

GENII: Source Terms and Initial Conditions

BRUCE NAPIER

RAMP GENII Training, Taipei, Taiwan

A set of computer programs for estimation of radionuclide concentrations in the environment and dose/risk to humans from:

- Acute or chronic exposures to
- Releases to surface water or atmosphere, or
- Initial contamination conditions



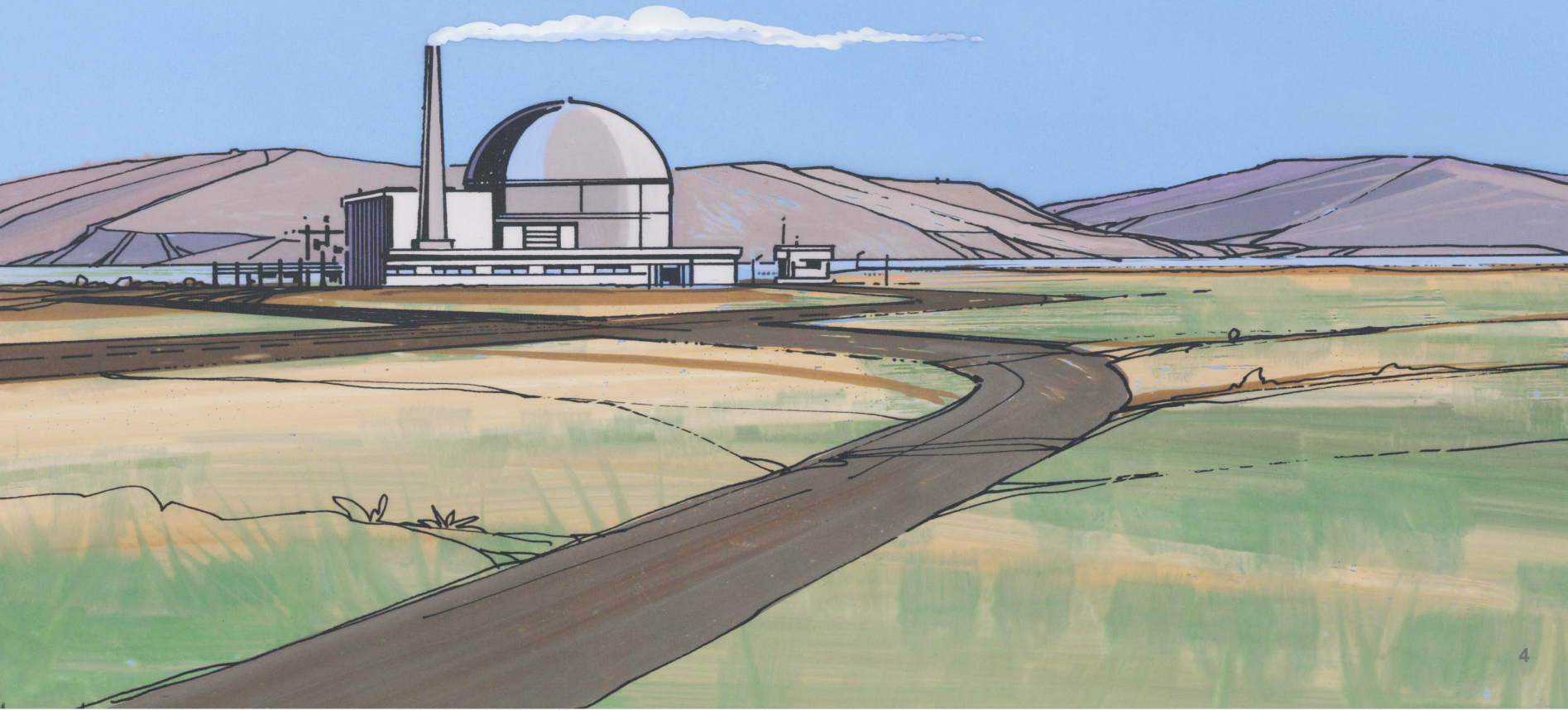
Basic Assessment Questions

- ▶ How much material is released (and on what time scale)?
- ▶ What fraction of it reaches receptors (and on what time scale)?
- ▶ What is the resultant risk of harm to receptors?



Radionuclide Source Terms

- ▶ GENII does not calculate reactor inventories
- ▶ Input is flexible; chain decay progeny grow in

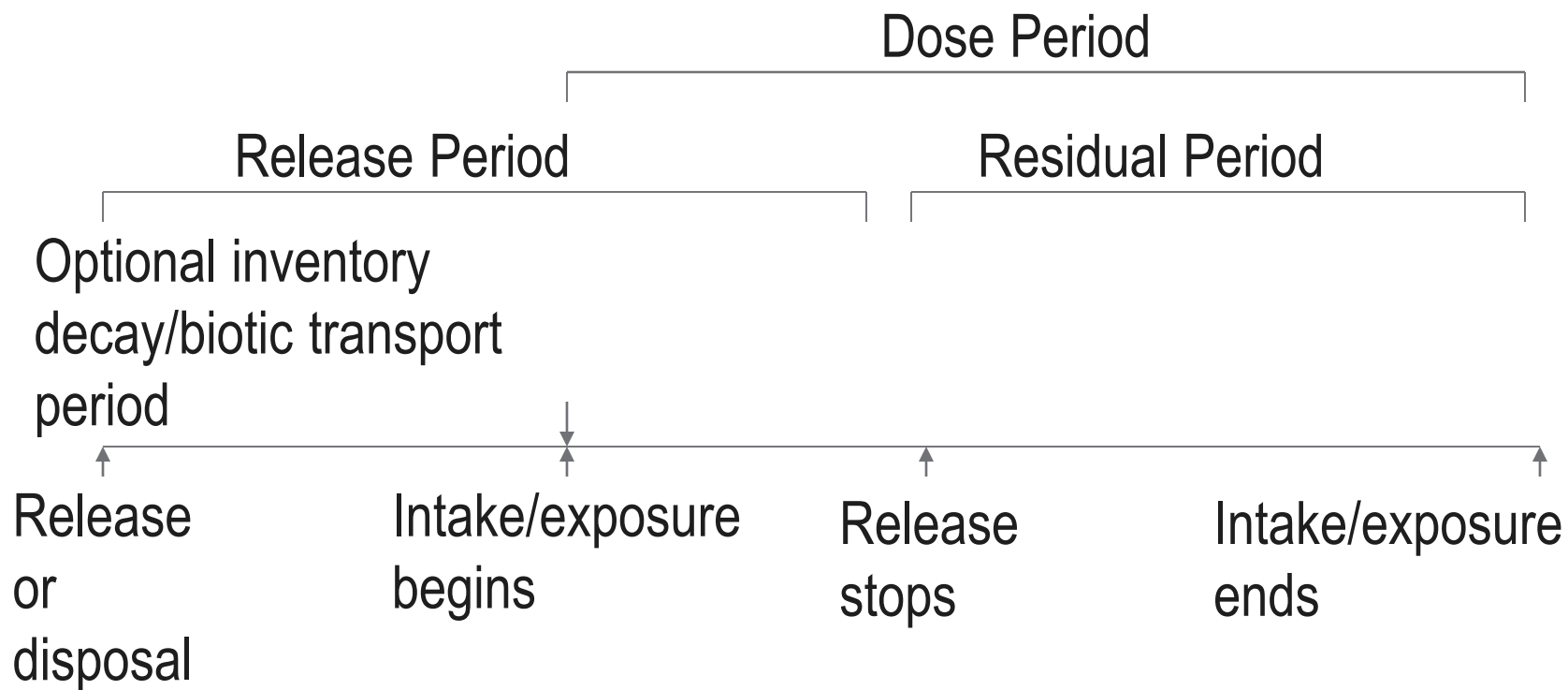




Radionuclides of Interest

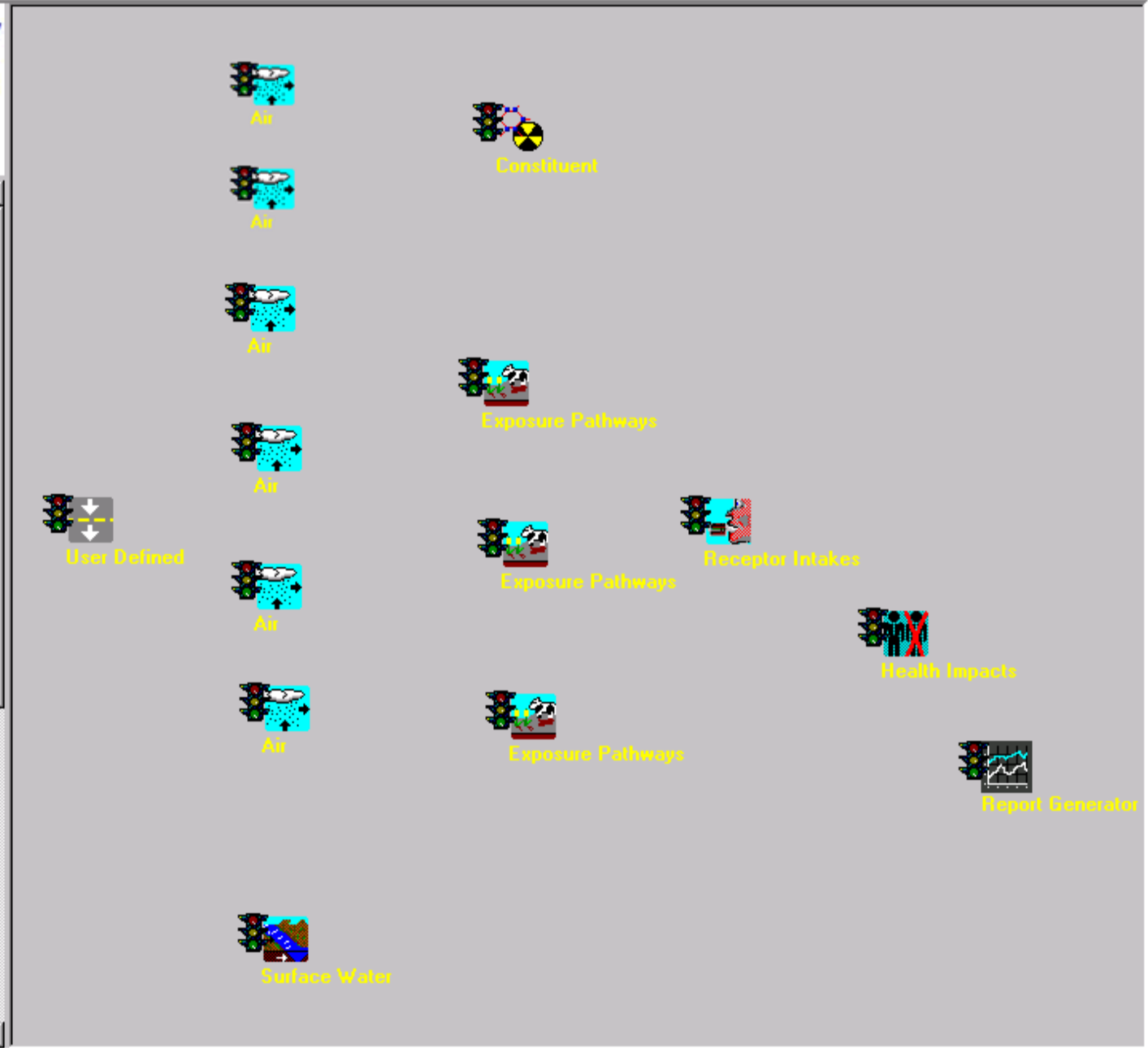
- ▶ All those with half-lives greater than 10 minutes*
 - ▶ All decay progeny of these
 - Some are included “implicitly”
- *(Except radon progeny...)

GENII V.2 Time Line





- Boundary Conditions
 - Plus Operators
 - User Defined
- Database
 - Aquatic Benchmarks
 - Aquatic Organism Selector
 - Constituent
 - GIS
- Eco Exposure & Risk
 - Eco Health Effects
- Fate & Transport
 - Air
 - Aquifer
 - Overland Flow
 - Source
 - Surface Water
 - Vadose Zone





Source Term

- ▶ Identity of contaminants released
- ▶ Amount of each contaminant released
- ▶ Physical and chemical characteristics
- ▶ Time of day, season of release
- ▶ Routine vs. episodic release

Important Source Term Characteristics



Pacific Northwest
NATIONAL LABORATORY

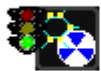
*Proudly Operated by **Battelle** Since 1965*

- ▶ Height of release above ground
- ▶ Time and duration of release
- ▶ Geographical location of release
- ▶ Structures near release
- ▶ Buoyancy of release



Initial GENII Input has Two Parts

► Selection of Radionuclides

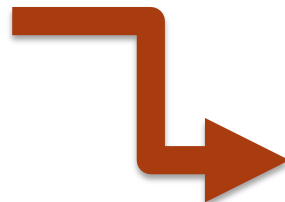


Constituent

► Input of releases or initial concentrations



User_Defined



Object General Information

Easting coordinate	0 km	Class	Boundary Conditions
Northing coordinate	0 km	Group	User Defined
Elevation	0 km	Object Id	usr2
User Label	User_Defined	Previous Model	AFF Air Module

Select from Applicable Models

- AFF Air Module
- ATO Acute Air Module
- ATO Air Module
- EPF Acute Exposure Concentrations Module
- EPF Exposure Pathways Module
- RIF Receptor Intakes Module
- SCF Sediment-Dissolved Module
- SCF Sediment-Total Module
- SCF Soil-Dissolved Module
- SCF Soil-Total Module

Non-applicable Models

- BBF Eco Body Burden Module

Model Description

MODULE VERSION
1.7 Compiled on 6/1/2006

MODULE DESCRIPTION
Use this module only if you know the air emission rates in air. The constituent rates all at user provided points in time, are entered directly through the interface.

DECAY PRODUCTS
This module does not compute the ingrowth of progeny because the user is assumed to know everything about the source, including progeny emission. Therefore, this module assumes that the progeny emissions are input along with the parent emissions.

MODULE REFERENCES
Document: FRAMES Known Source Module

Authors:
Mitch Pelton
Gariann Gelston
Melanie Eslinger

Other related sites:
<http://nepas.pnl.gov/earth>
<http://nepas.pnl.gov/FramesUI/documents/PNNL13411-knownsourcemodule.pdf>

VALID CONNECTIONS
Valid Input Reads
1 to 1 con required as input
Valid Output Writes

Ok Cancel



The Input Format Varies with Type

FRAMES User Defined Module - usr2

File Options Reference Help

Point located at 0 km Easting, 0 km Northing |

Type of release: Point

Exit area of source: 2 m² Ref: 0

Exit height of source: 60 m Ref: 0

Height of adjacent structure: 10 m Ref: 0

Exit velocity of source: 3 m/sec Ref: 0

Exit temperature of source: 20 C Ref: 0

Ambient air temperature: 10 C Ref: 0

Constituent: AR41 Ref: 0

Time	Gas 1	Particle 1
yr	Ci/yr	pCi/yr
0	40000	0
1	40000	0

Atmospheric Suspended Particle Definitions

☒ Gas 1

Non reactive fraction: 1 fraction Ref: 0

Density: 0.01 g/cm³ Ref: 0

☒ Particle 1

Radius: 7.5 um Ref: 0

Density: 1.5 g/cm³ Ref: 0

☐ Particle 2

Radius: 1.0 um Ref: 0

Density: 1.5 g/cm³ Ref: 0

☐ Particle 3

Radius: 0.3 um Ref: 0

Density: 1.5 g/cm³ Ref: 0

FRAMES Known Exposure Pathway Module - usr2

File Reference Help

EPF

- Aquifer
 - SR90
 - Constituent Pathways
 - Ingestion (Water)
 - Y90
 - Constituent Pathways
 - Ingestion (Water)
 - Soil
 - SR90
 - Constituent Pathways
 - Ingestion (Leafy vegetable)
 - Ingestion (Milk)
 - Y90
 - Constituent Pathways
 - Ingestion (Leafy vegetable)
 - Ingestion (Milk)

Ingestion (Milk)

Time in: yr

Concentrations in: Bq/L

Ref: 0

Times	Conc. at Location
0	12
1	0

Almost always need to enter values for 2 (or more) time periods

