



SDDP VERSION 10.0.3d

News and corrections in the graphic interface

- An error which was introduced in version 10.0.3c in the gauging station configuration data reading has been fixed. The interface wasn't loading the downstream station data correctly and, if any data was changed in this screen, the interface wasn't saving this data correctly, causing the loss of this information.

We recommend to the users who used version 10.0.3c to edit the gauging stations configuration data to verify the downstream station data in the gauging station configuration screen. If any data has been lost, it is possible to recover the original file by closing the interface and renaming the file "arq.bak" (or "arqs.bak") to "arq.usi" (or "arqs.usi"). In case of any doubt, please, contact sddp@psr-inc.com.

SDDP VERSION 10.0.3c

News and corrections in the graphic interface

- New feature for importing and exporting configuration data in CSV format for hydro plants, thermal plants, buses and circuits.
- External bus numbers were extended from 4 to 5 digits.
- Last screen accessed by the user is now displayed when reopening the interface.
- The layout for “circuit operational state” (circuit data) and “SE” and “Inflow x Turbinning” (hydro plant data) within the modification screen were changed for checkboxes. Now they have the same appearance as the respective configuration screens.
- Error correction in the sorting of hydrological gauging stations while saving the inflow file, which could make it incompatible with the gauging station configuration file.
- Error correction on the exclusion of a thermal modification after sorting data by date selection.
- Error correction on retrieving the right consumption factor when adding a new thermal plant modification.
- Error correction upon the elimination of downstream plants for the filtration and for the calculation of stored energy.
- Error correction in the convergence tolerance field from integer to real numbers.
- Error correction on the elimination of a thermal plant that is part of a combined cycle. Now the interface excludes all data associated with it.

News and corrections on the model

- Inclusion of the Risk Aversion Curve outputs, which were disabled.
- The contribution of regulation constraints of run of the river plants have been added to the calculation of Benders cuts.
- For cases with network representation, the system marginal price for systems without load is now defined as the average of marginal price of all buses. For systems with load greater than zero, the system marginal price continued to be defined as the average of bus marginal prices, weighted by each bus load.
- Error correction on the generation of inflows based upon historical data for the deterministic case when carousel in the data is needed.
- Correction of the circuit flow limits representation of circuits that are not selected for monitoring for cases with transmission network and losses modeled by the linear method. In this specific case, the limit of the circuit flow variable in the “TO→FROM” direction was being incorrectly relaxed.

- All outputs associated to circuits in cases with transmission network and losses modeled by the linear method now depend on the total number circuits in the system, and not only on the circuits selected for monitoring.
- The restriction that limited the bus external number was removed, allowing numbers between 1 and 99999 to be used.
- The agents of the “minimal operative volume” and “stored energy” outputs were corrected and they now are associated to the reservoirs instead of hydro plants. In the same way, “losses” (approximated losses) and “quadratic losses” (real losses) outputs consider all circuits as their agents instead of only the circuits selected for monitoring.
- The definition of the Risk Aversion Curve output was corrected and does not vary per series anymore.
- In the presence of an island in the transmission network, which is not allowed in SDDP, an error message is presented to the user identifying one bus of the island.
- The name of the outputs “Thermal utilization”, “Hydro utilization” and “Circuit utilization” outputs were changed to “Thermal dispatch factor”, “Hydro dispatch factor” and “Circuit loading”, respectively.
- The calculation of the circuit marginal cost for the linearized method with losses representation was corrected. The marginal price used to be calculated as the sum of marginal cost of each flow segment (used in the losses approximation), which could result in values greater than zero even though the total circuit flow was not on its limit.

SDDP VERSION 10.0.2b

Graphical interface corrections

- New buttons, with “Cut, Copy and Paste” functionality, have been added on the chronological data tables.
- A problem in the modification screens which have data varying by blocks has been fixed. The problem occurred when there was no data for all load blocks (“blank” fields in the file are interpreted by the model repeating the last informed value for a load block). In such cases, the interface was incorrectly writing zero in the file for the inexistent data.

We recommend the users which define “blank” fields in the modification data which varies by blocks verify in the Complementary data/ “Entity”/ “Entity modification” if the values are correctly informed for all load blocks.

- A problem in the fuel price screen has been fixed. When the user changed some data and left this screen choosing the “Don’t save” option, the interface was not reloading the original data correctly.
- A problem in the sum of circuit flows screen has been fixed. Now it is possible to change the minimum limit to a negative value.
- A problem in the hydro plants modification has been fixed. The default is to not consider the “Inflow x Turbining” table, but the interface activated this option by mistake for the new modifications.
- The error criteria for the bus data (file “dbus.dat”) was modified. The interface is not considering anymore the presence of inexistent elements associated to the buses as a critical error.

Model corrections

- A printing problem, introduced in the version 10.0, has been fixed. This error affected the “.fcf” files, used for chained studies.
- A problem that did not allow the execution of coordinated cases in which one of the systems did not have hydro plants has been fixed. In addition, SDDP was extended to allow the execution of stochastic studies without hydro plants but with outage sampling and/or renewable resources.
- A problem in the creation of the spilled energy worksheet, which put the agent names as the hydro plants instead of the systems, has been fixed.
- The maximum number of flow constraints in the circuits was increased in the relaxation algorithm to allow the addition of constraints for all the circuits, if necessary.
- A warning message for incomplete specific consumption data by blocks when reading the thermal modification data was included.

SDDP VERSION 10.0.1a

Graphical interface corrections

- A problem in the thermal plants modification data has been fixed. The problem occurred in existing cases that had non-specified data for some fields (“blanks” in the file) for thermal modifications. In such cases, the interface was incorrectly writing “-1” in the file. This error is now automatically fixed (undone) when the case is loaded by the interface.
- A problem in the interconnections modification data has been fixed. The problem occurred in existing cases that had no capacity data for all load blocks (“blanks” in the file). In such cases, the interface was incorrectly writing zero in the file.

We recommend the users that represent interconnections verify the in *Complementary data/Interconnection/Interconnection modification* if the capacity values are correctly defined for all load blocks.

- An error alert message has been included for the cases that present in the data files more than one modification defined for a given agent for the same date or that have incoherent data, such as when the number of an agent is incompatible with the name of the agent defined in the configuration data. In these cases, the interface data loading will be cancelled and the user will have to revise the input data manually.
- An error in the screen of the definition of renewable sources scenarios has been fixed. The interface was saving the file with errors.

Model corrections

- A stopping condition has been implemented in the model for the cases that the number of years in the historical data of inflows exceeds the maximum, which is 100 years.
- A stopping condition has been implemented in the model to detect historical inflow data that are constant or whose annual sum is constant.
- A problem in the generation of the spreadsheets of marginal costs of generation constraints has been fixed. This problem caused the interruption of the program in the final simulation.
- The maximum number of backward series has been increased to 200.

SDDP VERSION 10.0

New graphical interface

Version 10 of SDDP presents a restructured graphical interface which makes the use and data management in SDDP easier and more intuitive. For example:

- Data were grouped into *Basic Data*, *Complementary Data* and *Execution Options*. The user can select which data is to be shown using the option *Preferences*, adapting the list of screens to the specific needs of the system being studied.
- New screen navigation tools were created. In particular, there is a list that shows all elements, which can be ordered in accordance with the available attributes. Additionally, it is possible to filter those elements by system, by informing the search option and, in the case of modification screens, by date.
- The user can run SDDP or read the model outputs at any moment without having to go back to the execution screen.

Note that the layout of the individual screens is similar to that of the previous version, which makes it easier to adapt to the new interface.

The new interface also provides data consistency checks. All data is loaded into memory, which allows the control of inconsistencies and interdependences which were not possible in the previous versions. For example:

- When a plant is eliminated, the interface also removes the references to that plant in all operating constraints in which it appears (such as generation, reserves etc.).
- The interface would not allow a given fuel to be eliminated if it is used by one or more thermal plants.

Reduction of execution time

Two improvements were implemented in the optimization algorithms which reduce significantly the execution time while preserving the same accuracy of the results:

- A relaxation strategy for the linear segments that compose the future cost function;
- When the transmission network model is used (with an iterative method) the optimal solution in each iteration is used as a starting point for a new iteration (where new power flow constraints for overloaded lines are added).

Note that both improvements require the use of advanced functions in the *Xpress* solver; as a consequence, they are only activated if the user has a license for that solver.

A new functionality was implemented to allow initial storage volumes to be read from an external file provided by the user. In addition to defining initial reservoir storage levels for each hydrological sequence in the first stage of the study, it is also possible to inform the storage levels that will be used in the first *backward* recursion. The use of this feature can accelerate the convergence process. The external file can be imported from a previous run of the model. See the User Manual for more details on those features.

Parallel SDDP

- The execution times of the operation policy were improved through a broadcast scheme for the cuts and final volumes, thus avoiding disk access by the processes.
- A parallel scheme for the final simulation was implemented: one dedicated process receives from the other processes their outputs and produces the consolidated output.
- The process messaging software was upgraded to the MPI-2 library, which resulted in a significant improvement in communication times.
- Some additional controls were implemented to facilitate the identification the cause of interruptions during the execution.

PSR Cloud

PSR Cloud is a web-based computational environment which can be used to run SDDP, thus avoiding the need for the user to invest in high-performance computers, Parallel SDDP license and dedicated networks. PSR Cloud currently has 800 CPUs Intel Xeon 64bits 2.33GHz. (For more details visit <http://portal.psr-inc.com/psrcloud/>.)

PSR Cloud is fully integrated into version 10 of del SDDP, that is, it is an user option to run SDDP on a stand-alone computer, on a local network or in the web, through PSR Cloud.

PSR offers to all SDDP users the free use of up to 64 processor-hours in PSR Cloud; please contact PSR: sddp@psr-inc.com for more details.

Restructured data and output files

- The fuel data file was divided into two files: one with the fuel configuration data, and the other with variable fuel cost information. See the User Manual for further details.

When a study case compatible with version 9.2.2b is opened with the version 10.0 interface, the data files are automatically converted to the new formats. If the user wishes to retain the files with the old formats, they should be copied to a different directory before using the interface.

- The two binary files produced by SDDP (future cost function and final volumes) plus the two user-provided binary files read by SDDP (external inflow files for the forward and backward recursions) have been changed from single to double precision. Any user that wishes to read these SDDP-produced files (for example, in order to use them for other applications) and/or to prepare external inflow files, should refer to the User Manual for more details.

Due to the changes in the precision, it is not possible to run a simulation study with version 10.0 using a future cost function obtained with version 9.2.2b.

Model updates

- An overall revision of the code was carried out: most of the routines were reorganized and several standard schemes were adopted. Although these changes are “invisible” to the user, they made SDDP version 10 a more robust product, which is also easier to maintain.
- Coordinated studies including gas pipelines are now allowed.
- The representation of Risk Aversion Curves (CAR) together with transmission networks is now allowed.
- Two spreadsheets were created: initial volumes for each stage and sequence and marginal cost for gas production.

Corrections

- It is no longer required to provide a chidroxx.dat file when there are no hydro plants in the study.
- Two errors were corrected in the table outflow volume x tailwater elevation: (i) zero generation if there is zero outflow; (ii) allow maximum capacity for the maximum outflow.
- The program now represents correctly the reservoir fill-up (“dead storage”) when it starts before the first stage of the study.
- In the case of deterministic studies with historical inflows, it is no longer required to inform the following data for the six stages prior to the first stage: (i) inflows; and (ii) duration of the load block in each of the six stages (this information is required to transform the inflows, which are given in m^3/s , into cumulative volumes along the stage (in m^3).
- A consistency check of the thermal plant and gas node was implemented.
- Default values for the chronological constraints of minimum generation, risk aversion curve (CAR) and were defined.
- The reading of international circuit cost data was modified to ignore information about circuits which are not part of the study.
- A verification of duplicate names for interconnections was included, because they led to errors in the graph module.
- An error was corrected in the case of coordinated studies with renewable sources.
- An error was corrected in the case of coordinated studies with more than 10 systems.
- Errors were corrected in the following minimum outflow-related spreadsheets: violation, cost of violation and marginal cost of the constraints.
- An error was corrected in the spreadsheet of marginal costs of generation constraints.

Notes

SDDP version 10.0 does not include the interface for the Short-Term model. Users that require this model should contact PSR: sddp@psr-inc.com

- In this version the facility for importing/exporting data in CSV format is not available. This feature is being extended for all data and will be included in the next update.