FRAPCON-3.4 Input Instructions

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Input Structure

The NAMELIST input is divided into four sections: Case control integers (in $FRPCN); case design and operation descriptors (real and integer variables) located in ($FRPCON); evaluation model options (in $EMFPCN); and plutonium isotopic distributions (in $FRPMOX). The variables in the first group must be separated by commas and placed between the statement $FRPCN and $END. Similarly, the variables in the second, third, and fourth groups must be placed between $FRPCON and $END, between $EMFPCN and $END, and between $FRPMOX and $END, respectively.

Before the NAMELIST input the following lines must be included in the input file

FILE05='nullfile', STATUS='UNKNOWN', FORM='FORMATTED',
CARRIAGE CONTROL='NONE'

This line sets up a file called “nullfile” which is needed by FRAPCON-3.3

FILE06=’file.out', STATUS='UNKNOWN', CARRIAGE CONTROL='LIST'

This line specifies the name of the output file. In this case the output file would be called “file.out”

FILE66='file.plot', STATUS='UNKNOWN', FORM='FORMATTED',
CARRIAGE CONTROL='LIST'

This line is needed if a plot output file is being created. (see definition of variable NPLOT) In this case the plot file would be called “file.plot”

The above three lines should not exceed 72 spaces, and if they do, continue on the next line with no continuation symbols needed

/**********

The line seen above, which is proceeded by the character “/” tells the code that the lines specifying files are complete.

The line immediately after this line is reserved for the case description that will be displayed in the page headers in the output. Up to 72 characters can be inserted here to describe the case.

After this line the NAMELIST input can be entered. In the above section any line with a “*” in column 1 is considered a comment and will not be read by the code. An example case input is given in Section 2 below.

The following tables describe the input variables to FRAPCON3.4. Unless otherwise noted in the Limitations/Default value column, the variables should be placed in the $frpcon data input block.

Input Variables Specifying Rod Design

Rod Size

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
dco (R)	Cladding outer diameter	inches / meters	Required Input
thkcld (R)	Cladding wall thickness	inches, meters	Required Input
thkgap (R)	Pellet-cladding as-fabricated radial gap thickness	inches, meters	Required Input
totl (R)	The total (active) fuel column length.	Feet / meters	Required Input
cpl (R)	Cold plenum length	inches/meters	Required Input

(R) = real, (I) = integer

Spring Dimensions

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
dspg (R)	Outer diameter of plenum spring	inches / meters	Required Input (*dgpg* should be less than the clad inner diameter)
dspgw (R)	Diameter of the plenum spring wire	inches / meters	Required Input
vs (R)	Number of turns in the plenum spring	Dimensionless	Required Input

(R) = real, (I) = integer

Input Variables Specifying Pellet Fabrication

Pellet Shape

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
hplt (R)	Height (length) of each pellet	Inches / meters	Required Input
rc (R)	The inner pellet radius	inches / meters	Default = 0.0
hdish (R)	Height (depth) of pellet dish, assumed to be a spherical indentation.	Inches / meters	Default = 0.0
dishsd (R)	Pellet end-dish shoulder width (outer radius of fuel pellet minus radius of dish)	inches / meters	Default = 0.0

(R) = real, (I) = integer

Pellet Isotopics

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
enrch (R)	Fuel pellet U-235 enrichment	Atom % U-235 in total U	Required Input
imox (I)	Index for modeling MOX: 0 = UO_2 fuel >0= mixed oxide fuel 1 = use Duriez/Ronchi/NFI Mod thermal conductivity correlation 2 = use Halden thermal conductivity correlation (if *imox*>0, must include *comp* and namelist $FRPMOX)	Dimensionless	Default = 0
comp (R)	Weight percent of plutonia in fuel (Must specify if *imox*>0)	Weight percent	Default = 0.0
moxtype (I)	Type of Pu used in MOX moxtype=1 reactor grade moxtype=2 weapons grade	Dimensionless	Default = 1 (namelist frpmox)
enrpu39 (R)	Fuel pellet Pu-239 content	Atom % Pu-239 in total Pu	Default = 0.0 (namelist frpmox)

enrpu40 (R)	Fuel pellet Pu-240 content	Atom % Pu-240 in total Pu	Default = 0.0 (namelist frpmox)
enrpu41 (R)	Fuel pellet Pu-241 content	Atom % Pu-241 in total Pu	Default = 0.0 (namelist frpmox)
enrpu42 (R)	Fuel pellet Pu-242 content	Atom % Pu-242 in total Pu	Default = 0.0 (namelist frpmox)
fotmtl (R)	Oxygen-to-metal atomic ratio in the oxide fuel pellet	Dimensionless	Default = 2.0 (If MOX fuel is selected, *fotmtl* should be less than 2.0)
gadoln (R)	Weight fraction of gadolinia in urania-gadolinia fuel pellets	Dimensionless	Default = 0.0
ifba (R)	Percent of IFBA rods in the core	%	Default = 0.0
b10 (R)	Boron-10 enrichment in ZrB_2	atom %	Default = 0.0
zrb2thick (R)	ZrB_2 layer thickness on pellets	inches, meters	Default = 0.0
zrb2den (R)	Percent theoretical density of ZrB_2 T.D.=6.08 g/cm³	% Theoretical density	Default = 90.0
ppmh2o (R)	Parts per million by weight of moisture in the as-fabricated pellets	ppm	Default = 0.0
ppmn2 (R)	Parts per million by weight of nitrogen in the as-fabricated pellets	ppm	Default = 0.0

(R) = real, (I) = integer

Pellet Fabrication

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
den (R)	As-fabricated apparent fuel density	% of theoretical density	Required Input (Theoretical density taken as 10.96 g/cc)

deng (R)	Open porosity fraction for pellets	% of theoretical density	Default = 0.0
roughf (R)	The fuel pellet surface arithmetic mean roughness, peak-to-average	inches / meters	Required Input
rsntr (R)	The increase in pellet density expected during in-reactor operation (determined from a standard re-sintering test as per NUREG-0085 and regulatory Guide 1.126)	kg/m^3	Required Input
tsint (R)	Temperature at which pellets were sintered	°F / K	Default = 2911° F

(R) = real, (I) = integer

Input Variables Specifying Cladding Fabrication

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
icm (I)	Cladding Type Indicator: 2 = Zircaloy 2 4 = Zircaloy 4 5 = M5™ 6 = ZIRLO™	Dimensionless	Required Input
zr2vinage (I)	Flag to select Zircaloy-2 vintage zr2vintage= 0 older Zircaloy-2 prior to 1998 zr2vintage=1 newer Zircaloy-2 since 1998	Dimensionless	Default = 1
cldwks (R)	Cold-work of the cladding (fractional reduction in cross-section area due to processing). PNNL recommends 0.5 for stress relief annealed cladding and 0.0 for fully recrystallized cladding.	Dimensionless	Default = 0.2
roughc (R)	The cladding surface arithmetic mean roughness, peak-to-average	inches / meters	Required Input
catexf (R)	Cladding texture factor; defined as the fraction of cladding cells with basal poles parallel to the longitudinal axis of the cladding tube.	Dimensionless	Default = 0.05
chorg (R)	As-fabricated hydrogen in cladding	ppm wt.	Default = 10.0

(R) = real, (I) = integer

Input Variables Specifying Rod Fill Conditions

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
fgpav (R)	Initial fill gas pressure (taken to be at room temperature)	psia / Pa	Required Input
idxgas (I)	Initial fill gas type indictator: 1 = helium 2 = air 3 = nitrogen 4 = fission gas 5 = argon 6 = user-specified mix, using the *amfxx* variables *amfair* etc.	Dimensionless	Default = 1
amfair (R)	Mole fraction of air; use only if *idxgas* = 6.	Mole Fraction	Default = 0.0
amfarg (R)	Mole fraction of argon; use only if *idxgas* = 6	Mole Fraction	Default = 0.0
amffg (R)	Mole fraction of fission gas; use only if *idxgas* = 6 and if *amfxe* and *amfkry* = 0.0	Mole Fraction	Default = 0.0
amfhe (R)	Mole fraction of helium; use only *idxgas* = 6.	Mole Fraction	Default = 0.0 (note default on *idxgas* = 1 initializes pure He
amfh2 (R)	Mole fraction of hydrogen; use only if *idxgas* = 6.	Mole Fraction	Default = 0.0
amfh2o (R)	Mole fraction of water vapor; use only if *idxgas* = 6.	Mole Fraction	Default = 0.0
amfkry (R)	Mole fraction of krypton; use only if *idxgas* = 6.	Mole Fraction	Default = 0.0
amfn2 (R)	Mole fraction of nitrogen; use only if *idxgas* = 6	Mole Fraction	Default = 0.0
amfxe (R)	Mole fraction of xenon; use only if *idxgas* = 6.	Mole Fraction	Default = 0.0

(R) = real, (I) = integer

Input Variables Specifying Reactor Conditions

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
iplant (I)	Signal for which type of reactor: -2 = PWR -3 = BWR -4 = HBWR	Dimensionless	Default = -2
nsp (I)	Signal for time-dependent input arrays for *p2*, *tw*, and *go*: If *nsp* = 0, single values for these three variables will be used for all time steps If *nsp* = 1, a value for each variable for each time step must be input.	Dimensionless	Required Input
p2(IT) (R)	Coolant System pressure. Must be input for each time step if *nsp* = 1	psia / Pa	Required Input
tw(IT) (R)	Coolant inlet temperature. Enter a value for every time step if *nsp* =1	°F / K	Required Input
go(IT) (R)	Mass flux of coolant around fuel rod. Input a value for each time step if *nsp* = 1. Note that *go* input may have to be adjusted to yield both desired coolant and desired cladding surface temperatures. Concurrent adjustment of *pitch* may also be required.	lb/hr-ft^2 / kg/s-m^2	Required Input
pitch (R)	Center-to-center distance between rods in a square array	inches / meters	Required Input (Must be greater than *dco*)

icor (I)	Index for Crud Model: *icor* = 0 or 1 yields constant crud thickness; 0.0 mil crud as default; input *crdt* as constant thickness. Maximum temperature rise permitted across this layer is 20 ºF. *icor* = 2 yields time-dependent crud; growth rate is *crdtr*, starting from zero crud layer. There is no limit to the temperature rise across the crud when *icor*=2. The conductivity of the layer is 0.5 Btu/hr/ft-EF.	Dimensionless	Default = 0
crdt (R)	Initial thickness of crud layer on cladding outside surface	mils/meters	Default = 0.0
crdtr (R)	Rate of crud accumulation (used if *icor* = 2)	mils/hr / meters/s	Default = 0.0
crudmult(J-1) (R)	Axial array of multipliers on crud thickness or crud growth rate	Dimensionless	Default = 1.0
flux(J) (R)	Conversion between fuel specific power (W/g) and fast neutron flux ($n/m^2/s$, E>1MeV). Input as an axial array; the second value of the array corresponds to the first axial node, the *na*+1 value corresponds to the top axial node.	neutrons per square meter per second per W/g of fuel	Default = $0.221x10^{17}$ (Maximum of 20 values)

(R) = real, (I) = integer
IT = Time Step Index
J = 1 + Axial Node Index

Input Variables Specifying Power History

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
im (I)	Number of time steps	Dimensionless	Greater than 1, less than 400 Required Input (namelist frpcn)
ProblemTime(IT) (R)	Cumulative time at the end of each time step. Note: Time steps greater than 50 days are not recommended. If steady state operation is being modeled use time steps greater than 1 day. Time steps less than 1 day should only be used when modeling a fast power ramp.	Days	Required Input Limit 400 steps
qmpy(IT) (R)	The linear heat generation rate at each time step. This equals the rod-average value if *iq* = 0 and the peak value if *iq* = 1. Note: Changes in local LHGR of greater than 1.5 kw/ft per time step are not recommended. Size *qmpy* accordingly.	kW/ft / kW/m	Required Input Limit 400 steps

(R) = real, (I) = integer
IT = Time Step Index

Input Variables Specifying Axial Power Profile

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
iq (I)	Indicator for axial power shape: 0 = User-input power shapes, with *qmpy* = rod-average powers and power shapes defined by *qf*,*x*, and *fa* = 1.0 1 = Chopped-cosine shape, with *fa* = Peak-to-average ratio and *qmpy* = peak power (use na=odd in order to have an axial node corresponding to the input peak power)	Dimensionless	Required Input
x(N) (R)	The elevations in each *qf, x* array defining a power shape. Note the first value should be 0.0 and the last value must = *totl*	feet / meters	Required Input if *iq*=0 Maximum number of *qf, x* pairs is 40
qf(N) (R)	The ratio of the linear power at the *x*(N) elevation to the axially-averaged value for the M-th power shape. The number of QF, X pairs for the Mth power shape is defined by *jn*(M). The code will automatically normalize to an average value of 1.0	Dimensionless	Required Input if *iq* = 0 Maximum number of *qf, x* pairs is 40
jn(M) (I)	The number of *qf, x* value pairs for each axial power shape; required input if *iq* = 0. Input in the same sequence as the *qf* and *x* arrays.	Dimensionless	Required Input if *iq*=0 Maximum number of shapes is 20. Maximum number of *qf, x* pairs is 40

jst(IT) (I)	The sequential number of the power shape to be used for each time step. One value of *jst* is required per time step if *iq* = 0.	Dimensionless	Required Input if *iq*=0 Maximum number of power shapes = 20. Maximum time steps is 400.
fa (R)	Peak-to-Average Power ratio for cosine-type axial power distribution (= 1.0, unless *iq* = 1; see description of *iq*)	Dimensionless	Required Input

(R) = real, (I) = integer
N = Axial Node Index for Input Power Profile
M = Power Shape Number
IT = Time Step Index

Input Variables Specifying Axial Temperature Distribution (Optional)

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
ifixedtsurf (I)	Indicator for using axial temperature distribution 0 = Cladding temperature will be calculated based on input power and coolant conditions 1 = Cladding temperature will be specified by the user for certain time steps. Each time step where the temperature will be set by the user, the input variable, *go*, should be set equal to 0.0.	Dimensionless	Default Value = 0
xt(N) (R)	The elevations in each *cladt*, *xt* array defining a cladding temperature profile. Note the first value should be 0.0 and the last value must = *totl* Begin the input elevations for the second temperature profile at xt(n+1) where n is the number of values in the first profile.	feet / meters	Default Value =0.0
cladt(N) (R)	The cladding surface temperature *xt*(N) elevation for the M-th temperature profile. The number of *cladt*, *xt* pairs for the Mth power shape is defined by *jnsurftemp*(M).	Dimensionless	Default Value =0.0 Maximum number of *cladt*, *xt* pairs is 40
jnsurftemp(M) (I)	The number of *cladt*, *xt* value pairs for each axial temperature distribution; Input in the same sequence as the *cladt* and *xt* arrays.	Dimensionless	Default Value = 0 Maximum number of shapes is 20. Maximum number of *cladt*, *xt* pairs is 40

jstsurftemp(IT) (I)	The sequential number of the temperature profile to be used for each time step. One value of *jstsurftemp* is required per time step if *ifixedtsurf* = 1.	Dimensionless	Default Value = 0 Maximum number of shapes = 20. Maximum time steps is 400.

(R) = real, (I) = integer
N = Axial Node Index for Input Surface Temperature Profile
M = Surface Temperature Profile Number
IT = Time Step Index

Input Variables Specifying Code Operation

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
nr (I)	Number of radial boundaries in the pellet (for temperature calculations and temperature distribution output) These are spaced by the code with greater fraction in the outer region to optimize definition of the heat generation radial distribution.	Dimensionless	Greater than 1, less than 25; suggested minimum number is 17 Default = 17 (namelist frpcn)
ngasr (I)	Number of equal-volume radial rings in the pellet for gas release calculations.	Dimensionless	Greater than 6, less than 50; suggested number is 45. Default = 45 (namelist frpcn)
ngasmod (I)	Flag to select fission gas release model ngasmod=1 selects ANS5.4 model ngasmod=2 selects Massih model ngasmod=3 slects FRAPFGR model	Dimensionless	Default = 2
na (I)	Number of equal-length axial regions along the rod, for which calculations are performed and output.	Dimensionless	Greater than 1, less than 18 Default = 9 (namelist frpcn)
nunits (I)	Signal for units system to be used for input and output: 1 = British Units 0 = SI Units Note that input of *nunits* >10 will activate "debug" output, which is significant in volume.	Dimensionless	Default = 1

crephr (R)	Subdivision for internal creep steps (should be set to a minimum of 10 creep steps per time step for smallest step)	hours	Default = 10.0
sgapf (R)	Number of fission gas atoms formed per 100 fissions.	Dimensionless	Default = 31.0
slim (R)	Limit on swelling	Volume fraction	Default = 0.05
qend (R)	Fraction of end-node heat that transfers to the plenum gas	Dimensionless	Default = 0.3
igas (I)	Time step to begin calculation of fission gas release. For all time steps prior to *igas*, the calculated gas release will not be included in the gas in the rod void volume. (Note: this option only is available when using the Massih fission gas release model)	Dimensionless	Default = 0
mechan (I)	Option to select mechanical model mechan=1 selects FEA model mechan=2 seclects FRACAS-I model	Dimensionless	Default = 2 (namelist frpcn)
nce (I)	Number of radial elements in the cladding for FEA model	Dimensionless	Default = 5 (namelist frpcn)
frcoef (R)	Coulomb friction coefficient between the cladding and the fuel pellet	Dimensionless	Default = 0.015
igascal (I)	Internal pressure calculation for FEA model igascal=1 normal pressure calculation igascal=0 use prescribed pressure set by p1	Dimensionless	Default = 1

p1(IT) (I)	Rod internal pressure for each time step for FEA model. Needed only if igascal=0	psi / Pa	Default = 0

(R) = real, (I) = integer
IT = Time Step Index

Model Uncertainty Variables for Sensitivity Analysis

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
sigftc (I)	Bias on fuel thermal conductivity model. sigftc=1 biases model up 1σ, sigftc=-1.5 biases model down 1.5σ.	Dimensionless	Default = 0
sigftex (I)	Bias on fuel thermal expansion model. sigftex=1 biases model up 1σ, sigftex=-1.5 biases model down 1.5σ.	Dimensionless	Default = 0
sigfgr (I)	Bias on fission gas release model. sigfgr=1 biases model up 1σ, sigfgr=-1.5 biases model down 1.5σ.	Dimensionless	Default = 0
sigswell (I)	Bias on fuel swelling model. sigswell=1 biases model up 1σ, sigswell=-1.5 biases model down 1.5σ.	Dimensionless	Default = 0
sigcreep (I)	Bias on cladding creep model. sigcreep=1 biases model up 1σ, sigcreep=-1.5 biases model down 1.5σ.	Dimensionless	Default = 0
siggro (I)	Bias on cladding axial growth model. siggro=1 biases model up 1σ, siggro=-1.5 biases model down 1.5σ.	Dimensionless	Default = 0
sigcor (I)	Bias on cladding corrosion model. sigcor=1 biases model up 1σ, sigcor=-1.5 biases model down 1.5σ.	Dimensionless	Default = 0

sigh2 (I)	Bias on cladding hydrogen pickup model. sigh2=1 biases model up 1σ, sigh2=-1.5 biases model down 1.5σ.	Dimensionless	Default = 0

(R) = real, (I) = integer

Model Selection Variables not Recommended by PNNL

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
imswch (I)	Signal for EM models: =1 All EM models = 0 No EM models = -1 Selected EM models, input signals in $EMFPCN	Dimensionless	Default = 0
impowr (R)	EM Power requirement index; = 0, not assumed to be required	Dimensionless	Default = 0 (namelist emfpcn)
imfuel (R)	Switch on dimensional changes: = 0, BE changes, =1, EM changes	Dimensionless	Default = 0 (namelist emfpcn)
imdens (R)	Switch on densification model	Dimensionless	Default = 0 (namelist emfpcn)
imrelo (R)	Switch on fuel relocation model	Dimensionless	Default = 0 (namelist emfpcn)
imclad (R)	Switch on cladding deformation; = 1, no permanent deformation	Dimensionless	Default = 0 (namelist emfpcn)
imgapc (R)	switch on gap conductance calculation	Dimensionless	Default = 0 (namelist emfpcn)
imenrg (R)	Switch on stored energy reference temperature: = 0 reference = 298 K = 1, reference = 273 K	Dimensionless	Default = 0 (namelist emfpcn)

(R) = real, (I) = integer

Input Variables Specifying Code Output

Variable Name (type)	Description	Units British/SI	Limitations/Default Value
jdlpr (I)	Output print control for each time step: 0 = All axial nodes 1 = peak-power axial node -1 = axial summary for NO printout each step, see *nopt*	Dimensionless	Default = 1 Note: The code sets *jdlpr* to 0 (full output) when *ntape* is greater than 0, to assure full axial array of permanent radial deformations is passed to FRAPTRAN
nopt (I)	Control on printout = 0, printout each time step, controlled by *jdlpr* =1, Case input and summary sheet only	Dimensionless	Default = 0
nplot (I)	Control on output of plot file for excel plotting routine = 0, No output plot file will be created =1, Plot output file will be created (File 66). Note: The name of the plot file should be specified in the input file below where the name of the ordinary output (File 06) is specified	Dimensionless	Default = 0
ntape (I)	Signal for creating a start tape for FRAPTRAN, from subroutine RESTFS. If *ntape* > 0, RESTFS is called and a tape (file 22="restart") is incrementally written each time step	Dimensionless	Default = 0.

nread (I)	Signal to start up from a restart tape (File 13). The value of *nread* is the time step to start from. NOTE: user must switch his restart-write tape file number from 12 to 13 to make it a restart-read tape. Note that the restart tape does not currently contain complete restart information for the fission gas release models.	Dimensionless	Default = 0
nrestr (I)	Signal for writing a restart tape for FRAPCON-3. If *nrestr* not equal to 0, subroutine TAPEGEN generates a restart tape (file 12) at each time step. Note that the restart tape does not currently contain complete restart information for the fission gas release models.	Dimensionless	Default = 0

(R) = real, (I) = integer

Example Case with MOX Fuel

```
*************************************************************************
*        frapcon3, steady-state fuel rod analysis code
*
*------------------------------------------------------------------------
*
*
*
*         CASE DESCRIPTION: MOX example rod
*
*
*
*UNIT     FILE DESCRIPTION
*
*----     -----------------------------------------------Output:
*
*         Output :
*
*    6         STANDARD PRINTER OUTPUT
*
*
*
*         Scratch:
*
*    5         SCRATCH INPUT FILE FROM ECH01
*
*
*
*  Input:   FRAPCON3 INPUT FILE (UNIT 55)
*
*
*
*************************************************************************
* GOESINS:
FILE05='nullfile', STATUS='UNKNOWN', FORM='FORMATTED',
         CARRIAGE CONTROL='NONE'
*
* GOESOUTS:
FILE06='MOXexample.out',    STATUS='UNKNOWN', CARRIAGE CONTROL='LIST'
FILE66='MOXexample.plot', STATUS='UNKNOWN', FORM='FORMATTED',
        CARRIAGE CONTROL='LIST'
/*************************************************************************
         MOX Example Rod
 $frpcn
 im=50, na=4,
 ngasr = 45,
 $end
 $frpcon
 cpl = 2., crdt = 0.0, thkcld = 0.0224, thkgap = 0.0033,
 dco = 0.374, pitch = 0.5,nplot=1,
 rc = 0.0453, fotmtl = 1.997,dishsd=0.06488,
 den = 94.43, dspg = 0.3,fa = 1.,
 dspgw = 0.03, enrch = 0.229, fgpav = 382, hdish = 0.011,
 hplt = 0.5, icm = 4, imox = 1, comp = 5.945,
 idxgas = 1, iplant =-2, iq = 0, jdlpr = 0,
```

```
jn = 5,5,
totl = 1.31, roughc = 3.94e-5, roughf = 7.9e-5, vs = 10.0,
nunits = 1, rsntr = 52., nsp = 1,
p2(1) = 44*2250., p2(45) = 6*2352,
tw(1) = 44*570, tw(45) = 6*590
go(1) = 50*2.0e6,
jst = 44*1, 6*2
qf(1) = 1.0, 1.0, 1.0, 1.0, 1.0
x(1) = 0.0, 0.3275, 0.6650, 0.9925, 1.31
qf(6) = 0.9, 1.0, 1.1, 1.0, 0.9
x(6) = 0.0, 0.3275, 0.6650, 0.9925, 1.31
ProblemTime=
0.1, 0.2, 0.3, 0.4, 0.5,
0.6, 30., 60., 90., 120.,
150., 180., 210., 240., 270.,
300., 331., 360., 390., 420.,
450., 480., 510., 540., 570.,
600., 625., 650., 700., 750.,
800., 850., 900., 945., 990.,
1000., 1050., 1100., 1150., 1200.,
1250., 1300., 1350., 1400
1401., 1402., 1403., 1404., 1405.,
1406.
qmpy =
1,2,3,4,5,
6., 6.7, 6.7, 6.7, 6.7,
5*6.7
6.7, 6.7, 7.0, 7.0, 7.0,
5*7.0,
7.0, 7.0, 7.0, 5.8, 5.8,
5*5.8,
5*4.11,
4.11, 4.11, 4.11, 4.11,
4.0, 3.5, 3.0,
2.5, 2.0, 1.5
slim = .05,
$end
$frpmox
enrpu39 = 65.83, enrpu40 = 23.45, enrpu41 = 7.39,
enrpu42 = 3.33
$end
```

Input Variables Arranged Alphabetically and by Input Block

$frpcn input block

Variable Name	Page Number
im	12
mechan	18
na	17
nce	18
ngasr	17
nr	17

$frpmox input block

Variable Name	Page Number
enrpu39	5
enrpu40	6
enrpu41	6
enrpu42	6
moxtype	5

$emfpcn input block

Variable Name	Page Number
imclad	20
imdens	20
imenrg	20
imfuel	20
imgapc	20
impowr	20
imrelo	20

$frpcon input block

Variable Name	Page Number	Variable Name	Page Number
amfair	9	imox	5
amfarg	9	imswch	20
amffg	9	iplant	10
amfh2	9	iq	13
amfh2o	9	jdlpr	21
amfhe	9	jn	13
amfkry	9	jnsurftemp	15
amfn2	9	jst	14
amfxe	9	jstsurftemp	16
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