RETRAN-02 CODE TROUBLE REPORTS

R2-TRF-002, Revision 77
April 2024

Prepared for

RETRAN/VIPRE User Group

APPROVED BY:

Pam Richardson	4/18/24
Preparer	Date

Mike Howard	4/18/24
Project Manager	Date

Prepared by

Numerical Advisory Solutions, LLC
410 Memorial Dr., Suite 205
Idaho Falls, ID 83402

Released Date   4/18/24

RETRAN-02 MOD005.3 Trouble Report List

The following table summarizes the status of all trouble reports filed for RETRAN-02 since the release of MOD005.3. New trouble reports or those whose status have changed since the previous trouble report list was issued are identified with **bold** trouble report numbers.

The **Part 21 Status Codes** regarding relevance to 10CFR Part 21, *Reporting of Defects and Noncompliance*, are interpreted as follows;

    No, "not a safety issue"
    Yes, "potentially a substantial safety issue"
    Indeterminate, "indeterminate defect, which must be evaluated by licensee"

Code errors that are determined to pose a potential substantial safety issue are assigned a **Part 21 Status Code** of Yes and must be reported directly to the U.S. Nuclear Regulatory Commission. To date, no such error has been discovered in the RETRAN-02 code.

Indeterminate defects are assigned a **Part 21 Status Code** of Indeterminate. They must be evaluated by each organization using RETRAN-02 to determine whether or not the defect is reportable per the requirements of 10CFR21, based on the organization's use of the code version (or related version) identified above.

Copies of any preliminary modifications are available from Numerical Advisory Solutions, the RETRAN User Group Engineering Contractor. Please contact Mike Howard at (208) 419-4012 or Pam Richardson at (208) 419-4004; or via email at howardml@numerical.com or richardsonp@numerical.com, respectively.

  (1) **num**   bold indicates a new trouble report or an old one whose status changed since last report
  (2) ----   indicates the reported problem is not an error
       ****   indicates the reported problem has not been resolved
       num   indicates modification number or document and revision number for corrections

Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_461	The deck initializes just fine on MOD005.2, but encounters a lot of enthalpy errors and negative separation velocity messages with MOD005.3.	No	mod_420
tr_462	Steady-state initialization fails to converge in the vicinity of the first steamline volume for both loops. Two adjacent junctions in each steam header have equal but opposite acceleration pressure errors (1.7 x 10-2 psia). The volumes to which the junctions connect also have an energy imbalance (1.3 x 10-3 Btu/lb). An equal and opposite enthalpy error shows up in the volume where the enthalpy is input.	No	mod_421
tr_463	Steady-state initialization converges in 9 iterations but the initial indicated steam generator water level (cblk -143) is 60.9307% and does not remain constant after time 0. For MOD005.2.1, the indicated steam generator water level is 70.6937% as indicated by control block 143 (file OUTPUT 5.2).	No	mod_420
tr_464	Two input decks identified as "INPUT without add cards" and "INPUT with add cards." These input files create output files "OUTPUT without add cards" and "OUTPUT with add cards." These decks are being executed on WINDOWS 7 RETRAN02 Mod 5.3.1. The trip summary for each deck is provided below. The problem is without the add cards, trips 1, 595, 996, 997, 998 and 999 occur at 10 seconds as they should. With the add cards, the trip occurs 1.40471E-01 seconds later, which is the mystery. The change cards are the cards after the .END in the INPUT without add cards deck.	No	mod_422
tr_465	The problem was originally reported as an error in RETRAN-3D, but upon examination of the source code for RETRAN-02 the error was also determined to be present. The error occurs in subroutine statph. Some values in the PROP array may be carried over from previously processed volumes. This can result in differences between the steady state calculation and the transient calculation. In the problem filed with the RETRAN-3D trouble report, the error resulted in the use of an incorrect heat capacity that affected the heat transfer coefficients in a volume that used the local conditions model.

See Tr_547, and mod_493 of the RETRAN-3D project for more information. | No | mod_423 |

(1) **num**   bold indicates a new trouble report or an old one whose status changed since last report
(2) ----   indicates the reported problem is not an error
   ****   indicates the reported problem has not been resolved
   num   indicates modification number or document and revision number for corrections

Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_466	The problem was originally reported as tr_551 in the RETRAN-3D, but upon examination of the source code for RETRAN-02 the error was also determined to be present. The wrong density is used for the drive nozzle term. The code uses the mixing plain value rather than the drive junction value. For most single phase situations, the two densities are nearly the same. Under two-phase conditions they two values become different. These conditions typically are not encountered for Chapter 15 analyses. See Tr_551, and mod_487of the RETRAN-3D project for more information.	No	mod_424
tr_467	The problem was originally reported as an error in RETRAN-3D, but upon examination of the source code for RETRAN-02 the error was also determined to be present. When the local conditions model is used; RETRAN calculates local temperatures and qualities for a conductor based on the conductor elevation. When the mixture level resides at the conductor, the overall heat flux is calculated by using a weighted sum of the flux calculated at the conductor elevation and the flux calculated for the conductor either above or below depending on where the level resides with respect to the conductor elevation. This method contains several errors and limitations. 1.The temperature of the conductor is never updated using the weighted flux, instead the conductor temperature is calculated as if the conductor were completely covered by whatever conditions exist at the conductor elevation. 2.In some cases such as a steam generator, the flux of different conductors in a stack can vary significantly, even if they are all covered by the same phase. In such instances, using the flux of another conductor in a stack to obtain a weighted flux for a partially covered conductor may result in unrealistic spikes or dips in the heat flux when the level passes to a different conductor in the stack. See Tr_560 of the RETRAN-3D project for more information.	No	
tr_468	The spray line junction enthalpy instantaneously drops to -11419.35 btu/lbm over a single time step, causing code failure. The error is driven by an anomalous junction kinetic energy calculation driven by an extremely large velocity, which is caused by the spray line junction area control system giving a very small value (~1.0E-6).	No	

Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_469	The problem was originally reported as an error for RETRAN-3D as TR_661. Upon examination of the source code, some of the errors also exist in RETRAN-02. The index error and dryout edit were introduced during the Fortran 95 conversion and are not present in RETRAN-02. The following problems were observed with RETRAN-3D (reported in TR-661), but no attempt has been made to reproduce them with RETRAN-02. When using the two-region enthalpy transport model, there are occasional spikes in the secondary side temperature which greatly exceed the primary side temperature. Additionally, there is an extended period of time when there are two mixture levels predicted in one SG. These errors result in the junction enthalpy exceeding the volume enthalpy once the dryout occurs in the secondary side. A review of the source code identified the errors listed below. •A few HT area and heat transfer coefficient terms use the left side index instead of the right side. •The coefficient for the dryout length for functions related to the heat conduction and heat transfer coefficients include the time-step size as a multiplier. •In the calculation of one of the functions, the dryout length 'l2' is used instead of (1-l2). •Incorrect coefficients for function F6 (auxiliary region enthalpy equation). •Dryout point is always edited as 0.5, whenever dryout occurs. Errors were also observed in the two-region enthalpy transport model documentation.	No	
tr_470	When running a restart problem from time 0, there may be differences in results even when nothing is changed. In the input provided, incorrect separator constants were saved to the restart file. (RETRAN-3D TR-706) The differences in RETRAN-02 are trivial, but greater than expected.	No	
tr_471	The general transport, DNB, and kinetics models are initialized after the control systems in the steady state solution. As a result, any control inputs which use variables from these models are zero on the first time step (regardless of actual value). This is analogous to RETRAN-3D TR-733.	No	

(1) **num** bold indicates a new trouble report or an old one whose status changed since last report
(2) ---- indicates the reported problem is not an error
    **** indicates the reported problem has not been resolved
    num indicates modification number or document and revision number for corrections

Trouble Report Number: tr_461

Reported By: Nathan Huffman, Duke   **Date:** 3 /7 /2013

Reported To: Mark Paulsen   **Date:** 3/7/2013

Program Version: RETRAN-02 MOD005.3   **Computer/Operating System:** All

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

The input deck models a steam generator tube rupture for the Catawba nuclear station.

Description of Problem:

The deck initializes just fine on MOD005.2, but encounters a lot of enthalpy errors and negative separation velocity messages with MOD005.3.

Impact of Error on Current and Previous Code Versions:

MOD005.3

Modeling Alternatives:

There are no alternatives.

Modification Number or Resolution:

mod 420

Originator Notification:

User Notified: Yes   **Method of Contact:** Email

Notified By: Mark Paulsen   **Date:** 6/14/2013

Trouble Report Disposition:

Determined By: Mark Paulsen   **Closure/Discovery Date:** 3/11/2013

Deviation Evalaution: Major

Reason for Determination:

Steady-state initialization fails to converge. The largest enthalpy error is 2 x 10-4 btu/lb and the largest acceleration pressure is 4 x 10-6 psia, both of which are not significantly large, but they are larger than normal.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The steady-state nonconvergence errors are relatively small and will not have a significant effect on the transient solution.

| **Determined By:** | Mark Paulsen | **Date:** | 3/11/2013 |

Numerical Advisory Solutions, LLC

RETRAN-02 Software Trouble Report

Trouble Report Number: tr_462

Reported By: Mark Paulsen   **Date:**   6 /13/2013

Reported To: Mark Paulsen   **Date:**   6/13/2013

Program Version: RETRAN-02 MOD005.2.1   **Computer/Operating System:**   All

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

The input deck models a hot zero power steamline break for the McGuire/Catawba nuclear stations. The model lumps 3 loops into a composite loop so the model has 2 loops.

Description of Problem:

Steady-state initialization fails to converge in the vicinity of the first steamline volume for both loops. Two adjacent junctions in each steam header have equal but opposite acceleration pressure errors (1.7 x 10-2 psia). The volumes to which the junctions connect also have an energy imbalance (1.3 x 10-3 Btu/lb). An equal and opposite enthalpy error shows up in the volume where the enthalpy is input.

Impact of Error on Current and Previous Code Versions:

All

Modeling Alternatives:

There are no alternatives.

Modification Number or Resolution:

mod 421

Originator Notification:

User Notified: Yes   **Method of Contact:**   Self

Notified By: **Date:**

Trouble Report Disposition:

Determined By: Mark Paulsen   **Closure/Discovery Date:**   6/13/2013

Deviation Evalaution: Major

Reason for Determination:

Steady-state initialization fails to converge. The largest enthalpy error is 1.3 x 10-3 btu/lb and the largest acceleration pressure is 1.7 x 10-2 psia, both of which are not significantly large, but they are larger than normal. These convergence errors will not affect the results for a steamline break.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The steady-state nonconvergence errors are relatively small and will not have a significant effect on the transient solution.

Determined By: Mark Paulsen   *Date:*   6/14/2013

Numerical Advisory Solutions, LLC
RETRAN-02 Software Trouble Report

Trouble Report Number: tr_463

Reported By: Charlie Albury, STP   **Date:**   6 /18/2013

Reported To: Mark Paulsen   **Date:**   6/18/2013

Program Version: RETRAN-02 MOD005.3   **Computer/Operating System:**   All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

The input deck is a four-loop model of the South Texas Project generating station.

Description of Problem:

Steady-state initialization converges in 9 iterations but the initial indicated steam generator water level (cblk -143) is 60.9307% and does not remain constant after time 0. For MOD005.2.1, the indicated steam generator water level is 70.6937% as indicated by control block 143 (file OUTPUT 5.2).

Impact of Error on Current and Previous Code Versions:

MOD005.3

Modeling Alternatives:

There are no alternatives.

Modification Number or Resolution:

mod 420

Originator Notification:

User Notified: Yes   **Method of Contact:**   Email

Notified By: Mark Paulsen   **Date:**   6/18/2013

Trouble Report Disposition:

Determined By: Mark Paulsen   **Closure/Discovery Date:**   6/13/2013

Deviation Evalaution: Major

Reason for Determination:

The initial indicated level is representative of the water mass in the steam generator secondary. This has a significant effect on most transient results.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The indicated level is a parameter that users review and confirm that it matches known target values. They often make adjustments to bring the level into agreement with the known target value. Since the initial indicated water level was ~14% lower MOD005.3 than for MOD005.2.1 the user suspected a code

error.

Determined By: Mark Paulsen   ***Date:***   6/13/2013

Numerical Advisory Solutions, LLC
RETRAN-02 Software Trouble Report

Trouble Report Number: tr_464

Reported By: Charles Albury, STP   **Date:**   4 /11/2014

Reported To: Mark Paulsen   **Date:**   4/11/2014

Program Version: RETRAN-02 MOD005.3.1   **Computer/Operating System:**   PC/Windows 7

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

The input model is STPs four loop model for STPEGS.

Description of Problem:

Two input decks identified as "INPUT without add cards" and "INPUT with add cards." These input files create output files "OUTPUT without add cards" and "OUTPUT with add cards." These decks are being executed on WINDOWS 7 RETRAN02 Mod 5.3.1. The trip summary for each deck is provided below. The problem is without the add cards, trips 1, 595, 996, 997, 998 and 999 occur at 10 seconds as they should. With the add cards, the trip occurs 1.40471E-01 seconds later, which is the mystery. The change cards are the cards after the .END in the INPUT without add cards deck.

Impact of Error on Current and Previous Code Versions:

All

Modeling Alternatives:

The problem rarely occurs. It might be possible to set the end problem trip 1.0d-6 seconds less than the desired end value. For example, the end problem trip time could be set to 9.999999 seconds rather than 10.0.

Modification Number or Resolution:

mod 422

Originator Notification:

User Notified: Yes   **Method of Contact:**   Email

Notified By: Mark Paulsen   **Date:**   4/18/2014

Trouble Report Disposition:

Determined By: Mark Paulsen   **Closure/Discovery Date:**   4/21/2014

Deviation Evalaution: Minor

Reason for Determination:

When the additional cards are added to the input deck, they result in slightly different time-step sizes being used when compared with the original run. As the elapsed time approaches 10.0 seconds, round off has resulted in the elapsed time being ~1.d-7 seconds less than 10.0 seconds. This results in the end problem trip not being activated and another time-step with a size of 0.04047 being taken. This puts the elapsed time beyond the trip time of 10.0 seconds so the problem terminates with an end problem trip at 10.04047 seconds.

The TRIP summary shown in the "OUTPUT with add cards" file shows the end problem trip time is 10.04047 seconds. It also shows a time of 10.04047 seconds for related time trips. All of the results in the output edits are for 10.04047 seconds and are slightly different than those for the base case (without added cards) because the elapsed time is 0.04047 seconds larger. Had an output major and minor edit been made one time step sooner, the results would have been essentially the same for the two cases.

The failure to end at 10.0 seconds in an error, but it is benign in nature and does not produce incorrect result.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Insignificant Error

Determined By: Mark Paulsen   **Date:**   4/18/2014

Numerical Advisory Solutions, LLC
RETRAN-02 Software Trouble Report

Trouble Report Number: tr_465

Reported By: Andrew Baker, CSA   **Date:**   9 /30/2014

Reported To: Mark Paulsen   **Date:**   9/30/2014

Program Version: RETRAN-02 MOD005.3.1   **Computer/Operating System:**   Windows &

Listing Supplied: No

Input File Supplied: No

Input Model Description:

NA

Description of Problem:

The problem was originally reported as an error in RETRAN-3D, but upon examination of the source code for RETRAN-02 the error was also determined to be present. The error occurs in subroutine statph. Some values in the PROP array may be carried over from previously processed volumes. This can result in differences between the steady state calculation and the transient calculation. In the problem filed with the RETRAN-3D trouble report, the error resulted in the use of an incorrect heat capacity that affected the heat transfer coefficients in a volume that used the local conditions model.

See Tr_547, and mod_493 of the RETRAN-3D project for more information.

Impact of Error on Current and Previous Code Versions:

All

Modeling Alternatives:

Run a null transient.

Modification Number or Resolution:

mod 423

Originator Notification:

User Notified: Yes   **Method of Contact:**   Self

Notified By: Andrew Baker   **Date:**   9/30/2014

Trouble Report Disposition:

Determined By: Mark Paulsen   **Closure/Discovery Date:**   9/30/2014

Deviation Evalaution: Major

Reason for Determination:

There is an obvious difference between the steady state and transient for affected volumes as the affected parameters show an immediate change in the first time step.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

This error only occurs for steady-state and should not significantly impact the transient results. By following recommended practice of running a null transient following steady-state the problem would be identified by an experienced user.

Determined By: Mark Paulsen   ***Date:***   10/8/2014

Trouble Report Number: tr_466

Reported By: Andrew Baker, CSA   **Date:**   9 /30/2014

Reported To: Mark Paulsen   **Date:**   9/30/2014

Program Version: RETRAN-02 MOD005.3.1   **Computer/Operating System:**   Windows 7

Listing Supplied: No

Input File Supplied: No

Input Model Description:

    NA

Description of Problem:

    The problem was originally reported as tr_551 in the RETRAN-3D, but upon examination of the source code for RETRAN-02 the error was also determined to be present. The wrong density is used for the drive nozzle term. The code uses the mixing plain value rather than the drive junction value. For most single phase situations, the two densities are nearly the same. Under two-phase conditions they two values become different. These conditions typically are not encountered for Chapter 15 analyses.

    See Tr_551, and mod_487of the RETRAN-3D project for more information.

Impact of Error on Current and Previous Code Versions:

    All

Modeling Alternatives:

    None – The error has minimal effect unless jet pump is two-phase.

Modification Number or Resolution:

    mod 424

Originator Notification:

    User Notified: Yes   **Method of Contact:**   Self

    Notified By: Andrew Baker   **Date:**   9/30/2014

Trouble Report Disposition:

    Determined By: Mark Paulsen   **Closure/Discovery Date:**   9/30/2014

    Deviation Evalaution: Major

    Reason for Determination:

The error causes the flow and pressure to be in error. The error appears to have a positive feedback that causes the flows to accelerate and drain the volume, causing the pressure search failure.

This error is negligible until the diffuser volume becomes highly voided, so it will not have a significant affect for BWR Chapter 15 transients.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The error results in a code failure with anomalous drive and suction flows in the intact recirculation loop. It had no effect on the BWR sample problem results as expected.

Determined By: Mark Paulsen   **Date:**   10/8/2014

Trouble Report Number: tr_467

Reported By: Andrew Baker, CSA   **Date:**   9 /30/2014

Reported To: Mark Paulsen   **Date:**   9/30/2014

Program Version: RETRAN-02 MOD005.3.1   **Computer/Operating System:**   Windows 7

Listing Supplied: No

Input File Supplied: No

Input Model Description:

　　　NA

Description of Problem:

　　　The problem was originally reported as an error in RETRAN-3D, but upon examination of the source code for RETRAN-02 the error was also determined to be present.

　　　When the local conditions model is used; RETRAN calculates local temperatures and qualities for a conductor based on the conductor elevation. When the mixture level resides at the conductor, the overall heat flux is calculated by using a weighted sum of the flux calculated at the conductor elevation and the flux calculated for the conductor either above or below depending on where the level resides with respect to the conductor elevation.   This method contains several errors and limitations.
1.The temperature of the conductor is never updated using the weighted flux, instead the conductor temperature is calculated as if the conductor were completely covered by whatever conditions exist at the conductor elevation.
2.In some cases such as a steam generator, the flux of different conductors in a stack can vary significantly, even if they are all covered by the same phase. In such instances, using the flux of another conductor in a stack to obtain a weighted flux for a partially covered conductor may result in unrealistic spikes or dips in the heat flux when the level passes to a different conductor in the stack.

　　　See Tr_560 of the RETRAN-3D project for more information.

Impact of Error on Current and Previous Code Versions:

　　　All

Modeling Alternatives:

　　　Use additional conductors in the stack to minimize the effects of this error.

Modification Number or Resolution:

Originator Notification:

　　　User Notified: Yes   **Method of Contact:**   Self

　　　Notified By: Andrew Baker   **Date:**   9/30/2014

Trouble Report Disposition:

　　　Determined By: Mark Paulsen   **Closure/Discovery Date:**   9/30/2014

　　　Deviation Evalaution: Major

Reason for Determination:

The error causes incorrect heat transfer to be calculated at the conductor where the mixture level resides when the local conditions model is used.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The error is due to a modeling technique not used for Chapter 15 or plant support input models. It is unique to ELAP modeling where the vessel head metal mass is needed to account for heat transfer to the liquid and vapor space in the upper head during very long term transients. Since the energy from the upper vessel head heat conductor isn't being transferred to the vapor space, the pressure may be under predicted between 17 and 22 hours, but overall should not significantly affect the results. No submittal has been made with this error. The modeling technique used with RETRAN-3D is unlikely to be used with RETRAN-02.

Determined By: Mark Paulsen   ***Date:***   10/15/2014

Trouble Report Number: tr_468

Reported By: Christy Ray, Duke   **Date:**   6 /3 /2016

Reported To: Mark Paulsen   **Date:**   6/3/2016

Program Version: RETRAN-02 MOD005.3   **Computer/Operating System:**   PC/Windows 7

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

CNS plant model.

Description of Problem:

The spray line junction enthalpy instantaneously drops to -11419.35 btu/lbm over a single time step, causing code failure. The error is driven by an anomalous junction kinetic energy calculation driven by an extremely large velocity, which is caused by the spray line junction area control system giving a very small value (~1.0E-6).

Impact of Error on Current and Previous Code Versions:

All previous

Modeling Alternatives:

Add additional control system logic which prevents extremely small values for the junction area. This effectively retains desired valve functionality, but prevents large spikes in the junction KE from being calculated.

Modification Number or Resolution:

Originator Notification:

User Notified: Yes   **Method of Contact:**   Email

Notified By: Jake Westacott   **Date:**   6/3/2016

Trouble Report Disposition:

Determined By: Mark Paulsen   **Closure/Discovery Date:**   6/3/2016

Deviation Evalaution: Minor

Reason for Determination:

The control system computed a very small area that resulted in a large velocity and kinetic energy. As a result, a negative junction enthalpy was computed and the code failed. It could be possible that a larger area (but small) could give a large kinetic energy, but small enough that the enthalpy remained within range. Such an occurrence should only last 1 or 2 time-steps and the flow should reduce consistent with the area. Overall, this would not significantly affect the results. This problem can occur when valves open or close.

10CFR Part 21 Evaluation:

Numerical Advisory Solutions, LLC

RETRAN-02 Software Trouble Report

Reportable Defect: No

Reason for Determination:

Insignificant Error

Determined By: Mark Paulsen **Date:** 6/3/2016

Trouble Report Number: tr_469

Reported By: Phillip Gorman, ZNE   **Date:**   4 /4 /2018

Reported To: Mark Paulsen   **Date:**   4/4/2018

Program Version: RETRAN-02 MOD005.3.1   **Computer/Operating System:**   Windows 7

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

> Feedring SG test case for the two-region enthalpy transport model

Description of Problem:

> The problem was originally reported as an error for RETRAN-3D as TR_661. Upon examination of the source code, some of the errors also exist in RETRAN-02. The index error and dryout edit were introduced during the Fortran 95 conversion and are not present in RETRAN-02.

> The following problems were observed with RETRAN-3D (reported in TR-661), but no attempt has been made to reproduce them with RETRAN-02.

> When using the two-region enthalpy transport model, there are occasional spikes in the secondary side temperature which greatly exceed the primary side temperature. Additionally, there is an extended period of time when there are two mixture levels predicted in one SG. These errors result in the junction enthalpy exceeding the volume enthalpy once the dryout occurs in the secondary side.

> A review of the source code identified the errors listed below.

> •A few HT area and heat transfer coefficient terms use the left side index instead of the right side.
> •The coefficient for the dryout length for functions related to the heat conduction and heat transfer coefficients include the time-step size as a multiplier.
> •In the calculation of one of the functions, the dryout length 'l2' is used instead of (1-l2).
> •Incorrect coefficients for function F6 (auxiliary region enthalpy equation).
> •Dryout point is always edited as 0.5, whenever dryout occurs.

> Errors were also observed in the two-region enthalpy transport model documentation.

Impact of Error on Current and Previous Code Versions:

> None

Modeling Alternatives:

> None

Modification Number or Resolution:

Originator Notification:

> **User Notified:**   Yes   **Method of Contact:**   Self

> **Notified By:**   Phillip Gorman   **Date:**   4/4/2018

Trouble Report Disposition:

Determined By: Phillip Gorman   **Closure/Discovery Date:**   4/4/2018

Deviation Evalaution: Major

Reason for Determination:

The two-region enthalpy transport model could result in junction enthalpy higher than the associated volume enthalpy.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Two-region enthalpy transport model has not been reviewed by NRC. As such experienced user would be able to recognize the abnormal spikes in the temperature and higher junction enthalpy compared to the associated volume enthalpy.

Determined By: Mike Howard   **Date:**   4/9/2018

Trouble Report Number: tr_470

Reported By: Phillip Gorman (ZNE)   **Date:**   2021 8:34:45 AM

Reported To: Phillip Gorman   **Date:**   6/21/2021

Program Version: RETRAN-02 MOD005.3.1   **Computer/Operating System:**   Linux RHEL

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

ttwob sample problem (described in V3). The restart starts from 0.2 seconds and changes nothing.

Description of Problem:

When running a restart problem from time 0, there may be differences in results even when nothing is changed. In the input provided, incorrect separator constants were saved to the restart file. (RETRAN-3D TR-706) The differences in RETRAN-02 are trivial, but greater than expected.

Impact of Error on Current and Previous Code Versions:

All

Modeling Alternatives:

Don't use the restart feature if the separator perfomance model is used; otherwise, there is no modeling alternative.

Modification Number or Resolution:

Originator Notification:

User Notified: Yes   **Method of Contact:**   Self

Notified By: Phillip Gorman   **Date:**   6/21/2021

Trouble Report Disposition:

Determined By: Phillip Gorman   **Closure/Discovery Date:**

Deviation Evalaution: Major

Reason for Determination:

The separator perfomance normalization constants determined during steady-state initialization are not saved in the restart file. As a result, the carryover and carryunder normalization constants are incorrect after restart which changes the carryover and carryunder values from those of the original run.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Although the error results in an impact to results, the error would result in a step change in the separator

conditions and in the steam system. Therefore, appearance of the error would be directly appearant to the analyst at the point of the restart due to a step change in PWR secondary and BWR steam conditions.

Determined By: Mike Howard   ***Date:***   6/25/2021

Trouble Report Number: tr_471

Reported By: Phil Gorman   **Date:**   2022 8:25:09 AM

Reported To: Phillip Gorman   **Date:**   6/13/2022

Program Version: MOD002.5.1   **Computer/Operating System:**   All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Source code review ststat.f90

Description of Problem:

The general transport, DNB, and kinetics models are initialized after the control systems in the steady state solution. As a result, any control inputs which use variables from these models are zero on the first time step (regardless of actual value). This is analogous to RETRAN-3D TR-733.

Impact of Error on Current and Previous Code Versions:

All

Modeling Alternatives:

None

Modification Number or Resolution:

Originator Notification:

User Notified: Yes   **Method of Contact:**   self

Notified By: Phillip Gorman   **Date:**   6/13/2022

Trouble Report Disposition:

Determined By: Phillip Gorman   **Closure/Discovery Date:**   6/13/2022

Deviation Evalaution: Major

Reason for Determination:

This can change the solution in the first time step, which meets the definition of a major deviation.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Only affects steady state initialization/first time step. Any jump in the first time step is obvious, and if it impacts results, it should be obvious during a null transeint.

Determined By: Mike Howard   **Date:**   6/14/2022