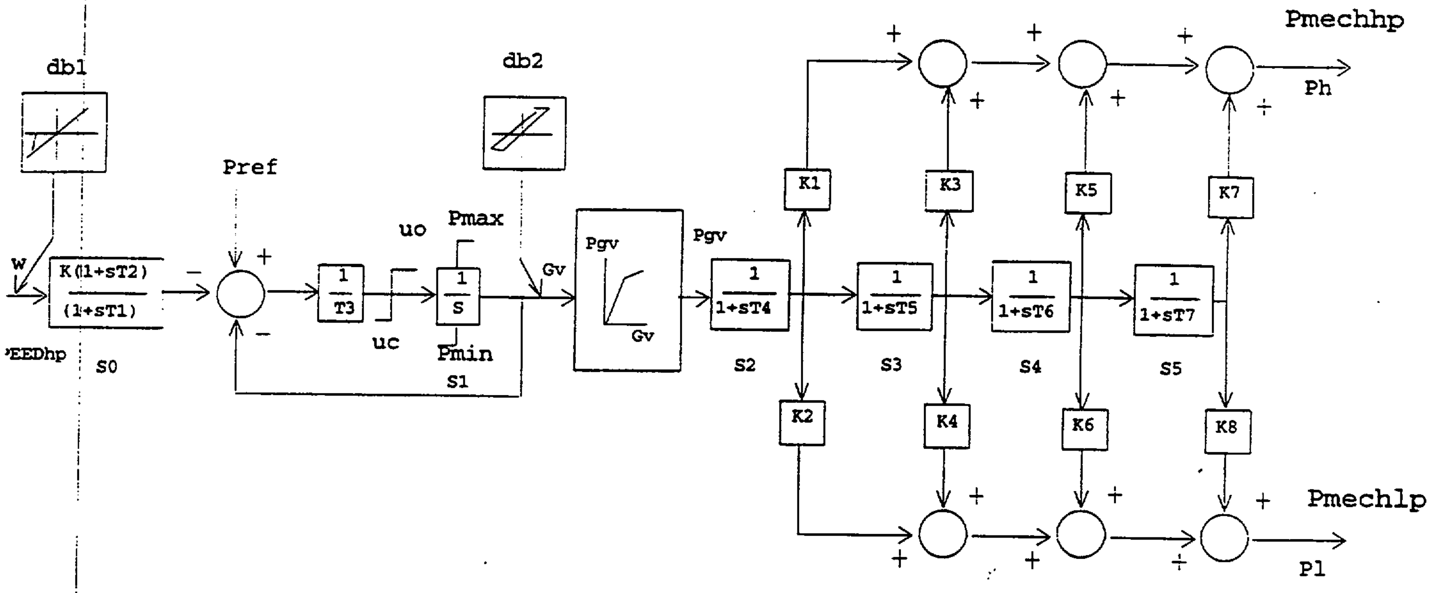
$$Vfemax = \frac{(KliEtx+Vs+Vref-Etx-Vf)}{KfaKli}$$

$$Vemax = (Vfemax-KdIfd)/(Se+Ke)$$

$$Vemin = Vlv/Fex$$

Thu Aug 12 09:45:26 1999 exac3a 700 DB GEN 25.0 1

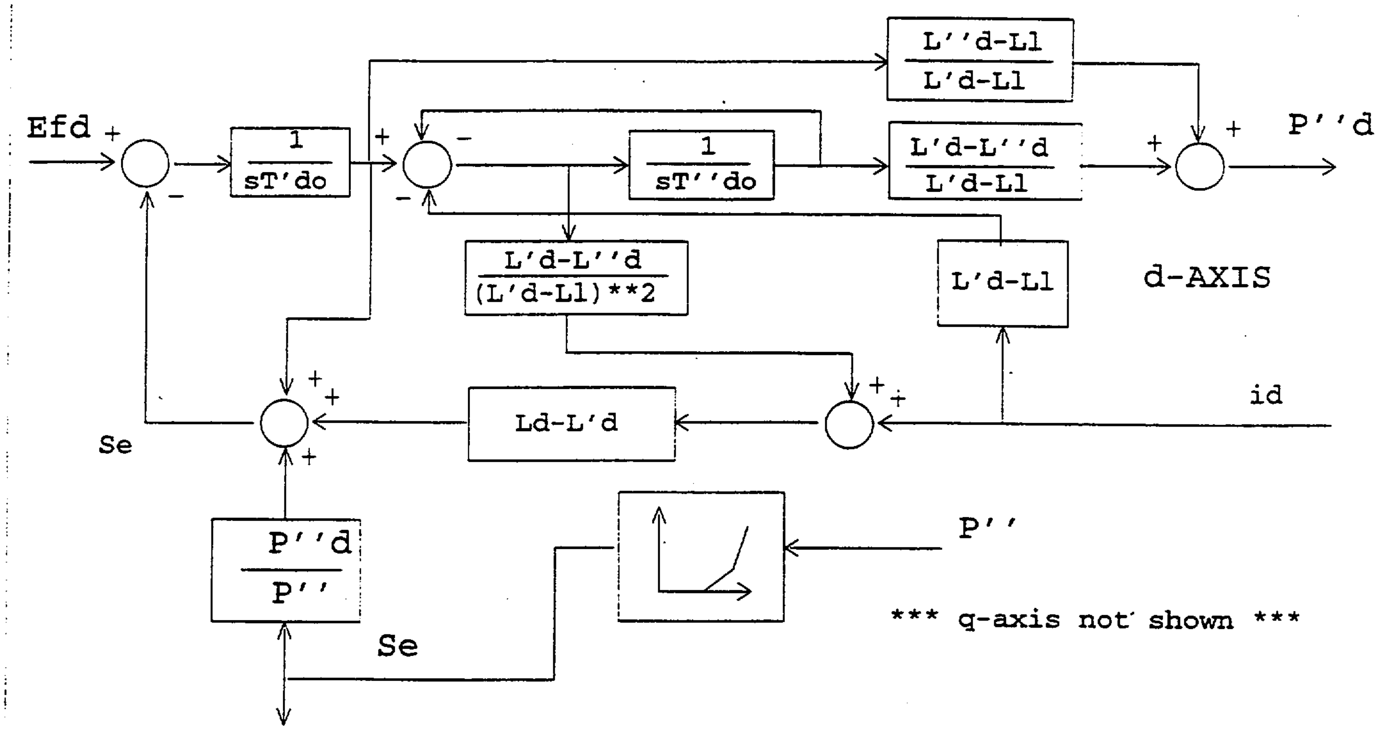
tr	0.0000	efdn	0.8610
tb	0.0000	kc	0.1300
tc	0.0000	kd	1.0500
ka	46.2500	ke	1.0000
ta	0.0130	vlv	0.5900
vamax	1.0000	e1	5.0800
vamin	-0.9500	se1	0.3330
te	4.8500	e2	6.7800
klv	0.2600	se2	2.7500
kr	6.1700	kl1	0.5900
kf	0.0720	kfa	0.0500
tf	1.0000		
kn	0.0500		



Thu Aug 12 09:45:29 1999 ieeeg1 700 DB GEN 25.0 1

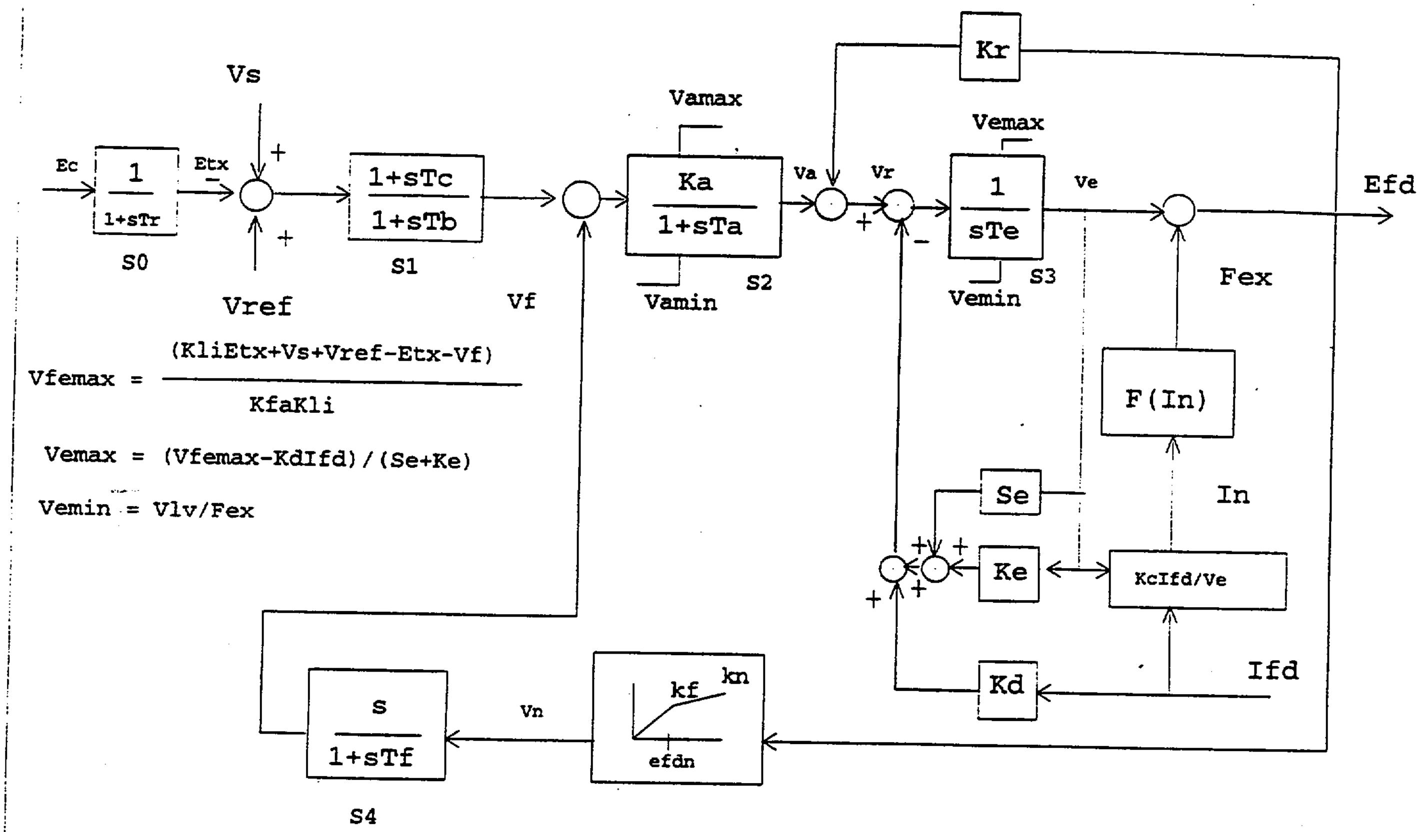
k	20.0000	k4	0.0000	pgv2	0.0000
t1	0.0500	t6	0.0000	gv3	0.0000
t2	0.0000	k5	0.0000	pgv3	0.0000
t3	0.0500	k6	0.0000	gv4	0.0000
uo	10.0000	t7	0.0000	pgv4	0.0000
uc	-10.0000	k7	0.0000	gv5	0.0000
pmax	1.0000	k8	0.0000	pgv5	0.0000
pmin	0.0000	db1	0.0000	gv6	0.0000
t4	0.5000	eps	0.0000	pgv6	0.0000
k1	0.3300	db2	0.0000		
k2	0.0000	gv1	0.0000		
t5	10.0000	pgv1	0.0000		
k3	0.6700	gv2	0.0000		

Davis-Besse Plant Model with Power Output = 1033MW



Thu Aug 12 09:45:52 1999 genrou 700 DB GEN 25.0 1

ld	1.8760	s12	0.4120
lpd	0.3830	h	3.4300
lppd	0.2930	d	0.0000
lq	1.7610	rcomp	0.0000
lpq	0.6030	xcomp	0.0000
lppq	0.2930	accel	0.0000
ll	0.2250		
ra	0.0046		
tpdo	7.3000		
tppdo	0.0320		
tpqo	0.4100		
tppqo	0.0550		
s1	0.0907		



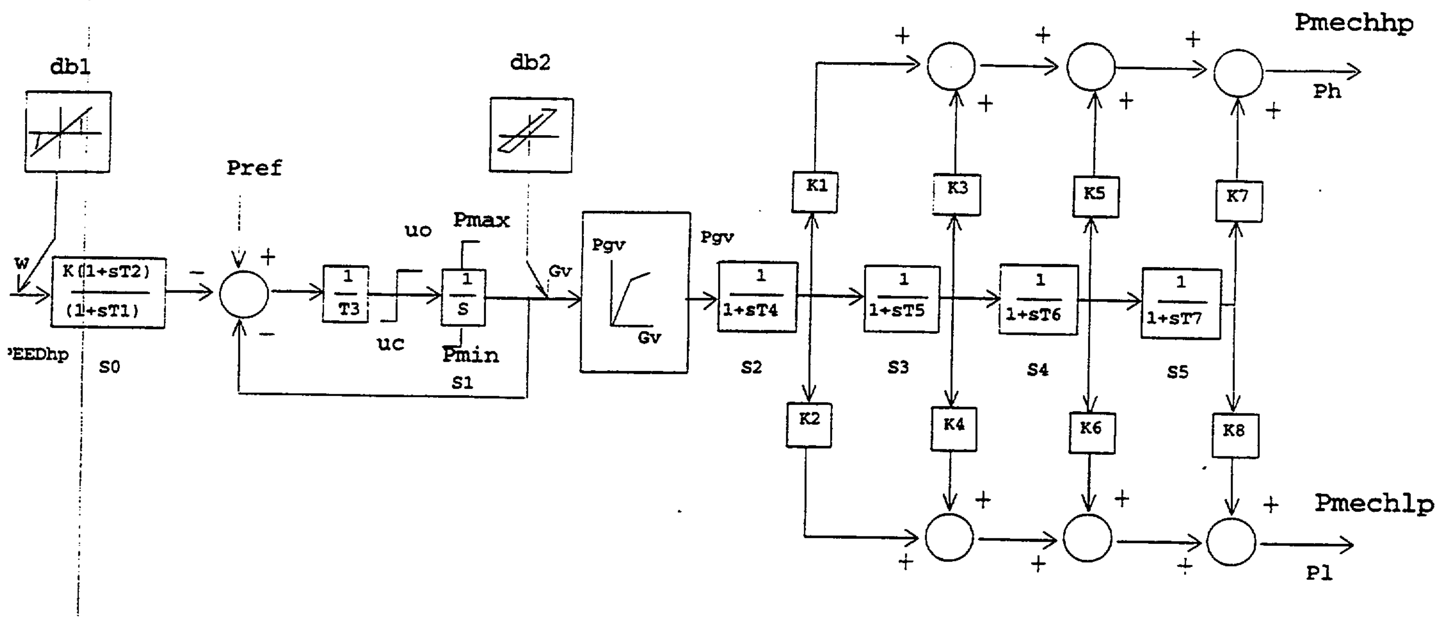
$$\mathrm{Vfemax} = \frac{(\mathrm{KliEtx+Vs+Vref-Etx-Vf})}{\mathrm{KfaKli}}$$

Vemax = (Vfemax-KdIfd)/(Se+Ke)

Vemin = Vlv/Fex

Thu Aug 12 09:45:55 1999 exac3a 700 DB GEN 25.0 1

tr	0.0000	efdn	0.8610
tb	0.0000	kc	0.1300
tc	0.0000	kd	1.0500
ka	46.2500	ke	1.0000
ta	0.0130	vlv	0.5900
vamax	1.0000	e1	5.0800
vamin	-0.9500	se1	0.3330
te	4.8500	e2	6.7800
klv	0.2600	se2	2.7500
kr	6.1700	kl1	0.5900
kf	0.0720	kfa	0.0500
tf	1.0000		
kn	0.0500		



Thu Aug 12 09:45:57 1999 ieeeg1 700 DB GEN 25.0 1

k	20.0000	k4	0.0000	pgv2	0.0000
t1	0.0500	t6	0.0000	gv3	0.0000
t2	0.0000	k5	0.0000	pgv3	0.0000
t3	0.0500	k6	0.0000	gv4	0.0000
uo	10.0000	t7	0.0000	pgv4	0.0000
uc	-10.0000	k7	0.0000	gv5	0.0000
pmax	1.0000	k8	0.0000	pgv5	0.0000
pmin	0.0000	db1	0.0000	gv6	0.0000
t4	0.5000	eps	0.0000	pgv6	0.0000
k1	0.3300	db2	0.0000		
k2	0.0000	gv1	0.0000		
t5	10.0000	pgv1	0.0000		
k3	0.6700	gv2	0.0000		

Appendix B
Power Flow Analysis Contingency List

#	From Bus-To Bus, "ID"	Description
1	22021-22025, "1"	Trip Davis Besse-Bayshore 345kV Line
2	22021-22026, "1"	Trip Davis Besse-Lemoyne 345kV Line
3	22021-21330, "1"	Trip Davis Besse-Beaver 345kV Line
7	22021-22025, "1" 700, "1" 22021-700, "1" 22021-22026, "1"	Trip Davis Besse-Bayshore 345kV Line Trip Davis-Besse Unit, Redispatch, Trip Davis-Besse GSU, Transfer Auxiliary Loads Davis Besse-Lemoyne 345kV Line Out-of-service Pre-contingency
8	22021-22026, "1" 22021-21330, "1"	Trip Davis Besse-Lemoyne 345kV Line, Trip Davis Besse-Beaver 345kV Line
9	22021-22025, "1" 22021-21330, "1"	Trip Davis Besse-Bayshore 345kV Line, Trip Davis Besse-Beaver 345kV Line
10	700, "1" 22021-700, "1"	Trip Davis-Besse Unit, Redispatch, Trip Davis-Besse GSU, Transfer Auxiliary Loads
12	28861, "2" 28766-28861, "1"	Trip Fermi Unit, Redispatch, Trip Fermi GSU
13	22025-28761, "1" 22026-28754, "1"	Trip Bayshore-Monroe 345kV Line, Trip Lemoyne-Majestic 345kV Line
14	22025-22605, "1" 22605-22606, "1" 22026-22606, "1"	Trip Bayshore-Fostoria 345kV Line, Trip Lemoyne-Fostoria 345kV Line

Appendix C
Power Flow Post-Contingency One-line Diagrams

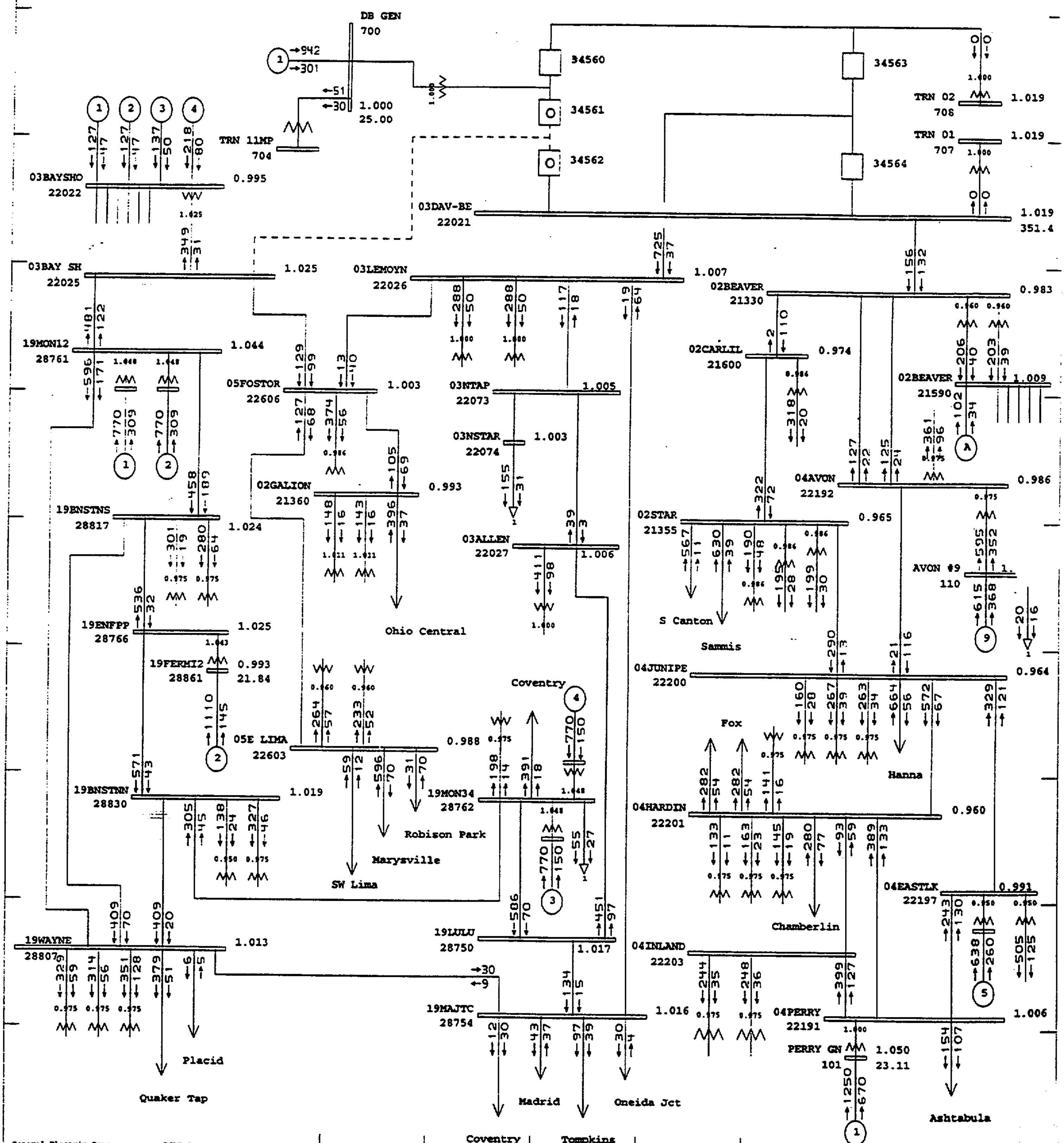
Tab Number	Case Description
1	345kV Drawing, Benchmark with Davis-Besse Plant Output = 942MW
2	DBS Drawing, Benchmark with Davis-Besse Plant Output = 942MW
3	345kV Drawing, Uprate with Davis-Besse Plant Output = 1033MW
4	DBS Drawing, Uprate with Davis-Besse Plant Output = 1033MW

345kV Network Drawing

Benchmark with Davis-Besse Plant Output=942MW

Post-Contingency Power Flow Results

Loss of Davis Besse-Bayshore 345kV Line
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



General Electric Company PSLF Program

MW/MVAR Wed Aug 11 14:17:54 1...

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/

dvb (1) Loss of Davis Besse-Bayshore 345kV Line

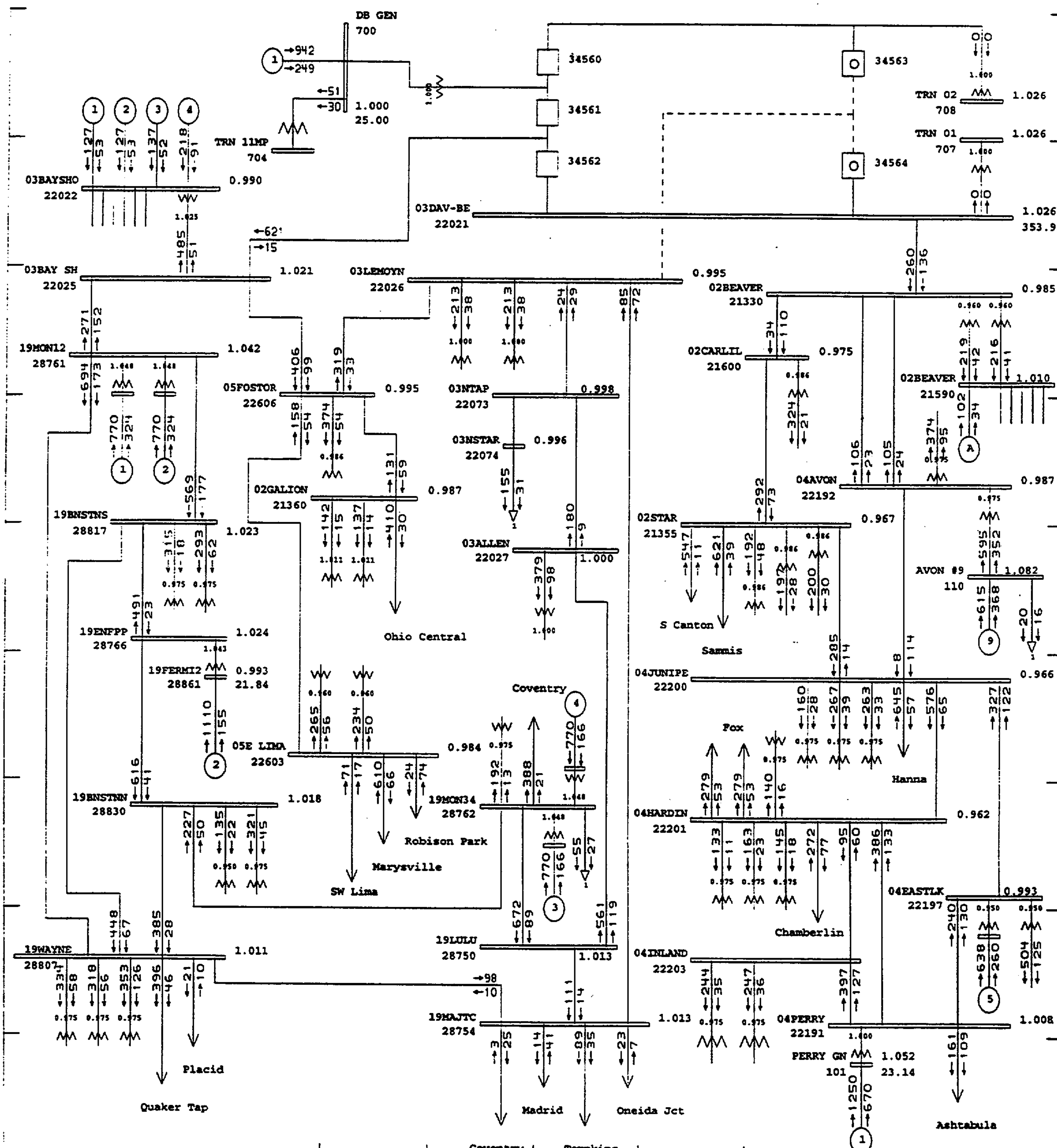
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw

temp.wrk

Rating = 1

Loss of Davis Besse-Lemoyne 345kV Line
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



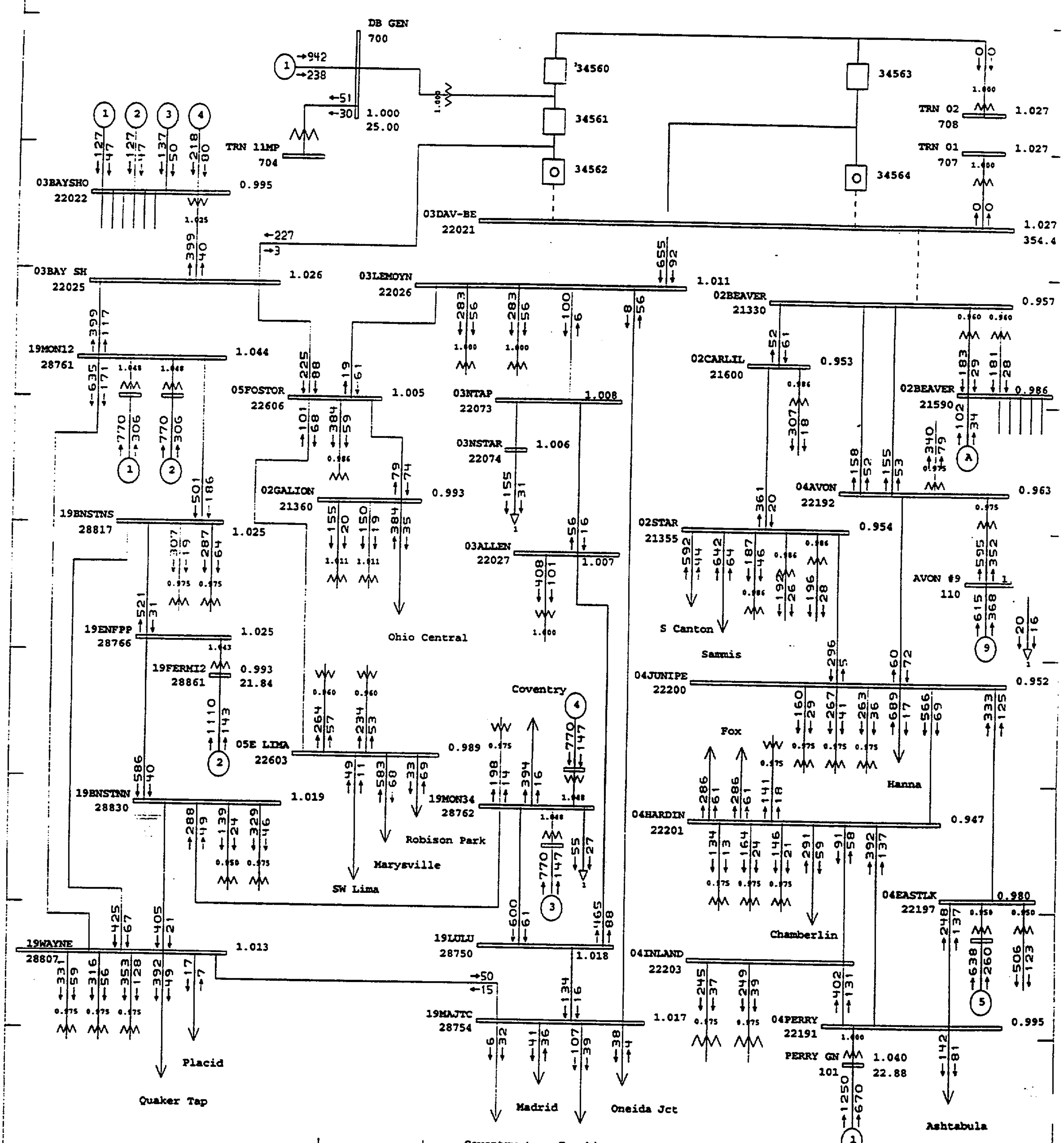
General Electric Company | PSLF Program

MW/MVAR | Wed Aug 11 14:18:01 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (2) Loss of Davis Besse-Lemoyne 345kV Line
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
temp.wrk
Rating = 1

Loss of Davis Besse-Beaver 345kV Line
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



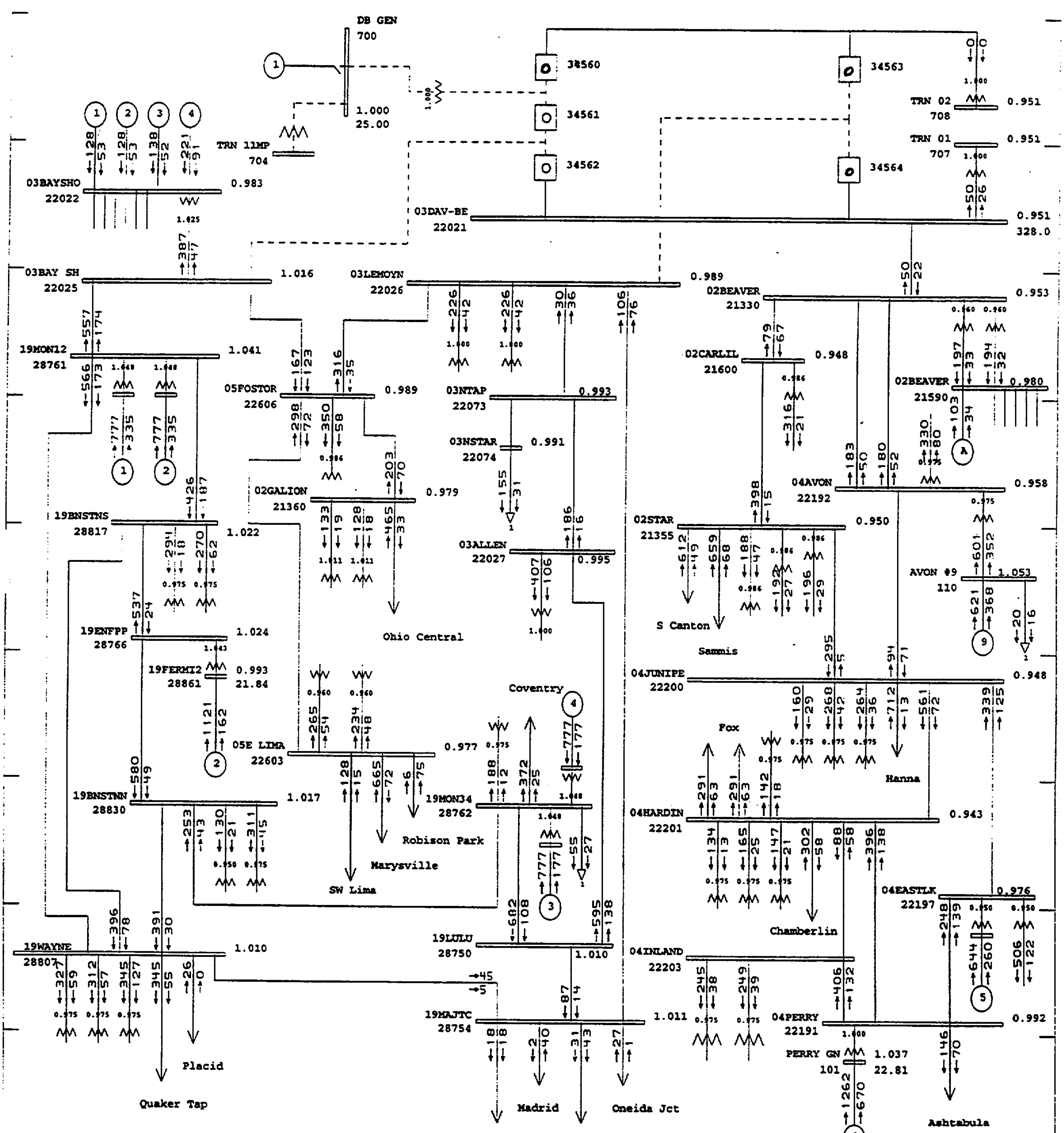
General Electric Company PSLF Program

MW/MVAR Wed Aug 11 14:18:09

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLH 10/
dvb [3] Loss of Davis Besse-Beaver 345kV Line
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
temp.wrk
Rating = 1

Loss of Davis Besse-Bayshore 345kV Lines & DB Unit
Davis Besse-Lemoyne 345kV Line Out Pre-Contingency
Existing Davis-Besse Plant (942MW)

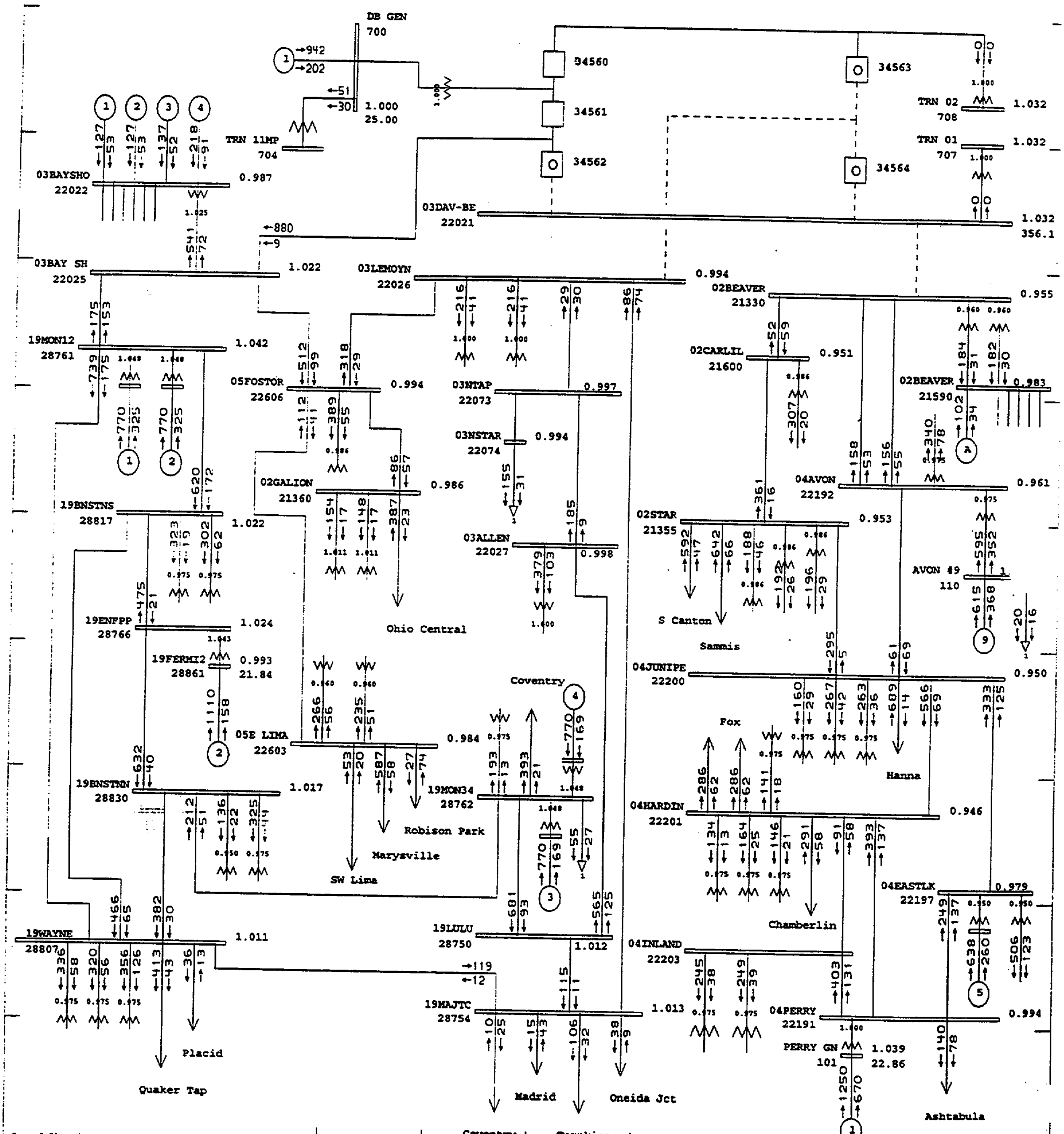


General Electric Company	PSLF Program	Coventry	Tompkins	MW/MVAR	Wed Aug 11 14:16:43 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (7) Loss of Davis Besse-Bayshore 345kV Lines & DB Unit
1240MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
temp.wrk
Rating = 1

Loss of DB-Lemoyne & DB-Beaver 345kV Lines
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)

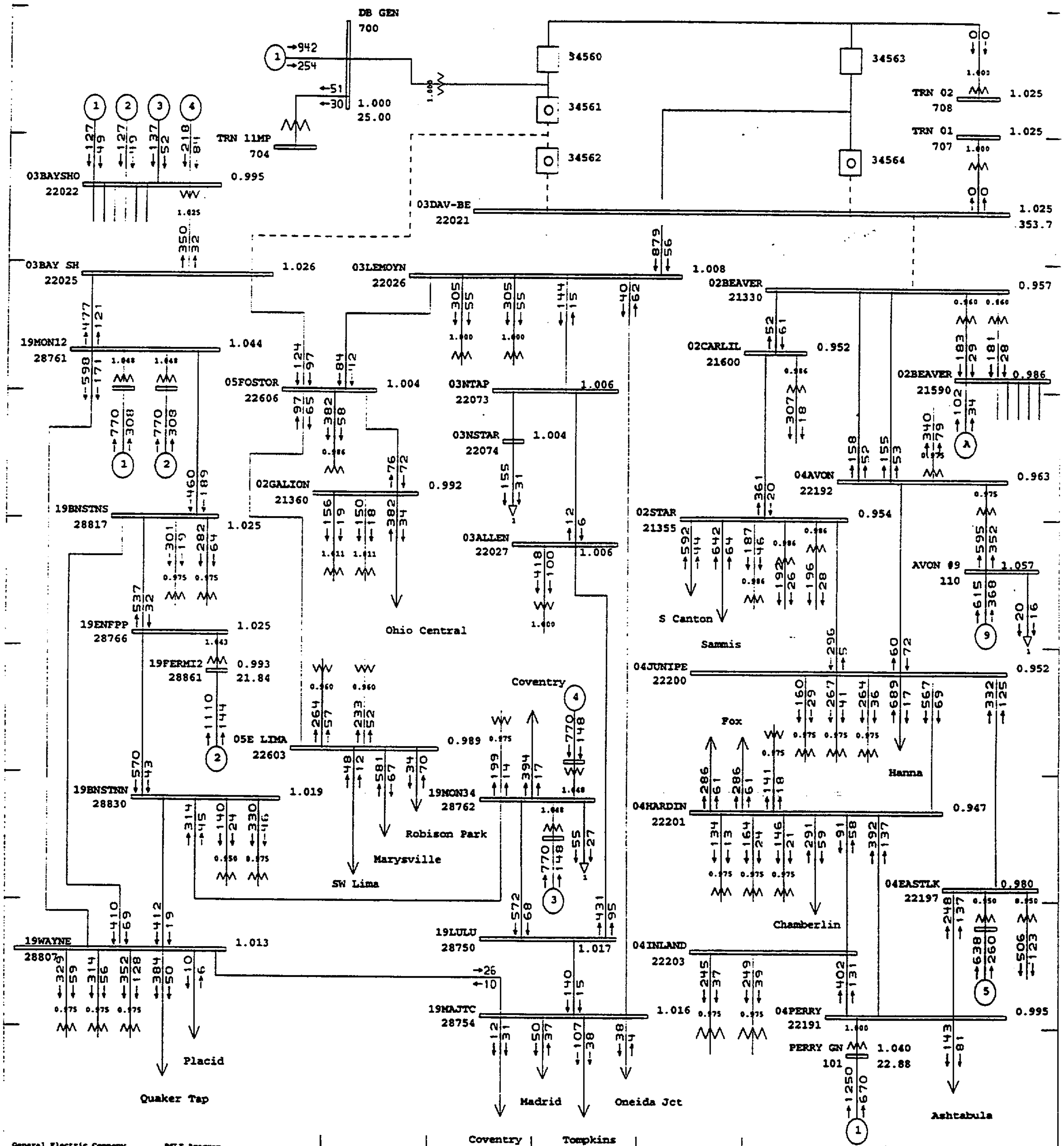


General Electric Company
PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLK 10/
dvb (8) Loss of DB-Lemoyne & DB-Beaver 345kV Lines
1240MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR
Wed Aug 11 14:18:18
db345.drw
temp.wrk
Rating = 1

Loss of DB-Bayshore & DB-Beaver 345kV Lines
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



General Electric Company PSLF Program

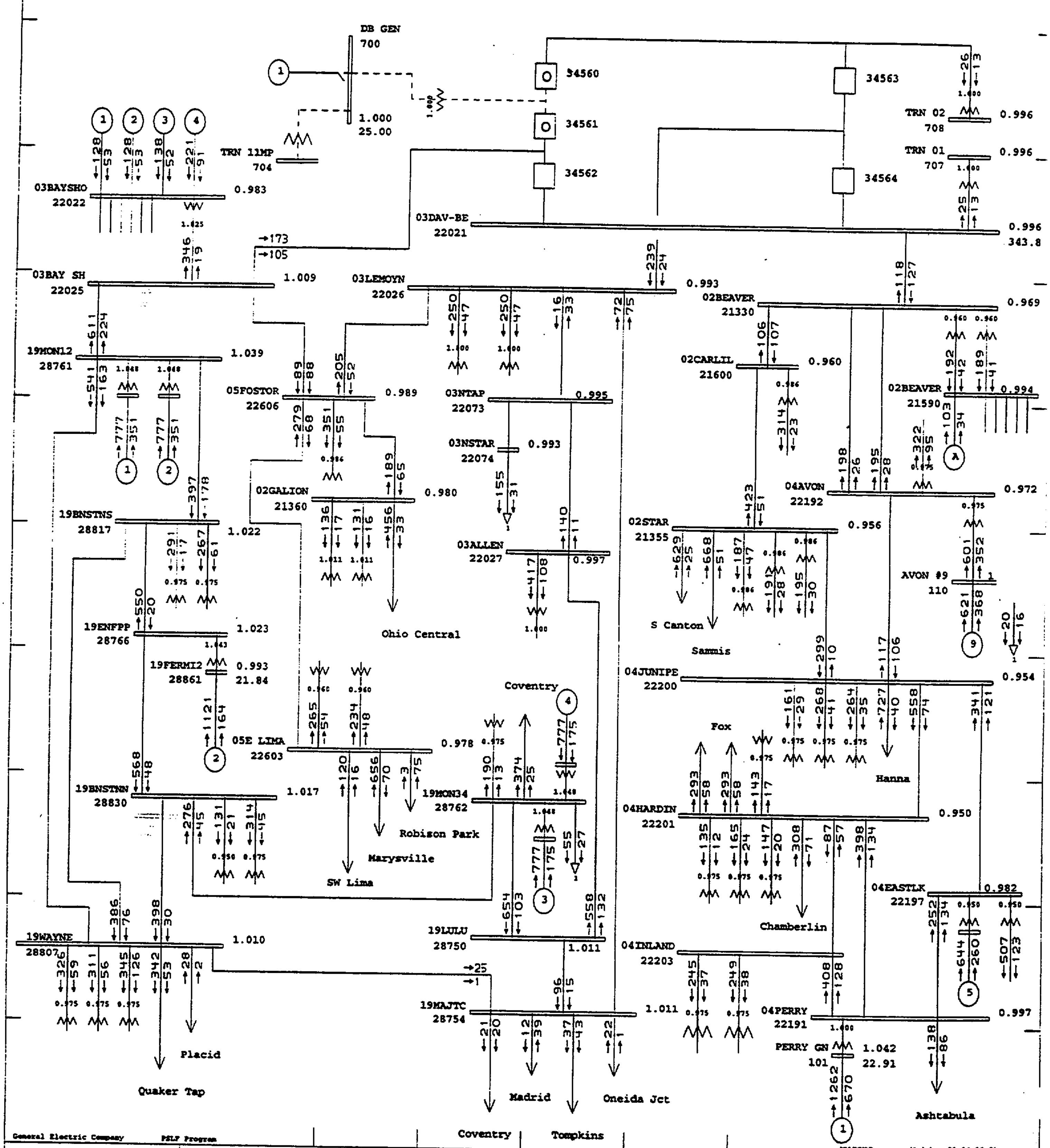
1999 SUMMER PEAK 3000 CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (9) Loss of DB-Bayshore & DB-Beaver 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR

Wed Aug 11 14:18:27 1999

db345.drw
temp.wrk
Rating = 1

Loss of Davis Besse Unit
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)

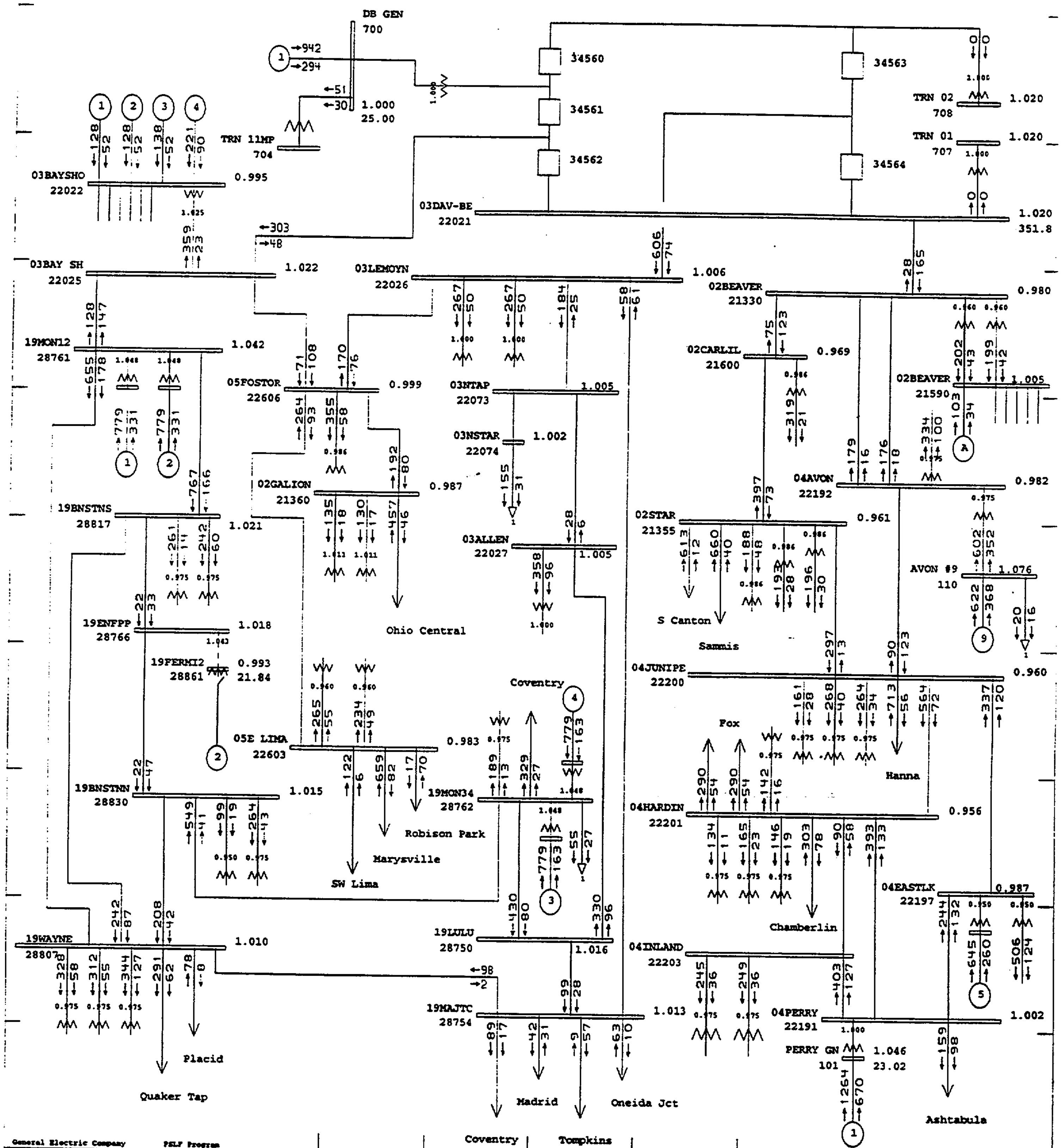


General Electric Company PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [10] Loss of Davis Besse Unit
1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR
Wed Aug 11 14:18:3
db345.drw
temp.wrk
Rating = 1

Loss of Fermi Unit
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



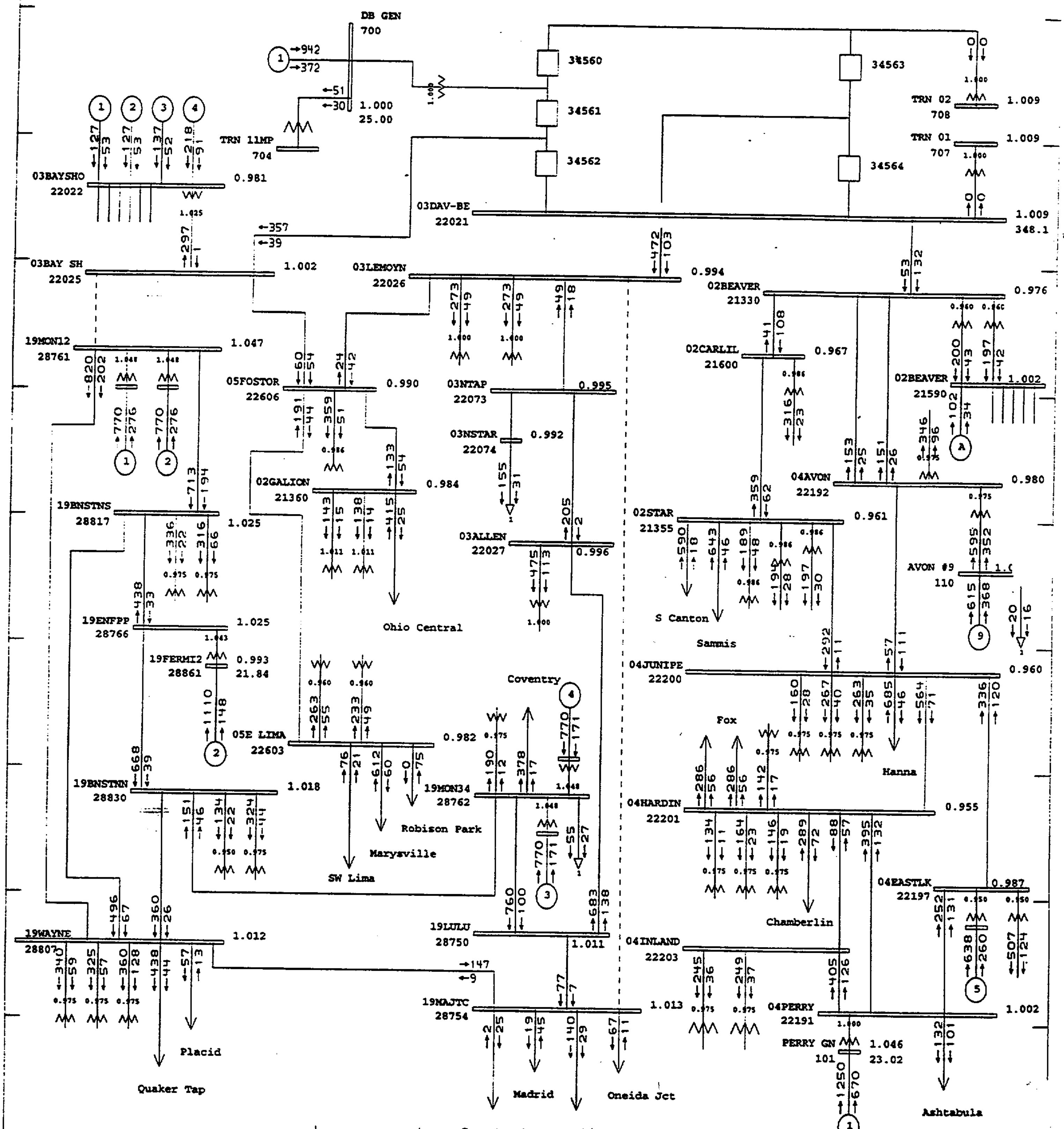
General Electric Company
PSLF Program

MW/MVAR
Wed Aug 11 14:18:45 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (12) Loss of Fermi Unit
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
comp.wrk
Rating = 1

Loss of Bayshore-Monroe & Lemoyne-Majestic 345kV Lines
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



General Electric Company PSLF Program

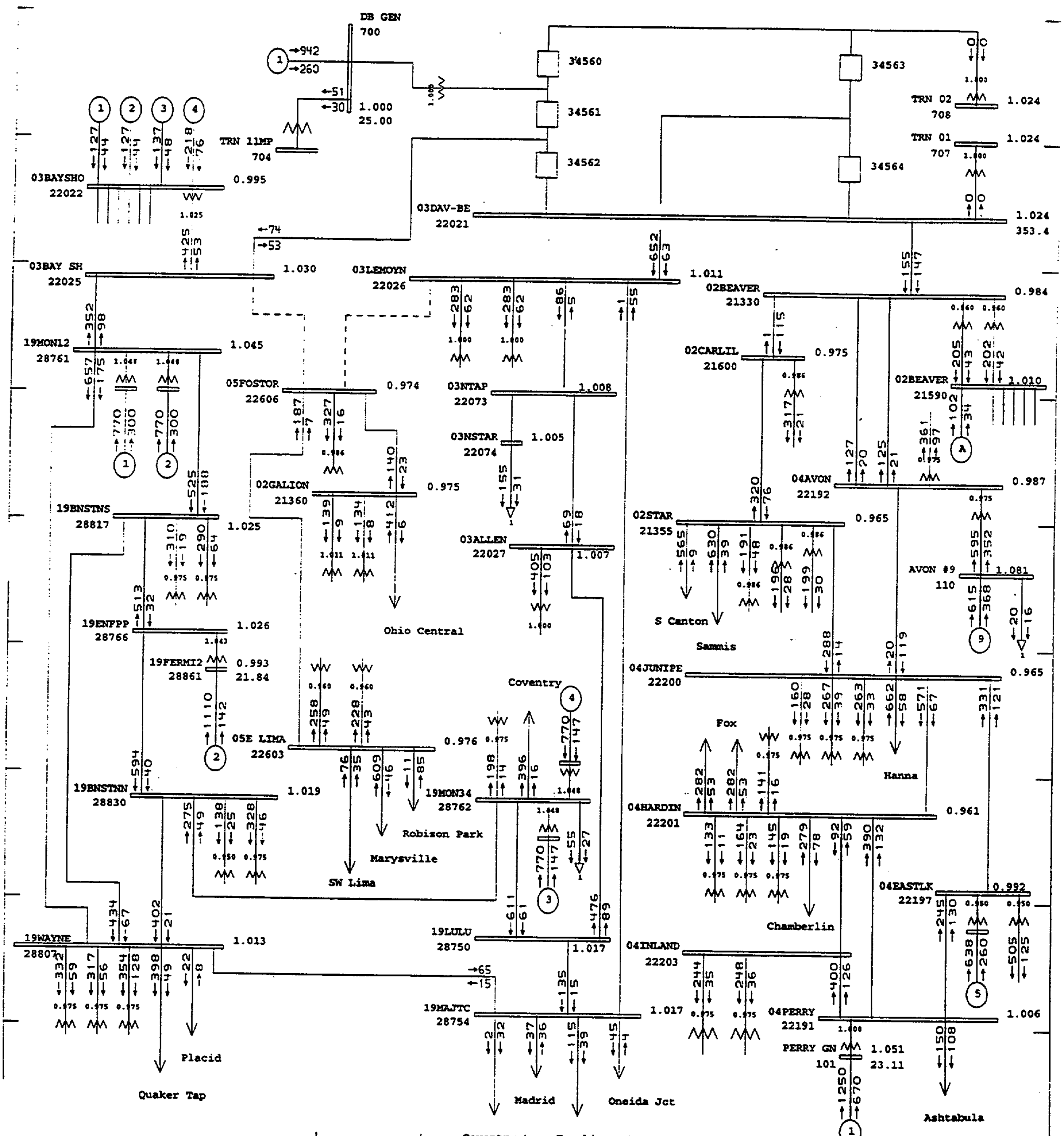
1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [13] Loss of Bayshore-Monroe & Lemoyne-Majestic 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR

Wed Aug 11 14:28:51 1.

db345.drw
temp.wrk
Rating = 1

Loss of Bayshore-Fostoria & Lemoyne-Fostoria 345kV Lines
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



General Electric Company | PSLF Program

MW/MVAR | Wed Aug 11 14:18:58 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [14] Loss of Bayshore-Fostoria & Lemoyne-Fostoria 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

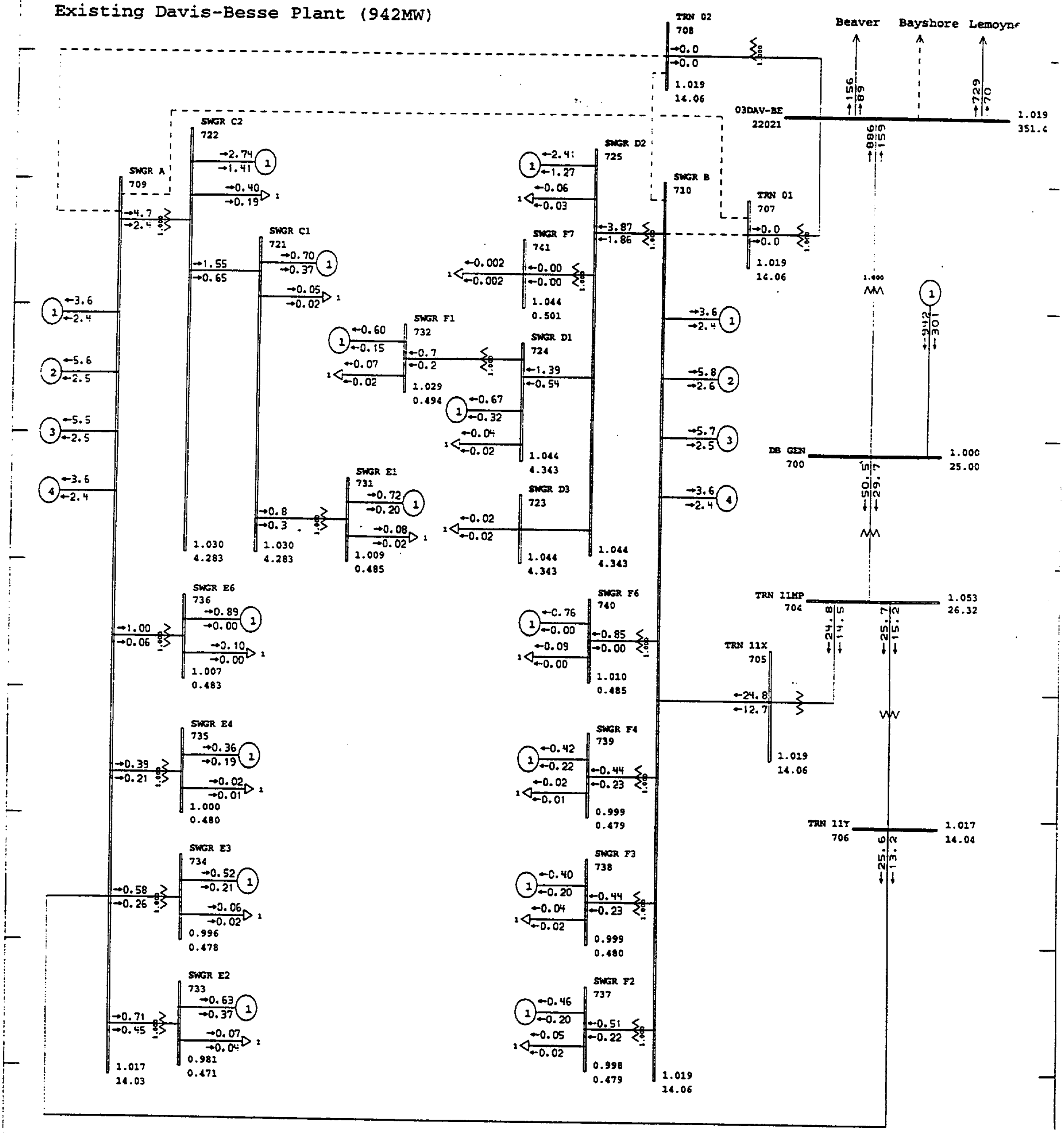
db345.drw
temp.wrk
Rating = 1

Davis-Besse Station Drawing

Benchmark with Davis-Besse Plant Output=942MW

Post-Contingency Power Flow Results

Loss of Davis Besse-Bayshore 345kV Line
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



General Electric Company

PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/

dvb [1] Loss of Davis Besse-Bayshore 345kV Line

1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR

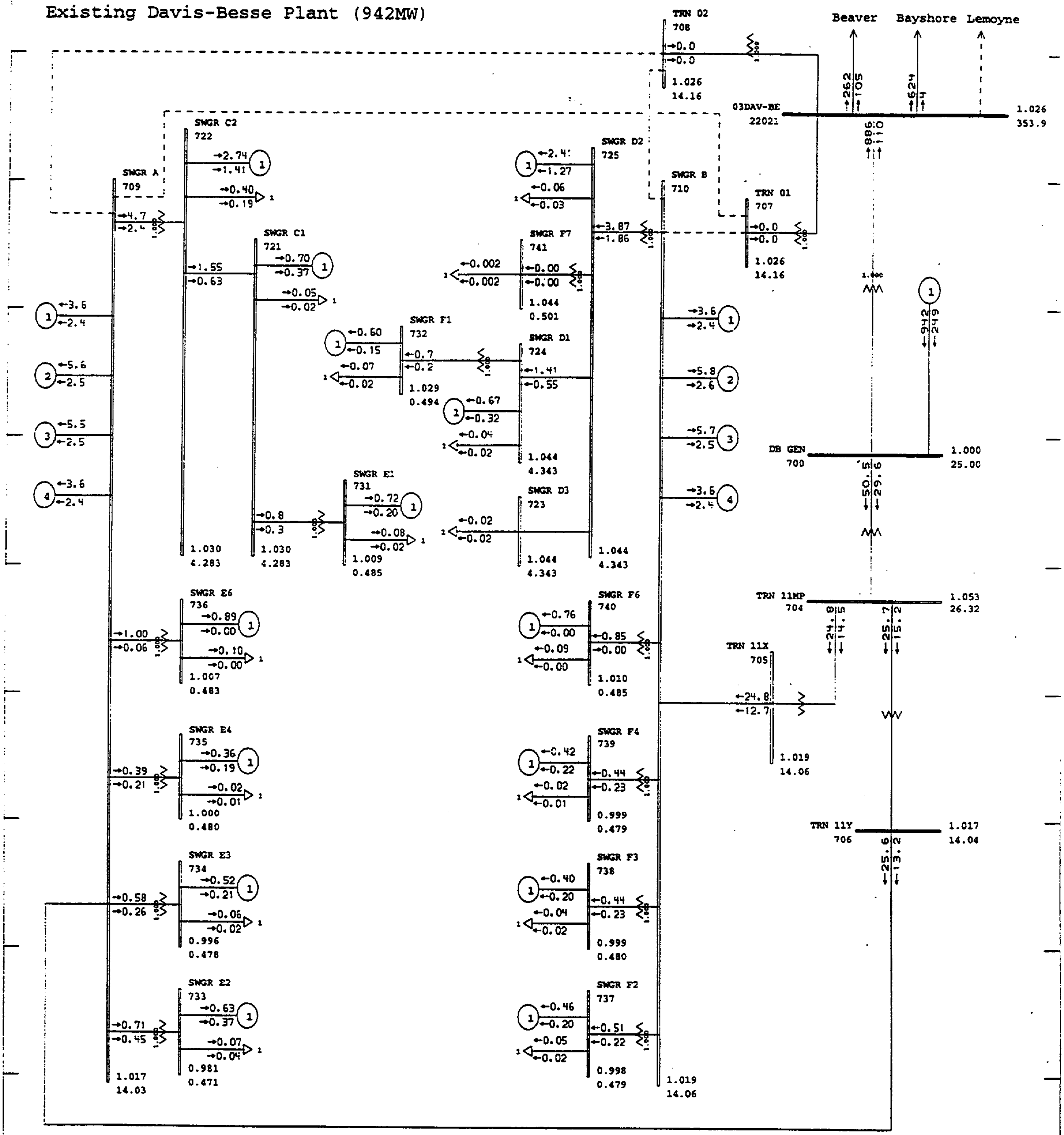
Wed Aug 11 14:17:55 19...

dbe.drw

temp.wrk

Rating = 1

Loss of Davis Besse-Lemoyne 345kV Line
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)

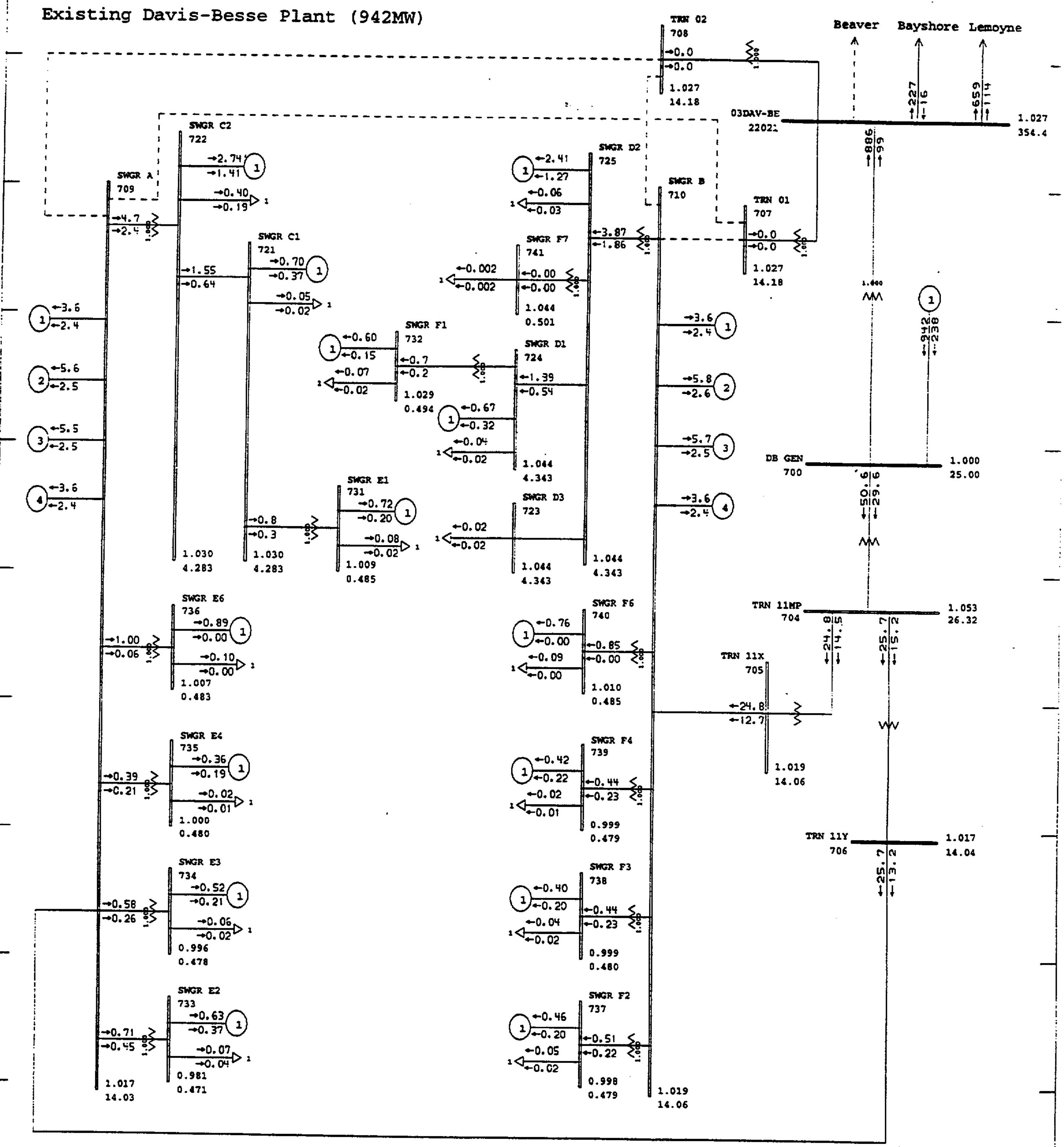


General Electric Company PSLF Program MW/MVAR Wed Aug 11 14:18:01 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [2] Loss of Davis Besse-Lemoyne 345kV Line
1240MW PERRY GROSS OUTPUT, 1205MW NET

dbc.drw
temp.wrk
Rating = 1

Loss of Davis Besse-Beaver 345kV Line
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)

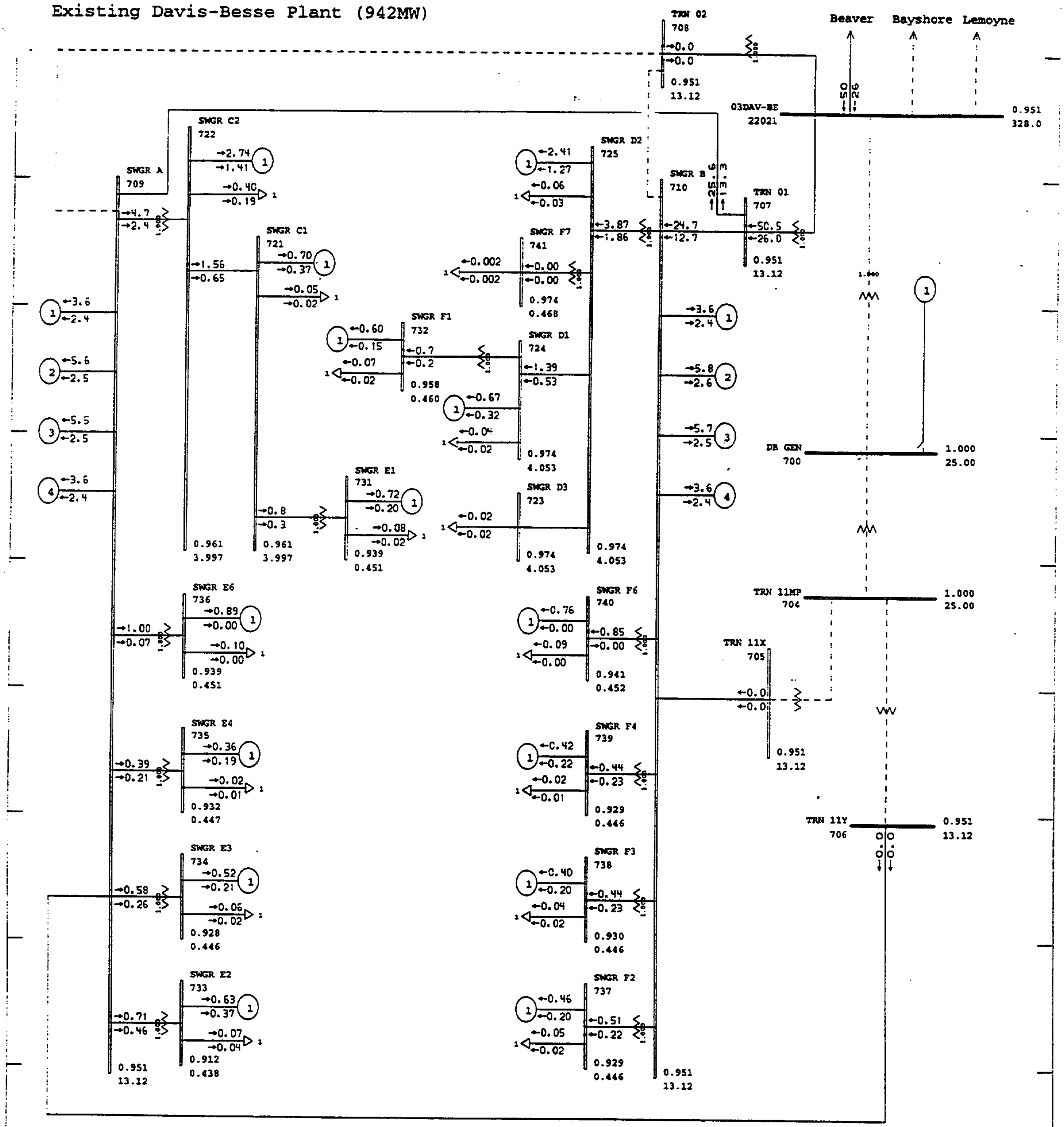


General Electric Company | PSLF Program | MW/MVAR | Wed Aug 11 14:18:10

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLH 10/
dvb [3] Loss of Davis Besse-Beaver 345kV Line
1260MW PERRY GROSS OUTPUT. 1205MW NET

dbs.drw
temp.wrk
Rating = 1

Loss of Davis Besse-Bayshore 345kV Lines & DB Unit
Davis Besse-Lemoyne 345kV Line Out Pre-Contingency
Existing Davis-Besse Plant (942MW)

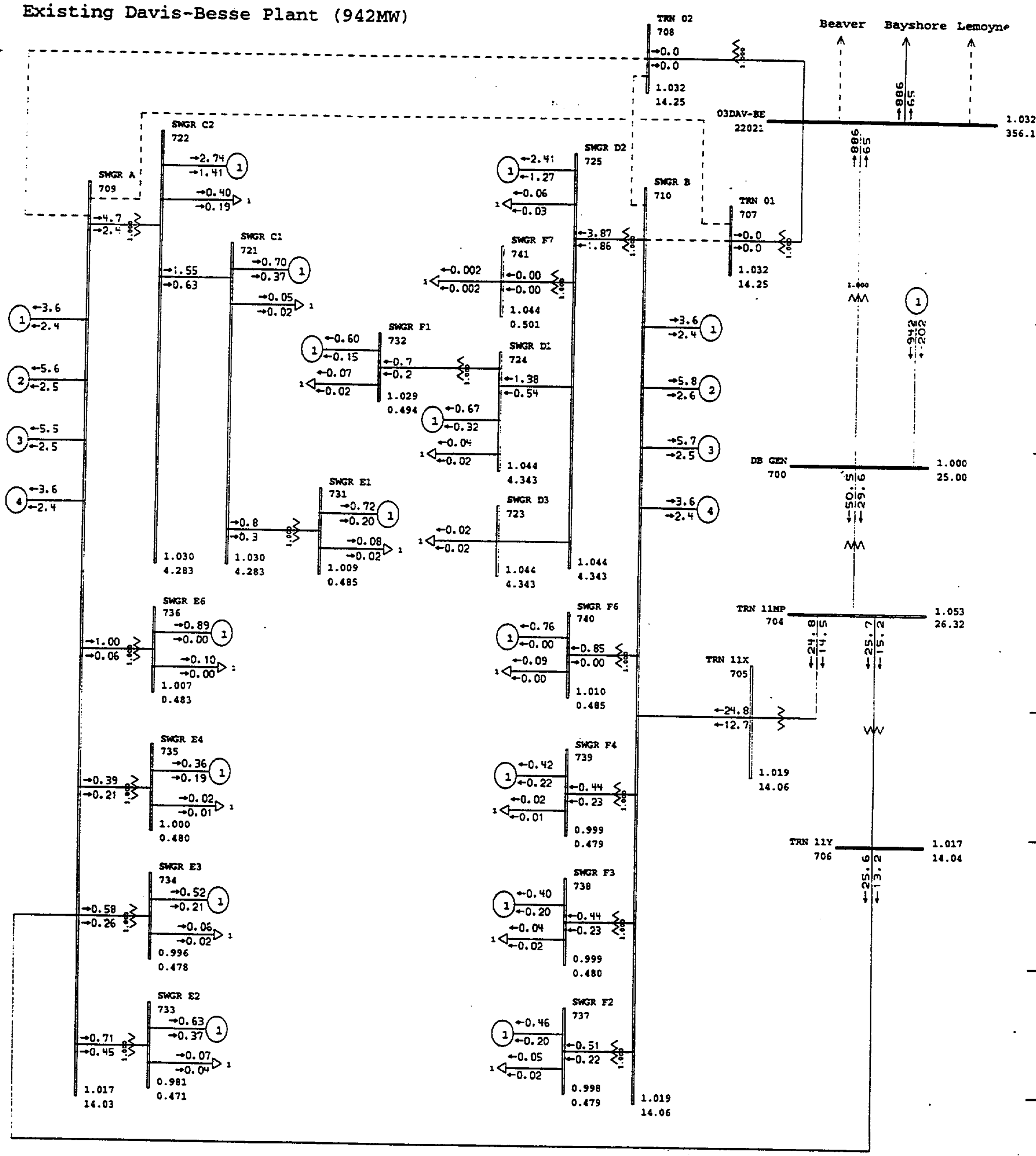


General Electric Company   PSLF Program   MW/MVAR   Wed Aug 11 14:16:44 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [7] Loss of Davis Besse-Bayshore 345kV Lines & DB Unit
1260MW PERRY GROSS OUTPUT, 1205MW NET

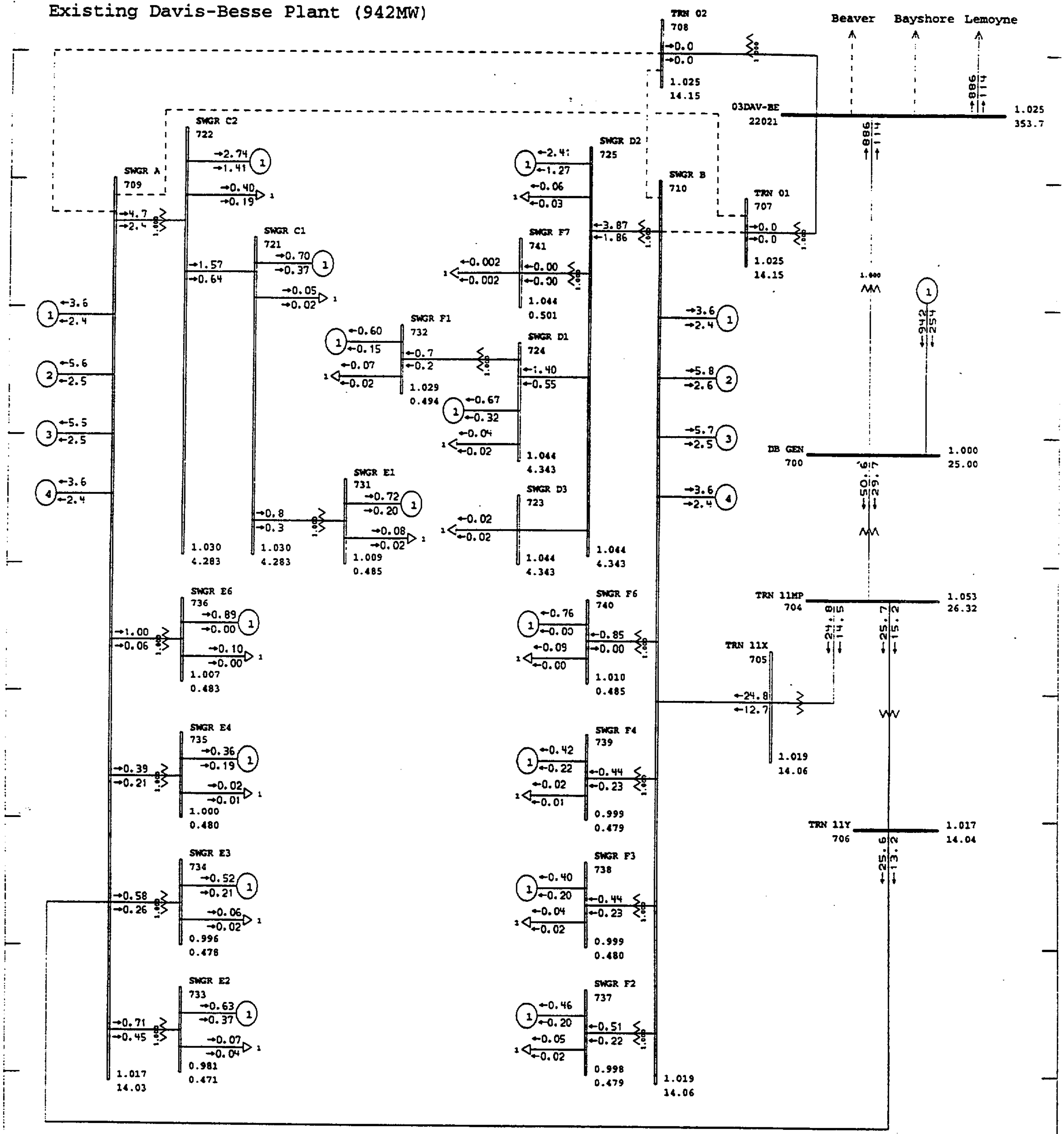
dbs.drw
temp.wrk
Rating = 1

Loss of DB-Lemoyne & DB-Beaver 345kV Lines
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



General Electric Company	PSLF Program		
	1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/	MW/MVAR	Wed Aug 11 14:18:14
	dvb [8] Loss of DB-Lemoyne & DB-Beaver 345kV Lines		dbs.drw
	1260MW PERRY GROSS OUTPUT, 1205MW NET		temp.wrk
			Rating = 1

Loss of DB-Bayshore & DB-Beaver 345kV Lines
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)

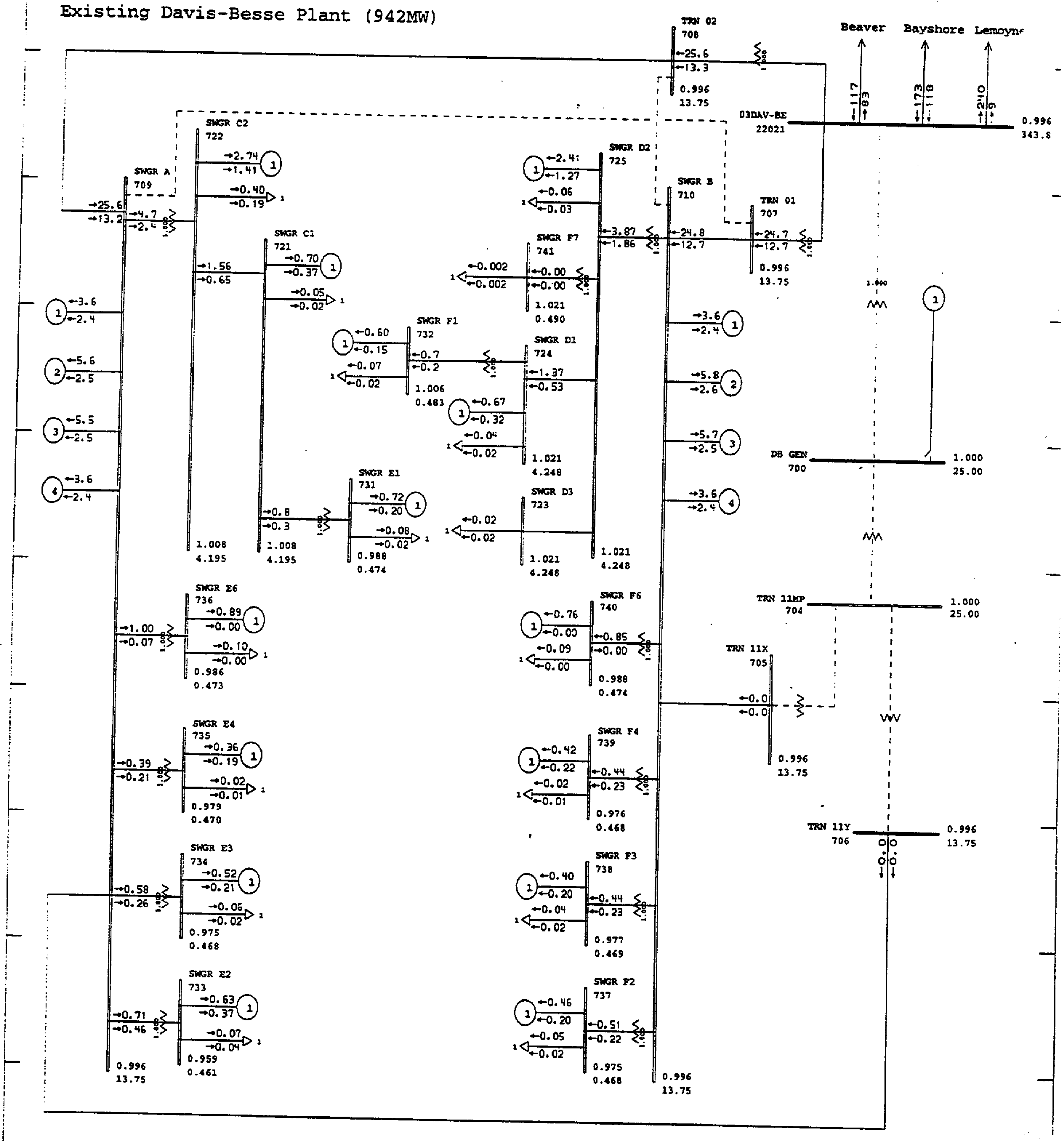


General Electric Company
PSLF Program
MW/MVAR
Wed Aug 11 14:38:27 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb | 9] Loss of DB-Bayshore & DB-Beaver 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

dbs.drw
temp.wrk
Rating = 1

Loss of Davis Besse Unit
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)

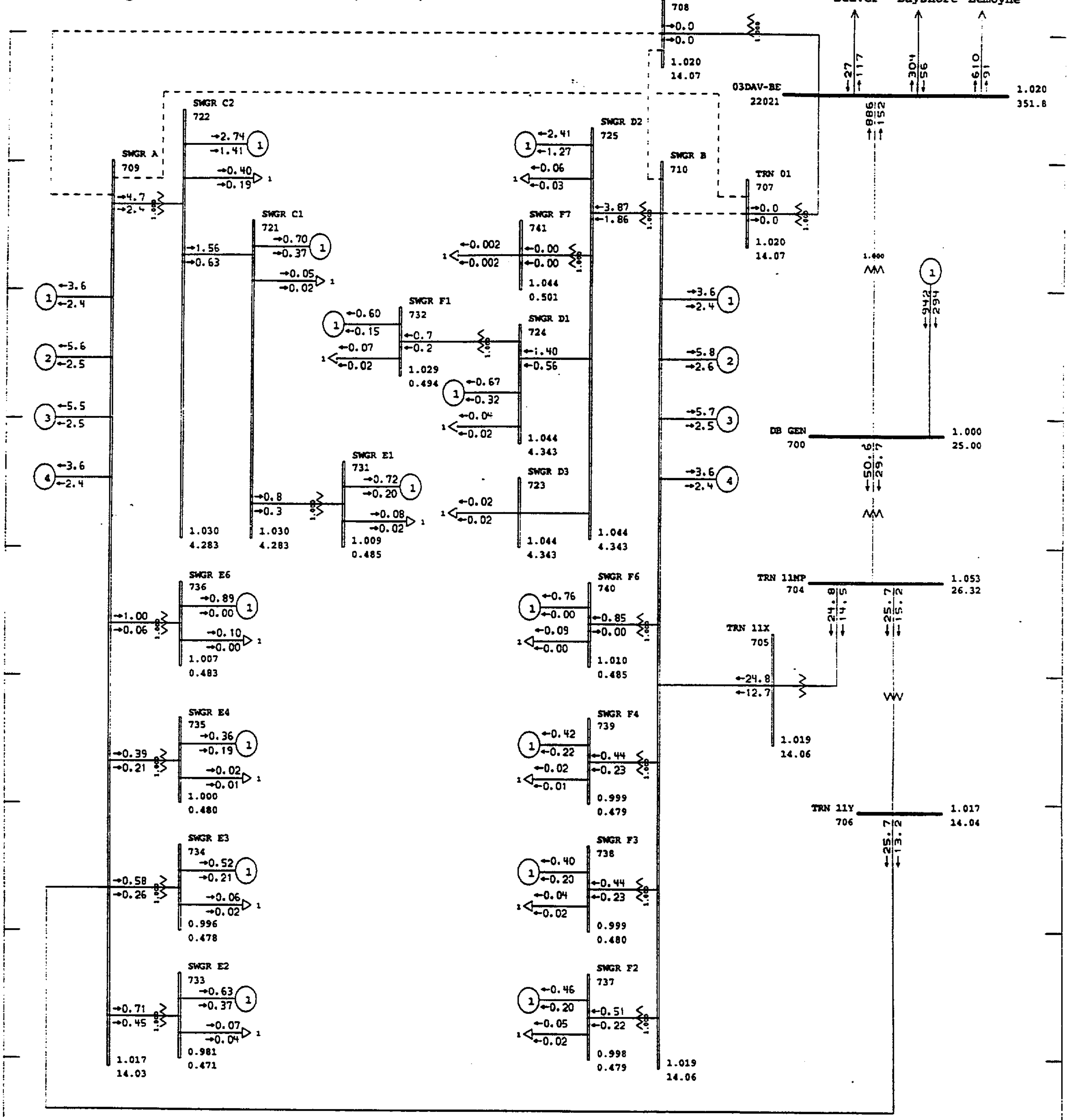


General Electric Company | PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (10) Loss of Davis Besse Unit
1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR
Wed Aug 11 14:16:38 1..
dbs.drw
temp.wrk
Rating = 1

Loss of Fermi Unit
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)

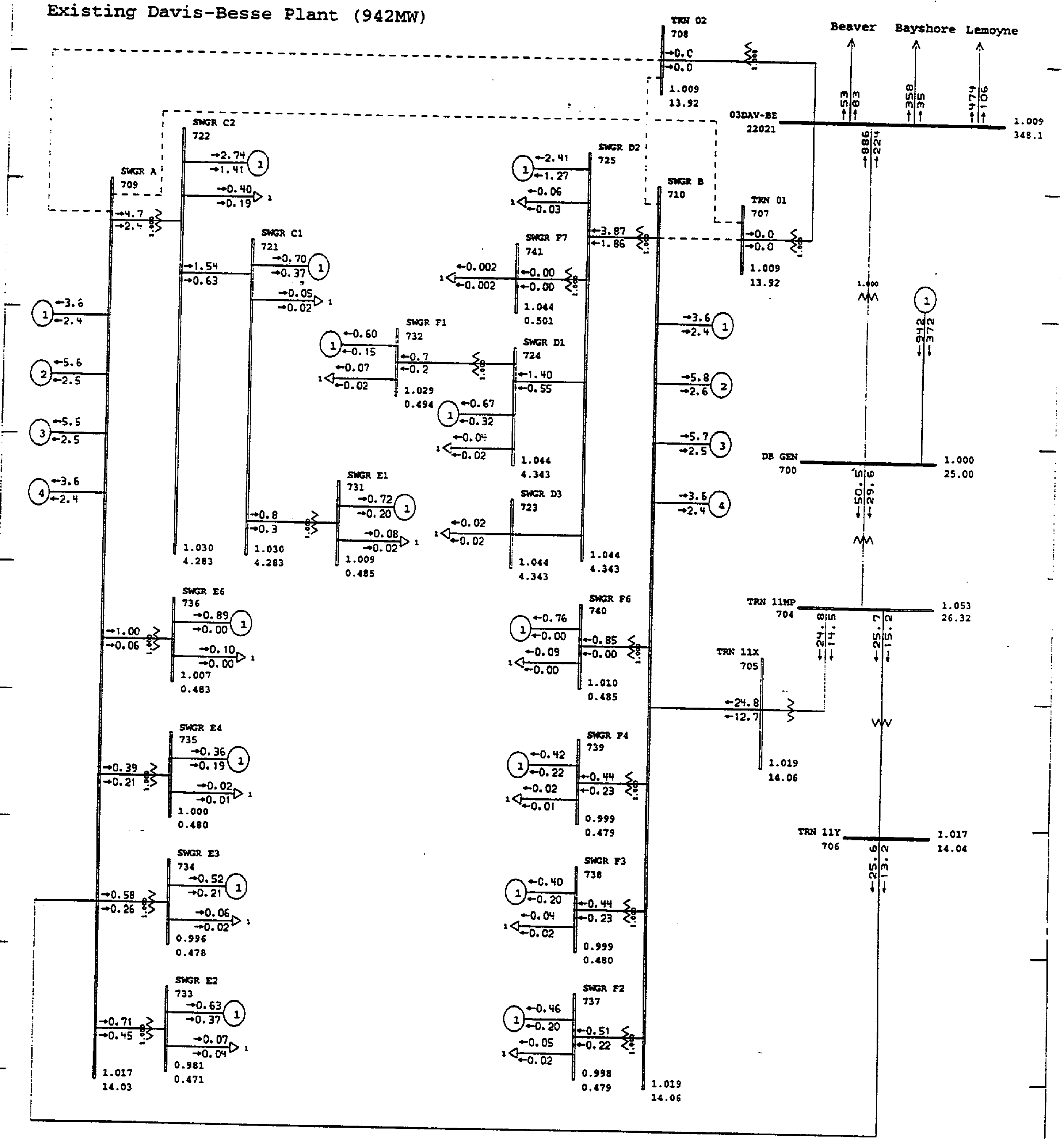


General Electric Company | PSLF Program | MW/MVAR | Wed Aug 11 14:18:46 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [12] Loss of Fermi Unit
1260MW PERRY GROSS OUTPUT, 1205MW NET

dbs.drw
temp.wrk
Rating = 1

Loss of Bayshore-Monroe & Lemoyne-Majestic 345kV Lines
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



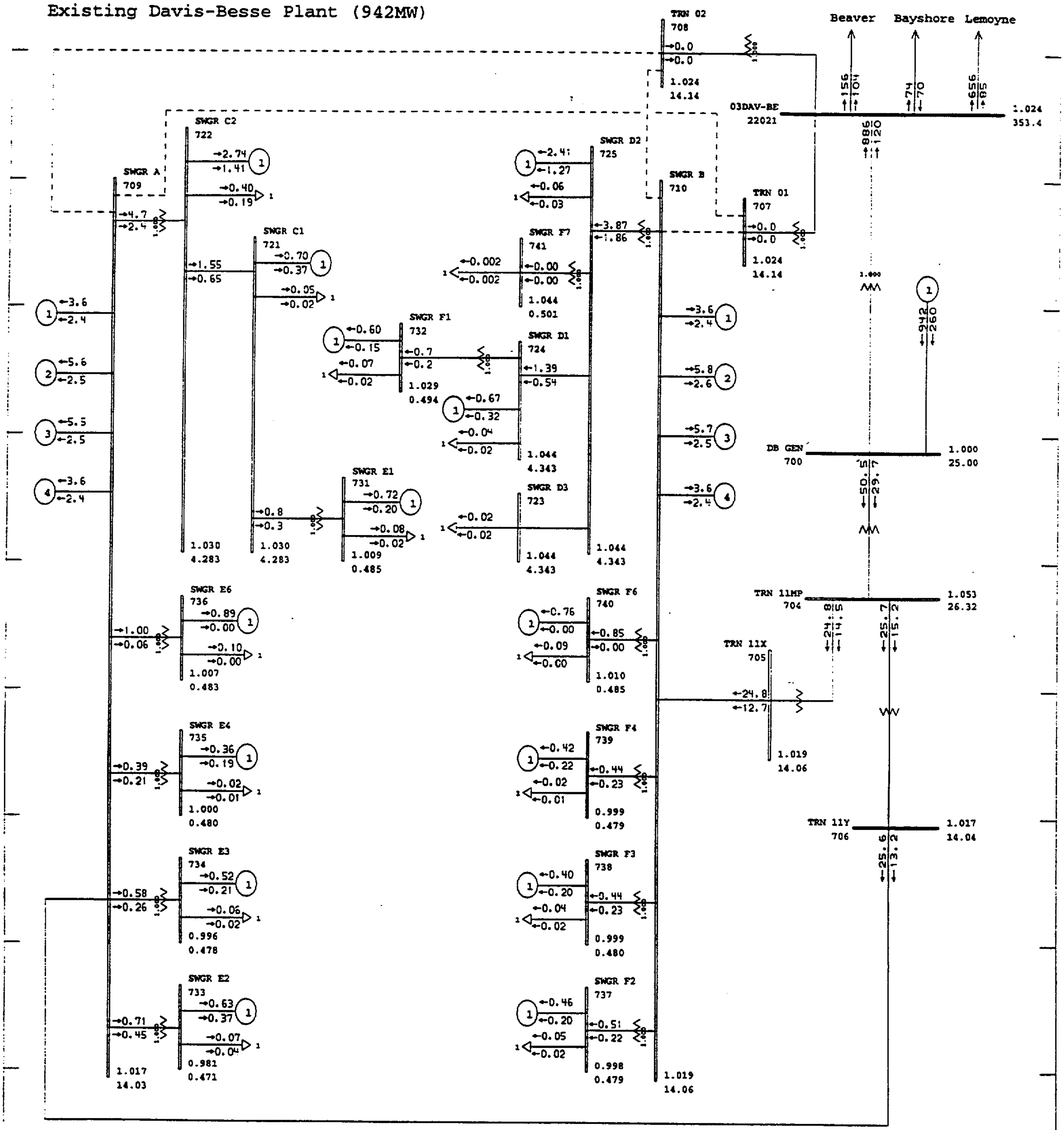
General Electric Company PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (13) Loss of Bayshore-Monroe & Lemoyne-Majestic 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR Wed Aug 11 14:18:52 19..

dbe.drw
temp.wrk
Rating = 1

Loss of Bayshore-Fostoria & Lemoyne-Fostoria 345kV Lines
All Lines In Pre-Contingency
Existing Davis-Besse Plant (942MW)



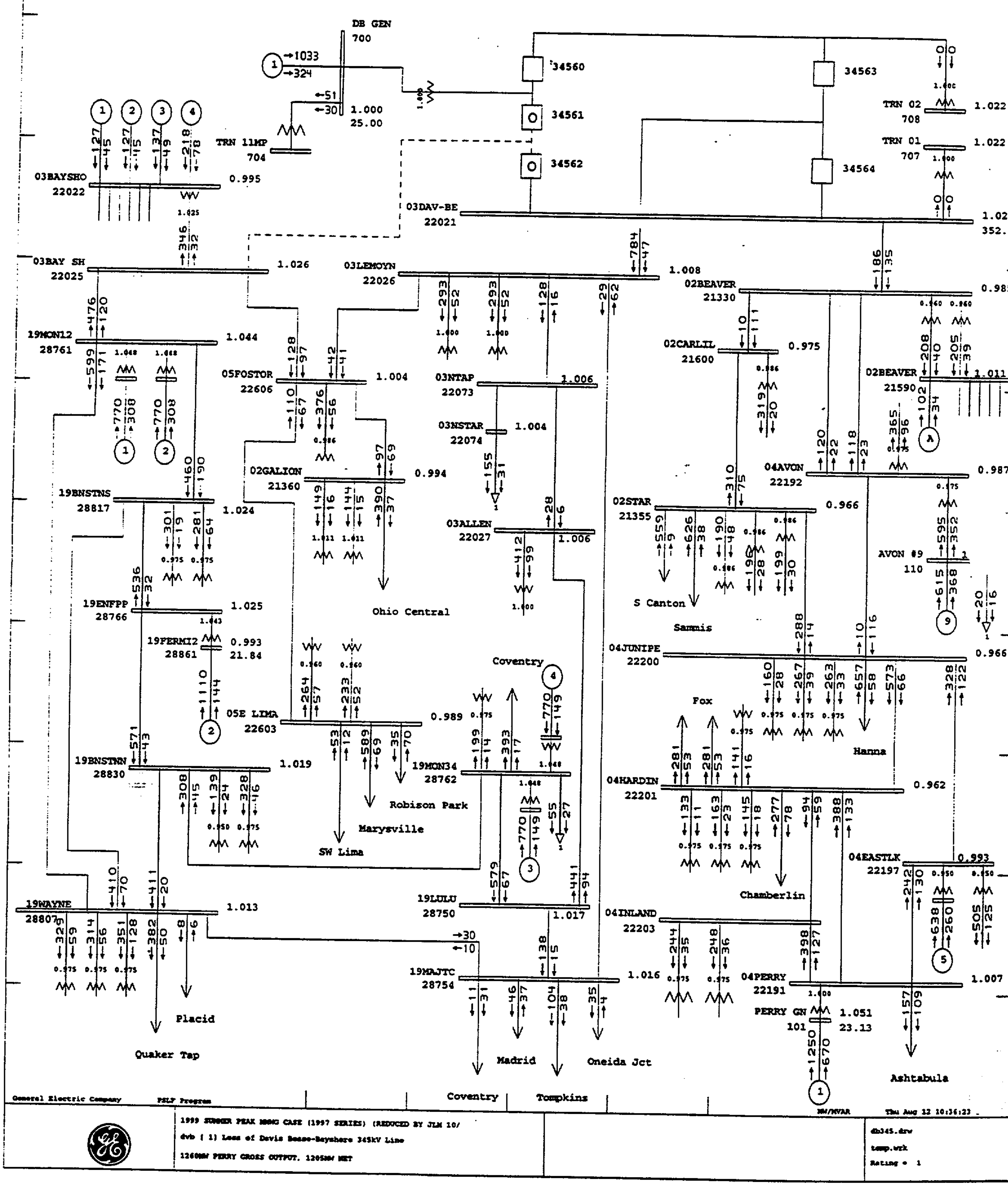
General Electric Company | PSLF Program | MW/MVAR | Wed Aug 11 14:18:58 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [14] Loss of Bayshore-Fostoria & Lemoyne-Fostoria 345kV Lines
1240MW PERRY GROSS OUTPUT. 1205MW NET

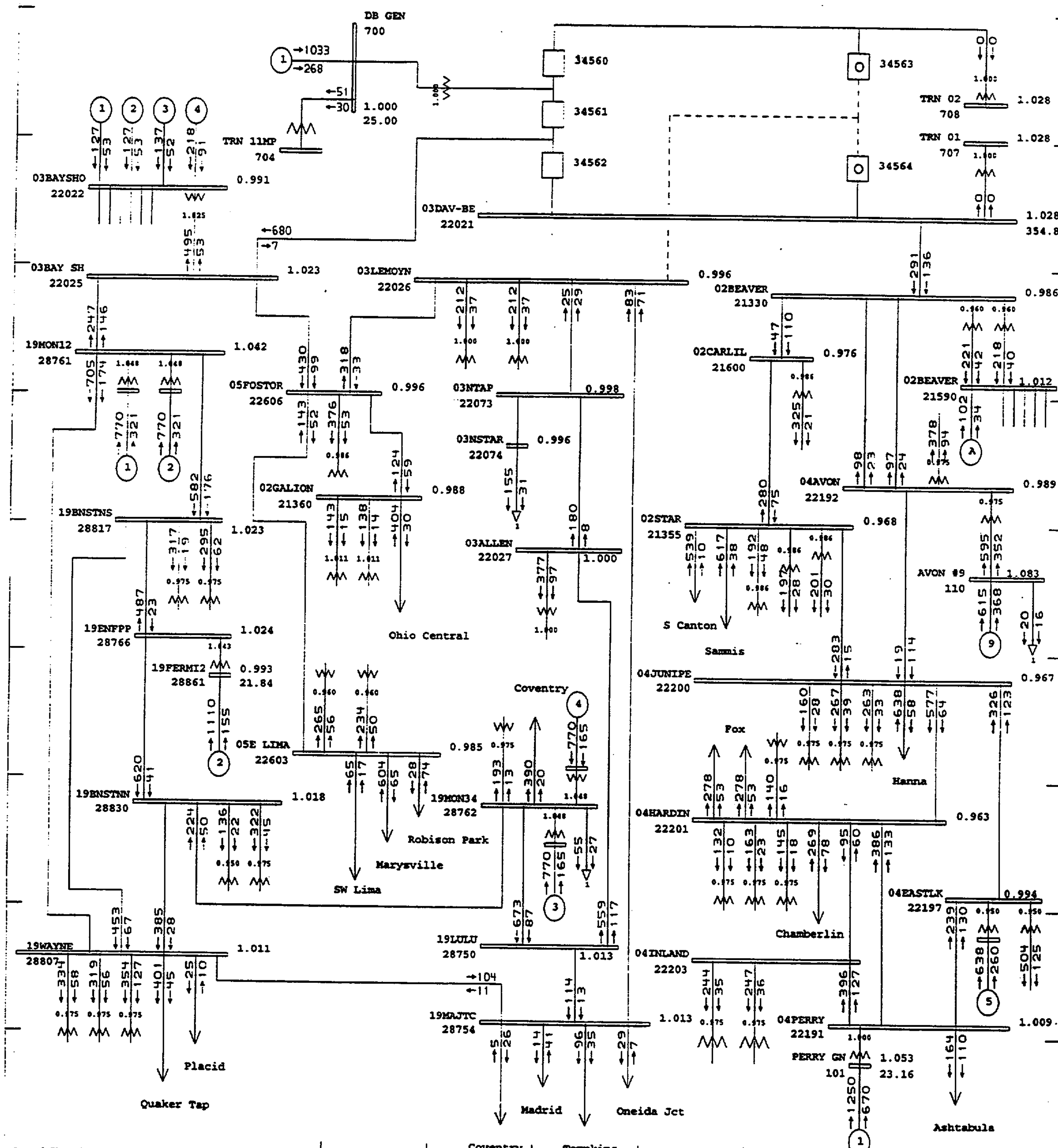
dbs.drw
temp.wrk
Rating = 1

345kV Network Drawing
Uprate with Davis-Besse Plant Output=1033MW
Post-Contingency Power Flow Results

Loss of Davis Besse-Bayshore 345kV Line
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



Loss of Davis Besse-Lemoyne 345kV Line
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



General Electric Company | PSLF Program | MW/MVAR | Thu Aug 12 10:36:30 1999

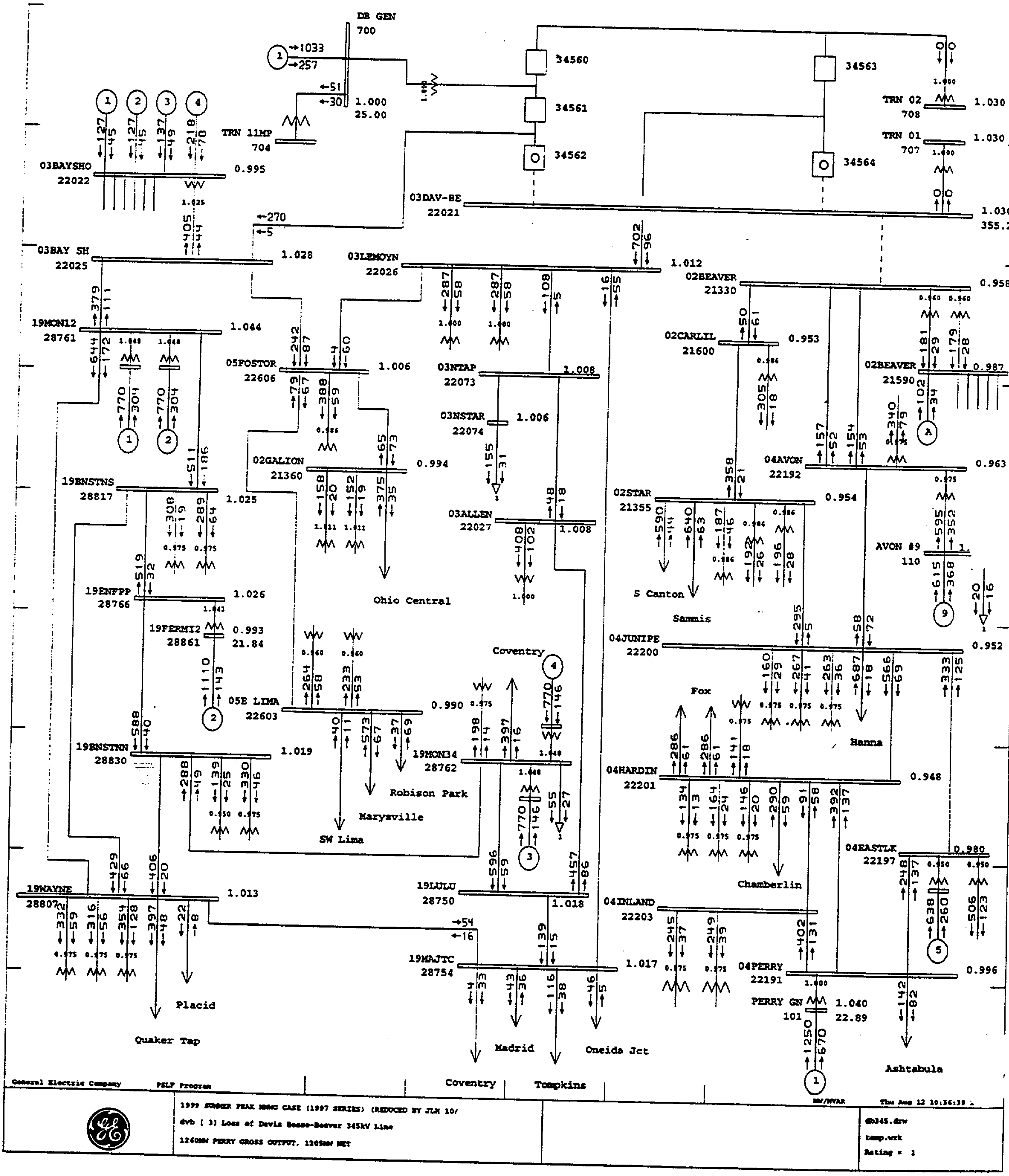
1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [2] Loss of Davis Besse-Lemoyne 345kV Line
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
temp.wrk
Rating = 1

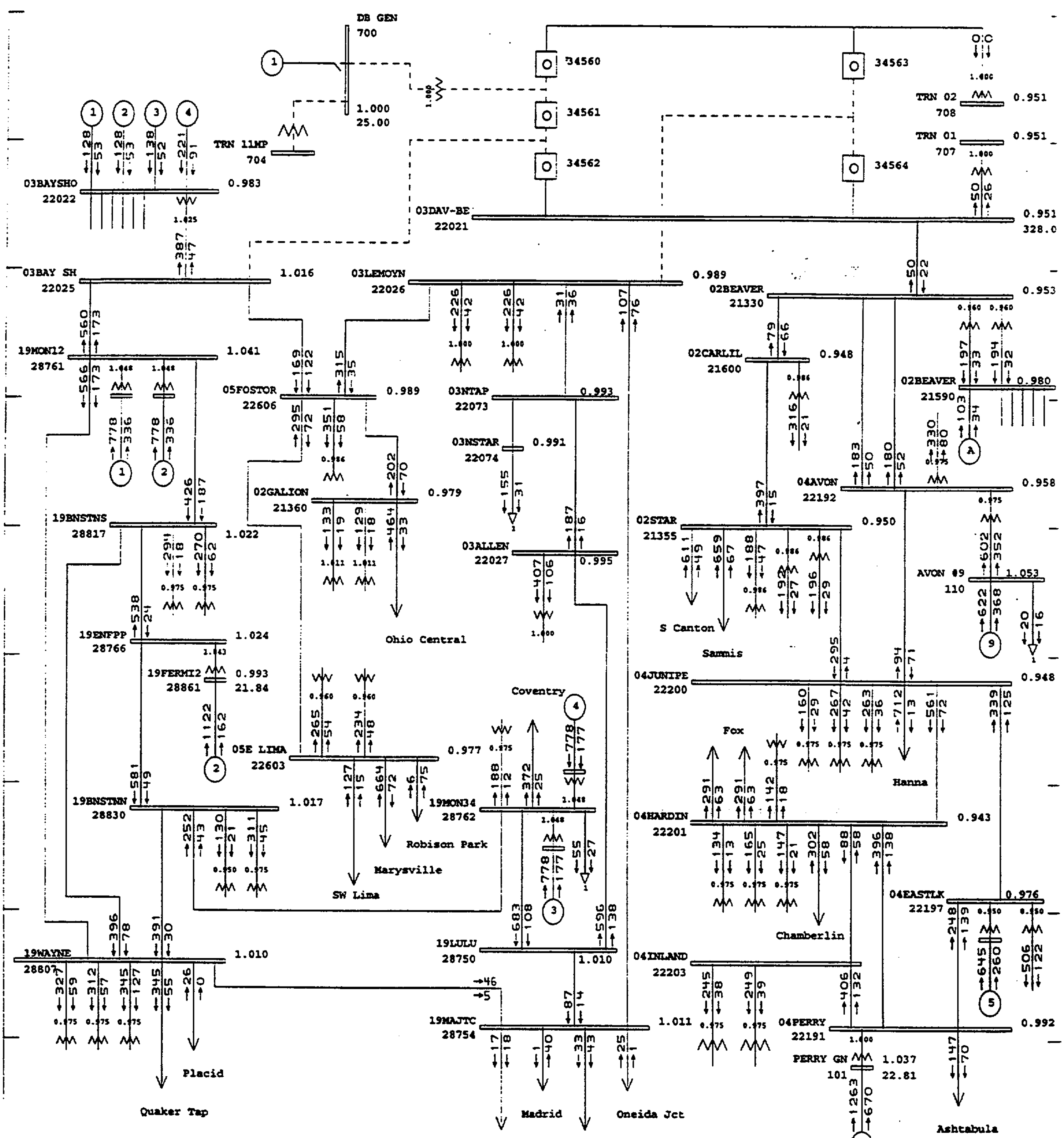
Loss of Davis Besse-Beaver 345kV Line

All Lines In Pre-Contingency

Uprated Davis-Besse Plant (1033MW)



Loss of Davis Besse-Bayshore 345kV Lines & DB Unit
Davis Besse-Lemoyne 345kV Line Out Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



General Electric Company PSLF Program

MW/MVAR Wed Aug 11 14:17:28 1999

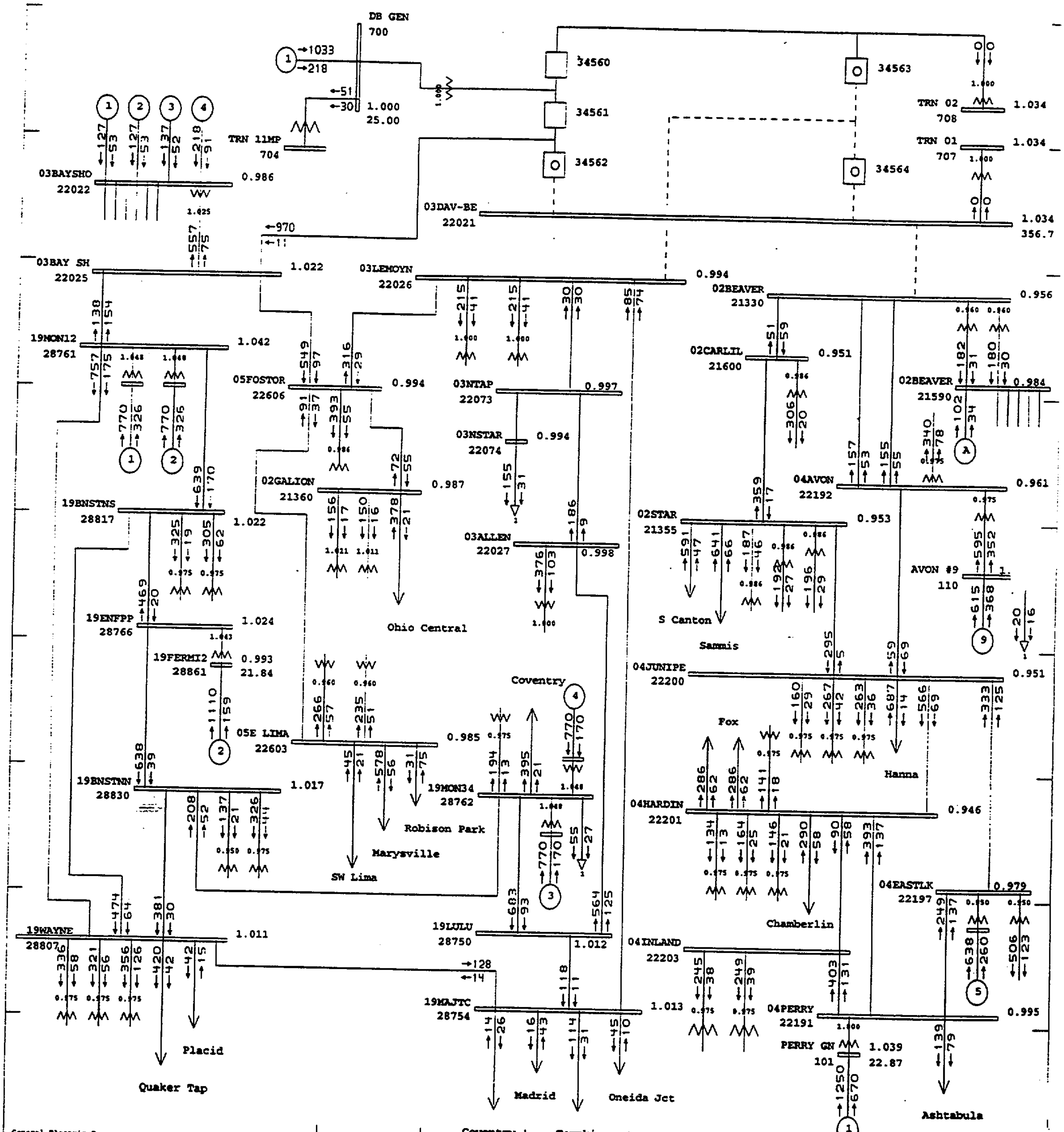
1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [7] Loss of Davis Besse-Bayshore 345kV Lines & DB Unit
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
temp.wrk
Rating = 1

Loss of DB-Lemoyne & DB-Beaver 345kV Lines

All Lines In Pre-Contingency

Uprated Davis-Besse Plant (1033MW)



General Electric Company | PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/

dvb | 8| Loss of DB-Lemoyne & DB-Beaver 345kV Lines

1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR

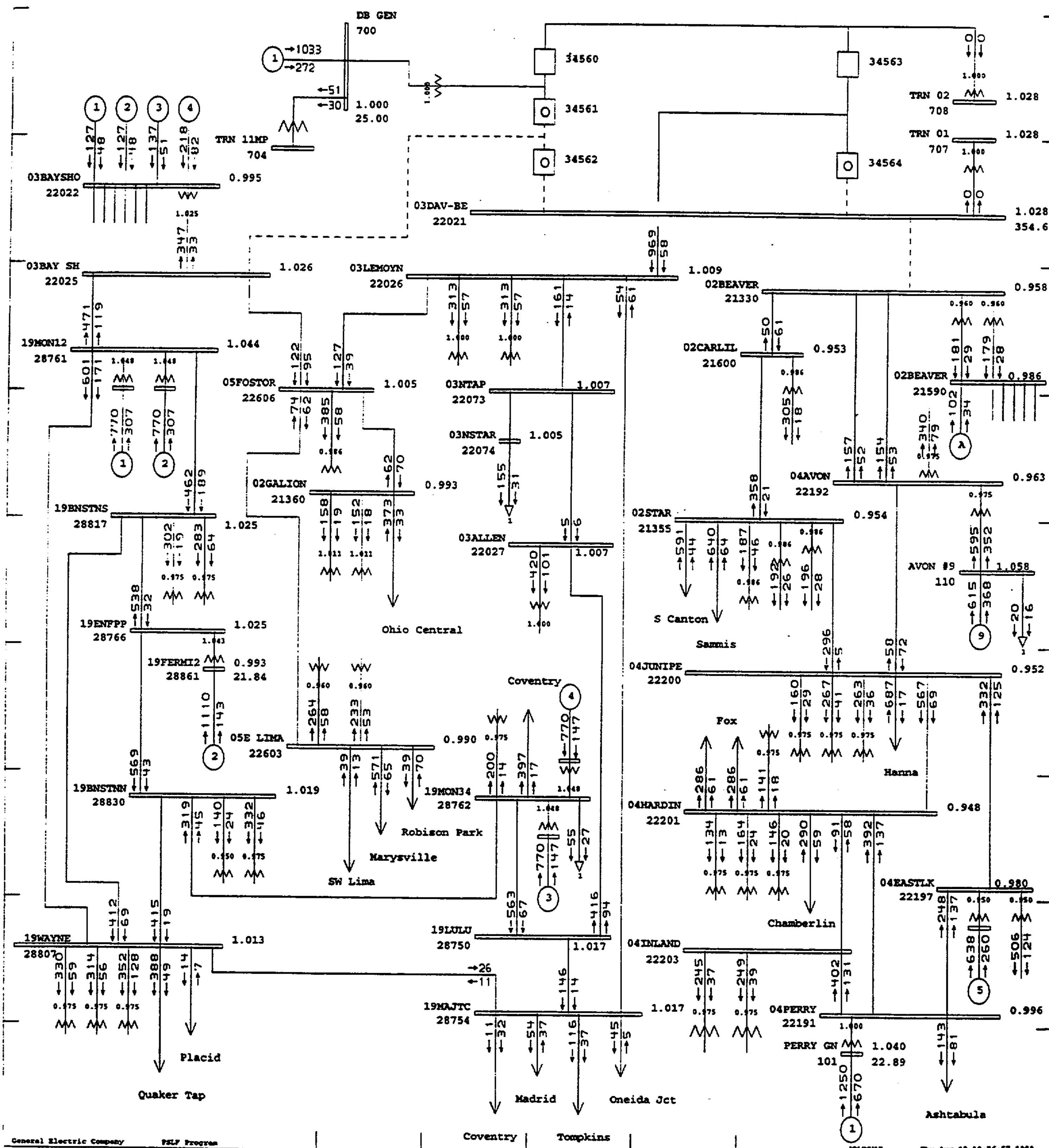
Thu Aug 12 10:36:48

db345.drw

temp.wrk

Rating = 1

Loss of DB-Bayshore & DB-Beaver 345kV Lines
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)

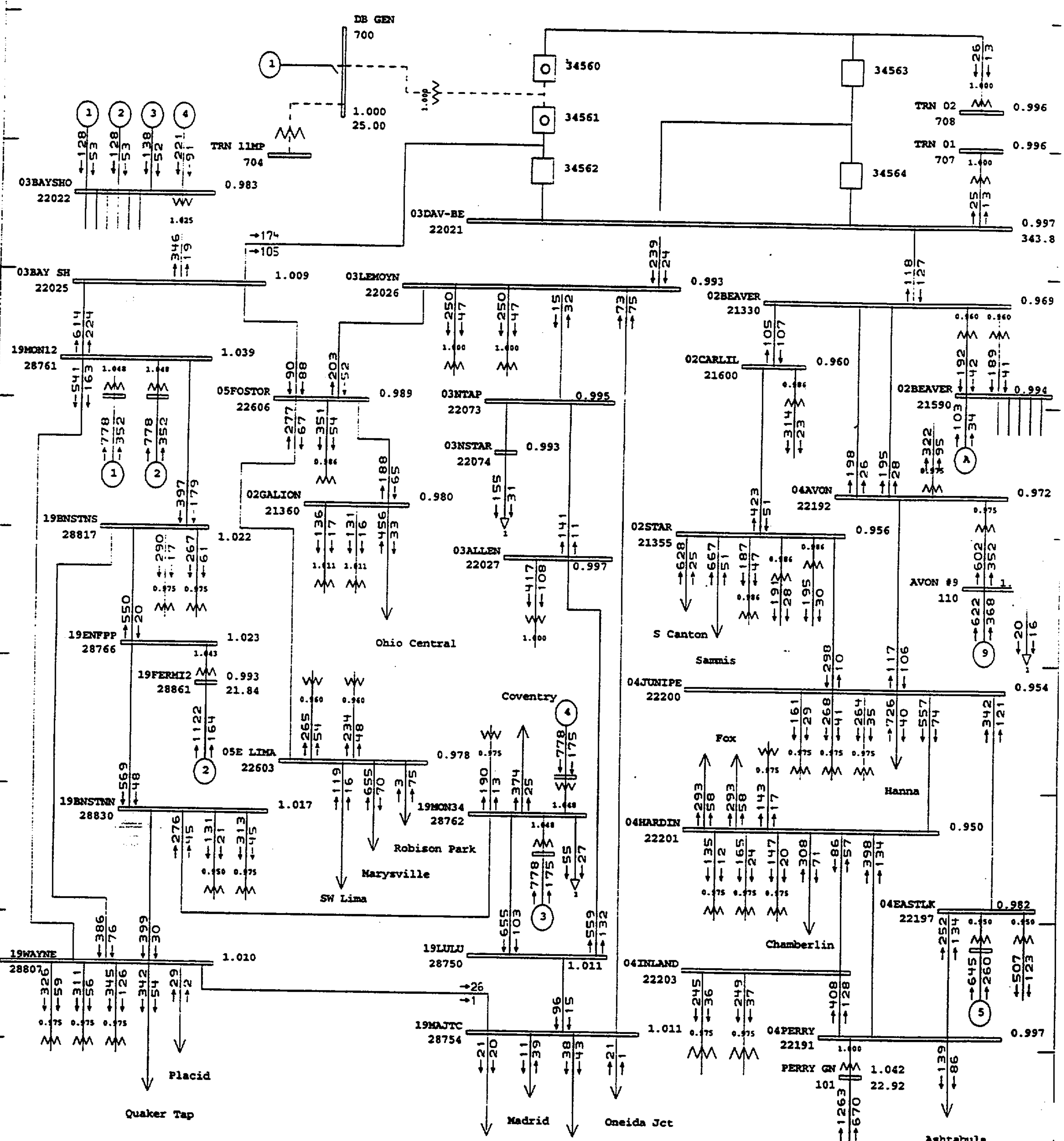


General Electric Company | PSLF Program | Thu Aug 12 10:36:57 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [9] Loss of DB-Bayshore & DB-Beaver 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
temp.wrk
Rating = 1

Loss of Davis Besse Unit
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



General Electric Company

PSLF Program

Thu Aug 12 10:37:08 1...

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/

dvb (10) Loss of Davis Besse Unit

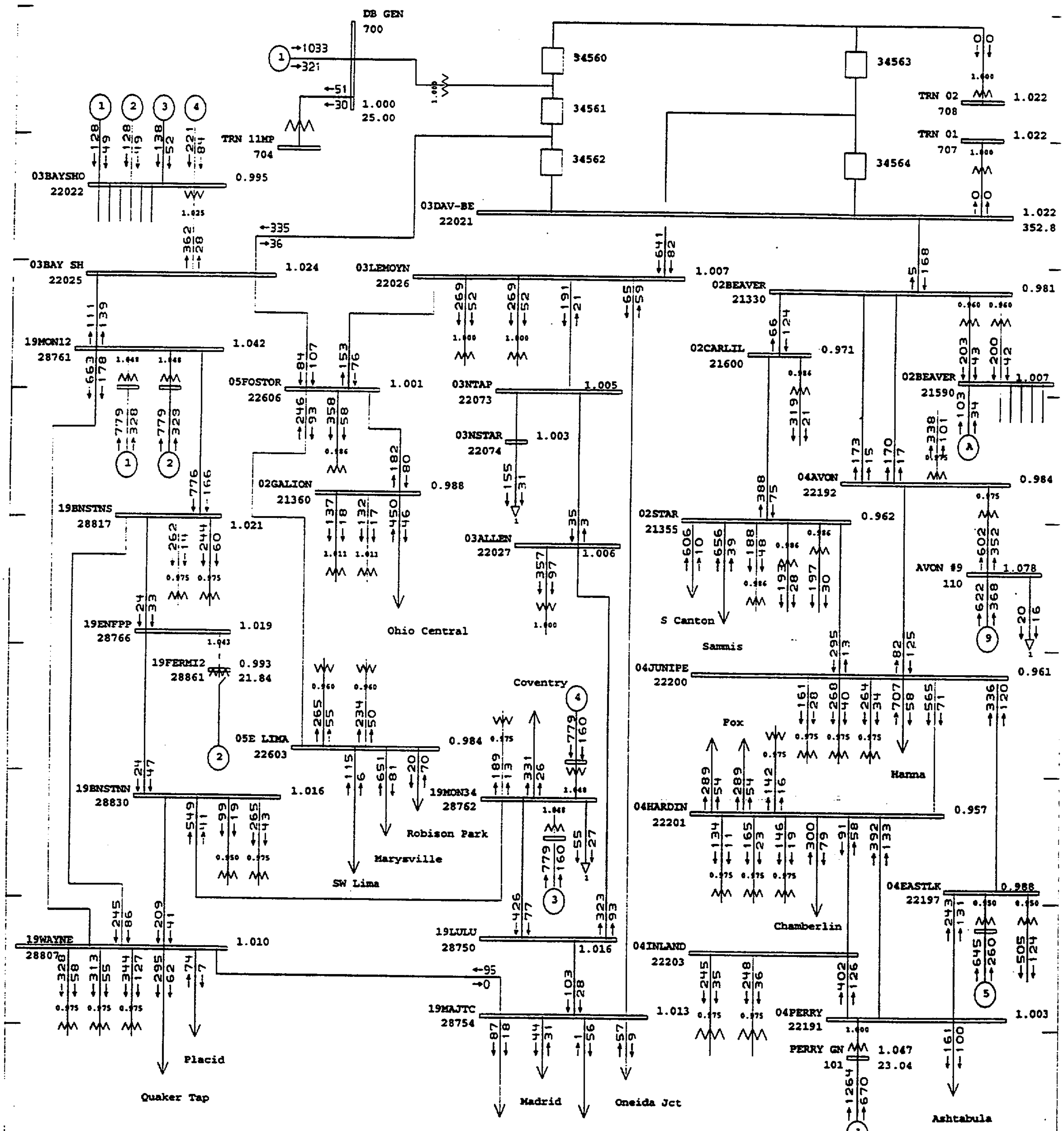
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw

temp.wrk

Rating = 1

Loss of Fermi Unit
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



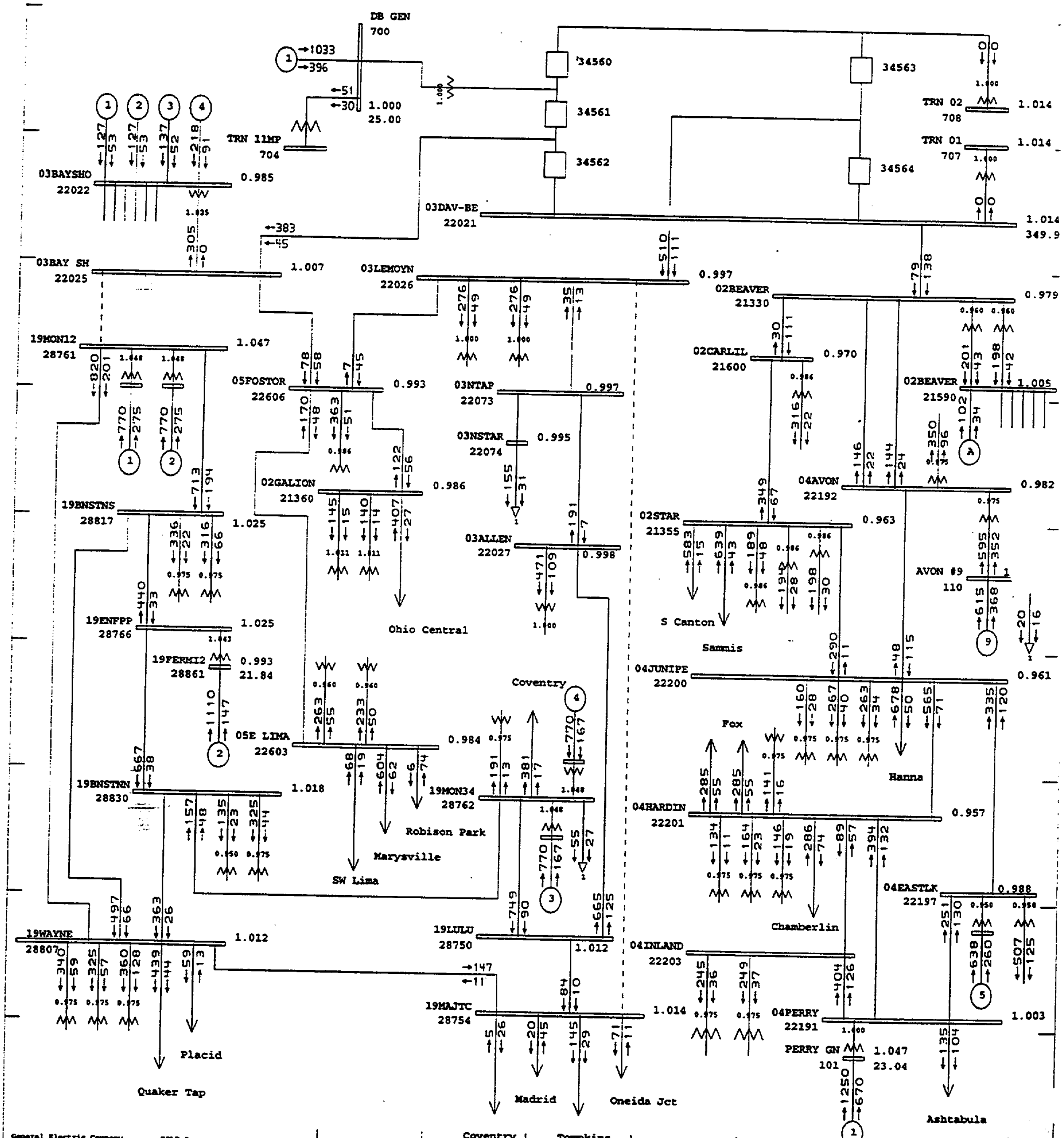
General Electric Company　PSLF Program

MW/MVAR　Thu Aug 12 10:37:15 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLK 10/
dvb [12] Loss of Fermi Unit
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
temp.wrk
Rating = 1

Loss of Bayshore-Monroe & Lemoyne-Majestic 345kV Lines
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



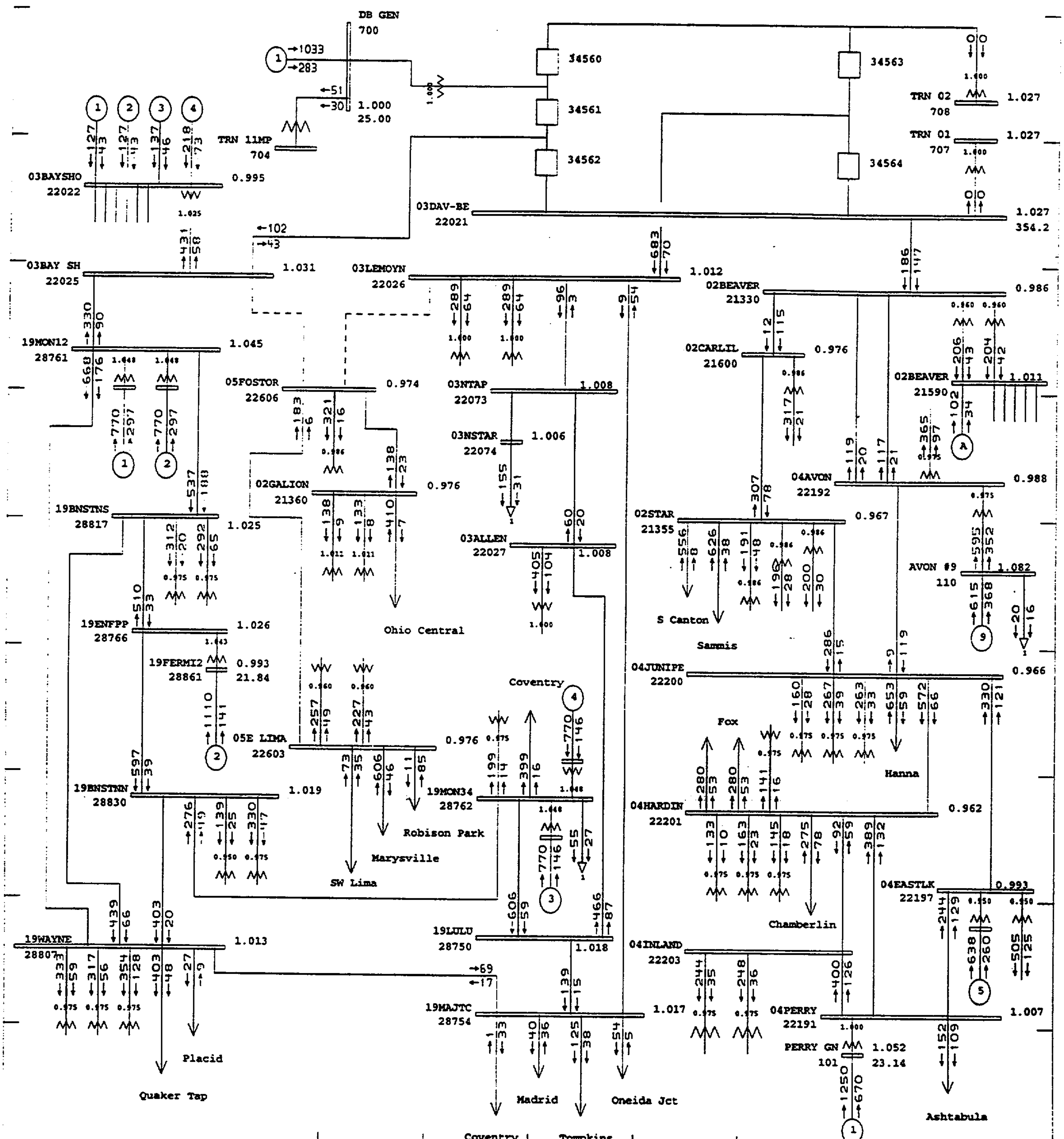
General Electric Company   PSLF Program

MW/MVAR   Thu Aug 12 10:37:22

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (13) Loss of Bayshore-Monroe & Lemoyne-Majestic 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

db345.drw
temp.wrk
Rating = 1

Loss of Bayshore-Fostoria & Lemoyne-Fostoria 345kV Lines
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



General Electric Company PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (14) Loss of Bayshore-Fostoria & Lemoyne-Fostoria 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

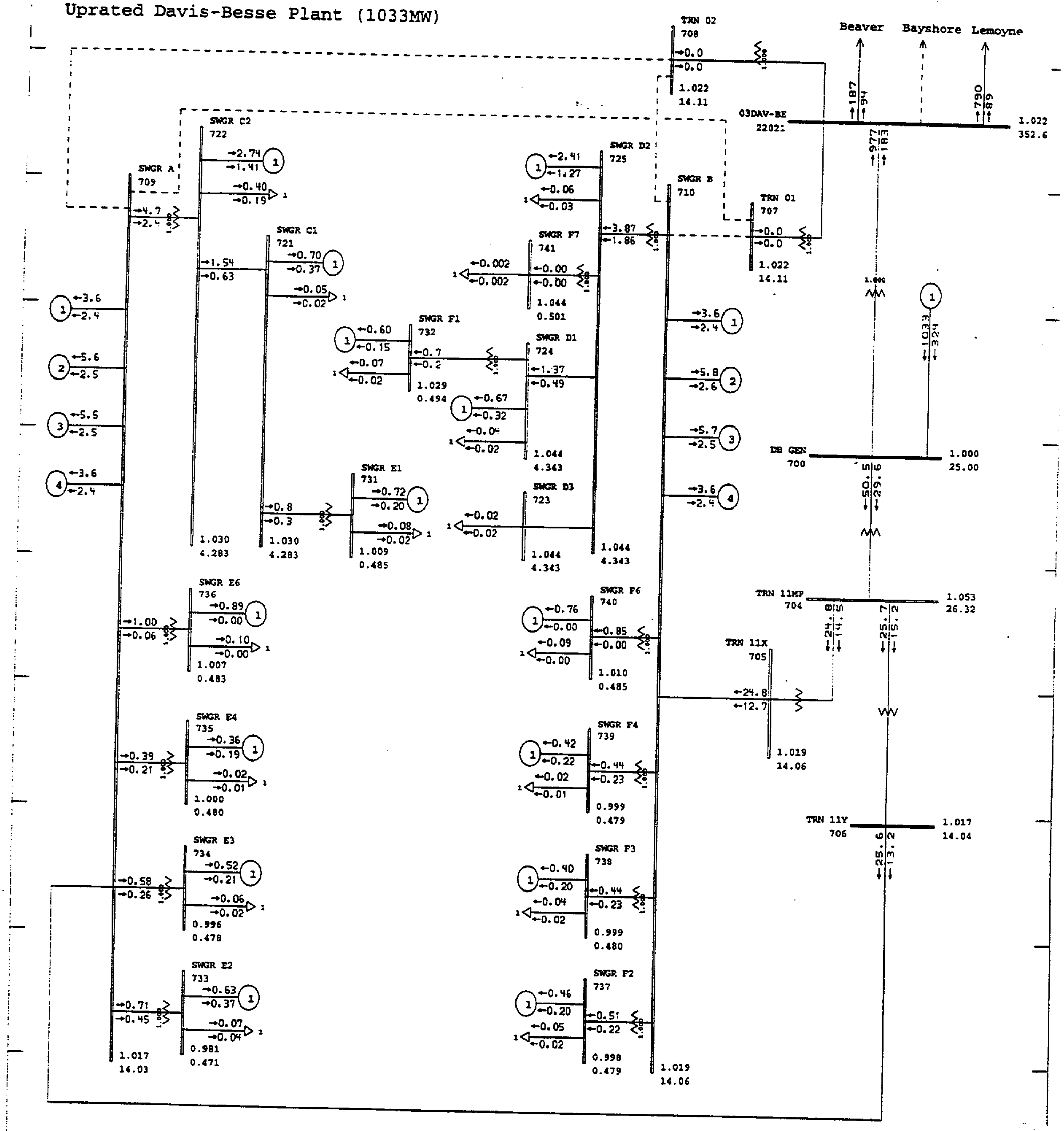
MW/KVAR
Thu Aug 12 16:37:29 1999
db145.drw
temp.wrk
Rating = 1

Davis-Besse Station Drawing

Uprate with Davis-Besse Plant Output=1033MW

Post-Contingency Power Flow Results

Loss of Davis Besse-Bayshore 345kV Line
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



General Electric Company PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLK 10/

dvb (1) Loss of Davis Besse-Bayshore 345kV Line

1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR

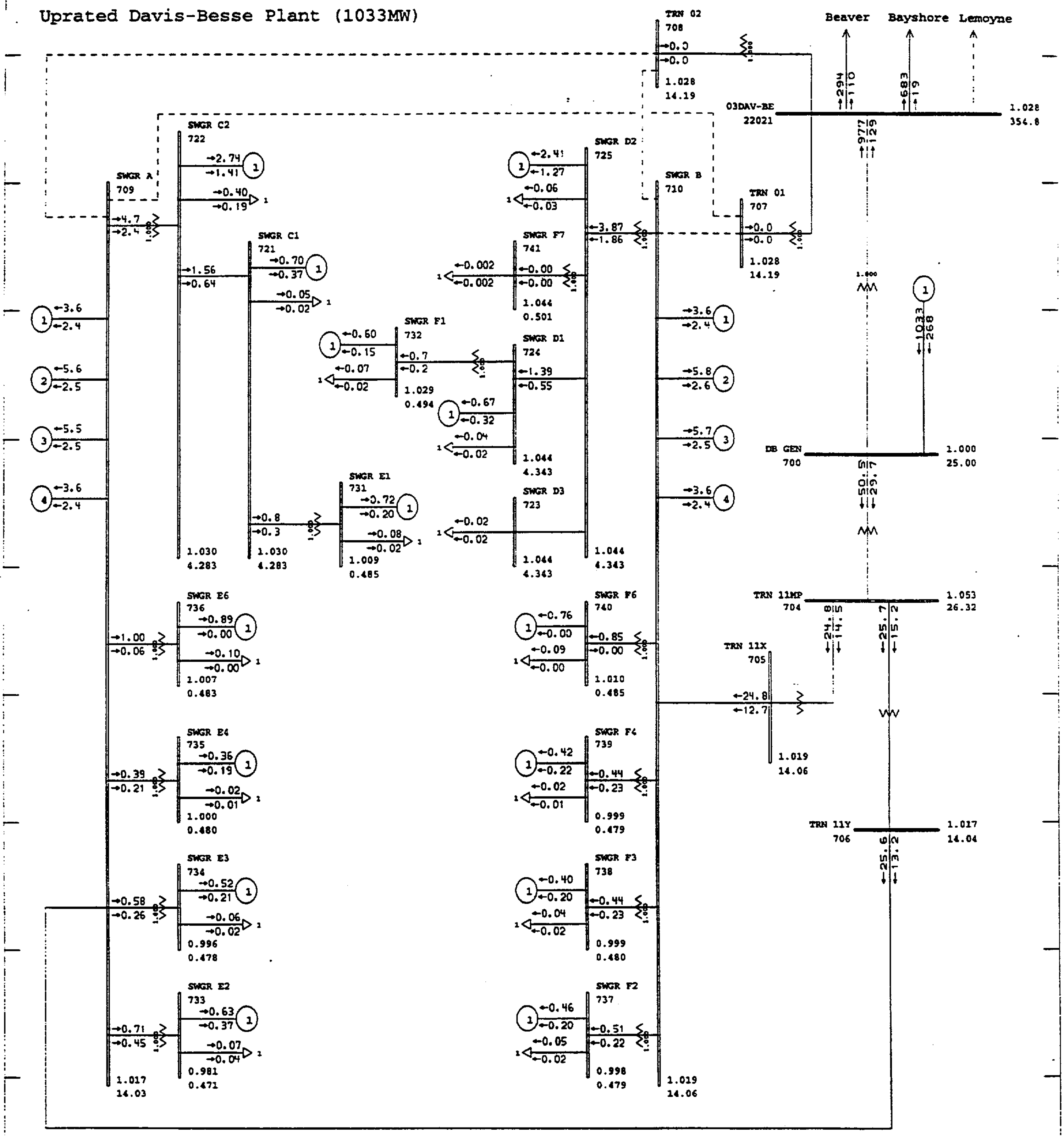
Wed Aug 11 14:19:25 1..

dbs.drw

temp.wrk

Rating = 1

Loss of Davis Besse-Lemoyne 345kV Line
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)

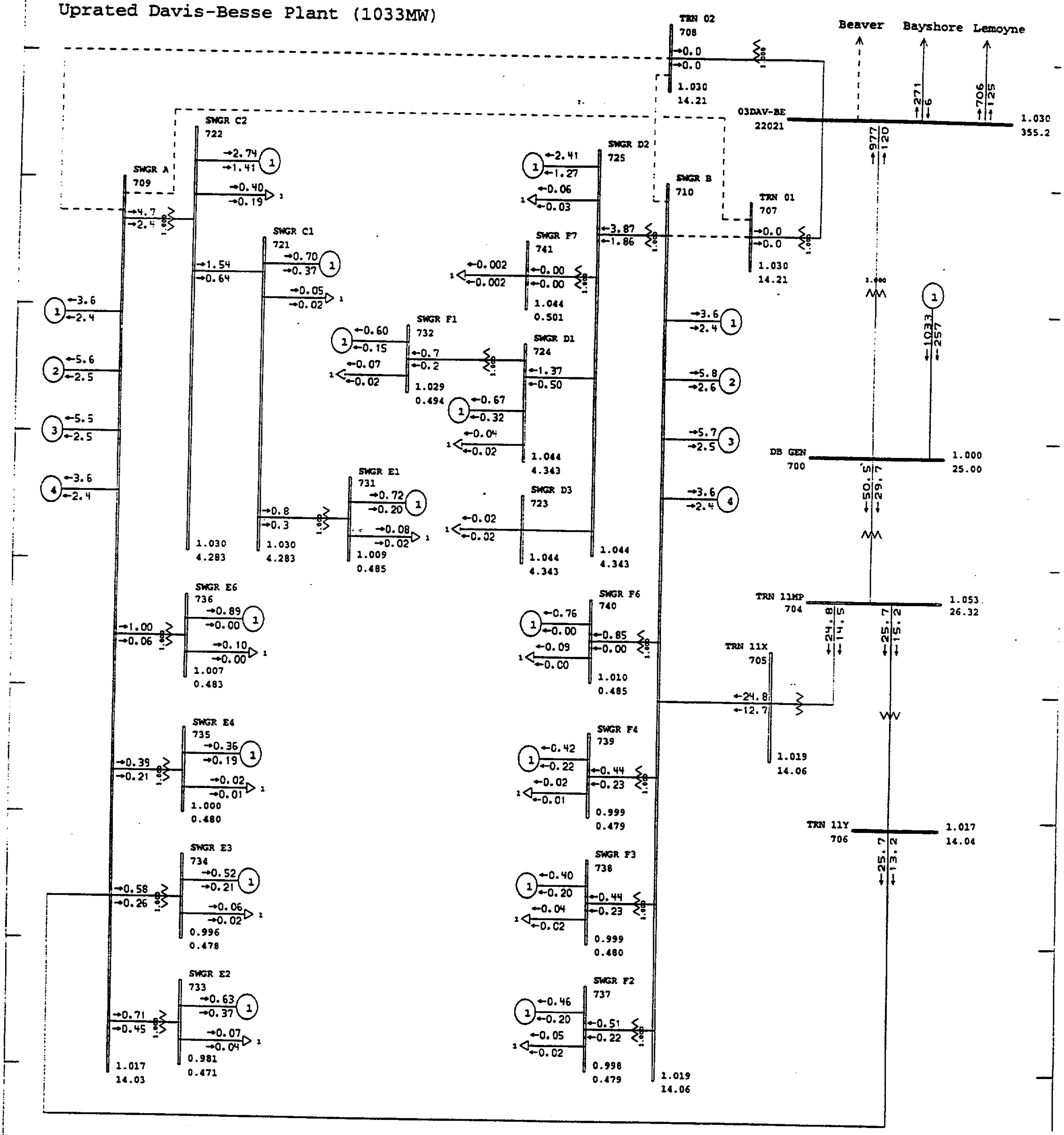


General Electric Company PSLF Program MW/MVAR Wed Aug 11 14:19:32 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [3] Loss of Davis Besse-Lemoyne 345kV Line
1260MW PERRY GROSS OUTPUT, 1205MW NET

dbs.drw
temp.wrk
Rating = 1

Loss of Davis Besse-Beaver 345kV Line
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)

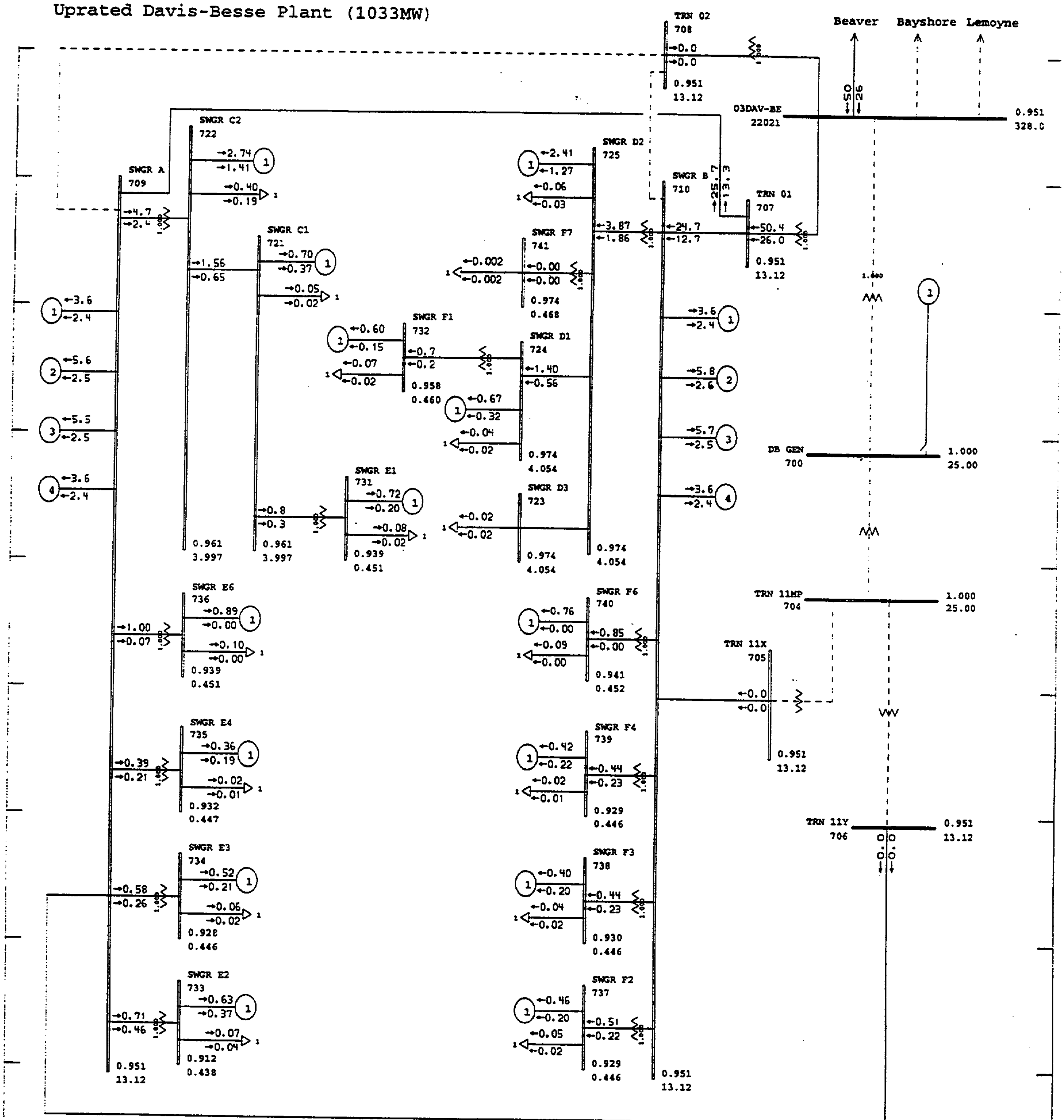


General Electric Company
PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb (3) Loss of Davis Besse-Beaver 345kV Line
1260MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR
Wed Aug 11 14:19:40
dbs.drw
temp.wrk
Rating = 1

Loss of Davis Besse-Bayshore 345kV Lines & DB Unit
Davis Besse-Lemoyne 345kV Line Out Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



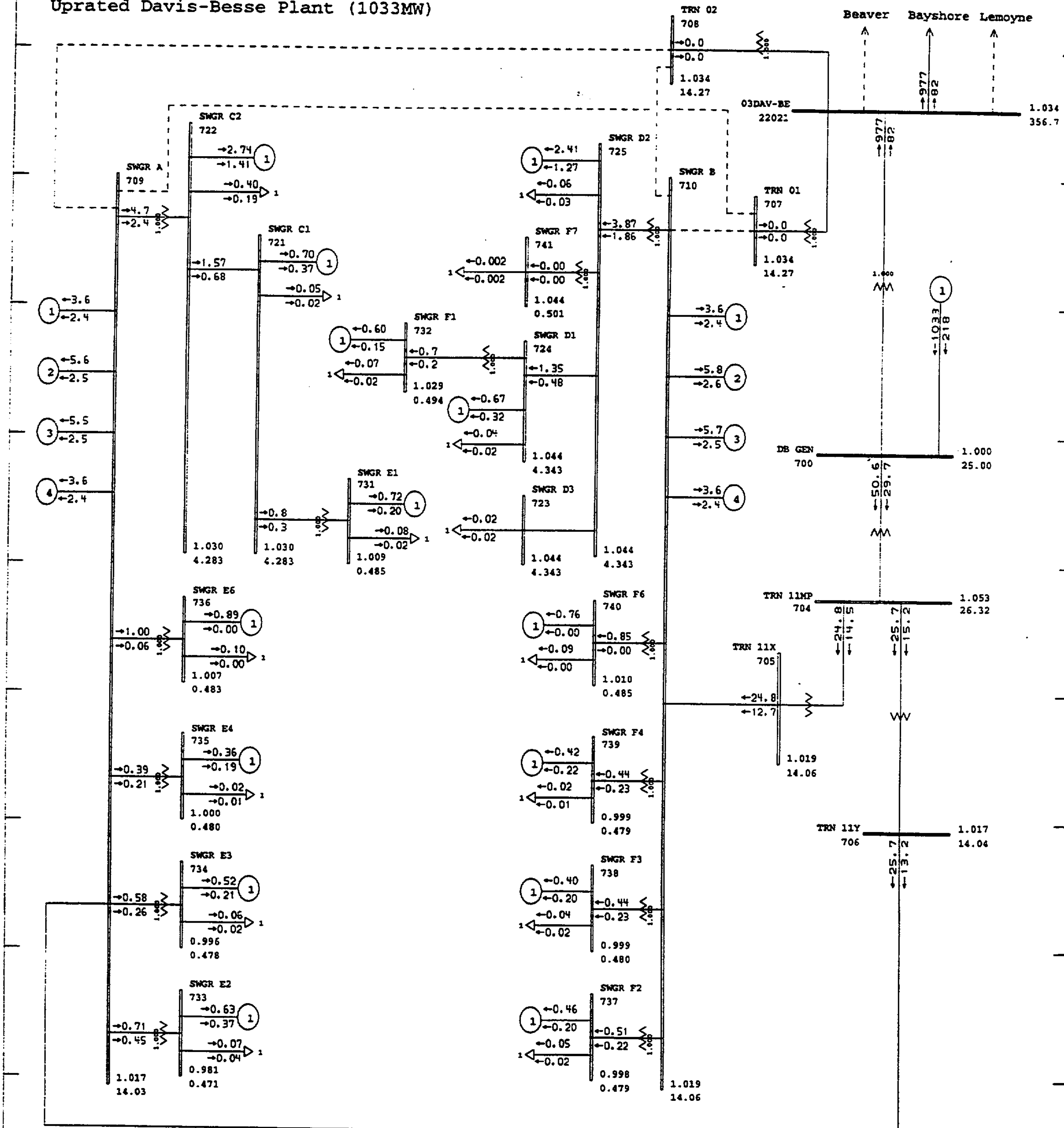
General Electric Company PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLK 10/
dvb (7) Loss of Davis Besse-Bayshore 345kV Lines & DB Unit
1260MW PERRY GROSS OUTPUT. 1205MW NET

MW/MVAR Wed Aug 11 14:17:21 1999

dbe.drw
temp.wrk
Rating = 1

Loss of DB-Lemoyne & DB-Beaver 345kV Lines
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)

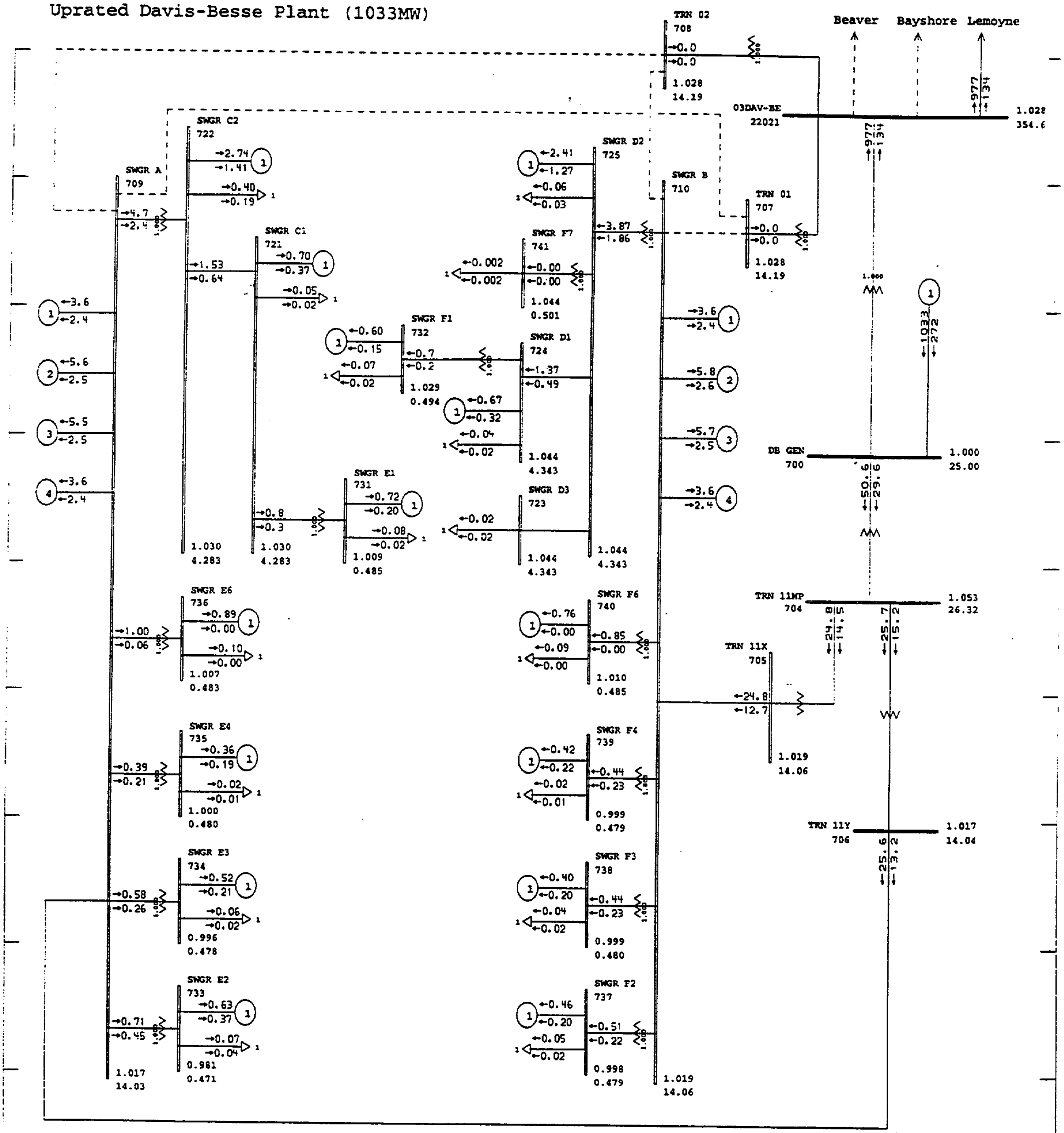


General Electric Company PSLF Program MW/MVAR Wed Aug 11 14:29:49

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [8] Loss of DB-Lemoyne & DB-Beaver 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

dbs.drv
temp.wrk
Rating = 1

Loss of DB-Bayshore & DB-Beaver 345kV Lines
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



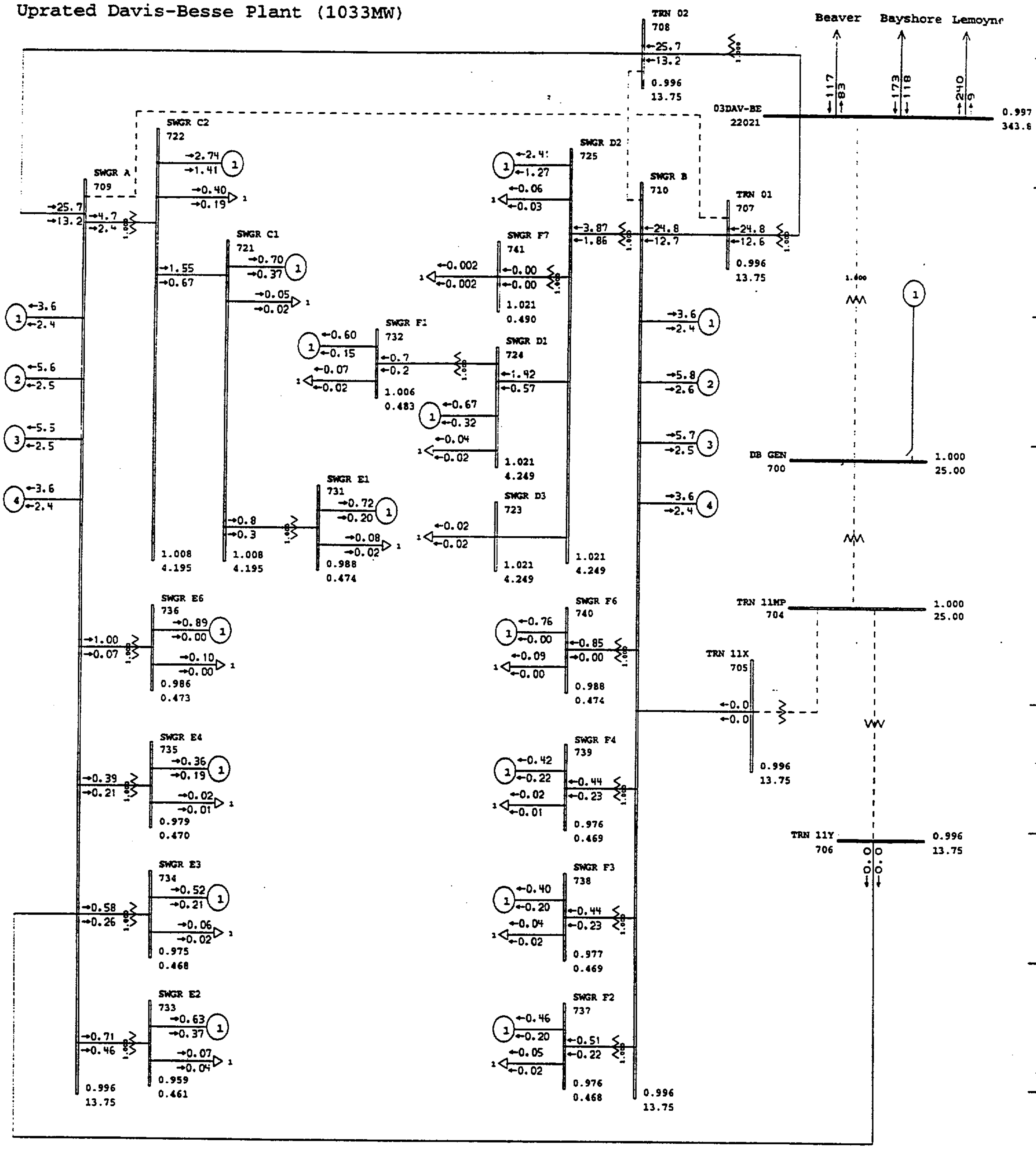
General Electric Company PSLF Program

MW/MVAR Wed Aug 11 14:19:58 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [9] Loss of DB-Bayshore & DB-Beaver 345kV Lines
1260MW PERRY GROSS OUTPUT, 1205MW NET

dbs.drw
temp.wrk
Rating = 1

Loss of Davis Besse Unit
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



General Electric Company

PSLF Program

MW/MVAR

Wed Aug 11 14:20:09 1..

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLN 10/

dvb [10] Loss of Davis Besse Unit

1260MW PERRY GROSS OUTPUT, 1205MW NET

dbs.drw

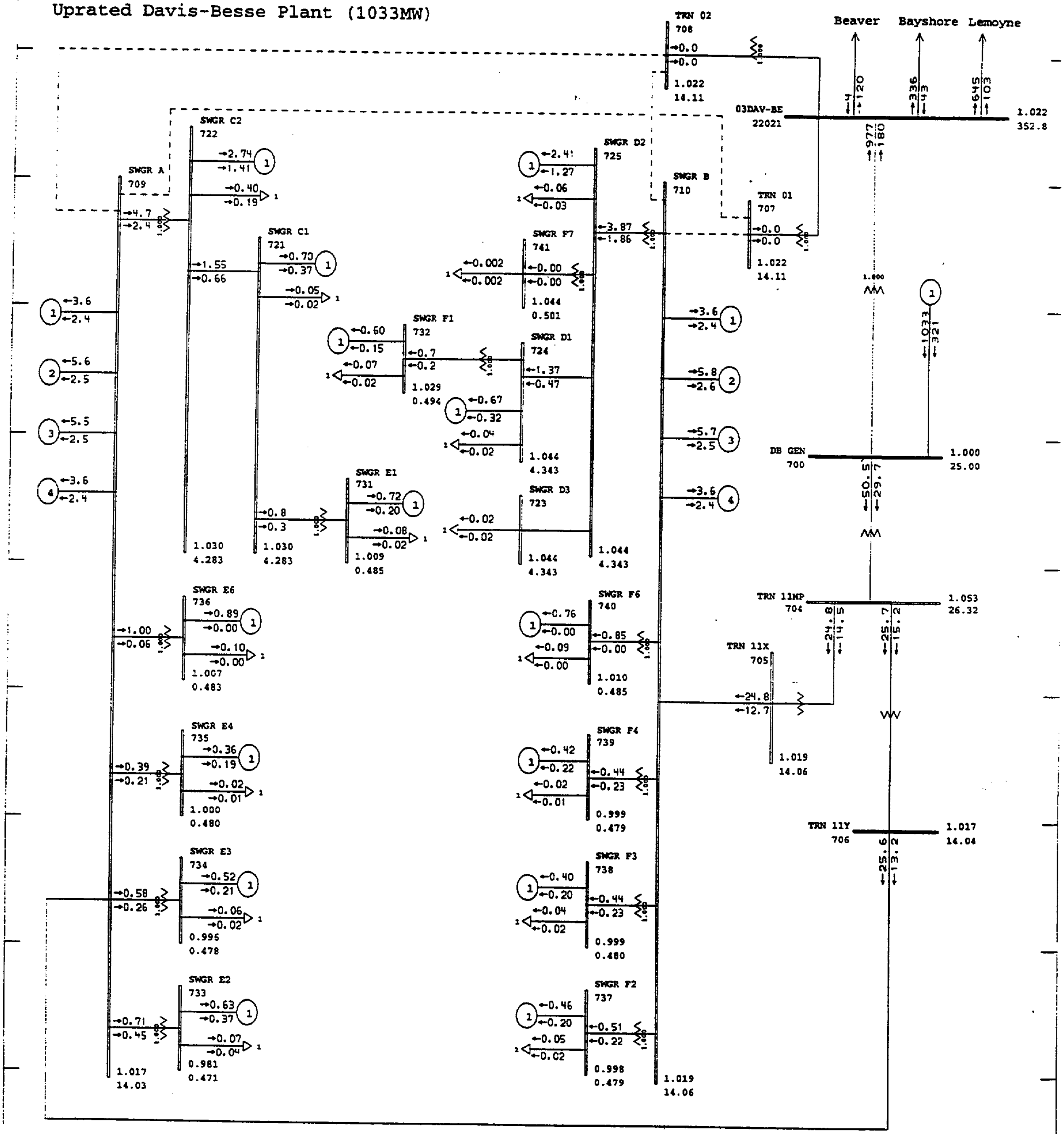
temp.wrk

Rating = 1

Loss of Fermi Unit

All Lines In Pre-Contingency

Uprated Davis-Besse Plant (1033MW)



General Electric Company — PSLF Program — MW/MVAR — Wed Aug 11 14:20:16 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/

dvb [12] Loss of Fermi Unit

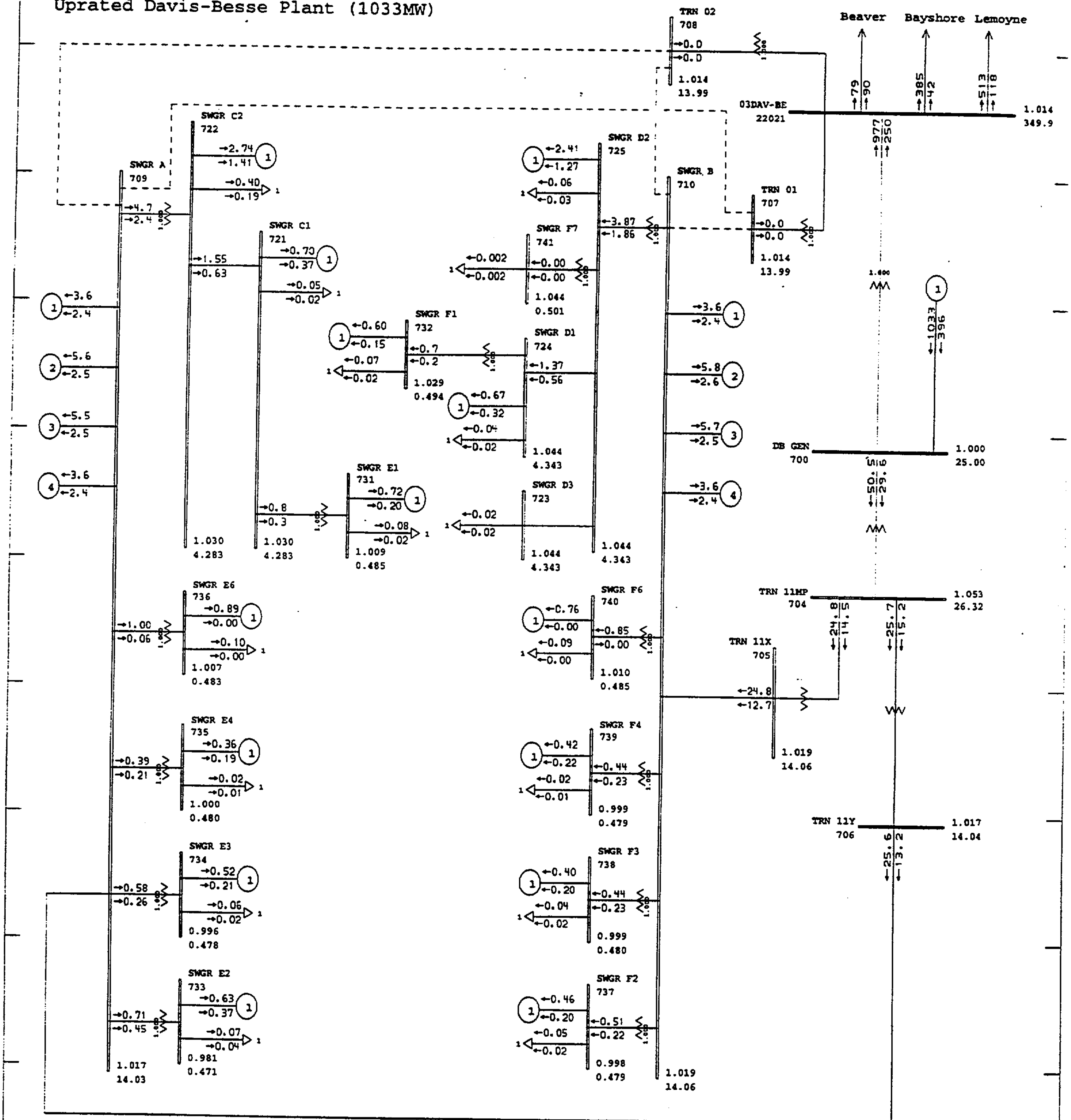
1260MW PERRY GROSS OUTPUT, 1205MW NET

dbs.drw

temp.wrk

Rating = 1

Loss of Bayshore-Monroe & Lemoyne-Majestic 345kV Lines
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)

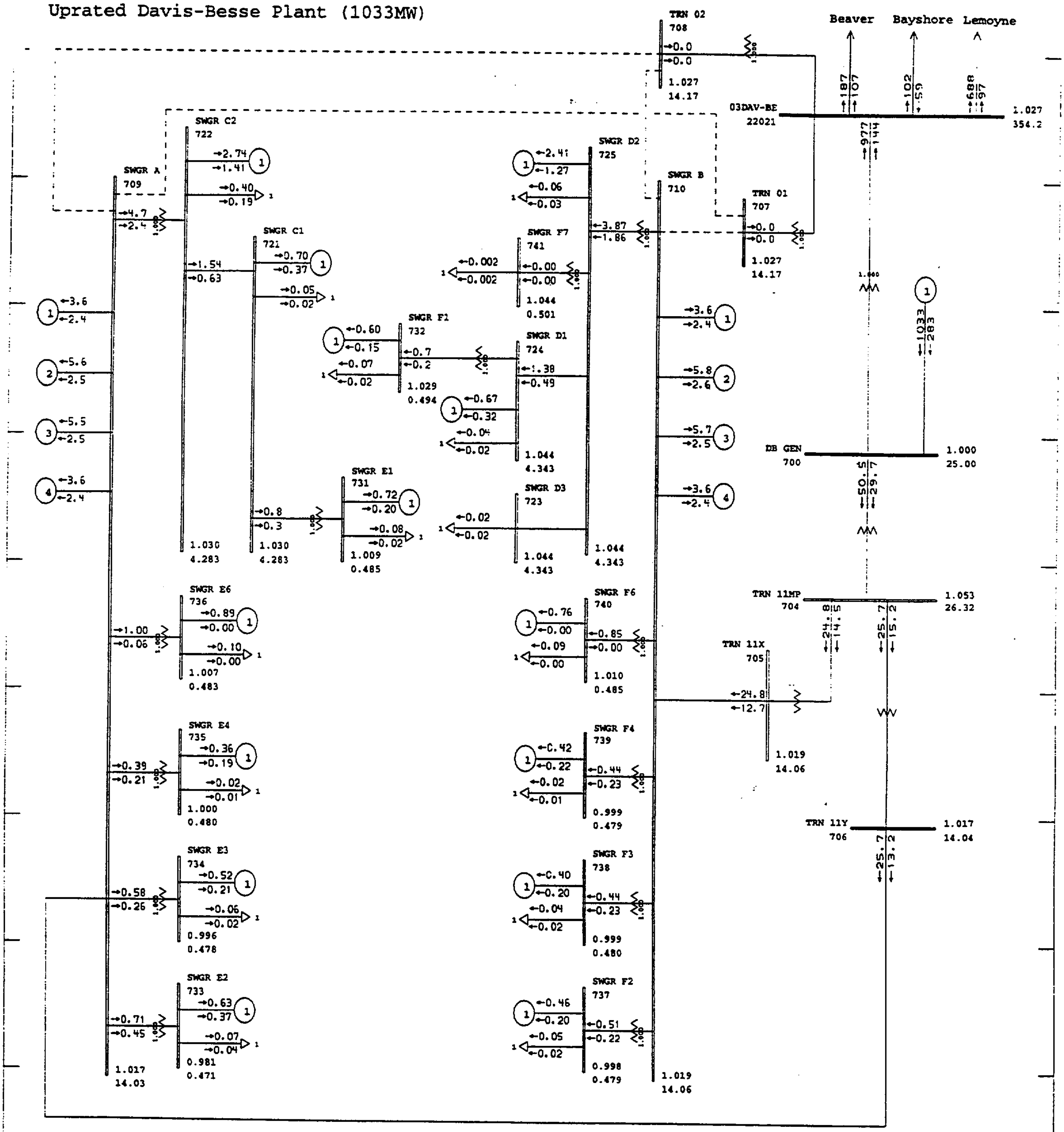


General Electric Company PSLF Program

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLM 10/
dvb [13] Loss of Bayshore-Monroe & Lemoyne-Majestic 345kV Lines
1240MW PERRY GROSS OUTPUT, 1205MW NET

MW/MVAR Wed Aug 11 14:20:23 1.
dbs.drw
temp.wrk
Rating = 1

Loss of Bayshore-Fostoria & Lemoyne-Fostoria 345kV Lines
All Lines In Pre-Contingency
Uprated Davis-Besse Plant (1033MW)



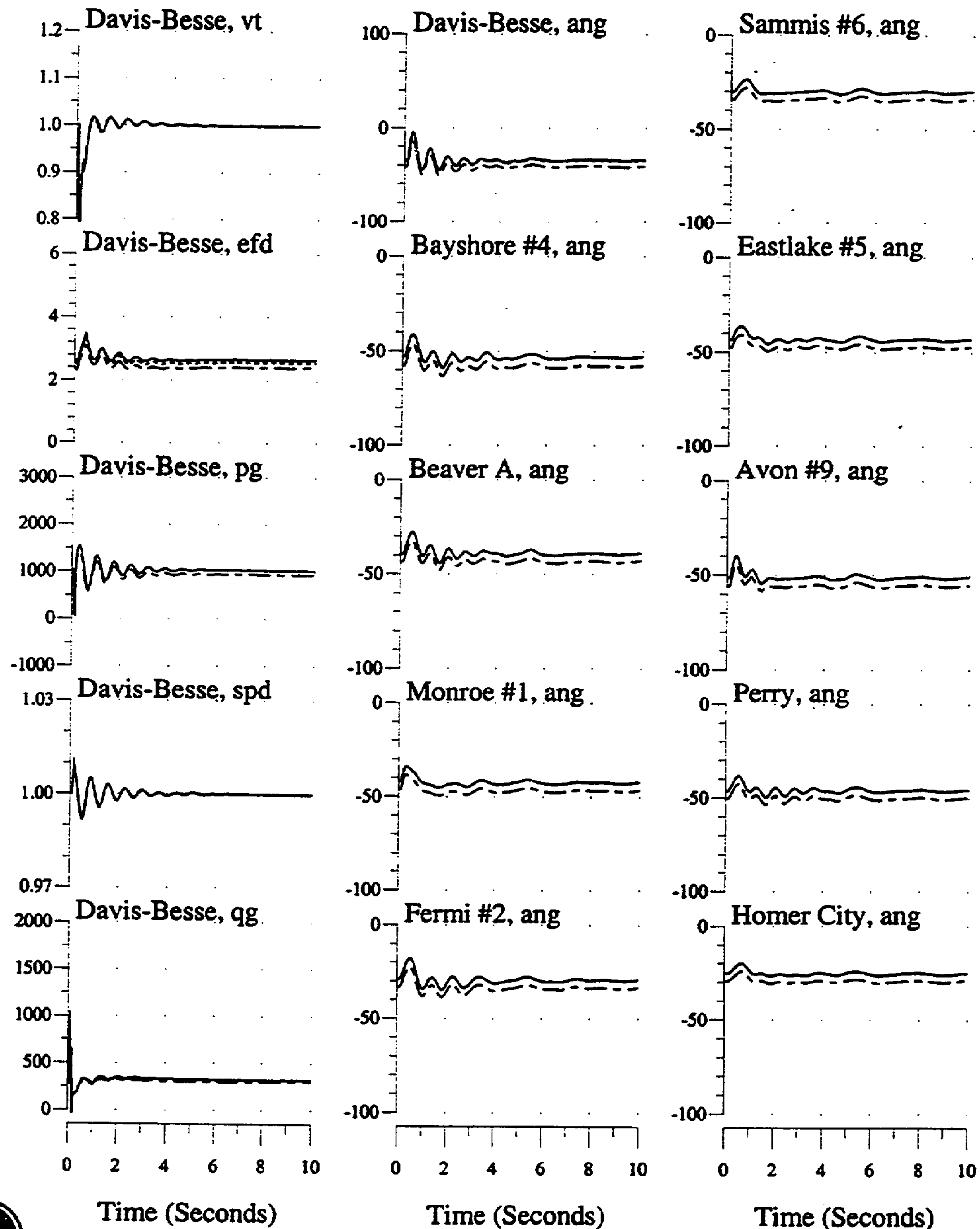
General Electric Company | PSLF Program | MW/MVAR | Wed Aug 11 14:20:30 1999

1999 SUMMER PEAK MMWG CASE (1997 SERIES) (REDUCED BY JLK 10/
dvb [14] Loss of Bayshore-Fostoria & Lemoyne-Fostoria 345kV Lines
1240MW PERRY GROSS OUTPUT, 1205MW NET

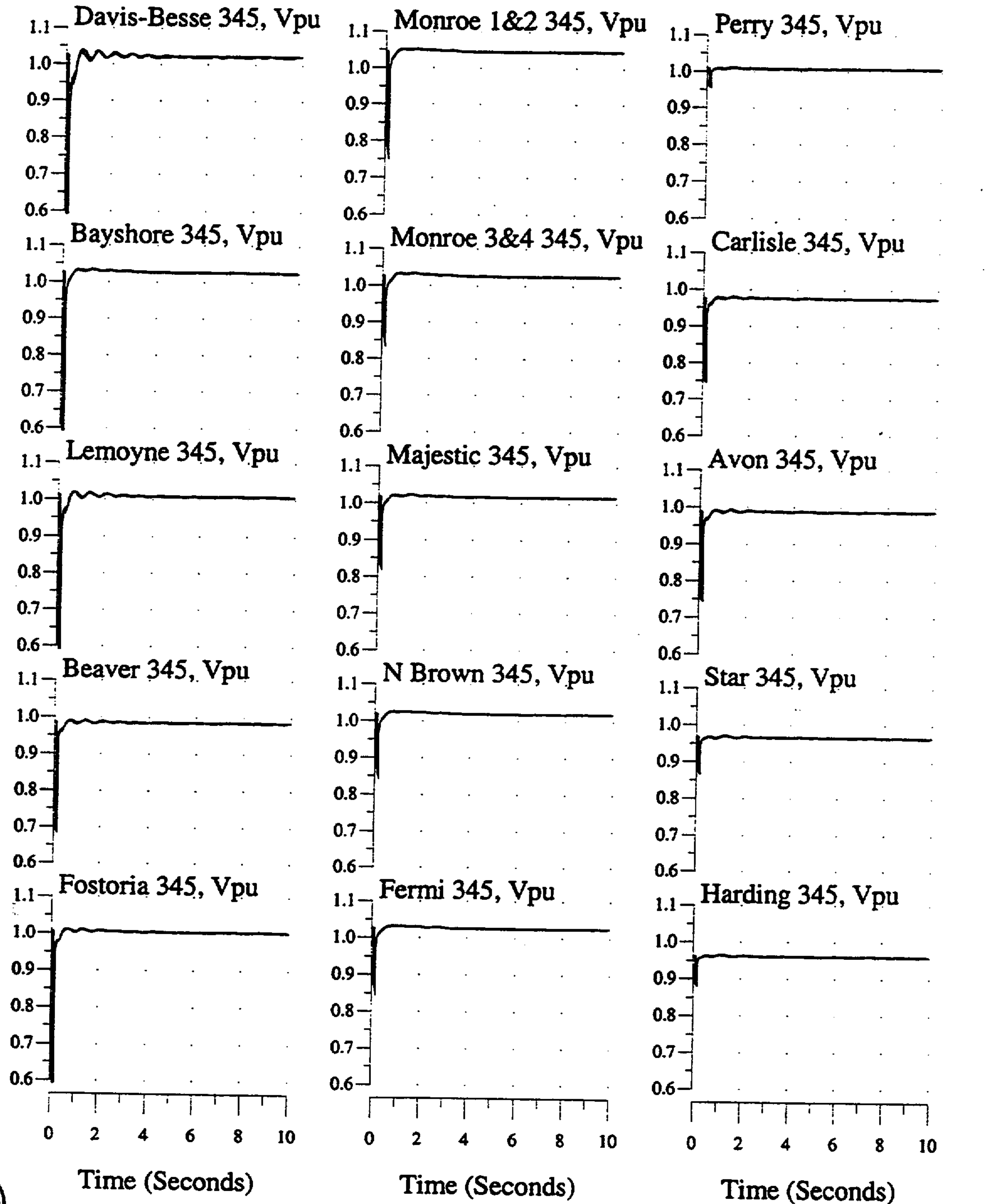
dbs.drw
temp.wrk
Rating = 1

Appendix D
Stability Analysis Results

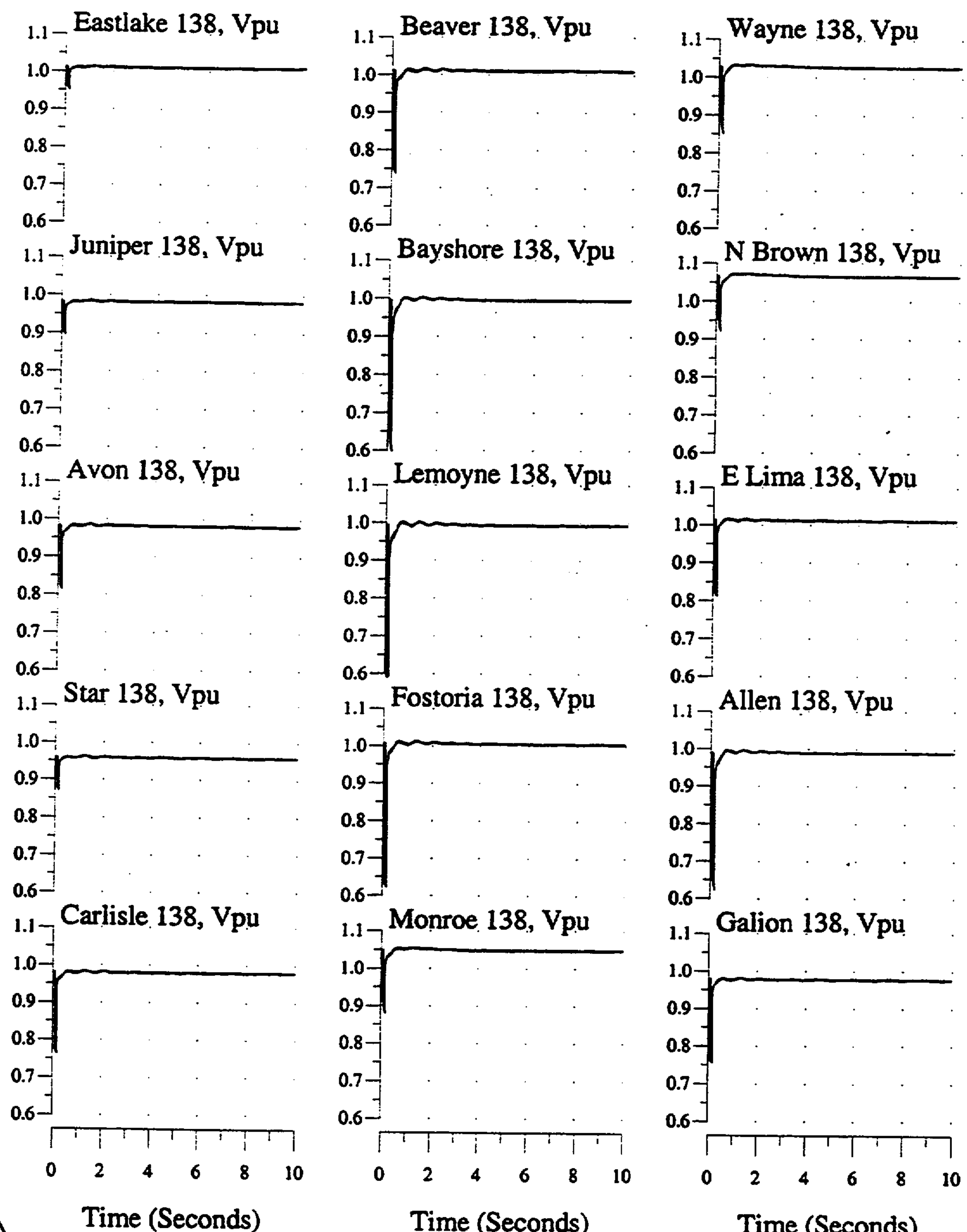
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Bayshore 345kV Line
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



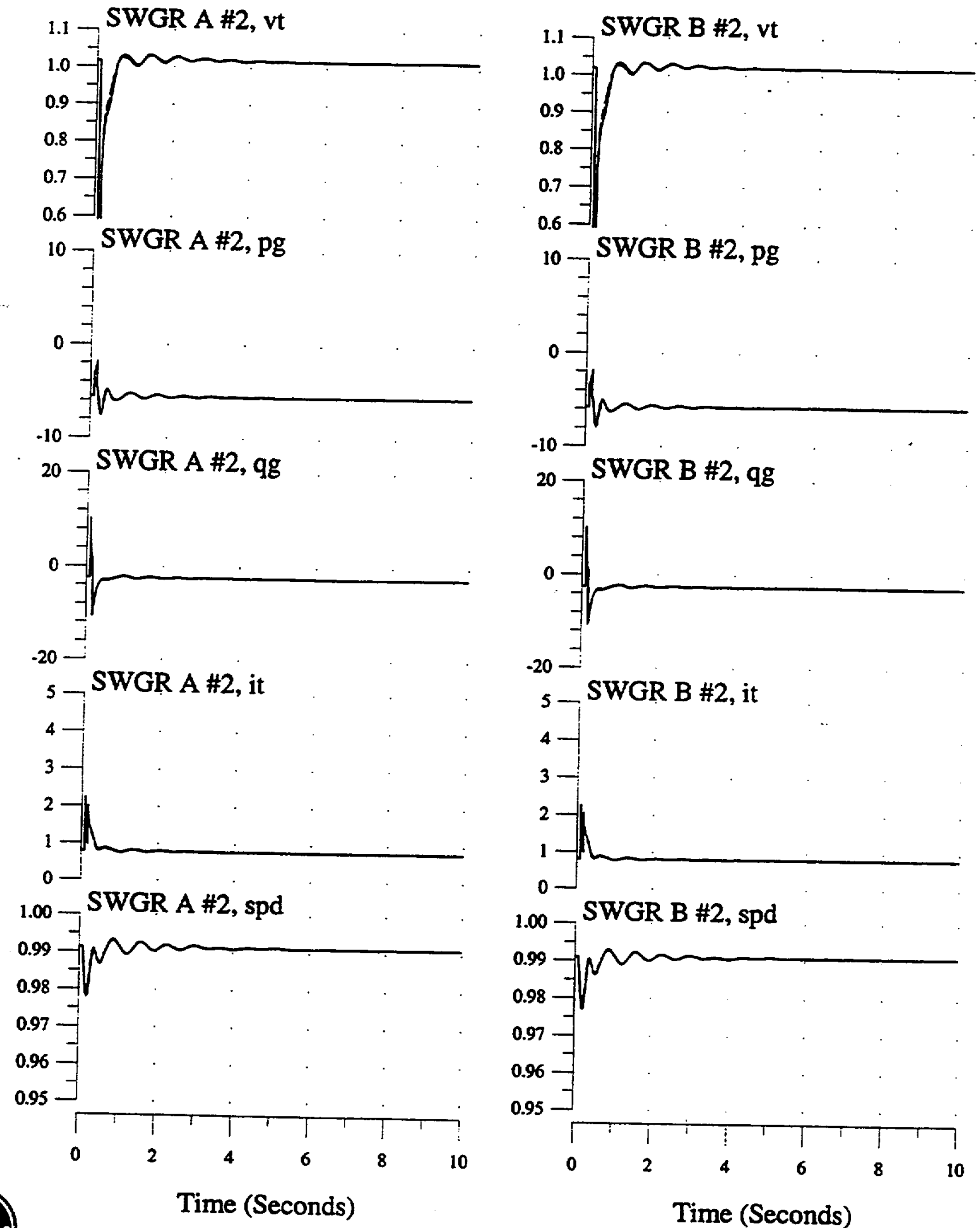
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Bayshore 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



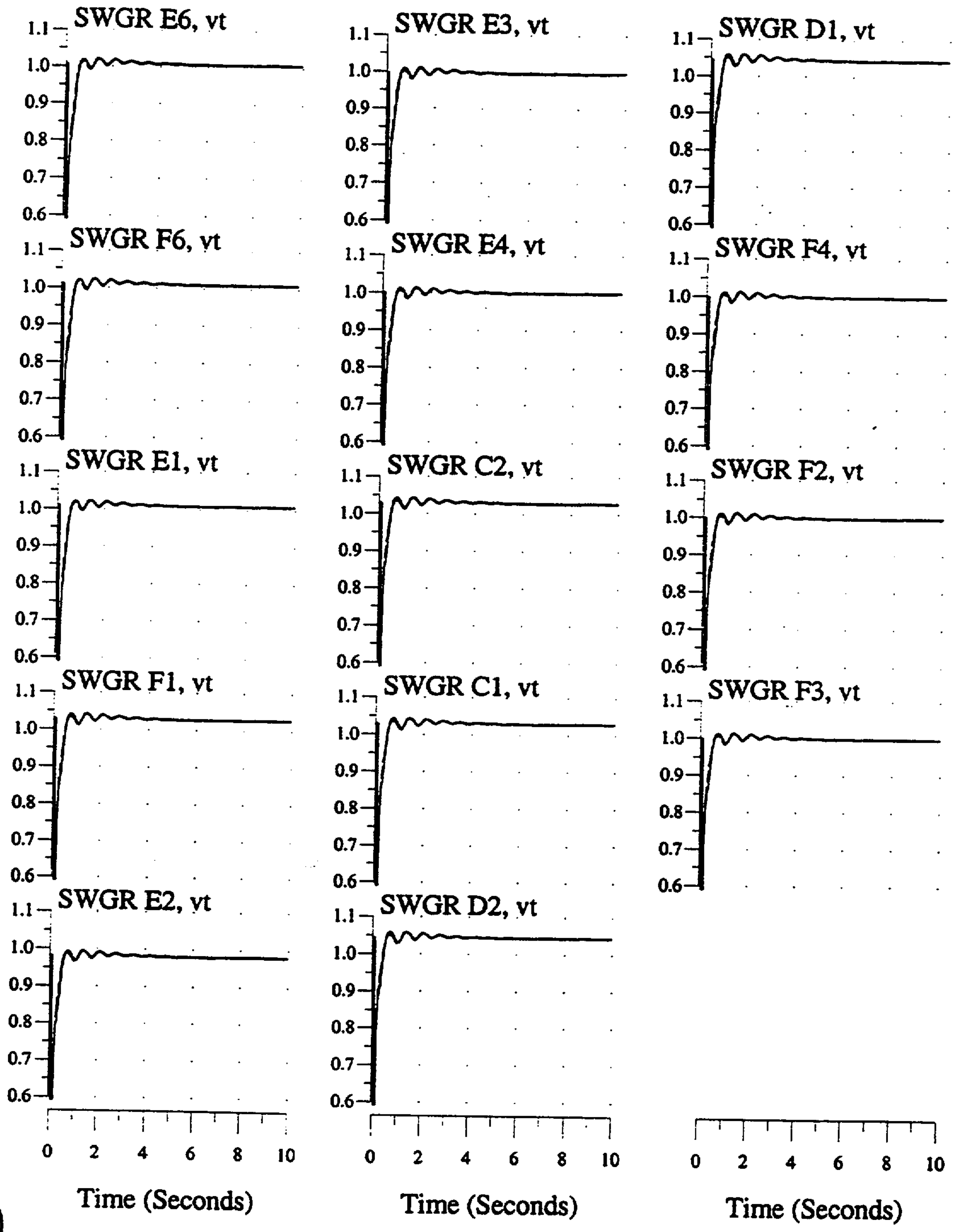
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Bayshore 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



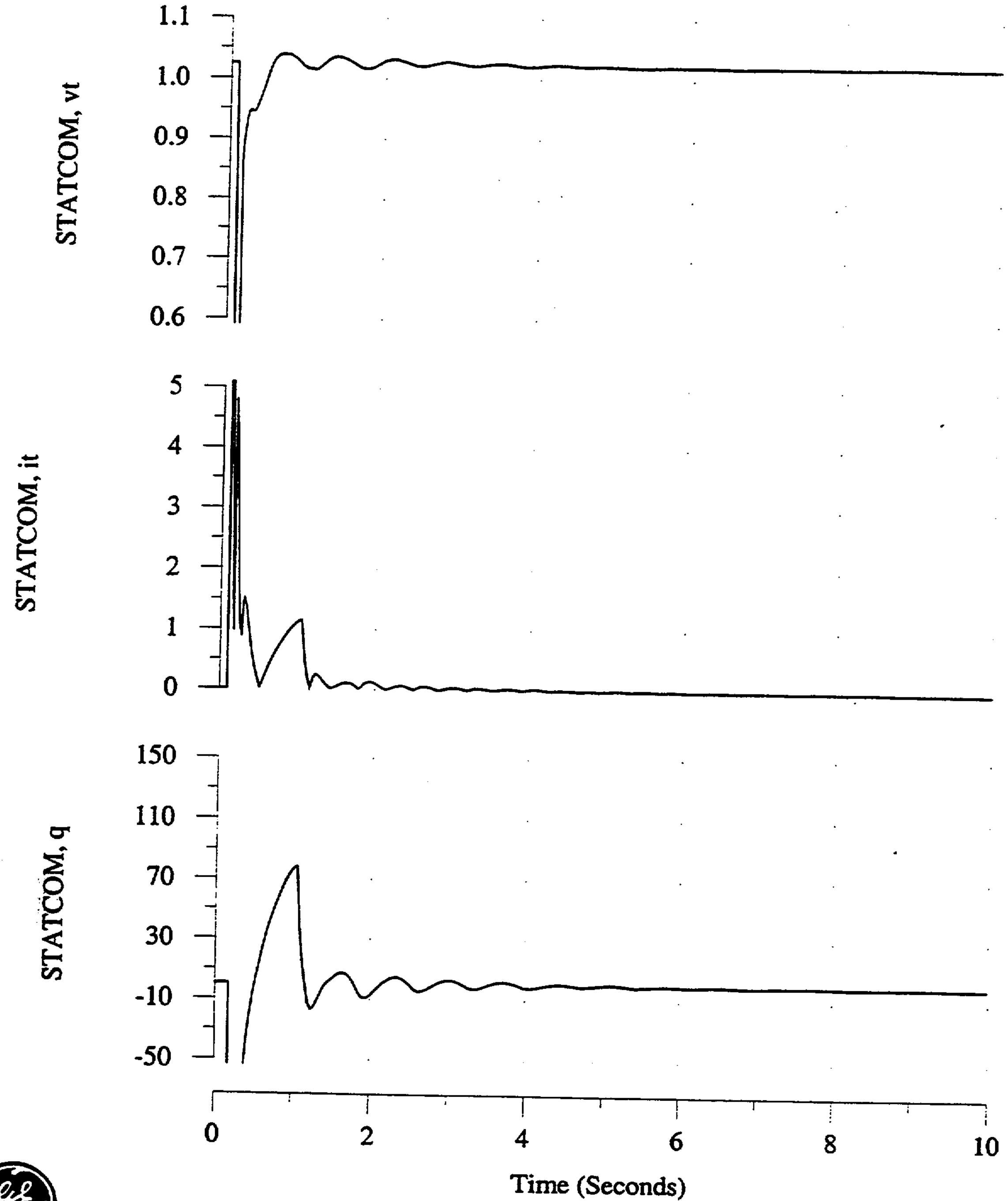
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Bayshore 345kV Line
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



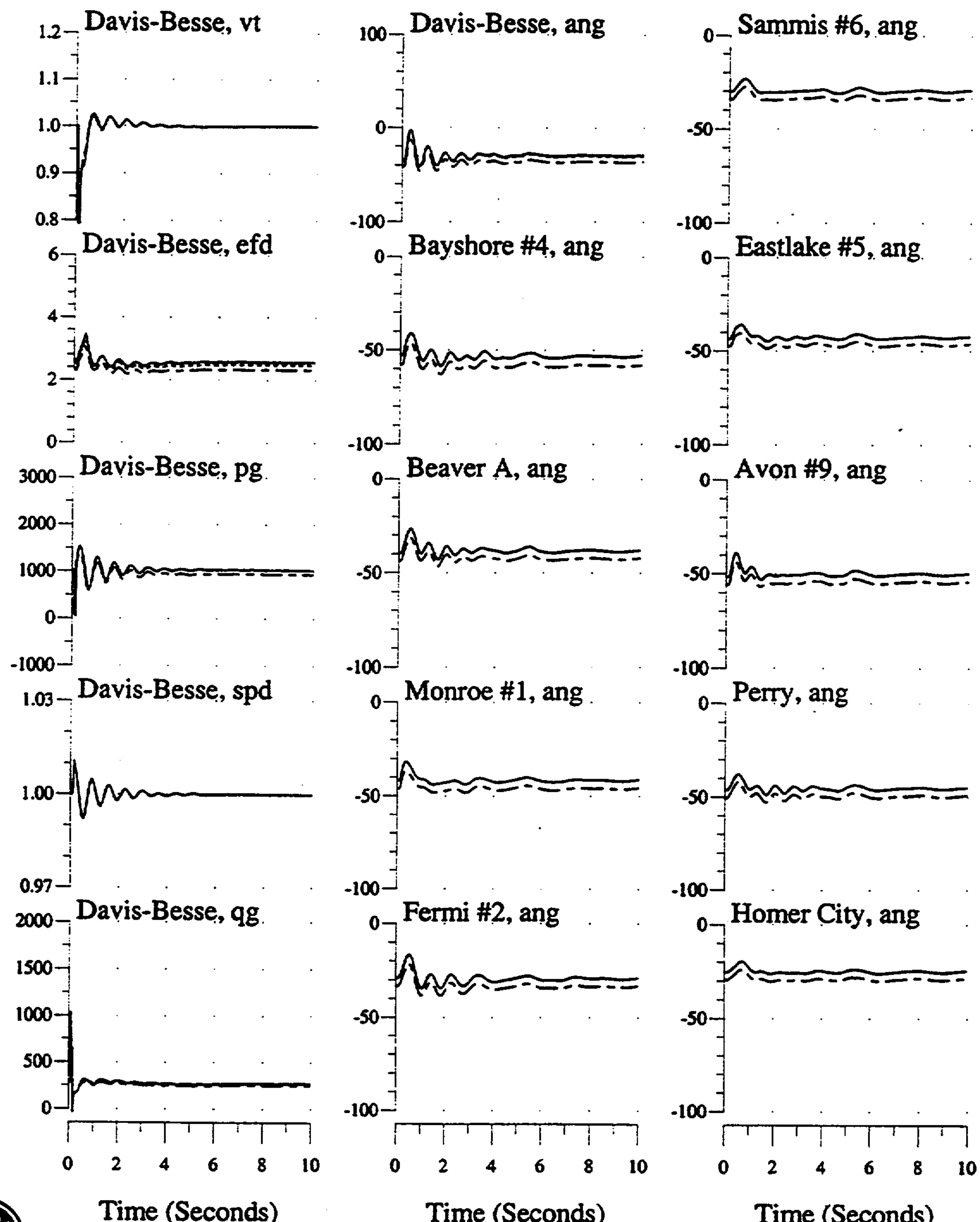
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Bayshore 345kV Line
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



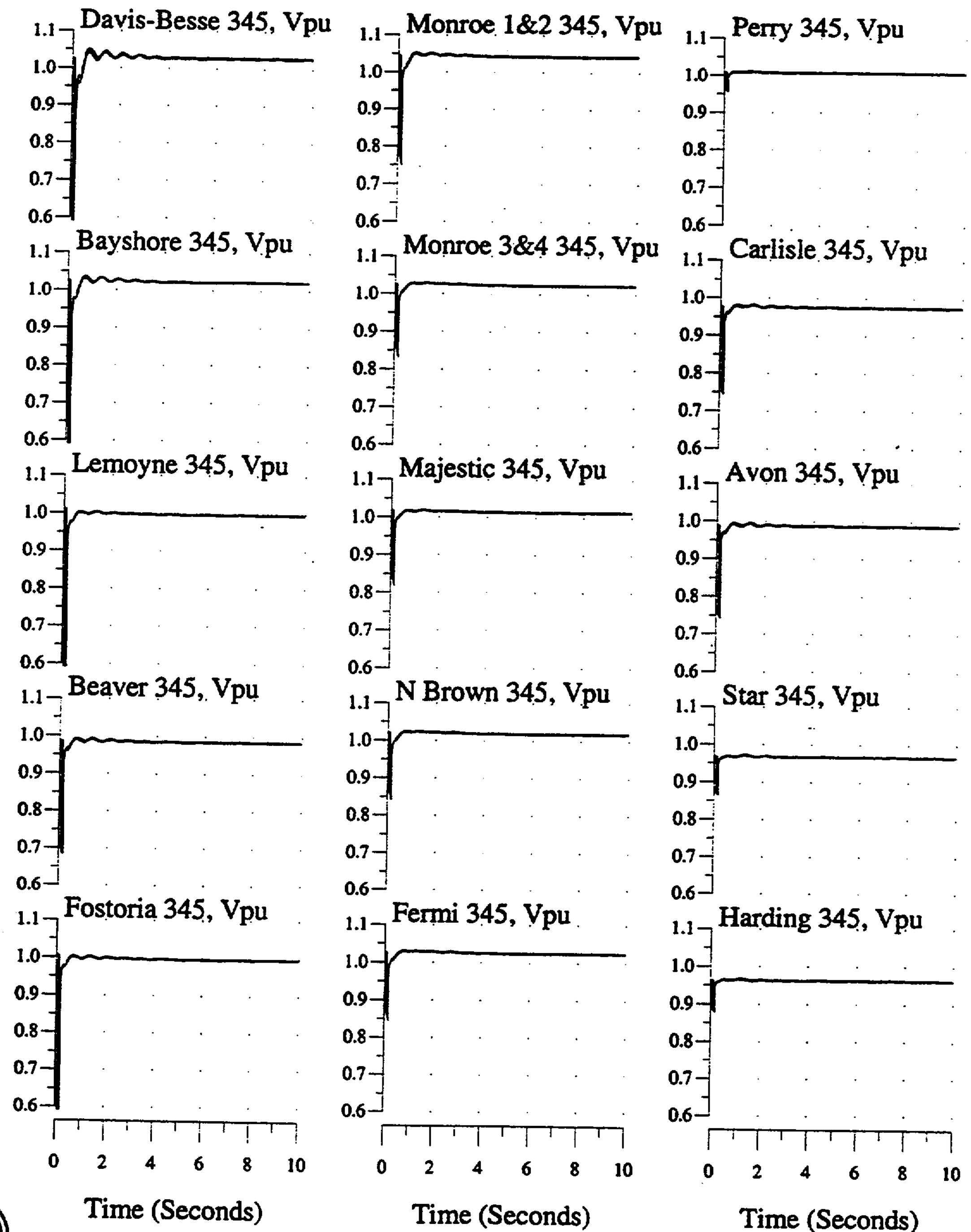
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Bayshore 345kV Line
STATCOM Variables: (__) With Uprate & STATCOM



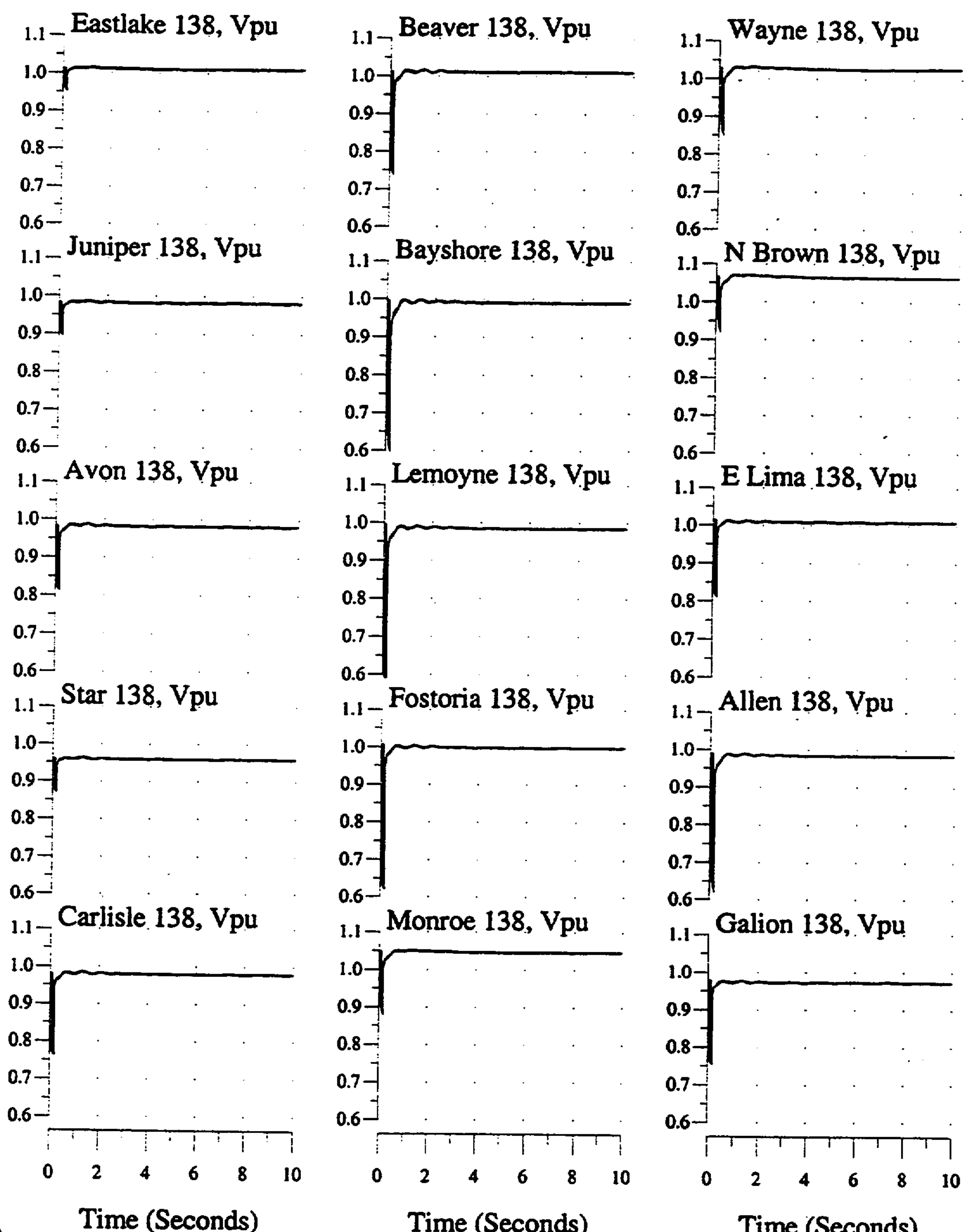
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Lemoyne 345kV Line
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



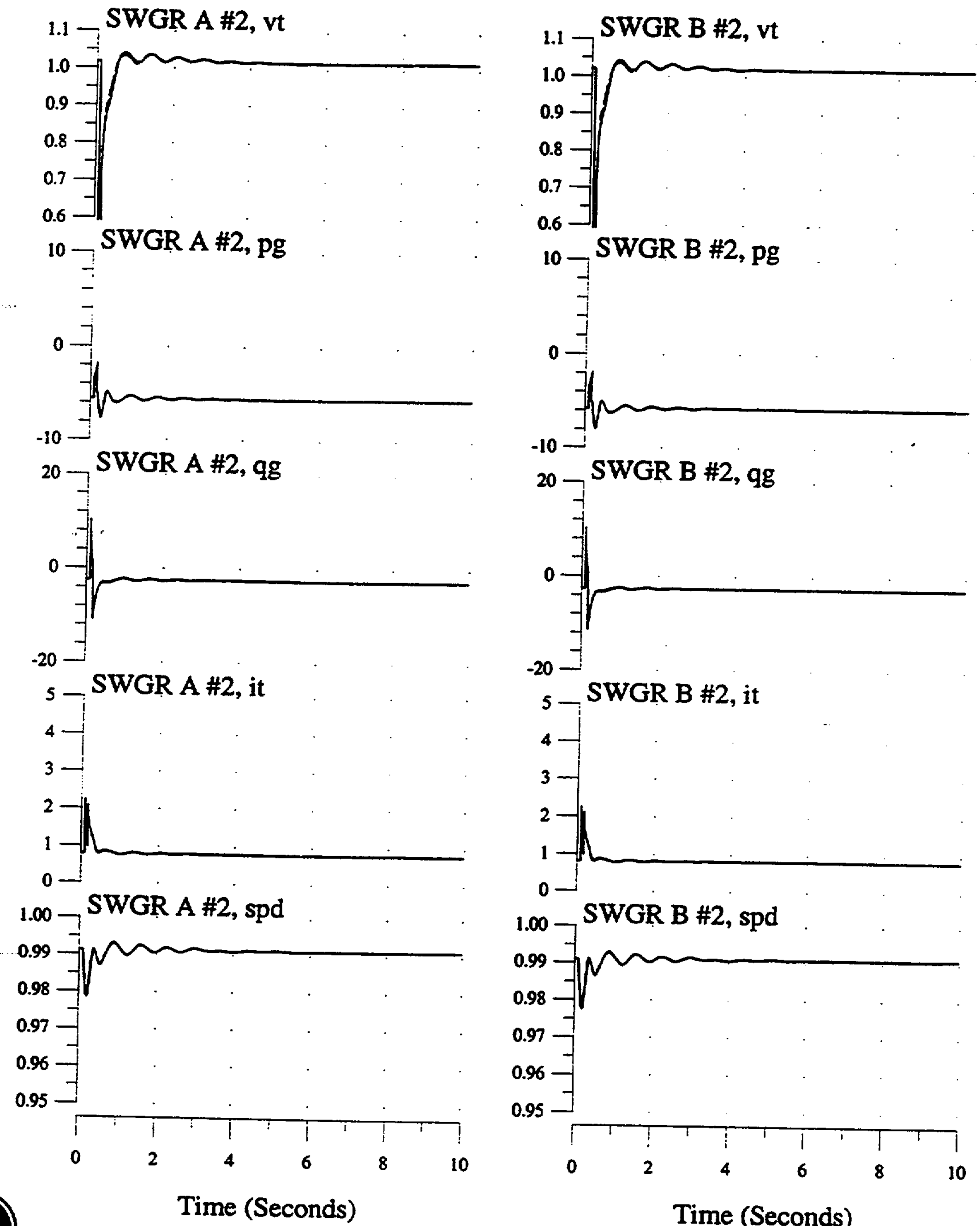
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Lemoyne 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



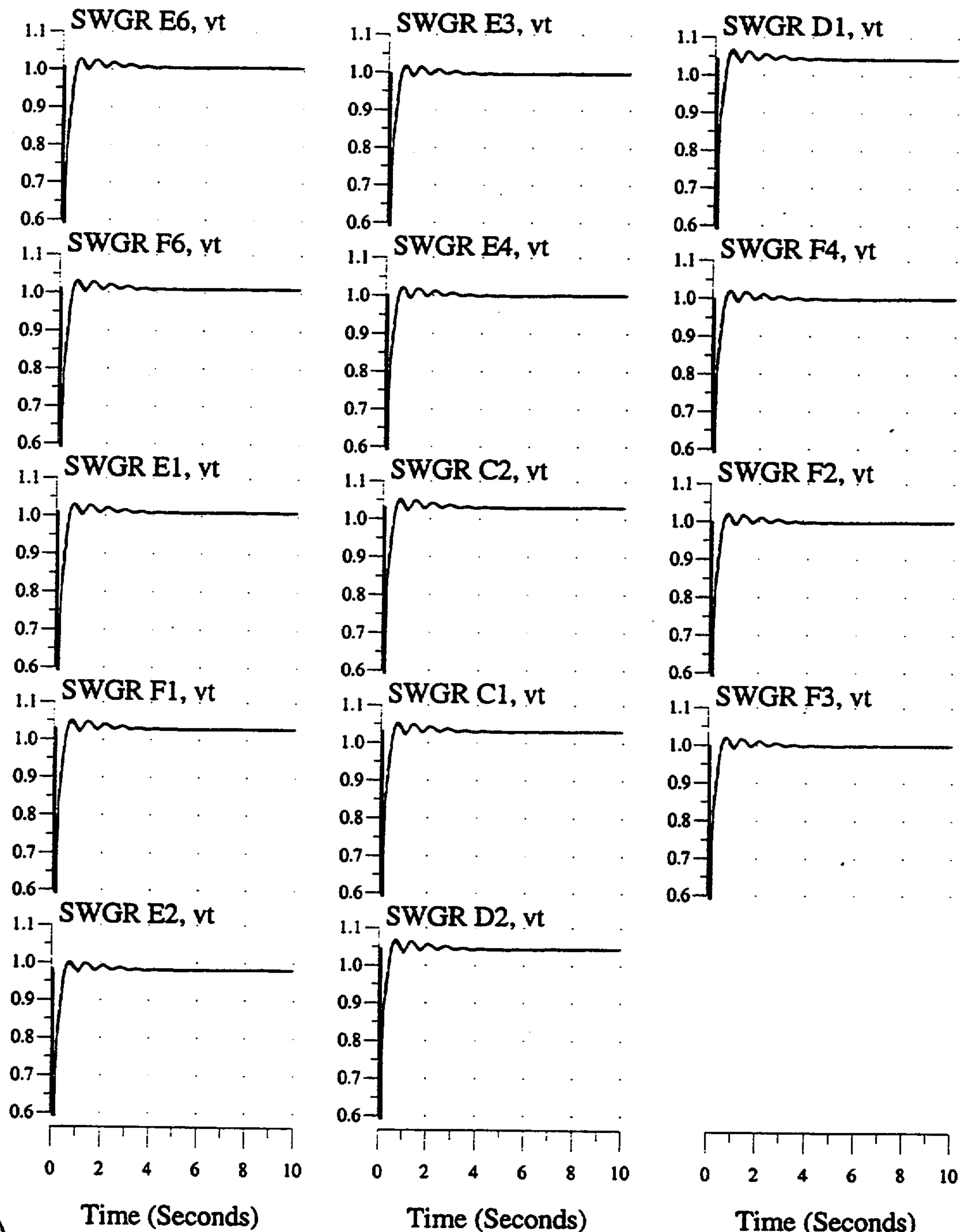
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Lemoyne 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



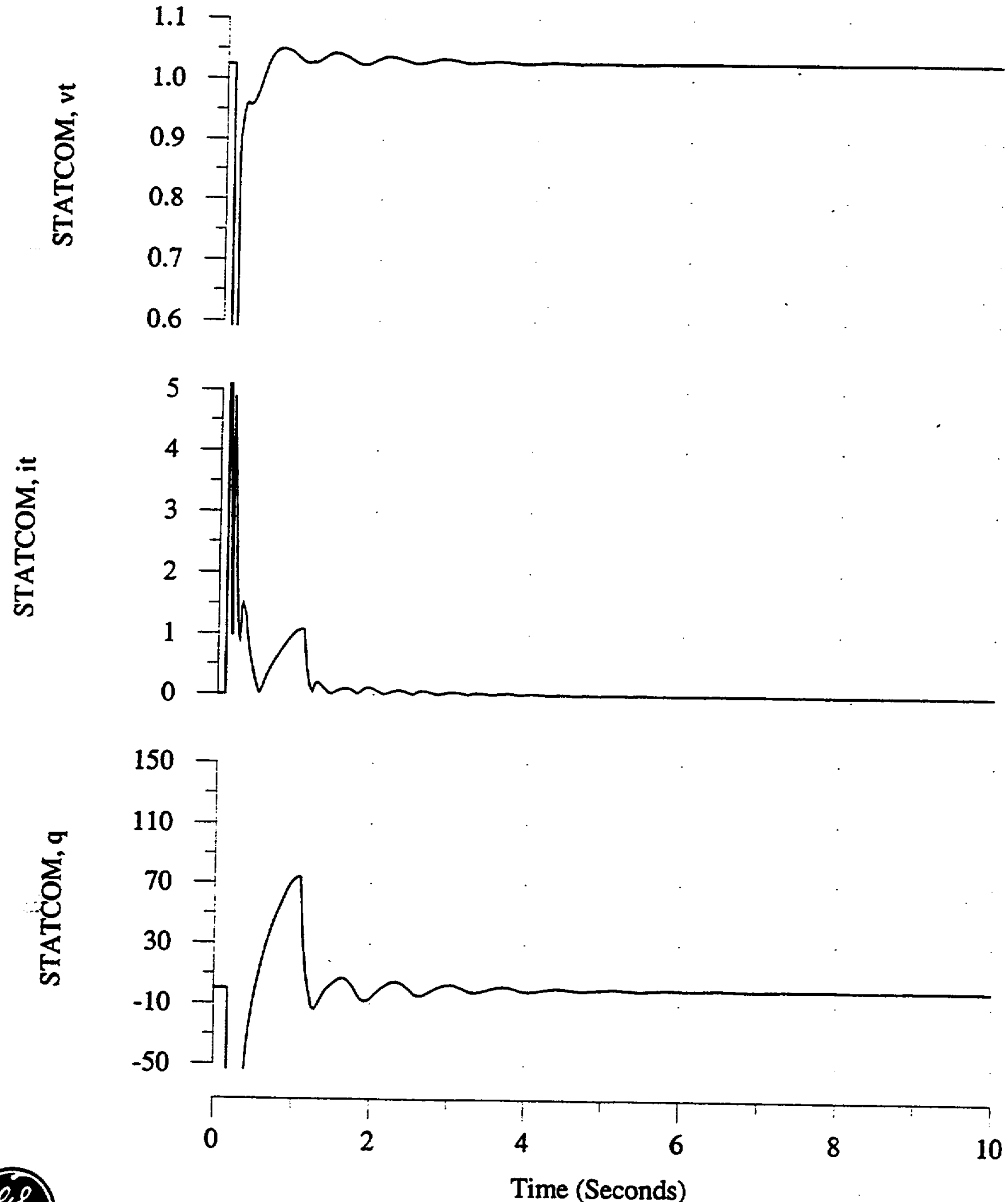
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Lemoyne 345kV Line
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



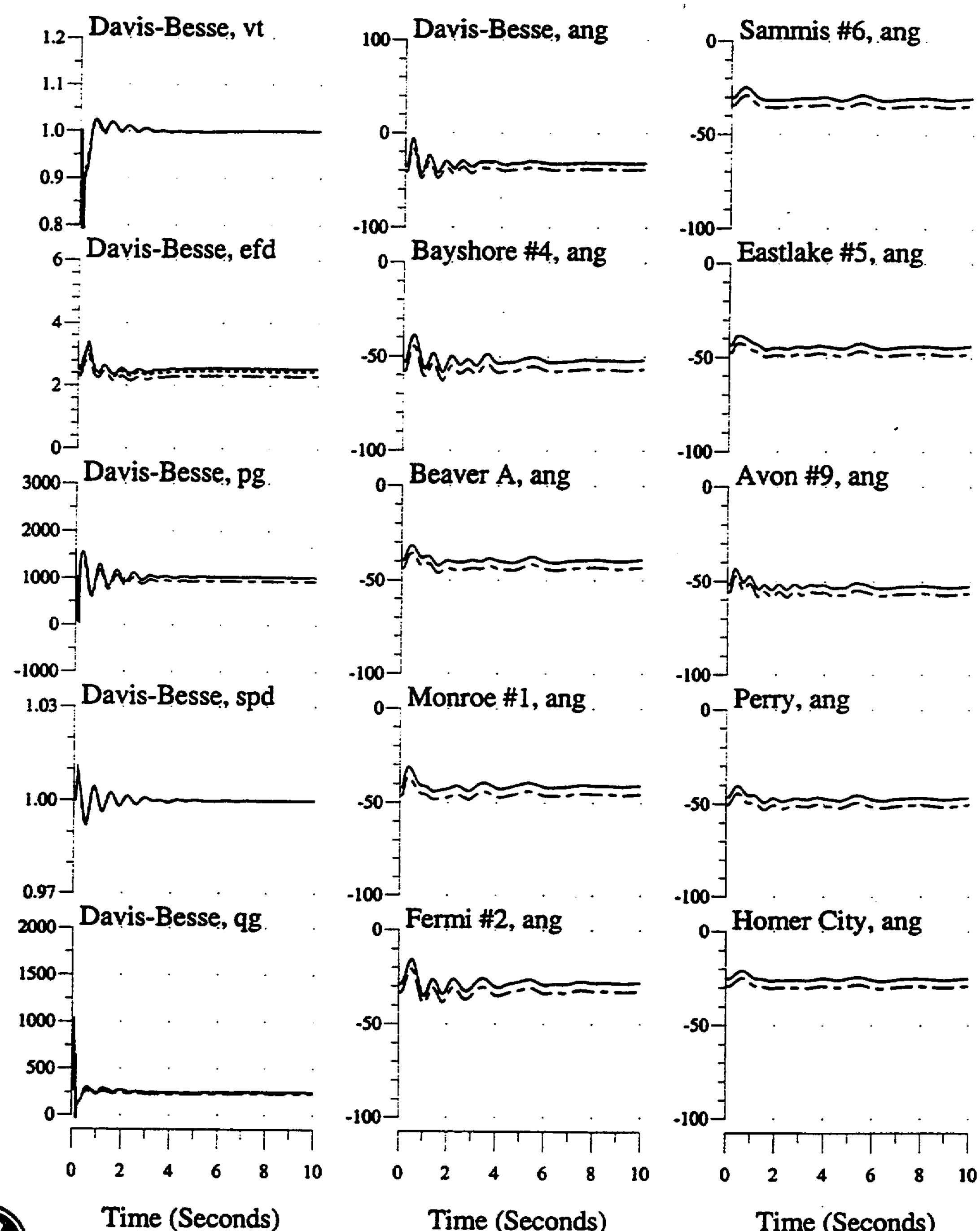
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Lemoyne 345kV Line
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



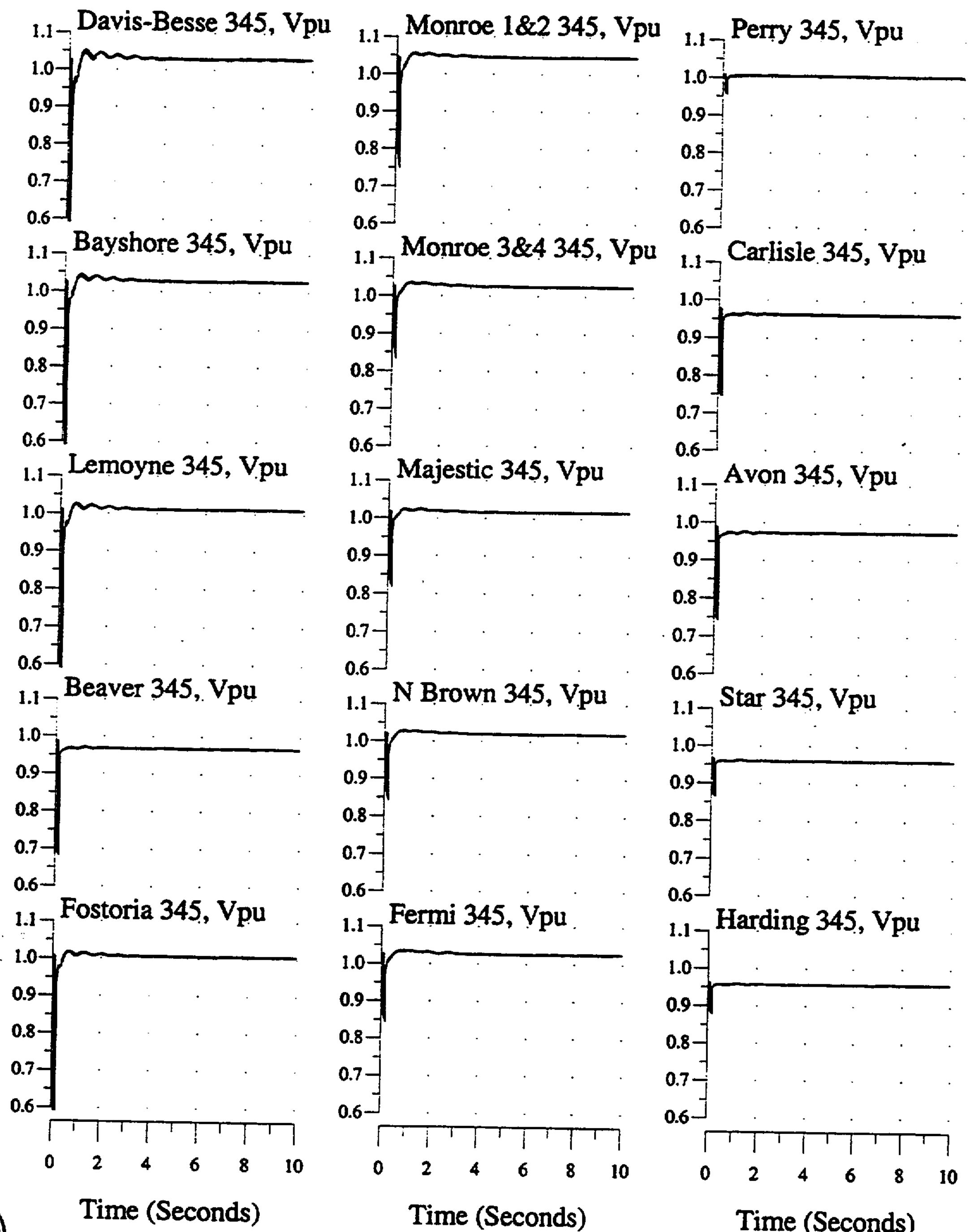
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Lemoyne 345kV Line
STATCOM Variables: (__) With Uprate & STATCOM



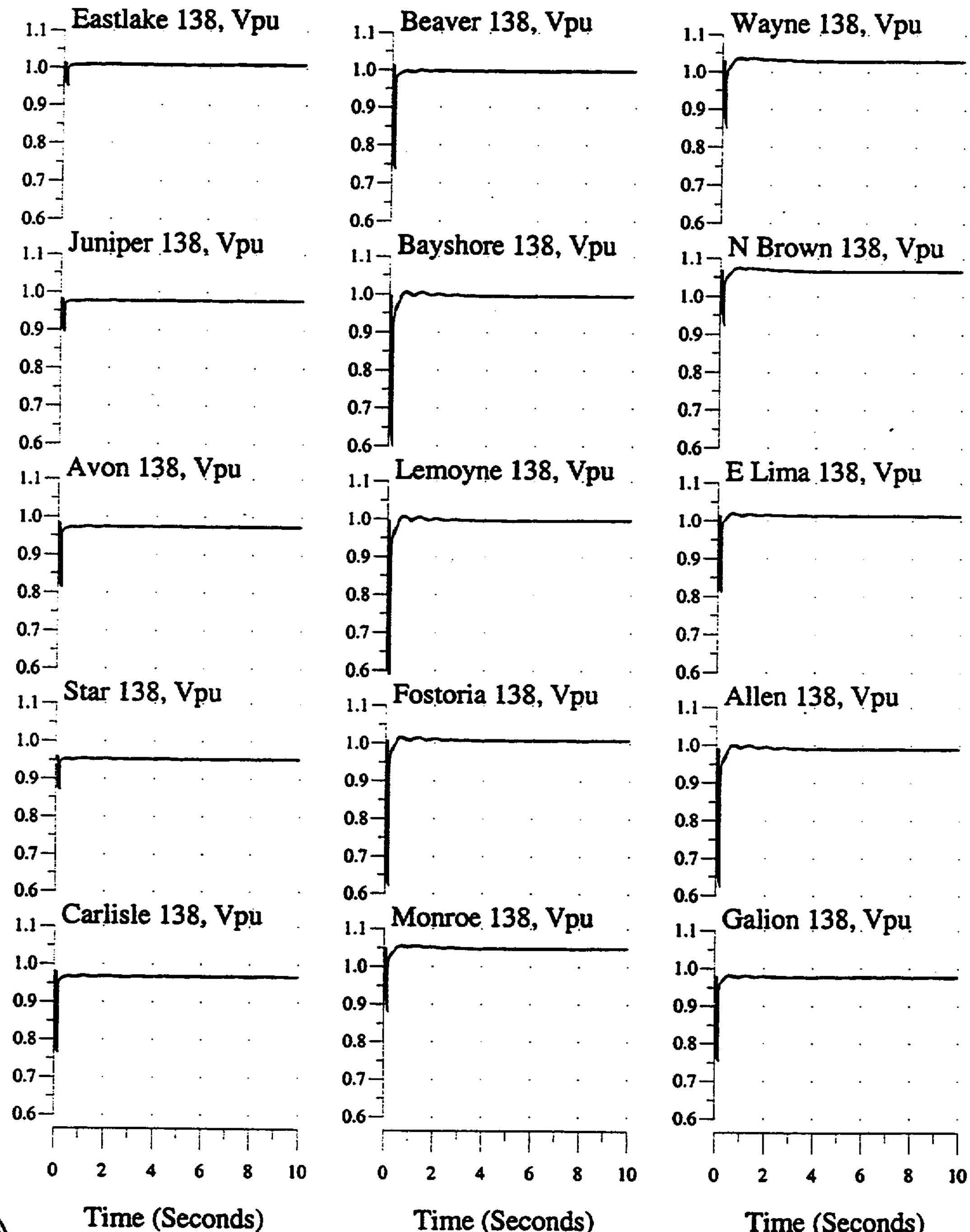
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Beaver 345kV Line
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



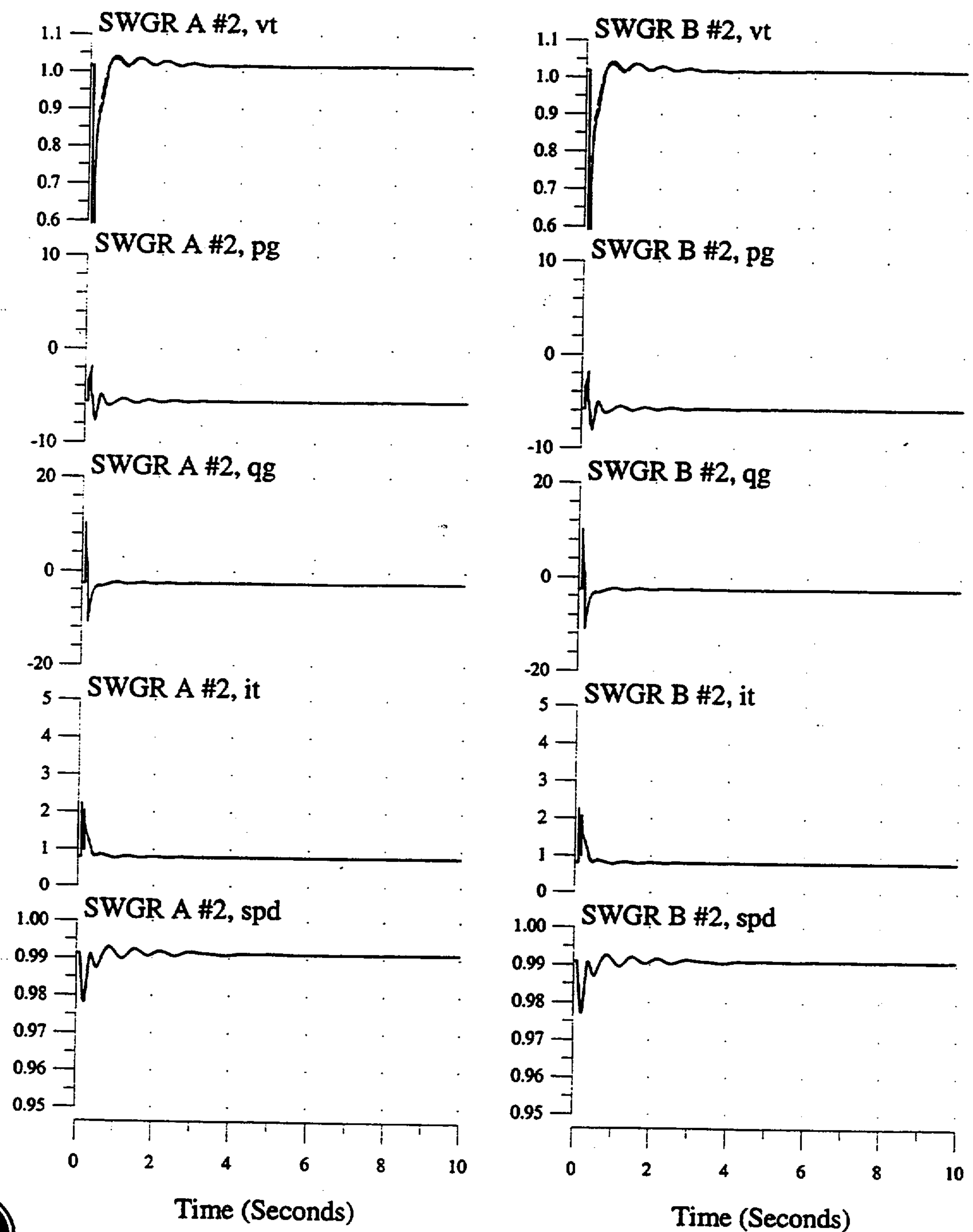
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Beaver 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



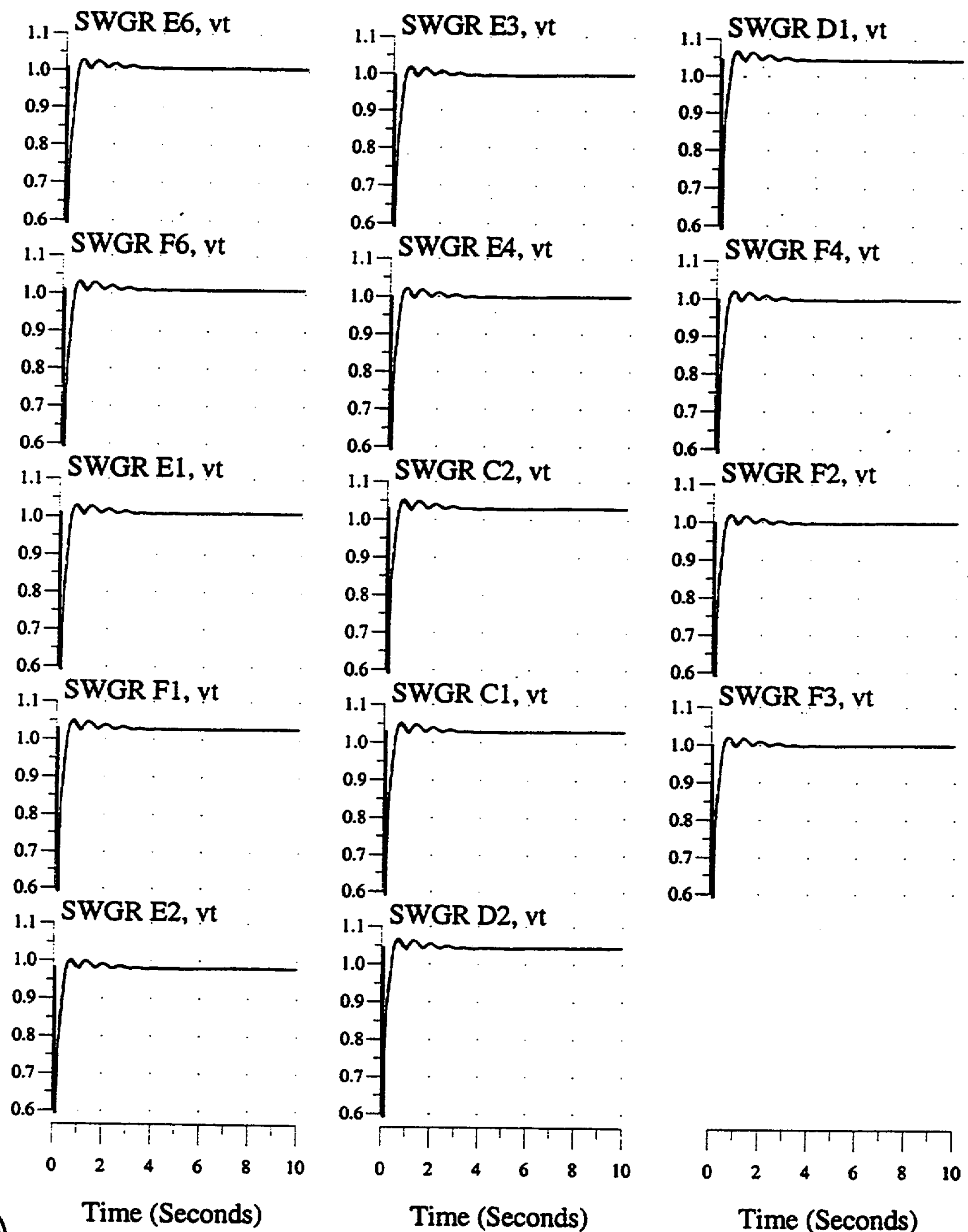
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Beaver 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



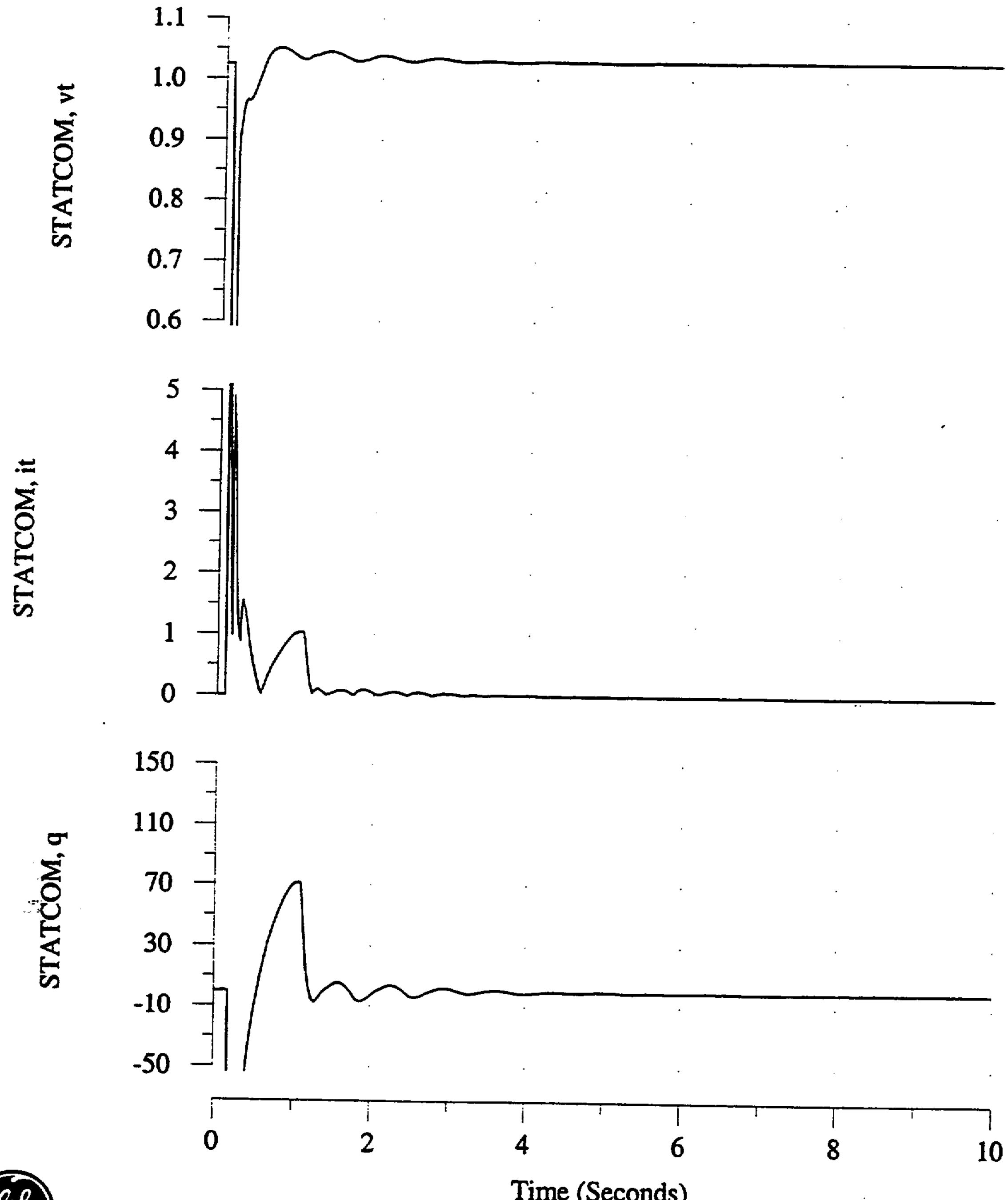
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Beaver 345kV Line
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



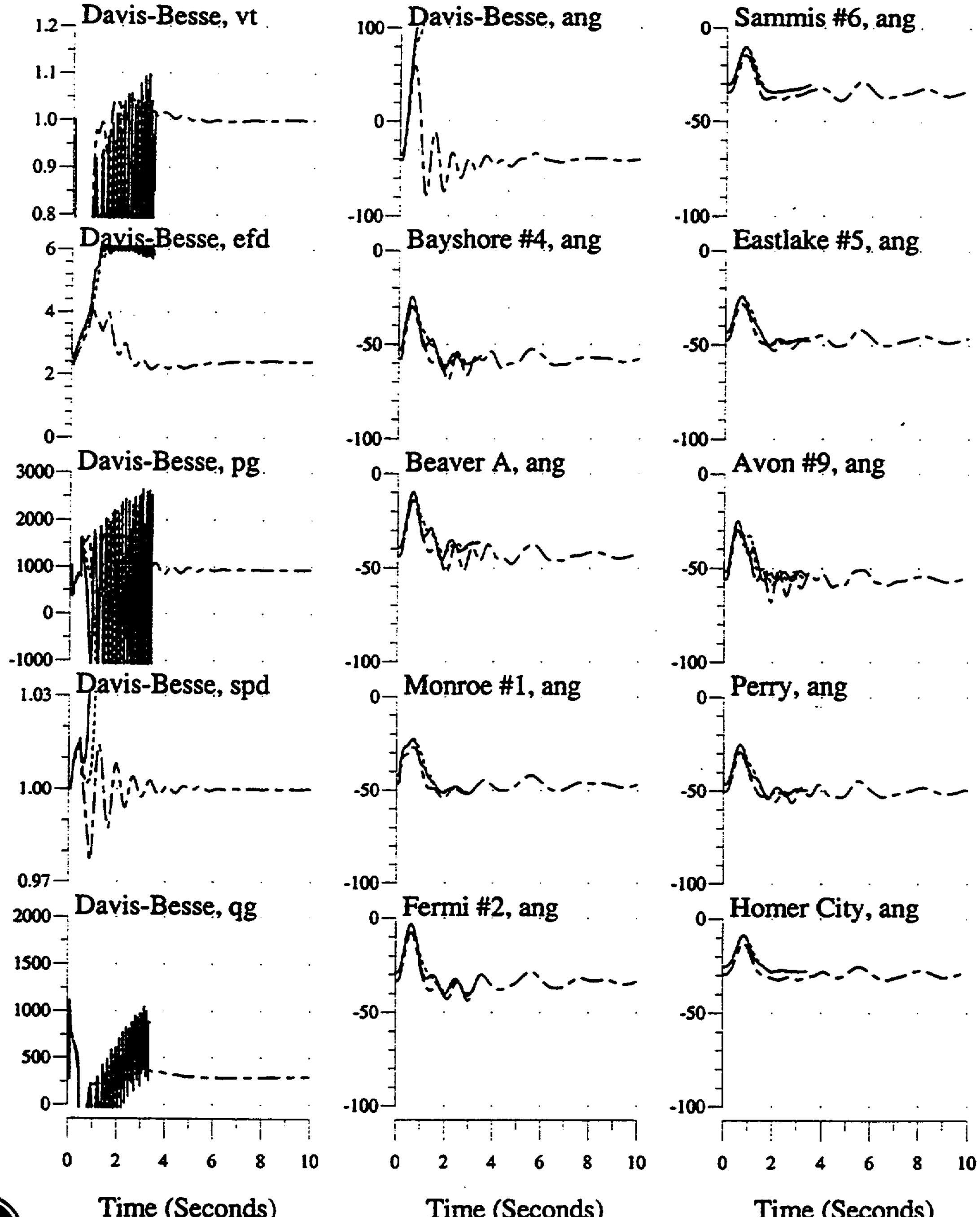
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Beaver 345kV Line
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



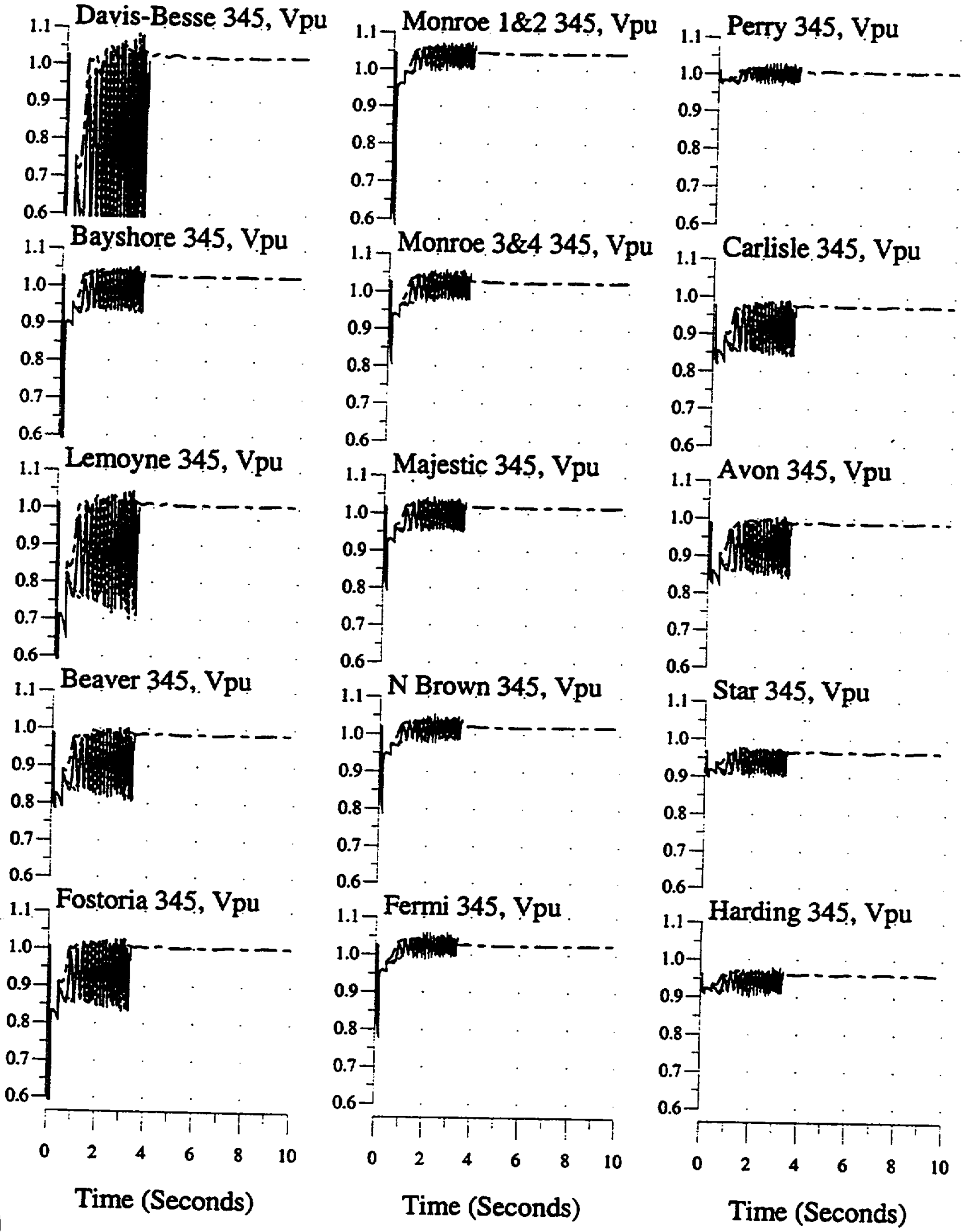
3phase, 4.5cycle Fault at Davis-Besse 345kV Bus
Trip Davis Besse-Beaver 345kV Line
STATCOM Variables: (__) With Uprate & STATCOM



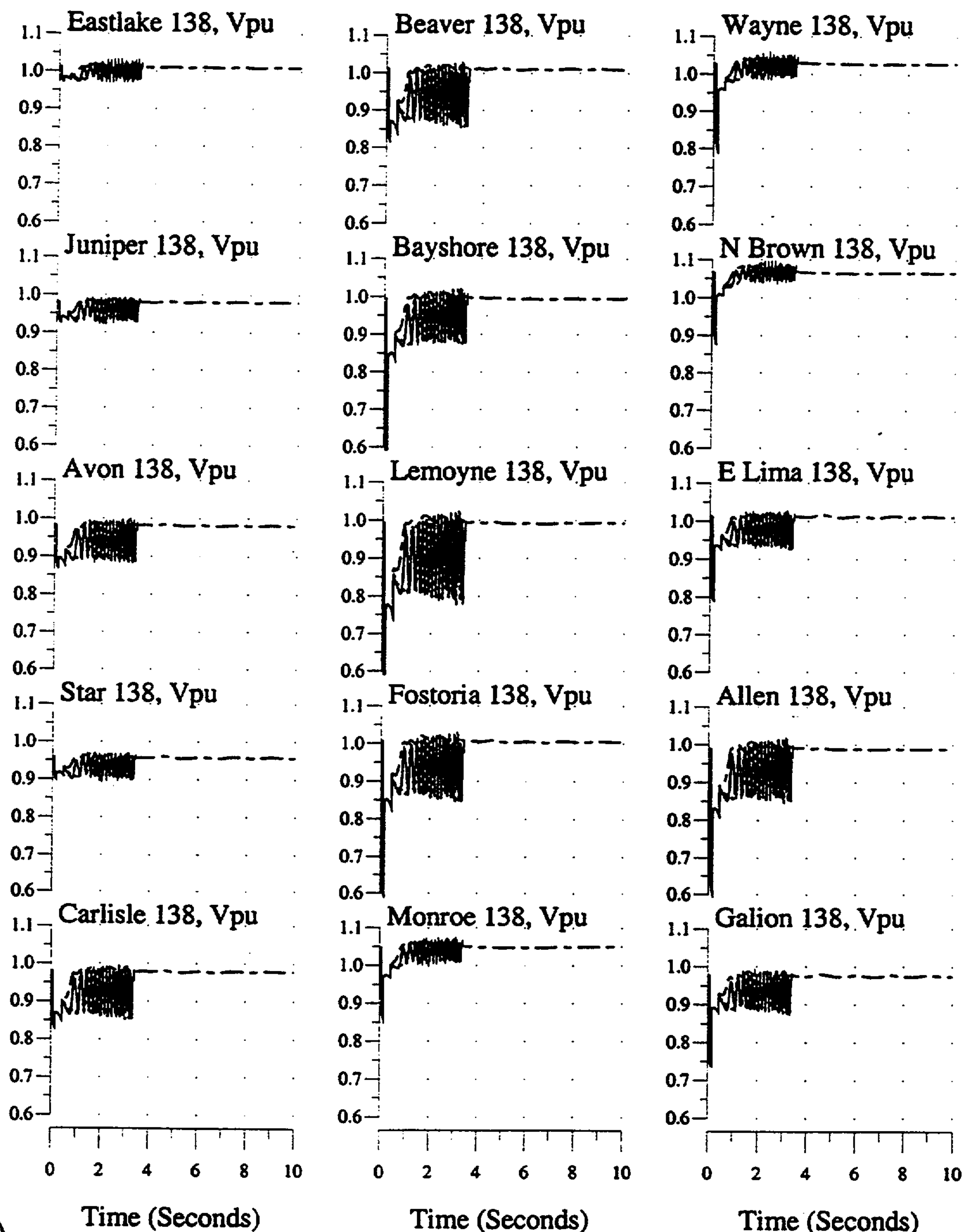
3phase Fault at Bayshore 345kV Bus
Trip DB-Bayshore 345kV Line (4.5cy @Bayshore, 22.5cy @DB)
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



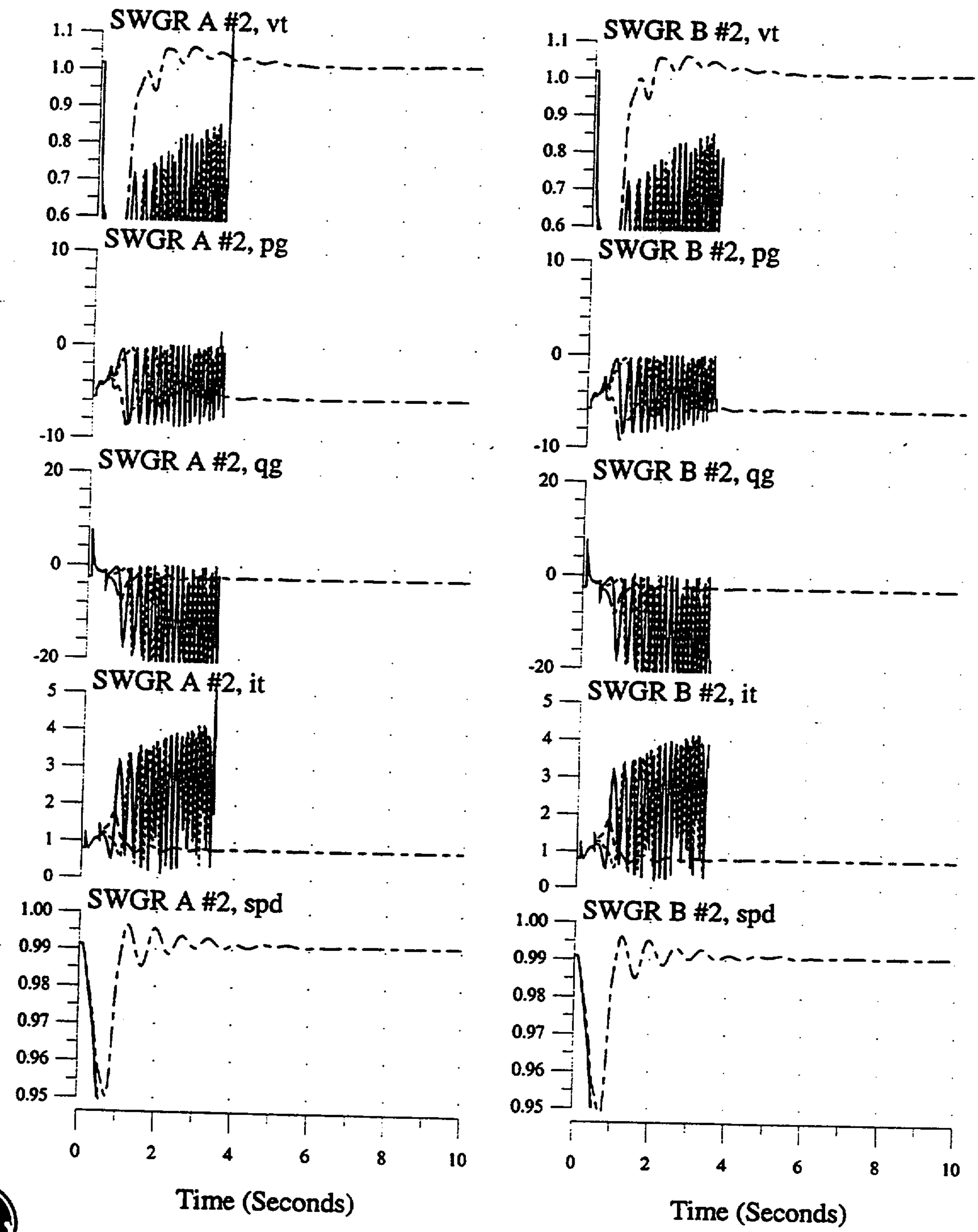
3phase Fault at Bayshore 345kV Bus
Trip DB-Bayshore 345kV Line (4.5cy @Bayshore, 22.5cy @DB)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



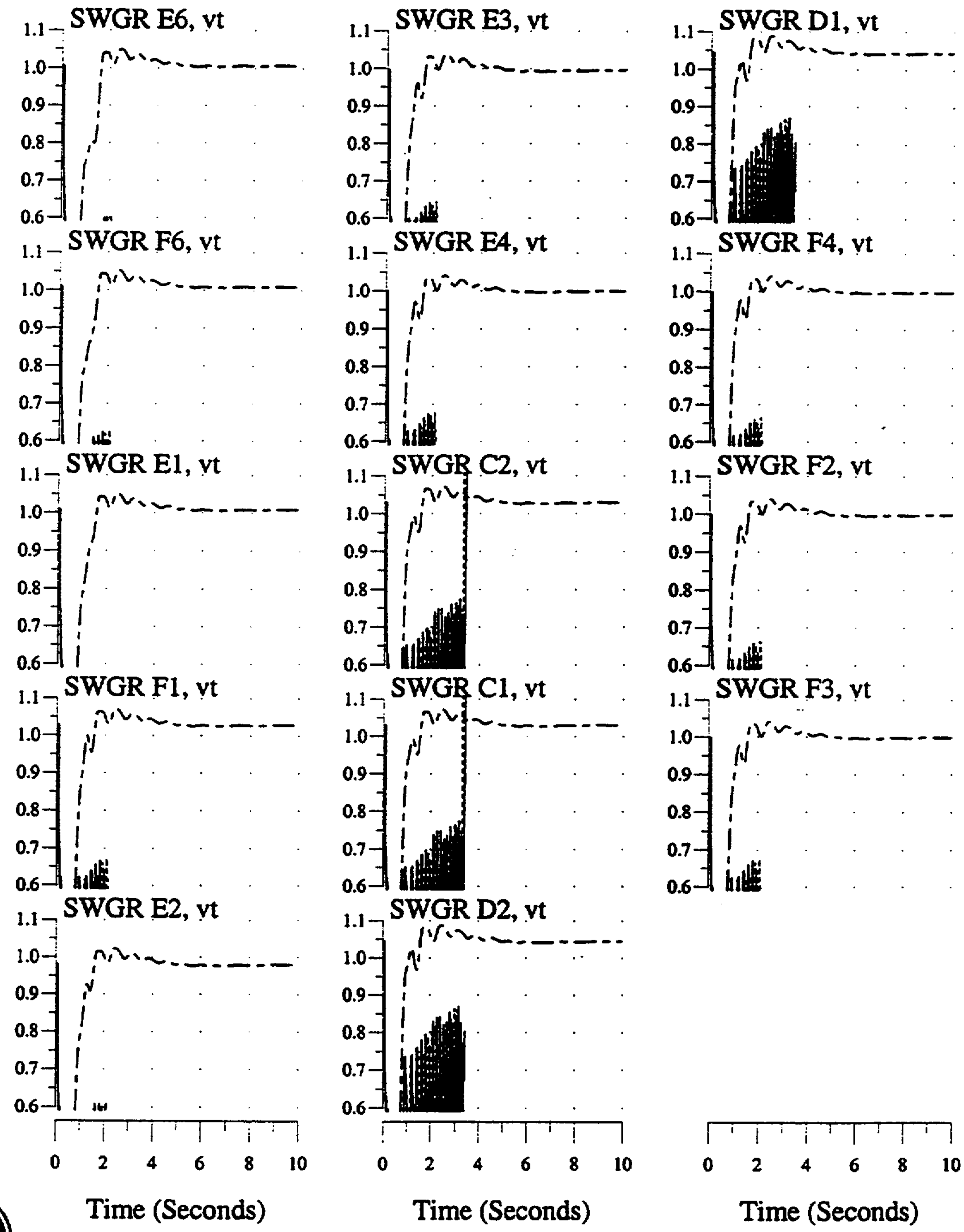
3phase Fault at Bayshore 345kV Bus
Trip DB-Bayshore 345kV Line (4.5cy @Bayshore, 22.5cy @DB)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



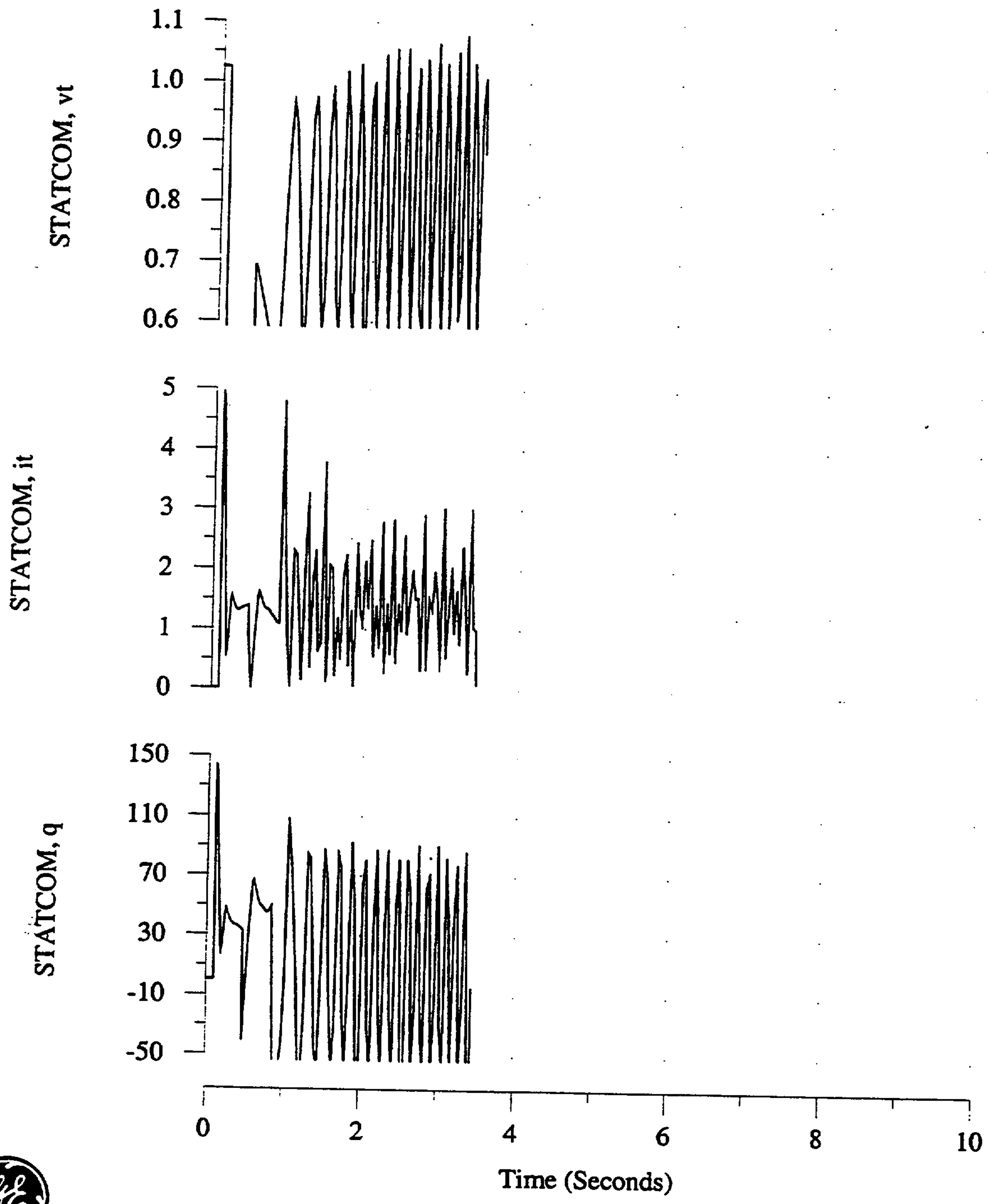
3phase Fault at Bayshore 345kV Bus
Trip DB-Bayshore 345kV Line (4.5cy @Bayshore, 22.5cy @DB)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



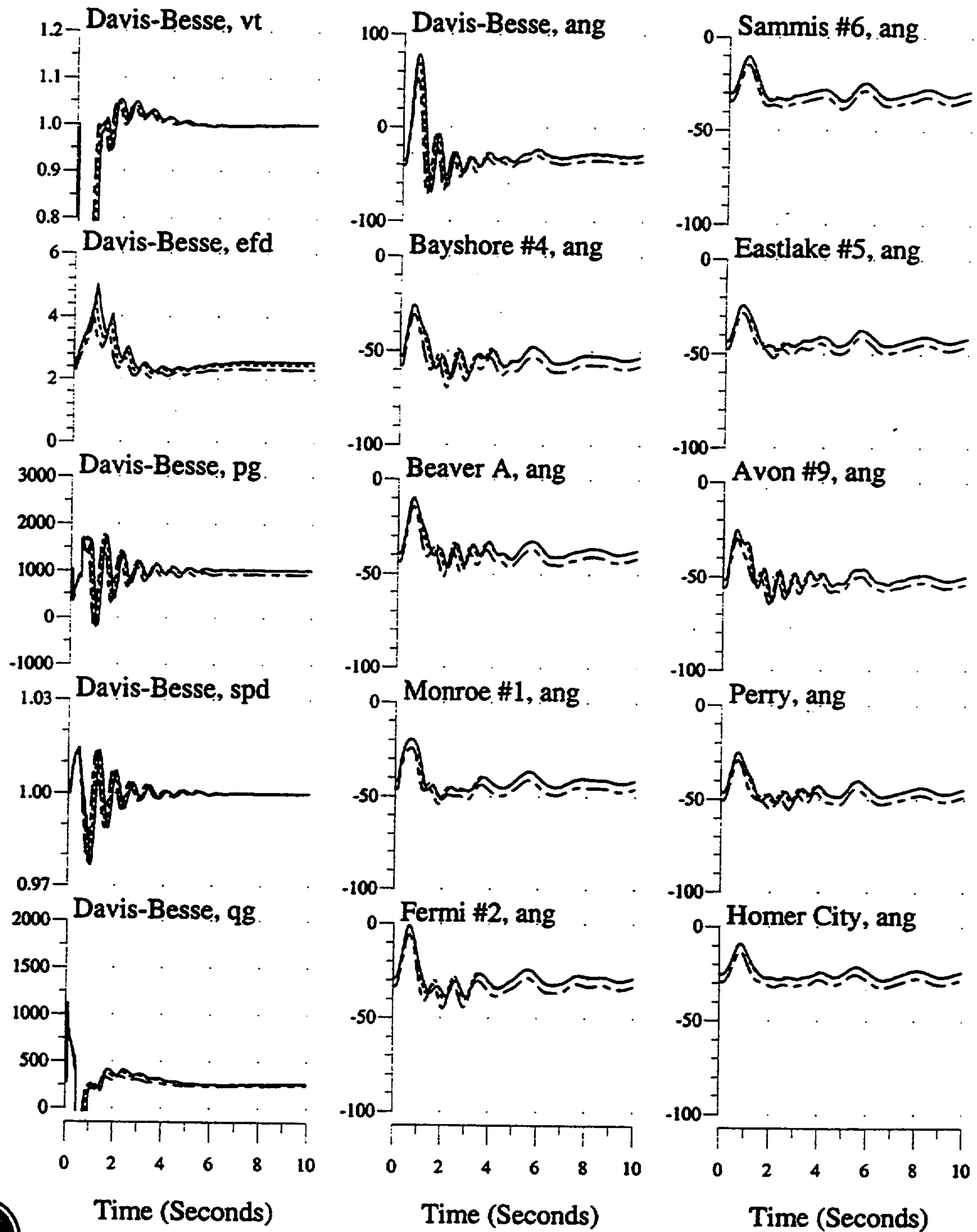
3phase Fault at Bayshore 345kV Bus
Trip DB-Bayshore 345kV Line (4.5cy @Bayshore, 22.5cy @DB)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



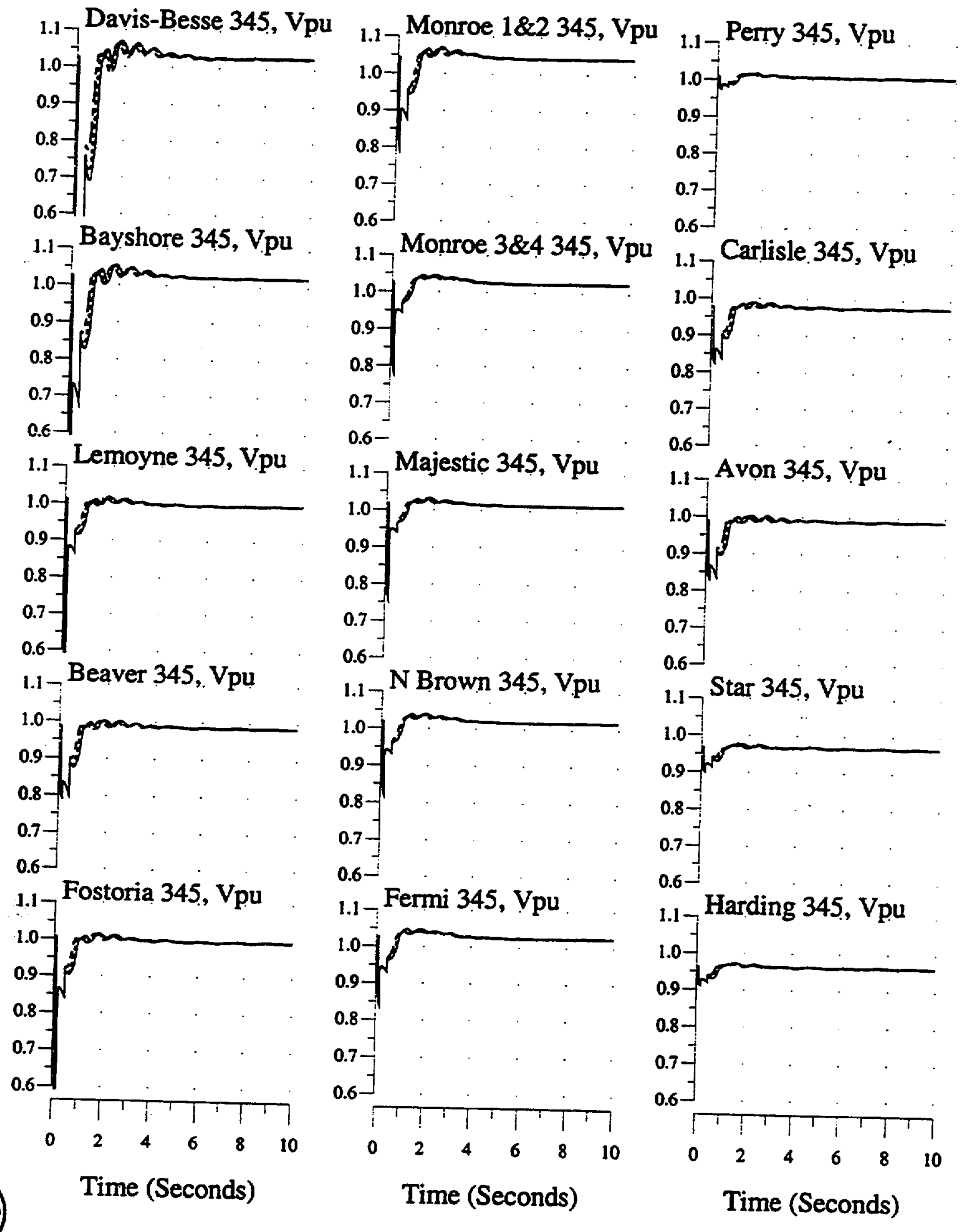
3phase Fault at Bayshore 345kV Bus
Trip DB-Bayshore 345kV Line (4.5cy @Bayshore, 22.5cy @DB)
STATCOM Variables: (__) With Uprate & STATCOM



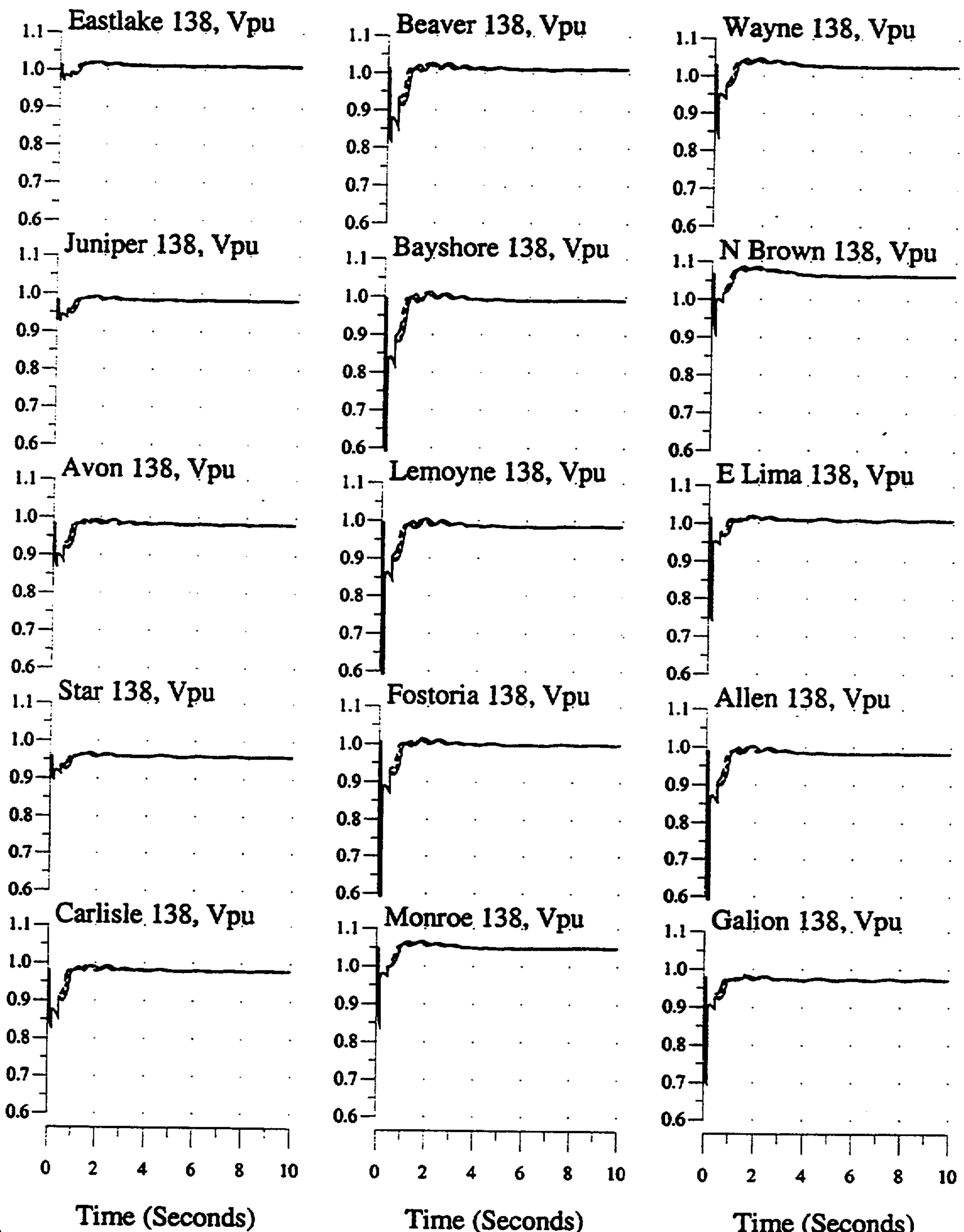
3phase Fault at Lemoyne 345kV Bus
Trip DB-Lemoyne 345kV Line (4.5cy @Lemoyne, 22.5cy @DB)
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



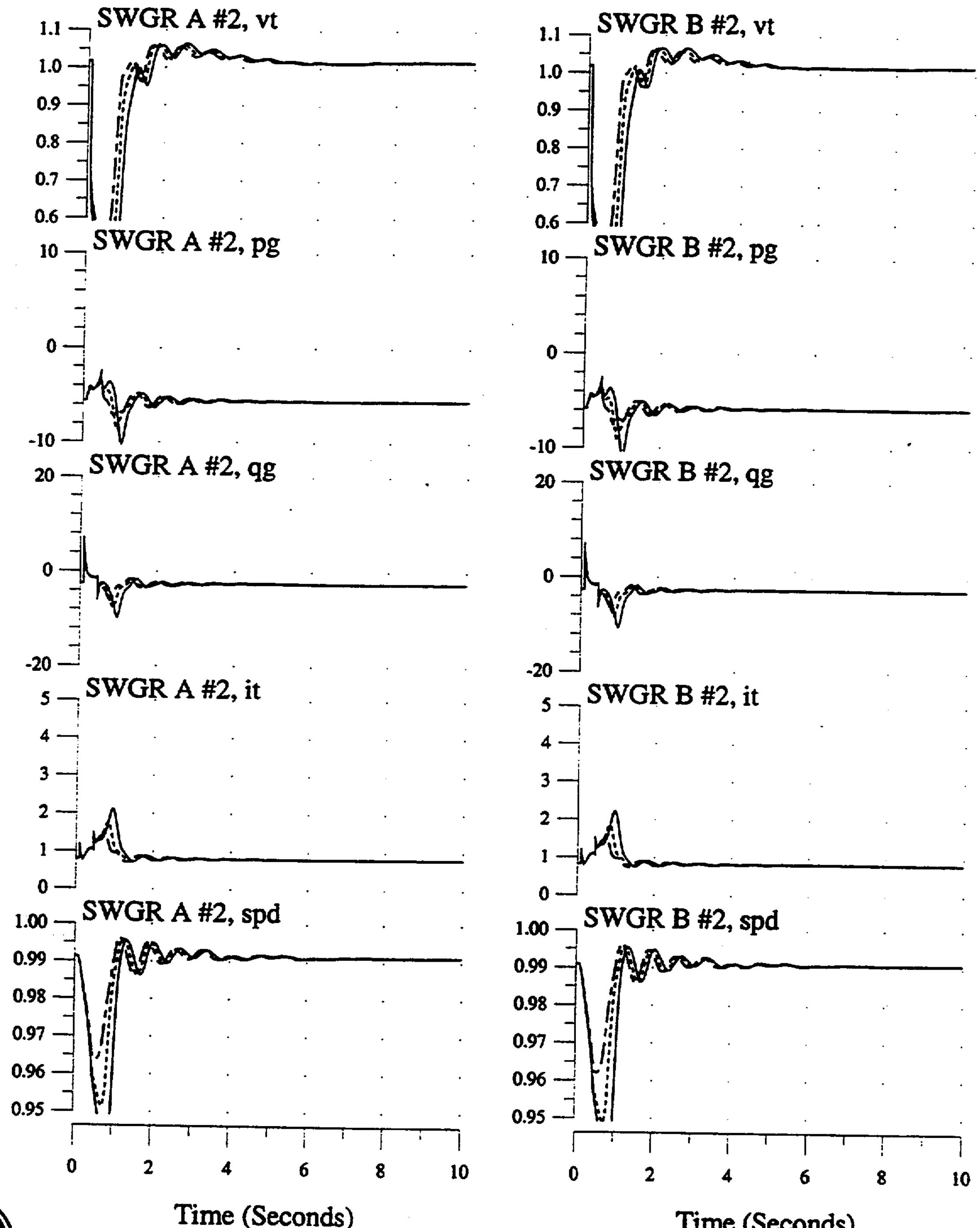
3phase Fault at Lemoyne 345kV Bus
Trip DB-Lemoyne 345kV Line (4.5cy @Lemoyne, 22.5cy @DB)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



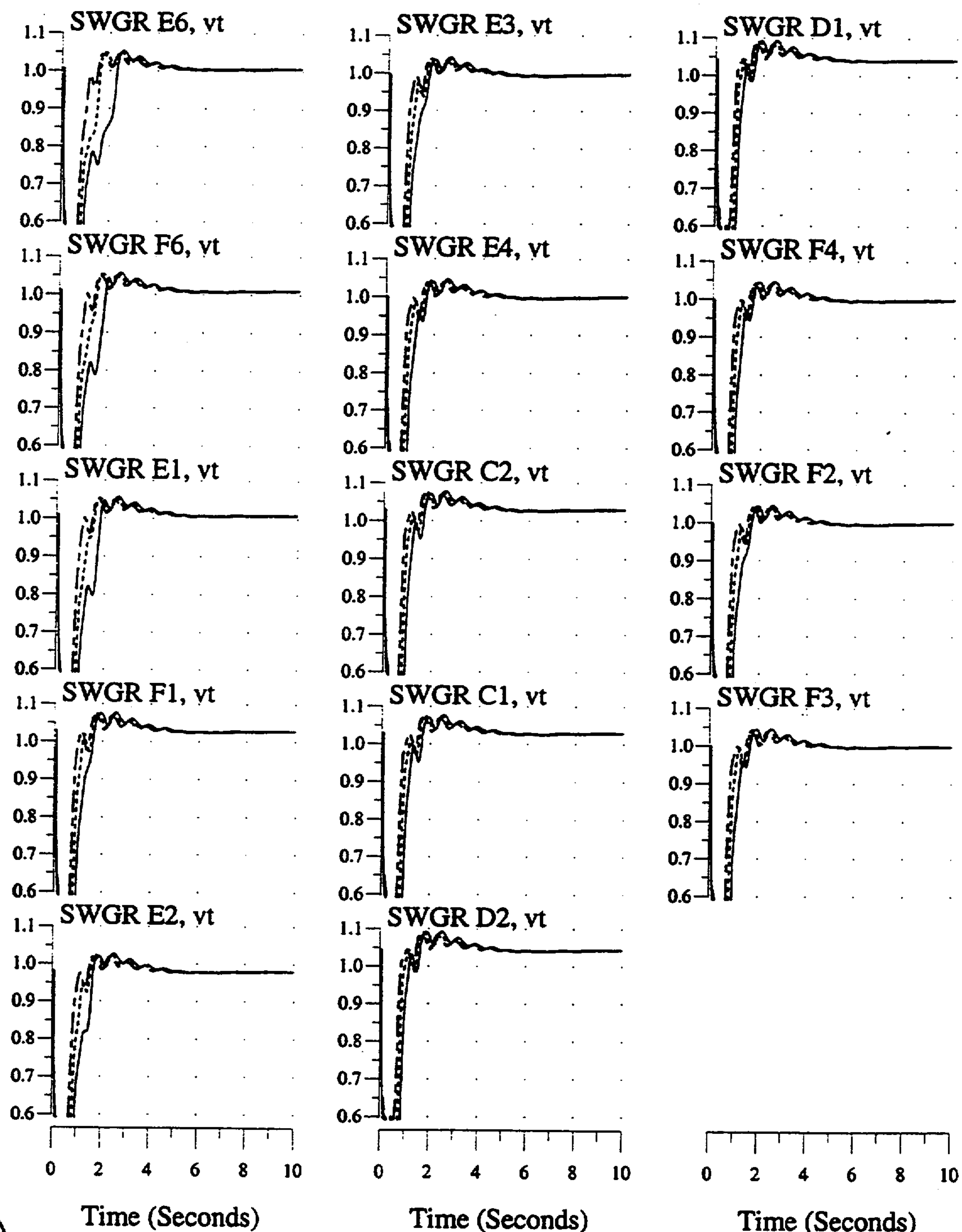
3phase Fault at Lemoyne 345kV Bus
Trip DB-Lemoyne 345kV Line (4.5cy @Lemoyne, 22.5cy @DB)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

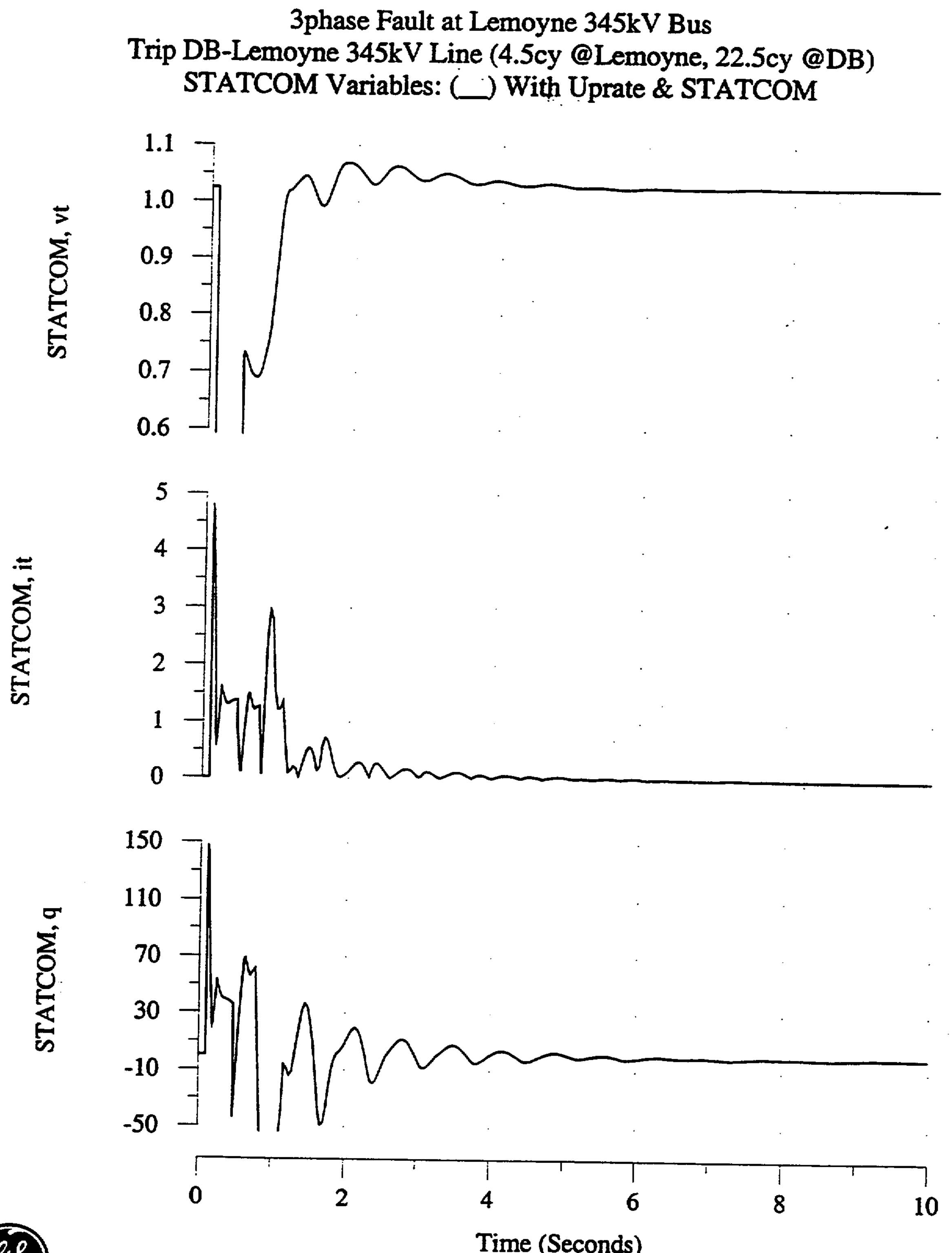


3phase Fault at Lemoyne 345kV Bus
Trip DB-Lemoyne 345kV Line (4.5cy @Lemoyne, 22.5cy @DB)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

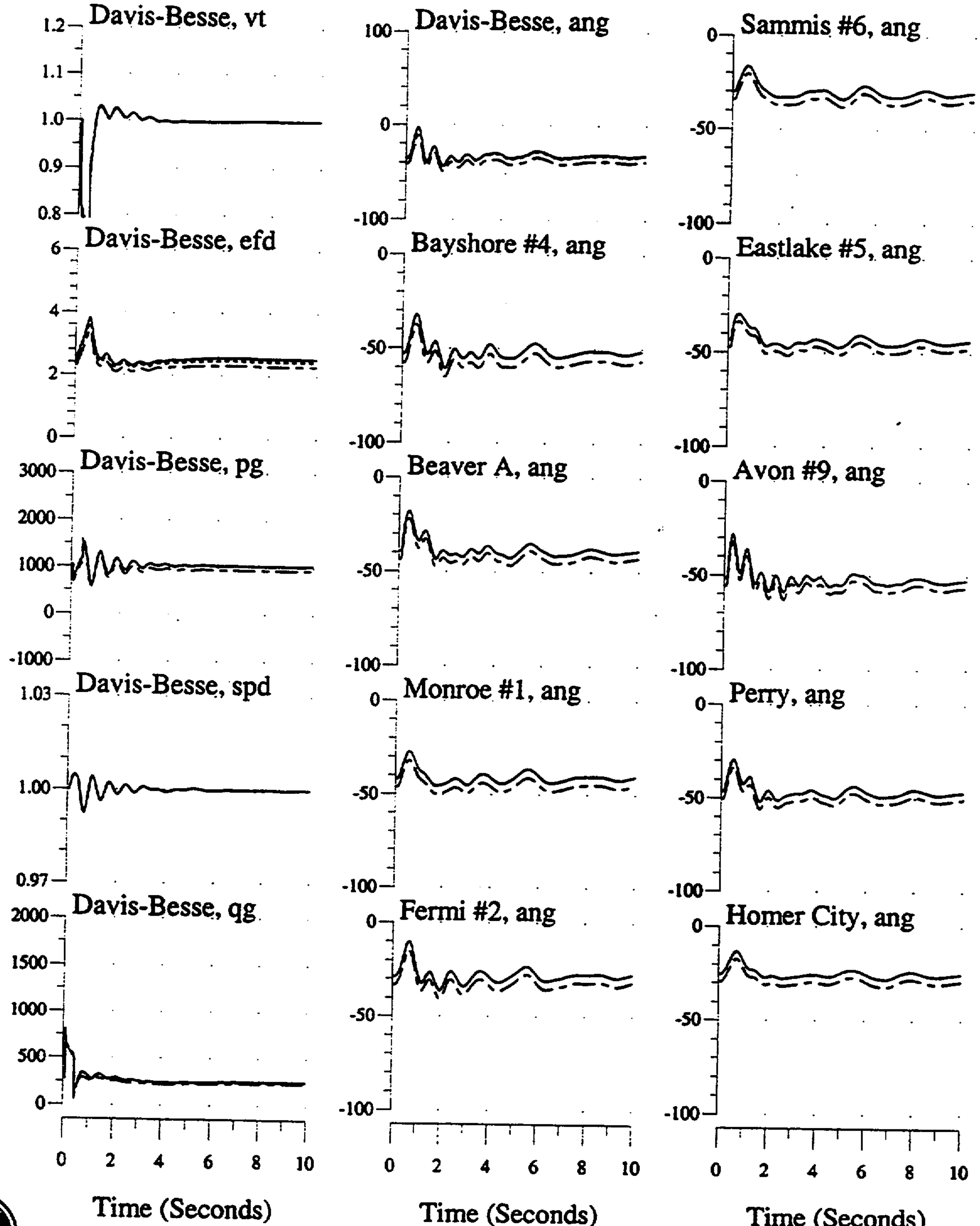


3phase Fault at Lemoyne 345kV Bus
Trip DB-Lemoyne 345kV Line (4.5cy @Lemoyne, 22.5cy @DB)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

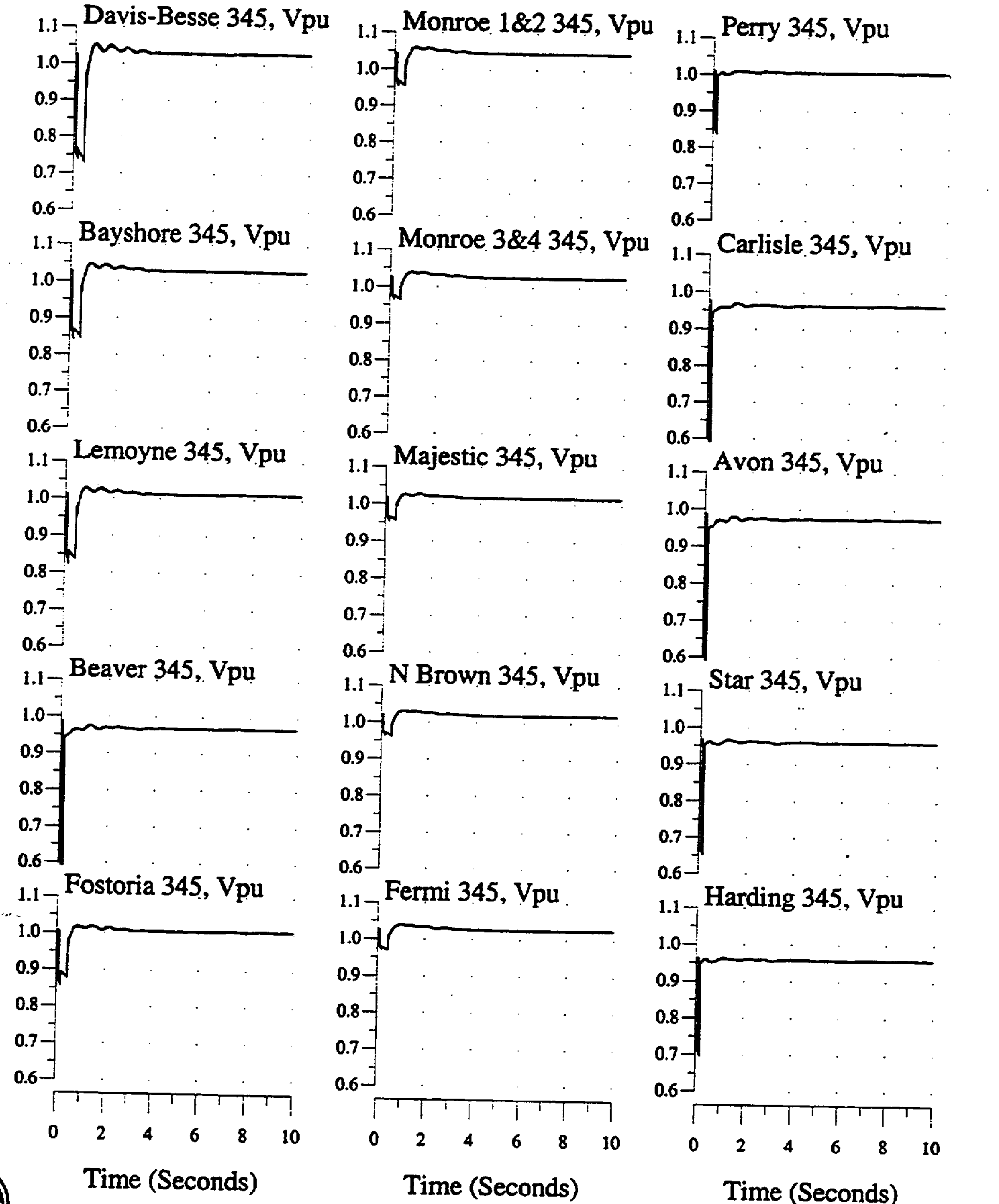



3phase Fault at Lemoyne 345kV Bus
Trip DB-Lemoyne 345kV Line (4.5cy @Lemoyne, 22.5cy @DB)
STATCOM Variables: (__) With Uprate & STATCOM
STATCOM, vt
1.1
1.0
0.9
0.8
0.7
0.6
STATCOM, it
5
4
3
2
1
0
STATCOM, q
150
110
70
30
-10
-50
0
2
4
6
8
10
Time (Seconds)

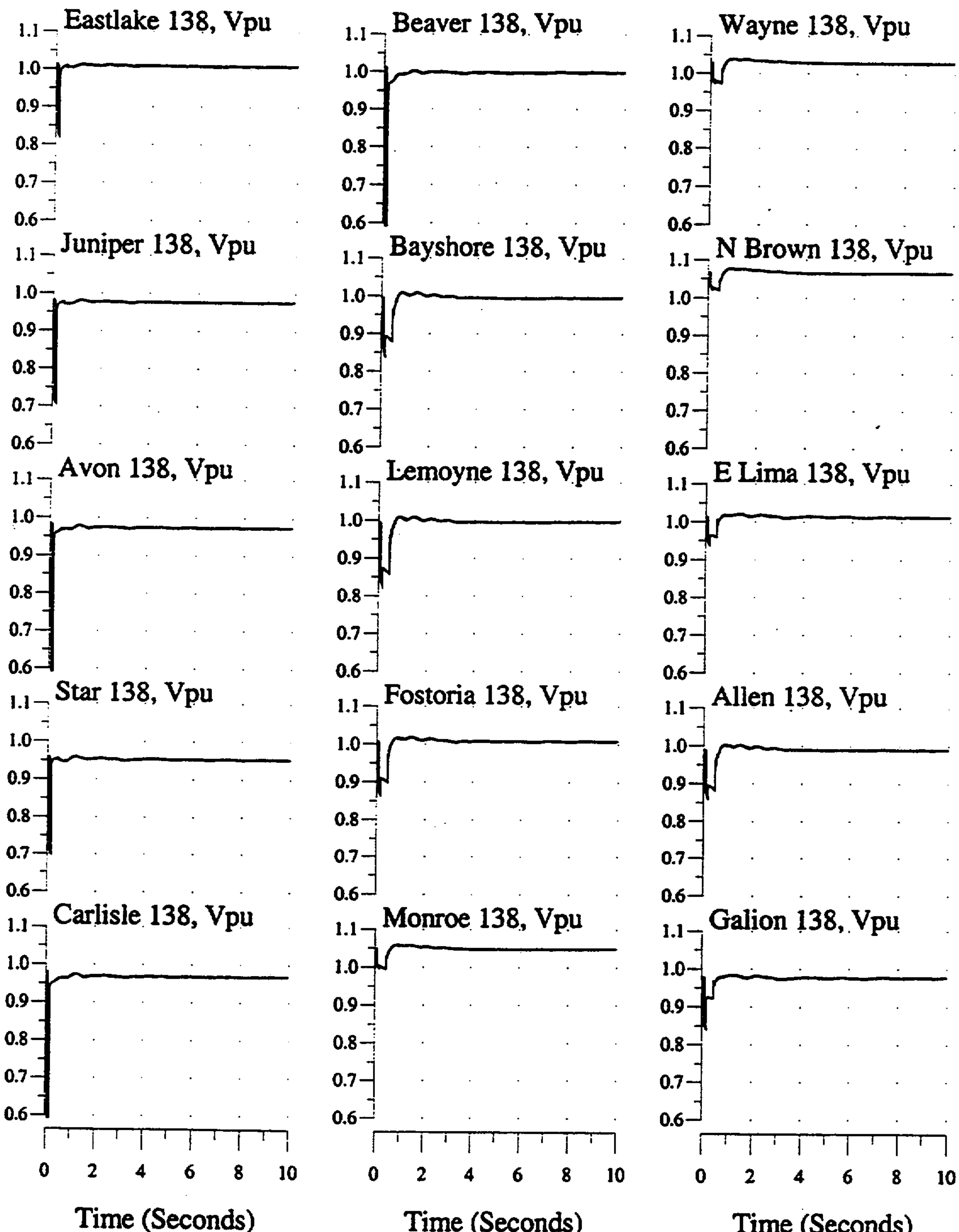
3phase Fault at Beaver 345kV Bus
Trip DB-Beaver 345kV Line (4.5cy @Beaver, 22.5cy @DB)
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



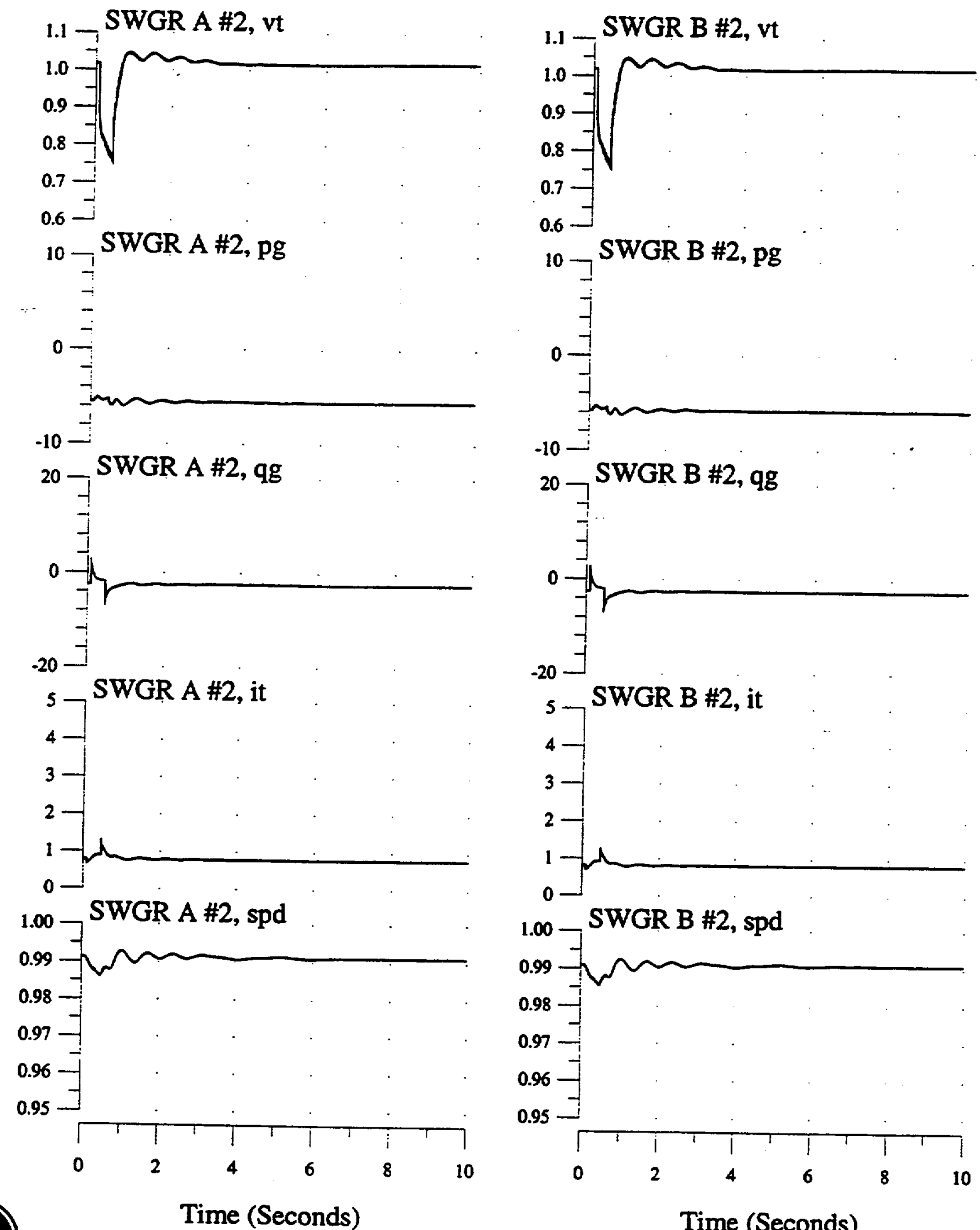
3phase Fault at Beaver 345kV Bus
Trip DB-Beaver 345kV Line (4.5cy @Beaver, 22.5cy @DB)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



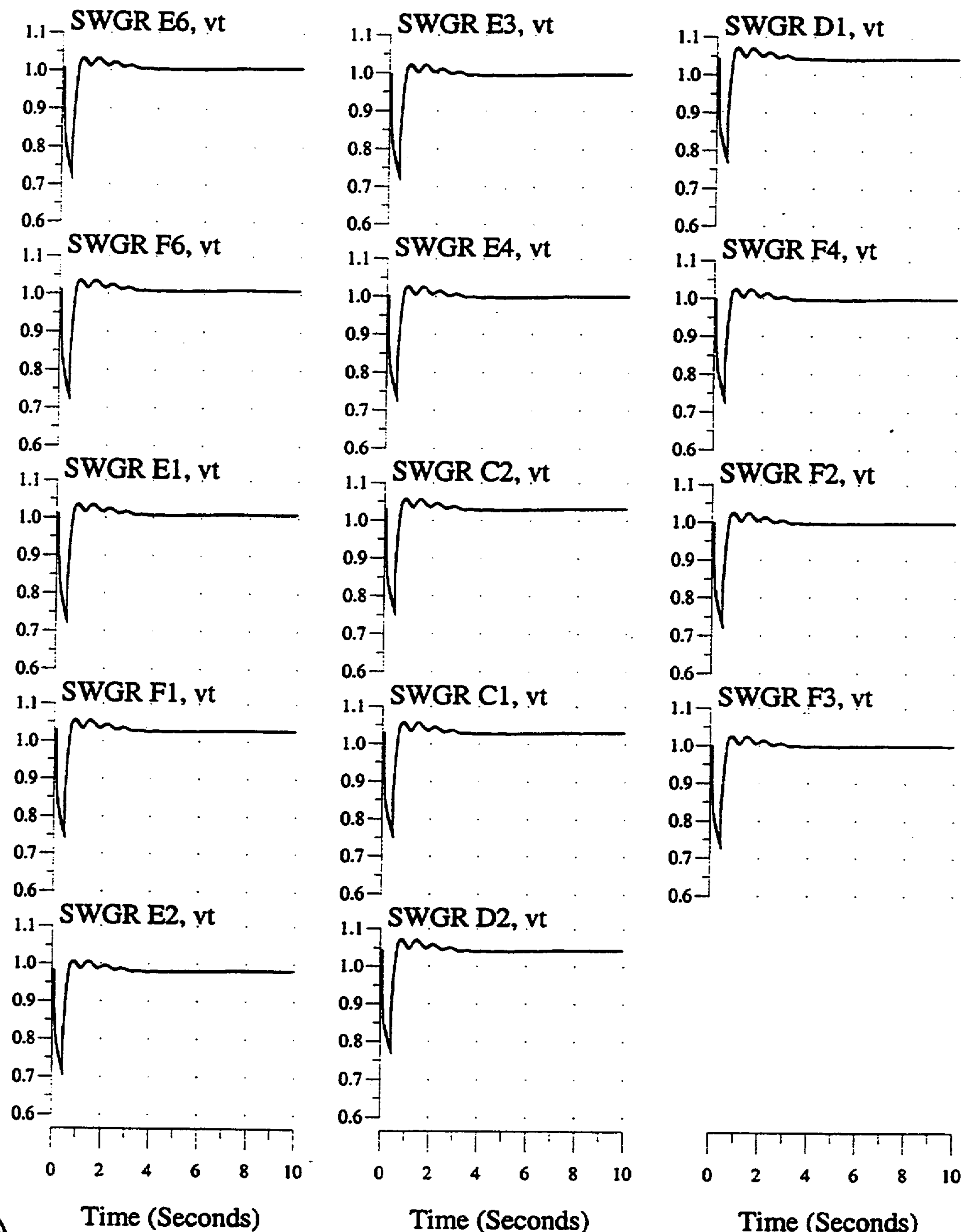
3phase Fault at Beaver 345kV Bus
Trip DB-Beaver 345kV Line (4.5cy @Beaver, 22.5cy @DB)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



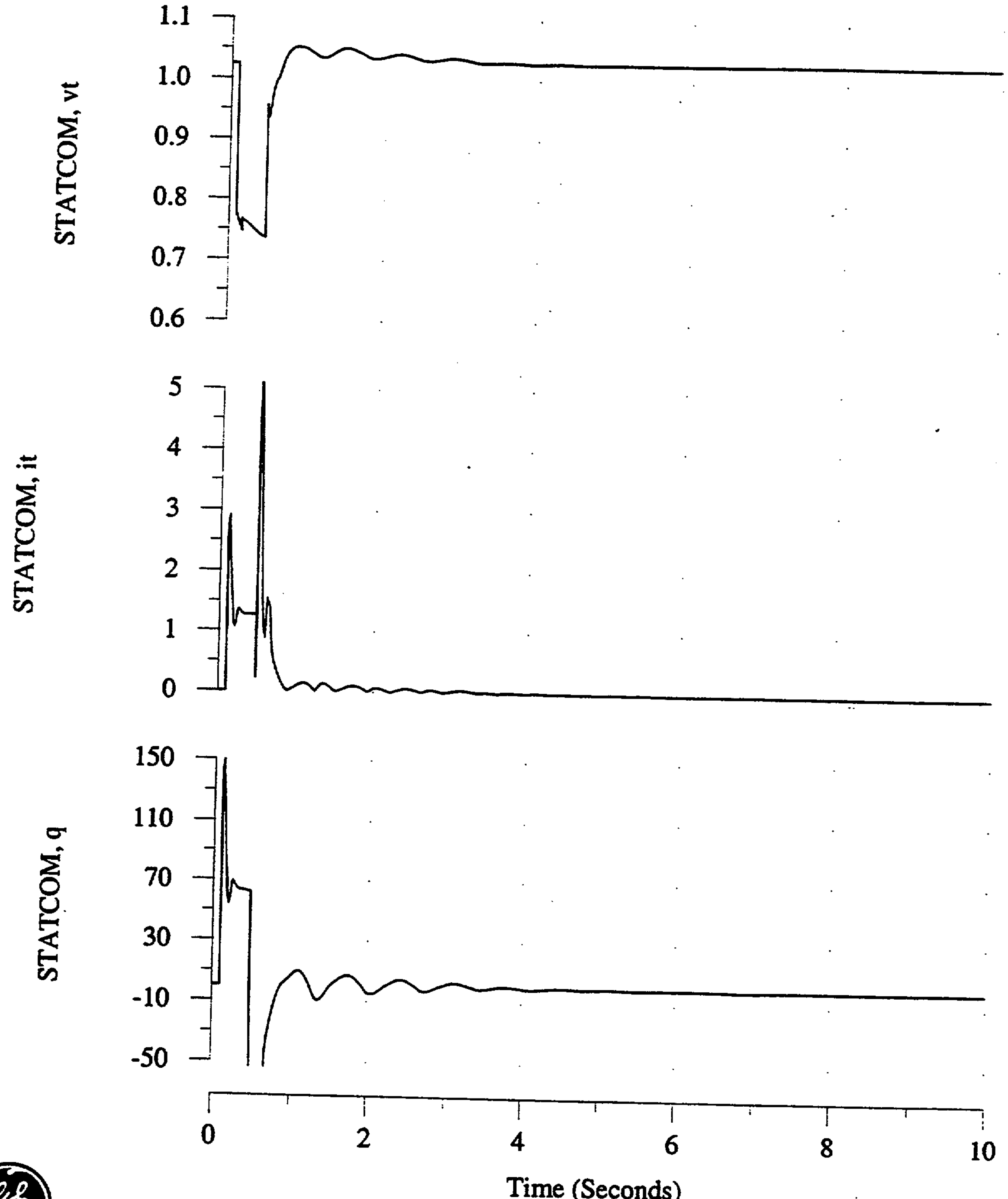
3phase Fault at Beaver 345kV Bus
Trip DB-Beaver 345kV Line (4.5cy @Beaver, 22.5cy @DB)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (-.) Without Uprate



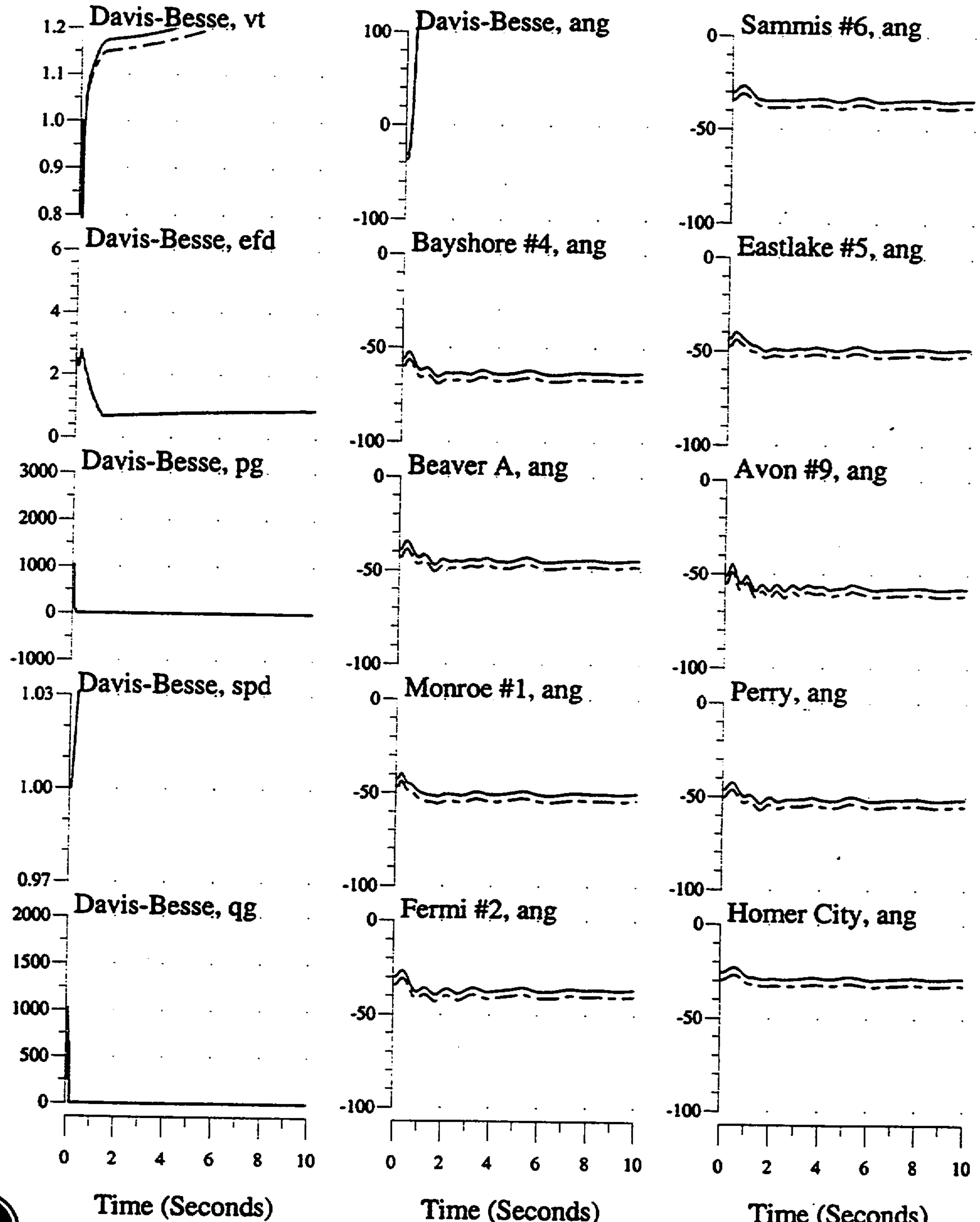
3phase Fault at Beaver 345kV Bus
Trip DB-Beaver 345kV Line (4.5cy @Beaver, 22.5cy @DB)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



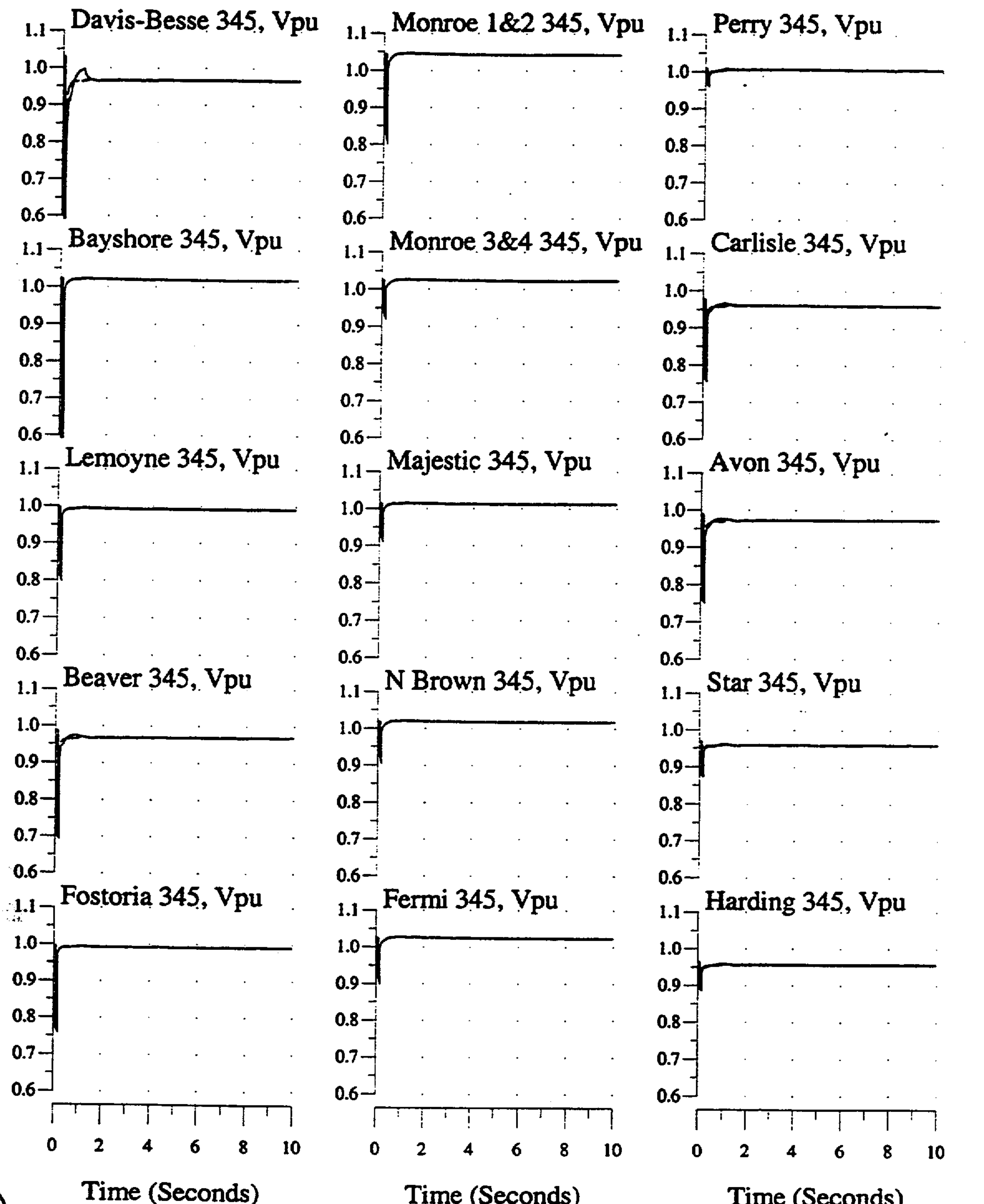
3phase Fault at Beaver 345kV Bus
Trip DB-Beaver 345kV Line (4.5cy @Beaver, 22.5cy @DB)
STATCOM Variables: (__) With Uprate & STATCOM



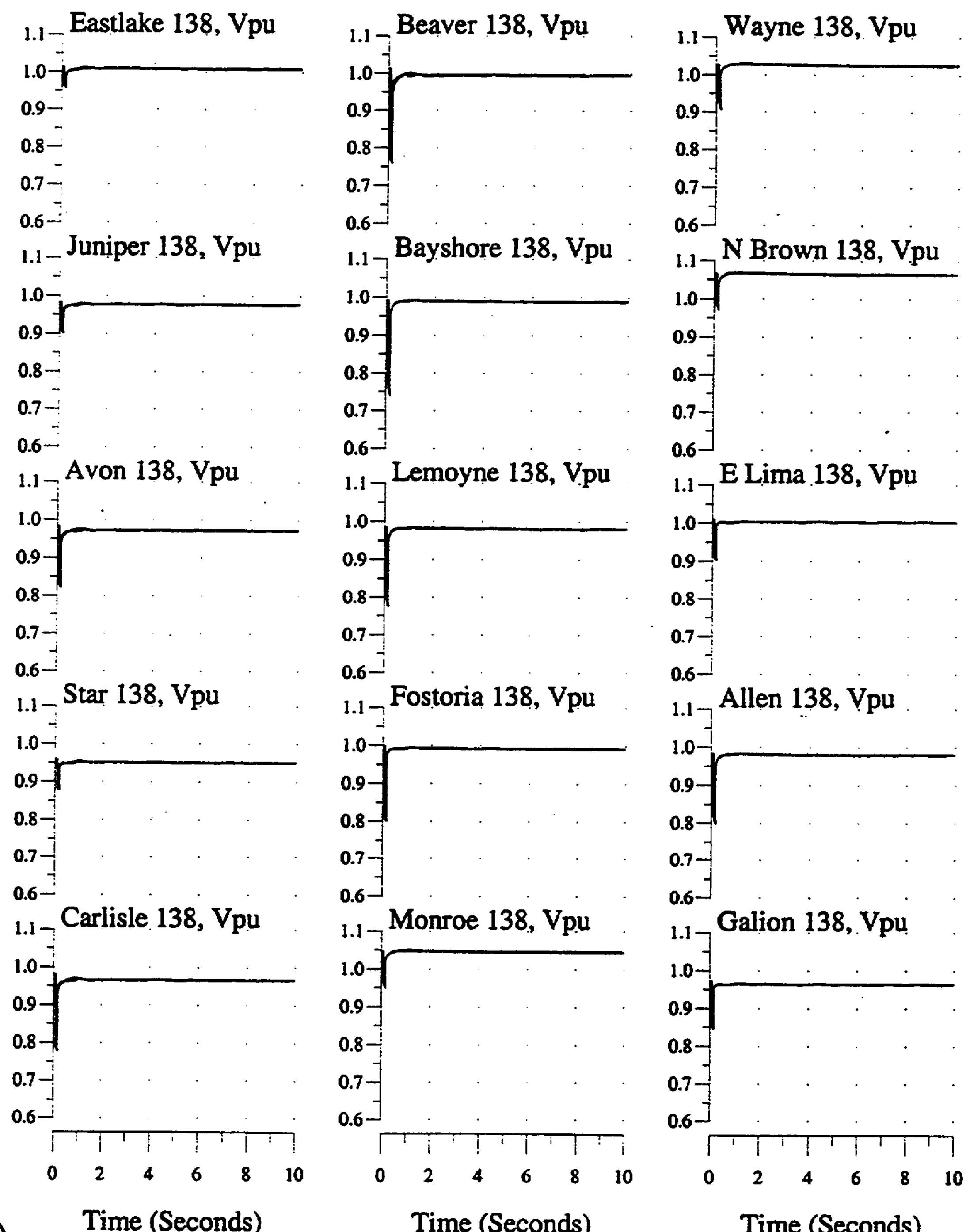
3ph, 4.5cy Fault at DB 345kV Bus, Trip DB-Bayshore 345kV Line & DB Unit, Transfer Aux Load
DB-Lemoyne 345kV Line Out-Of-Service Pre-contingency
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



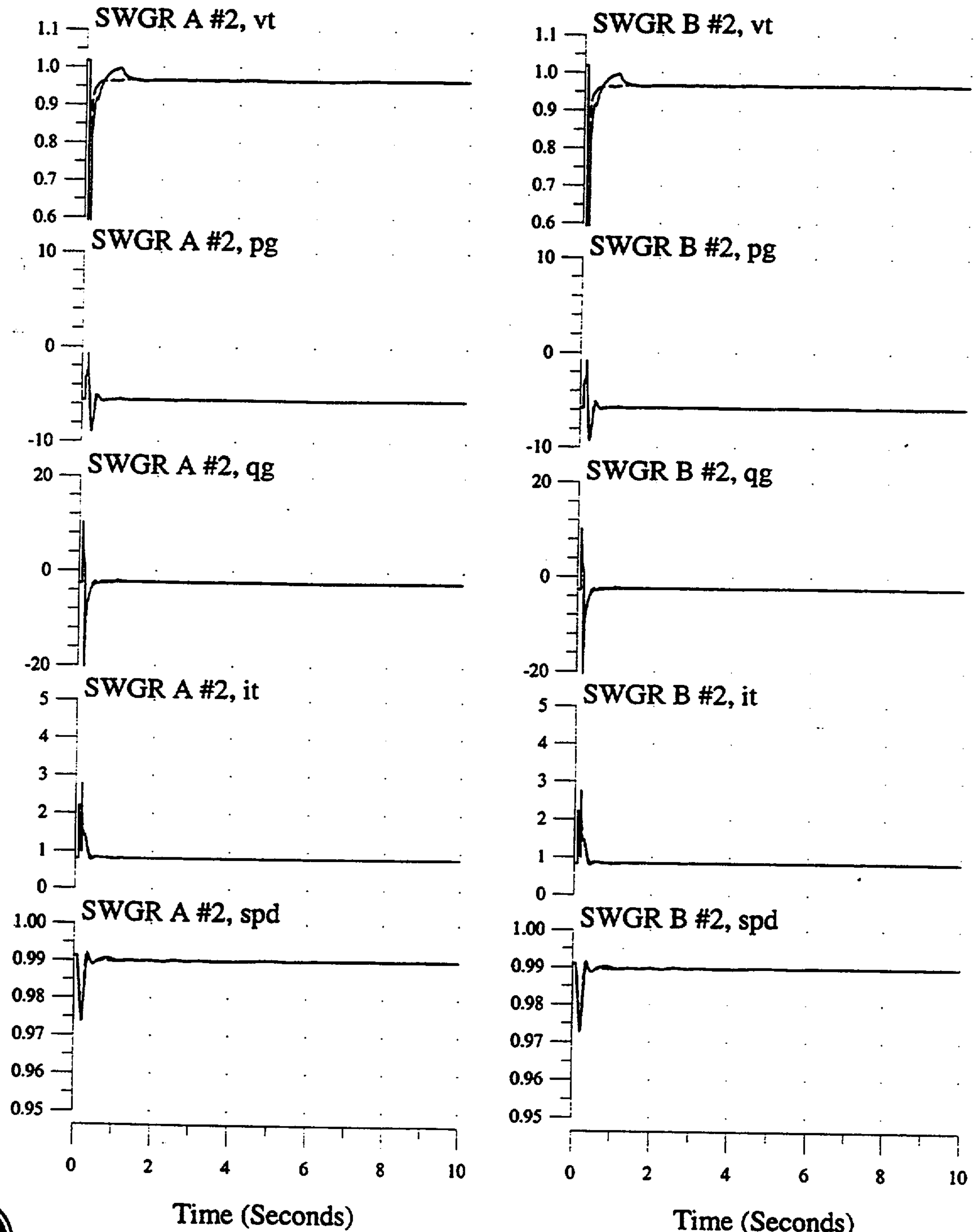
3ph, 4.5cy Fault at DB 345kV Bus, Trip DB-Bayshore 345kV Line & DB Unit, Transfer Aux Load
DB-Lemoyne 345kV Line Out-Of-Service Pre-contingency
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



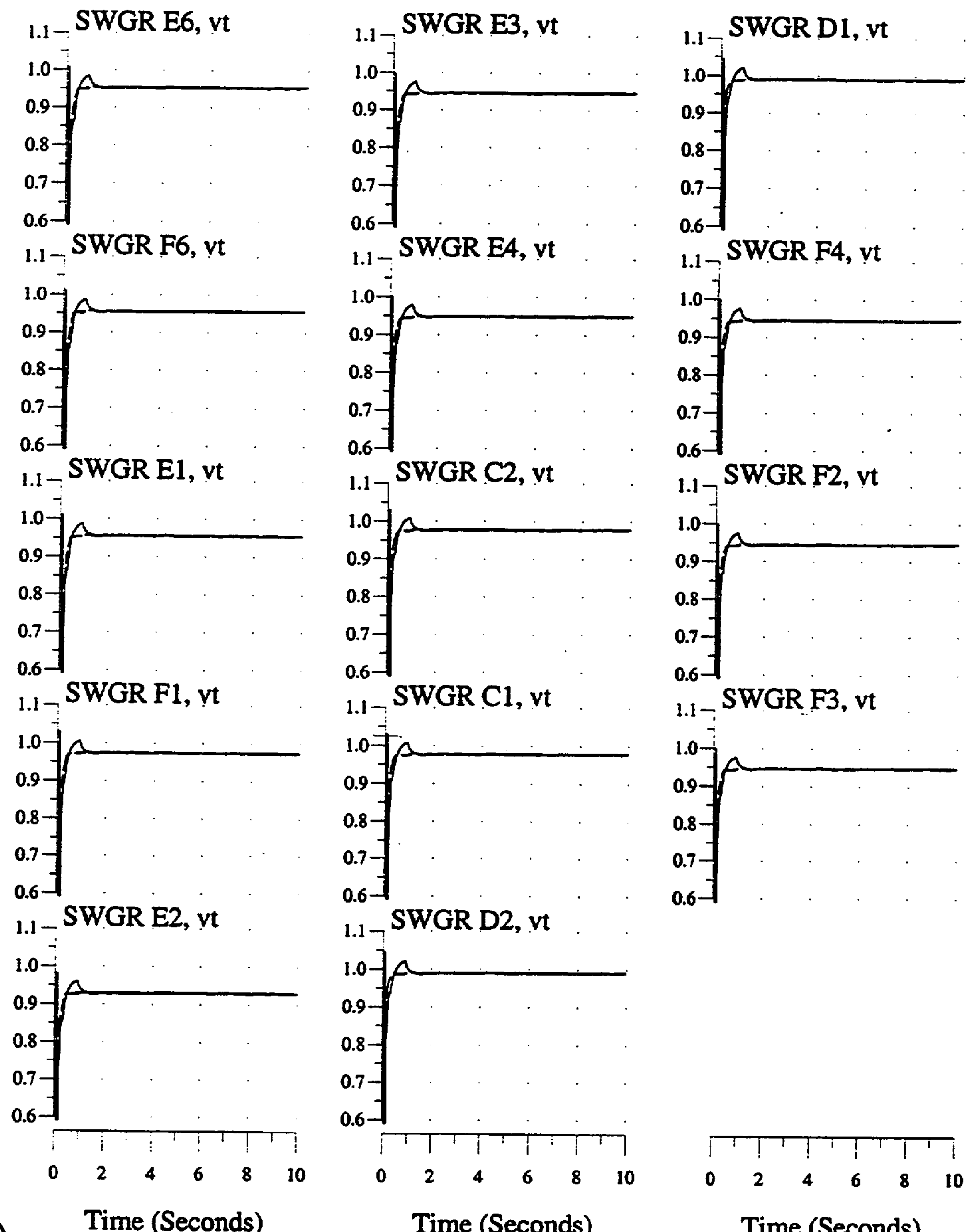
3ph, 4.5cy Fault at DB 345kV Bus, Trip DB-Bayshore 345kV Line & DB Unit, Transfer Aux Load
DB-Lemoyne 345kV Line Out-Of-Service Pre-contingency
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



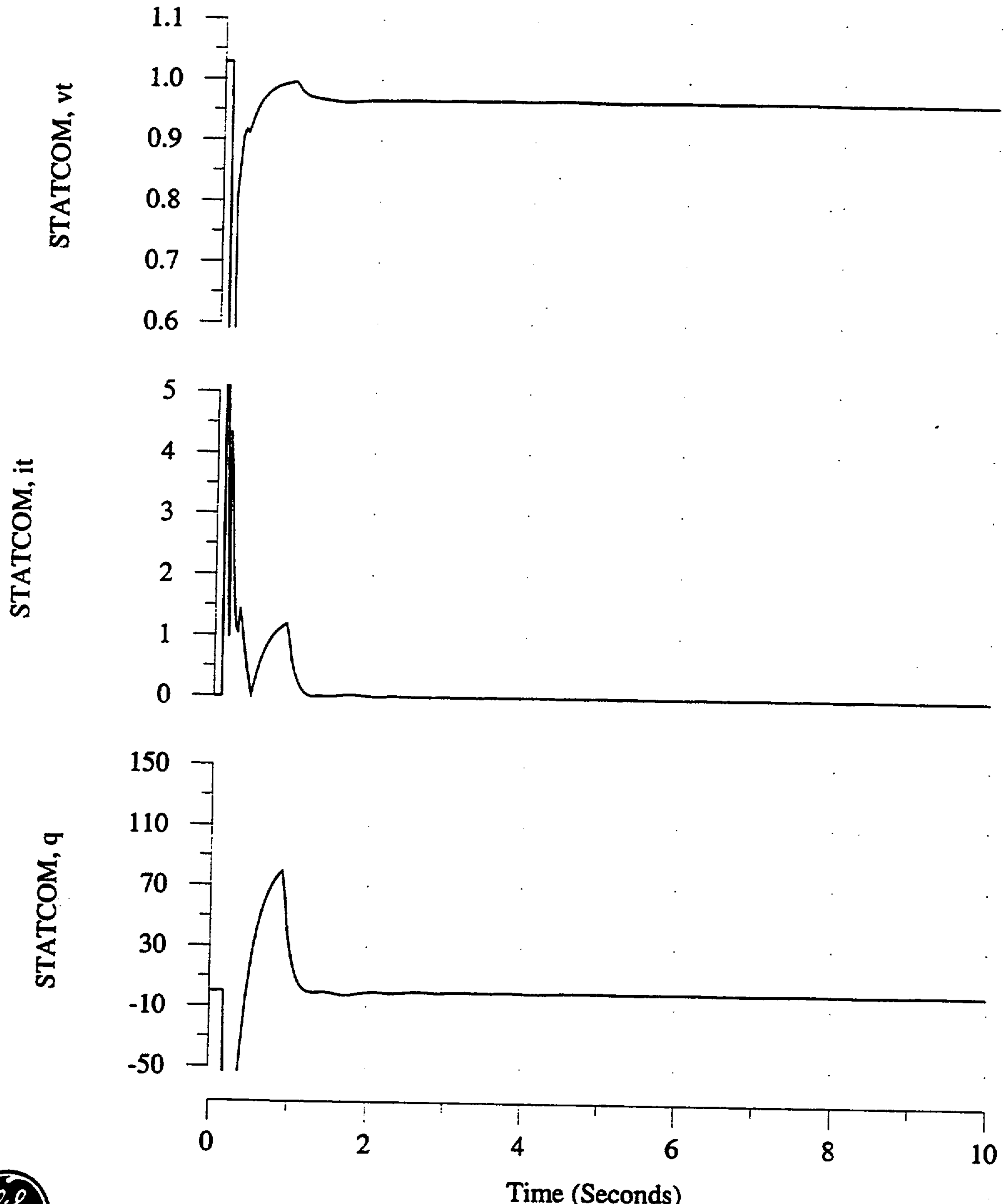
3ph, 4.5cy Fault at DB 345kV Bus, Trip DB-Bayshore 345kV Line & DB Unit, Transfer Aux Load
DB-Lemoyne 345kV Line Out-Of-Service Pre-contingency
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



3ph, 4.5cy Fault at DB 345kV Bus, Trip DB-Bayshore 345kV Line & DB Unit, Transfer Aux Load
DB-Lemoyne 345kV Line Out-Of-Service Pre-contingency
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

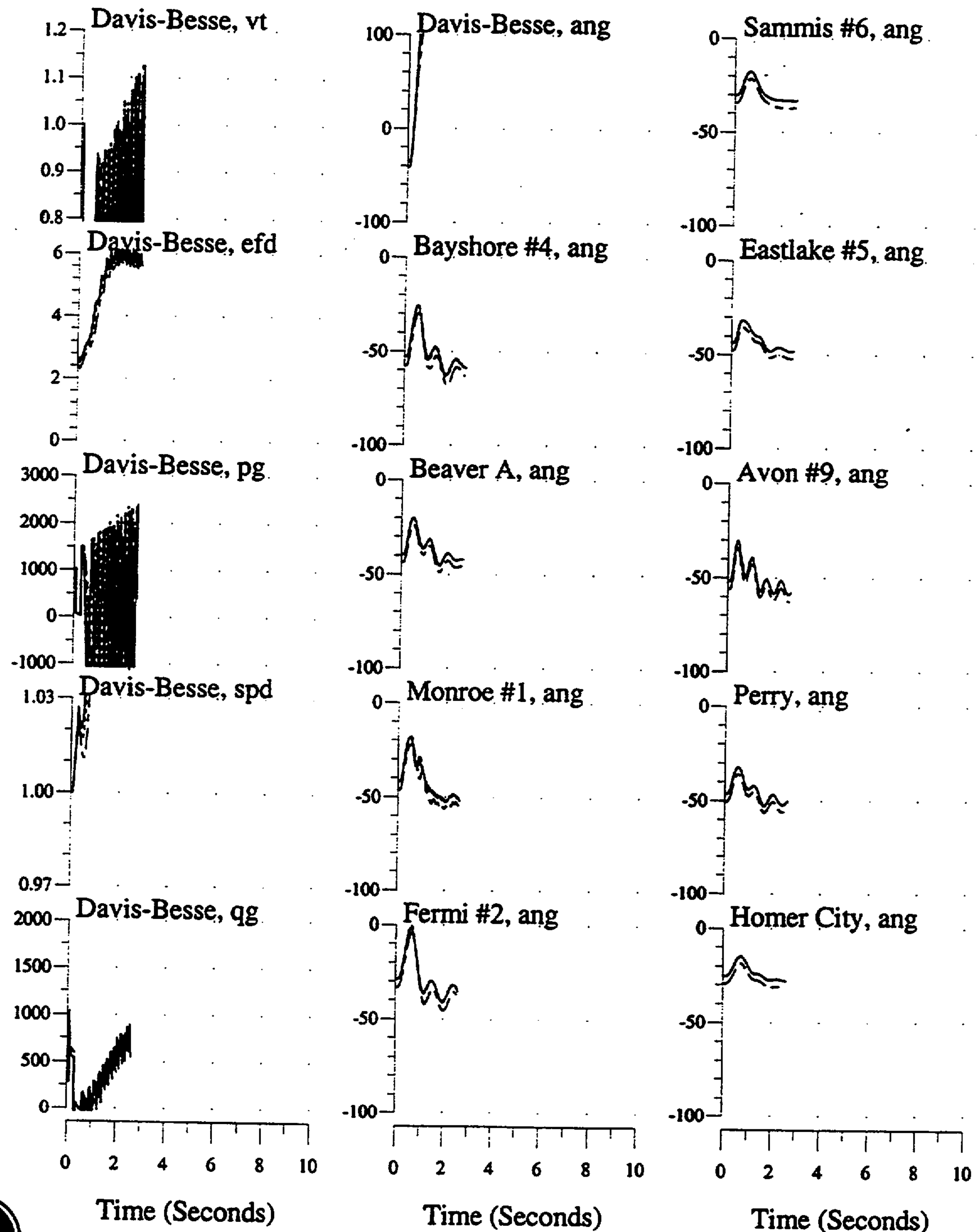


3ph, 4.5cy Fault at DB 345kV Bus, Trip DB-Bayshore 345kV Line & DB Unit, Transfer Aux Load
DB-Lemoyne 345kV Line Out-Of-Service Pre-contingency
STATCOM Variables: (__) With Uprate & STATCOM

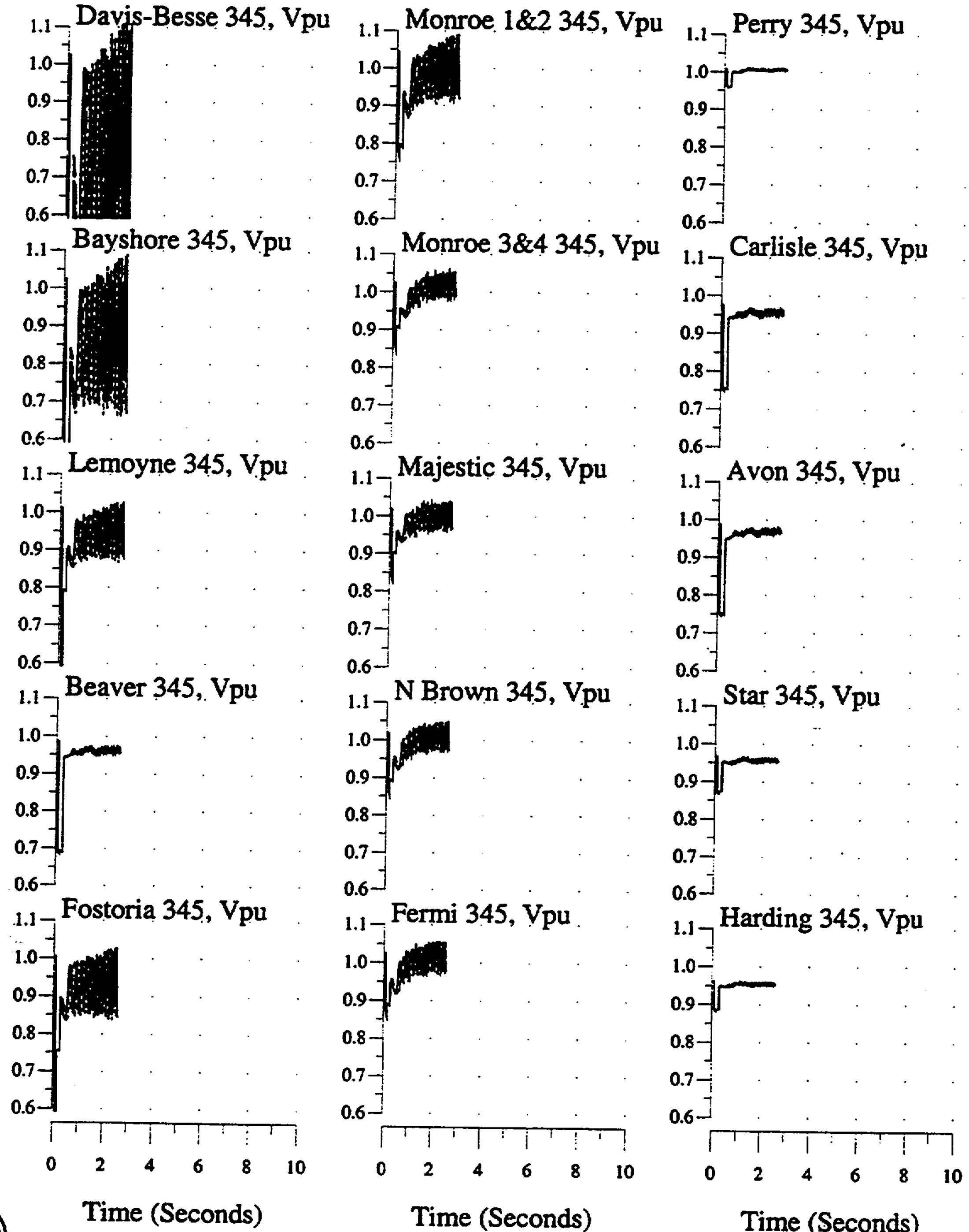


27-APR-2000 09:02:18 chanfiles/d1_99s_r2_c07.chan

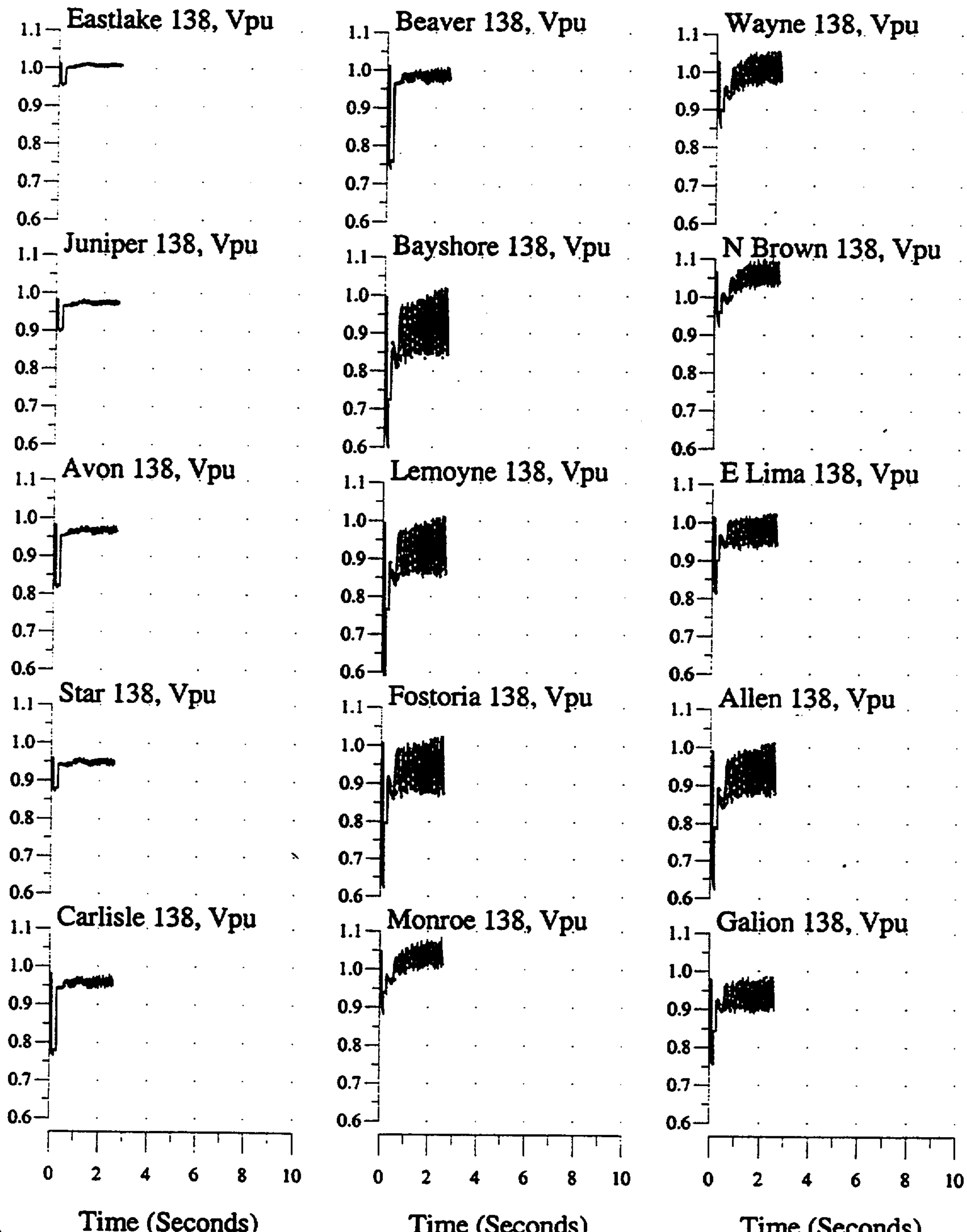
3phase Fault in Davis-Besse Circuit Breaker 34564
Trip DB-Lemoyne 345kV Line (4.5cy), Trip DB-Beaver 345kV Line (12cy)
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



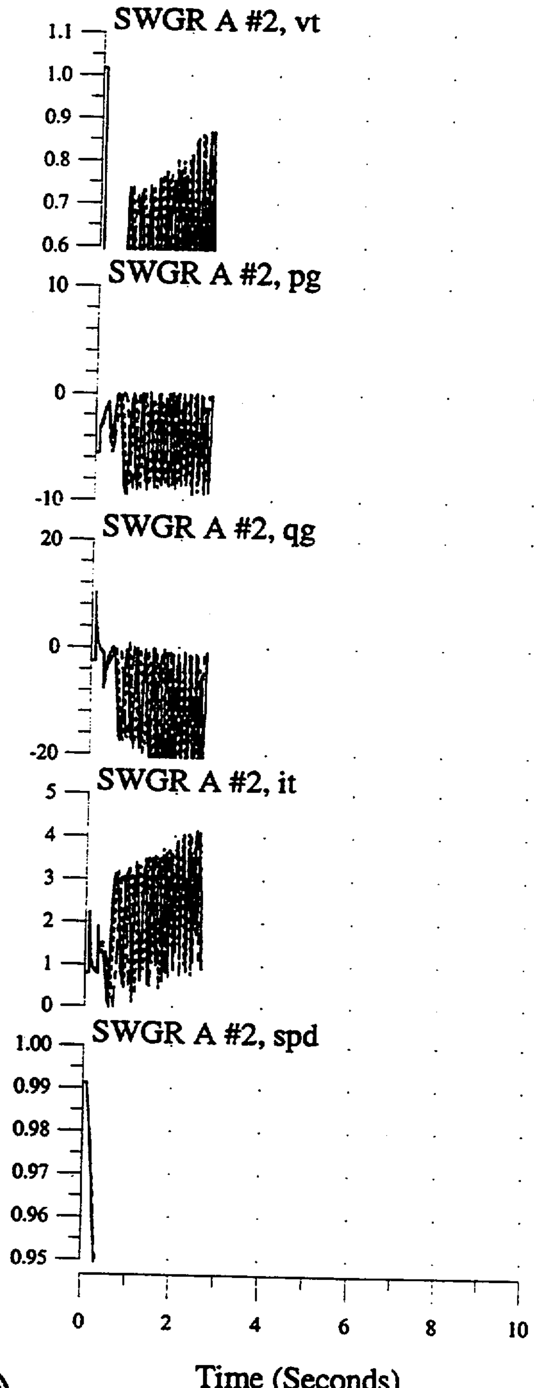
3phase Fault in Davis-Besse Circuit Breaker 34564
Trip DB-Lemoyne 345kV Line (4.5cy), Trip DB-Beaver 345kV Line (12cy)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

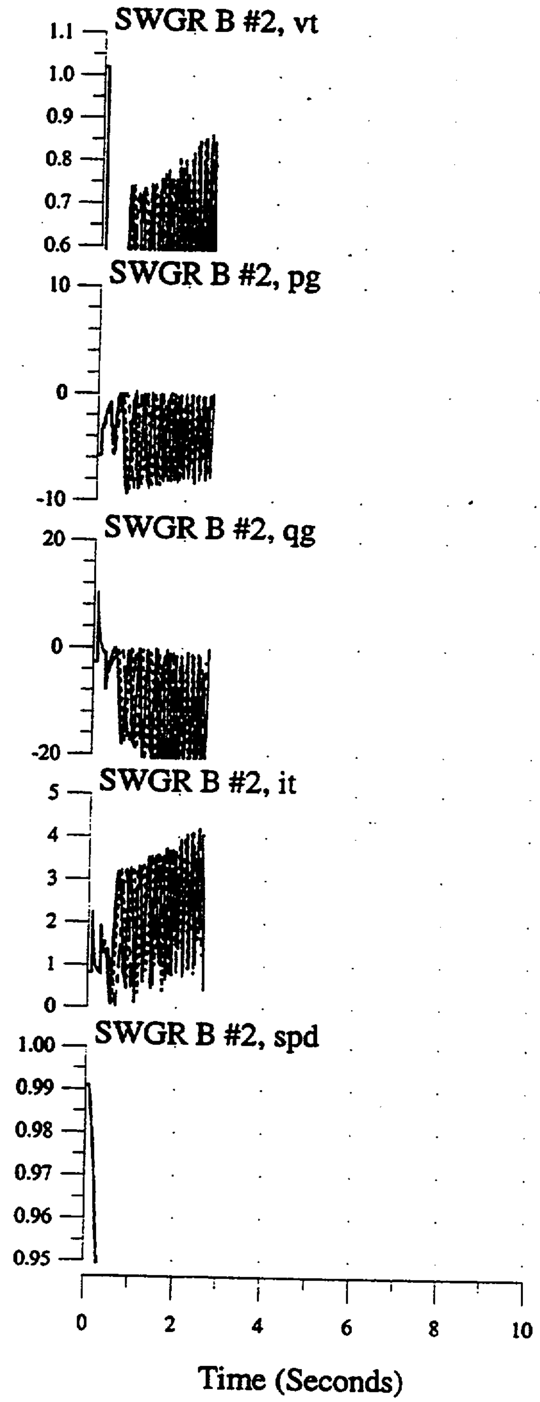


3phase Fault in Davis-Besse Circuit Breaker 34564
Trip DB-Lemoyne 345kV Line (4.5cy), Trip DB-Beaver 345kV Line (12cy)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

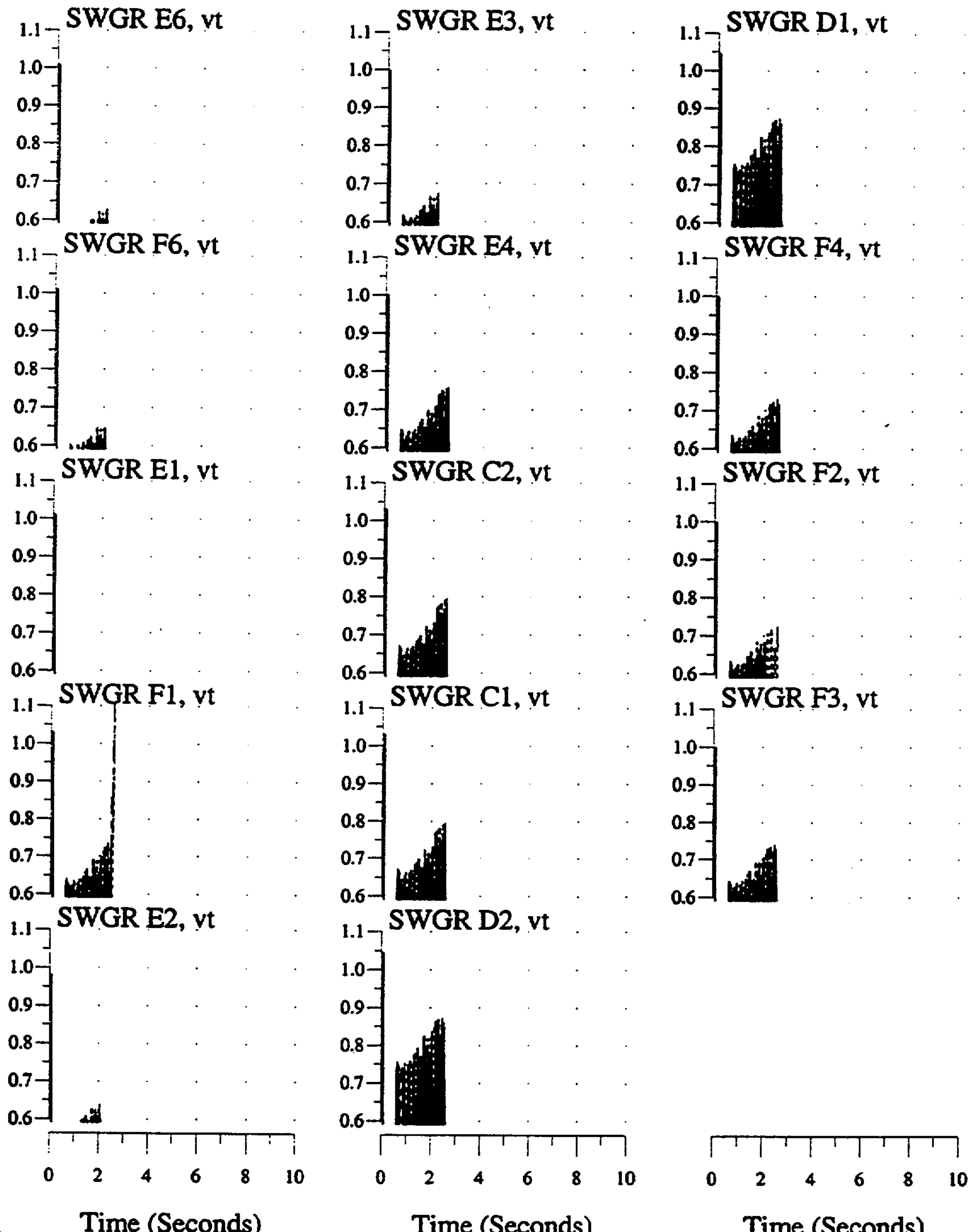


3phase Fault in Davis-Besse Circuit Breaker 34564
Trip DB-Lemoyne 345kV Line (4.5cy), Trip DB-Beaver 345kV Line (12cy)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

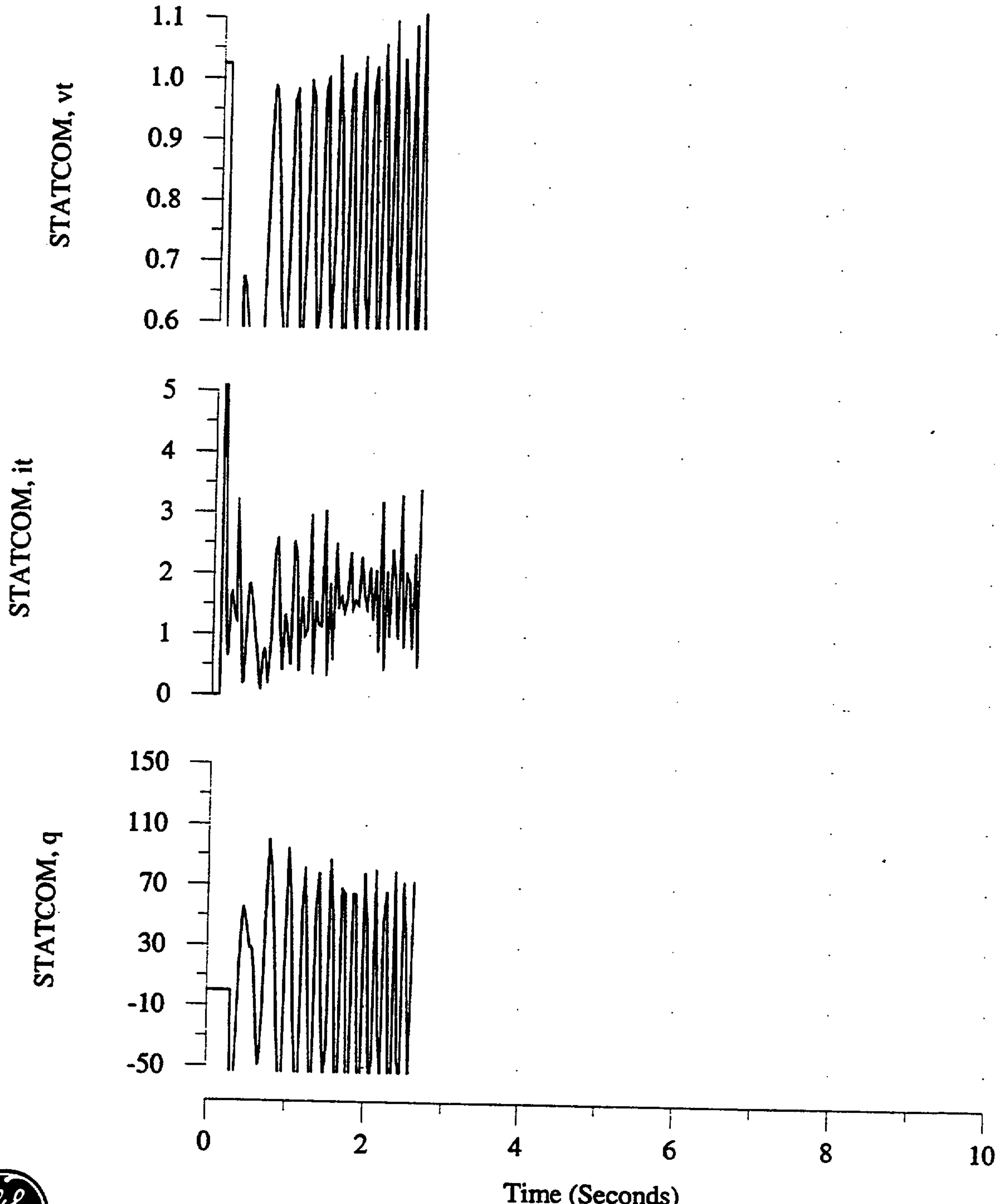




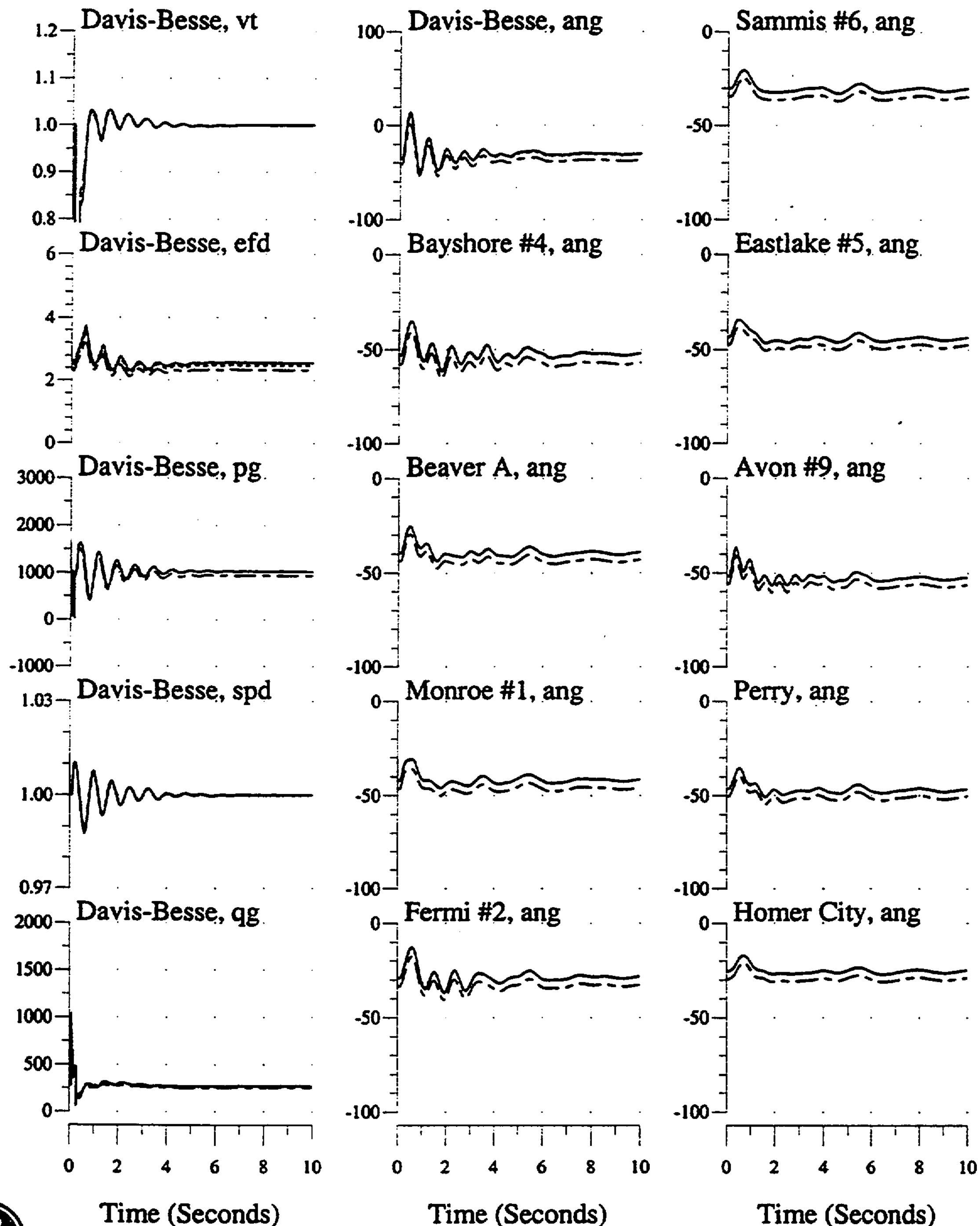
3phase Fault in Davis-Besse Circuit Breaker 34564
Trip DB-Lemoyne 345kV Line (4.5cy), Trip DB-Beaver 345kV Line (12cy)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



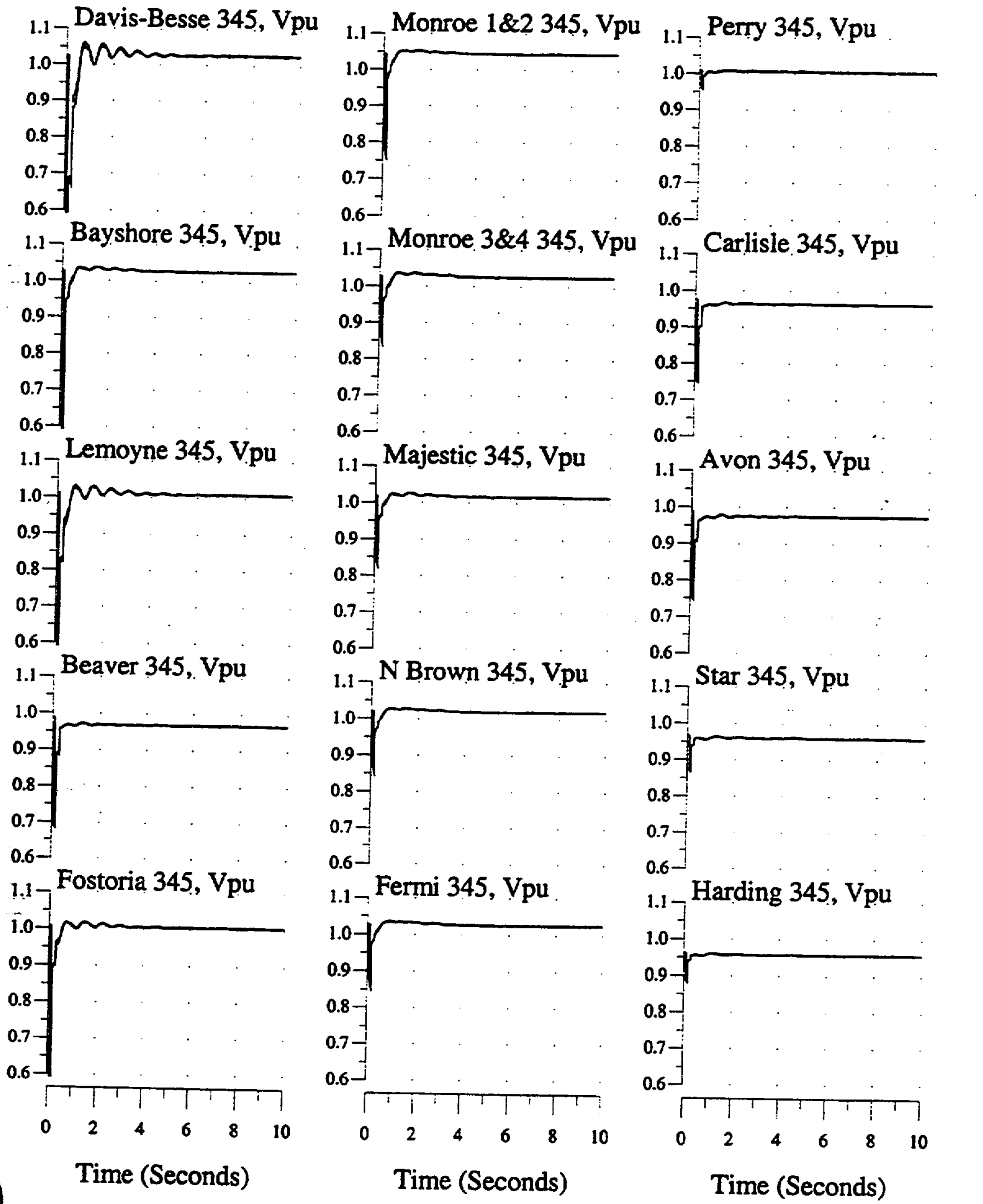
3phase Fault in Davis-Besse Circuit Breaker 34564
Trip DB-Lemoyne 345kV Line (4.5cy), Trip DB-Beaver 345kV Line (12cy)
STATCOM Variables: (__) With Uprate & STATCOM



3phase/1phase Fault near Davis-Besse 345kV Bus
Trip DB-Bayshore Line (4.5cy), Breaker IPO Fails, Trip DB-Beaver Line (12cy)
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

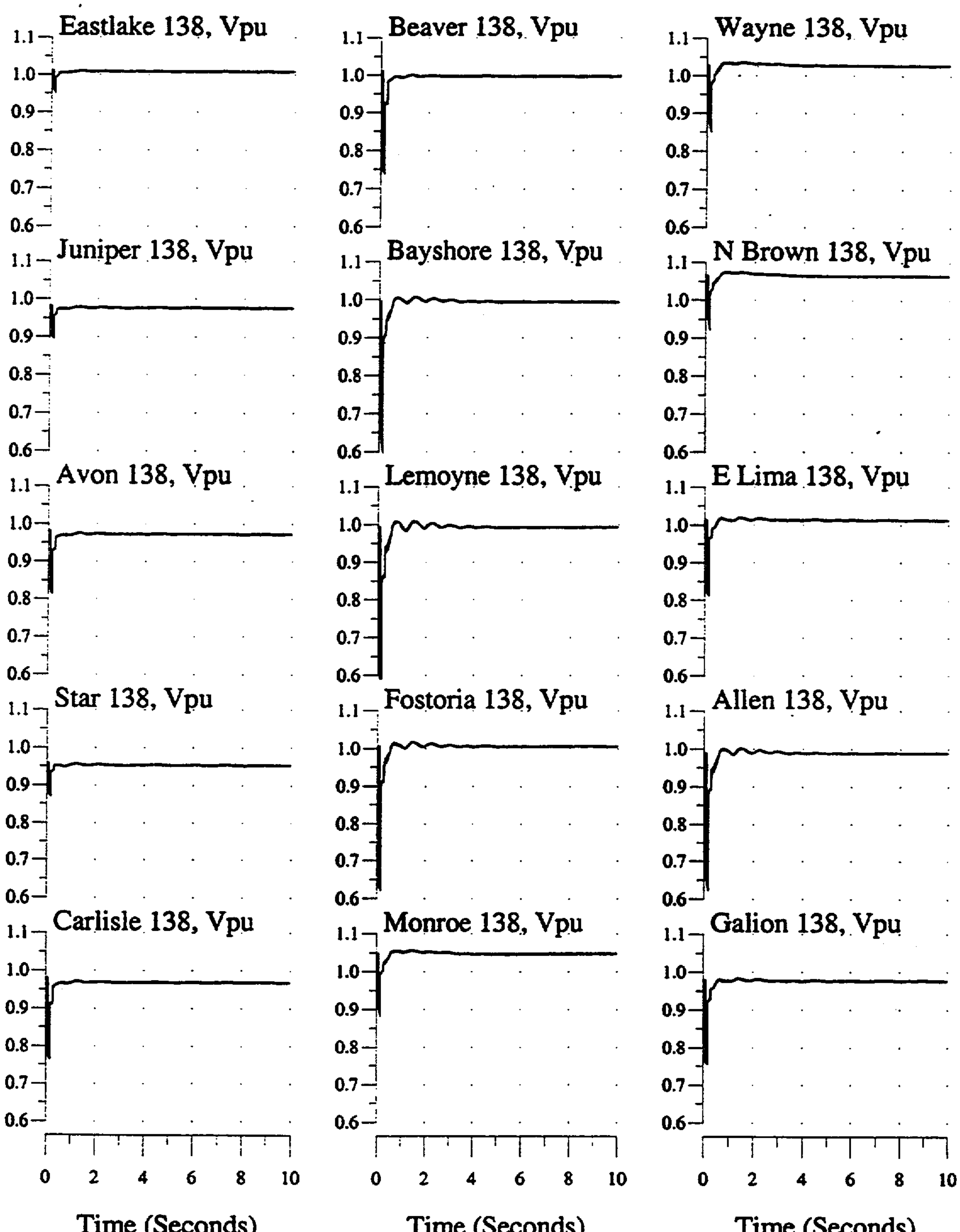


3phase/1phase Fault near Davis-Besse 345kV Bus
Trip DB-Bayshore Line (4.5cy), Breaker IPO Fails, Trip DB-Beaver Line (12cy)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

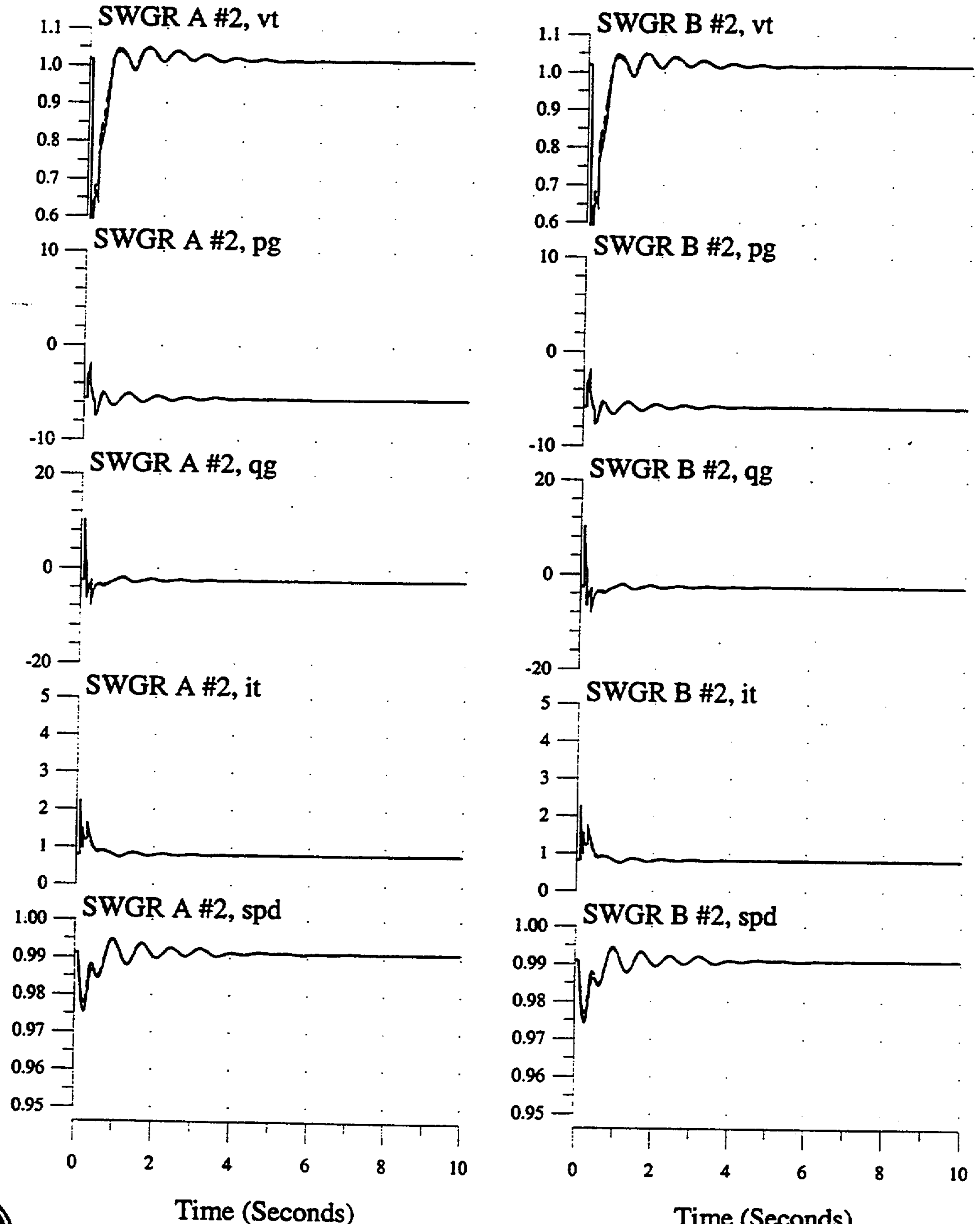


26-APR-2000 14:49:12 chanfiles/d0_99s_r2_c09.chan

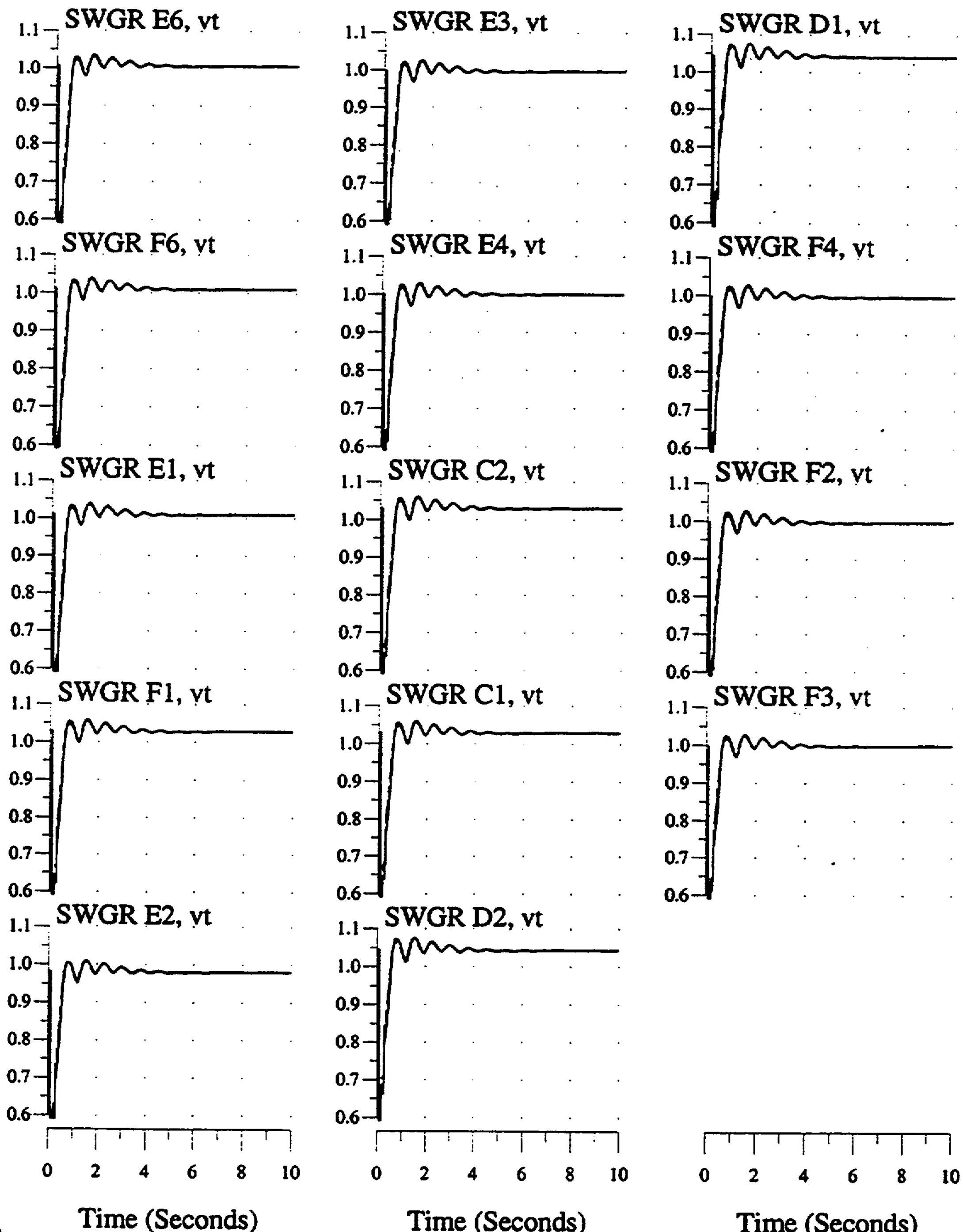
3phase/1phase Fault near Davis-Besse 345kV Bus
Trip DB-Bayshore Line (4.5cy), Breaker IPO Fails, Trip DB-Beaver Line (12cy)
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



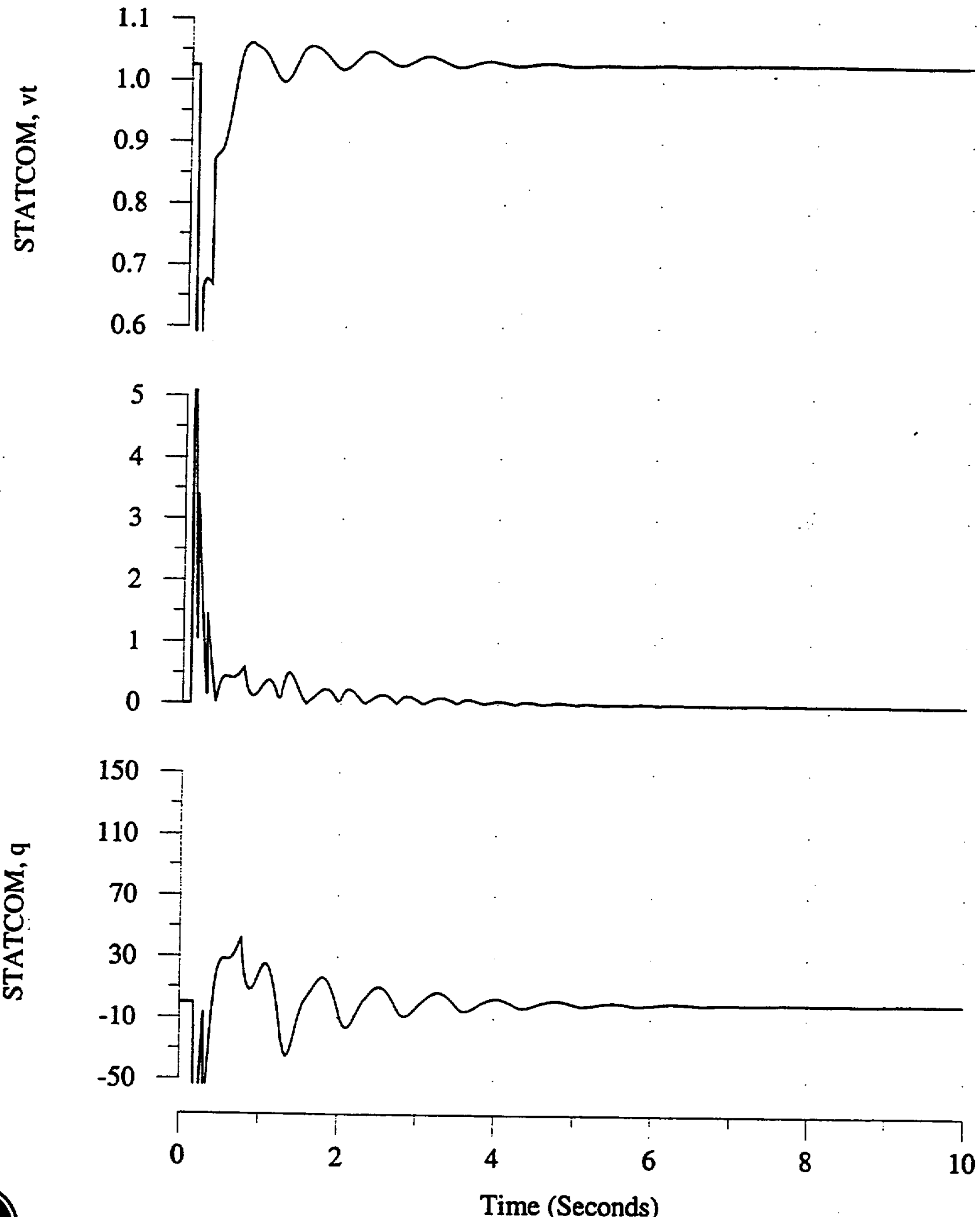
3phase/1phase Fault near Davis-Besse 345kV Bus
Trip DB-Bayshore Line (4.5cy), Breaker IPO Fails, Trip DB-Beaver Line (12cy)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



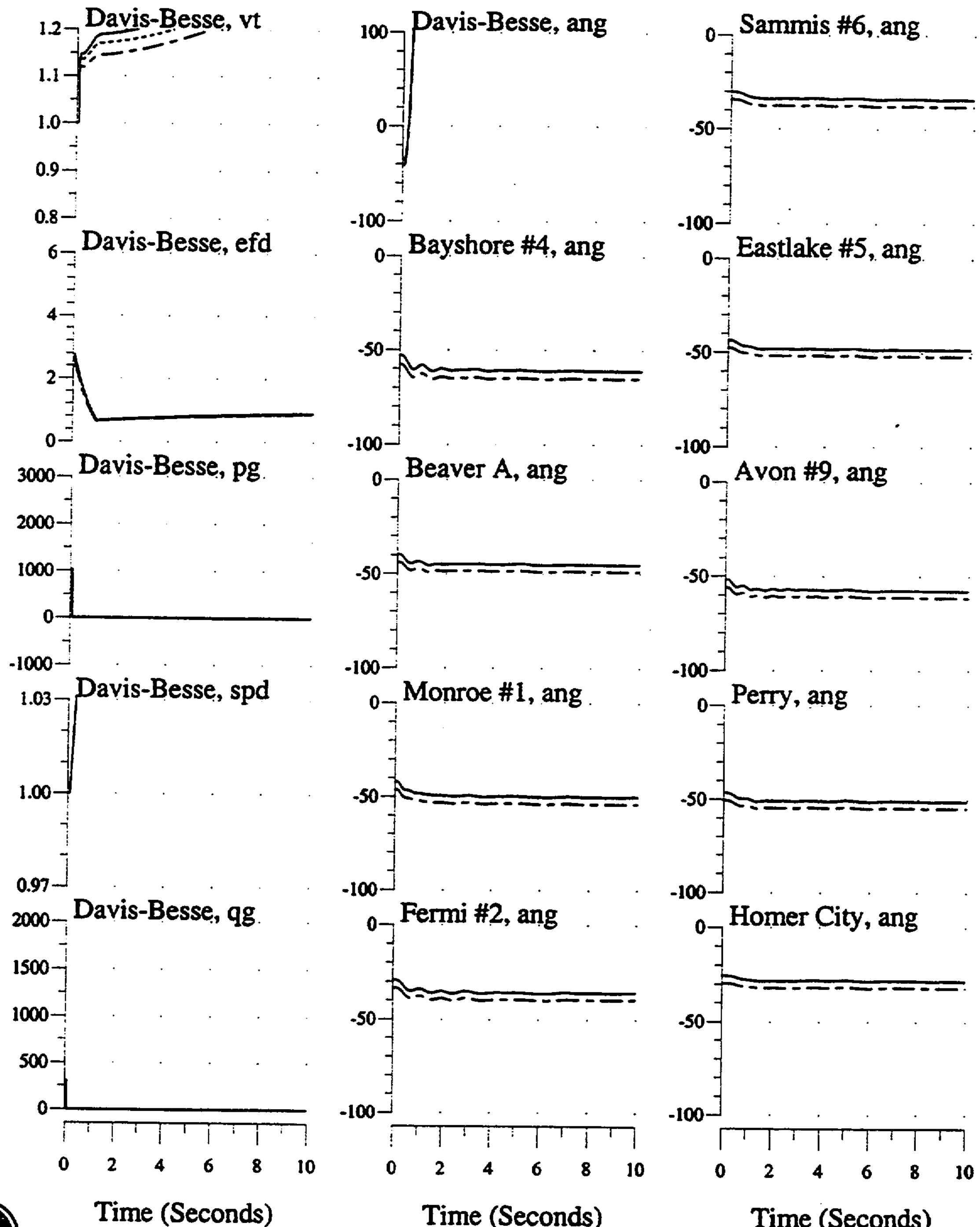
3phase/1phase Fault near Davis-Besse 345kV Bus
Trip DB-Bayshore Line (4.5cy), Breaker IPO Fails, Trip DB-Beaver Line (12cy)
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



3phase/1phase Fault near Davis-Besse 345kV Bus
Trip DB-Bayshore Line (4.5cy), Breaker IPO Fails, Trip DB-Beaver Line (12cy)
STATCOM Variables: (__) With Uprate & STATCOM



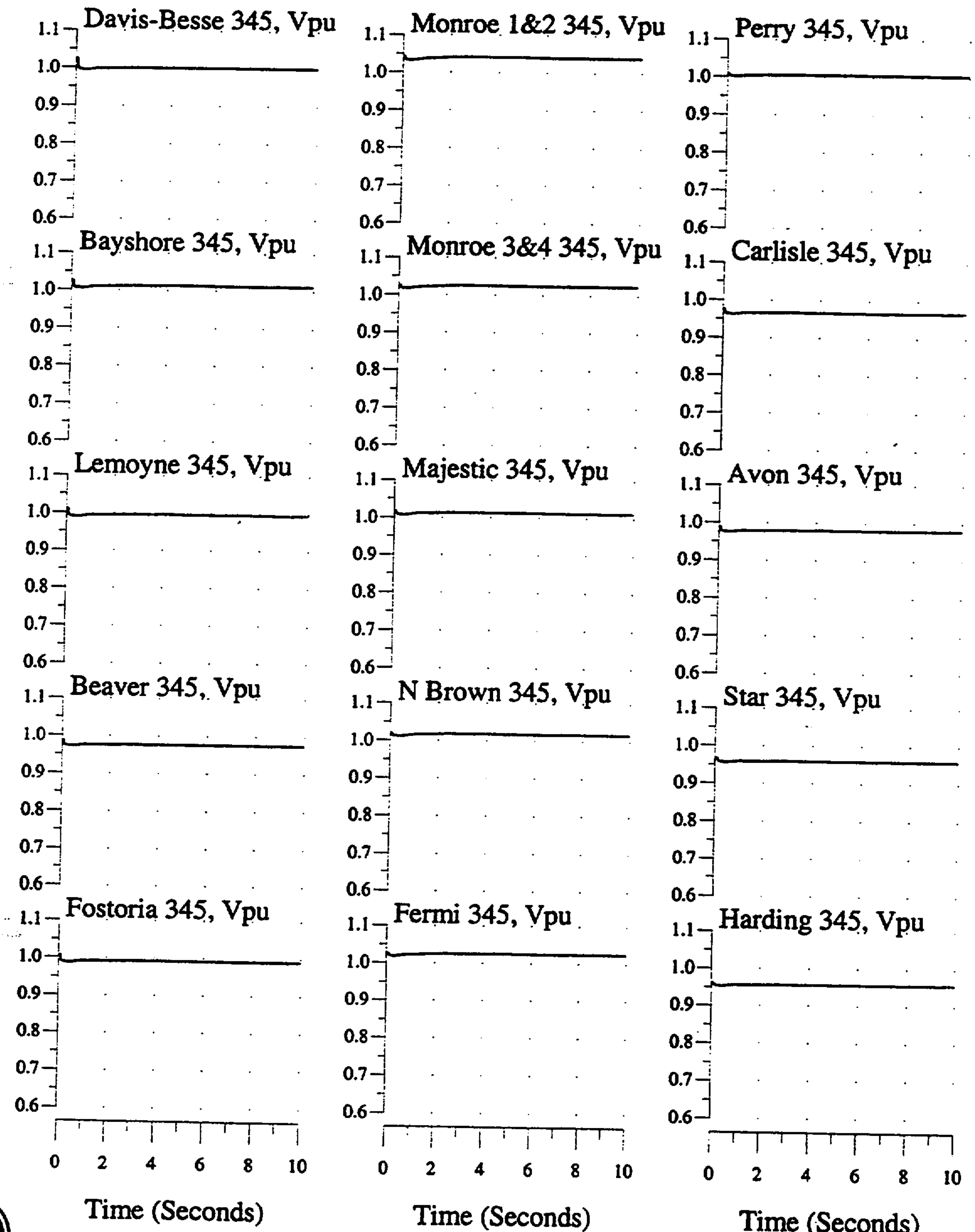
No Fault
Trip Davis-Besse Unit
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



No Fault

Trip Davis-Besse Unit

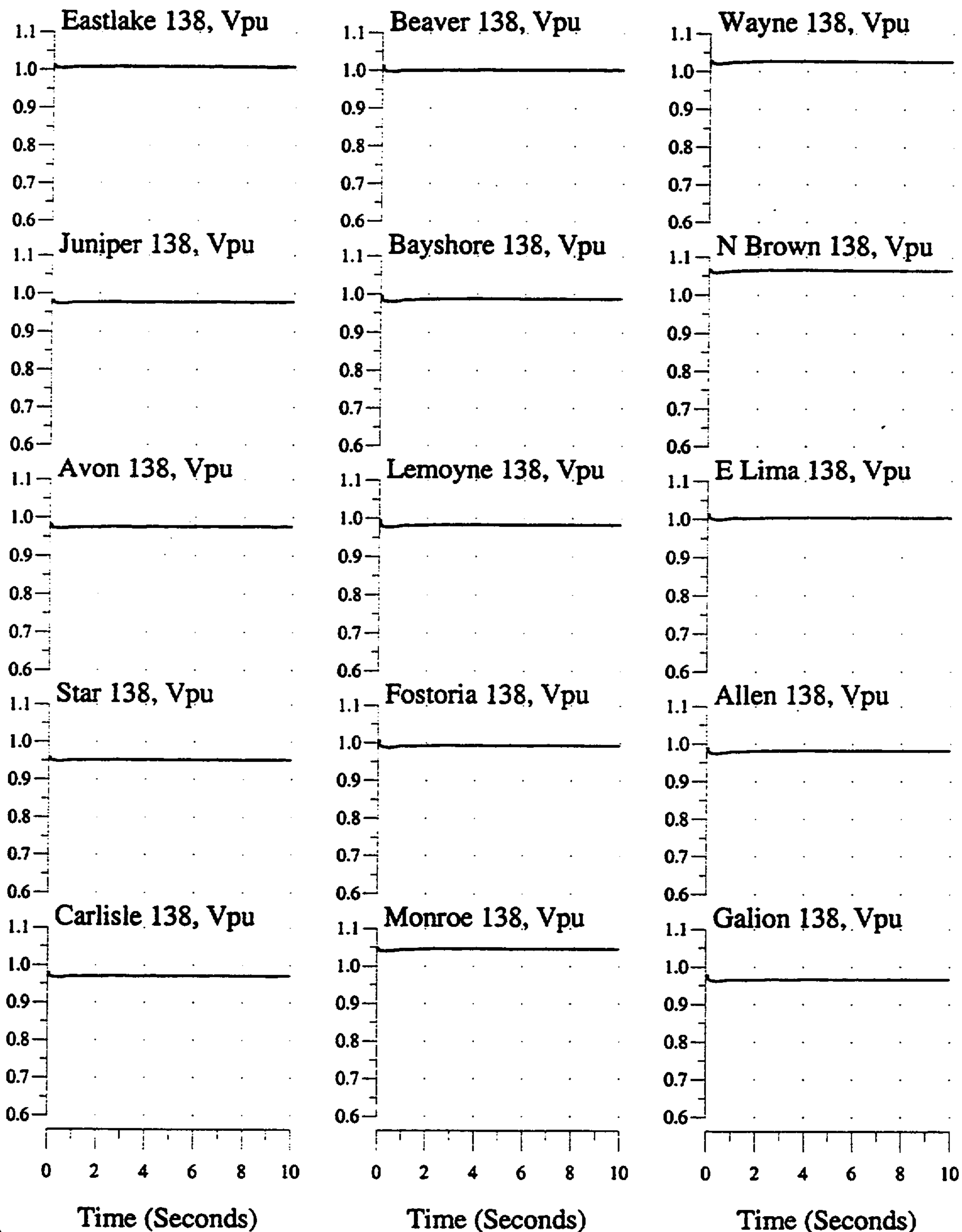
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



No Fault

Trip Davis-Besse Unit

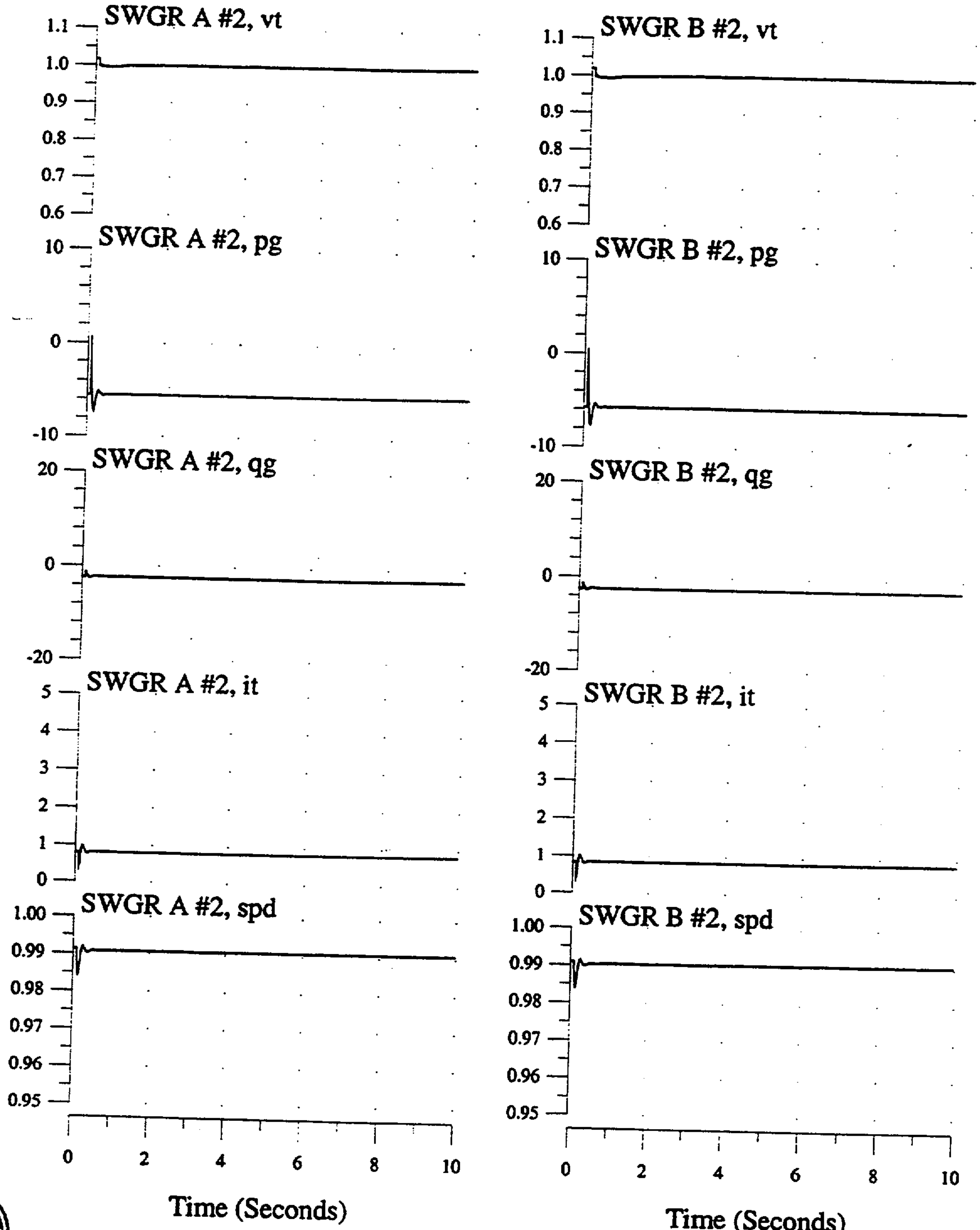
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



No Fault

Trip Davis-Besse Unit

Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



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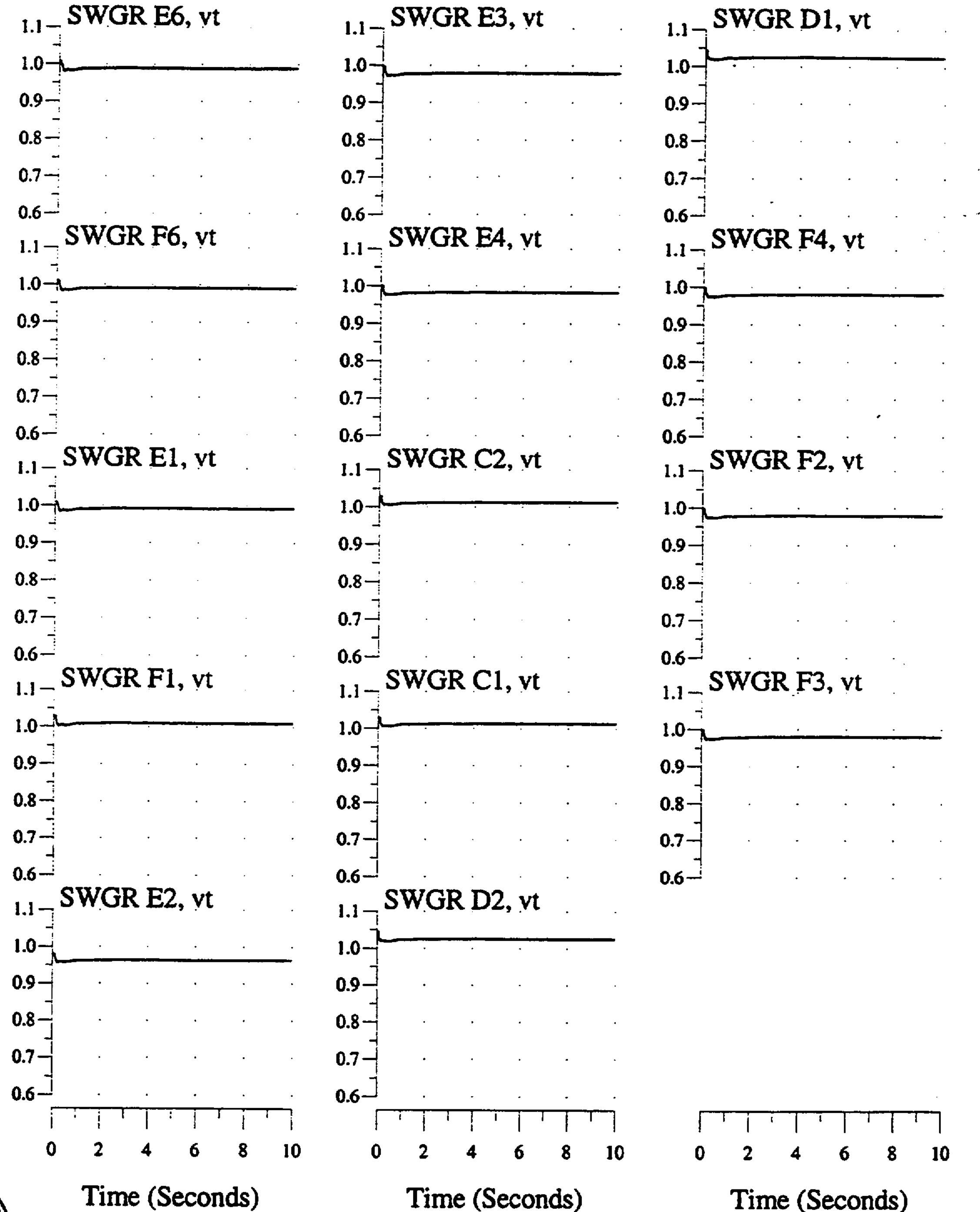
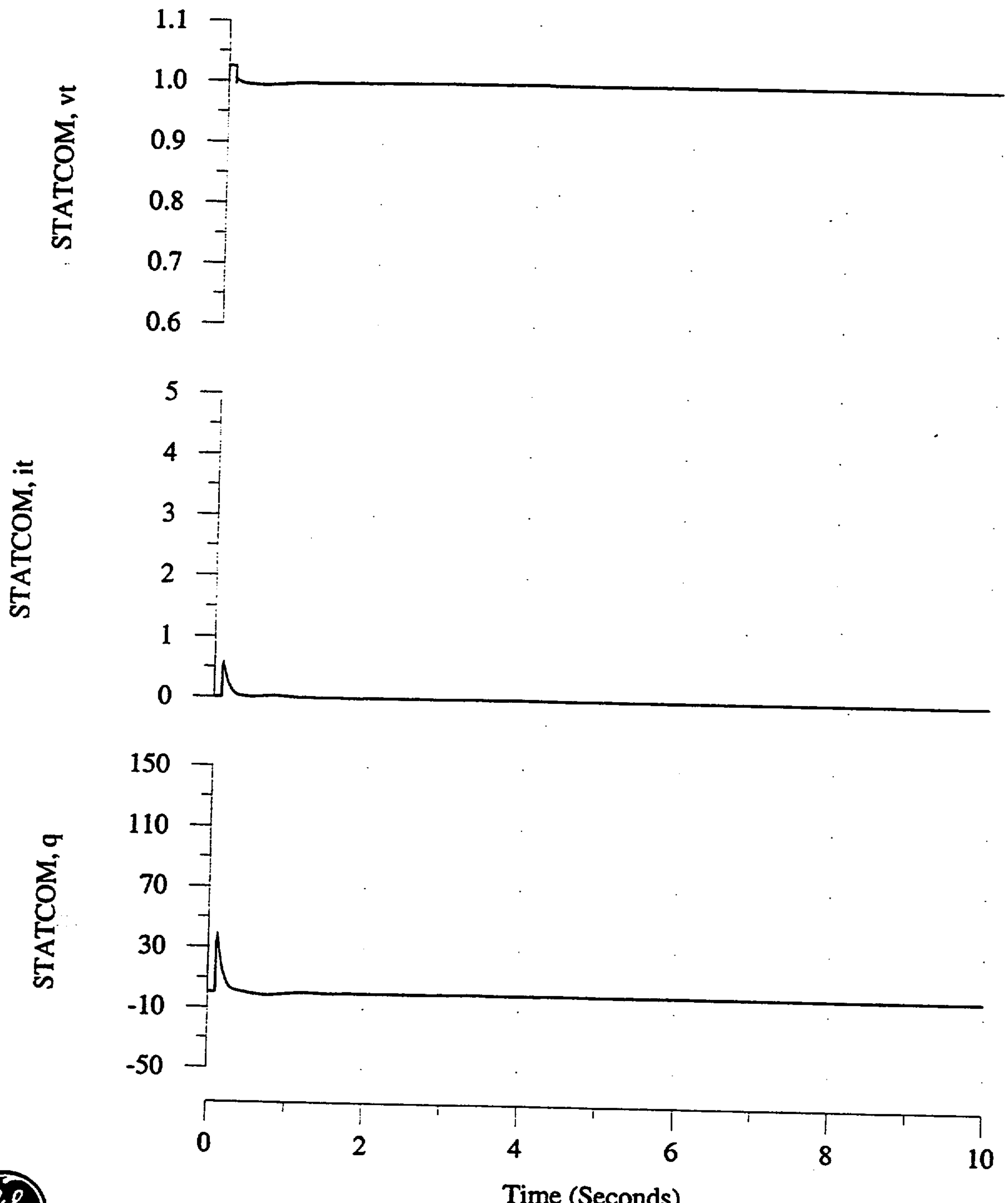
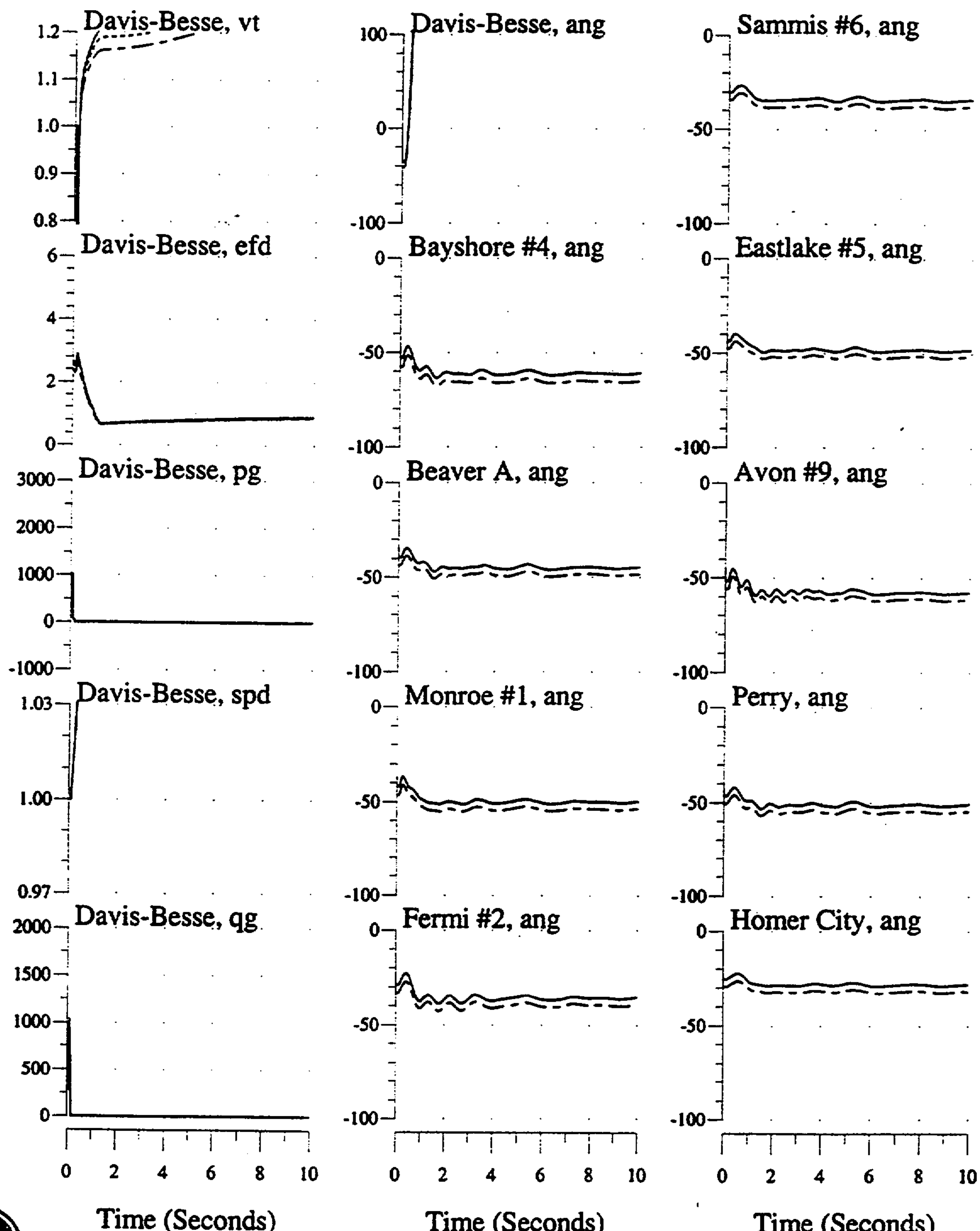
No Fault
Trip Davis-Besse Unit
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



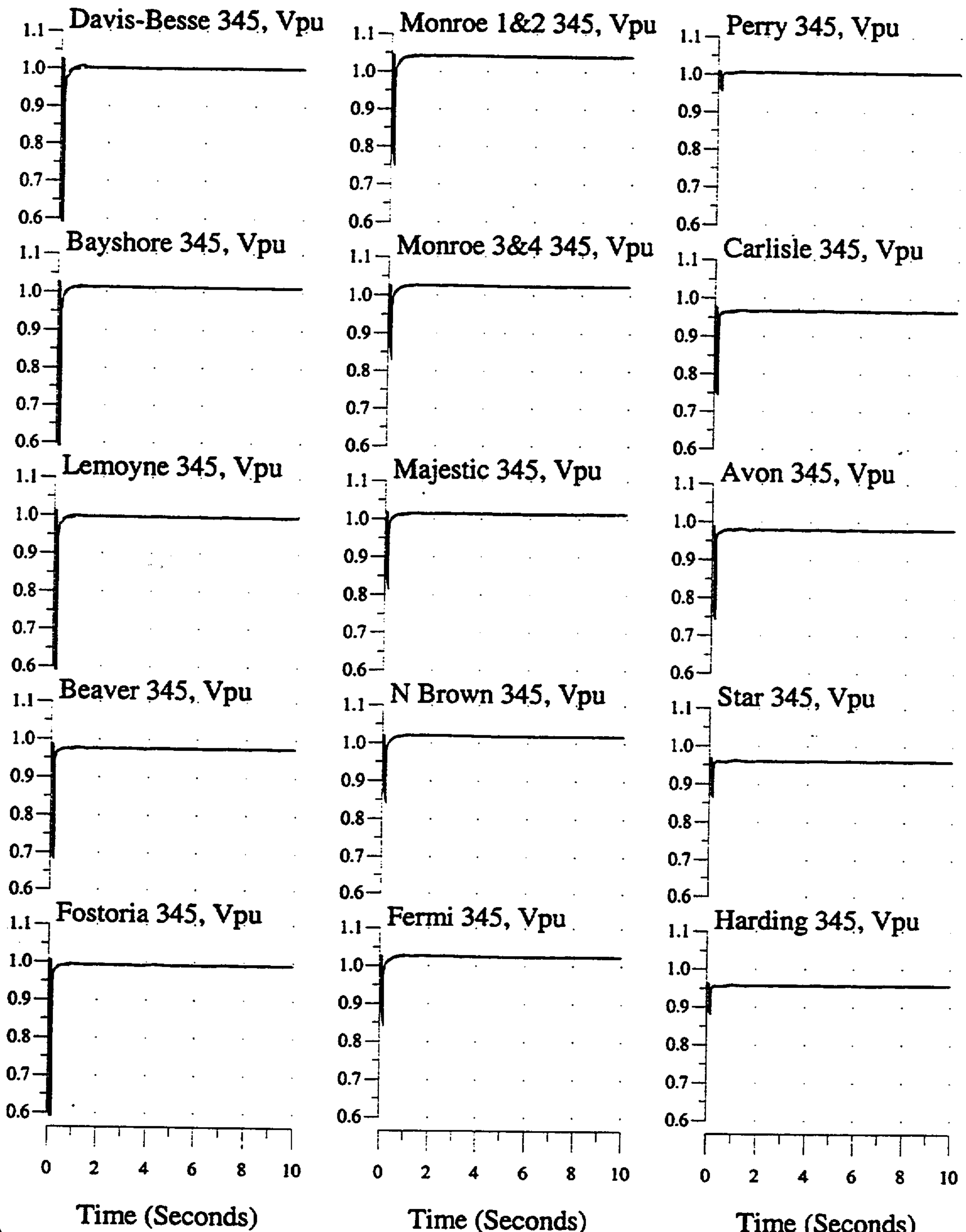
No Fault
Trip Davis-Besse Unit
STATCOM Variables: (__) With Uprate & STATCOM



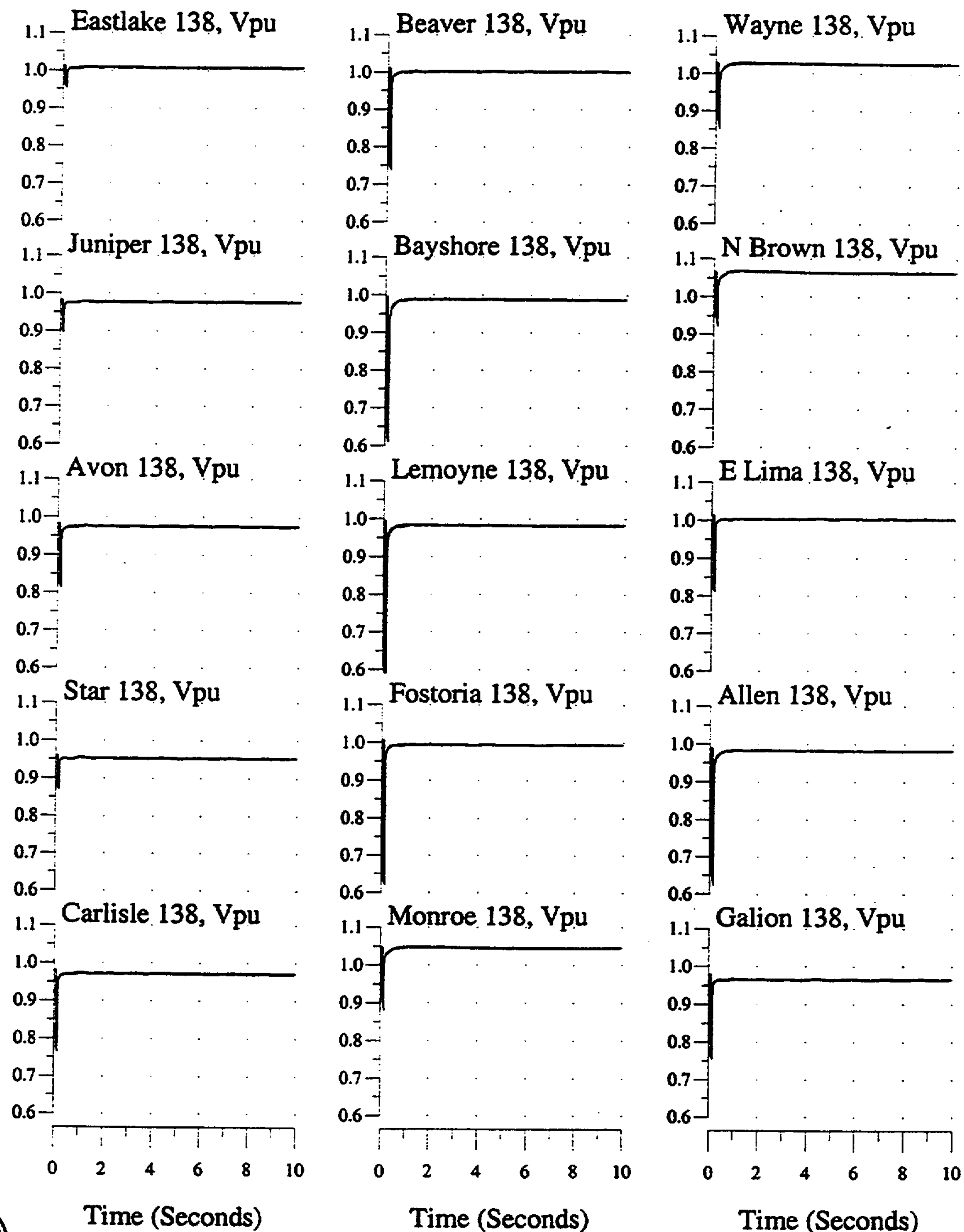
3phase Fault in Davis-Besse GSU Transformer
Trip Davis-Besse Unit
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



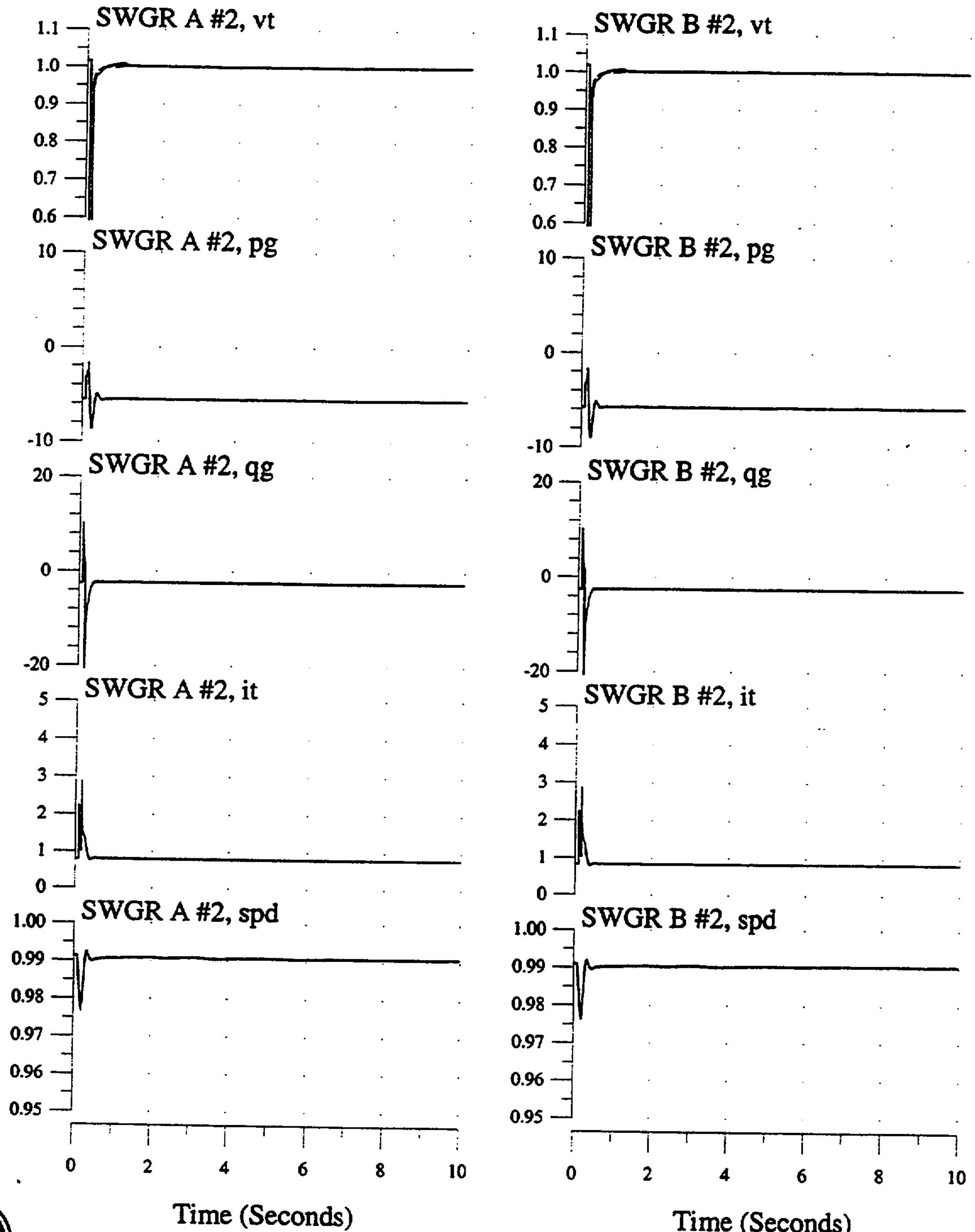
3phase Fault in Davis-Besse GSU Transformer
Trip Davis-Besse Unit
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



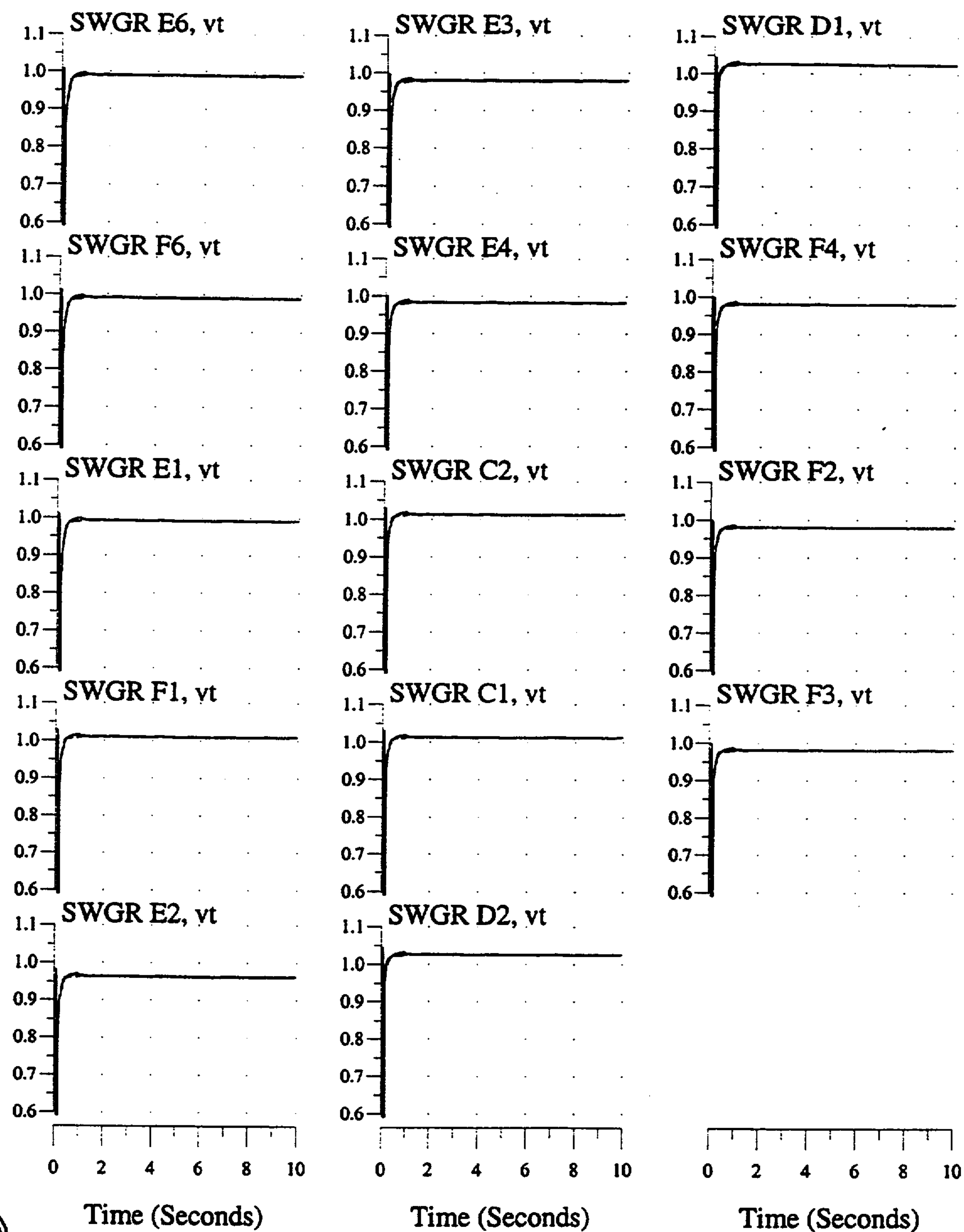
3phase Fault in Davis-Besse GSU Transformer
Trip Davis-Besse Unit
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



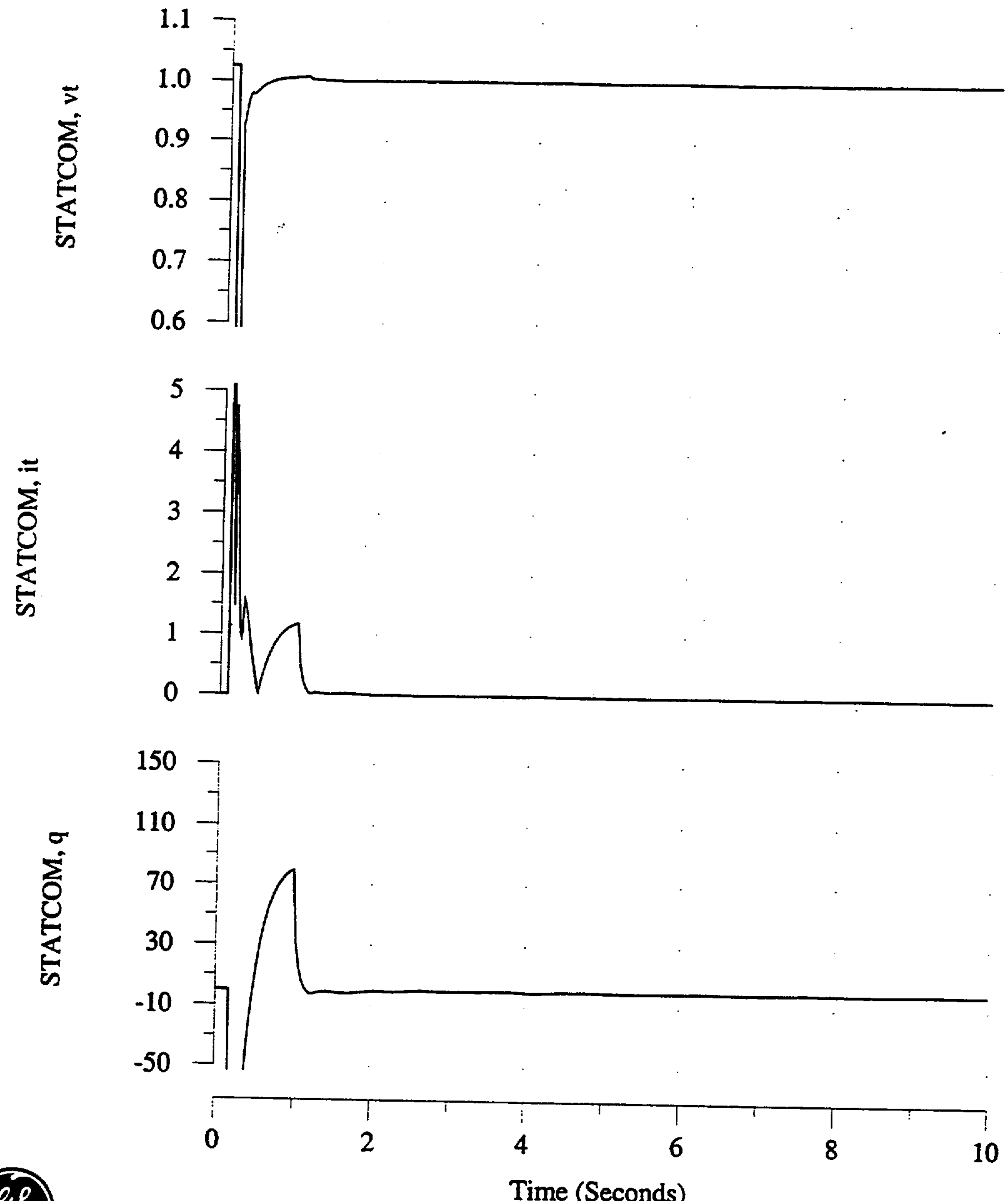
3phase Fault in Davis-Besse GSU Transformer
Trip Davis-Besse Unit
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



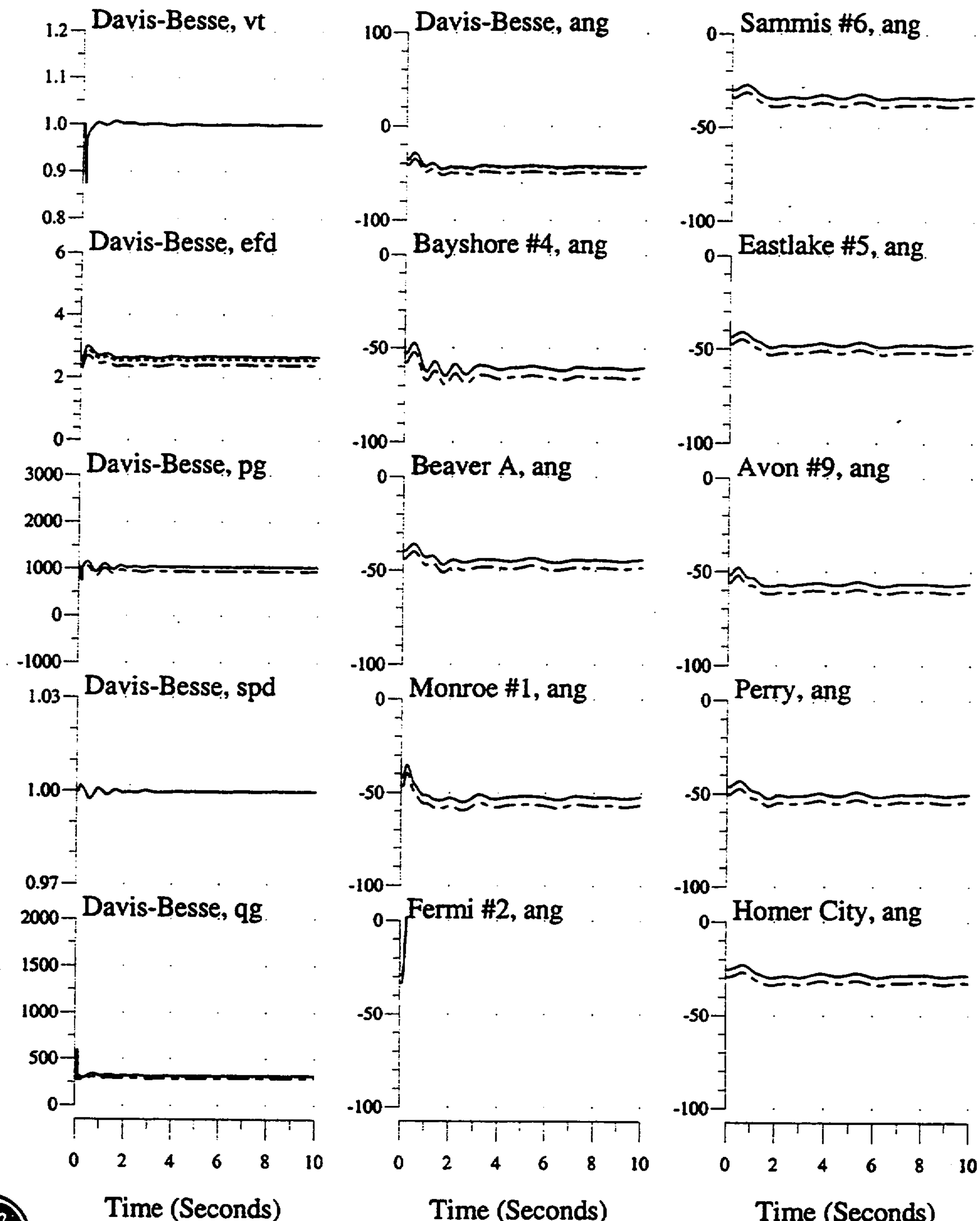
3phase Fault in Davis-Besse GSU Transformer
Trip Davis-Besse Unit
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



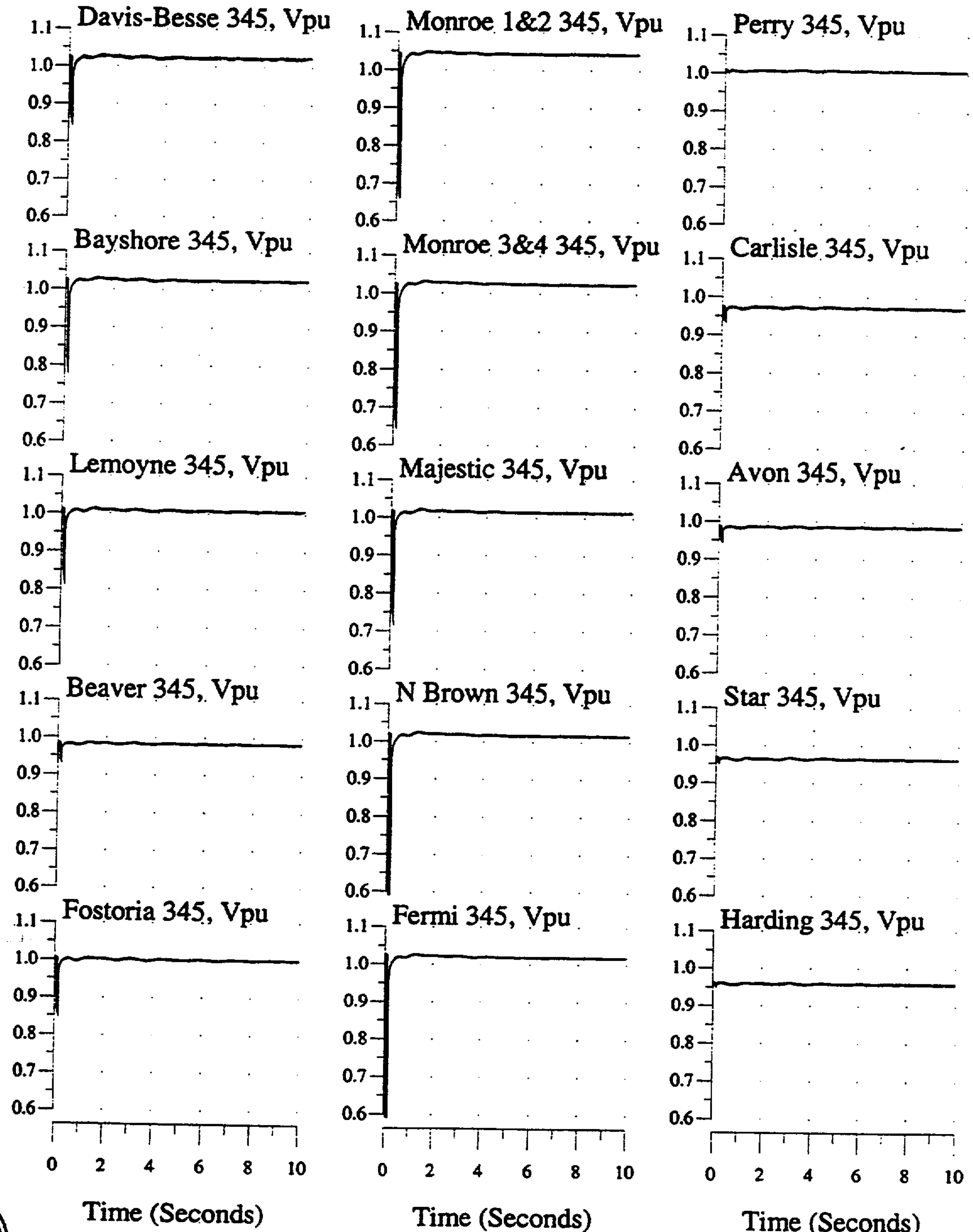
3phase Fault in Davis-Besse GSU Transformer
Trip Davis-Besse Unit
STATCOM Variables: (__) With Uprate & STATCOM



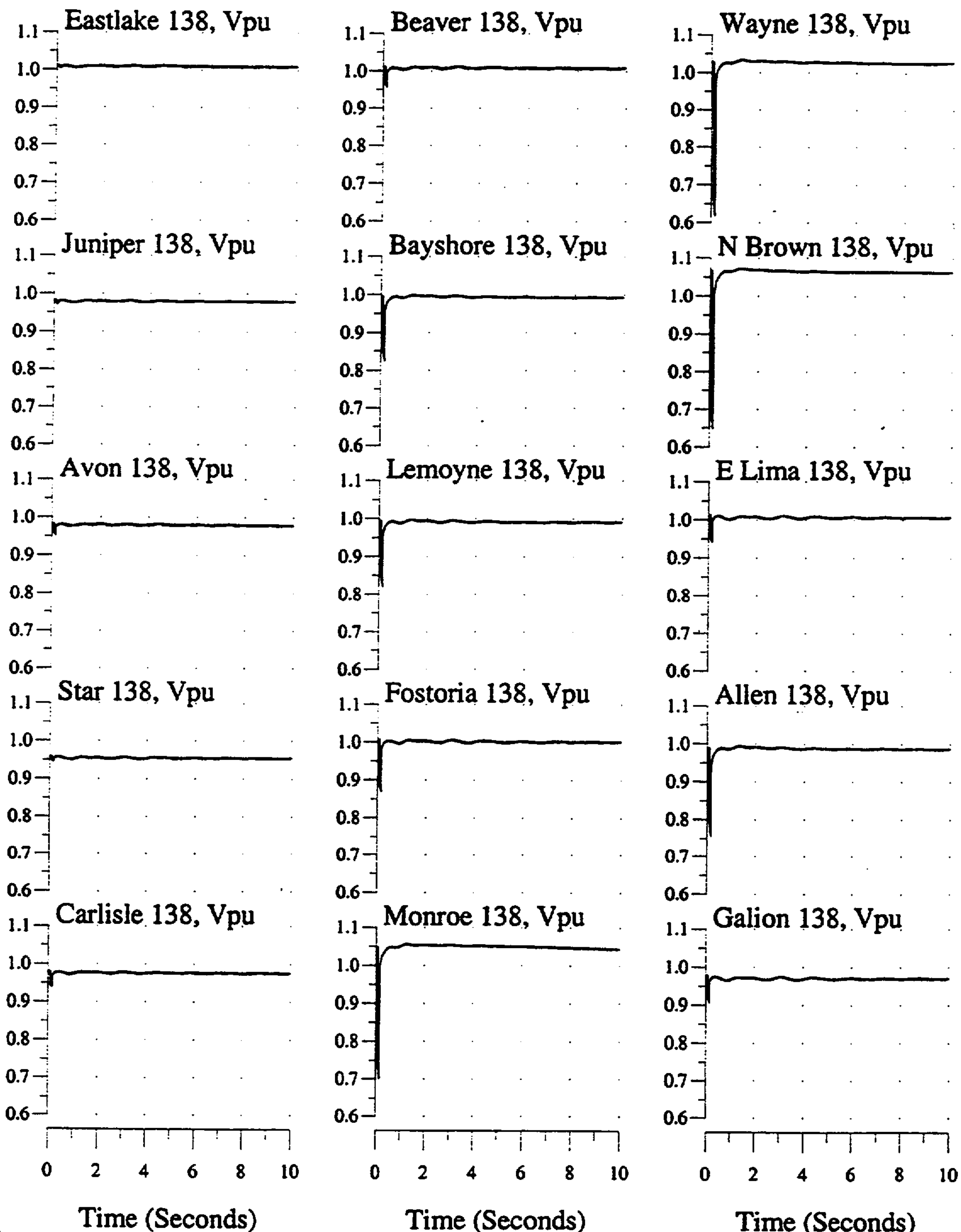
3phase Fault in Fermi GSU Transformer
Trip Fermi Unit
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



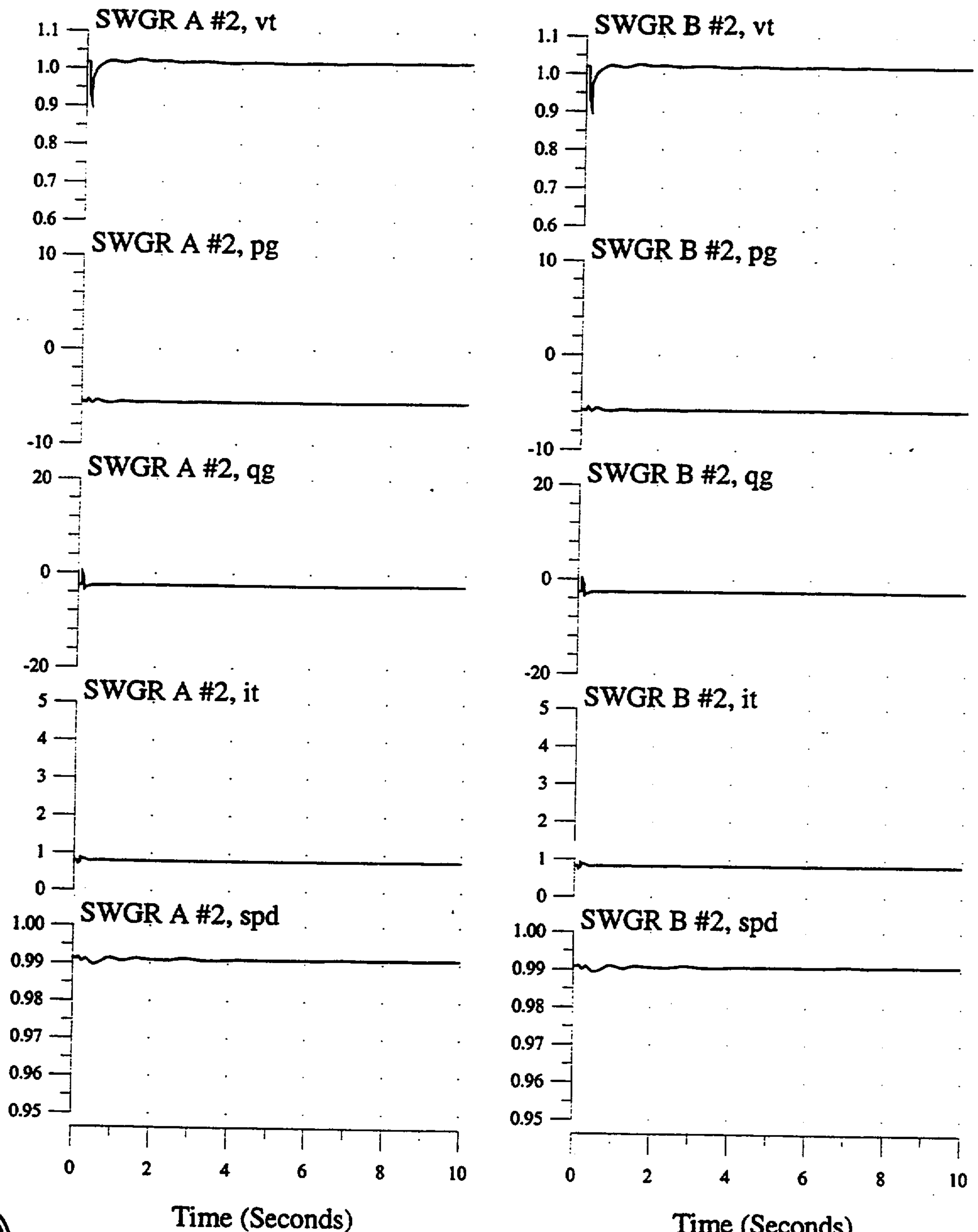
3phase Fault in Fermi GSU Transformer
Trip Fermi Unit
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



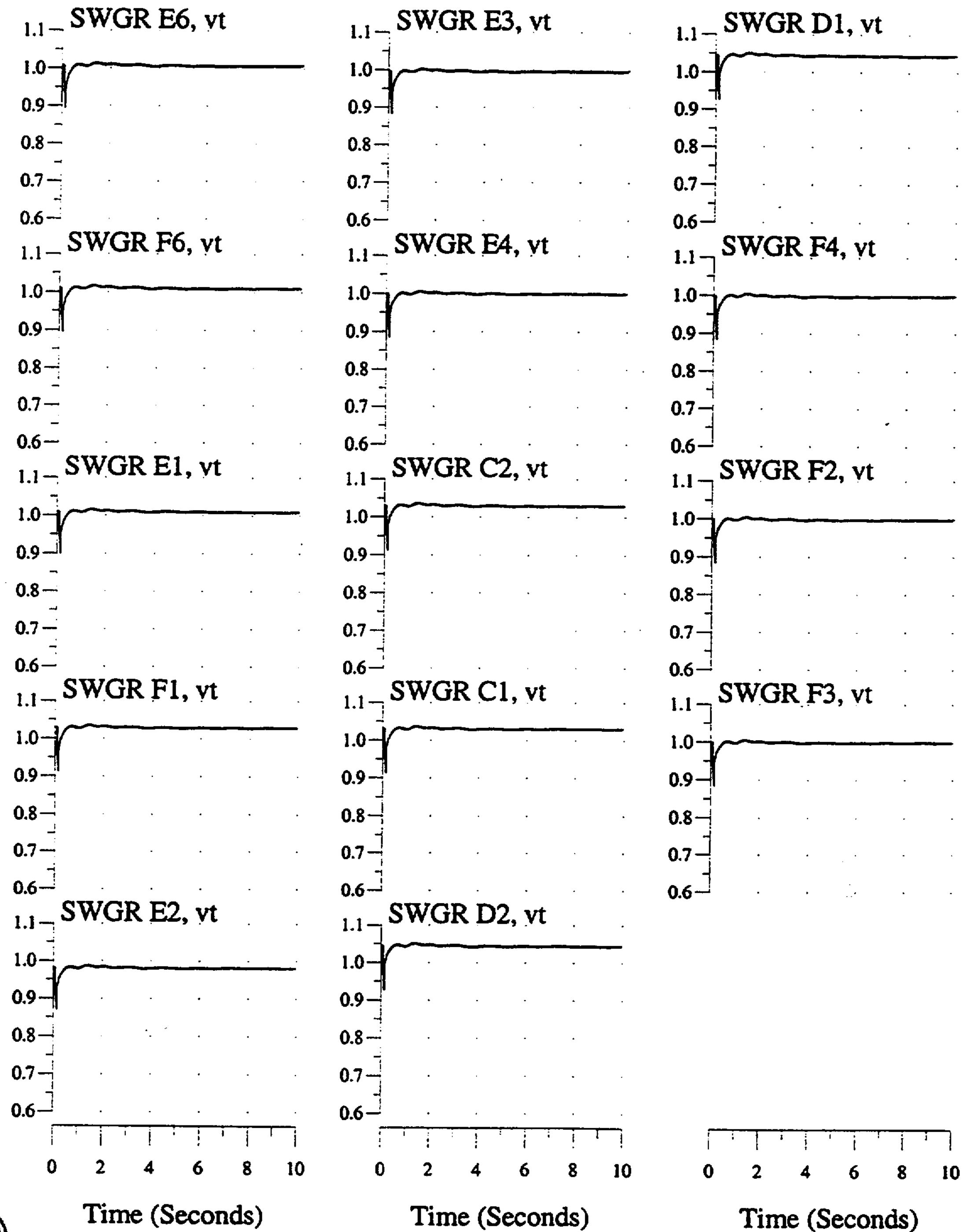
3phase Fault in Fermi GSU Transformer
Trip Fermi Unit
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



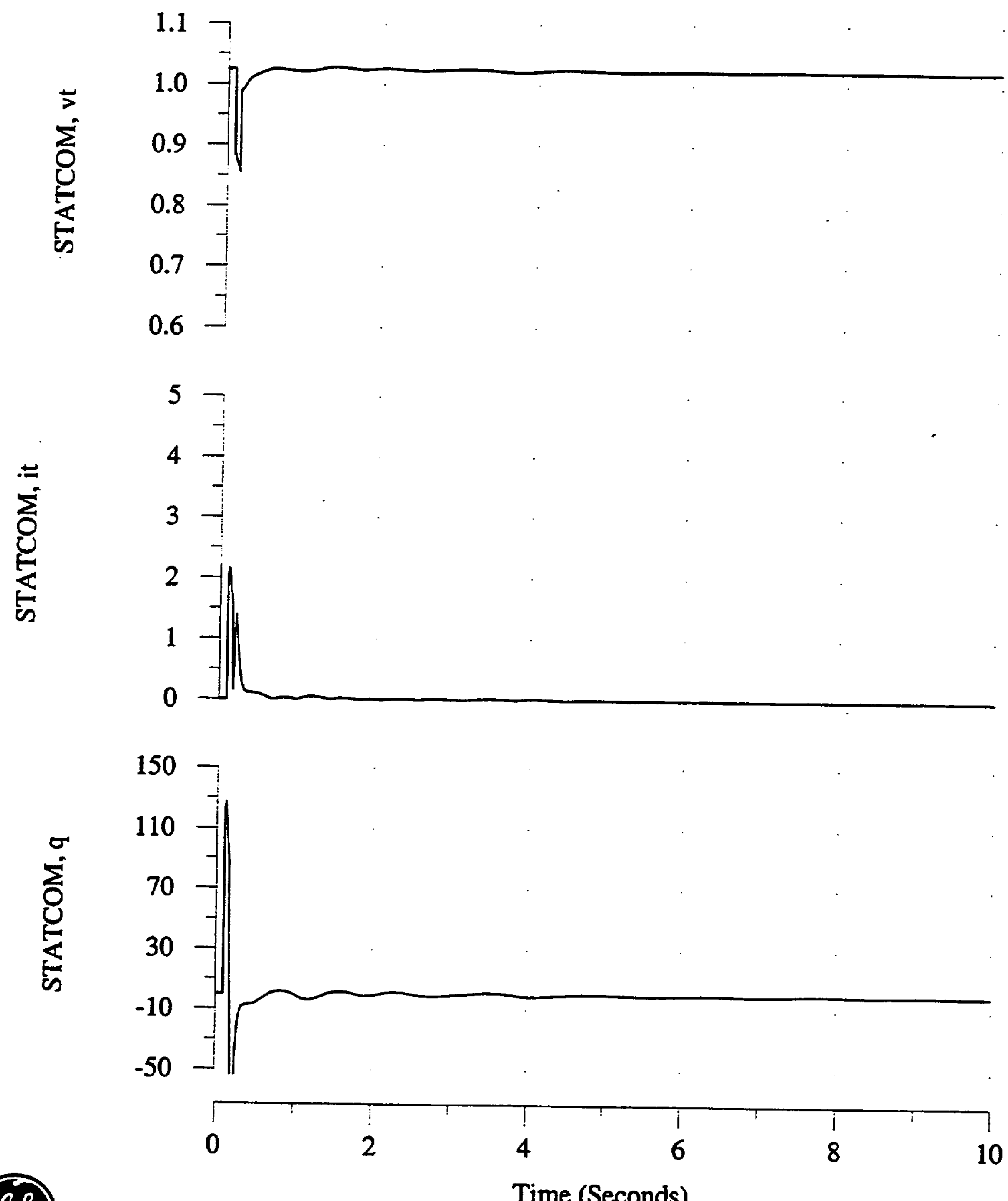
3phase Fault in Fermi GSU Transformer
Trip Fermi Unit
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



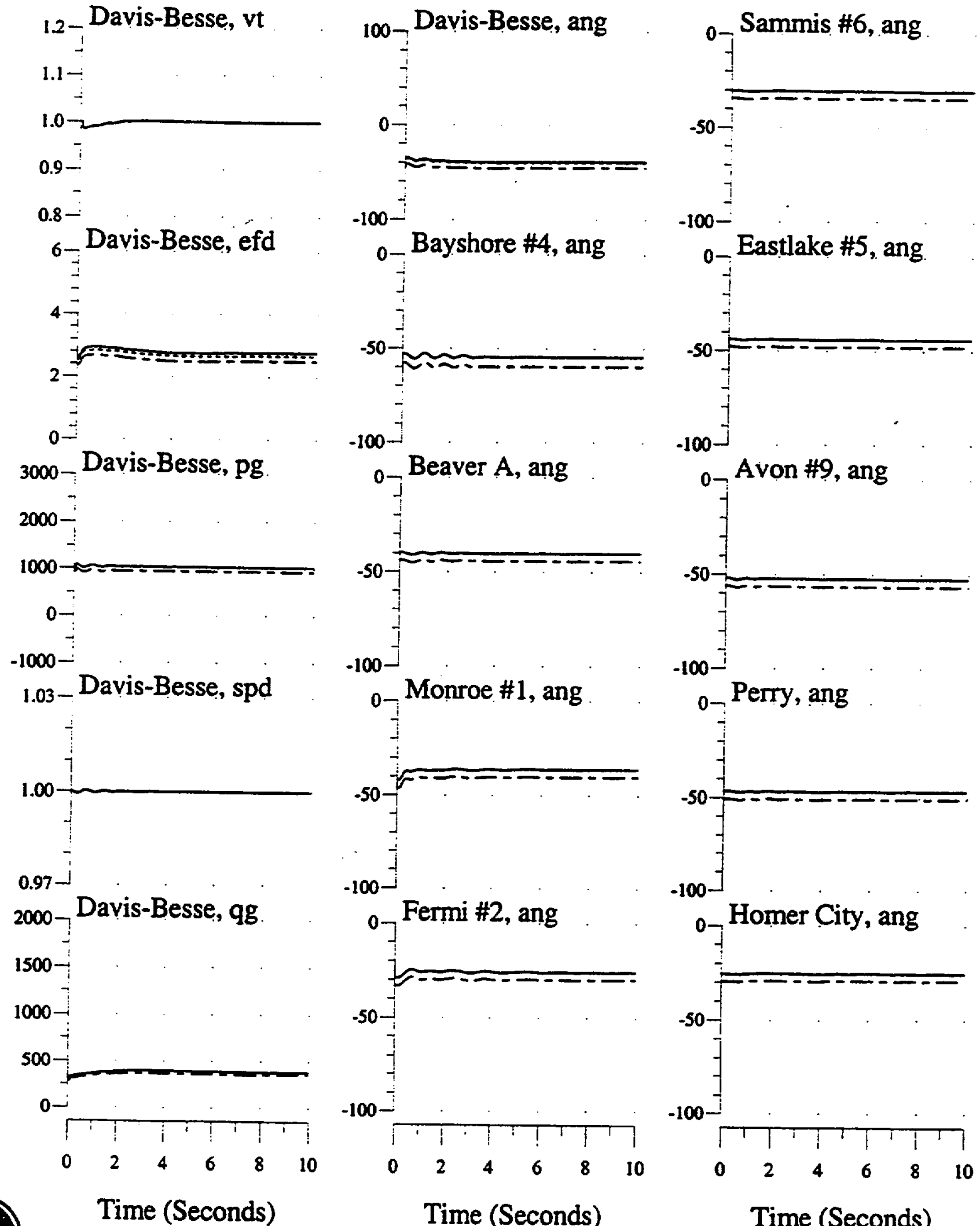
3phase Fault in Fermi GSU Transformer
Trip Fermi Unit
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



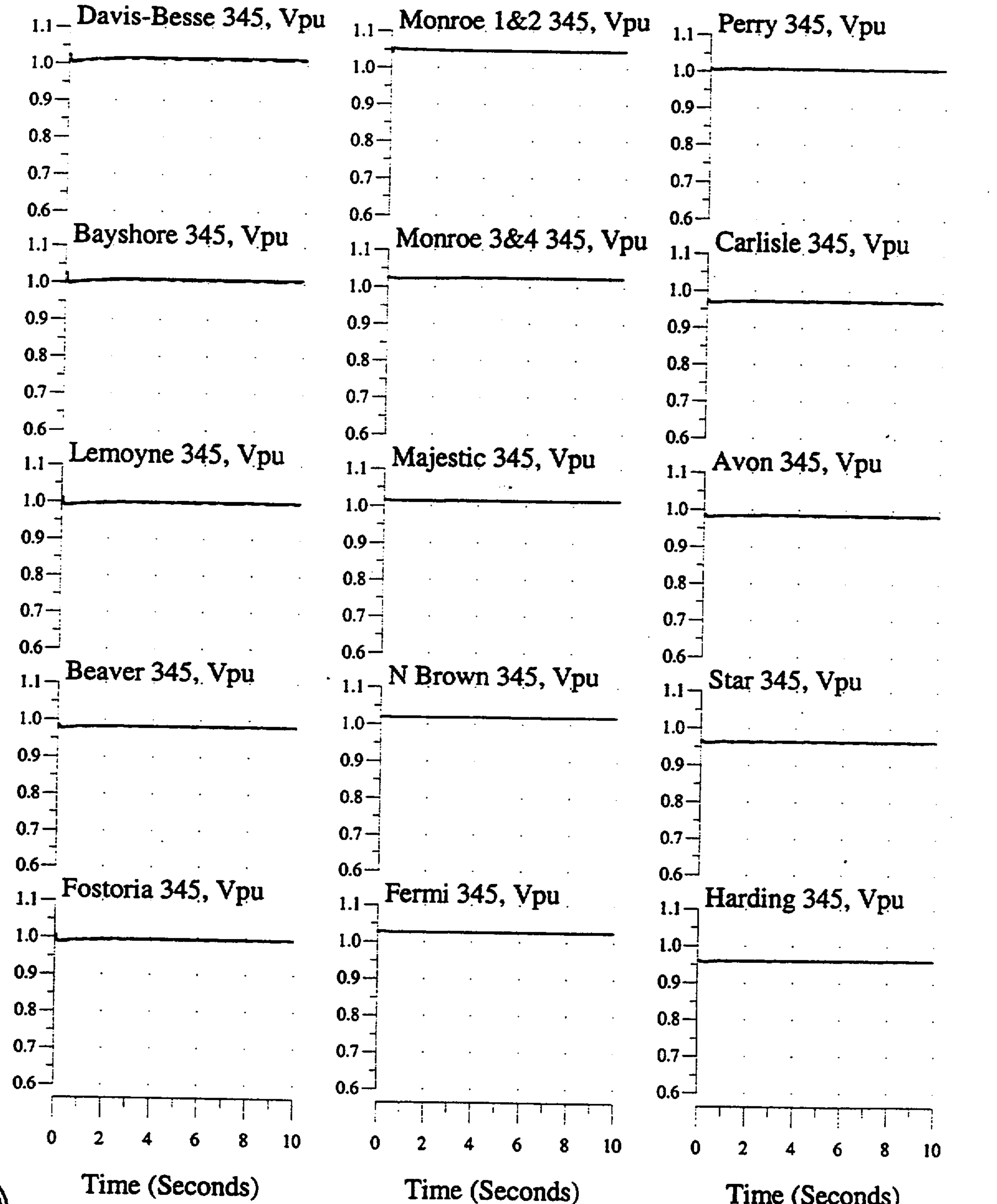
3phase Fault in Fermi GSU Transformer
Trip Fermi Unit
STATCOM Variables: (__) With Uprate & STATCOM



No Fault
Trip Bayshore-Monroe 345kV Line & Lemoyne-Majestic 345kV Line
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



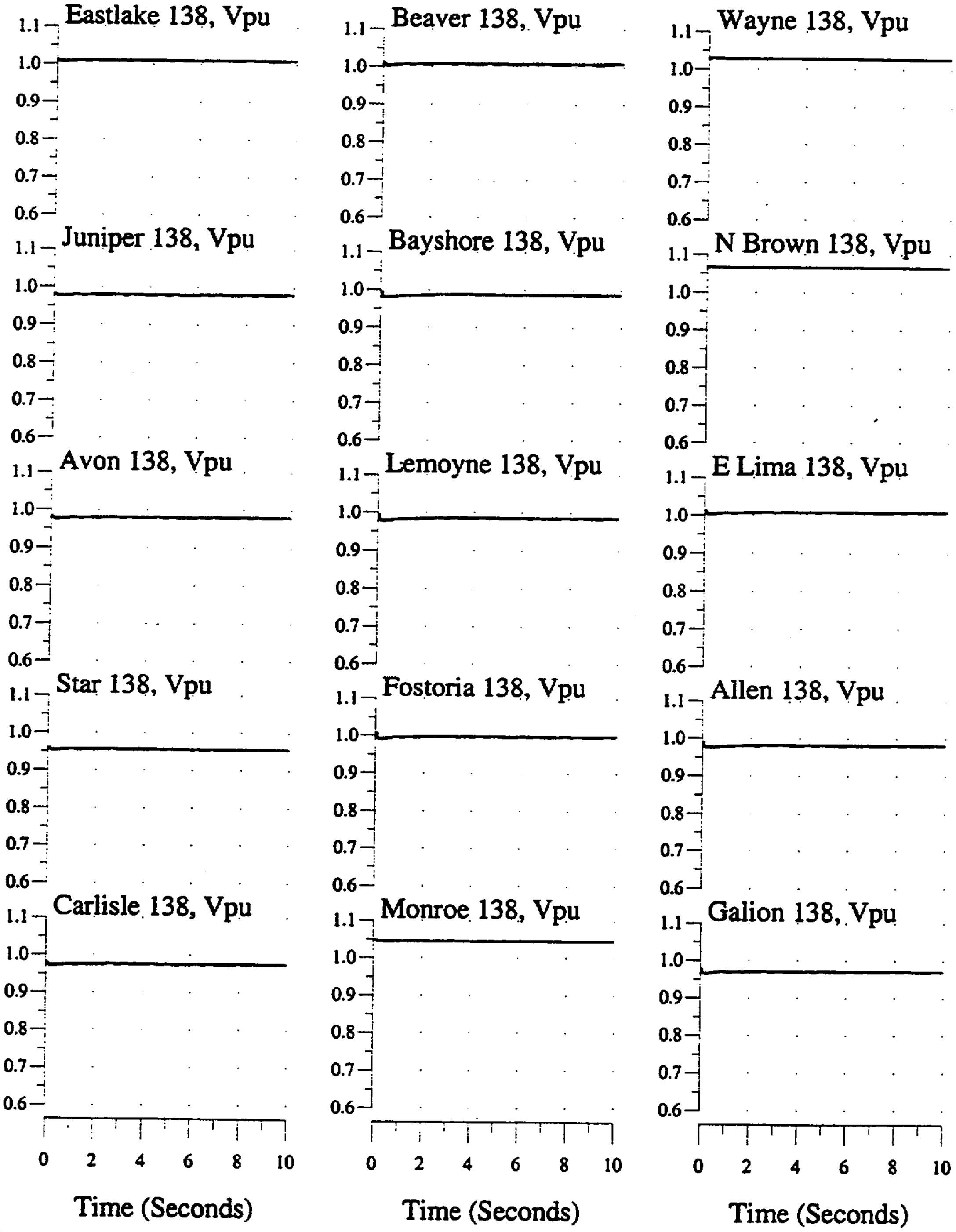
No Fault
Trip Bayshore-Monroe 345kV Line & Lemoyne-Majestic 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



No Fault

Trip Bayshore-Monroe 345kV Line & Lemoyne-Majestic 345kV Line

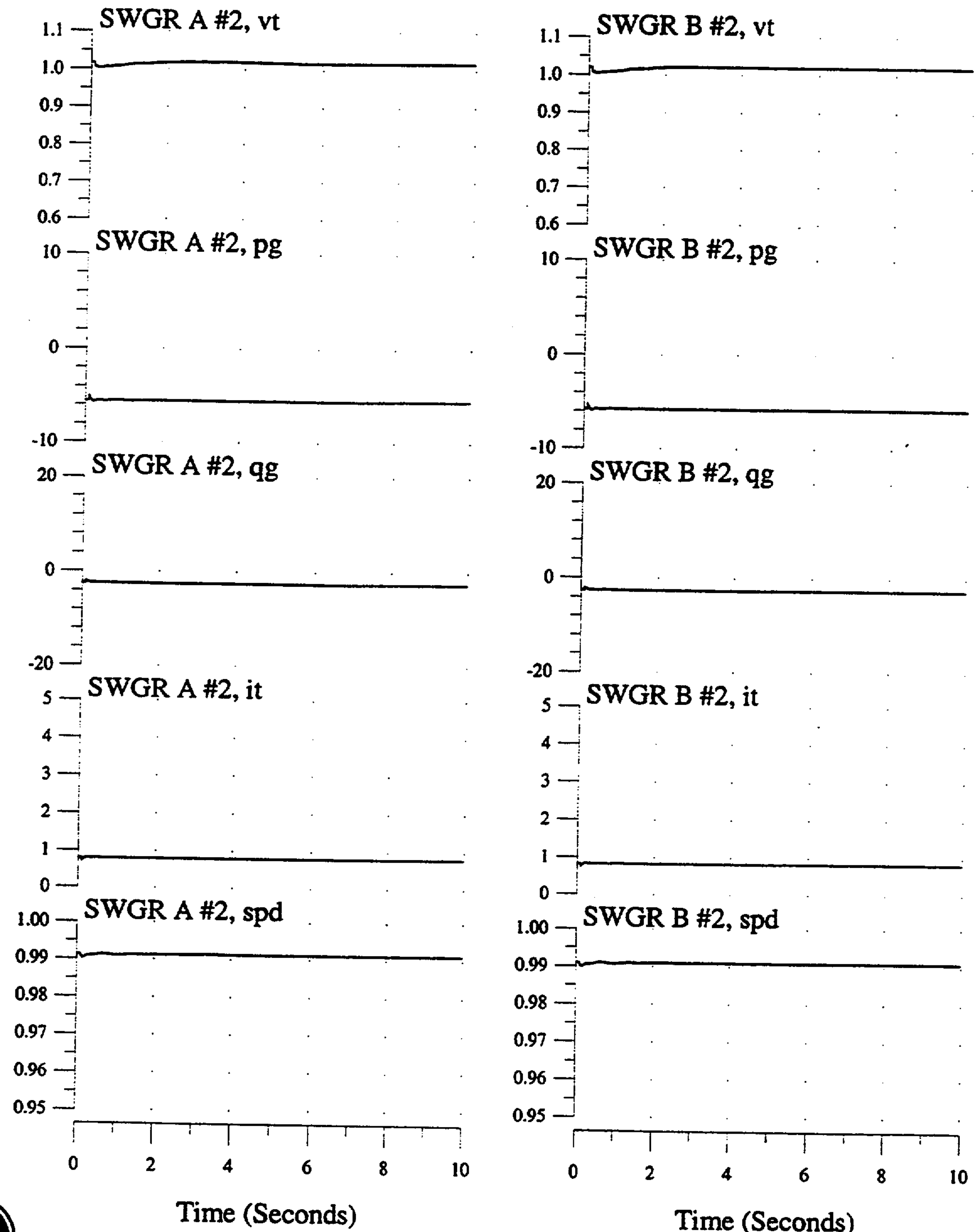
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



No Fault

Trip Bayshore-Monroe 345kV Line & Lemoyne-Majestic 345kV Line

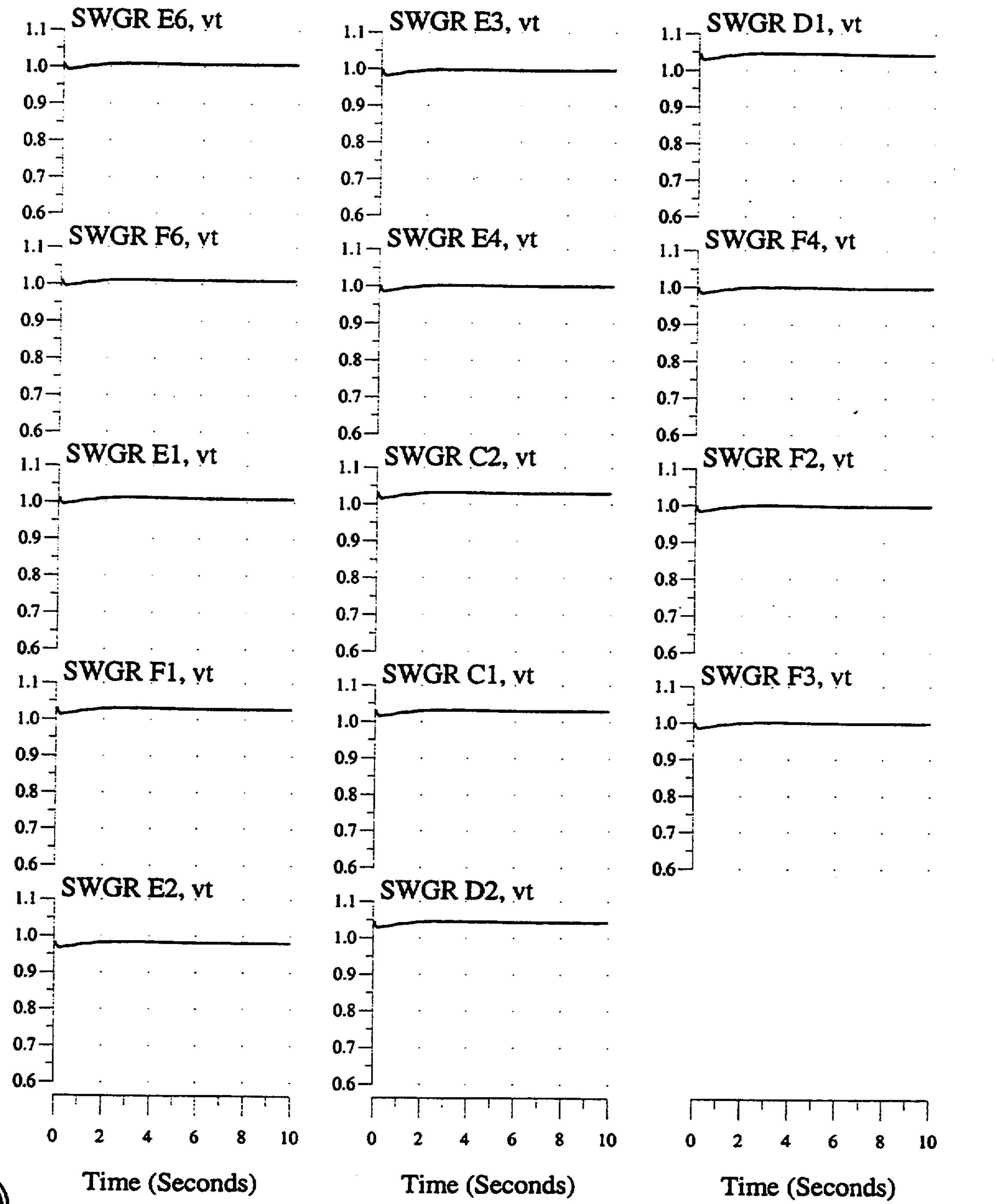
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



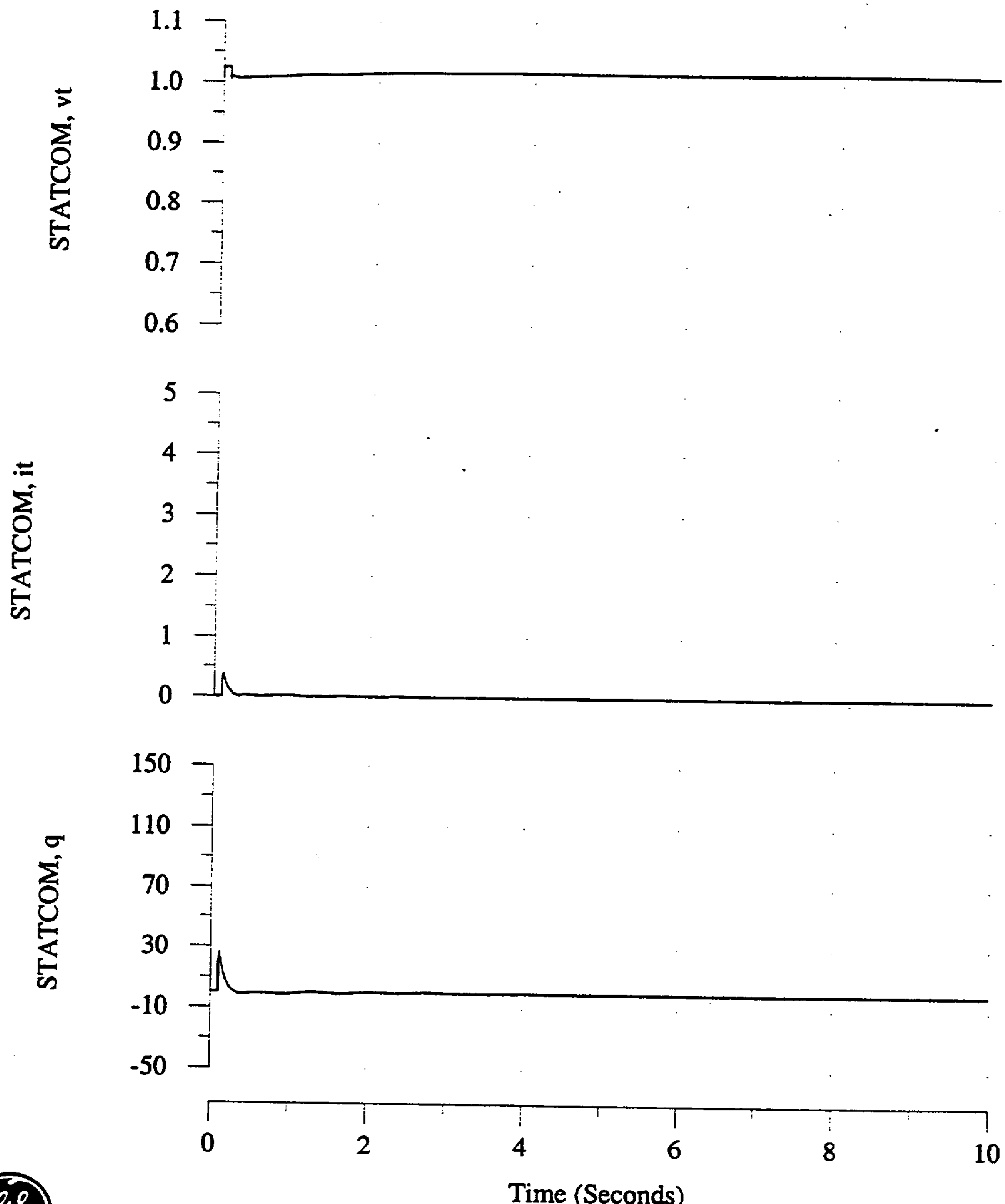
No Fault

Trip Bayshore-Monroe 345kV Line & Lemoyne-Majestic 345kV Line

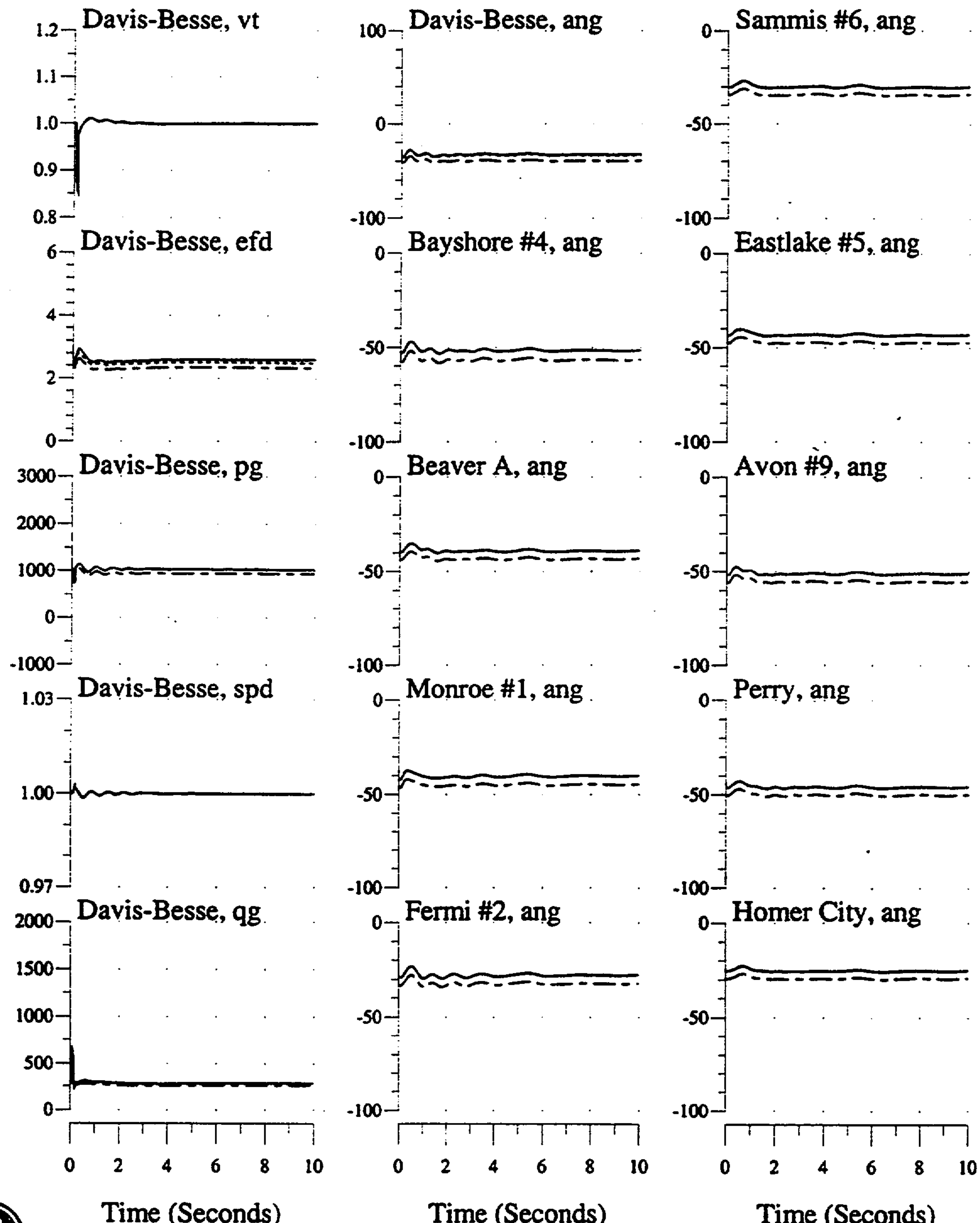
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



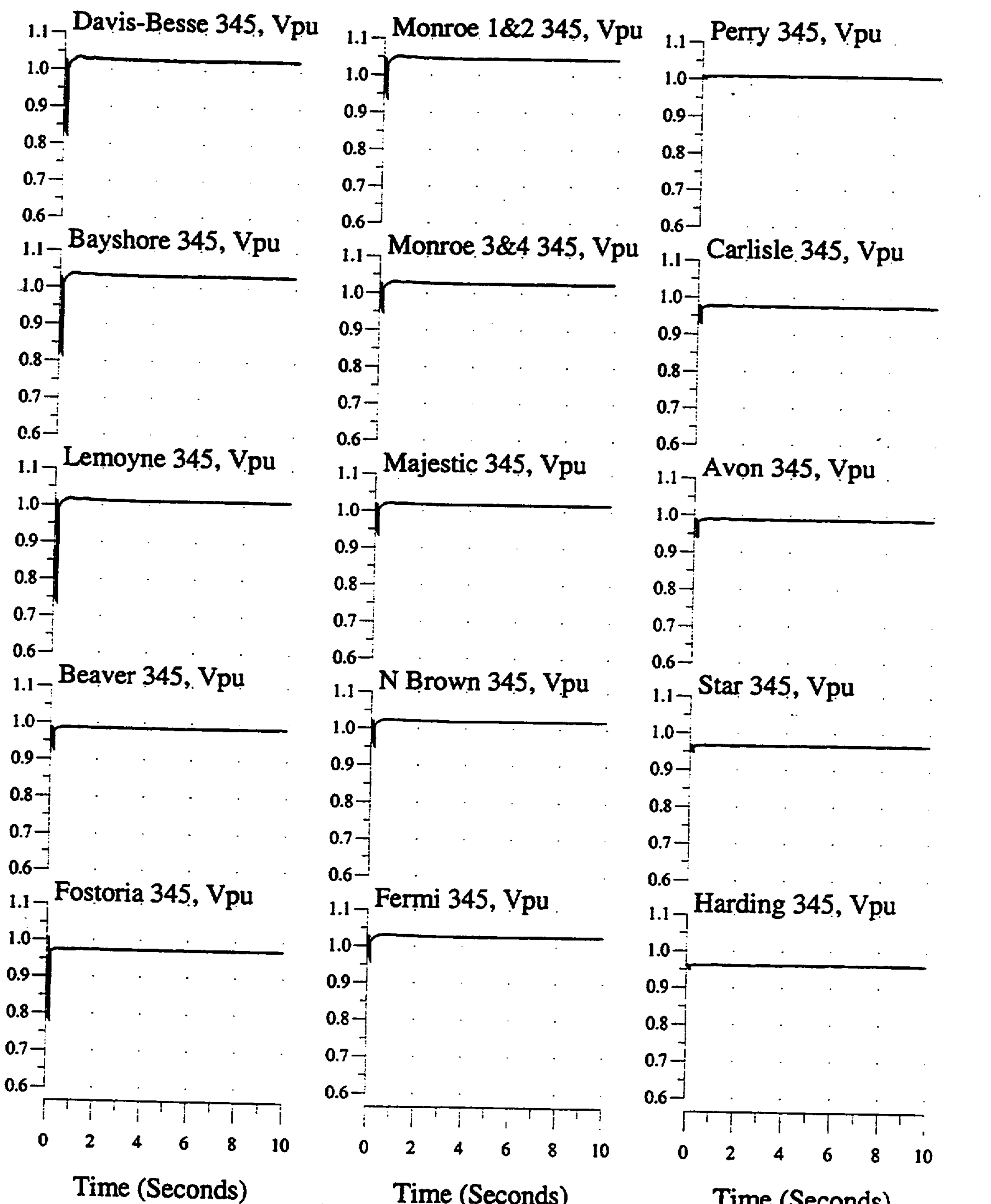
No Fault
Trip Bayshore-Monroe 345kV Line & Lemoyne-Majestic 345kV Line
STATCOM Variables: (__) With Uprate & STATCOM



1phase Fault on 2 Lines near Lemoyne 345kV Bus
Trip Bayshore-Fostoria 345kV Line & Lemoyne/Fostoria 345kV Line
Machine Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

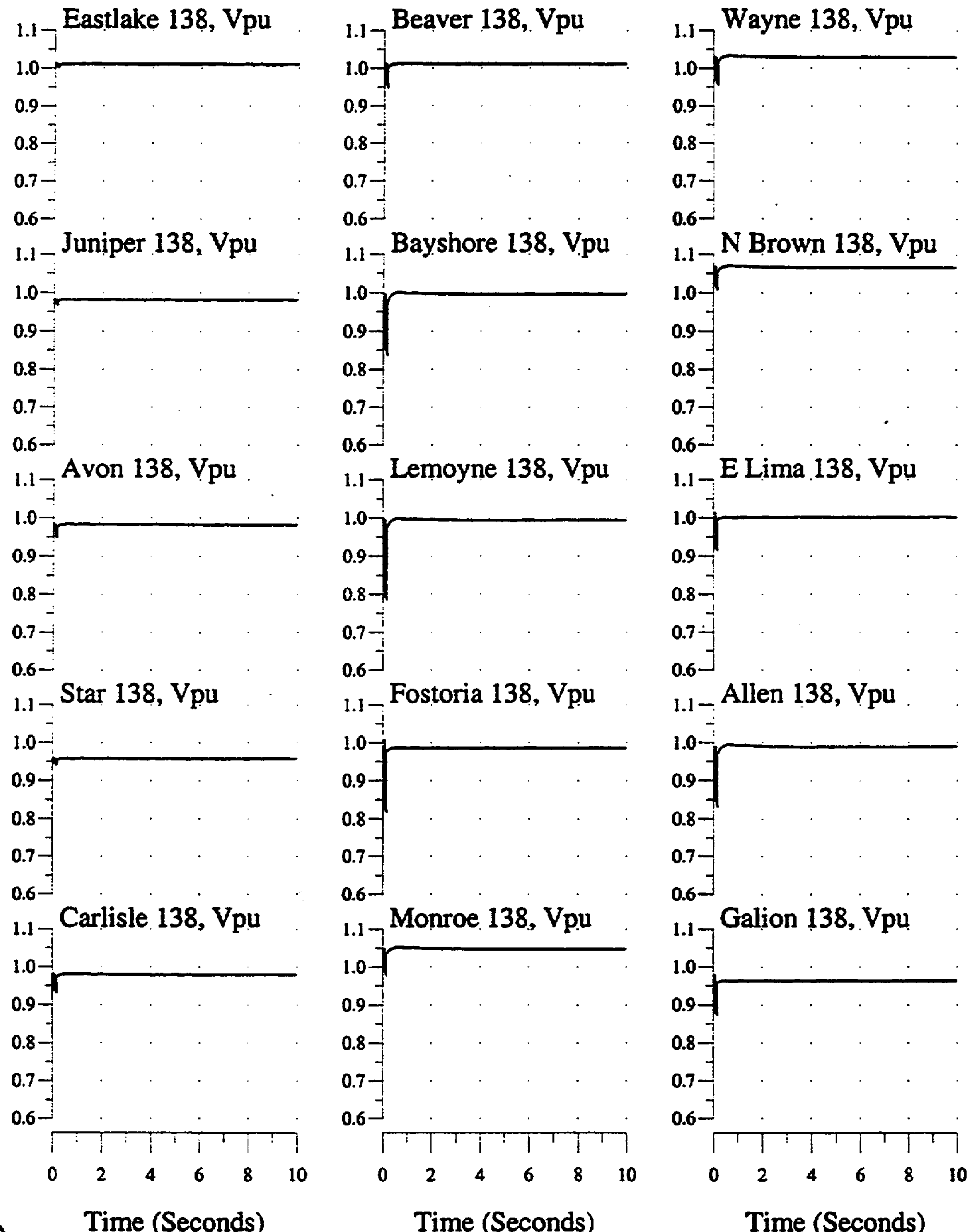


1phase Fault on 2 Lines near Lemoyne 345kV Bus
Trip Bayshore-Fostoria 345kV Line & Lemoyne/Fostoria 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate

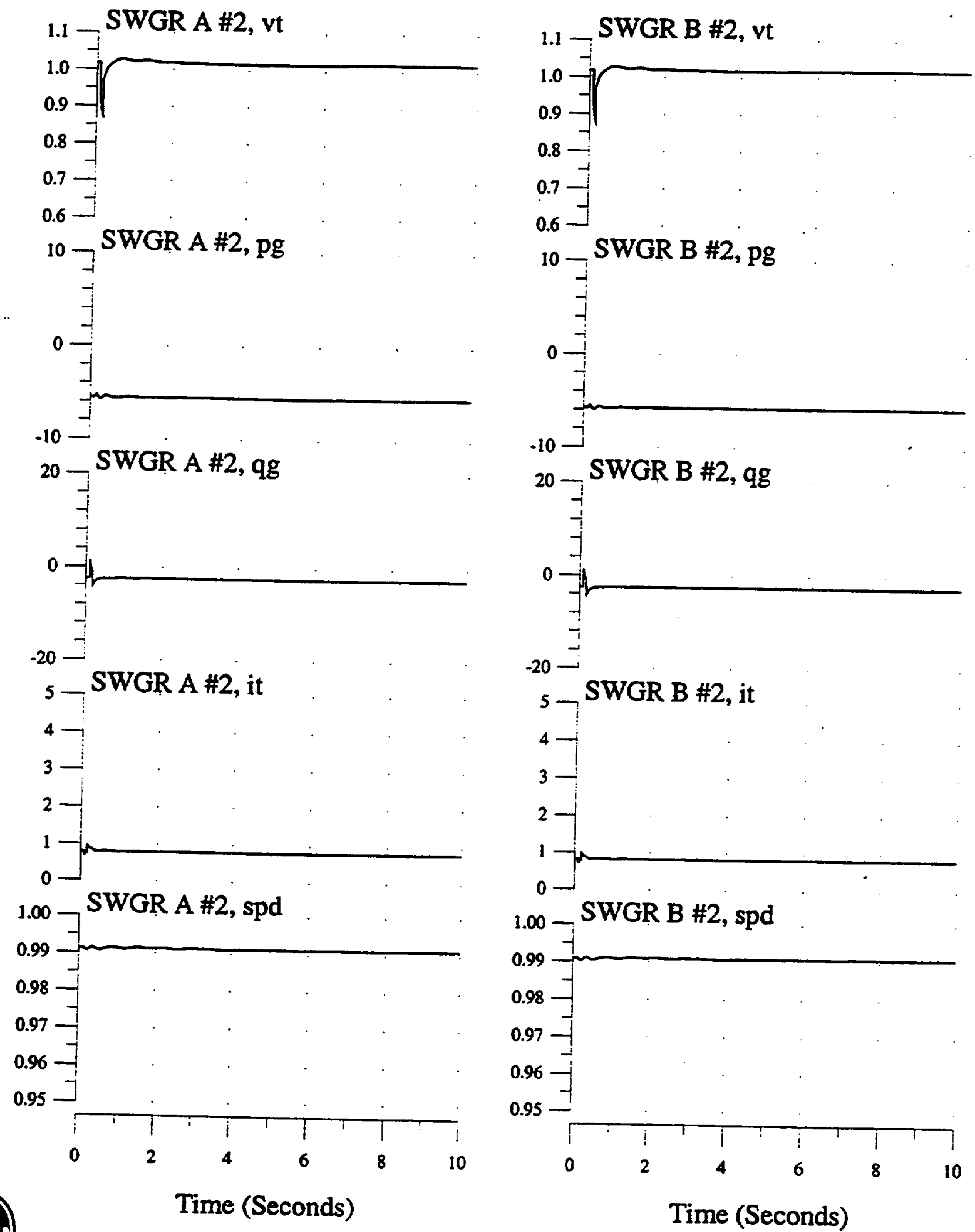


26-APR-2000 14:49:20 chanfiles/d0_99s_r2_c14.chan

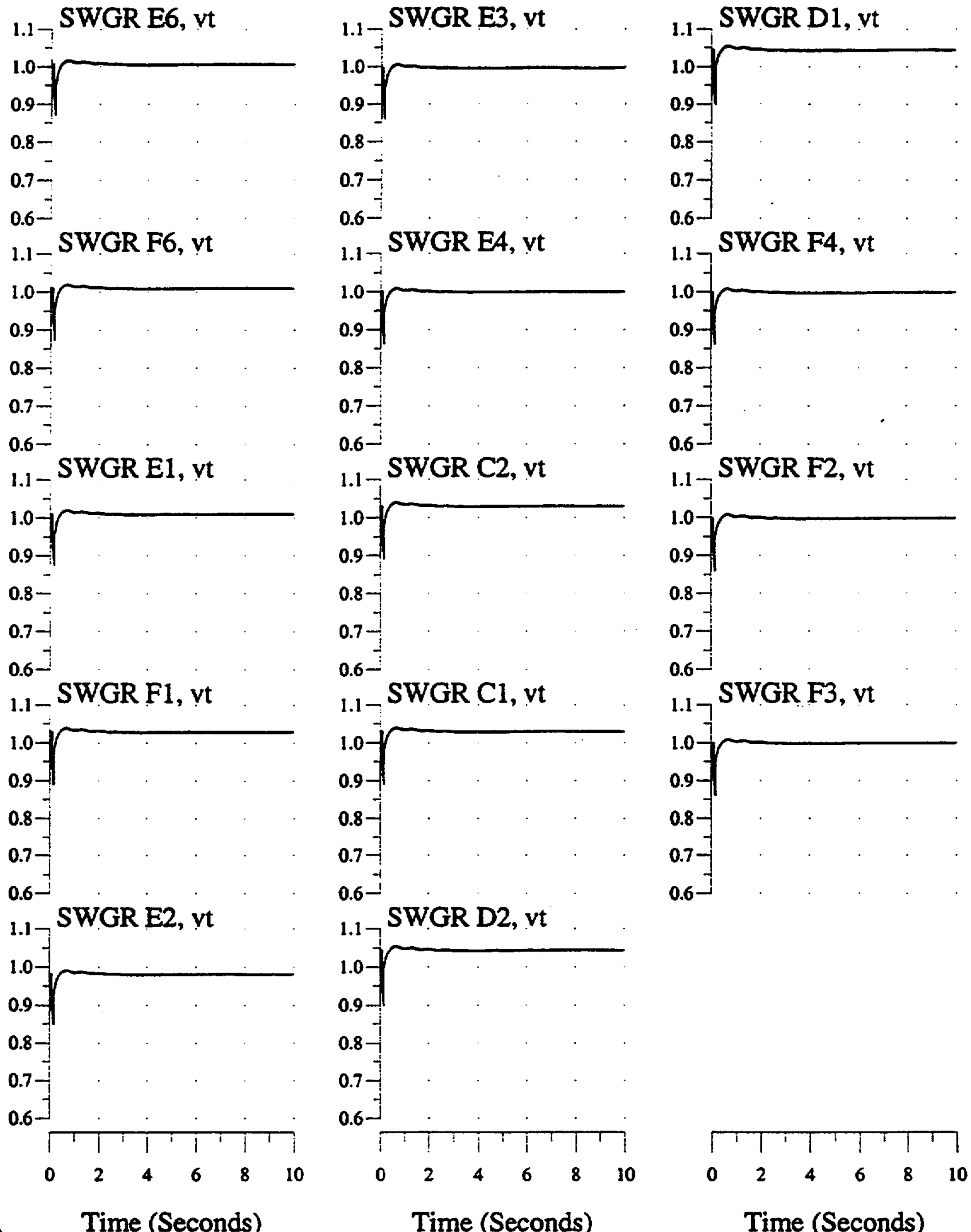
1phase Fault on 2 Lines near Lemoyne 345kV Bus
Trip Bayshore-Fostoria 345kV Line & Lemoyne/Fostoria 345kV Line
Bus Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



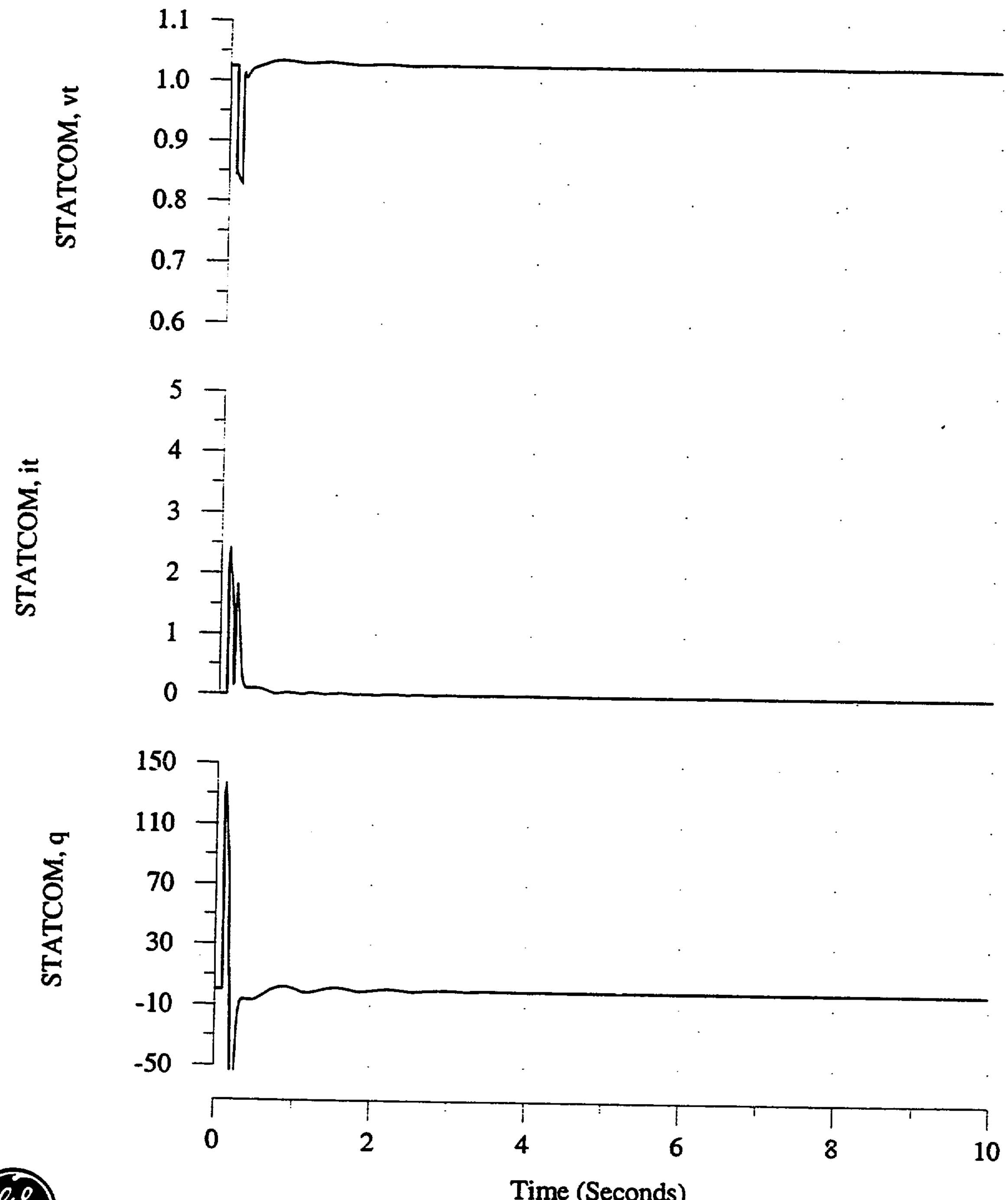
1phase Fault on 2 Lines near Lemoyne 345kV Bus
Trip Bayshore-Fostoria 345kV Line & Lemoyne/Fostoria 345kV Line
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



1phase Fault on 2 Lines near Lemoyne 345kV Bus
Trip Bayshore-Fostoria 345kV Line & Lemoyne/Fostoria 345kV Line
Motor Variables: (__) With Uprate & STATCOM, (...) With Uprate, (.-.) Without Uprate



1phase Fault on 2 Lines near Lemoyne 345kV Bus
Trip Bayshore-Fostoria 345kV Line & Lemoyne/Fostoria 345kV Line
STATCOM Variables: (__) With Uprate & STATCOM



Docket Number 50-346
License Number NPF-3
Serial Number 2759
Enclosure 3

COMMITMENT LIST

THE FOLLOWING LIST IDENTIFIES THOSE ACTIONS COMMITTED TO BY THE DAVIS-BESSE NUCLEAR POWER STATION (DBNPS) IN THIS DOCUMENT. ANY OTHER ACTIONS DISCUSSED IN THE SUBMITTAL REPRESENT INTENDED OR PLANNED ACTIONS BY THE DBNPS. THEY ARE DESCRIBED ONLY FOR INFORMATION AND ARE NOT REGULATORY COMMITMENTS. PLEASE NOTIFY THE MANAGER – REGULATORY AFFAIRS (419-321-8450) AT THE DBNPS OF ANY QUESTIONS REGARDING THIS DOCUMENT OR ANY ASSOCIATED REGULATORY COMMITMENTS.

COMMITMENTS	**DUE DATE**
1. The FIV analysis of the ABB/CE stabilizer was documented in a separate calculation. This stabilizer design was determined to not have an adequate stability margin for the power uprate conditions. Thus, these stabilizers will be replaced in the upcoming Thirteenth Refueling Outage (13RFO).	1. By the end of 13RFO.
2. The DBNPS plans to rerun the CHECWORKS model within 90 days of startup from 13RFO utilizing actual plant heat balance data. The results will be factored into future inspection/pipe replacement plans consistent with the current Corrosion/Erosion Monitoring and Analysis Program (CEMAP).	2. Within 90 days of startup from 13RFO.