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Validation Report for
Total System Model Preprocessor Version 6

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CHANGE HISTORY

Revision Number	Interim Change No.	Date	Description of Change
00		10/2007	Original Issue, for use with TSMPP Version 6

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ABBREVIATIONS AND ACRONYMS

BSC	Bechtel SAIC Company, LLC
CaS	Create-a-Soft™
CRWMS	Civilian Radioactive Waste Management System
CSNF	commercial spent nuclear fuel
DOE	U.S. Department of Energy
DOE SNF	U.S. Department of Energy Spent Nuclear Fuel
DPC	dual-purpose canister
FIFO	first in – first out
HLW	high-level radioactive waste
INL	Idaho National Laboratory Formerly Idaho National Engineering and Environmental Laboratory (INEEL)
IS	Initial State file
LIFO	last in – first out
MCO	multi-canister overpack
MGR	Monitored Geologic Repository
MTHM	metric tons of heavy metal
OCRWM	Office of Civilian Radioactive Waste Management (DOE)
OFF	oldest fuel first
SNF	spent nuclear fuel
SRS	Savannah River Site
TAD	transportation, aging, and disposal
TSC	transportable storage cask
TSM	Total System Model
TSMPP	Total System Model PreProcessor
WO	Work Order
WP	waste package
YFF	youngest fuel first

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1. INTRODUCTION

The Total System Model Preprocessor (TSMPP) is a part of the Total System Model (TSM), which is a PC-based simulator that is a decision aid to achieve overall Office of Civilian Radioactive Waste Management (OCRWM) disposal objectives. The TSM is identified as Level 3, i.e., not Important To Safety (ITS) and not Important To Waste Isolation (ITWI), software in the Bechtel SAIC Company, LLC (BSC) Controlled Software Report.

The TSMPP combines information about existing conditions, such as waste inventory estimates and site capabilities, with projections of future conditions, such as projected waste discharges and expected cask capabilities, to provide a waste shipment schedule that is input to the TSM. The TSM then uses this shipment schedule to simulate national transportation and operations at the repository.

1.1 FUNCTIONAL OVERVIEW

The complete TSM, consisting of the TSMPP and the SimCad™ (CaS 2006) model, is used to simulate the Civilian Radioactive Waste Management System (CRWMS) mission. As shown in Figure 1, the TSM incorporates a number of elements to form a comprehensive systems analysis tool.

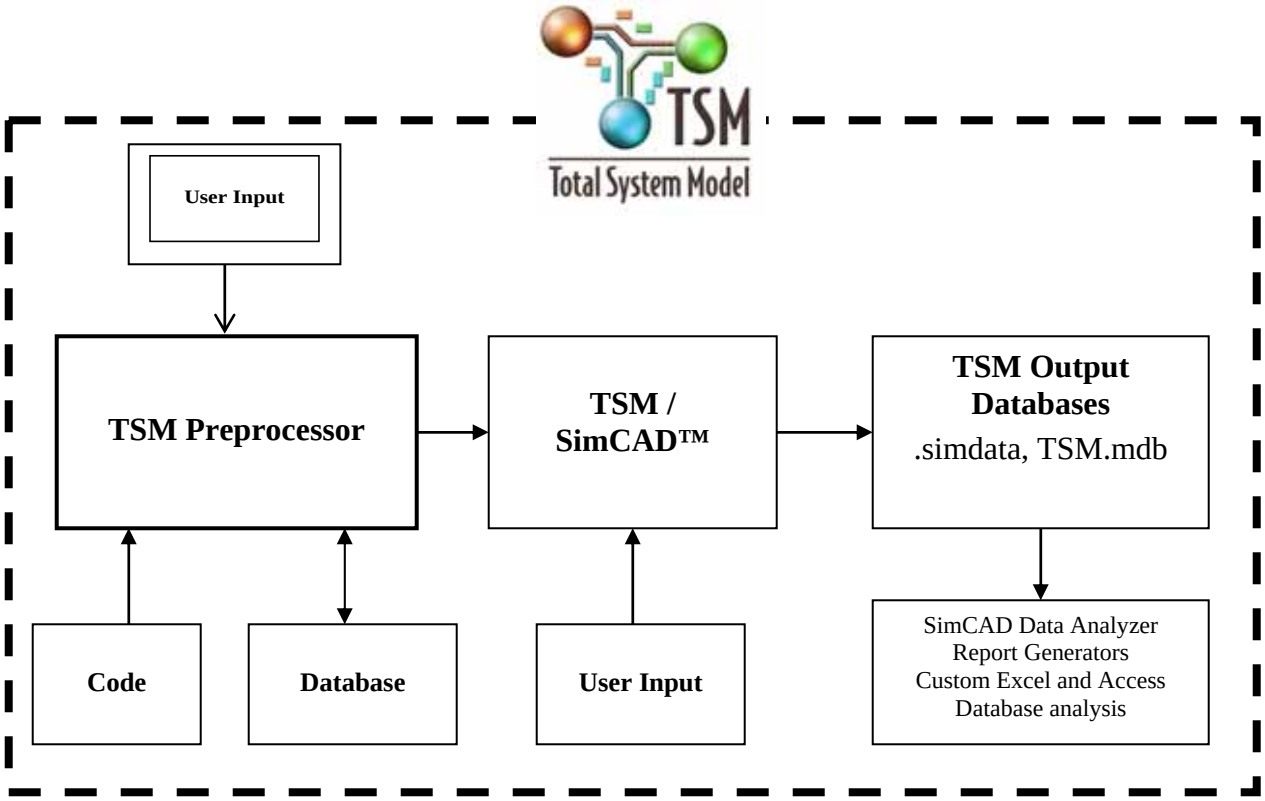

Figure 1. TSM Operating Elements

The TSM is:

- a real-time process simulation model that achieves the established requirements and provides a rapid means to evaluate alternative approaches to achieve program and project goals,
- based on established process optimization tools and methods, usability and accepted system analysis techniques; and
- an end-to-end model with interaction of waste acceptance, transportation, and repository parameters and constraints.

The role of the TSMPP is to simulate the operation of the reactor sites, to characterize the contents of the reactor pools and dry storage pads, and to apply a combination of user options to analyze waste acceptance and cask options. The TSMPP then defines a queue of casks to be accepted at each reactor site with a proposed schedule for acceptance. This schedule provides the Initial State (IS) file that drives the transportation and repository performance simulation.

1.1.1 TSMPP Capabilities

The TSMPP can handle various cask and canister/cask technologies, such as transportable storage casks (TSC), dual-purpose canisters (DPC), and transportation, aging, and disposal (TAD) canisters. In addition, various types of single–purpose transportation and storage casks are simulated.

Fuel can be accepted in an oldest fuel first (OFF) methodology or in a youngest fuel first (YFF) greater than or equal to a specified year x methodology (YFFx). In addition, a priority acceptance rate can be specified, which can be used to accept fuel from overflowing pools and/or from shutdown facilities.

The TSMPP provides information that describes how and when commercial spent nuclear fuel (CSNF) assemblies will move from reactor pools to dry storage at reactor sites and schedules acceptance for transport to the Monitored Geologic Repository (MGR). Acceptance rates and shipment schedules are also provided for Department of Energy (DOE) spent nuclear fuel (SNF) and high-level radioactive waste (HLW).

The TSMPP also utilizes the following parameters in modeling CSNF, DOE SNF and HLW movement:

- System Operating Rules
  - Annual rates for shipping fuel from reactors/DOE sites to the repository
  - Minimum CSNF aging times
- Acceptance Rights (method by which the annual CSNF acceptance rate is allocated among the various storage locations)
  - Based on discharge order of waste (i.e., OFF)
  - Option to grant priority acceptance for pool overflow conditions and decommissioning activities
  - Option to share allocations among reactors owned by a utility
  - Option to specify annual allocations at specific pools

- CSNF Selection
  - Total accepted based on acceptance rights
  - Particular assemblies accepted determined by user-selected criteria (OFF, YFFx, Strict YFF, thermal limits, burnup/enrichment limits)
  - Option to "zone load" transportation casks
- Reactor Management
  - Option to unload shutdown sites and to specify the number of years after shutdown to wait before unloading
  - Option to give priority to shipment of fuel from dry storage versus shipment of fuel from the pool
  - Option to select DPC stored at reactors using FIFO (first in-first out), LIFO (last in-first out), giving preference to TAD canisters, and setting a threshold acceptance date
- Cask Specifications
  - Heat limits
  - Capacity (assemblies or canisters/cask)
  - Cask loading priority sequence
  - Burnup/enrichment curves
  - Cavity length

Each year, commercial reactors discharge SNF assemblies into storage pools. If a pool exceeds available capacity an appropriate number of assemblies are selected, and are moved to onsite dry storage. Assemblies remain in dry storage, or in the pool, until accepted by the CRWMS. Once accepted, the assemblies are loaded into transportation casks and sent to the Monitored Geologic Repository (MGR) for final emplacement. For HLW and DOE SNF canisters, annual shipping rates from each facility are specified as input.

1.1.2 Data Sources and Parameters

The source data used by the TSMPP currently includes the following:

- Current waste site inventories provided by the Energy Information Administration (EIA), coupled with future discharge projections based on current industry trends for commercial fuel
- DOE SNF and HLW inventories provided by the DOE Office of Environmental Management (EM)
- Reactor pool capacities, dry storage preferences, and modal capabilities developed using data complied by OCRWM
- Best-estimate evaluations of cask capabilities at the time of MGR operation. In addition, Certificates of Compliance, issued by the U.S. Nuclear Regulatory Commission (NRC), are a source of data used to update cask information.

Note that source data versions in use are updated periodically. Scenario-specific parameters can be specified by the user for fuel selection rules, dry storage options, inventory management, and cask capacities. The defaults for these parameters also are updated frequently.

1.2 QUALIFYING PROCEDURES

As the TSM is Level 3 software, the TSMPP and all associated documentation will not be used to drive the design or the regulatory basis for the Yucca Mountain Project (YMP). The TSMPP, as part of the TSM, is maintained in the (software) CMSynergy system. Changes to the TSMPP are made and documented in accordance with procedure AP-ENG-006. The enhancements for TSM Version 6 are described in the *User Manual for the Total System Model Version 6.0 Preprocessor* (BSC 2007b).

2. MODEL CHANGES

This section discusses the method by which each significant model change was implemented, in order to migrate TSMPP Version 5 (BSC 2007a) to TSMPP Version 6 (BSC 2007b).

2.1 CHANGES TO LOGISTICS CALCULATION

The TSMPP functions in three distinctly different steps. The first step characterizes the fuel discharge, the reactors and pools, and defines options for waste acceptance. The next step, the logistics calculation, then provides an annual schedule for waste acceptance to the third step, IS file and/or report generation.

2.1.1 DOE Waste

Previous releases of the TSMPP have characterized the sites with DOE waste (e.g., Hanford, Idaho National Laboratory (INL), Savannah River Site (SRS), etc.) by merely specifying the amount of waste to be accepted, with no consideration of the potential storage needs at those sites. For Version 6 the DOE sites are simulated just like commercial reactor sites, using the difference between DOE waste production and acceptance to assess the need for storage on site.

A pair of tables has been added to the TSMPP supporting database to characterize the production of DOE SNF and HLW. These tables, named DOE SNF_Production and HLW_Production, are similar to the CSNF fuel file, and describe the production of the respective waste. The waste production is unique to each scenario, and describes the year of production, the reactor that produced the waste, the number of canisters, and the heat of each canister. Note that for DOE SNF and HLW, it is the discharge "reactor" that defines the waste type, as shown in Tables 1 and 2.

A pair of additional input screens was added to allow the user to specify production rates. These screens, shown in Figures 2 and 3, are accessed by selecting the "Rates" menu option on the main menu, and then selecting either the "High Level Waste" or "DOE SNF" production sub-category. Although the current method is sufficient for this level of analytical complexity, as the TSMPP evolves and the need for more complicated production rates increases, it is expected that an Excel interface will be implemented.

Table 1. DOE SNF Reactor Numbers

Site	Waste Type	Length	Reactor	Canister Mass[1] (MTHM/canister)	Canister Heat[1] Watts
Hanford	DOE SNF	Long	142	0.143	125
Hanford	DOE SNF	MCO	143	4.773	776
INL	Navy	Short	144	0.1625	3,980
INL	Navy	Long	145	0.1625	3,980
INL	DOE SNF	Short	146	0.143	125
INL	DOE SNF	Long	147	0.143	125
SRS	DOE SNF	Short	148	0.143	125

[1] Typical values for canister mass and heat are provided, but may be changed by user.

Table 2. HLW Reactor Numbers

Site	Waste Type	Length	Reactor	Canister Mass[1] (MTHM/canister)	Canister Heat[1] Watts
Hanford	HLW	Long	137	0.5	56.4
INL	HLW	Short	138	0.5	571
SRS	HLW	Short	139	0.5	571
SRS	PU-HLW[2]	Short	141	0.5	571
WVDP	HLW	Short	140	2.13	155

[1] Typical values for canister mass and heat are provided, but may be changed by user
[2] Not currently used in TSM.

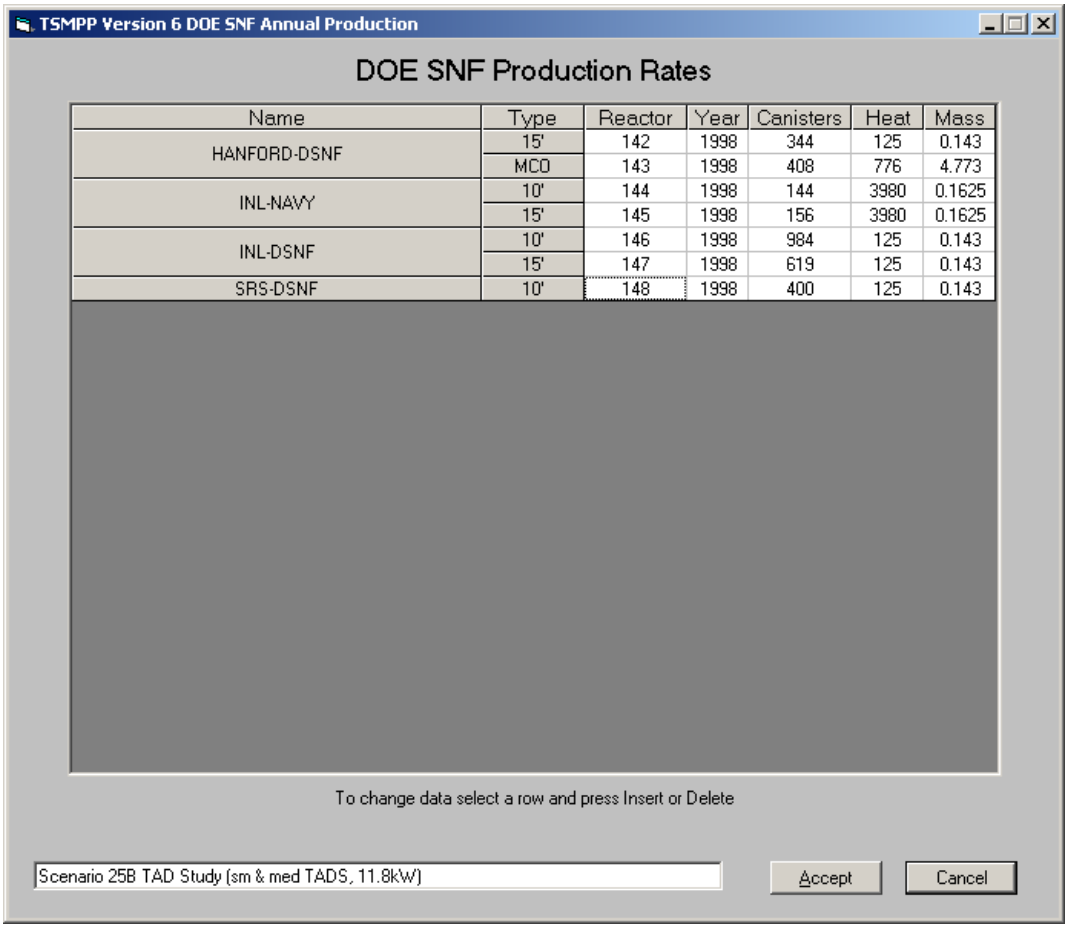

Figure 2. DOE SNF Production Rates Input Screen

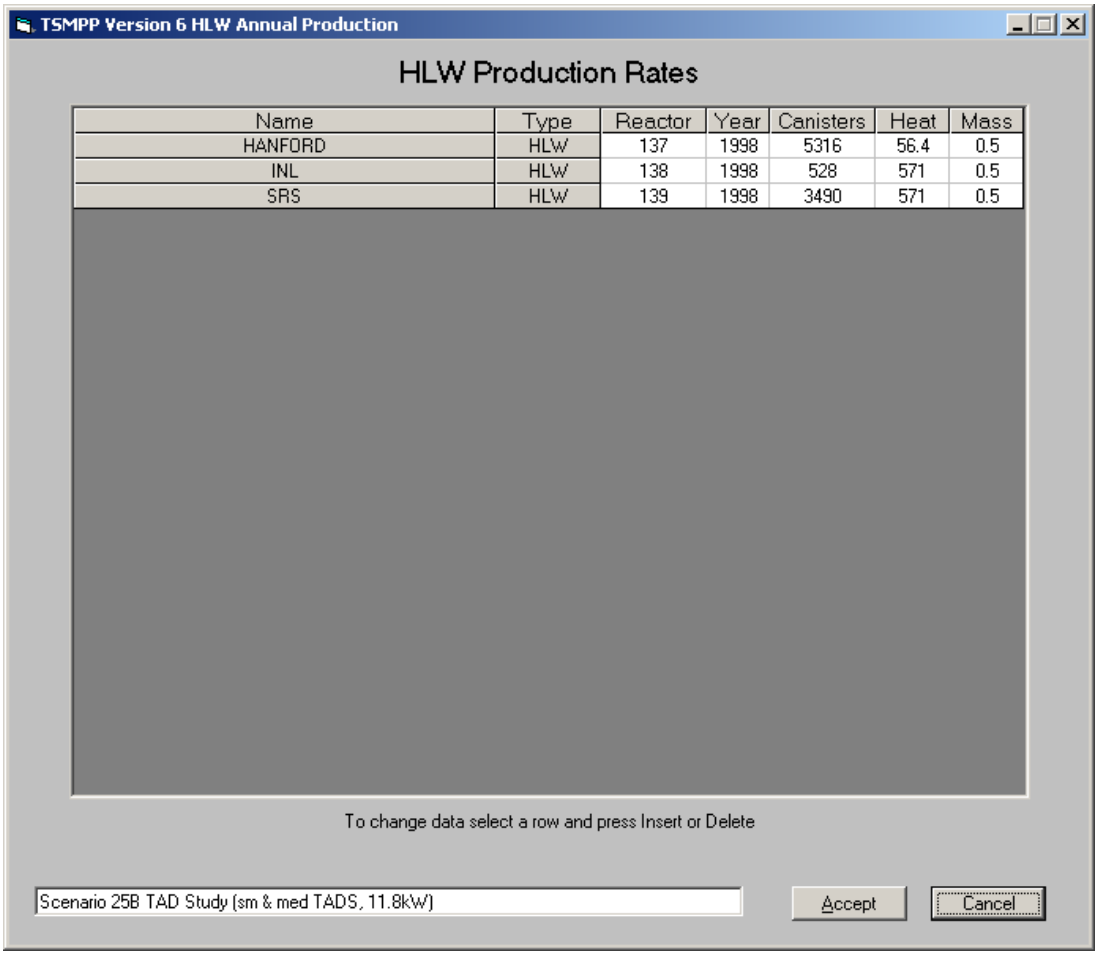

Figure 3. HLW Production Rates Input Screen

The user should note that the method of deleting or inserting rows is different than other screens. For these two screens only, the user selects a specific row by left-clicking with the mouse, and then pressing the "Insert" or "Delete" button. The user should also note that the input for each of these screens is canisters rather than metric tons of heavy metal (MTHM), and that the mass per canister is defined based upon the waste type.

In order to examine DOE waste production and acceptance information, two additional reports have been added to the "Logistics Reports menu" as shown in Figure 4. The "Storage" report summarizes the number of canisters remaining on-site at each of the HLW or DOE SNF-generating sites.

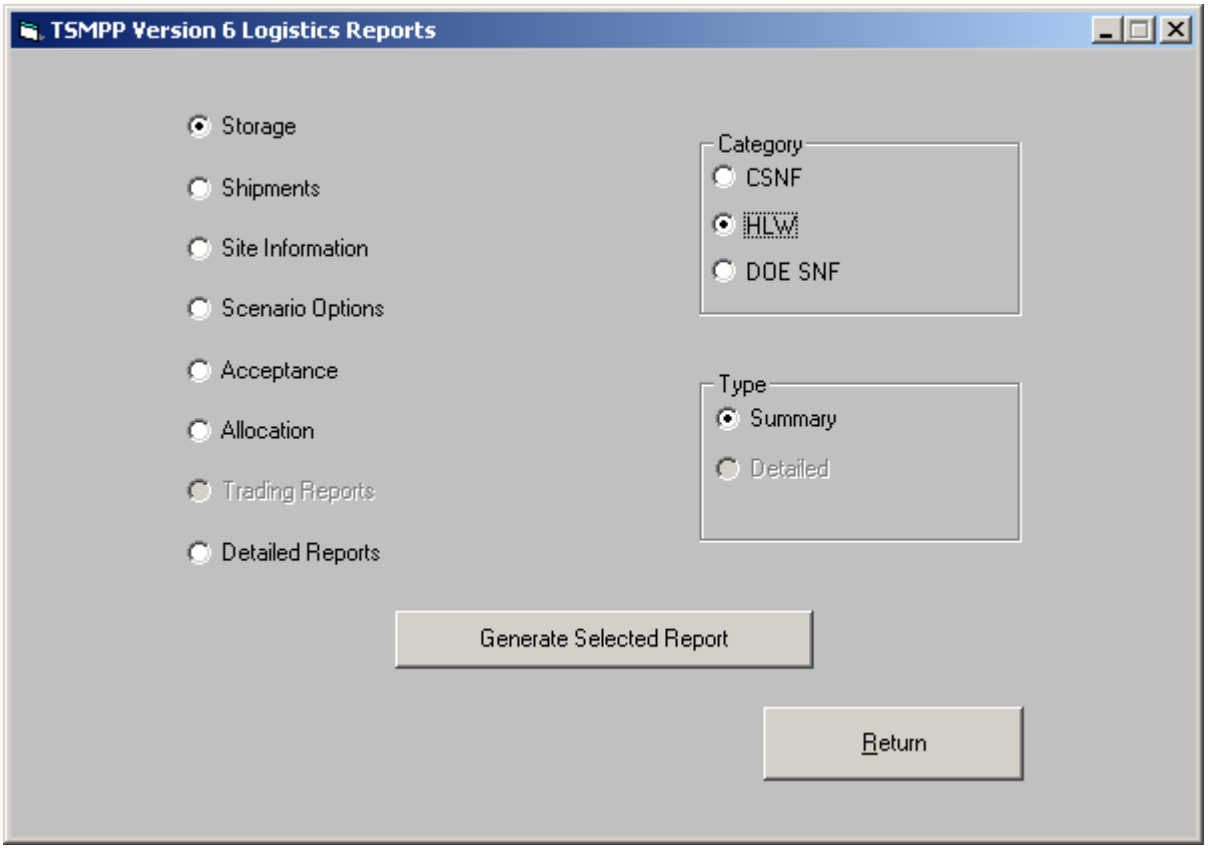

Figure 4. DOE SNF and HLW Report Selection

2.1.2 Dry Storage Acceptance Options

A significant amount of code re-structuring has occurred to enable the analyst to evaluate options of accepting the CSNF that either has been or will be stored on dry storage pads at the reactors. This type of acceptance is significant because of the potential for impact on surface facility operation.

As shown in Figure 5, there are three options displayed under “Dry Storage Acceptance Options” and associated with accepting fuel that has been placed in dry storage. The first option is to take whatever cask that has been on the storage pad the longest, also known as first in – first out or FIFO order. The second option is to accept whatever cask has been on the pad the shortest amount of time, known as last in - first out or LIFO order. Another possibility is to preferentially select any TAD canisters that have been placed on the pad, and after all TAD canisters have been shipped from that reactor to proceed with acceptance in either a FIFO or LIFO sequence. FIFO will result in the coolest waste stream being shipped from the storage pads and LIFO, obviously, the hottest. Accepting TAD canisters before DPCs is significant because DPCs must be opened in the Wet Handling Facility (WHF) and transferred into TAD canisters, and therefore selecting TAD canisters before DPCs could impact scheduling at the surface facilities.

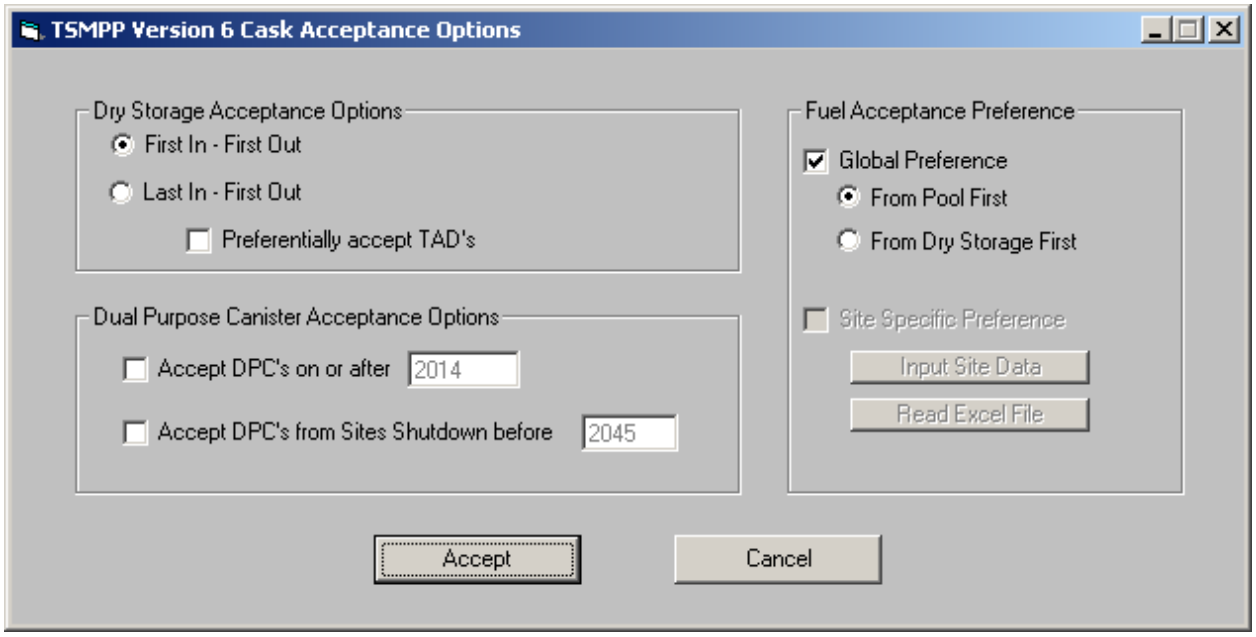

Figure 5. Cask Acceptance Input

2.1.3 DPC Acceptance Options

As described in the previous section, it is desirable to control the acceptance of DPCs because of their impact on the surfaces facilities, both in cost and scheduling. For this reason, modifications have been made to the logistics calculation so that, if desired, DPCs will only be accepted on or after a specified date, or DPCs will only be accepted from sites shut down before a specified date. The planned application for an option that only accepts DPCs after a specific date is to allow the scheduling of DPC acceptance only after the start of operation of a specific surface facility. The planned application of an option that accepts DPCs strictly from shutdown sites, and allows the user to further limit the acceptance of DPCs to those at sites shut down before a specific date, potentially models a limited number of shutdown pools as losing their capability of transferring fuel into a TAD canister, and that pools that shut down after TAD canisters are available will use TAD canisters rather than DPCs for all CSNF in dry storage.

It should be noted that the default date after which DPCs will be accepted is the first year of acceptance, and that the default shutdown date for shutdown sites from which DPCs may be accepted is the final year of acceptance.

2.2 REPORT CHANGES

In an on-going effort to provide additional information to the user, four additional shipment reports have been added. These reports provide shipment information, both summary and annual totals, for defense wastes. These reports are generated from the report section after the logistics calculation, and are available to the user when the “Shipments” report is selected. As shown in Figure 6, both HLW and DOE SNF reports are available in form of summary data and annual totals.

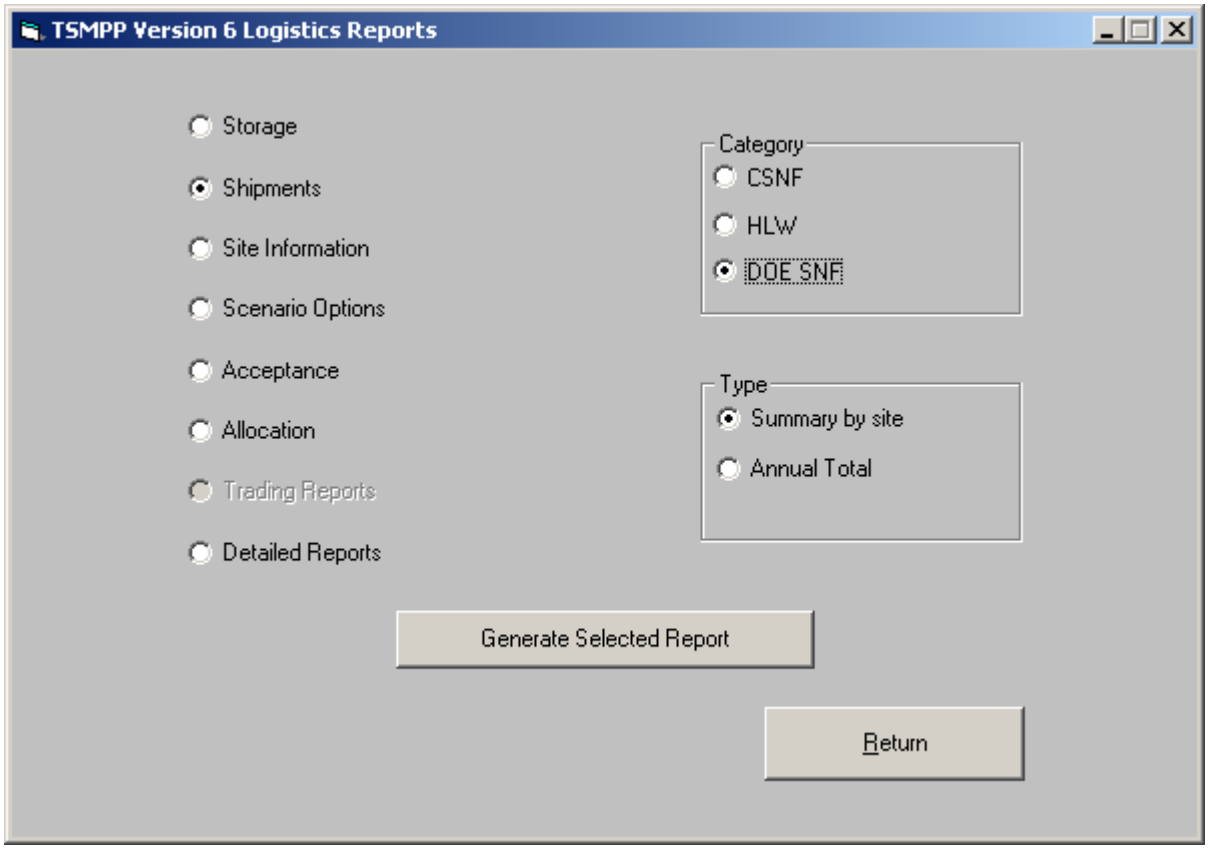

Figure 6. Defense Waste Shipment Availability Report Screen

Also the ability to generate a detailed arrival report, either by Batch or by Cask Average, is now available, as shown in Figure 7. The user should note that characterizing each batch within the transportation casks generates a longer report, which may or may not be more informative to the user.

Figure 7. Detailed Arrival Report Availability Screen

2.3 CHANGES TO INITIAL STATE FILE GENERATION

The strategy for disposal of DOE waste canisters includes the use of codisposal waste packages (WP), currently 4 or 5 HLW canisters and 1 DOE SNF canister, or 2 multi-canister overpacks (MCO) and 2 HLW canisters. The timing of HLW, DOE SNF, and MCO shipments can adversely impact the emplacement efficiency if DOE cask loads are not delivered in the proper ratios to make codisposal WPs. This issue can be (at least partially) addressed within the TSMPP by adjusting the timing of the DOE waste shipments after generation by the TSMPP, but before the IS File is created. Two shipping strategies have been developed. The first, called "SNF Lead", ships DOE SNF casks on schedule, but adjusts the HLW schedule to encourage proper codisposal acceptance ratios. The second strategy, called "HLW Lead", ships the HLW casks on schedule and adjusts the DOE SNF shipments. This change has been implemented in Version 6 and verified in the *Total System Model Version 6.0 Preprocessor Smoothing Algorithm Validation Report* (BSC 2007d).

Two additional changes were to implement an algorithm to calculate the purchase of truck rolling stock, and allow the use of transportation overpacks with interchangeable baskets for DOE SNF and HLW. These changes were implemented in Version 6 and verified in the *Total System Model Version 6.0 Preprocessor Work Order Algorithm Validation Report* (BSC 2007e). A discussion of the process of using work orders to purchase casks and rolling stock is presented in the *User Manual for the Total System Model Version 6.0* (BSC 2007c).

2.3.1 Minor changes

A number of minor changes have been implemented in the generation of the IS file. These changes are to alter the Naval SNF consist size from 5 to 6, to revise "Offset" values to calendar years, and to disable tracking of high criticality ("crit") CSNF assemblies.

The change to the Naval SNF consist size merely ships casks of that type in train sizes of 6, and was done to more accurately reflect the current OCRWM expectation of repository operation. The change to make "Offset" values (which are merely integer numbers from one to the number of years of acceptance) to calendar years was done to assist the user in characterizing the waste stream and to make the IS file easier to read. The tracking of high-criticality or "crit" CSNF assemblies was disabled because at present the identification of this type of fuel for specialized handling is no longer in use.

3. VALIDATION TESTS

The TSMPP uses Visual Basic for its development and runtime environment, with Access 2003 used for the data repository, and Excel 2003 used for output and analysis. Several Excel spreadsheets were employed in the analyses found in this calculation. These sheets are listed in Section 6.

3.1 BASE COMPARISON

The first test performed was to verify that all changes were either transparent or justified. This test verifies that no capability had been lost in the progression from Version 5 to Version 6. In order to perform this test the benchmark scenario, a modified Scenario 25B from Reference BSC 2005, was executed with Version 5 and Version 6. The executable and the compatible database for Version 5 are attached as "TSMPP Ver5.exe" and "TSMPP DB-V606b.mdb", respectively. The executable and the compatible database for Version 6 are attached as "TSMPP Ver6.exe" and "TSMPP DB-V611c.mdb", respectively.

The result of this comparison is contained in the Excel spreadsheet "BaseComparisonResults.xls", as listed in Table 3. The test is successful if either there are no differences in the results, or if any differences are explainable.

There are four changes between Version 5 and 6 that can have an impact on the base comparison. These changes are:

1. Mass of DOE SNF specified more accurately
2. Change in dry storage acceptance options
3. Change of the Offset to Year of acceptance in IS File
4. Navy consist change from 5 to 6.

The first two changes alter the logistics calculation and are difficult to isolate, while the last two changes alter the generation of the IS file and are relatively easy to isolate. The approach to performing this comparison will be performed in three steps. First the changes caused by mass specification will be isolated with a change to the Version 5 database, then the changes caused by dry storage acceptance will be isolated by a temporary, one-line change to the source code of Version 6, and finally the changes due to acceptance year and consist changes will be justified within the Excel spreadsheet. For this comparison, the acceptance criteria is to relate differences in the IS file to a specific change between Version 5 and 6, rather than to validate that the change causes a reasonable difference. In addition, it should be noted that the temporary changes made to both the TSMPP input database and source code described below are intended only to isolate and identify the differences caused by a specific change to the version.

Specifying a more realistic mass for DOE SNF will change the reported mass for those shipments in the IS file, but will also affect the acceptance in a specific year as the TSMPP attempts to schedule the shipment of an appropriate number of casks. The TSMPP logic subtracts the mass of material shipped from the mass of material allocated, and if that resulting allocation is greater than zero, an additional cask can be shipped. Unfortunately, because of a round-off issue identified in Visual Basic™, subtracting a shipment of 0.0225 MTHM from an allocation of 0.0225 MTHM yields a zero allocation (a second cask is not shipped), but

subtracting a shipment of 0.858 MTHM from an allocation of 0.858 MTHM yields an allocation of 5.3E-8 (and a second cask is shipped). Differences in the IS file resulting from this change were isolated in a two step process by first changing the mass of the DOE SNF specified in the Version 5 TSMPP input database. A comparison of the results from each version then showed a minor deviation in the shipments from SRS. It was observed that the first year's allocation to that site was a fraction of a full cask, and that if a full cask was allocated to that site there was no deviation in the SRS shipments between the two versions. The attached file "TSMPP DB-V606b_wt.mdb" contains these changes, and the resulting IS file is shown as "V5Mod" in the attached workbook "BaseComparisonResults.xls."

The change in dry storage acceptance occurred because of the use of the DPC acceptance options, described in Section 2.1.2. One of the options desired for acceptance of CSNF stored on dry storage pads was that it be accepted on a FIFO basis. That is, that the cask which had been placed on the pad first is the first to be accepted, which is the mode that Version 5 was thought to be using. During testing it was determined that the Version 6 model assumed that the first cask sent to the pad during any year was older than the next cask sent during the same year, while Version 5 assumed that the final cask sent was older than the first cask sent to the pad during any year. In order to identify the differences caused by this change, Version 6 was modified to return casks in the same order as Version 5. This required a one-line change in module "fuel.bas" in the function "GenIndexDS." The line:

For loadknt = 0 To Site_Dry_Storage(yr, nPool).NumLoads – 1

must be changed to:

For loadknt = Site_Dry_Storage(yr, nPool).NumLoads - 1 To 0 Step -1

An executable with this change incorporated is attached as "TSMPP Ver6_mod.exe.

An IS file generated with the modified executable is shown as "V6Mod" in the attached workbook "BaseComparisonResults.xls". Now, a comparison between the spreadsheets "V5Mod" and "V6Mod" will eliminate the differences due to the change in DOE SNF mass and the FIFO acceptance criterion, leaving only differences caused by the remaining changes, as shown in the sheet "V5ModVsV6Mod".

The change from Offset, an integer year from 1 to the number of years of acceptance, to the year of acceptance, will change every entry in the final column of the IS file but change no other data. Differences caused by this change may be isolated and resolved by subtracting a constant from the year of acceptance to obtain the offset, as shown in the spreadsheet "YearChange". The cells in this comparison which have differences identified as resulting from this change have been marked as "resolved" in yellow.

The change in Navy consist size may alter the timing of some Navy shipments, but should change no other entries. The sheet from the previous comparison has been copied to "ConsistChange" and extended to declare those differences attributed to the timing of Navy fuel as being resolved.

As shown in the last comparison spreadsheet, "ConsistChange", all differences in the IS file run with Version 5 and Version 6 have been isolated and resolved. As a result of this, the base comparison is accepted.

3.2 ERROR CORRECTIONS

Software Problem Report (SPR) TSM 0012 identified a problem in Version 5 that the values on the screen for HLW and DOE SNF acceptance rates could not be altered from the input screen. This was the result of a minor coding change that had defined the input grid as being "protected" from change. This error was corrected, and the values may now be altered from the input screen. This change is therefore accepted.

3.3 DOE WASTE

In order to make new capability available to the analyst, two reports have been added to the "Logistics Reports menu" as shown in Figure 4. When the "Storage" button is selected, categories for CSNF, HLW and DOE SNF appear. The HLW and DOE SNF categories generate a summary report which details the number of canisters remaining on site (canisters produced less canisters accepted) at each location for each year of acceptance. These reports are attached as "StorDSNF" and "StorHLW" in the attached workbook "V6StorageReports.XLS." The reports are consistent with the input and this change is therefore accepted.

3.4 DRY STORAGE ACCEPTANCE OPTIONS

The option of accepting casks from the dry storage pad in either FIFO or LIFO order, or with a preference for TAD canisters was validated by performing the benchmark scenario (25B), with the appropriate dry storage acceptance option selected. The attached spreadsheet "V6_DryAcceptanceOptions.XLS" contains the detailed CSNF storage report generated with each option in the DPC acceptance modification. As shown in the sheet "FIFO_StorDet", the casks being accepted from the storage pad are indeed accepted in FIFO order, that is the casks that went to the pad first, are being accepted first. As shown in the sheet "LIFO_StorDet", the casks being accepted from the storage pad are indeed accepted in LIFO order, that is the casks that went to the pad last are being accepted first. Exceptions in LIFO order are noted in Surry, Oconee, and Millstone, however, these exceptions are readily explained. Upon studying the acceptance criteria, the last cask(s) being put on the storage pad at these sites are rejected because their thermal output (heat) exceeds the acceptable thermal limit of their transport overpack.

As shown in the sheet "FIFOwTADPrefer_StorDet", TAD canisters are being accepted from the storage pad before non-TAD storage casks with FIFO order. Also in "LIFOwTADPrefer_StorDet", TAD canisters are accepted first, in LIFO order. It should be noted that when TAD canisters are loaded last, then TAD canister preference with LIFO order is identical to straight LIFO order.

Since the acceptance order was modified in each case as expected, this modification is accepted.

3.5 DPC ACCEPTANCE OPTIONS

The attached Microsoft Excel workbook "V6DpcOptions.xls" contains the detailed CSNF storage report generated with each option in the DPC acceptance modification. The sheet

"DefaultDPC Options" contains the storage report with all default DPC options, which is used for comparison purposes.

To validate the option to accept DPCs only after a specified date, the benchmark scenario was run with the option to accept DPCs only after 2025. The sheet "DPCafter2025" shows the resulting CSNF detailed storage report. As can be seen in the report, DPCs are accepted only after 2025, and no DPCs are accepted before that date.

As a further example, the attached workbook "IS_DPCafter2025.xls" contains the IS files for both the default DPC options and the option to accept DPCs only after 2025. The worksheet "Shipment Deltas" is a pair of pivot tables comparing the total acceptance from each site, by cask id. As can be seen in this worksheet, the only sites with altered total acceptance are at Oconee (OCO), Oyster Creek (OC), and Palo Verde (PV). In order to examine the reason for this, the worksheet "DeltaByYear" shows the annual acceptance for these three sites, as well as for Big Rock Point. As shown in this sheet, Big Rock Point had the same total acceptance, since it ships only DPCs, but the acceptance was delayed until 2025. Both Oconee and Oyster Creek ship both DPCs and TAD canisters, and in the delayed case, shipped TAD canisters rather than DPCs until DPCs began to ship. However, the different allocation carryover when shipping TAD canisters (which have a lower capacity than DPCs) changed the total mass shipped from these sites by a minor amount, 2.45 MTHM and 5.84 MTHM from Oconee and Oyster Creek, respectively. The change in allocation carry-over also slightly affected Palo Verde, which shipped 8.3 MTHM less. This behavior is justified and is expected. The modification functions as intended, and is accepted.

The spreadsheet, "DPCfromShutdownBefore2015", in the file "V6DpcOptions.xls", contains the storage report generated when the option to accept DPCs only from those sites shut down before 2015 is activated. As shown, DPCs are accepted from sites shutdown before 2015, such as Big Rock Point, but they are not accepted from those sites shutdown after 2015, such as Diablo Canyon. As a matter of interest, the IS files generated with default DPC options and with the option of accepting DPCs only from sites shutdown before 2015 are compared in the Excel spreadsheet "IS_ShutdownBefore2015.xls." Once again a pivot table comparing the site acceptance by cask is shown for each calculation. Unfortunately, the changes in carryover of annual allocation (due to different canister capacities) cause so many differences in this comparison that meaningful analysis is difficult. It is worth noting, however, that sites which ship DPCs, such as Big Rock Point, ship the same metric tonnage, and that the total tonnage shipped is about the same. The change in results is justified, and this modification is accepted.

3.6 CHANGES TO INITIAL STATE FILE GENERATION

The implementations of the DOE smoothing and rolling stock work orders have been verified in the *Smoothing Algorithm Validation Report* (BSC 2007d) and *WO Algorithm Validation Report* (BSC 2007e). The minor changes to the IS file generation are validated by the examination of the IS file "ISScn628_25B.CSV". The change of the Navy consist from 5 to 6 is validated by examining the IS file and determining that, for those occasions when 6 Navy casks are available, the train consist is set to 6. The modification to change "Offset" values to calendar years is validated by examining the final column of the IS file, to determine if the values are in the appropriate calendar years. The change to disable tracking of high-criticality ("crit") assemblies

is validated by verifying that no “crit” assemblies are specified in the IS file. After examining the IS file, these changes are accepted.

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4. CONCLUSIONS

This document, in conjunction with the *Total System Model Version 6.0 Preprocessor Smoothing Algorithm Validation Report* (BSC 2007d) and *Total System Model Version 6.0 Preprocessor Work Order Algorithm Validation Report* (BSC 2007e), has validated each of the significant changes made during the migration from TSMPP Version 5 to TSMPP Version 6. In addition, a test has been made to verify that the changes made did not adversely affect the results, and that each change in the results was explainable.

As a result, TSMPP Version 6 is validated and is acceptable for use with TSM Version 6.

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5. REFERENCES

5.1 DOCUMENTS CITED

BSC 2005. *TSM System Study: Impact of a Canister-Based System on the CRWMS, Phase 1*. MIS-CRW-SE-000003 REV 00. Washington, DC: BSC. ACC: DOC.20051213.0001.

BSC 2007a. *User Manual for the Total System Model Version 5.0 Preprocessor*, 50040-UM-02-5.0-00, Washington, DC. BSC. ACC: DOC.20070427.0002.

BSC 2007b. *User Manual for the Total System Model Version 6.0 Preprocessor*, 50040-UM-02-6.0-00, Washington, DC. BSC. ACC: Submit to RPC.

BSC 2007c. *User Manual for the Total System Model Version 6.0*, 50040-UM-01-6.0-00, Washington, DC. BSC. ACC: Submit to RPC.

BSC 2007d. *Total System Model Version 6.0 Preprocessor Smoothing Algorithm Validation Report*, 50040-VAL-05-6.0-00, Washington, DC. BSC. ACC: Submit to RPC.

BSC 2007e. *Total System Model Version 6.0 Preprocessor Work Order Algorithm Validation Report*, 50040-VAL-04-6.0-00, Washington, DC. BSC. ACC: Submit to RPC.

CaS 2006. *SimCAD Process Simulator Users' Manual*, V 7.1, Chicago, Illinois. Create-a-Soft, January 2006. ACC: MOV.20071016.0003.

5.2 CODES, STANDARDS, REGULATIONS, AND PROCEDURES

AP-ENG-006 REV 1 ICN 0, *Total System Model (TSM) – Changes to Configuration Items and Base Case*. Washington, DC: BSC. ACC: Submit to RPC.

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6. ATTACHMENTS

The files in Table 3 are included electronically.

Table 3. Electronic Attachments

Files Name	Description	Size (MB)	Date
BaseComparisonResults.xls	Comparison of the Acceptance Report, detailed by Pool, from Version 5 and Version 6	99.7	9/26/2007
IS_DPCafter2025.xls	IS generated with option to accept DPCs only after 2025	31.0	9/18/2007
IS_ShutdownBefore2015.xls	IS generated with option to accept DPCs only from sites that have shutdown before 2015	18.7	9/19/2007
ISScn628_25B.xls	IS for Scenario 628, identified as 25B, with defaults	4.0	8/28/2007
V6DpcOptions.xls	Detailed CSNF storage report generated with each DPC acceptance option	1.0	9/13/2007
V6StorageReports.XLS	Detailed storage report generated for DOE SNF and HLW storage	0.02	9/26/2007
V6_DryAcceptanceOptions.XLS	Detailed CSNF storage report generated with each dry storage acceptance option	1.3	9/28/2007
TSMPP DB-V606b.mdb	Database for TSMPP Version 5	4.3	9/25/2007
TSMPP DB-V606b_wt.mdb	Database for TSMPP Version 5, modified to include realistic masses for DOE SNF cask loads	4.3	9/25/2007
TSMPP DB-V611c.mdb	Database for TSMPP Version 6	4.3	9/25/2007
TSMPP Ver5.exe	Executable for TSMPP Version 5	1.0	8/28/2007
TSMPP Ver6.exe	Executable for TSMPP Version 6	1.0	9/25/2007
TSMPP Ver6_mod.exe	Executable for modified TSMPP Version 6	1.0	9/25/2007

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