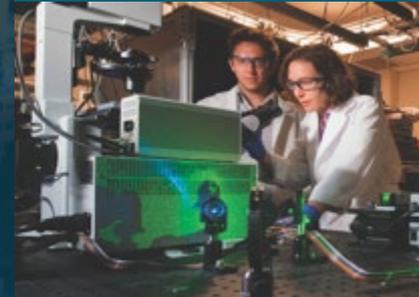


SNAP MELCOR Input Examples



PRESENTED BY

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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



SNAP

RN Classes should be defined before Decay Elements

Decay Heat

Shutdown Flag [0] Constant

Shutdown Time

Operating Power 4.3E9 (W)

Whole Core Decay [2] ANS

Operating Time 5.05E7 (s)

Fissions/Atom 0.713 (FA)

Decay Elements [7] Defined Elements

RN Classes [23] RN Classes

Normalization Flag <Inactive>

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 'H3B306' USER 1 1n cselm
                1 'B2'
DCH_CL 'HBO2'  USER 1 1n cselm
                1 'B3'
DCH_CL 'BH3'   USER 1 1n cselm
                1 'B4'
DCH_CL 'B2H6'  USER 1 1n cselm
                1 'B5'
DCH_CL 'BOH'   USER 1 1n cselm
                1 'B6'
DCH_CL 'B(S)'  USER 1 1n cselm
                1 'B7'
DCH_CL 'C(S)'  USER 1 1n cselm
                1 'B8'
DCH_EL 'B2'   0.0 1 1n time dcheat
                1 0.0 0.0
DCH_EL 'B3'   0.0 1 1n time dcheat
                1 0.0 0.0
DCH_EL 'B4'   0.0 1 1n time dcheat
                1 0.0 0.0
DCH_EL 'B5'   0.0 1 1n time dcheat
                1 0.0 0.0
DCH_EL 'B6'   0.0 1 1n time dcheat
                1 0.0 0.0

```

Element	Mass (kg)	Heat Data
B2	0.0	Rows: 1 [0.0,0.0]
B3	0.0	[1] Decay Row
B4	0.0	[1] Decay Row
B5	0.0	[1] Decay Row
B6	0.0	[1] Decay Row
B7	0.0	[1] Decay Row
B8	0.0	[1] Decay Row

Number	Class Name	Custom	Class Elements
1	XE	<input type="checkbox"/>	<none>
2	CS	<input type="checkbox"/>	<none>
3	BA	<input type="checkbox"/>	<none>
4	I2	<input type="checkbox"/>	<none>
5	TE	<input type="checkbox"/>	<none>
6	RU	<input type="checkbox"/>	<none>
7	MO	<input type="checkbox"/>	<none>
8	CE	<input type="checkbox"/>	<none>
9	LA	<input type="checkbox"/>	<none>
10	UO2	<input type="checkbox"/>	<none>
11	CD	<input type="checkbox"/>	<none>
12	AG	<input type="checkbox"/>	<none>
13	BO2	<input type="checkbox"/>	<none>
14	H2O	<input type="checkbox"/>	<none>
15	CON	<input type="checkbox"/>	<none>
16	CSI	<input type="checkbox"/>	<none>
17	H3B306	<input checked="" type="checkbox"/>	B2
18	HBO2	<input checked="" type="checkbox"/>	B3
19	BH3	<input checked="" type="checkbox"/>	B4
20	B2H6	<input checked="" type="checkbox"/>	B5
21	BOH	<input checked="" type="checkbox"/>	B6
22	B(S)	<input checked="" type="checkbox"/>	B7
23	C(S)	<input checked="" type="checkbox"/>	B8

SNAP



ASCII

Radionuclide

General Show Dis

Enabled True False

Description <none>

Default Scheme 1.8.6 Standards

Hygroscopic Model

Convection Option

Core Map Core Mappings (0)

Vahesá Enter Valid values

Vahesá Release Valid values

Fuel/Cavity Invent Specified Inventories (8)

Cladding Inventory Specified Inventories (12)

Transport Deposition Scaling [0] Rows

Define Booth Classes True False

Absorption Length Valid values

Cvol Split RN Split Data (0)

HS Split Heatstructure split data

Pool Scrubbing RN scrub data (2)

Filters RN Filters (2)

Iodine Class

Spray Partitions Valid values

Reactions Reaction Sets (0)

Transfers Transfer Sets (0)

Checks Enabled [0] Off

Iodine Pool Inactive

Visualization Output None

Dose Input Dose Input Data (0)

Cable Mass Valid values

Surface Coatings Valid values

Aqueous Species Valid values

Flashing-Jet Model Valid values

Film Entrainment Valid values

Pool Concentrate [0] Ratios Defined

▼ [RN1_DIM] Dimension Record

Enable	<input checked="" type="radio"/> True <input type="radio"/> False
Aerosol Sections	10
Aerosol Cmpts.	2

▼ Release Model

Release Model

Gap Release Gap Release Cells (8)

Release Comb. Class combinations (1)

▼ [RN1_ASP] Aerosol Sectional Parameters

Enable True False

Lwr. Aerosol Diam. 1.0E-7 (m)

Upr. Aerosol Diam. 5.0E-5 (m)

Aerosols Density 1000.0 (kg/m³)

▼ Aerosol Coefficients

Aero. Coeff. Opt. [1] Calculate and ...

Aerosol Coefficient (-) [0]

Use Aerosol Component Map True False

Surface Deposition Defined surfaces (1)

Intervolume Trans. Defined flows (5)

Aerosol Sources Defined aerosol source

Resuspension Resuspension data set

▼ [RN1_PTJ] Conditions for Aerosol Coefficients

Enable True False

▼ [RNCFDS] Generated values

Enable True False

▼ [RNCFFT] Generated values

Enable True False

▼ [RN1_MS00] Misc. Aerosol Dynamics Constants

Enable True False

Dyn. Shape Factor 1.0 (-)

Agglomeration Fac. 1.0 (-)

Particle Slip 1.257 (-)

Particle Stick 1.0 (-)

Turb. Dissipation 1.0E-3 (m²/s²)

Conductivity Ratio 0.05 (-)

Accommodation 2.25 (-)

Diffusion Thickness 1.0E-5 (m)

▼ Condensation Evaporation

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 rinpl rinp2
+RN1_GAP 12 !(n ir ia ninp irref iarref rinpl 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 xmasg
! age xmbedi dhrels specht
RN2_FVC 0.0 827.35 1.0 711.78
    
```

COR Package Utilizes Similar Interface for Cell Data



Cell Properties

Axial Levels	Ring 1	Ring 2	Ring 3
Level: 8	108	208	308
Level: 7	107	207	307
Level: 6	106	206	306
Level: 5	105	205	305
Level: 4	104	204	304
Level: 3	103	203	303
Level: 2	102	202	302
Level: 1	101	201	301

Initial Temperatures

Axial Levels	Ring 1	Ring 2	Ring 3
Level: 8			
Level: 7			
Level: 6			
Level: 5			
Level: 4			
Level: 3			
Level: 2			
Level: 1			

Areas/Hydraulic Diameter

Axial Levels	Ring 1	Ring 2	Ring 3
Level: 8	0.0135	0.0135	
Level: 7	0.0135	0.0135	
Level: 6	0.0135	0.0135	
Level: 5	0.0135	0.0135	
Level: 4	0.0135	0.0135	
Level: 3	Default	Default	0.0135
Level: 2	Default	Default	
Level: 1	0.0135	Default	0.0135

Material Masses

Axial Levels	Ring 1	Ring 2	Ring 3	Totals
Level: 8				
Level: 7				
Level: 6				
Level: 5				
Level: 4				
Level: 3				
Level: 2				
Level: 1				
Totals				



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
 - CV volumes associated with COR cells (Cell Properties)
 - Exceptions
 - PD material masses in channel and bypass
 - Core Blockage Cells
- 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 database
- 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

HS 11104 (SHROUD LEVEL 4)	
Enable	<input checked="" type="radio"/> True <input type="radio"/> False
Left Emissivity	0.9 (-)
Left Radiation Model	Gray Gas
Left Radiation Path	0.1 (m)
▼ Right (Outside) Boundary Surface Data	
Right Boundary Type	Convective Condition
Right Boundary Mass	<input checked="" type="radio"/> True <input type="radio"/> False
Rt. Boundary Vol.	CV 150 (DC+UP+SD)
Right Boundary Flow	[1] External Flow
Right Minimum Pool	0.5 (-)



7 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	10 8	24007.25	23992.75				
RVLH	4	9 7	24007.25	23992.75				
ZLHT	5	8 6	24007.25	23992.75				
		7 5	24007.25	23992.75				
Show Volume		6 4	0	0				
		5.9 3	0	0				
		5 2	0	0				
		2.95 1	0	0				

The screenshot shows the SNAP software interface. On the left, there are two views: 'Top Down View' showing a circular cross-section of a fuel rod with concentric rings, and 'Side View' showing a vertical stack of levels from 1 to 8. In the center, there is a 'Cell Property' list with various material and component names. On the right, there is a data table with the following structure:

Axial Levels	Ring: 1	Ring: 2	Ring: 3	Totals
Level: 8	24007.250...	23992.749...		48000.0
Level: 7	24007.250...	23992.749...		48000.0
Level: 6	24007.250...	23992.749...		48000.0
Level: 5	24007.250...	23992.749...		48000.0
Level: 4	Default	Default		0.0
Level: 3	Default	Default		0.0
Level: 2	Default	Default	0.0	0.0
Level: 1	Default	Default	0.0	0.0
Totals:	96029.000...	95970.999...	0.0	1.92E5

8 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

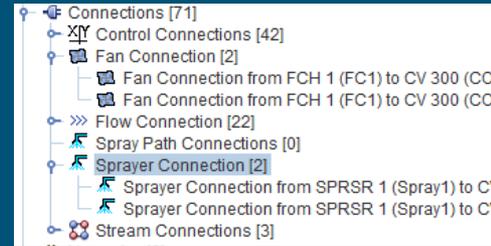
Connection types

- 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

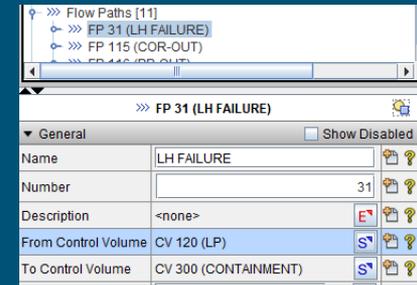
Graphical Connections

- 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.

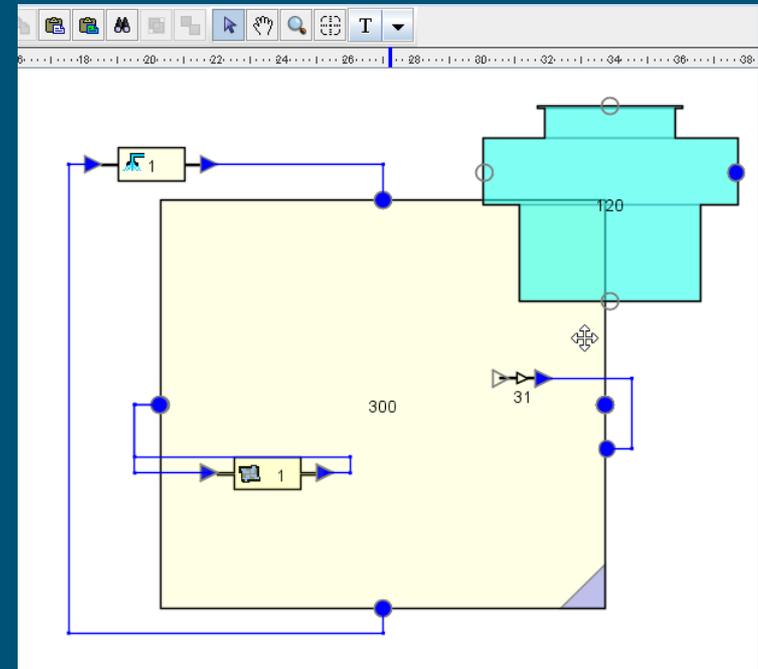
Connection cannot be made from Connections Menu



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



Connection can be made graphically



Database Variables (CF arguments available to model)

9

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

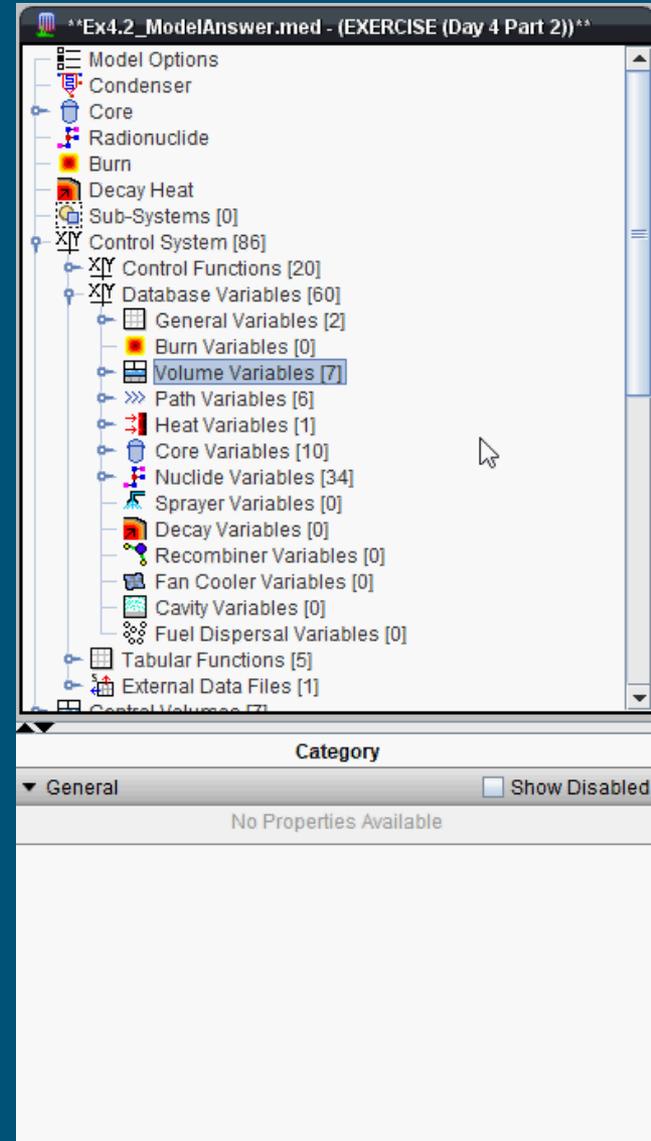
Used as input to control functions

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.



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)
```

The screenshot shows the MELCOR software interface. On the left, the 'Model Options' dialog is open, with the 'Plot Arguments' field set to 'X|Y [34]RN1-CVCLT(WETWEL...'. Below it, the 'File Names' section shows the 'Plot File' set to 'EX7.PTF'. On the right, the 'Select from Control System' dialog is open, showing a list of available control system variables on the left and a list of selected variables on the right. The selected variables include 'RN1-CVCLT(WETWELL','I2',TOT)' and 'RN1-AML(WETWELL','I2',TOT)'. The 'OK' button is highlighted.

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

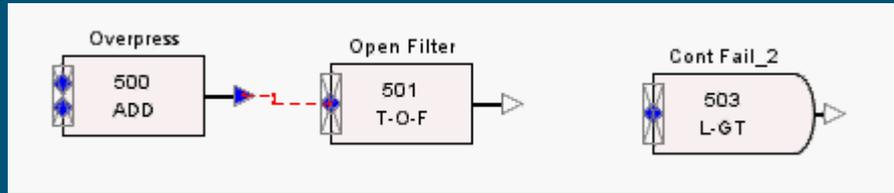


Connecting output from one CF to input of another CF

Graphically

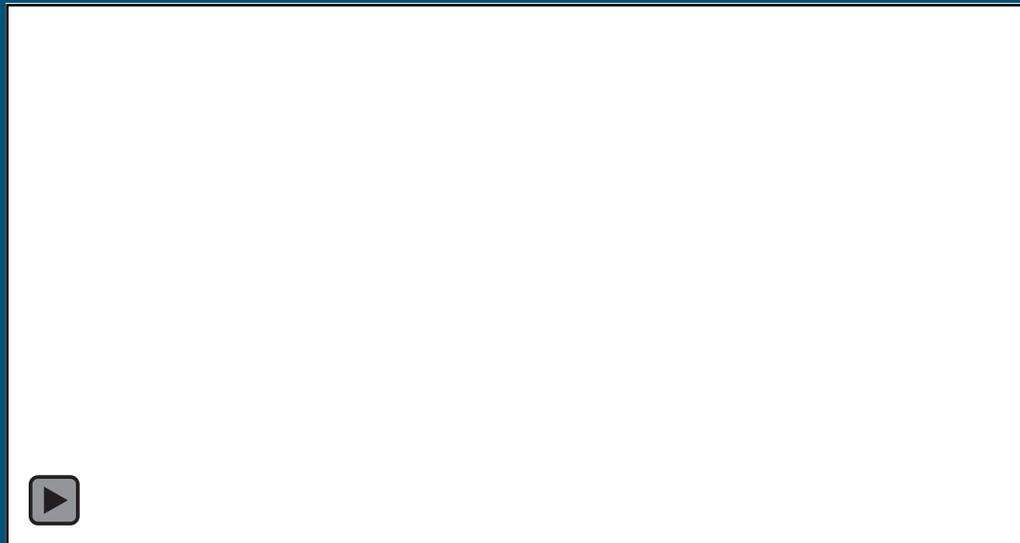
Drag both CF objects to the view and use connection tool

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.



MELCOR ASCII

```

1027 CV_PAS SEPARATE OnlyAtm SATURATED !IPORA, VaporState
1028 CV_PTD TATM 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

The screenshot shows the SNAP software interface. On the left is a tree view of model components:

- User Defined Materials [11]
- Fuel Dispersal [1]
- Hydrogen Recombiners [1]
- Fan Coolers [1]
 - FCH 1 (FC1)
- Containment Sprays [1]
- Flow Paths [11]
- CCF Model [0]
- Transfer Package [9]
- Sensitivity Coefficients [4]
 - COR 1132-1
 - COR 1132-2
 - COR 1600-1
 - DCH 3201-1
- Cases [1]
- Job Streams [1]

The main display area on the right is currently blank, with a mouse cursor visible. The status bar at the bottom indicates "No Selection" and "No Properties Available". The window title is "Ex4.2_ModelAnswer.med - (EXERCISE (Day 4 Part 2))".



MELCOR ASCII

```
!Nodalization from SANDXXXX Page 4-89
!https://svn-melcor.sandia.gov/svn/melcor-II/documentation/trunk/Assessments/ABCOVE/Assesment
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