SAND2019-13348PE

SNAP MELCOR Input Examples

PRESENTED BY

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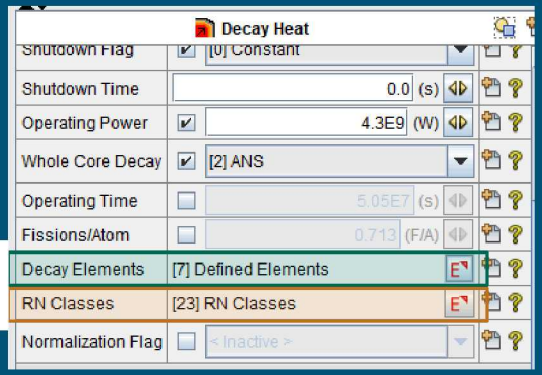
Objectives of Presentation

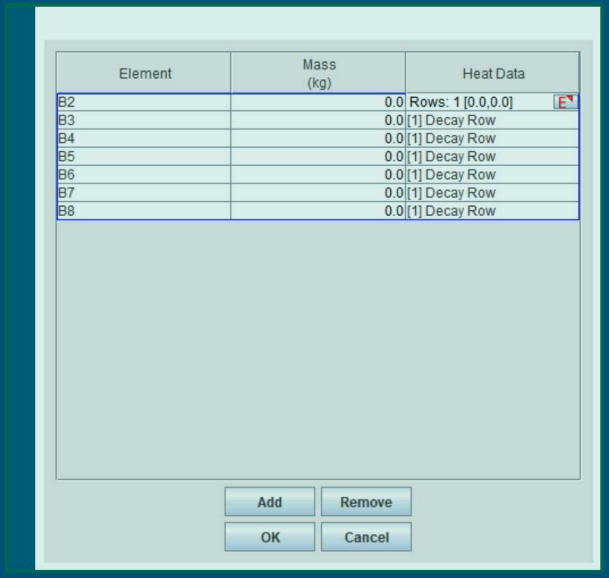
- Provide a review of the SNAP GUI for editing model input
  - Discuss layout of input
  - Provide comparisons with text input
- Unique Considerations for SNAP Input
  - Working with tabular input
  - Making Connections
  - Working with Database Variables
  - Sensitivity Coefficients
  - Comments and Notes

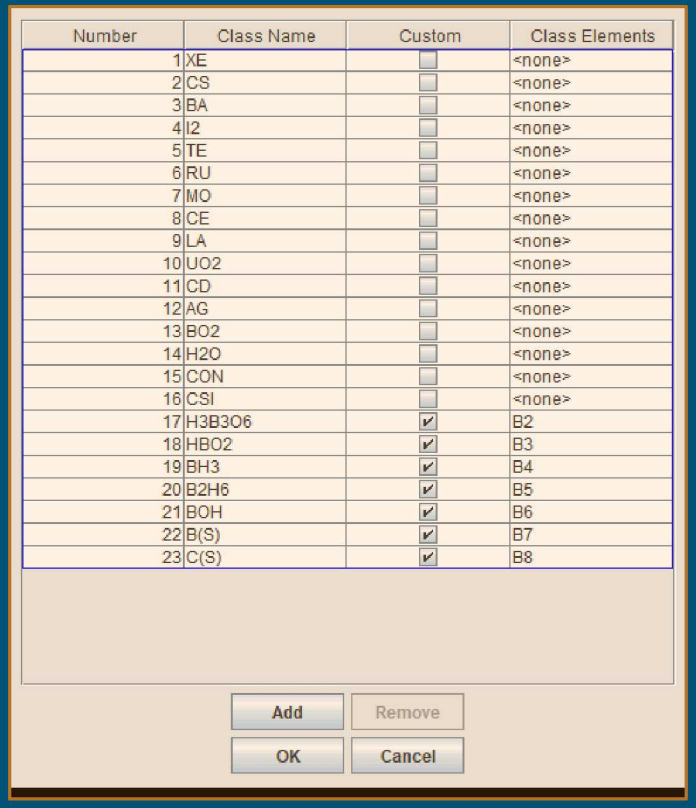
NCG Input

SNAP

RN Classes should be defined before Decay Elements





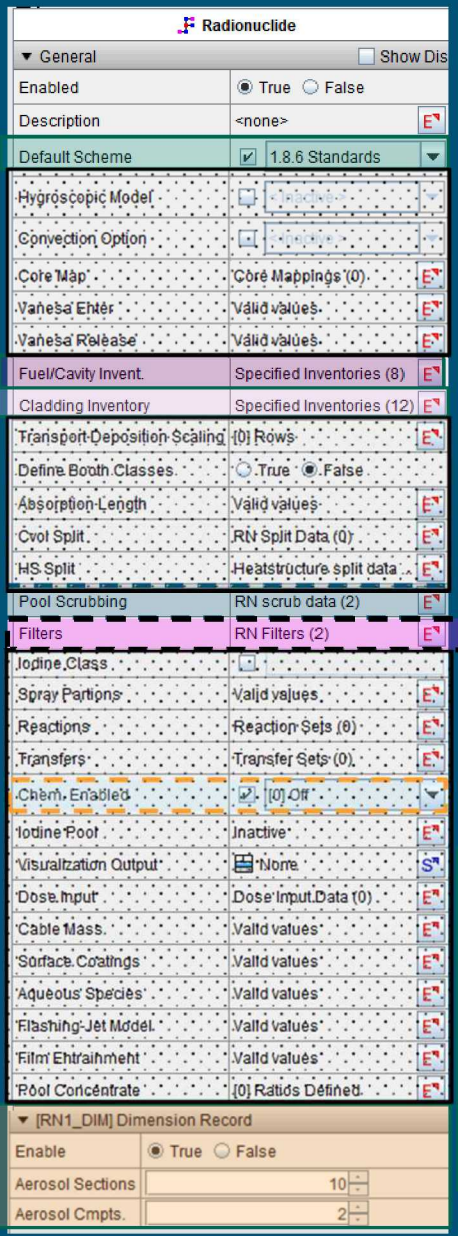


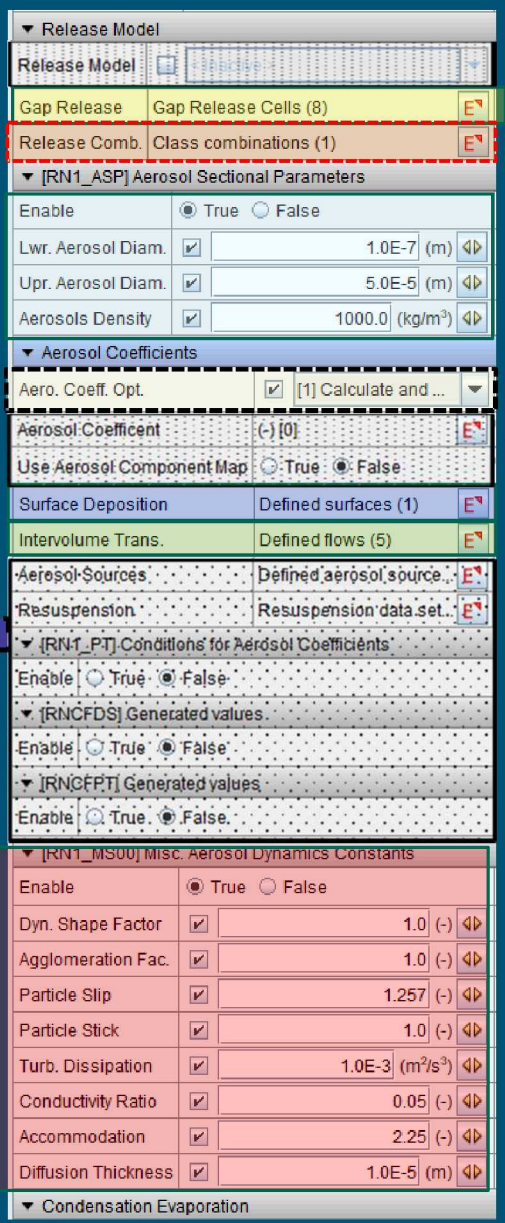
ASCII

```
DCH_CL  'CS'    DEFAULT
DCH_CL  'BA'    DEFAULT
DCH_CL  'I2'    DEFAULT
DCH_CL  'TE'    DEFAULT
DCH_CL  'RU'    DEFAULT
DCH_CL  'MO'    DEFAULT
DCH_CL  'CE'    DEFAULT
DCH_CL  'LA'    DEFAULT
DCH_CL  'UO2'   DEFAULT
DCH_CL  'CD'    DEFAULT
DCH_CL  'AG'    DEFAULT
DCH_CL  'BO2'   DEFAULT
DCH_CL  'H2O'   DEFAULT
DCH_CL  'CON'   DEFAULT
DCH_CL  'CSI'   DEFAULT
DCH_CL  'H3B3O6'    USER    1 !n        clselm
                                  1         'B2'
DCH_CL  'HBO2'    USER    1 !n        clselm
                                  1         'B3'
DCH_CL   'BH3'    USER    1 !n        clselm
                                  1         'B4'
DCH_CL  'B2H6'    USER    1 !n        clselm
                                  1         'B5'
DCH_CL   'BOH'    USER    1 !n        clselm
                                  1         'B6'
DCH_CL  'B(S)'    USER    1 !n        clselm
                                  1         'B7'
DCH_CL  'C(S)'    USER    1 !n        clselm
                                  1         'B8'
DCH_EL    'B2'    0.0     1 !n        time        dcheat
                                  1         0.0         0.0
DCH_EL    'B3'    0.0     1 !n        time        dcheat
                                  1         0.0         0.0
DCH_EL    'B4'    0.0     1 !n        time        dcheat
                                  1         0.0         0.0
DCH_EL    'B5'    0.0     1 !n        time        dcheat
                                  1         0.0         0.0
DCH_EL    'B6'    0.0     1 !n        time        dcheat
```

RN1 and RN2 Input Combined in SNAP and ASCII

SNAP



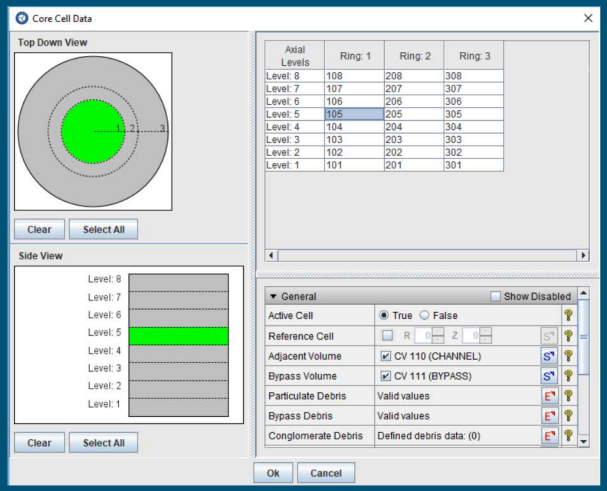


ASCII

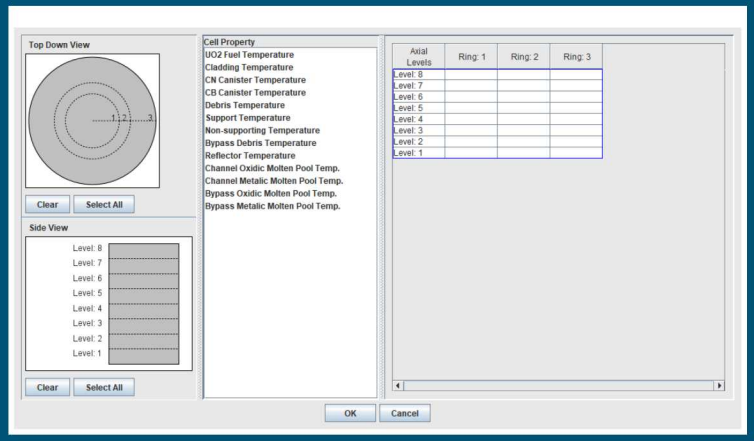
```
RN1_INPUT                0
RN1_DFT                1.86
!                   numsec          numcmp          numcls          numca
RN1_DIM                 10               2              23               6
!                   iclnrm
RN1_DCHNORM           NONE
RN1_FPN     8 !()n ir ia ninp irref iarref rinp1 rinp2
RN1_GAP    12 !( n ir ia  ninp irref iarref  rinp1 rinp2
RN1_GAP00   8 !(n             ir             ia         clfail
RN1_CLS  'CsI' 'CSI'    2 !(n          nclsd          xmrat
!                   dmin            dmax          rhonom
RN1_ASP          1.0E-7          5.0E-5          1000.0
!                  icoeff
RN1_ACOEF       CALANDWR
!                     chi           gamma           fslip           stick
RN1_MS00            1.0             1.0           1.257             1.0
!                     chi           gamma           fslip           stick
RN1_MS01          1.0E-3            0.05            2.25          1.0E-5
RN1_DS      1 !(n                ids             isde             ityp
RN1_SET     5 !(n          ivolf           ivolt             elev              are
!                   icaon
RN1_CAF               OFF
RN2_INPUT
RN2_PLS     2 !(n fpcav          name   avent mvent nvent ntyp
!                  fltnam        flttfp     ctype  ikey     gdf xmasg     icvtyp
RN2_FLT   FIL1-CONTVENT 'CONT VENT' AEROSOL VALUE 1000.0  -1.0 'FILTERS'
RN2_FLT   FIL2-CONTVENT 'CONT VENT' FPVAPOR VALUE 1000.0  -1.0 'FILTERS'
RN2_FCL     1 !(n            iclss             ikey              dfc             xmas
!                     age          xmbedi          dhrels          specht
RN2_FVC             0.0          827.35             1.0          711.78
```

COR Package Utilizes Similar Interface for Cell Data

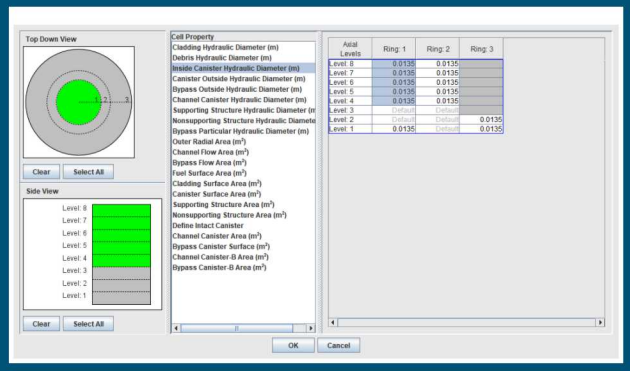
Cell Properties



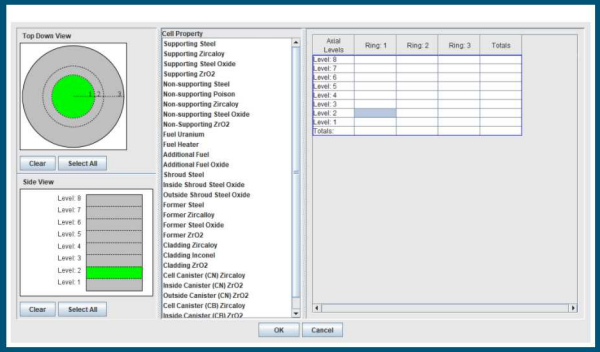
Initial Temperatures



Areas/Hydraulic Diameter



Material Masses



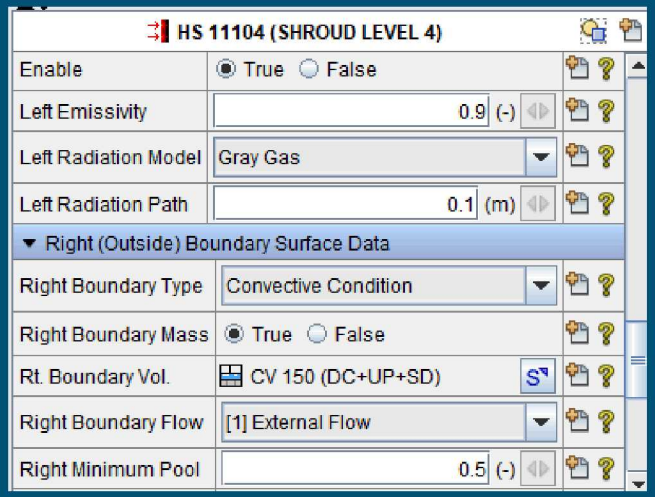
Tabular Input

Implemented as Table

- Tabular Function
- COR Axial Elevations
- COR Radial Rings
- Most COR Cell data
  - Examples
    - Component Material Masses, Surface Areas, Temperatures, hydraulic diameters, flow areas, Cell Radial Ring areas
    - Gap Release Temperatures
  - Exceptions
    - volumes associated with COR cells
    - PD material masses in channel and bypass
    - Core Blockage Cells
  - Additional Heat sources
  - Cladding/Canister/Fuel/Blade Collapse control functions
- CVH Volume Altitude tables
- DCH Elements
- RN Classes
- HS nodalizations
- Concrete Composition
- CAV geometry points

Not Implemented as Table

- RN Gap Inventories
- RN Fuel Cavity Inventories
- NCGs
- Material Properties
  - However, MPs can receive data from Tabular Functions defined in the databse
- Object information is implemented for each object. Does not allow editing a table of objects like CVs or HSs
  - CV initial conditions
  - HS Boundary volumes and conditions



Use of MS EXCEL

Though SNAP utilizes tables, it is not a spreadsheet. Depending on the table, SNAP has only the most basic functional capabilities of a spreadsheet.

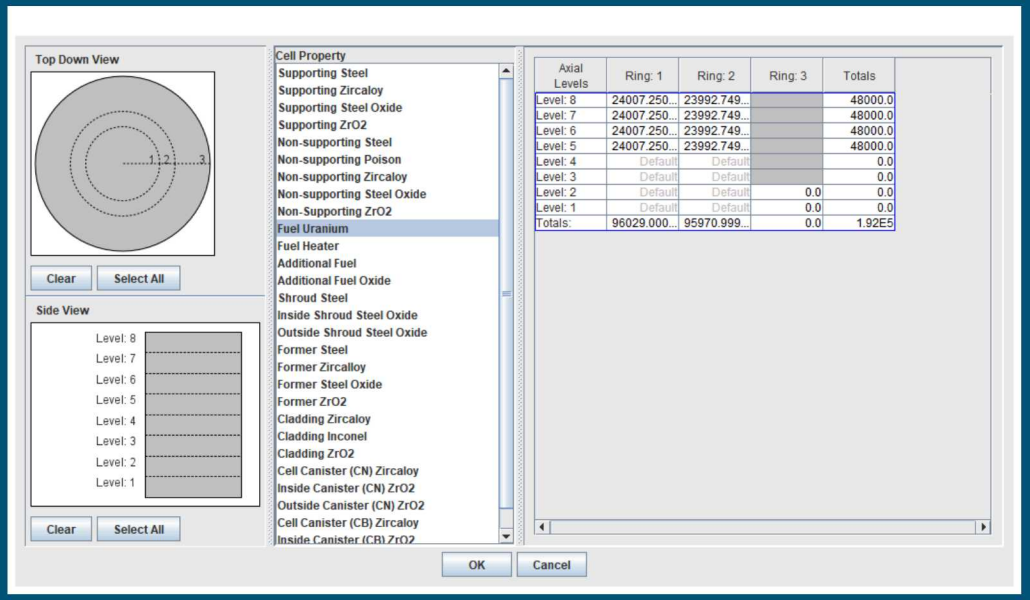
However, as an alternative, companion EXCEL spreadsheets can be used to create workbooks for calculating and documenting table entries.

Many, but not all of SNAP's tables can utilize cut-and-paste data from an EXCEL spreadsheet.

Component	Mass	Area
Fuel Rods		6640
UO2 fuel	192000	
Clad		7840
Zr clad	40960	
Canister		
CN (Zr)	11840	880
CB (Zr)	11840	880
Control Blades		800
Steel	10000	
B4C	1000	
Core Plate		20
Steel	5000	
CRGT		1200
Steel	80000	

NRINGS 3
NAXL 8
RVLH 4
ZLHT 5
Show Volume

			2	2.828	4
			1	2	3
10	8	24007.25	23992.75	0	
9	7	24007.25	23992.75	0	
8	6	24007.25	23992.75	0	
7	5	24007.25	23992.75	0	
6	4	0	0	0	
5.9	3	0	0	0	
5	2	0	0	0	
2.95	1	0	0	0	



Making Connections

Connections are made graphically from objects on a view window using the connection tool

- Cannot be made from Connections dropdown (right)
- Can be made from flow path, spray or control function menus

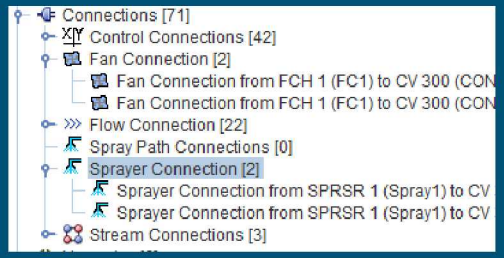
Connection types

- Flow Paths
  - Connects control volumes
- Fan Connections
  - Connects inlet and outlet control volumes to fan cooler
- Spray Connections
  - Connects source pool and target CV for spray
- Spray Path Connections
  - Connects multiple spray paths
- Control Functions
  - Connections to other control functions or control function arguments

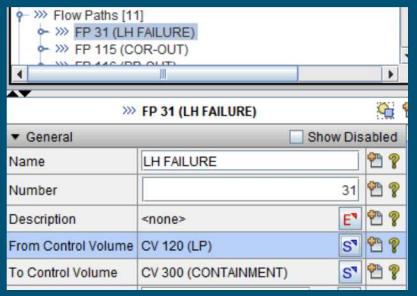
Graphical Connections

- User first drags associated connected objects (control volumes) and connections (Flow paths, sprays, Fan connections, spray paths) into view
- Click on connection tool and cursor changes to cross-hair 
  - Blue dot appears on connection 'cross-hairs' when node is detected and connection can be made
- User assigns node connections.
  - Connection node indicates input/output
  - Selection of object node is generally not important
    - SNAP adjusts connection node to correspond to elevations specified through other input.

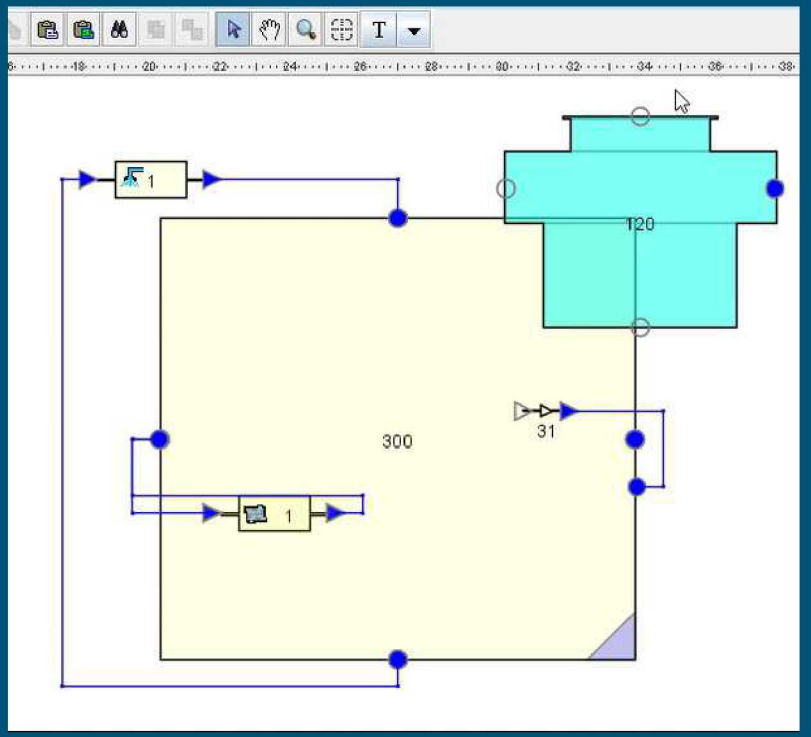
Connection cannot be made from Connections Menu



Connection can be made from Flow Paths, Sprays, and Fan Cooler Menu



Connection can be made graphically



Database Variables

Control Function arguments must be added to Database Variables before they can be used for input.

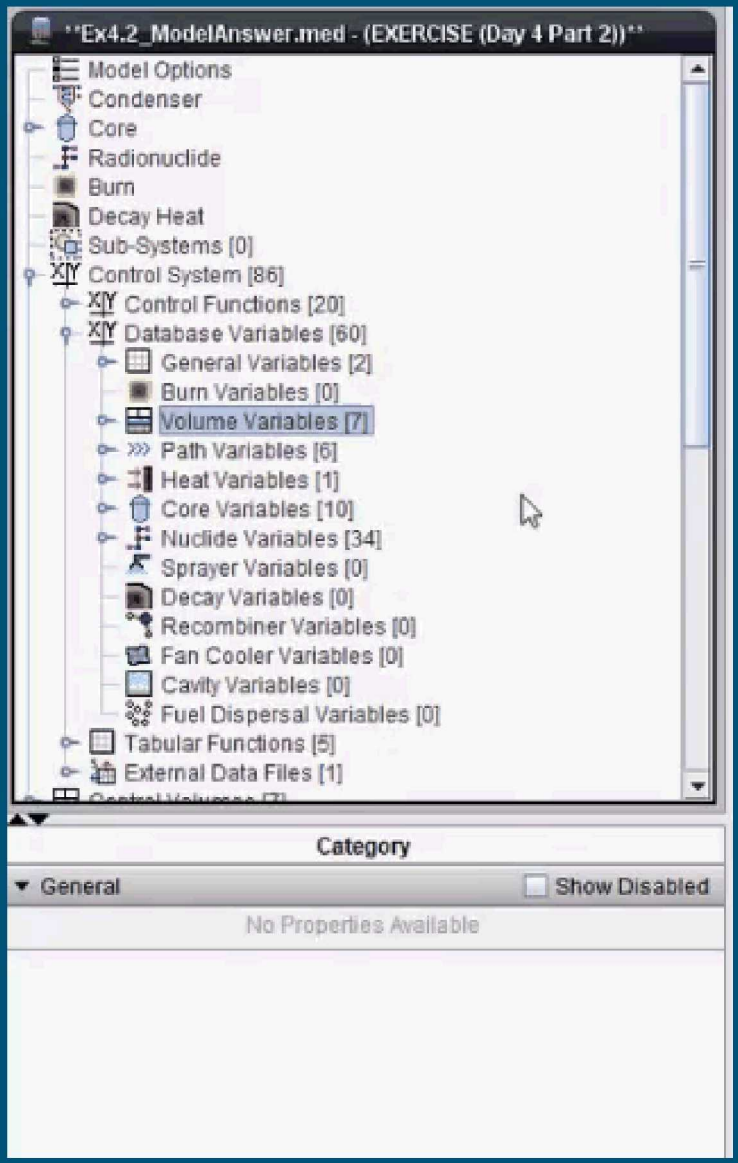
Used as input to control functions

Control Function arguments are organized by package

- General Variables (EXEC)
- Burn Variables (BUR)
- Path Variables (FL)
- Heat Variables (HS)
- Core Variables (COR)
- Nuclide Variable (RN)
- Sprayer Variables (SPR)
- Decay Variables (DCH)
- Recombiner Variables (PAR)
- Fan Cooler Variables (FCL)
- Cavity Variables (CAV)
- Fuel Dispersal Variables (FDI)

Adding a CF argument to the database

- Right Click Package category and select 'New'
- New variable appears in list
- Make selection to MELCOR CF arguments

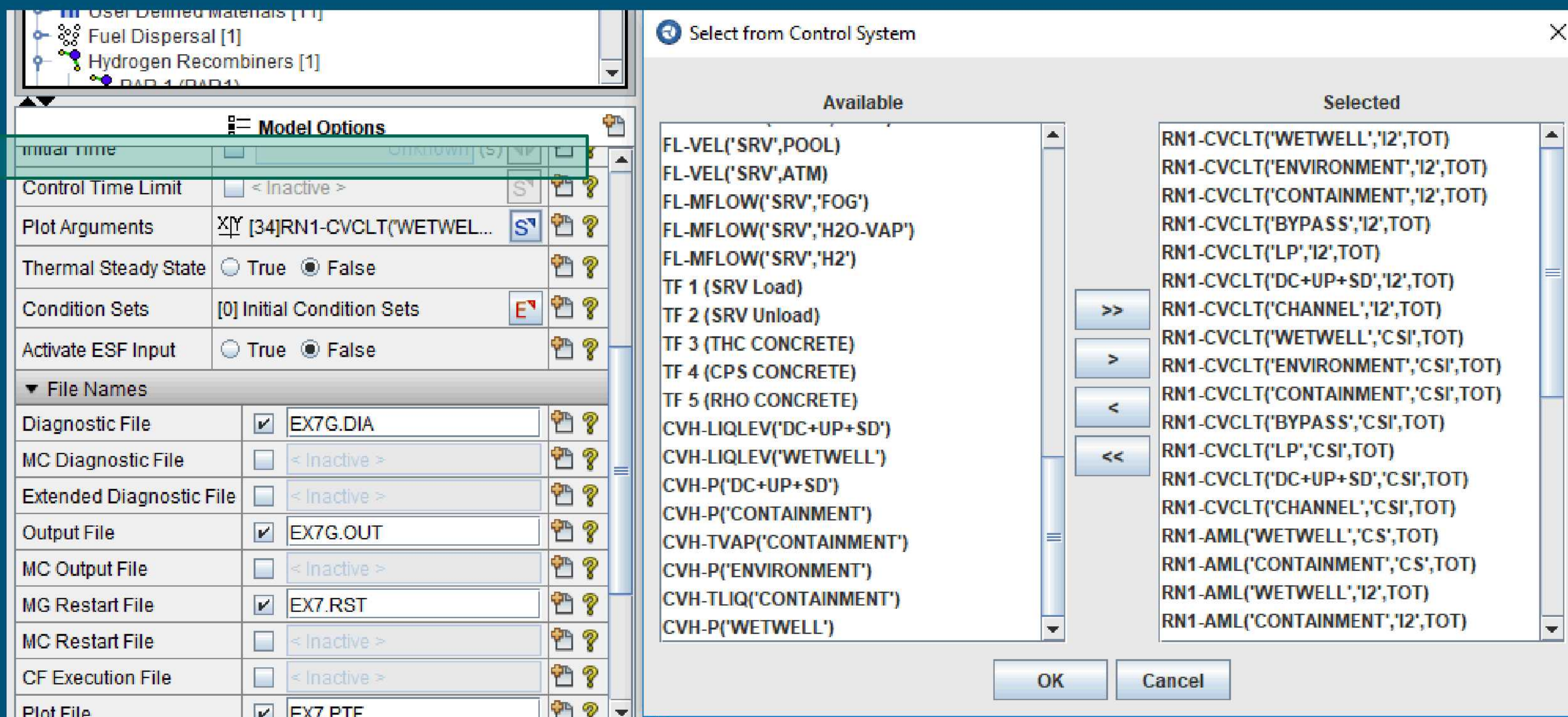


Example: Add swollen liquid level for wetwell to database.

Adding a CF argument to the Plot File

MELCOR ASCII Input:

```
EXEC_PLOT    4
     1 CAV-MASS('CAV7-R.C.',FE)
     2 CAV-MASS('CAV7-R.C.',NI)
     3 CAV-MASS('CAV7-R.C.',U)
     4 CAV-MASS('CAV7-R.C.',ZR)
```

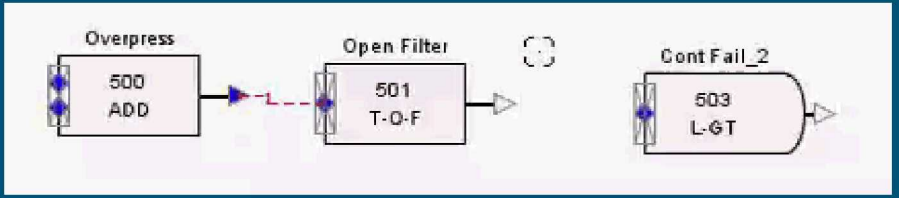


Note that a CF argument must be added to Control System Database before it can be assigned to a plot variable

Control Function connections

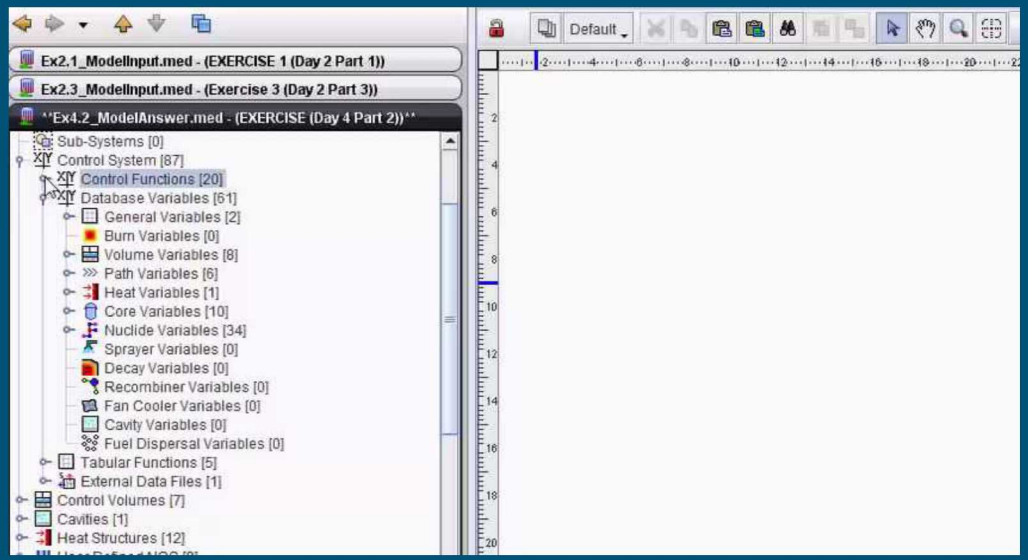
Connecting output from one CF to input of another CF

- Graphically
  - Drag both CF objects to the view and use connection tool
  - Cannot make connection from property window



Connecting control function arguments to the input of a control function

- Drag control function object and all Database variables to view
- Make adjustments to multipliers later from properties window
- Cannot make connection from property window



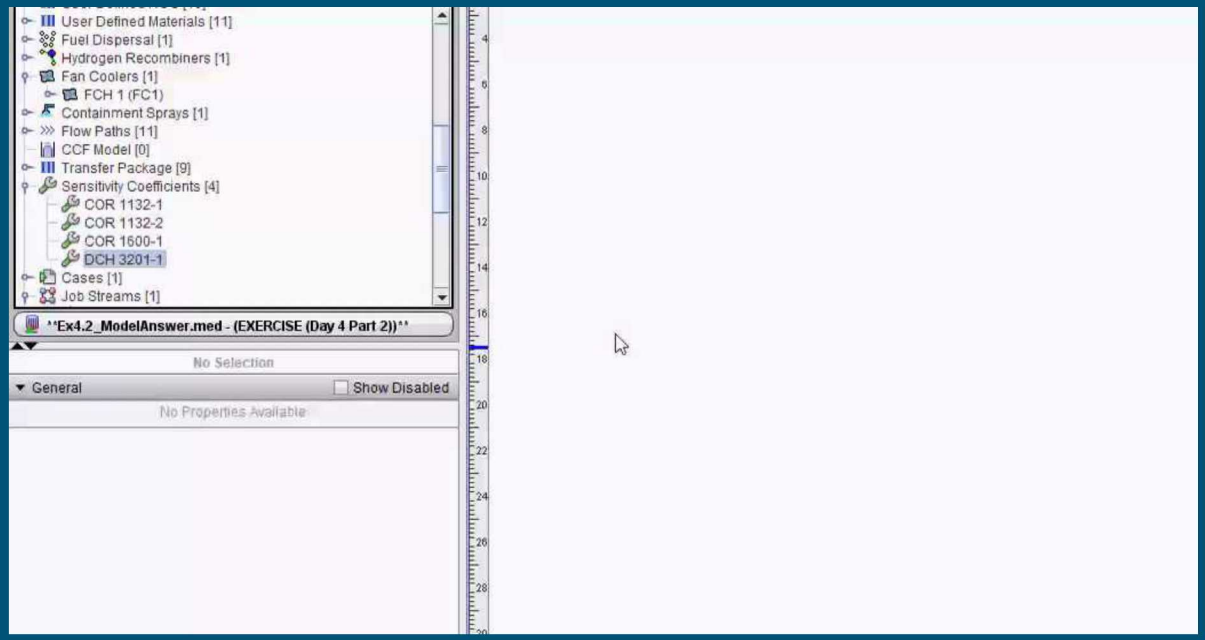
Example: Activate Sprays when containment pressure exceeds 1.2E5 Pa.

Sensitivity Coefficients

MELCOR ASCII

```
1027   CV_PAS SEPARATE OnlyAtm SATURATED   !IPORA, VaporState
1029   CV_PTD IATM   4.380000E+02
1029   CVH_SC   1  !SCnumber    Value        Index
1030   1   4414        5.000000E-01   1
1031   !
1032   FL_INPUT ! FL package start record
1033   !
1034   !-------------------------------------------------------------------------
1035   ! Test section flowpaths
1036   !-------------------------------------------------------------------------
```

SNAP



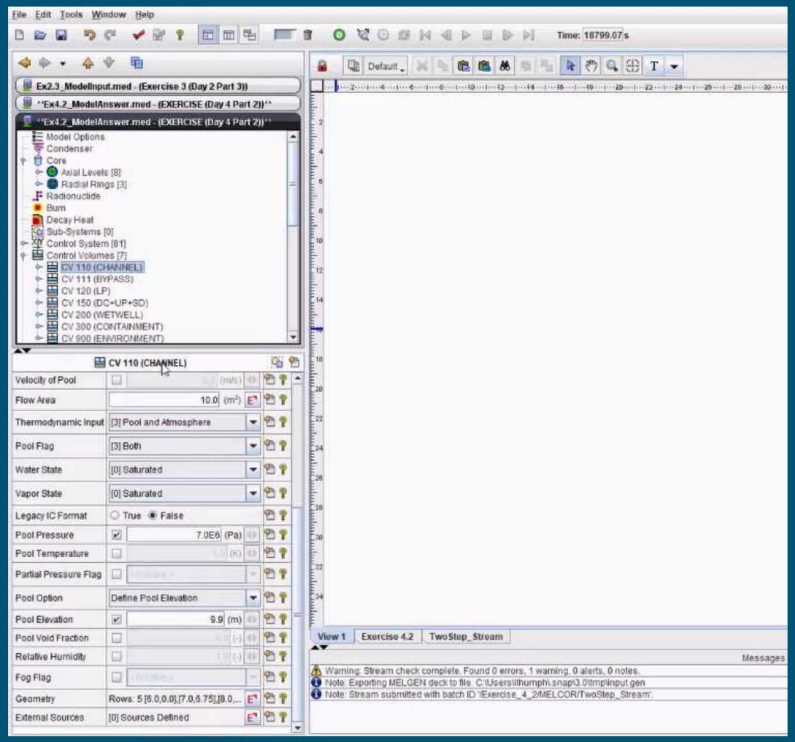
Comments and Notes

MELCOR ASCII

```
!Nodalization from SANDXXXX Page 4-89
! https://svn-melcor.sandia.gov/svn/melcor-II/documentation/trunk/Assessments/ABCOVE/Assessement
HS_ND    9 ! NXVALU NI XVALUE          TEMPIN         MATNAM
           1    1    0.17907000E+01    0.56233000E+03 'SS-3161'
           2    2    0.17970500E+01    0.56233000E+03 'SS-3161'
           3    3    0.18034000E+01    0.56233000E+03 'SS-3161'
           4    4    0.18097500E+01    0.56233000E+03 'SS-3161'
           5    5    0.18161000E+01    0.56233000E+03 'SS-3161'
           6    6    0.18224500E+01    0.56233000E+03 'SS-3161'
           7    7    0.18288000E+01    0.56233000E+03 'SS-3161'
           8    8    0.18351500E+01    0.56233000E+03 'SS-3161'  !Modified to use SS-3161 1/12/2007 by LLH
           9    9    0.18415000E+01    0.56233000E+03
```

- Greater granularity
  - Notes can be attached to single lines in a table
- Active HTML links in some editors

SNAP



- Less granularity
- A single note can be linked to multiple components
- Notes can include pictures
- HTML links are not active
- Notes cannot be printed with ASCII
- Notes Manager