SIEMENS

Release Notes for PSS®E 33.4

Introduction

PSS®E 33.4 continues the trend of increasing the performance of PSS®E, introducing new analysis tools and new Dynamic models. Performance enhancements have also been made to the Tripping Simulation contingency engine, allowing it to utilize multiple processors when available. This release also contains numerous minor enhancements and corrections as described below.

Important Installation Note

Changes have been made to the delivery of Model Source code. Please use the PSS®E Version 33.4 installer to un-install an existing PSS®E Version 33.X installation rather than Add/Remove Programs. The PSS®E Version 33.4 installer will preserve any Model Source code directories it encounters.

Program Enhancements

The following program enhancements appear in this release:

Multiple-Processor Support in Tripping Simulation Contingency Calculation

Two new APIs, ACCC_WITH_TRIP_2 and MACCC_WITH_TRIP_PARALLEL have been developed to support the use of multiple-processors during a Tripping Simulation contingency calculation. If more than 1 Contingency processor has been selected in the Program Settings dialog, the new ACCC_WITH_TRIP_2 and MACCC_WITH_TRIP_PARALLEL APIs will be invoked when running the Tripping Simulation contingency analysis. On a typical 4-core system, utilizing all available processors, performance improvements of approximately three fold have been achieved.

New Dynamic Models

Release 33.4 includes the second generation WT3 (Type 3) and WT4 (Type 4) generic wind models as proposed by the WECC Renewable Energy Task Force (REMTF). These models are:

- REGCAU1 (generator converter model) for modeling of Type 3 and 4 generic wind machines
- REECAU1 (electrical control model) for Type 3 and 4 wind machines
- REPCAU1 (plant control model) for Type 3 and 4 wind machines
- WTDTAU1 (mechanical system model) for Type 3 and 4 wind machines
- WTPTAU1 (pitch control model) for Type 3 wind machines
- WTARAU1 (aerodynamic model) for Type 3 wind machines
- WTTQAU1 (torque control model) for Type 3 wind machines.

Incremental Save Case Restoration

The networks produced and simulated for each evaluated contingency during contingency analysis, the networks simulated at each transfer level during PV analysis, and the networks simulated at each study bus voltage setpoint in QV analysis may now be saved for later evaluation. This will allow the user to reproduce the *exact* state of the network for each evaluated system state during these functions. New APIs, ACCC_WITH_DSP_3, ACCC_PARALLEL_2, PV_ENGINE_6 and

QV_ENGINE_4 support the specification of a Zip archive file in which to store these incremental Save cases. A new interface allows you to select any of these incremental cases from the set saved.

Interactive Data Checking on Data Record dialog

All Data Record dialogs now support interactive data checking.

Transformer Connection Code Symbols

Transformer connection code symbols are now displayed for all windings on two and three winding transformers on Slider diagrams.

Slider Layout Improvements

As a result of customer feedback, label positions and layout operation performance have been improved.

Support for Multiple Python Versions

For PSS®E versions 31, 32, and 33 the standard interpreter supplied for Python has been incompatible with the PSS®E GUI. As a result we have supplied a rebuilt copy of the interpreter that is installed with PSS®E. When you run the GUI, you are using this rebuilt interpreter. When you use the external interpreter, you are running the native installed version.

In most instances there will be no issues, however, some third party modules will not load in the GUI due to the same incompatibility issues.

Starting with release 33.4.0, a new command line switch has been supplied to allow you to run any of several versions of Python with PSS®E, including the native interpreter for 2.7, the version that we supply a rebuilt copy of. Through some internal conversions that we have developed, most of the original problems have been avoided. If you specify no command line switch then you will still get the rebuilt interpreter. The shortcut in the Start Menu will specify -pyver 27.

Modules supplied with PSS®E are only available for Python 2.7.

Dynamics Engine

1. Latest WECC dynamics data converter.
2. Added a Switched Shunt reference event. This is similar in operation to the Vref and Gref events that already exist in the Dynamics engine.
3. Removed a recurring transport delay message from GGOV1.

Power Flow Engine

1. Latest WECC Power Flow data converter. Added features include:
   - Conversion of Sequence data.
   - PSS®E raw file created with isolated buses status set to 4 (no need to run PSS®E activity TREE), swing bus assigned to swing bus found in PSLF data (not hard coded bus 30000).
   - Creates or uses PSLF to PSS®E mapping file. If PSLF to PSS®E mapping file is provided as input, PSS®E network elements (multi-section lines, transformer tertiary buses, switched shunts and FACTS devices) are created using dummy bus numbers from mapping file. This will ensure same bus numbers are used for same PSLF and PSS®E network elements when EPC data is converted. This mapping file is automatically created and/or updated by converter, and can be manually edited if necessary.

- Creates a PSLF and PSS®E Power Flow solution comparison report.
- Redesigned GUI to provide options to solve PSS®E case and compare Power Flow solutions.
- In addition to running it from its GUI, it can be called from any Python interpreter as: import ndppslf; ndppslf.pslf2psse(...).
- Get additional help as: import ndppslf; help(ndppslf)

2. Updated GNE sample files with latest *.MAC files.
3. Updated the subsystem engine to preserve range entries and expand ranges to actual elements upon evaluation.
4. Added an XML form of the Subsystem settings file. This will replace the existing binary form. Existing binary files will continue to be read but no longer output.
5. Provided a join block structure to specify the monitoring condition through the logical ANDing of two or more of the simple monitoring records.

GIC

1. Added a new dialog to enter/edit transformer Mvar loss scaling factors.
2. Added 'GIC' class to Python module 'pssarrays'. It runs GIC calculations and returns GIC results in Python objects. Get detailed information on how to use and return objects by getting help on gic object as: import pssarrays; help(pssarrays.GIC)

GUI

1. Improvements to bus, branch, load, machine and shunt selection fields in the area of data checking and messaging.
2. Improvements to significant digit management in Slider diagram result labels.
3. Added the ability to right-click on a Row in the network spreadsheet and launch a Network Data record dialog for the selected item.
4. Improved Annotation dialog and Command Line Input to allow use of <Shift> key to enter a <Return> instead of exiting the dialog/submitting the command.
5. Multiple files can be selected from the File Selector in the ACCC Multiple Report dialog.
6. Added functionality to detect a corrupted workspace and automatically reset to default configuration.
7. Added Reset Workspace to the Edit menu to allow resetting workspace to default configuration.
8. Added option to change the ability to select all labels that are associated with a bus, branch, or radial. The option is located under Edit->Preferences, at the bottom of the Diagram tab. Users can now determine if a label is selectable from the context menu of the label's parent item.
9. Added hotkeys for toggling label (L) and grid (G) visibility. Added hotkey for refreshing the diagram (F5). A Workspace Reset will be needed for these hotkeys to take effect.

Program Corrections

The following program errors have been detected and corrected in this release:

Power Flow

1. Changed the formatting in IMD from 6 digits to 7 digits for bus number.
2. Corrected an issue outputting transformer RAW data when CW = 3.
3. AcccBrwsGrid now supports local formatting for decimal point.
4. Corrected a compiler related issue in SUBS.
5. Corrected an issue with updating the admittance matrix during phase shift adjustment if the following conditions were met:
    a. A transformer was set to symmetric MW control.
    b. A transformer impedance correction table was assigned to the transformer.
    c. This table adjusted impedance as a function of the winding 1 tap setting rather than phase shift angle.
    d. A multiplying factor other than 1.0 was obtained from the table.
6. Corrected an issue comparing line length data in DIFF.
7. Corrected a complier related precision issue in DCCALC when RDC is small but non-zero.
8. Corrected several issues in Python extension modules.
9. Fixed an issue handling out-of-service participating machines in a dispatch block in a contingency file.
10. Fixed an issue crashing EEQV when the bus number is 999997.
11. Fixed an issue skipping non-existing branches in contingency analysis.

Dynamics

1. Corrected several issues in PSSPLT due to insufficient filename lengths.
2. Corrected an issue in DOCU with outputting Miscellaneous Other models.
3. Corrected an issue in REMOVE_CCT_MODEL where the CONs and ICONs could get out of synch after a model removal.
4. Fixed a frequency relay issue in UVUFBLU1.
5. Added additional data checking in CMLDBLU1.
6. Removed an incorrect FATAL error check from WEHGOV.
7. Removed incorrect FATAL error checks from EX2000.
8. Corrected a DOCU issue in SLNOS1.
9. Corrected a data checking error in ESST1A for CON TF.
10. Corrected a precision issue in the “pickup timer started” message in OLTC1T and OLTC3T.

Short Circuit

1. Corrected several issues reading sequence data files.

2. Fixed an issue in IECS and ASCC where the fault control file was being ignored when updating the faulted bus list.
3. Fixed an issue in treating connection code 9 sequence data when transformer tap ratios are non-unity.

GIC

1. Corrected numerous issues in reporting and processing of K factors, intertie elements, substations, transformer windings, subsystems.
2. Calculations now include transformer windings in the study subsystem as per inter-tie levels.

GUI

1. Corrected an issue with a flickering cursor in Slider diagrams on some systems running Windows 7.
2. Corrected an issue with sorting columns in the Scenario Editor.
3. Corrected several issues with Slider Legends and layout.
4. Corrected several issues with individual item annotation in Slider diagrams.
5. Corrected an issue with missing bus annotation for OPF results.
6. Corrected an issue in N-1-1 where a missing DFAX file would trigger multiple error messages.
7. 3 winding transformer data tags are generated in ascending bus order to prevent identification issues.
8. Corrected an issue with generating proper names for Dynamic load models.
9. Corrected issues with updating PU/kV labels on the Bus, Switched Shunt and Plant spreadsheets.
10. Corrected an issue with a data checking range on the Multi-Terminal Bus spreadsheet.
11. Corrected an issue where the GNE spreadsheet could not be selected in the right-click popup in the network spreadsheet.
12. Fixed an issue where changing a DC line name in the spreadsheet would not update the name in the Tree View.
13. Fixed issues on the Line and 2/3 winding transformer spreadsheets with uninitialized model names.
14. Corrected several issues with GNE item description labels.
15. Corrected an issue where the dynamic model spreadsheet wasn’t getting updated correctly when a two machine model was added.
16. Fixed several issues with selecting branch and transformer elements from the Short Circuit Annotation dialog.
17. Fixed an issue where changing the current contingency with the selection arrows would not actually update the current selected contingency.
18. Corrected an issue with the Custom Toolbar Button dialog when all elements were on the “Active” side.
19. Corrected an issue where event items could not be created from the Tree View.

20. Corrected an issue where the Zoom selection Combobox on the Toolbar would size itself incorrectly on systems running Windows 7.

Compiler Information

General Information

PSS®E 33 is built using the Intel Visual Fortran (IVF) 12.0 compiler and the Microsoft® Visual C/C++ 2010.net compiler. This is the recommended platform to use for building user-written extensions to PSS®E 33, such as Conec, Conet, and user-written dynamics models. Fortran code must be compiled with IVF 9.1 or later. Intel Parallel Studio comes with a VS2010 option, which will work with PSS®E 33 as well. When using a version of IVF other than 12.0, please be aware that the later run-time libraries must be used. The PSS®E Environment Manager, which is delivered with PSS®E 33, or downloadable from our website, can assist with maintaining environment variables associated with controlling the compiler versions in use.

Additional Notes

A compiler is not required to run PSS®E because the FORTRAN and C run-time libraries are included with PSS®E. A compiler is required only if you are compiling Conec and/or Conet, user-written dynamics models, or programs that call USRCAS.

Intel has offered a special discounted upgrade fee to Siemens PTI customers. To purchase either the upgrade or a new license of Intel Visual FORTRAN compiler under this offer, you must contact Frankie Terlecki at frank.terlecki@intel.com. Please be sure *Siemens PTI customer* is stated in the subject line.

User-Written Model Notes

Since PSS®E 31, DC line and FACTS devices are identified by 12 character devices names instead of numbers. To retain backward compatibility of old Saved Case files, device names are now set to the old device number left-justified, for example, 1 becomes “1 “. However, User-Written models of these devices that are called in Conec and/or Conet will have to be modified to map the old device number to its corresponding new internal device index. If you have any questions, please contact PSS®E support at https://siemens-energy.secure.force.com/pti.

Program Documentation

Documentation can be found in the DOCS directory of the PSS®E installation.

Important Compatibility Notes

The following items deal with issues of backwards compatibility:

- PSS®E 33 SAV files are not compatible with previous versions of PSS®E.
- PSS®E 33 SNP files are not compatible with previous versions of PSS®E.
- PSS®E 33 SLD files are not compatible with previous versions of PSS®E.

Conversely, data files are always forward compatible.

Release Notes for PSS®E 33.3

The following subsections apply specifically to PSS®E release 33.3.

Geomagnetic Induced Currents (GIC) Module

The new GIC calculation, available as a value added module, can be used to calculate and analyze the effects of a Geo-Magnetic Disturbance (GMD) on your network. The resulting network, containing the effect of the GMD on the network and the resultant GICs, can then be used to perform other forms of power system analysis, such as:

- Power flow studies to determine system voltage and reactive power margins
- Contingency analysis
- PV/QV analysis
- Dynamic analysis

The results of the analysis are displayed in extensive reporting capabilities as well as included for display and contouring on diagrams.

Other Program Enhancements

The following program enhancements appear in this release:

Multiple-Processor Support in Multi-Level Contingency Calculation

A new API, MACCC_PARALLEL, has been developed to support the use of multiple-processors during a Multi-level contingency calculation. If more than 1 Contingency processor has been selected in the Program Settings dialog, the new MACCC_PARALLEL API will be invoked when running the multi-level contingency analysis. If only 1 Contingency processor has been selected, the standard MACCCAPI_2 will be invoked. On a typical 4-core system, utilizing all available processors, performance improvements of approximately three fold have been achieved.

New Dynamic Models

Release 33.3 includes new versions of the SVSMO (SVSMO1, SVSMO2 and SVSMO3) family of dynamic models. The new SVSMO models (SVSMO1U2, SVSMO2U2, and SVSMO3U2) are fully compliant with the WECC SVSMO modeling requirements in terms of input dynamic data, and the mechanically switched (fixed) shunts with which the dynamic model coordinates.

Slider Busbar Spacing Options

In order to allow greater user flexibility and better compatibility with older diagrams, a new setting has been introduced to control the spacing requirement that is enforced between branches on busbars. This setting, found under "Diagrams->Properties...," will allow the user to suppress the application of a spacing requirement by checking the "Overwrite branch spacing on busbars," or hard code a specific spacing amount by then changing the "Spacing" value to a positive, non-zero value.

Dynamics Engine

1. Latest WECC dynamics data converter containing the SVSMO family of models.
2. Updates to ABBSVC1 model as requested by ABB.

Power Flow Engine

1. “Orphan” temporary files are now deleted upon program startup.
2. A new API, SOLVED_CA, is provided to check whether the last corrective action solution attempt reached tolerance.
3. The AC Contingency Single Run report function creates a summary table that provides the following details for each contingency:
    a. Solution status.
    b. Number of overloads and voltage limit violations at post contingency.
    c. Post tripping and post corrective action stages when the report format is one of Spreadsheet Overload Report.
    d. Non-spreadsheet Overload Report.
    e. Non-spreadsheet Corrective Action Report.
4. In the AC Contingency Multiple Run Report, the number of AC Contingency Solution Output Files that may be processed had been increased from 9 to 22. Depending on your printer, comparing more than 9 files *might* not fit on a single printed page.

GUI

1. Data record dialogs are now automatically displayed when adding new network items through the diagram if, “Use property sheet dialogs to edit Network data,” is set on the Edit>Preferences>Diagram tab. The appearance of this dialog can be suppressed by holding down the <Shift> key when adding the network element to the diagram.
2. The System Level Diagram Defaults dialog now contains separate entries for the precision of OPF and PU values displayed on diagrams.
3. Double-clicking on a Breaker/Switch component automatically switches the component.

Program Corrections

The following program errors have been detected and corrected in this release:

Power Flow

1. Improved precision of line flow contributions for borderline precision conditions.
2. Corrected the option limit for RCNL in the LMI.
3. Corrected assignments for SQCH, GENERATORS.
4. Corrected an issue in EEQV where a bus numbered 999997 in the case could cause a crash.
5. In any members of the ac contingency analysis family, a crash can occur when outaging a three-winding transformer that has two of its winding buses connected by an in-service zero impedance line.

Dynamics

1. DOCU for AC7B was reporting CON(J+16) as ‘TF’ rather than ‘TF3’.

2. DOCU for ESST4B VRMIN was referencing CON 4 instead of 5.
3. DOCU for ST7B was no handling KIA correctly. Also, in MODE 1, the KIA block was not getting initialized correctly.
4. Fixed several issues with the initialization and processing of GNEs in dynamics.
5. Fixed an issue where response files were not working from inside PSAS and PLINC.

OPF

1. Ignore switched shunts and OPF bus shunts that have a status of zero.

GUI

1. Fixed several issues with row sorting in the Scenario editor dialog.
2. Corrected an incorrect column heading on the three winding transformer terminal spreadsheet.
3. When breakers/switches or two winding transformers were inserted, sometimes the link direction is reversed from the "low->high" order and flows appear on the wrong sides.
4. Fixed an issue where contouring a diagram that contained three winding transformers where all three winding were *not* drawn could result in a crash.

PSS®E 33.2

The following subsections apply specifically to PSS®E release 33.2.

Multiple-Processor Support in N-1-1 Calculation

A new API, N11_ACCC_PARALLEL, has been developed to support the use of multiple-processors during an N-1-1 calculation. If more than 1 Contingency processor has been selected in the Program Settings dialog, the new N11_ACCC_PARALLEL API will be invoked when running N-1-1. If only 1 Contingency processor has been selected, the standard N11_ACCC_2 will be invoked. On a typical 4-core system, utilizing all available processors, performance improvements of approximately three fold have been achieved.

Enhanced OPF Solutions

The OPF solution engine has been significantly updated with the following enhancements:

- An advanced Primal-Dual Interior Point solver
- Incorporation of a new line-search algorithm for finding optimal step sizes of the primal and dual variables
- Improvements to the reduction of the barrier parameter during the course of the solution algorithm. For large-scale optimization problems, an increase in the Initial Barrier Coefficient value, on the order of 10 to 100, may additionally improve the efficiency and robustness of the OPF.

These improvements have resulted in a more robust optimal Power Flow solver that has been able to solve cases that previously did not solve, and generally attains a better solution with a fewer number of iterations than in PSS®E OPF versions prior to version 33.2.

OPF Results on Diagrams

Several OPF sensitivity results can now be displayed on diagrams:

- Bus voltage magnitude
- Bus active power injection
- Bus reactive power injection
- Fixed bus shunts, for active bus shunts processed during an OPF Minimize Adjustable Bus Shunts study
- Switched shunts
- Loads, for active loads processed during an OPF Minimize Adjustable Bus Load study

Scenarios Run from Zip files

The Scenario manager can now read and write directly to Zip files without the need to unpack the Zip file before accessing the contents. Using the Scenario manager, entire studies can be created and updated from a single Zip file and easily exchanged with others.

Additional PV Analysis Functionality

The following improvements have been made to the PV engine.

- Allow overlapping/same Source and Sink subsystems
- Low voltage check allows the use of the normal/emergency voltage limits
- ECDI-based transfer increment method that uses ECDI's unit commitment calculation
- List the violations at the Progress device when the solution is terminated due to the low voltage or excessive loading check

New Bus Voltage and Angle Correction

For small groups of buses that are added to a solved case with default voltage values (1.0 magnitude, 0.0 phase angle), their voltages are set to values that match those of the point(s) at which they are connected to the original system.

New Dynamic Models

The following models have been added:

- Synchronous generator model - GENTPJU1
- Siemens HVDC plus model - HVDCPLU1

Custom File Suffix Support

A new dialog found under Tools>Change File Type Properties allows the creation of additional file suffixes recognized by all GUI elements that deal with files. For example, a new suffix, *.cnv, can be defined to represent all converted cases. When selecting for cases, all files with the predefined suffix *.sav will be presented as well as the user defined *.cnv suffix.

Temporary File Creation

The processing of the PSS®E temporary files has been improved. This will resolve the issue some users experience when they hit a hard limit of 999 predefined temporary files.

In addition:

- The name extensions are different; instead of 001-999 they are 0-FFFF (hex numbers).
- The files are now in a subdirectory named "PTI". This makes it simpler to clean up (erase the whole directory).
- The location of the temp directory no longer uses the value from the INI file
- The files should no longer be subject to race conditions
- Additionally there is a new API, deltmpfiles(), that will erase the files in the temp\PTI directory.

Dynamics Engine

1. Increased the number of CONs, VARs and ICONs at all size levels above 12,000 buses.
2. Voltage limits are now honored in contingency analysis functions.
3. All channel definitions can now be deleted using the DELETE_ALL_PLOT_CHANNELS API available under Dynamics>Delete all output channels.

Power Flow Engine

1. Added support for Y4 type Generic network Elements (GNEs)
2. Improved GNE model selection and editing dialog.
3. Area, Owner and Zone data is now included in *.acc files.
4. Global commands are used to include all branches in a subsystem; for a three-winding transformer to be included, all its three winding buses must be connected to subsystem buses. A keyword is provided to enable the global commands to include a three-winding transformer regardless of the connection of its low voltage winding bus to a subsystem bus.
5. Added a new check for transformer loss data inconsistencies in BRCH.
6. Parallel APIs now support the selection of up to 24 processors, increased from the previous limit of 15.
7. Updated WECC PSLF to PSS®E data converters to correct all issues identified to date.
8. A new command is provided in the monitored element data file to monitor buses for voltage limit violations.

GUI

1. Three-winding transformer flows are now displayed in diagrams displaying contingency results.
2. Preserve all control settings on SCAL dialogs between uses of the program.
3. Breaker and Switch colors can be specified by selecting Diagram>System level diagram defaults.
4. Better defaults for Contour ranges and settings are preserved between invocations of the Contour dialog.
5. The OPF solution dialog is now mode-less, allowing access to progress and reporting windows without having to dismiss the dialog.
6. Optimized the auto-layout functions to reduce the number of refreshes when drawing the diagram.
7. Typing the first few characters of a contingency label and then hitting <Enter> in a Contingency list combo box will jump to the first matching contingency in the list.
8. Global default values are now maintained for all diagram elements.
9. Only check elements on Move Network Elements dialog upon pressing <Apply>.

Program Corrections

The following program errors have been detected and corrected in this release:

Power Flow

1. Fixed an issue where calculating sensitivities on three-winding transformers would cause a crash.
2. Fixed a compiler related issue in EEQV and RDEQ that could cause a crash.
3. Fixed an issue in the LMI with processing the switched shunt option for the Newton parameters.

4. Fixed an issue with the incorrect return of area data when queried from the LMI.
5. Export to Excel" Python utility updated to determine PSS®E installation location.
6. Fixed an issue with checking data on two and three winding transformers. Vector groups would always generate an error.
7. Fixed an issue with calling ECDI from an automation file in APIOPT modes 2 or 3 when a fatal error was encountered.
8. Fixed an issue in the ANSI fault calculations where incorrect zero sequence Thevenin impedances were calculated for faults at buses in ungrounded zero sequence islands.
9. Fixed an issue with incorrect reporting of Voltage Factors in Short Circuit reports.
10. Fixed an issue in contingency analysis where a contingency with the outage of one winding of a three-winding transformer may be ignored if a contingency consisting of the outage of the three winding transformer has been processed.
11. Fixed an issue in the parallel AC contingency analysis API where an AC contingency analysis may crash when the Fixed Slope Decoupled Newton-Raphson (FDNS) solution engine is selected.
12. Fixed an issue in Corrective actions where the working case is not updated correctly with the load curtailments specified by corrective action solution after the solution terminates successfully.
13. Fixed an issue in substation reliability assessment where a secondary contingency may be ignored if its primary contingency causes 100% loss of load at post-fault stage.
14. Fixed an issue in the single AC run report that occurred when the non-spreadsheet corrective actions report is selected, the rating set printed in the headings is not the one used in the AC contingency analysis.

Dynamics

1. Fixed an issue with the SWSHNT dynamics model and data checking. Missing check for CON 4 and included a check for non-existent CON 7.
2. In the rate of frequency load relay model (DLSHBL), the rate of change of frequency (df/dt) had to be entered as a negative value. Entering a positive value for df/dt would cause mis-operation of the relay.

GUI

1. Fixed a crash that would occur when inserting a breaker or branch in a diagram with the perpendicular line option enabled.
2. Fixed several issues involved with growing all buses in a diagram.
3. Refresh the active spreadsheet after a Generation Dispatch.
4. When doing a READ,OPT, create Area, Owner and Zone subsystems based on existing elements in the network.

PSS®E 33.1.1

The following subsections apply specifically to PSS®E release 33.1.1.

Program Enhancements

The following program enhancements appear in this release:

- Added GENCUR and RBRMVA inputs for GMB models.
- Several updates to CMLDBLU1 model to in response to MV&WG.
- Updated exciter limit calculation (removed iteration with closedform calculation) for AC7B, AC8B, ESAC3A and EXAC2 models.
- Updated Short Circuit Total Report to consider Short Circuit Coordinate settings (polar/rectangular).
- Updated Short Circuit Thevenin Z reporting to consider Short Circuit Coordinate settings (polar/rectangular).
- Updated WECC PSLF to PSS®E dynamics data converter to correct all issues identified to date.
- Added Alpha blending for imported Slider background images.
- Improved the placement of floaters on diagram items.
- Improved behavior when importing background images into Slider diagrams.
- Improved the system response when zooming and panning over Slider diagrams that contain background images.
- In the Scenario Manager, when no active group exists, tracked files are added to a default group that then becomes the active group.
- PU values for buses on Slider diagrams now honor the load flow precision setting.
- Removed the Image Selectability option from the Image properties dialog.
- When double-clicking on a model name in an Output window to edit model data, reselect the select model name when the dialog is dismissed.
- Program Corrections
- The following program errors have been detected and corrected in this release:
- Fixed an issue with displaying ACCC and REL results for three winding transformers.
- Fixed an issue with the BUSFRQ model and ICON allocations.
- Fixed an issue with some PV functions recording extraneous subsystem function calls.
- SET_GENANG and SET_SENANG_2 input angle must be > 0.
- Fixed an issue where a type 1 bus could be assigned as an island swing during ACCC calculations.
- Fixed several issues in network equivalencing due to compiler bugs.
- Fixed an issue with the handling of character arrays in the LMI for two and three winding transformer elements.

- Fixed an issue in the RAW file converters with translating DC devices with device names into RAW versions that don't support DC device names.
- Fixed several Python issues
  - Argument parsing for accc_parallel()
  - Error returns from nxtbrn(), nxtbrn3(), nxttie() and nxttie3().
  - Number of records returned by afxshuntint()
- Fixed an issue where sometimes GEOL would not detect that a machine's loading was outside of the assumed capability curve.
- Fixed an issue where automating the creation of a bus subsystem could result in the creation of an invalid subsystem with *all* buses selected.
- Fixed a KE data check in the REXSYS model.
- Fixed an issue coordinating application and system paths.
- Fixed an issue in ASTR where the second set of STATES was not being processed.
- Fixed an issue where frequency and probability of load curtailment at buses are incorrect due to the floating point truncation errors in Substation Reliability Analysis.
- Fixed an issue where induction machine contributions were not included in total island load.
- Fixed an issue with modifying OPF branch flow data in the OPF subsystem spreadsheet.
- Fixed an issue with the Context menu being displayed correctly in the Scenario Manager dialog.
- Fixed an issue on OPF subsystem spreadsheets that could cause an error when saving data.
- Updated excelpy module to consider regional number format.
- Fixed an issue in Slider diagrams displaying and updating switched shunt statuses.
- Fixed an issue in the Configuration File Builder dialog when creating subsystem files (too many JOIN constructs were being created).
- Fixed an issue with default value tests in several dialogs and APIs.
- Fixed an issue with the Calculate Line Fault Disturbance dialog.
- Fixed an issue with the GNE edit dialog.
- Fixed an issue with a combo box on the SPCB dialog.
- Fixed several issues related to bus nodes that appear on the right side of a GOUT/GEXM display.
- Fixed an issue when reading a bus location file when the system uses a "," as the decimal point character.
- Fixed several issues involving automatic creation of perpendicular line segments on Slider diagram items.
- Fixed an issue with Line Mode activity CHNG finding out-of-service fixed shunts.

- Fixed an issue with Line Mode activity RESQ recognizing prior version sequence data files.
- Fixed an issue with Line Mode activity CHNG incorrectly altering transformer name and vector group name.

Important Configuration Notes

A new feature introduced in v33.1 is support for multiple processors in basic contingency analysis. On a typical 4-core system, utilizing all available processors, performance improvements of up to 300% are possible. To achieve this, the engine of PSS®E is compiled to recognize the presence of multiple processors. This recompilation of the PSS®E engine forces a recompilation of any user models that are used with the engine.

To avoid any inconvenience this might present to Dynamics users of the program, v33.1 ships with two PSS®E configurations. The first, regular "PSS®E 33", contains the complete PSS®E engine, minus the multiple processor support. This configuration presents the full functionality of PSS®E. The second configuration, "PSS®E 33 with Parallel ACCC", supports multiple processors in basic ACC calculations but disables support for Dynamic Simulation activities. This is done to avoid the use of the second configuration with Dynamic user models that have *not* been recompiled against the new PSS®E engine. All existing scripts and automation files that reference Psse33.exe will continue to work. New scripts that take advantage of the multiple processor support in the second configuration will need to reference Psseomp33.exe.

The need for two PSS®E configurations will be removed at the next major release.

PSS®E 33.1

The following subsections apply specifically to PSS®E release 33.1.

Multiple-Processor Support in Basic ACCC Calculation

A new API, ACCC_PARALLEL, has been developed to support the use of multiple-processors during a basic ACCC calculation. If more than 1 Contingency processor has been selected in the Program Settings dialog, as shown below, the new ACCC_PARALLEL will be invoked when running ACCC. If only 1 Contingency processor has been selected, the standard ACCC_WITH_DSP_2 API will be invoked. On a typical 4-core system, utilizing all available processors, performance improvements of 300%+ have been achieved.

Interactive Data Checking

Data warnings/error can now be visualized directly on the spreadsheets and model edit dialogs. The feature is enabled/disabled on the "General" tab of the Edit>Preferences dialog. Interactive data checking is currently *not* supported in Network Data Record dialogs.

Power Flow and Sequence Data Checking Report

Two new APIs, CHECK_POWERFLOW_DATA and CHECK_SEQUENCE_DATA, can be used to create a tabular report of the checks performed on the Power Flow and Sequence data by the interactive data checking function. The dialog can be found under Power Flow>Check Data>Data checking report.

Model Edits Directly from Output Windows

Double-clicking on a model name in any of the Output windows will bring you to instantly to the model edit dialog for that model.

Copy/Paste of Models on the Dynamics Spreadsheet

Models, and all their associated data, may now be copied from one network element to another on a Dynamics spreadsheet through the use of Copy/Paste.

Short Circuit Modeling of MOV Protected Series Capacitors

Modeling of MOV protected series capacitors has been added to Short Circuit calculations performed using activities SCMU, ASCC and IECS.

Interruptible Loads

Loads can be set as “interruptible” for participation in load scaling, corrective actions and other contingency analysis functions.

Voltage Limit Checking Report

A new API, CHECKVOLTAGELIMITS, similar to VCHK, will check bus voltage limits. Checks are performed against the normal and emergency limits specified on the bus data record. The dialog can be found under Power Flow>Reports>Limit checking reports.

New Auto-Draw Algorithms

New Diagram layout techniques allows for a better automatically generated diagram layout. Automatic update and label placement on Diagram components has been improved to allow greater control over Diagram layout and modification.

Output Bar Improvements

Report tabs are now automatically named with the API that was used to generate the report. In addition, the Report tab names are now editable for better identification. The font size used in the Output Bar is selectable through the “General” tab of the Edit>Preferences dialog.

Dynamic Model Additions

Two new models have been introduced

- HYGOVRU – A Hydro-governor model
- TSTGOV1 – A frequency playback model. This model is used to measure machine response against a measured frequency input as gathered from field measurements or defined frequency inputs as found in a Grid Code.

Windows 7 Compatibility

V33.1 has been tested extensively on Windows 7 and is certified as Windows 7 compatible.

Program Enhancements

The following program enhancements appear in this release:

- The maximum number of allowable tie lines in the OPF Area Interchange constraint has been increased to NAREAS*100.
- Added a new OPF Linear Dependency Constraint report.
- Updates to Environment Manager to better handle Python and compiler issues.
- Updates to PSLF->PSSE converters to address latest WECC conversion issues.
- Dynamic Simulations can be precluded if errors are encountered during STRT.
- The scheduled voltage and remote bus plant quantities are now editable from the Machine Data Record Power Flow tab.

- Added Induction Machine Data Record dialog.
- The IECS and ASCC dialogs are now non-modal, allowing interaction with other interface elements while the dialogs are active.
- Allow specification of arguments in automation files in Scenarios.
- The display and update of ACC results on Diagrams has been updated to harmonize with the other results presentations.
- Sensitivity dialog control values are now preserved.
- <Ins> and <Del> keys may now be used to add/remove models from the Dynamics spreadsheet.
- Model fields in the Dynamics spreadsheet can now be selected anywhere without entering “edit” mode.
- Models, as well as their data, may be copied and pasted in the Dynamics spreadsheet.
- Added a VERSION command to the beginning of the PSAS and PSEB response file.
- Added GUI support for accessing “Machine Other” type models in the Dynamics spreadsheet.
- The PSSPLT relay file now recognizes the loss of excitation relay model LOEXRIT.

Program Corrections

The following program errors have been detected and corrected in this release:

- The OPF Output Report now correctly displays Area and Zone Numbers within all summaries.
- Fixed an issue in PSAS clearing bus faults.
- Fixed an issue on the Machine Data Record Short Circuit tab with the “Grounding Z Units” combo box.
- Fixed an issue with subsystem specification on the SCOP dialog.
- Initialize *all* available subsystems during network initializations.
- Fixed an issue with “Save As” and “Save As Zip” buttons not being disabled when in zip mode in the Scenario Editor dialog.
- Diagram Transformer symbol could display the “tapped” arrow on the wrong side.
- Fixed a diagram issue with Switched Shunt flow and impedance results.
- Fixed a diagram issue with FACTS Device dynamic results.
- Fixed a diagram issue with Buses if Pu, kV and voltage results were selected.
- Fixed an issue with displaying both load characteristic and relay models in the Tree View.
- Fixed an issue with growing a bus multiple levels.
- Fixed an issue with displaying the table of contents in the online help dialog.
- Fixed an issue with the Custom toolbar.
- Fixed an issue with some diagram floaters having the “Unbound” color.

- Fixed an issue with default bus height and spacing values on systems using a character other than a period, ".", to indicate decimal points.
- Fixed an issue with decimal point representation on some dialogs.
- Fixed an issue with deleting elements from the Machine, Load and Fixed Shunt spreadsheets.
- Fixed an issue with the enabling/disabling of the auto-adjust column in two and three winding transformer spreadsheets.
- Fixed an issue with allowing editing of a model still in the process of creation.
- Fixed issues with displaying the correct CON, ICON and VAR names for GMB and GNE models.
- Fixed a number of issues with Scenarios and the Scenario Editor dialog.
- Fixed issues with accessing OPF data with User Case.
- Fixed an issue with uninitialized bus voltage limits when adding a new bus through LTAP.
- Fixed an issue in imposing the CURHVRCR limit in WT4G1 and WT4G2 models.
- Fixed an issue in the WT4E1 and WT4E2 models where the input to the active power control was not being set equal to ETERM.

PSS®E 33.0.1

The following subsections apply specifically to PSS®E release 33.0.1.

Program Enhancements

The following program enhancements appear in this release:

- Updated Breaker templates for PSS®E-33.
- Updated the application and clearing of bus faults in PSAS to use defined APIs.
- Updated both PSLF to PSS®E converters to support the latest WECC modeling requirements.
- Added two optical shield wires and British aaac conductors to the LineProp datatbase.
- Handle larger numbers in short circuit reporting so that fields are not filled with asterisks.

Program Corrections

The following program errors have been detected and corrected in this release:

- Fixed an issue with the Y Matrix and the tap and/or phase shift adjustment in PV analysis.
- Fixed an issue reading character data for the CHSVCT model
- Fixed an N-1-1 issue when dispatch mode is enabled and there are automatic commands in secondary contingency lists.
- Fixed several issues with the Aspen to PSS®E converter.

- Fixed an issue of reporting incorrect new values of magnetizing admittance (when CM = 2) and transformer impedance (when CZ = 3) when inconsistent input values are specified.
- Fixed an issue when reading ECDI files when PMAX and the final P value in the table are equal.
- Fixed an issue with writing to the Short Circuit results file when size of the file exceeds the physical file size limit.
- Fixed an issue for PQ and I type GNEs in dynamics. Was losing the reactive component of the current injection
- Fixed an issue with opening automation files from a Scenario.
- Fixed several issues with error checking and item update/refresh in the Scenario editor.
- Fixed an issue in TREE in the setting of the three-winding transformer to out-of-service when only one winding should have been outaged.
- Fixed an issue where conductors in the LineProp database display too many decimal places.
- Fixed an issue with the maximum number of characters for a channel identifier in the GUI.
- Fixed an issue on the Breaker and Multi-section line spreadsheets when creating new elements with blank Ids (“ “).
- Fixed an issue in the configuration file builder with the KVRANGE not being output if it was the only subsystem item selected.
- Fixed several issues on the N-1-1 dialog with controls not being initialized correctly.
- Fixed several issues on the PV and QV analysis dialogs with controls not being initialized correctly.
- Fixed an issue on the diagram with displaying circuit Ids or device names.
- Fixed an issue with a crash while importing some pre-v33 diagram files.
- Fixed an issue with refreshing diagrams after a configuration file was read.
- Fixed an issue with a ReportNode being converted to a Summation item during a diagram conversion or a Clean Diagram operation.
- Fixed an issue with animated flows on DC and VSC DC lines.
- Fixed an issue with auto-saving information on Windows 7 machine which caused a crash ~5 minutes after leaving the program idle.

PSS®E 33.0

Native Induction Machine Model

A native induction machine model is now in use throughout the PSS®E engine. In the RAW file the induction machine data now appears at the end of the file.

All CONEC and CONET models have been “Table-ized”

Provision has been made to call every PSS®E dynamic model from within PSS®E without the need for an explicit call statement in the connection routines (CONEC and CONET). As a consequence

of this change, none of the PSS®E supplied library of models would require any compilation or linking of the connection routines. A new family of models, called CCT models, have been introduced to replace the old CONEC and CONET type models. By using the new CCT models, in place of the old CONEC-CONET type models, users will be able to preclude user models from being called in the CONEC and CONET subroutines and thereby avoid compilation and linking of these routines.

User-written CONEC and/or CONET type models (i.e., those that generate model calls in CONEC and CONET subroutines) can be redesigned to the new CCT type model format. One of the key advantages of converting to the CCT type would be that the CONEC and CONET files would not be needed, and more importantly, the model themselves need to be compiled only once for a given release of PSS®E.

The use of CONEC and CONET files is still supported if you choose to run that way.

New Forms of Power Flow Analysis

Several new forms of analysis have been introduced.

Preventive Security Constrained OPF

System security is the ability of a system to withstand contingencies, in other words, to remain intact even after equipment outages or failures. The Security Constrained Optimal Power Flow (SCOPF) can be used to perform a secure control to ensure the system security. It is a special class of OPF problems which takes into consideration the system constraints of predefined contingencies. The preventive method enables the system to be prepared for certain contingencies beforehand, and it does not take into account the system's post-contingency control capabilities.

Sensitivity Analysis

Sensitivity analysis is a method to systematically study the impacts of changes in system operation conditions such as MW and MVar power injections on changes in branch flows and bus voltages. The function can calculate sensitivity factors with either a DC linear network or full AC network and can be used in the following applications:

- Mitigate System Operating Limit (SOL) violations
- Determine loading contribution
- Increase transfer capability
- Develop cost allocation

N-1-1 Contingency Solution

The N-1-1 contingency solution performs an AC power flow to solve the primary contingency, applies the appropriate system adjustments in accordance with one of three adjustment modes, and then runs another AC power flow to solve the secondary contingency. The three control modes are: Local control mode, Corrective action mode and Preventive Security constrained optimal power flow (PSCOPF) mode. Under each mode, several types of controls are available to adjust system to meet the specified goals.

Interruptible Loads

Each load may be characterized as either interruptible or non-interruptible. This attribute will be utilized in a future PSS®E release.

Short Circuit Analysis Enhancements

The Sequence Data File format has been redesigned to allow greater flexibility as well as a more convenient transfer of sequence data from its engineering sources into PSS®E.

The fault analysis positive sequence machine data includes provision for specifying subtransient, transient, and synchronous reactances. The various fault analysis calculation activities, as well as the generator conversion activity CONG, allow selection of the reactance to be used.

Additional modeling options are available in activity FLAT.

Load sequence data is now entered for individual loads rather than as the total load on a bus.

ANSI Calculations for Circuit Breakers tested on Symmetrical Current basis. Existing calculations are tested on Total Current basis.

Aspen to PSS®E Converter

PSS®E can now convert Aspen One-Liner data files into PSS®E formats for use in PSS®E. Look for this in the PSS®E program menu under Utilities>Data Converters.

Normal and Emergency Voltage Limits with each Bus

They may also be used to seed the OPF bus voltage limit values, either individually or on a subsystem basis. Additional uses of these limits will be implemented in a future PSS®E release.

Data Changing APIs

For each of the power flow data entry and data changing API routines (e.g.,BRANCH_DATA), a new data changing API routine (e.g., BRANCH_CHNG) is supplied. The "_CHNG" API routines can only modify data for an element that already exists in the case. Specifically, they cannot add a new element to the case.

Increases in Maximum Number of Network Elements

There is a factor of 10 increase in the maximum number of zero impedance lines allowed at all size levels. For example, at 50,000 buses, the maximum number of zero impedance lines is increased from 2,500 to 25,000.

There is a modest increase in the maximum number of two-terminal dc lines allowed at size levels of 4,000 buses and above. At 50,000 buses and above, the maximum number of two-terminal dc lines is increased from 50 to 100.

New Solution Parameter, MXTPSS

MXTPSS may be used to overcome the oscillations that can occur in the automatic adjustments of tap ratio and switched shunt settings during power flow solutions. Once tap and/or switched shunts have been adjusted MXTPSS times during a solution, further adjustments are suppressed.

Transformer Vector Groups

An alphanumeric vector group may be associated with each two- and three-winding transformer. For two and three winding transformers, vector groups and zero sequence connection codes can now be selected from a dialog.

New Commands in Linear Network Analysis Data Files

In the Subsystem Description Data File

- A SKIP command to skip a single bus or a group of buses has been provided.

In the Monitored Element Data File, two commands have been provided:

- A SKIP command to exclude individual branches form the monitored element list generated as a result of subsequent automatic specification commands.
- A command to place branches that are assigned to a line owner into the monitored element list.

In Contingency Description Data File, two commands have been added:

- The ADD and REMOVE commands allow the status change of an individual induction machine.
- Branches that are assigned to a line owner can be outaged, either singly or in pairs.
- The ADD and REMOVE commands allow the status change of an individual induction machine.

Contingency Analysis Solution Enhancements

- The length of the Contingency Label has been increased to 128 characters. Only the first 32 characters will appear in the standard PSS®E reports, but all characters are exportable to Excel and available to extraction and manipulation using the PSS®E results retrieval APIs for Contingency Analysis Output File, PV and QV Analysis Output File. ACCCBrowser can display all characters of a contingency label too.
- The length of the labels in Subsystem Description Data File and Monitored Element Data File has been increased from 12 to 32.
- The size limit on Contingency Analysis Output Files has been removed; previously the limit is 2GB.
- The Contingency Analysis Output Files from both AC Contingency Solution and Multiple Level Contingency Solution can be processed by Reliability Assessment function. In PSS®E 32 and early, only the output files from Multiple Level Contingency Solution can be used by Reliability Assessment function.

Enhanced Scenario Manager

The Scenario Manager has been enhanced and fully integrated into the PSS®E interface. Existing restrictions on the number and type of files tracked have been lifted. The load order of files in the scenario are now highly configurable. Files are now tracked by an embedded scenario engine and may be added to the scenario at any time. File selection has been simplified to allow selection of existing files from the scenario as well integrated into all dialogs that allow file selection.

Adding files to a scenario can be done through drag/drop operations as well as embedded hot keys and context menus.

The extraction of files from a zipped scenario is now highly customizable through the use of program preferences and defaults.

New Dynamics Models

The following models are added to the PSS®E simulation model library:

- ABBSVC1 – ABB SVC model (attached to switched shunt device in PSS®E power flow)
- WT4G2– Generic wind turbine model representing a generator connected to the grid via a power converter (Type – 4 wind machine)
- WT4E2 – Generic electrical control model for Type 4 wind machine
- VFT1 – GE variable frequency transformer

All the models can be used in the standard state-space simulations only.

A new model type called the "induction machine model" has been added to allow dynamic models to be created for those machines that are designated as induction machines in PSS®E power flow. Although currently, in version 33, there are no PSS®E standard induction machine models that can be attached to the induction machines in power flow, PSS®E users can write user-written induction machine models that key off the induction machines in power flow.

The following models have been converted from the old CONEC-CONET form into a new table-driven form (i.e., where the model calls are not generated in CONEC and CONET subroutines).

Old Model Name	New Model Name
DCTC1	DCTC1T
LOEXR1	LOEXR1T
VTGDCA	VTGDCAT
VTGTPA	VTGTPAT
FRQDCA	FRQDCAT
FRQTPA	FRQTPAT
SWCAP	SWCAPT
SAT2	SAT2T
OLTC1	OLTC1T
OLPS1	OLPS1T
OLTC3	OLTC3T
OLPS3	OLPS3T
CRANI	CRANIT
RUNBK	RUNBKT
CHIGAT	CHIGATT
CEELRI	CEELRIT
CMDWAS	CMDWAST
CMDWS2	CMDWS2T
CMFORD	CMFORDT

New Dynamic Features

The maximum number of dynamic simulation user-written model definitions has been increased to 500 at all size levels.

The bus voltage recovery and voltage dip violations checks during dynamic simulation fault recovery can now be performed on a bus subsystem basis.

An option to perform a generator angle scan for machines above a specified MVA size has now been added.

The PSS®E plot package can now read the COMTRADE format files and plot the data values using the plotting tool in PSS®E.

Report Loss of Load

The AC Contingency Single Run Report function has been expanded to report load losses due to a contingency event or tripping action for checking Interconnection Reliability Operating Limits (IROL).

Additional GUI Changes

The look and feel of the PSS®E GUI has been updated. Using a selection under the Windows menu for “Tabbed window”, the interface can be configured for easy viewing and selection of all open windows.

The Tree View can also be configured to operate as a Slide in/out panel, allowing quick access to elements but then quickly clearing to present as much of your data as possible.

GUI windows are now easily configurable using location tools found in other applications.

Global Settings and Preferences

All options found in the Edit>Preferences dialog can now be imported/exported from/to external XML configuration files. This allows a user to take many of their program settings to another machine and configure PSS®E to operate in the manner they’re used to.

In addition, many of the global diagram annotation settings have been removed from the Diagram files and moved to the Application level. These annotation settings are saved in the configuration file as well, so that different annotation settings may be used for different studies/regions.

Updated Environment Manager

The PSS®E Environment Manager can now be used for:

- Compiling and linking user models to create User Model DLLs (.dll)
- Compiling and linking user models to create User Model static libraries (.lib)
- Setting the Windows Environment to enable compile/link of user models

Documentation

Changes in documentation content include the following:

Program Operation Manual

Documentation for the following is provided in Chapter 5 - *Power Flow Data Entry, Modification, and Display Activities*:

- Induction Machine Data
- Machine Electrical Data
- Auto Transformer Equivalent Circuit
- Two Winding Transformer Zero Sequence Network Diagrams and Connection Codes

- Three Winding Transformer Zero Sequence Network Diagrams and Connection Codes
- Outage "Stalled" and "Tripped" Induction Machines

Additionally data items have been updated for Sequence Data File, Zero Sequence Transformer Data, Listing Sequence Data, Three-Winding Transformer Data.

Model Library

The following chapters have been added to the Model Library:

Chapter 23 - Branch Device Models

Chapter 24 - Machine and Wind Protection

Chapter 25 - Two-winding Device Transformer Models

Chapter 26 - Three-winding Device Transformer Models

Chapter 27 - Two-terminal dc Other Models

Chapter 28 - Miscellaneous Other Models

Chapter 29 - Model Functions

API Manual

Documentation for the following APIs is included:

- Induction Machine Models APIs are available in section 4.11.
- CCT Model APIs are available in section 4.12.
- Induction Machine Bus Data 8.27
- Induction Machine Data 8.28
- Scenario and Event Study APIs 13.11 – 58

ACCC_SINGLE_RUN_REPORT_3	ACCC_TRIP_COR_3	ACCC_WITH_COR_3
ACCC_TRIP_DSP_2	ACCC_WITH_TRIP_3	ANSI_2
ARNM_2	ASCC_1A	ASCC_3
FLAT_2	IECS_4	ImNeT
ImOutage	INLF_2	MACCC_2
MACCC_TRIP_COR_3	MACCC_WITH_COR_3	MACCC_WITH_TRIP_2
MbidIndMac	MoveIndMac	MoveIndMacs
N11_ACCC	N11_ACCC_PSCOPF	OWNM_3
PSCOPF	PURGGNE	PurgIndMac
PurgIndMacs	PV_ENGINE_1A	PV_ENGINE_4
QV_ENGINE_2	RWSQ_2	SCOP
SENSITIVITY_FLOW	SET_GANG_2	SET_VOLT_VIOL_SUBSYSTEM_FLAG
SENSITIVITY_FLOWS	SENSITIVITY_VOLTAGE	SENSITIVITY_VOLTAGES
SENSITIVITY_INTERFACE	SEQD_2	SWITCHED_SHUNT_ADJUSTMENT
TAP_ADJUSTMENT	TEXT	WRITERAWVERSION
WRITESQEQVERSION_2	ZONM_2	DIST_SPCB_FAULT_2
ZSYSINIT	SETDIAGRESSCGR	SETDIAGRESTYPEASCC
SETDIAGRESTYPEDATA	SETDIAGRESTYPEDYN	SETDIAGRESTYPEGDIF
SETDIAGRESTYPEFLOW	NEXTDIAGFILEDATASET	PREVDIAGFILEDATASET
SWITCHDIAGFILEDATASET	GNECHR	GNEDAT
GNEINT	INDDT1	INDDT2
INDINT	INIIND	NEXTIND
SWSBLZ2	ACCC_SOLUTION_REPORT	