Update on SIERRA Code Consolidation

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Software Integration for Environmental Radiological Release Assessments

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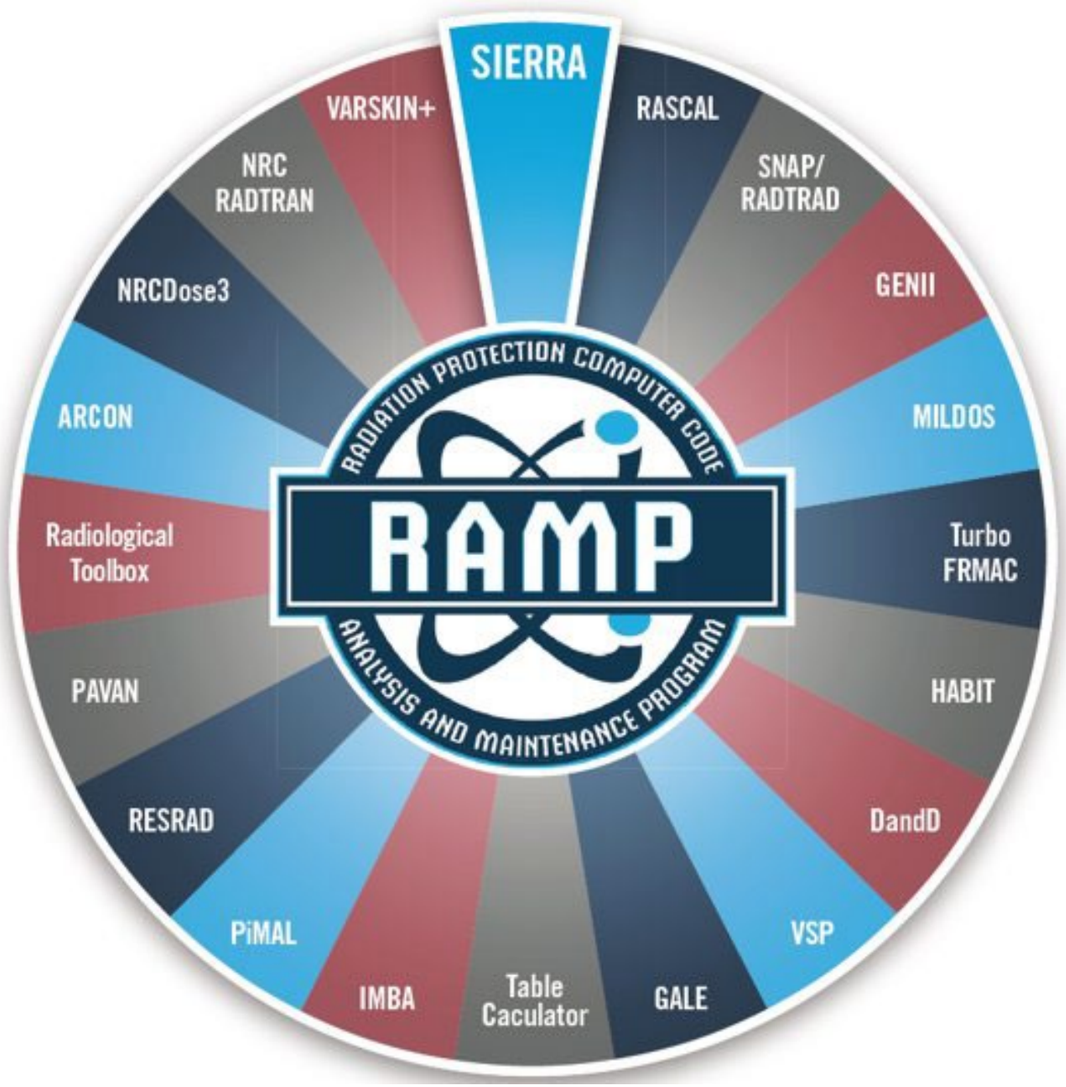
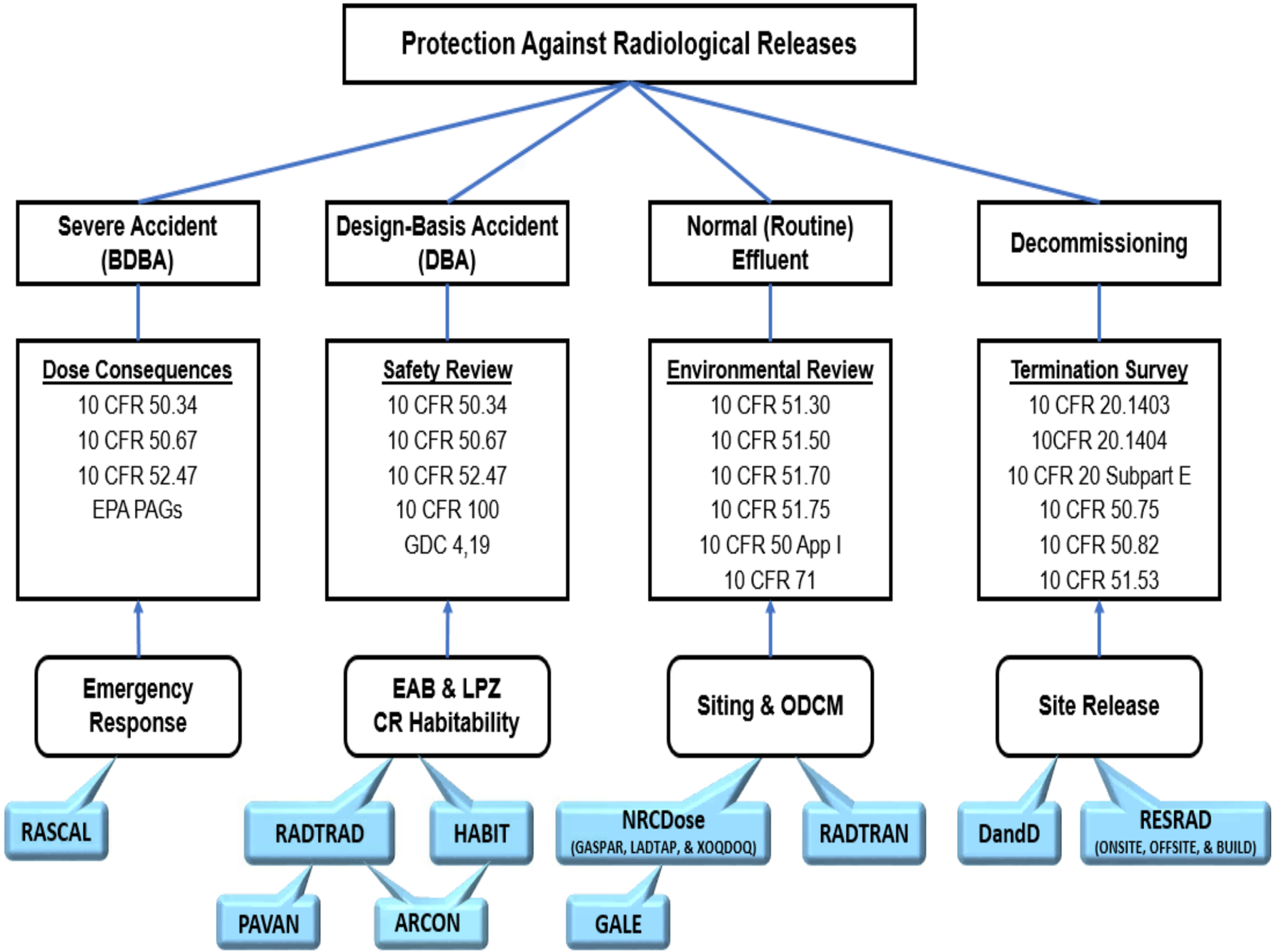
PNNL-SA-197363

Outline

- Motivation and framework for Code Consolidation Efforts
- Status of SIERRA ATD (Atmospheric Transport and Diffusion) Module
  - Example Case
  - Software Quality Assurance Testing
- Sneak peek at SIERRA Source Term

- Software Integration for Environmental Radiological Release Assessments (SIERRA)




Protection Against Radiological Releases
Severe Accident (BDBA)
Design-Basis Accident (DBA)
Normal (Routine) Effluent
Decommissioning
Dose Consequences
10 CFR 50.34
10 CFR 50.67
10 CFR 52.47
EPA PAGs
Safety Review
10 CFR 50.34
10 CFR 50.67
10 CFR 52.47
10 CFR 100
GDC 4,19
Environmental Review
10 CFR 51.30
10 CFR 51.50
10 CFR 51.70
10 CFR 51.75
10 CFR 50 App I
10 CFR 71
Termination Survey
10 CFR 20.1403
10CFR 20.1404
10 CFR 20 Subpart E
10 CFR 50.75
10 CFR 50.82
10 CFR 51.53
Emergency Response
EAB & LPZ CR Habitability
Siting & ODCM
Site Release
RASCAL
RADTRAD
HABIT
NRCDose (GASPAR, LADTAP, & XOQDOQ)
RADTRAN
DandD
RESRAD (ONSITE, OFFSITE, & BUILD)
PAVAN
ARCON
GALE

Motivation for Code Consolidation – Non LWRs

- NRC Non-Light Water Reactor (Non-LWR) Vision and Strategy, Volume 4 — Licensing and Siting Dose Assessment Codes (RAMP)
  - Describes the computer codes in RAMP and how they would be applied to each of the principal non-LWR design types, and summarizes the tasks necessary to resolve “gaps” in the capability to model and simulate those designs with the accuracy required by the regulator
- Code consolidation can help resolve the identified gaps in the RAMP suite of codes

How can we think about Code Consolidation?

1. Establish definition and scope of Code consolidation:
    a. What problem are we solving with consolidation?

2. Categorize the priorities:
    a. What Code languages should be used?
    b. How will the consolidate code be structured?
    c. What codes could be consolidated?

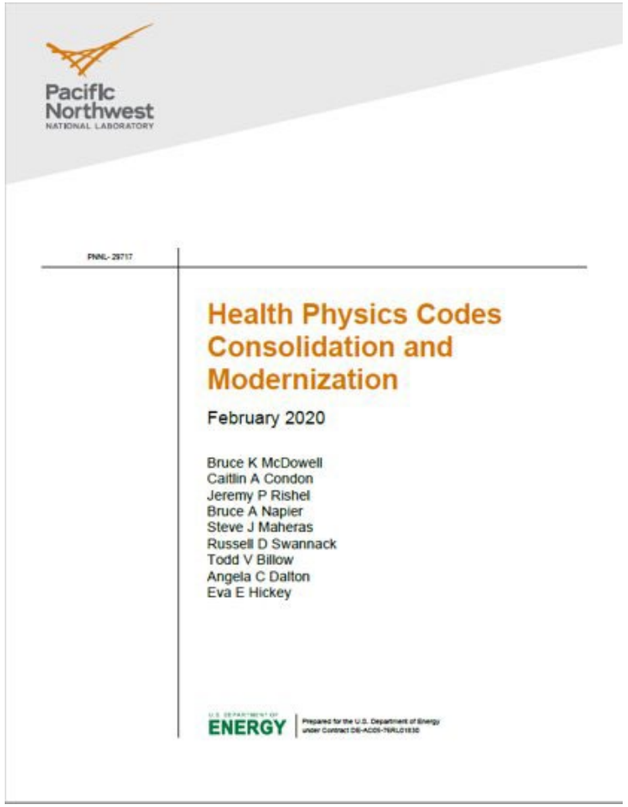
3. Establish the requirements:
    a. Regulatory Requirements
    b. Modeling requirements
    c. Data requirements
    d. Quality Assurance
    e. Consolidation requirements for efficiency

Motivation for Code Consolidation – Legacy Issues

- Incompatible with non-LWRs
- Ownership issues
- Lack of standardized code development
- Lack of maintenance
- Dated science
- Lack of standardized quality assurances
- Functional redundancy/data transfer
- Inefficiency

Thesis Statement for RAMP Code Modernization and Consolidation

- The computer codes in the RAMP program have been developed since the 1970's to address specific regulatory needs.
- These codes today have numerous current and legacy issues that reduce the efficiency of operation and maintenance of the codes and increase cost. In their current state, these codes are also unable to fully assess radiological doses from advanced non-light water reactor designs.
- These current and legacy issues could be addressed by transforming the current suite of single-purpose radiation protection and dose assessment computer codes to a consolidated functional and modern suite of codes that is modular, flexible, efficient and user-friendly.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PNNL-29717

Health Physics Codes Consolidation and Modernization

February 2020

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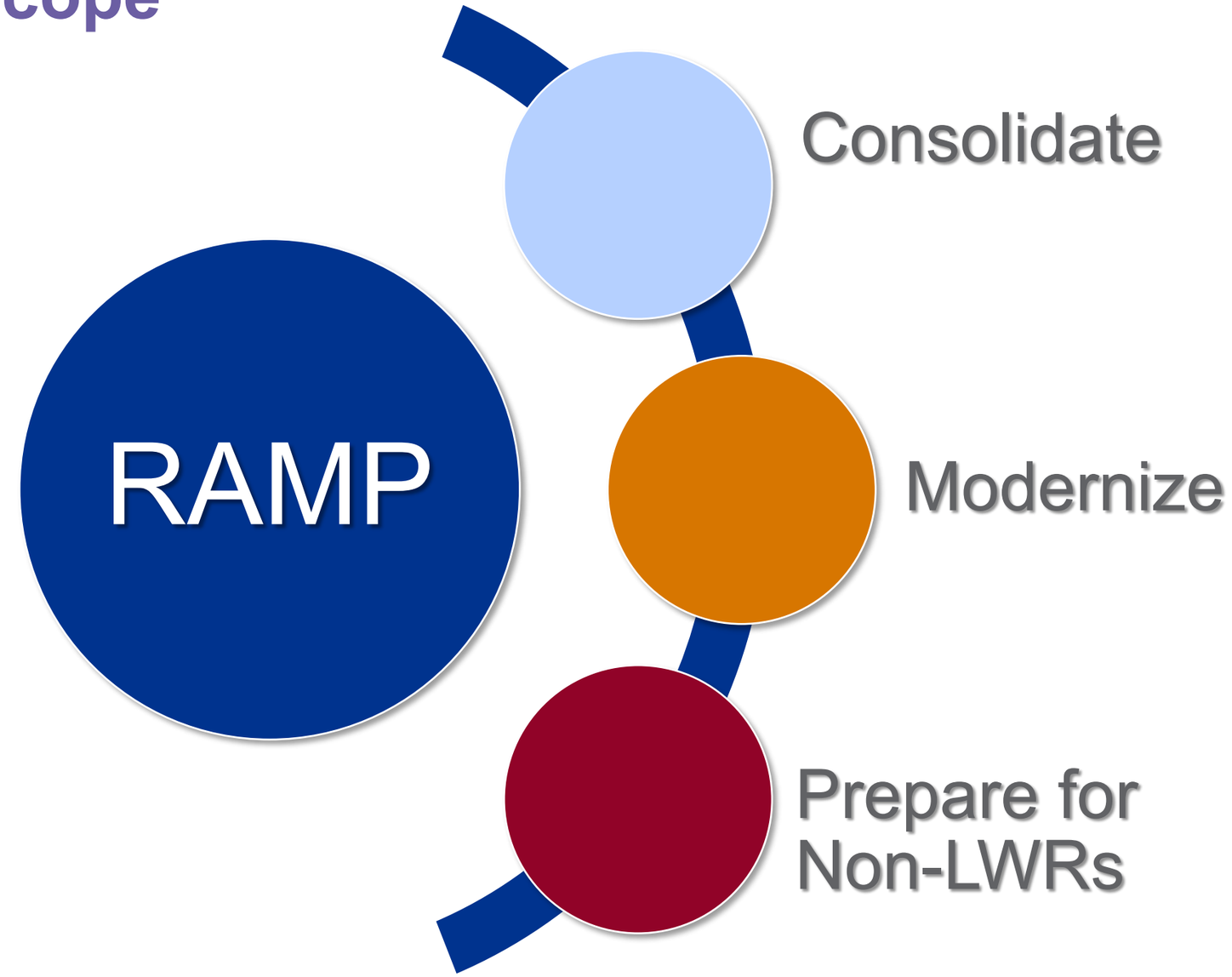
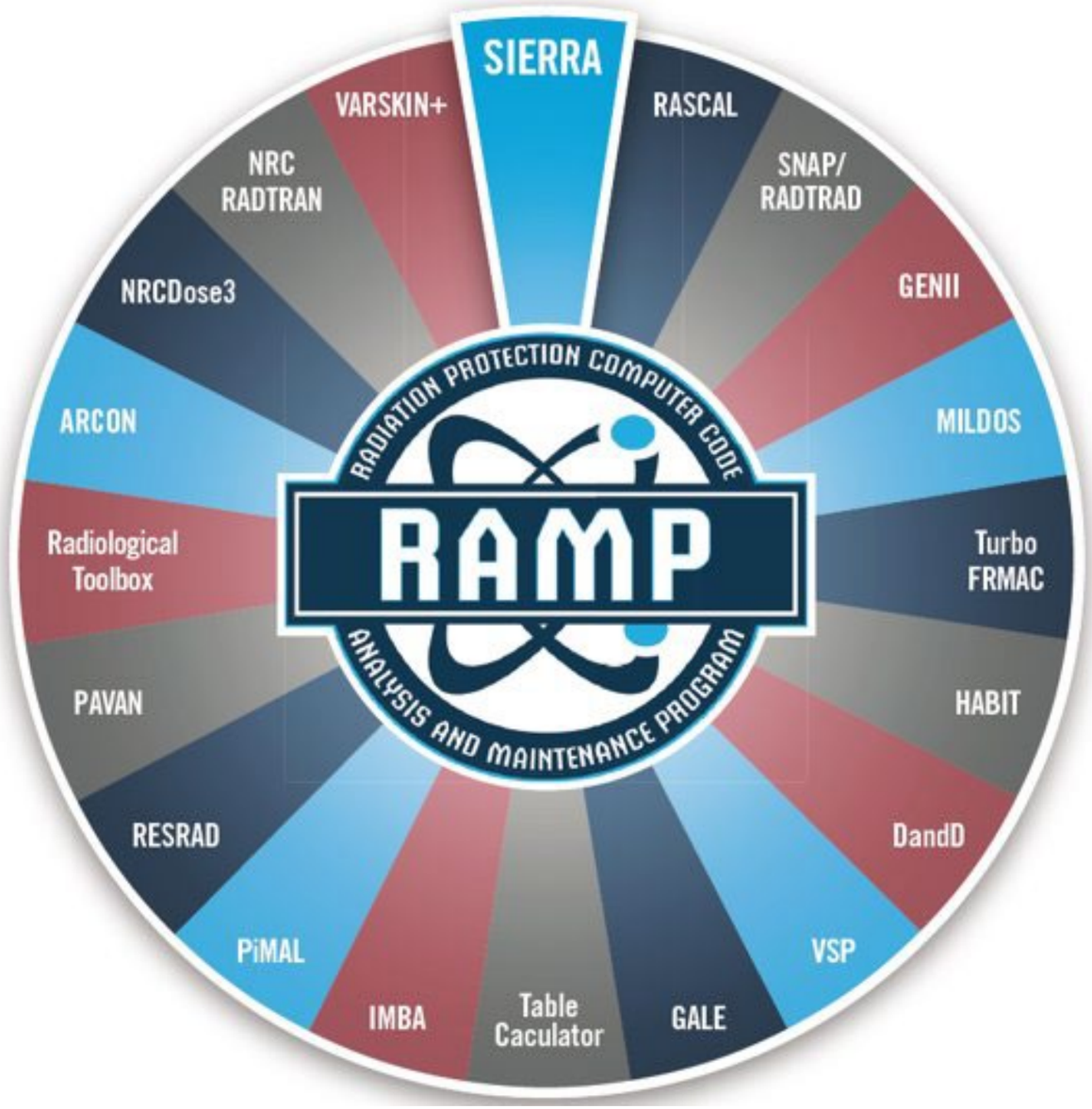
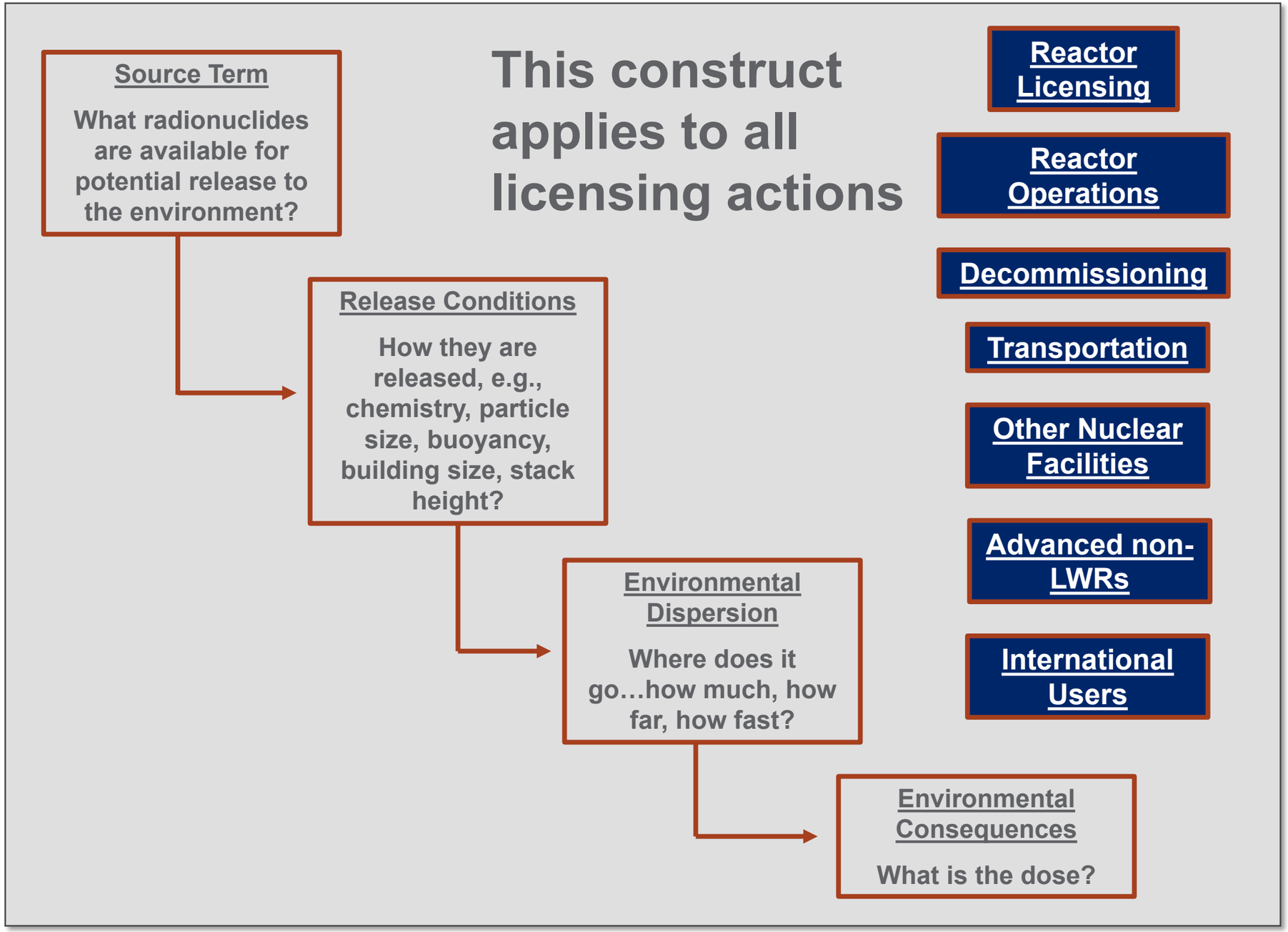
High Level Scope




SIERRA
RASCAL
SNAP/
RADTRAD
GENII
MILDOS
Turbo
FRMAC
HABIT
DandD
VSP
GALE
Table
Caculator
IMBA
PiMAL
RESRAD
PAVAN
Radiological
Toolbox
ARCON
NRCDose3
NRC
RADTRAN
VARSKIN+
RADIATION PROTECTION COMPUTER CODE
RAMP
ANALYSIS AND MAINTENANCE PROGRAM

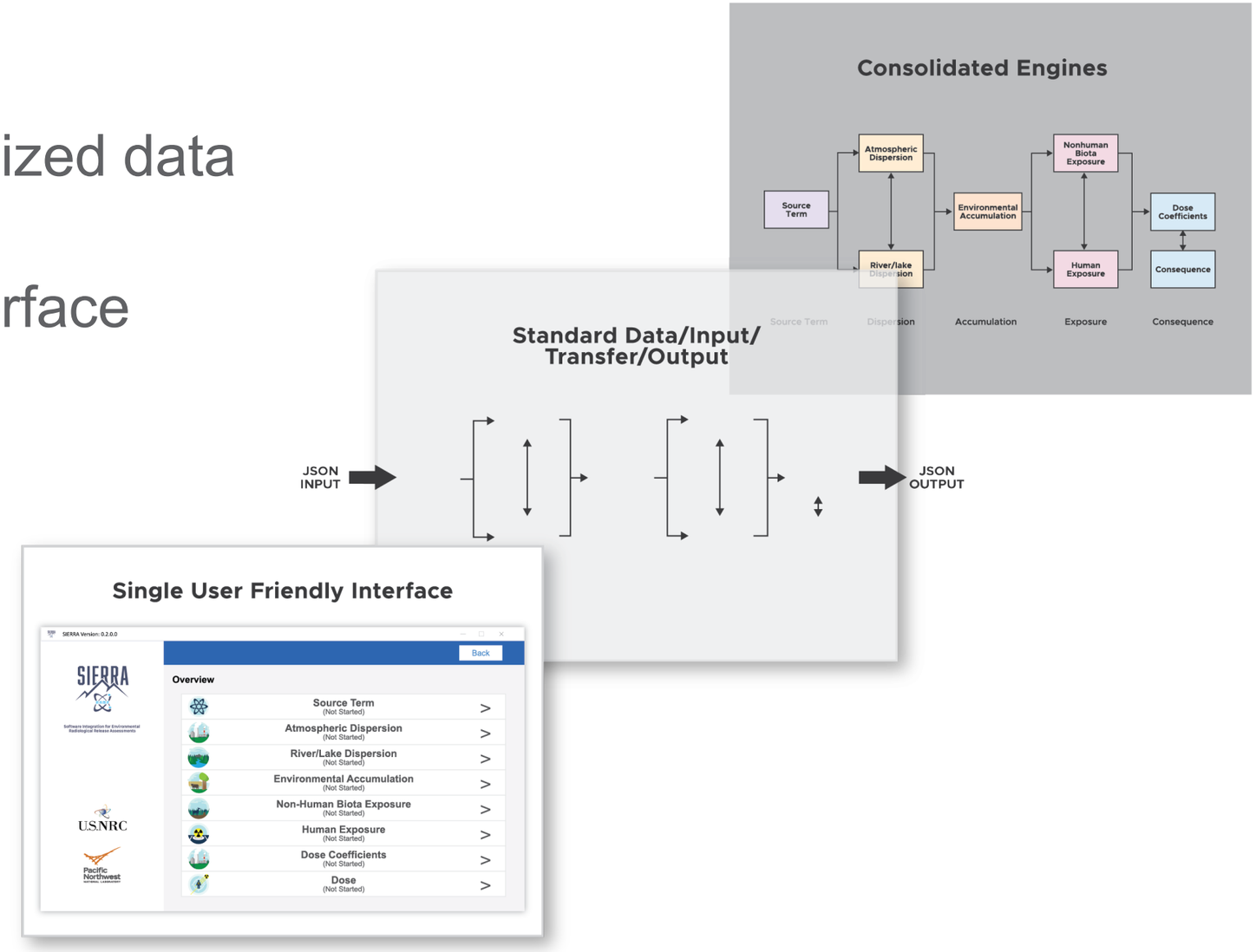

Source Term
What radionuclides are available for potential release to the environment?
Release Conditions
How they are released, e.g., chemistry, particle size, buoyancy, building size, stack height?
Environmental Dispersion
Where does it go…how much, how far, how fast?
Environmental Consequences
What is the dose?
This construct applies to all licensing actions
Reactor Licensing
Reactor Operations
Decommissioning
Transportation
Other Nuclear Facilities
Advanced non-LWRs
International Users

What are the Benefits of the Approach?

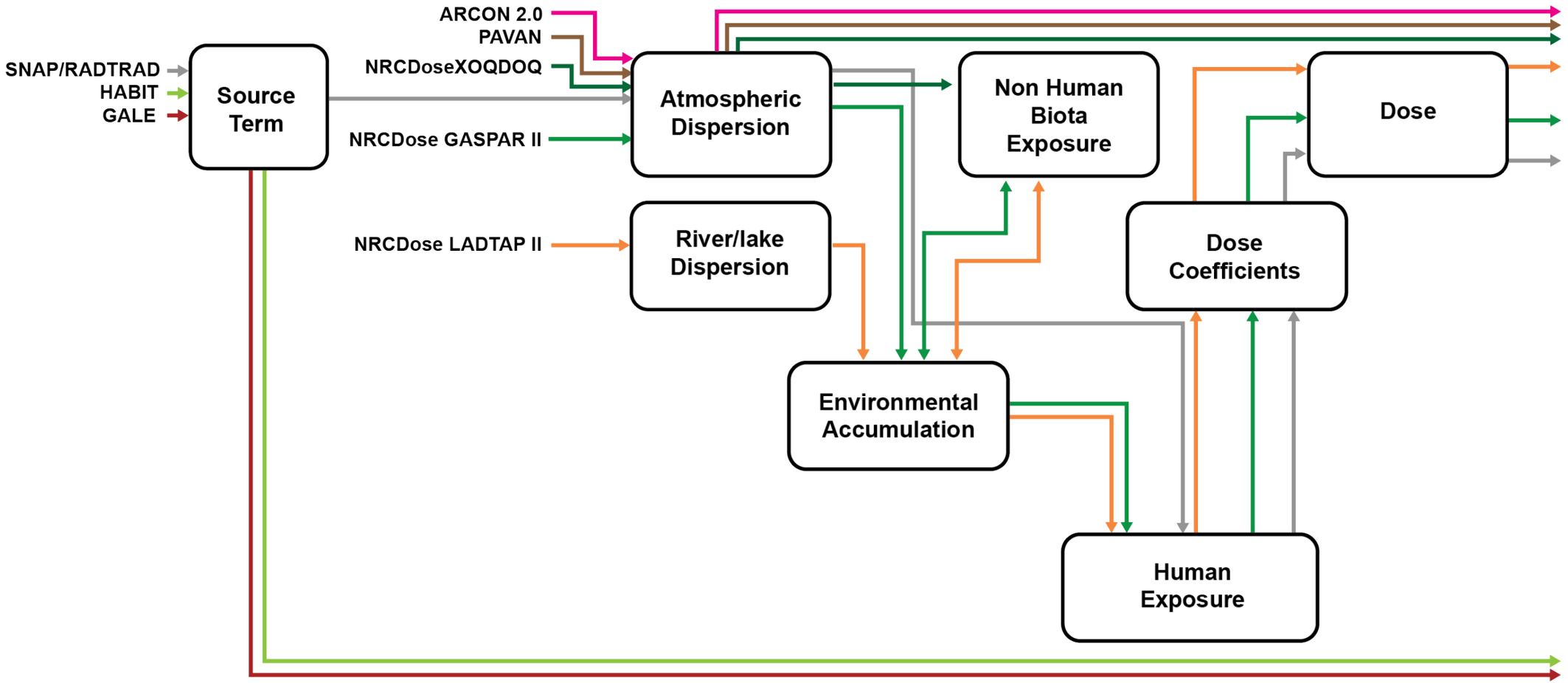
- ✓ Accommodates anticipated needs for non-LWR Designs
- ✓ Modernizes code languages and user experience
- ✓ Reduces number of codes to upgrade and maintain
- ✓ Standardizes inputs and outputs
- ✓ Flexible design for future expansion or updates
- ✓ Addresses known problems

Three Pillars of Code Consolidation

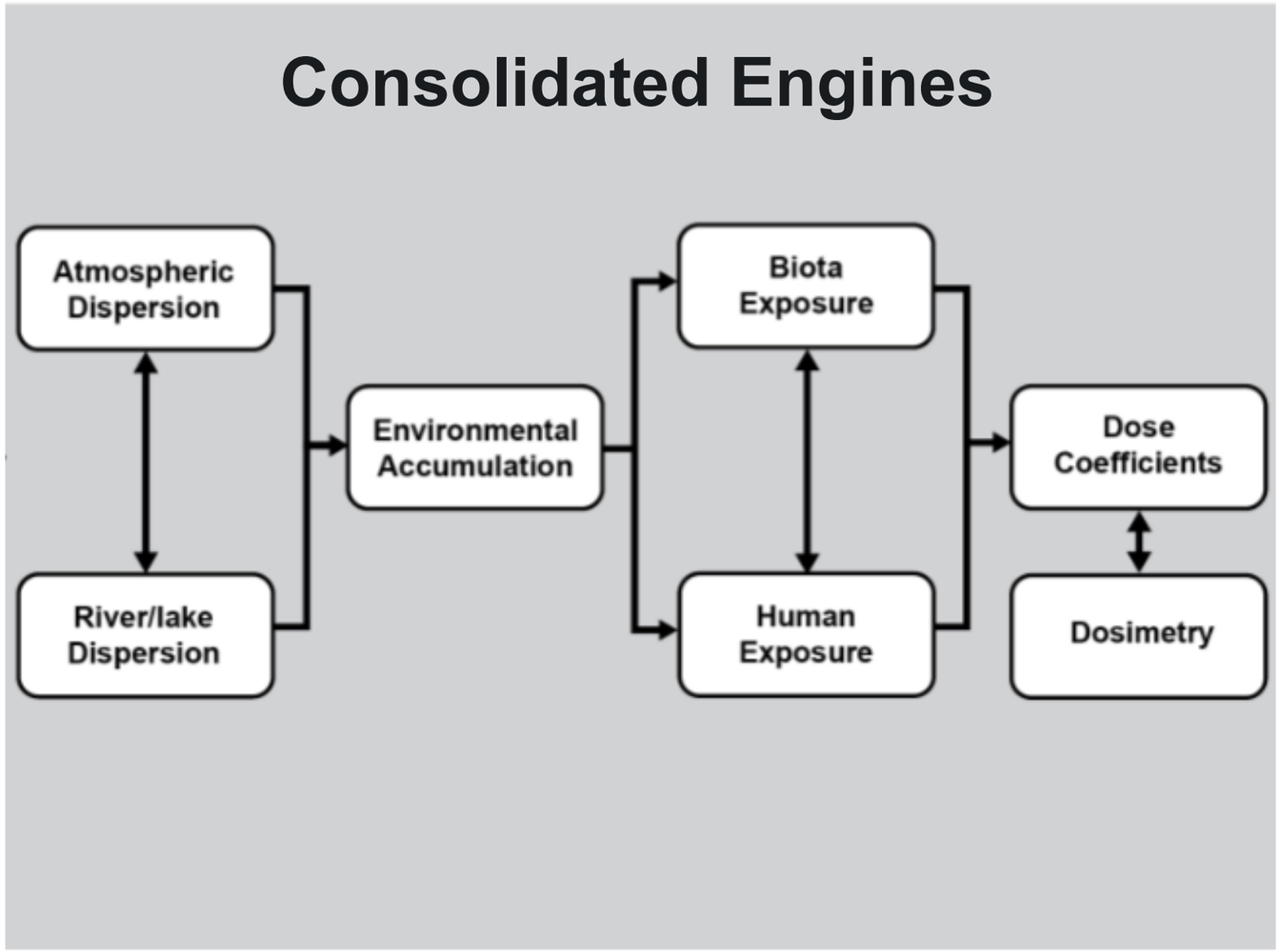
- Created consolidated engines/modules
- Developed a standardized data transfer schema
- Built a single user interface



Code Consolidation and Modernization in Context



Proposed Functional Engines will consolidate code functions

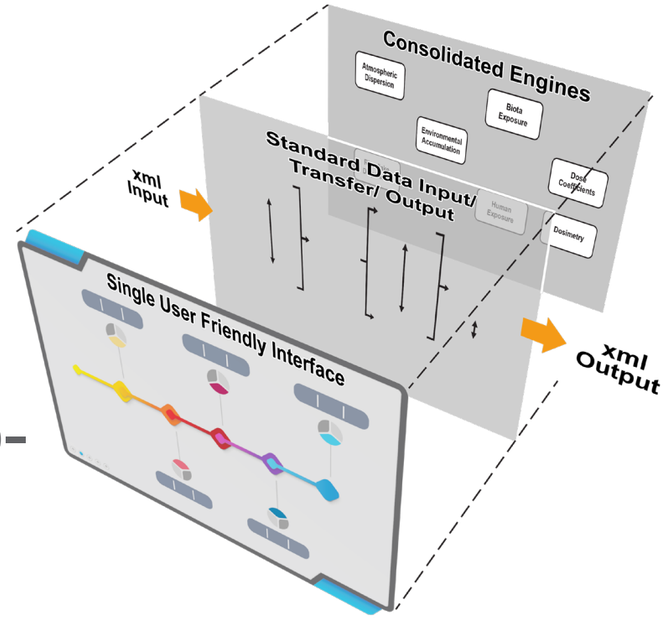


Standardized Input/Transfer/Output will simplify data transfer

- A JSON schema for the RAMP suite of codes will be
  - Flexible
    - ✓ Will allow additions of new variables yet unknown for advanced reactor designs
    - ✓ Variable data will not need to appear in the data transfer file in a particle order, will only need to be in the JSON format and have the associated keyword to signal the code
  - Standardized
    - ✓ All data transfer into the code, between functional engines, and out to the user will be in the same standard format
  - Modern
    - ✓ Widely used format

A Single Modern User Interface will improve the User Experience

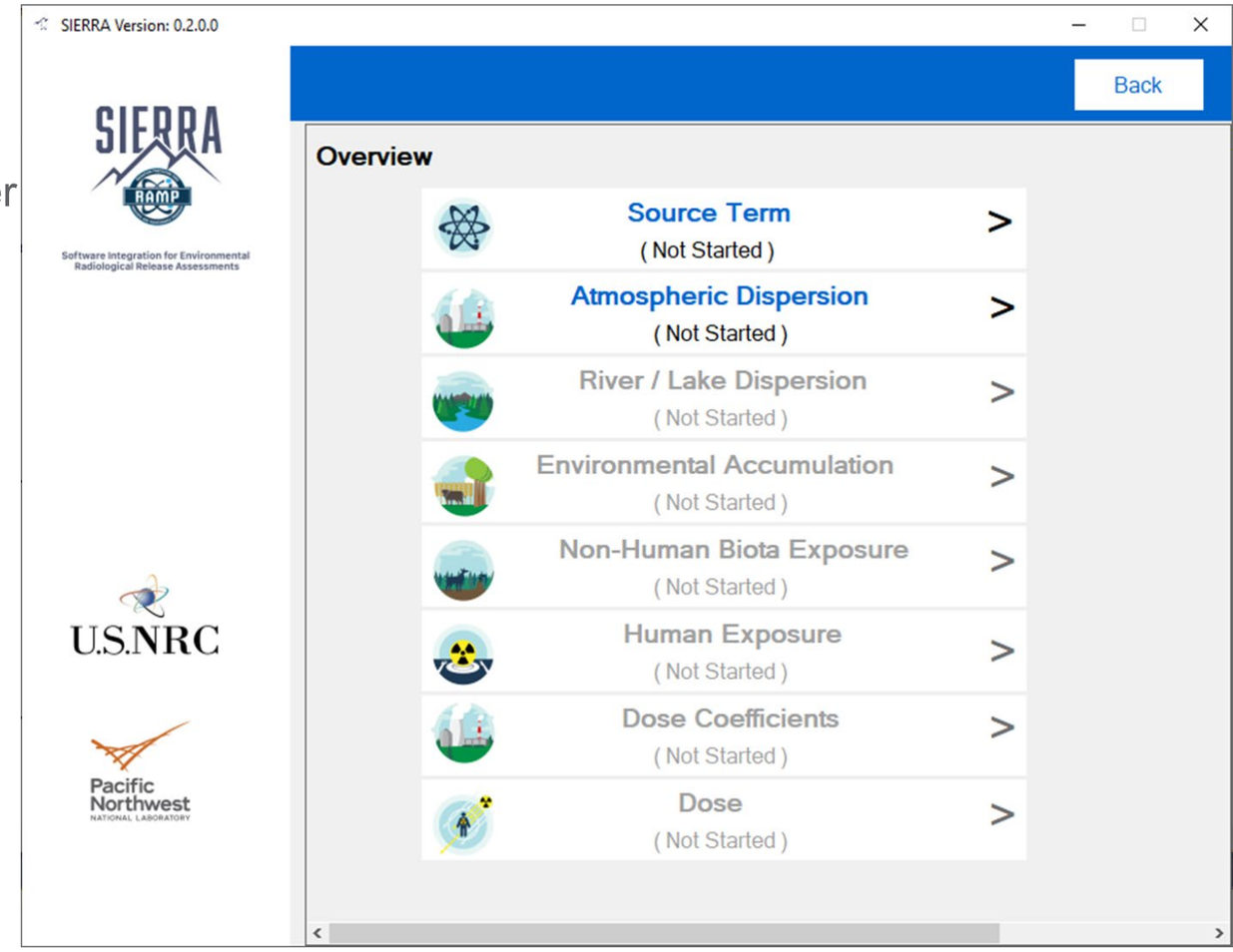
- User interface will be completely separate from the functional engines
  - ✓ Updating or changing the user interface will not inadvertently affect the quality of the functional capabilities
  - ✓ Allows for the possibility of developing a web-based user experience or mobile application
- User interface will require updates and maintenance
  - ✓ Will only have one user interface to maintain



Code Consolidation and Modernization

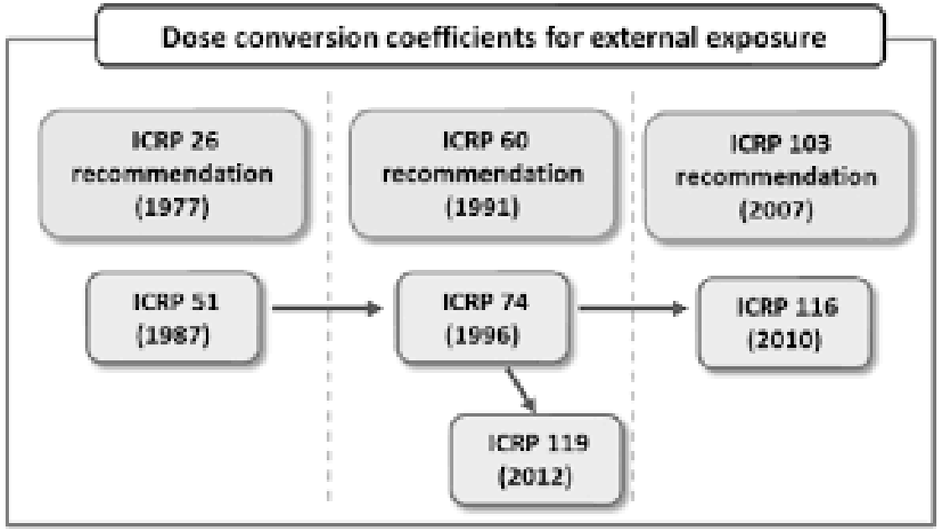
Phased Release of SIERRA

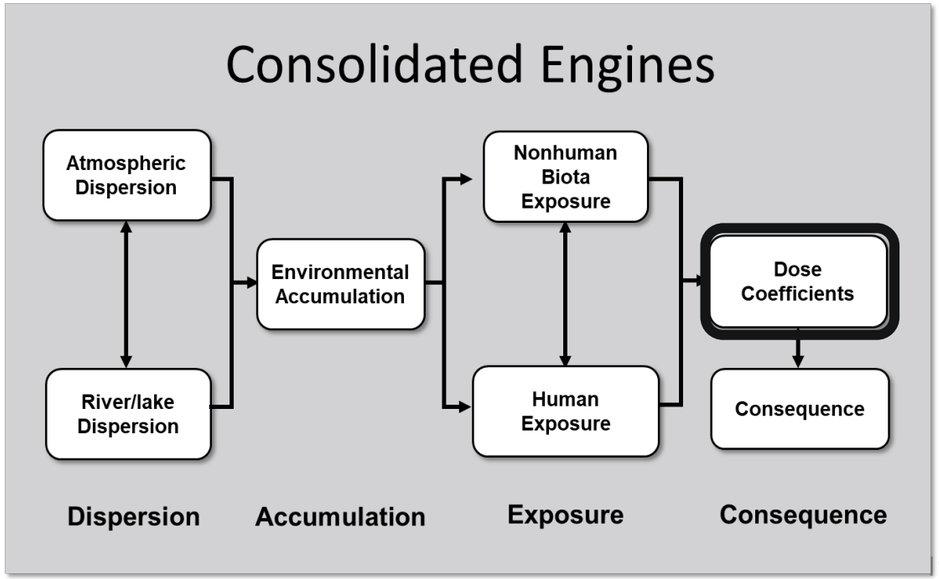
- Software under active development which aims to combine multiple RAMP codes into one easy to use package.
- Release of ATD Module of SIERRA at the end of September 2024.
- Currently have two efforts underway for SIERRA.
  - Atmospheric Dispersion Models (September 2024):
    - ARCON
    - PAVAN
    - XOQDOQ
  - Source Term:
    - GALE (Phase 1) – August 2024
    - Advanced reactors (Phase 2) – September 2025
  - Environmental Pathways (2026):
    - NRCDose3 (GASPAR & LADTAP)



Update Dose Coefficient Values

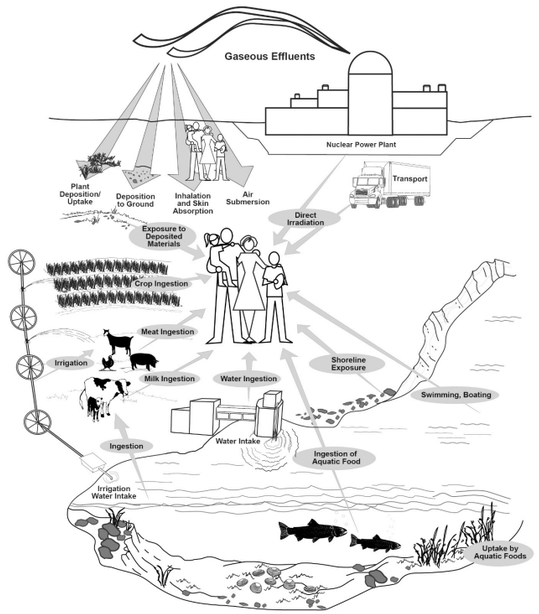
- This task involves:
  - Developing dosimetry modules/engines that have the flexibility to use different dose models and dose coefficient values
  - Examining dose coefficient models with respect to aerosol particle size in addition to exploring the impact of tritium and carbon-14 biokinetics since these radionuclides may be in higher quantities in non-LWRs

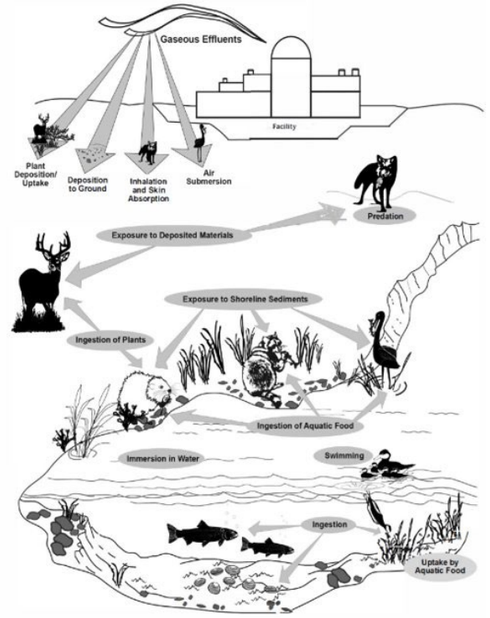




Develop Environmental Pathways Models

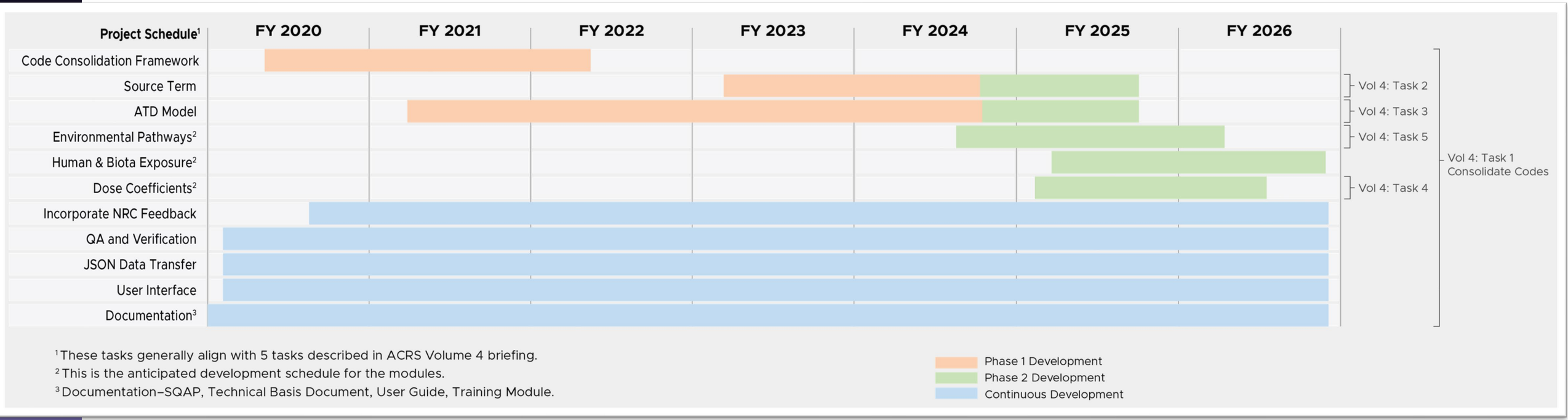
- Purpose:
  - Developing environmental transfer pathways and environmental accumulation
- Current Status:
  - Exploring transferring NRCDose Computer Code into SIERRA
  - Explore additional transfer model pathways for incorporation into SIERRA
  - Explore modeling H-3 and carbon-14 accumulation in the environment

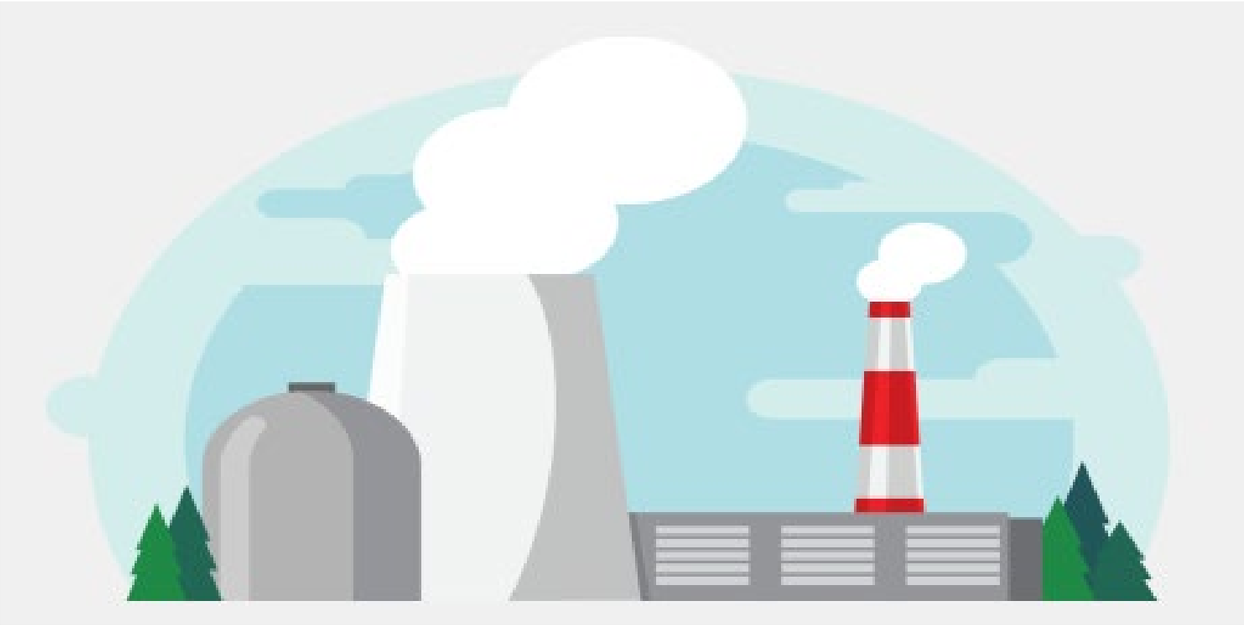




NRCDose → Expanded Pathways → H-3, C-14, and Special Models

High Level Schedule





SIERRA Atmospheric Transport and Diffusion (ATD) Engine

SIERRA Atmospheric Dispersion Software Development

- A new atmospheric dispersion module was developed (rather than directly using the legacy codes) for SIERRA for the following reasons:
  - To support a single user interface that allows users to access each of the codes (ARCON, PAVAN, XOQDOQ) in a relatively uniform manner
  - To facilitate future development to share data with other health physics codes in SIERRA
  - To allow users to estimate relative concentrations based on hourly meteorological data for all three codes, rather than use JFDs
  - To employ a more modern FORTRAN code development practice, which makes the code easier to maintain in the future

Legacy ATD Codes

Code	Description
ARCON	Used to calculate relative air concentrations (χ/Qs) in support of control room habitability assessments required by general design criteria (GDC) 19 of 10 CFR Part 50 Appendix A and RG 1.194.
PAVAN	Used to estimate relative ground-level air concentrations (χ/Qs) resulting from radioactive material releases from design-basis accidents at NPPs following the methodology in RG 1.145.
NRCDose/ XOQDOQ	Software suite that integrates the functionality of three individual Fortran codes: LADTAP II, GASPAR II, and XOQDOQ, which were developed by the NRC and have been in use by NPP licensees and the NRC staff for assessments of liquid radioactive releases and offsite doses, gaseous radioactive effluents and offsite doses, and meteorological transport and dispersion, respectively. XOQDOQ implements the atmospheric dispersion modeling described in RG 1.111.

SIERRA ATD Analysis Types / Applicability

SIERRA Analysis Type	Legacy Model	NRC Guidance Document	Applicability
Control room habitability assessment	ARCON	RG 1.194 SRP 2.3.4 SRP 15.0.3	Evaluate personnel exposures inside the control room during accidents Protection against radiation inside the onsite technical support center
Design basis accident analyses	PAVAN	RG 1.145 SRP2.3.4	Offsite consequence at EAB and LPZ for plant design Offsite consequence at EAB and LPZ for safety assessment Determine acceptable EAB and LPZ for siting Offsite consequence at EAB and LPZ for postulated accidents
Routine release analysis	NRCDose / XOQDOQ	RG 1.111 SRP 2.3.5	Annual dose assessment to ensure below threshold limit during operations Annual dose assessment to meet as low as is reasonably achievable (ALARA) criterion during preliminary plant design

PNNL Software Development – QA, Success Criteria

- Software QA Plan defines QA approach to provide adequate confidence that
  - Software development process is controlled
  - Software products meet established requirements
- User Interface Success Criteria
  - Invalid entries result in an error message or prevents simulations from running
  - Information displayed within each panel (e.g., meteorology, terrain) are correct
  - Saving / loading files functions correctly
  - When simulations are run, the appropriate output are saved to the appropriate locations
- Atmospheric Modules Success Criteria
  - Meteorology panel summary table in the UI aligns with atmospheric module output
  - The intended analysis is implemented by the code
  - Comparisons with the legacy code primarily fall within a factor of 2, with few cases up to a factor of 10.

PNNL Software Testing Approach

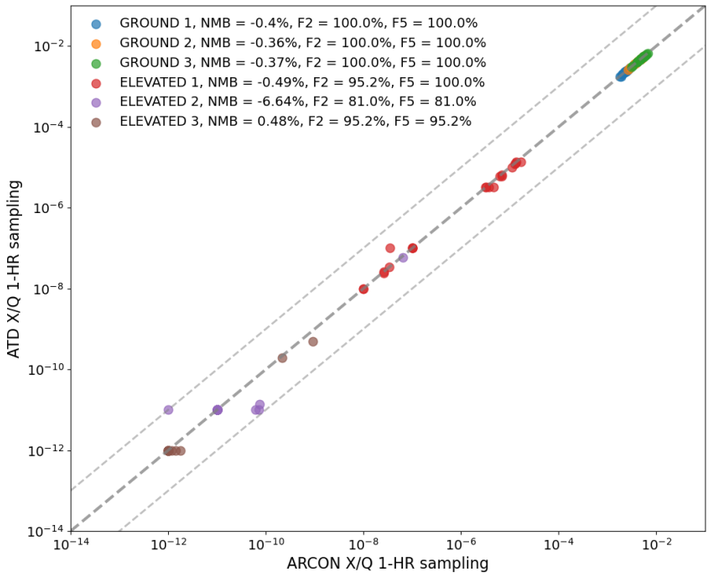
- Independent reviewers test the UI or atmospheric modules by following test cases identified in a Test Plan
- Any issues that were identified was reviewed / corrected by developers
  - New version(s) were tested by independent reviewers to check that the new functionality is appropriate
- User Interface
  - Testing involved setting up cases exclusively through the UI and by loading a JSON file and modifying variables; all cases were run until the outcomes were successful
- Atmospheric Modules
  - Testing involved both input through the UI and direct input to the ATD.exe software
  - Test cases were performed with 19 meteorological files from locations across the US
  - Modifications were made to ensure consistency with the legacy codes

Atmospheric Module Test Result Summary

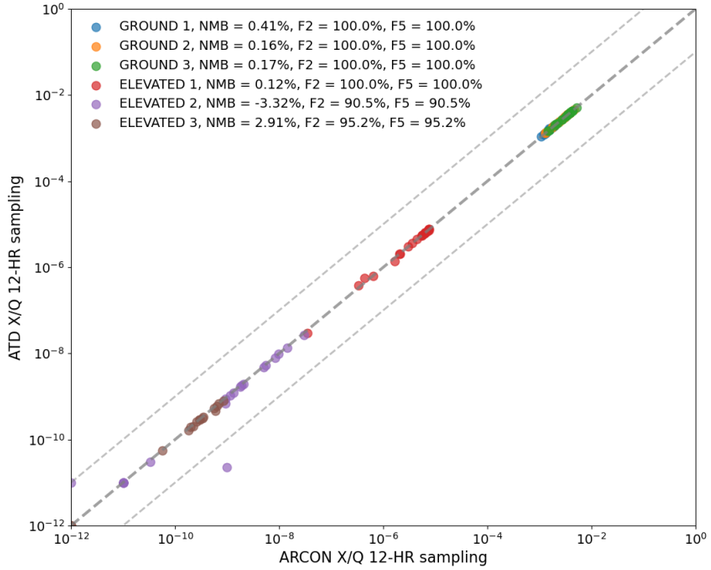
- Comparisons with legacy codes
  - Statistics
    - Percentage of values within a Factor of 2 (F2) between the ATD and legacy codes
    - Percentage of values within a Factor of 5 (F5) between the ATD and legacy codes
    - Normalized Mean Bias (NMB) between the ATD and legacy codes
  - Outcomes
    - Most results were near the 1:1 line, within F2 and F5
    - Differences observed were unlikely to change conclusions for applications where these models are used
    - Differences attributed to
      - Meteorological inputs - for PAVAN and XOQDOQ, data were JFD, rather than hourly
      - Treatment of calm winds – prescribed wind direction based on wind speeds < 2 m/s in legacy, vs distributed in all sectors in ATD
      - Log interpolation – for PAVAN
      - Calculation of percentiles – for ARCON

ATD Control Room Comparison with ARCON

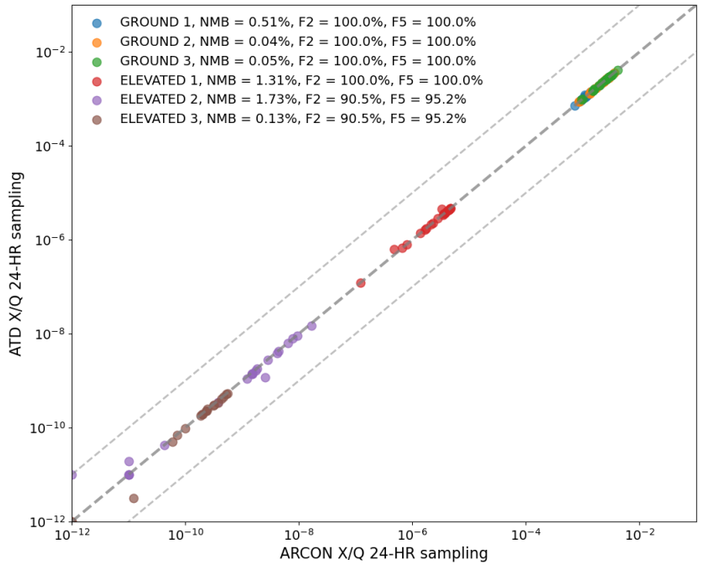
- Tests varied direction to source, receptor distance, intake height, building area, vertical stack flow, stack radius
- 3 ground and 3 elevated cases
- Compiled results from all meteorological files



1-HR



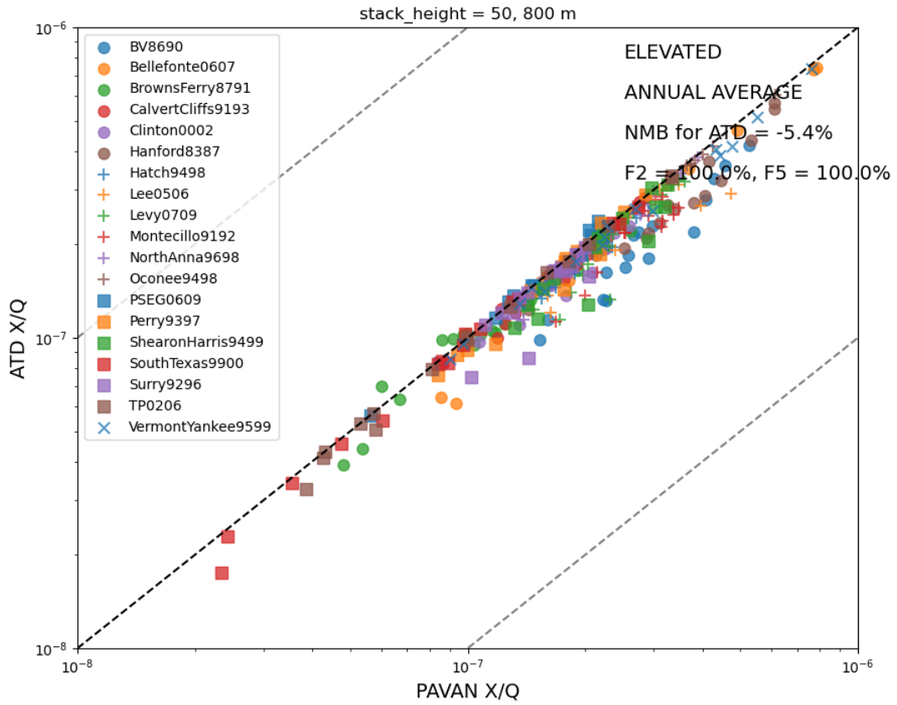
12-HR

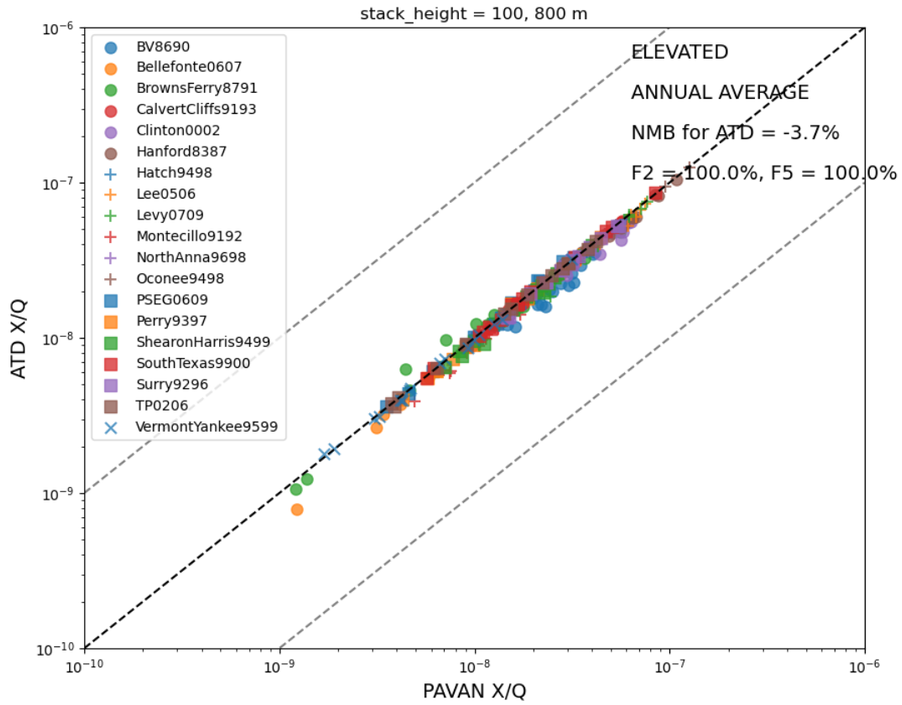


24-HR

ATD Design Basis Accidents Comparison with PAVAN

- Varied stack diameter, stack flow, and stack height for Elevated cases
- Varied building area and building height for Ground cases

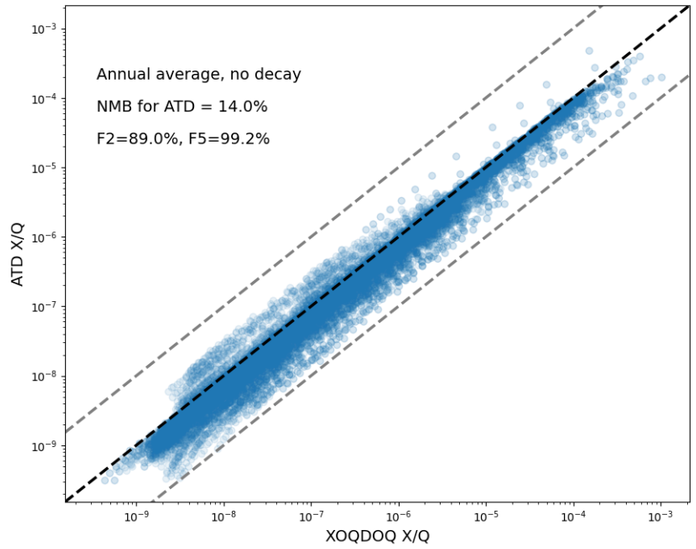


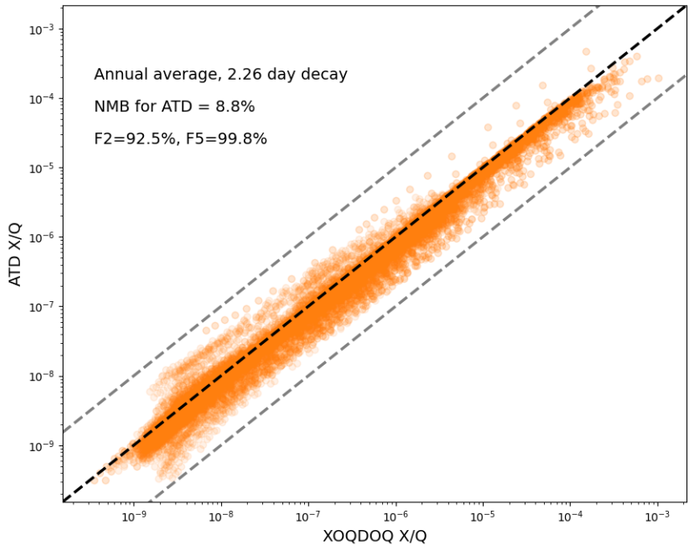


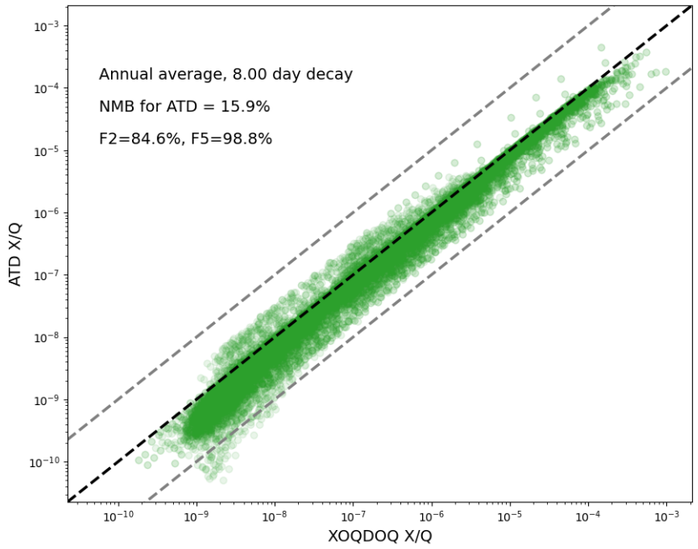
Annual Avg, Elevated cases for stack ht = 50, 100

ATD Routine Analysis Comparison with NRCDose (XOQDOQ)

- 8 scenarios based on combination of: Elevated vs Ground, With Terrain vs Without Terrain, for Recirculation vs No Recirculation



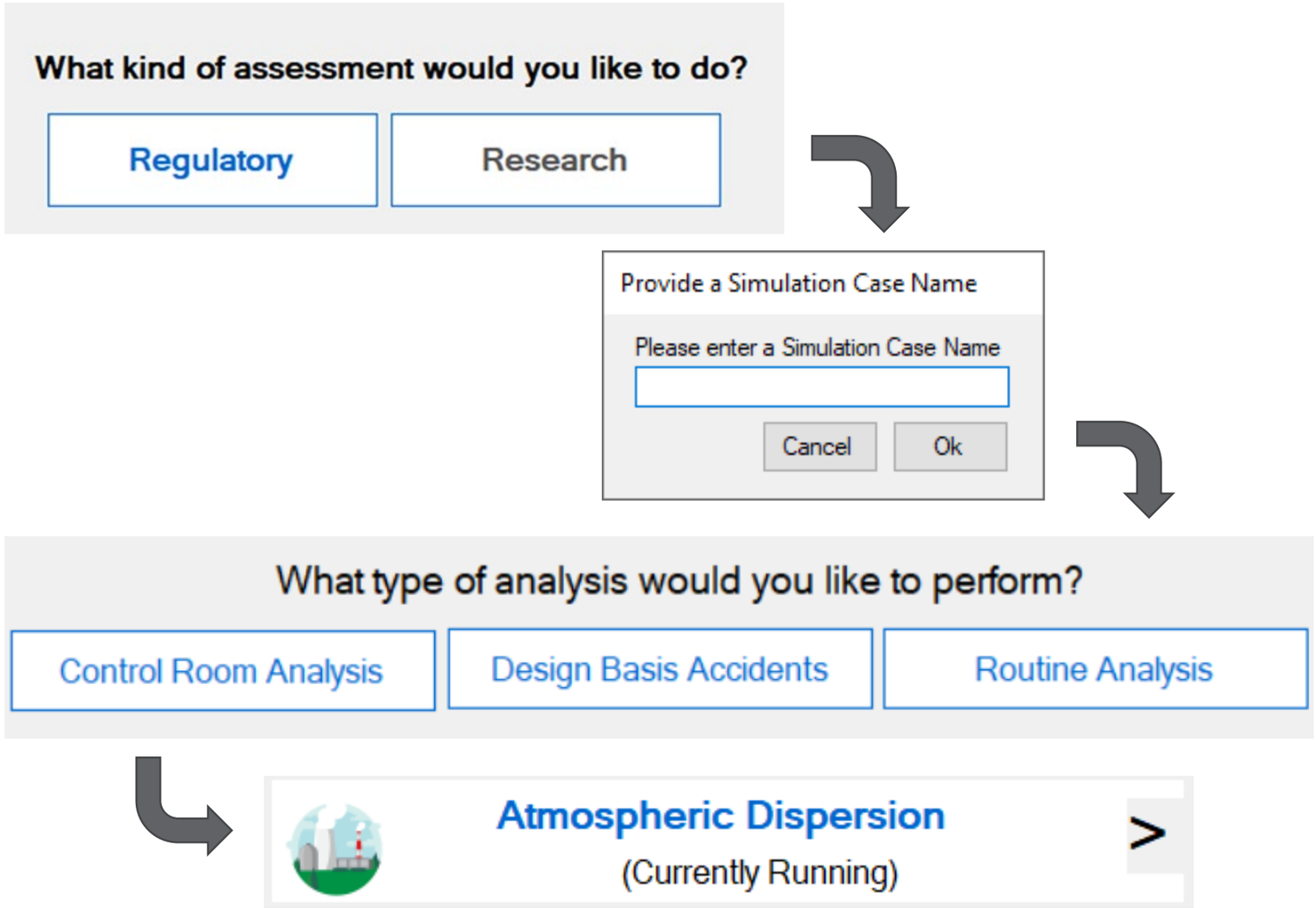




Results from Recirculation cases

SIERRA ATD UI Overview

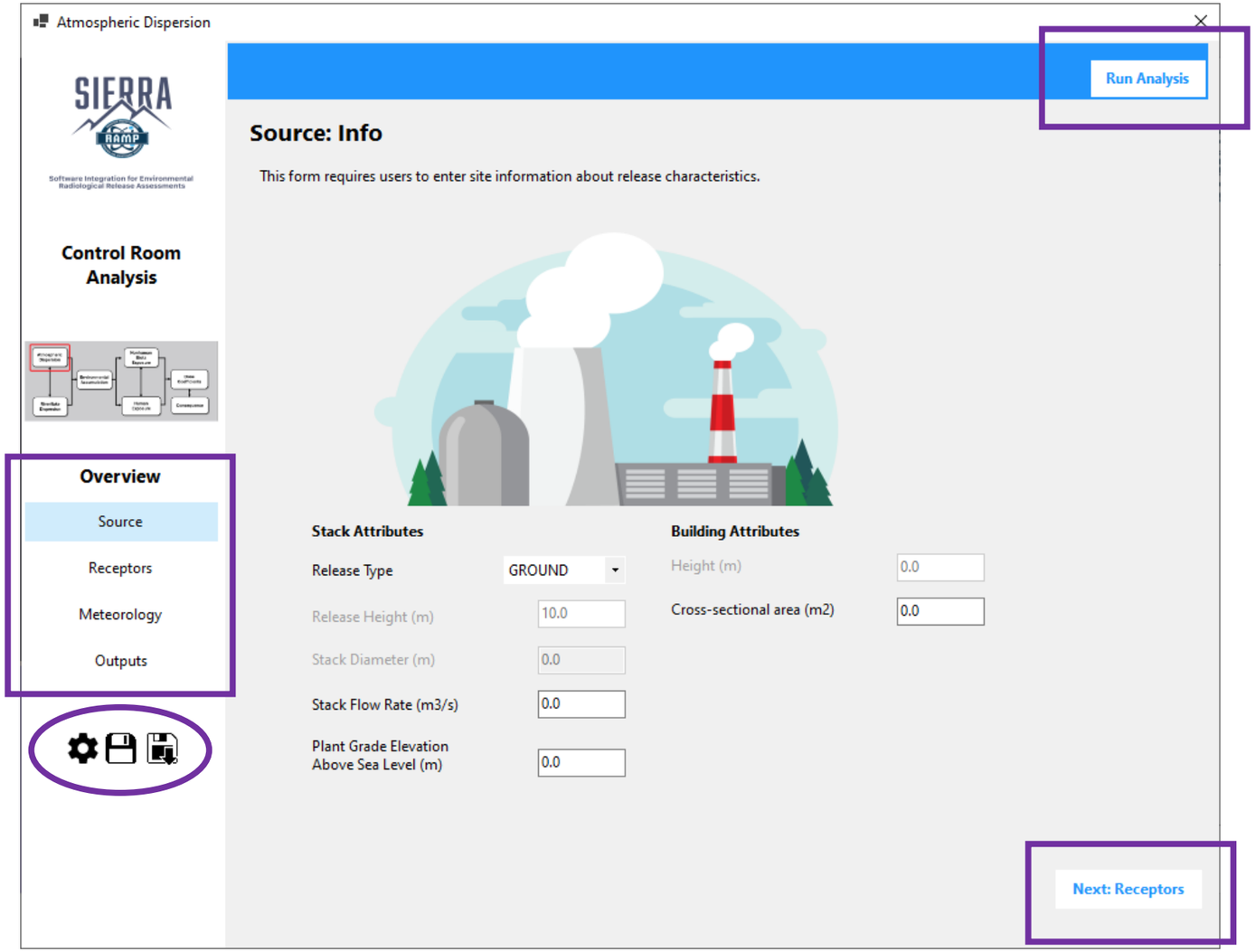
- Regulatory vs Research
- Analysis Types:
  - Control Room Analysis
  - Design Basis Accidents
  - Routine Analysis
- Module Selection:
  - Atmospheric Dispersion



SIERRA ATD Control Room Analysis (I)

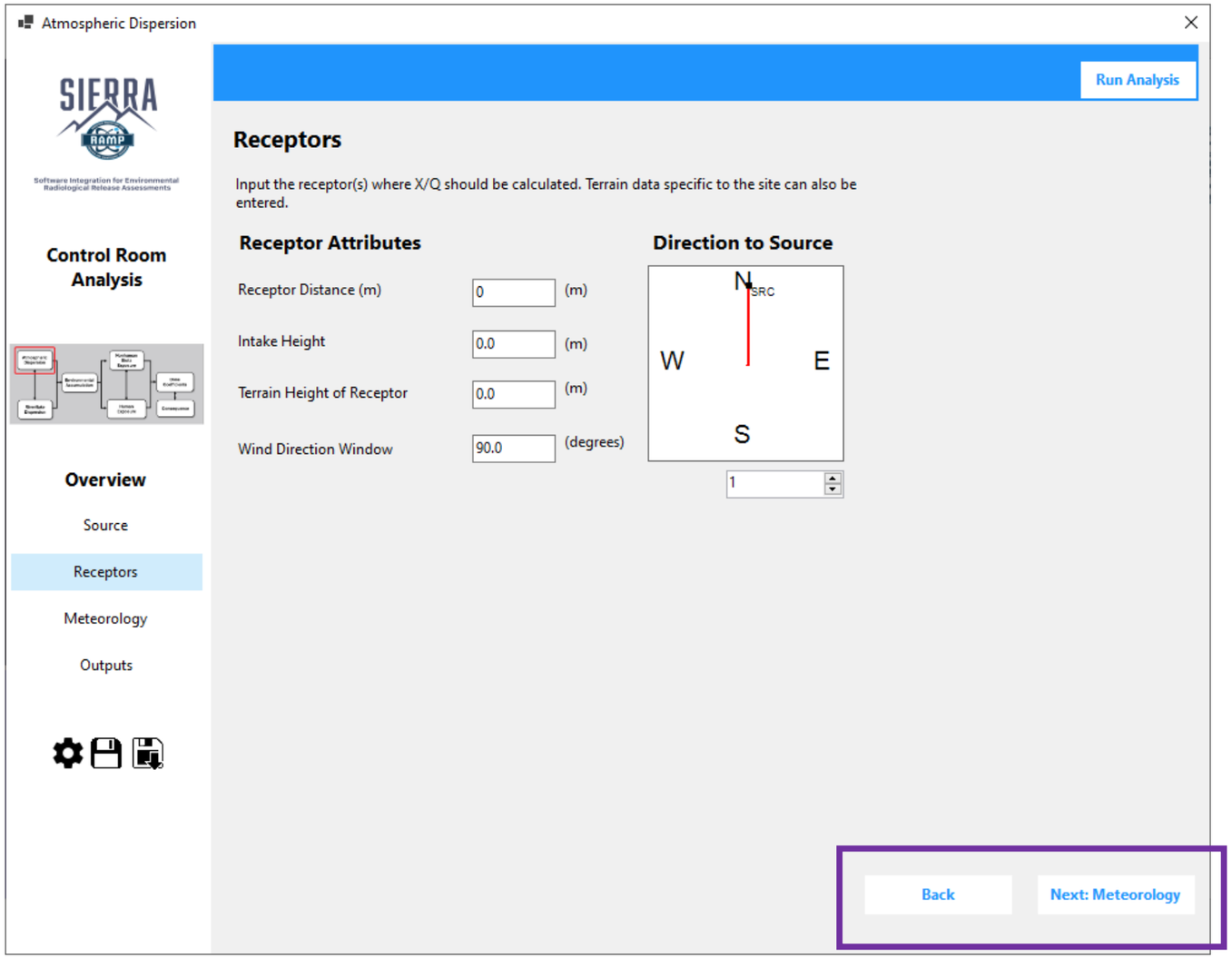
- The user interface layout is similar for each model
- Left bar navigation
  - Alternate navigation in lower right Next/Back
- Run Analysis in upper right
- Settings/Save/Load

- Source Panel
  - Input variables are available/unavailable depending on Release Type (Ground vs Elevated)



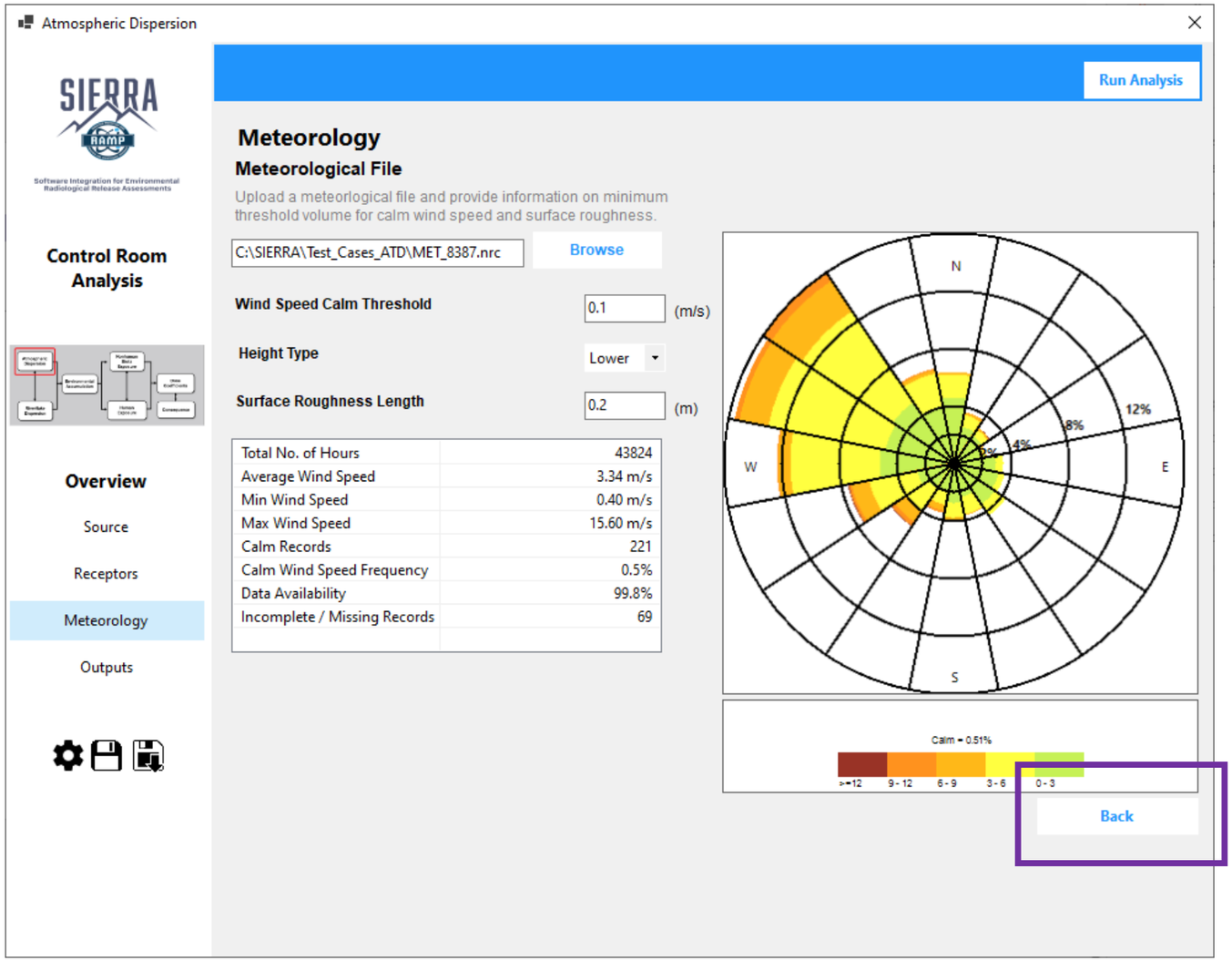
SIERRA ATD Control Room Analysis (II)

- Basic information for receptors
  - Distance
  - Intake Height
  - Receptor Terrain Height
  - Direction to Source
- Wind Direction Window



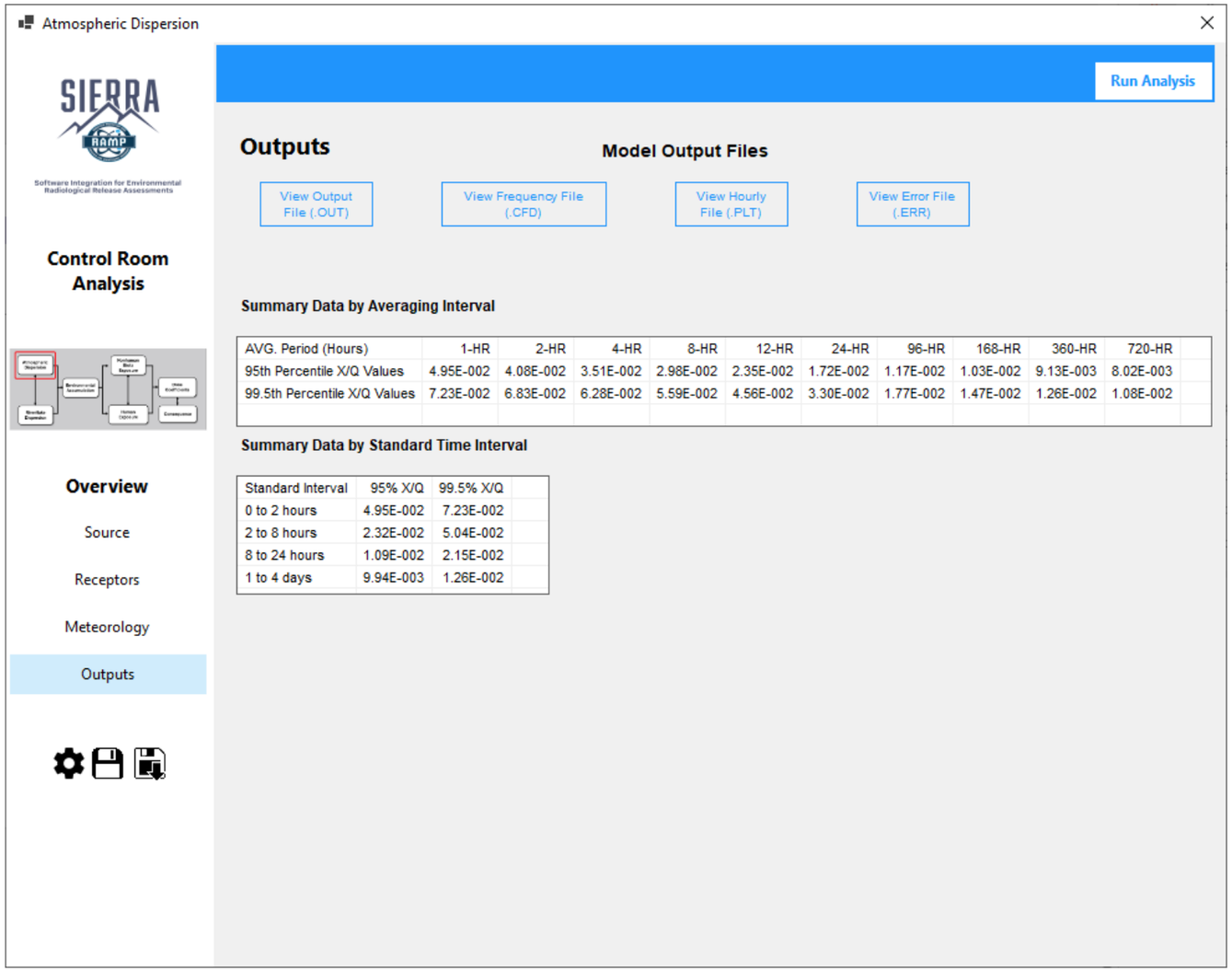
SIERRA ATD Control Room Analysis (III)

- Select an existing meteorological data file in RG 1.23 format (hourly data)
- Prescribe wind speed calm threshold (0-1 m/s) to be used within the simulation
- Height Type (lower or upper) for polar plot display
- Surface Roughness for site
- Statistical summary of the meteorological data (depends on Height Type and wind speed calm threshold)

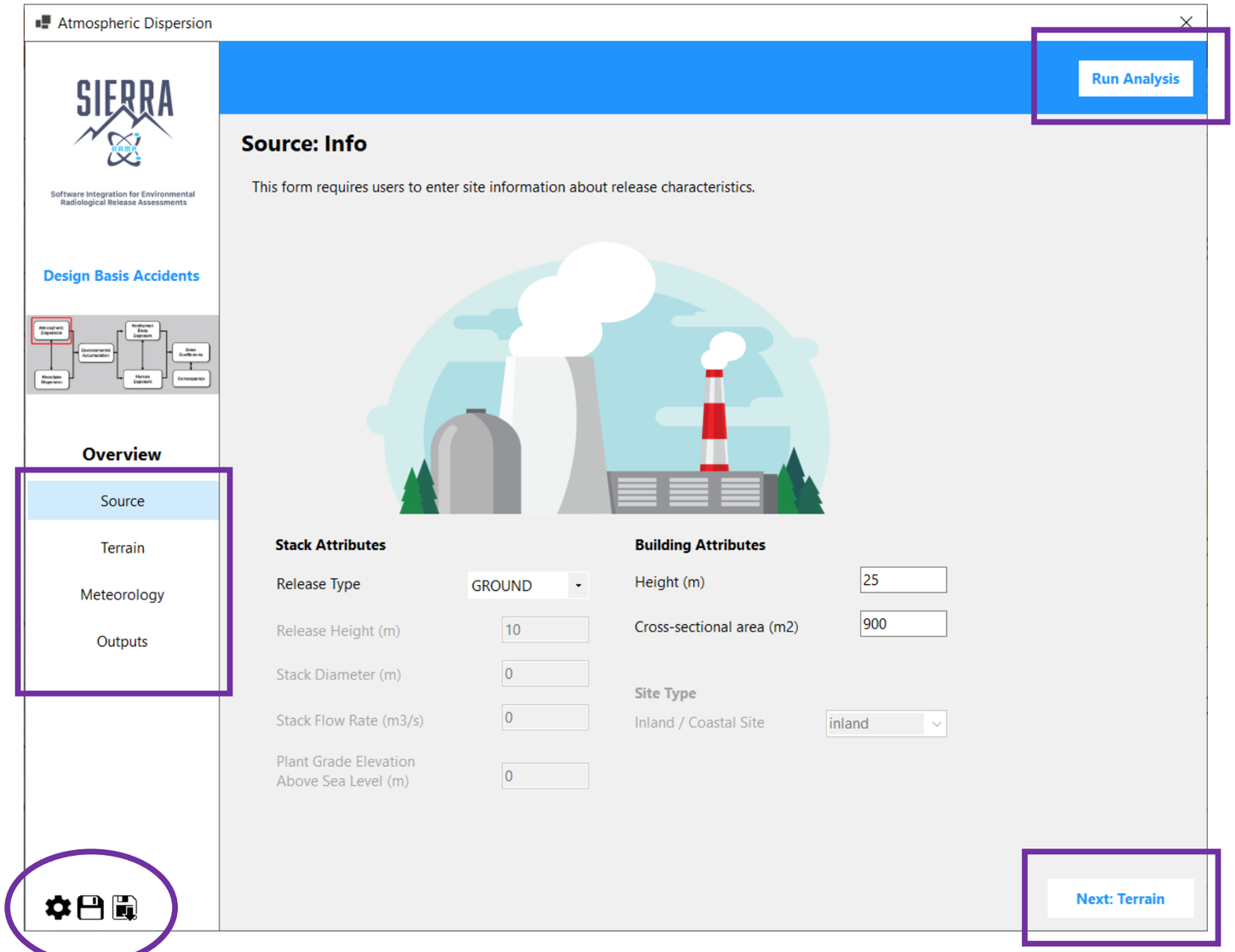


SIERRA ATD Control Room Analysis (IV)

- When the “Run Analysis” button is selected, a command line window is briefly displayed, and then the UI automatically displays the Outputs Panel
- A summary of the output is presented in tabular form
- The model output files (in text format) can also be viewed from the interface
- Output files are also available from C:\SIERRA\Users\Username\SimulationCaseName\DateTime\outputs

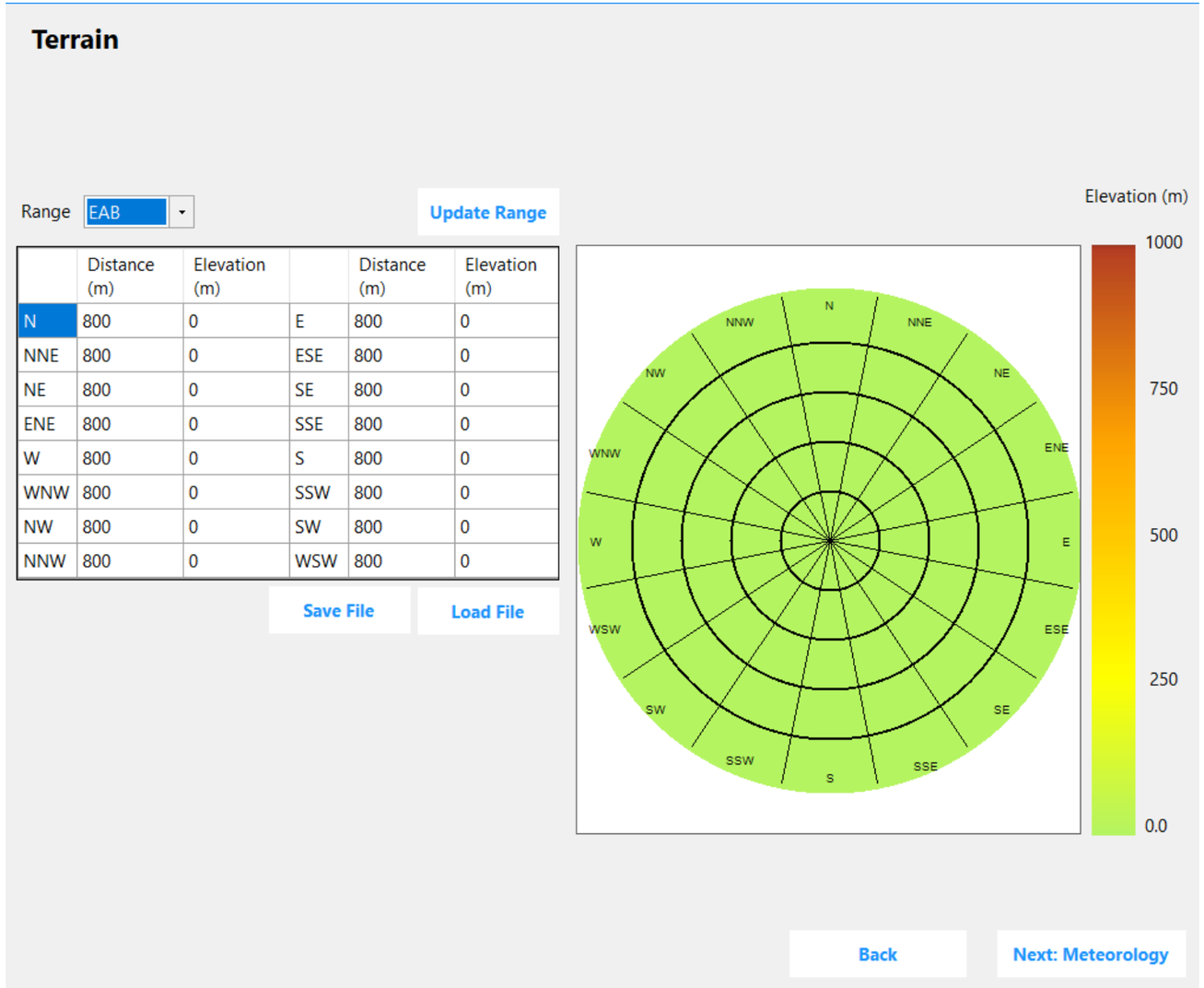


SIERRA ATD Design Basis Accidents (I)



- The user interface layout is similar for each model
- Source Panel
  - Input variables are available/unavailable depending on Release Type (Ground vs Elevated)
  - Elevated Release activates Release Height, Plant Grade Elevation, and Site Type (Inland / Coastal)

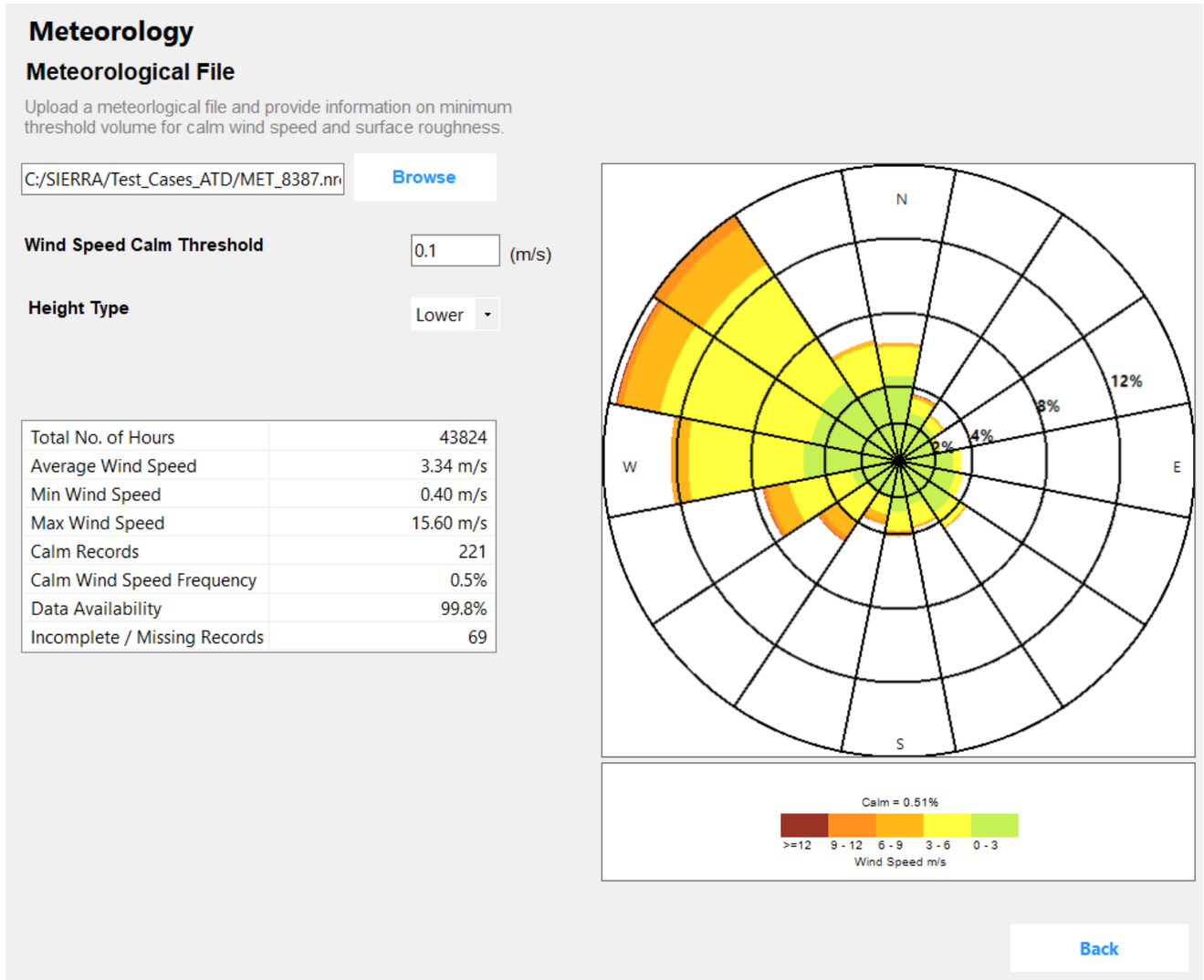
SIERRA ATD Design Basis Accidents (II)



	Distance (m)	Elevation (m)		Distance (m)	Elevation (m)
N	800	0	E	800	0
NNE	800	0	ESE	800	0
NE	800	0	SE	800	0
ENE	800	0	SSE	800	0
W	800	0	S	800	0
WNW	800	0	SSW	800	0
NW	800	0	SW	800	0
NNW	800	0	WSW	800	0

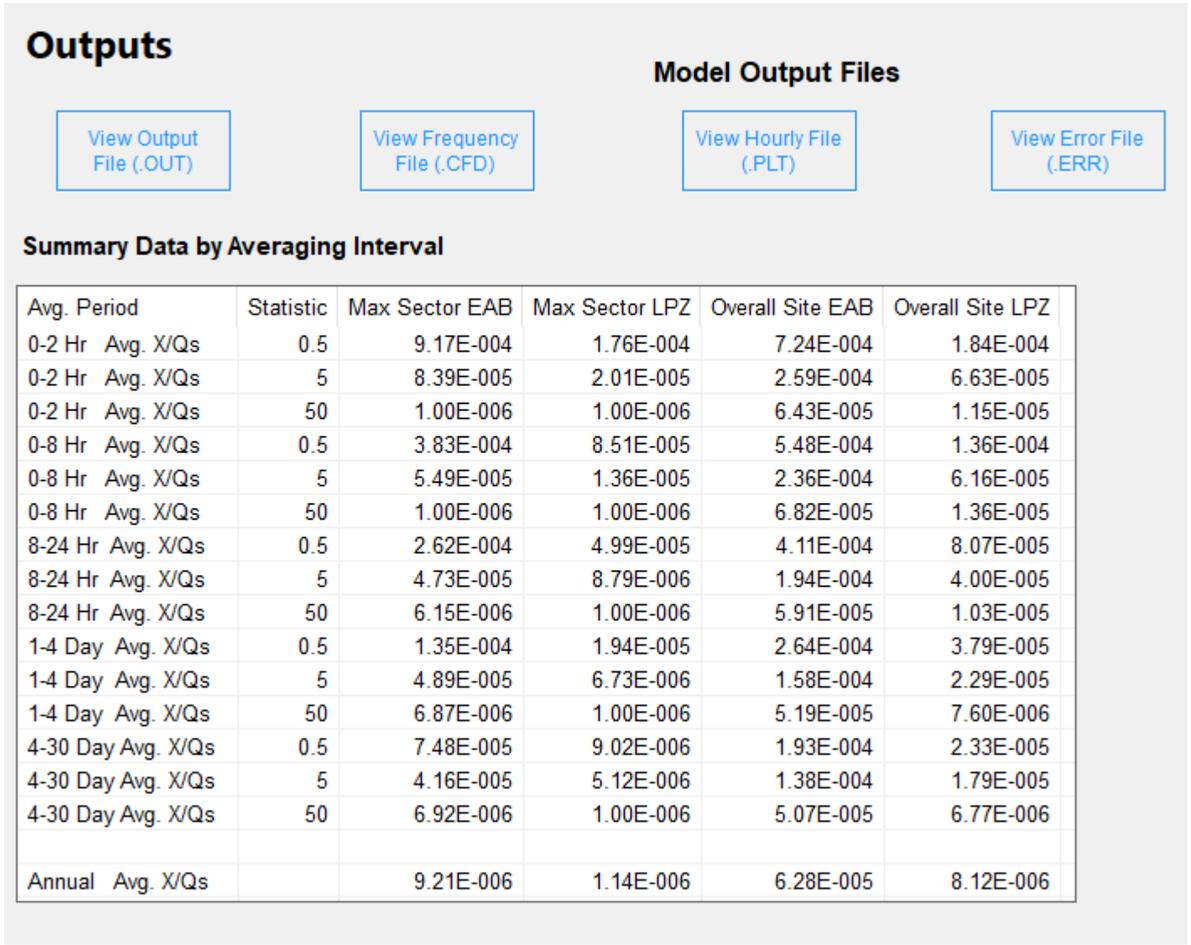
- EAB and LPZ distance and elevation entries
- Users can save the terrain entries for use (by using the "Save File" button) in another simulation (by using the "Load File" button)

SIERRA ATD Design Basis Accidents (III)



- Users select an existing meteorological data file that is in RG 1.23 format (hourly data)
- Users define the wind speed calm threshold (0-1 m/s) to be used within the simulation
- Users select Height Type (lower or upper) to change polar plot display
- Statistical summary of the meteorological data also changes with Height Type and wind speed calm threshold

SIERRA ATD Design Basis Accidents (IV)



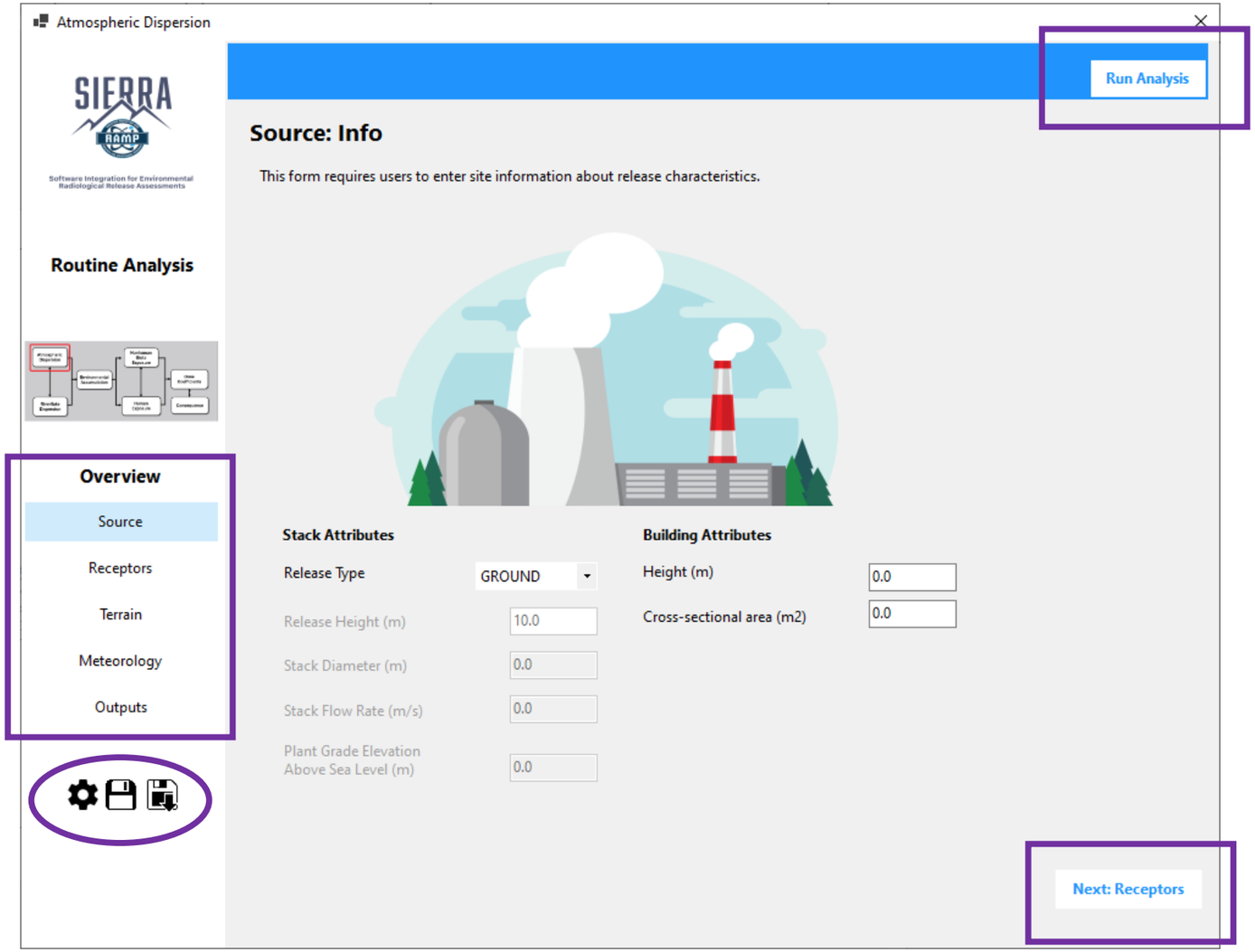
Avg. Period	Statistic	Max Sector EAB	Max Sector LPZ	Overall Site EAB	Overall Site LPZ
0-2 Hr Avg. X/Qs	0.5	9.17E-004	1.76E-004	7.24E-004	1.84E-004
0-2 Hr Avg. X/Qs	5	8.39E-005	2.01E-005	2.59E-004	6.63E-005
0-2 Hr Avg. X/Qs	50	1.00E-006	1.00E-006	6.43E-005	1.15E-005
0-8 Hr Avg. X/Qs	0.5	3.83E-004	8.51E-005	5.48E-004	1.36E-004
0-8 Hr Avg. X/Qs	5	5.49E-005	1.36E-005	2.36E-004	6.16E-005
0-8 Hr Avg. X/Qs	50	1.00E-006	1.00E-006	6.82E-005	1.36E-005
8-24 Hr Avg. X/Qs	0.5	2.62E-004	4.99E-005	4.11E-004	8.07E-005
8-24 Hr Avg. X/Qs	5	4.73E-005	8.79E-006	1.94E-004	4.00E-005
8-24 Hr Avg. X/Qs	50	6.15E-006	1.00E-006	5.91E-005	1.03E-005
1-4 Day Avg. X/Qs	0.5	1.35E-004	1.94E-005	2.64E-004	3.79E-005
1-4 Day Avg. X/Qs	5	4.89E-005	6.73E-006	1.58E-004	2.29E-005
1-4 Day Avg. X/Qs	50	6.87E-006	1.00E-006	5.19E-005	7.60E-006
4-30 Day Avg. X/Qs	0.5	7.48E-005	9.02E-006	1.93E-004	2.33E-005
4-30 Day Avg. X/Qs	5	4.16E-005	5.12E-006	1.38E-004	1.79E-005
4-30 Day Avg. X/Qs	50	6.92E-006	1.00E-006	5.07E-005	6.77E-006
Annual Avg. X/Qs		9.21E-006	1.14E-006	6.28E-005	8.12E-006

- When the “Run Analysis” button is selected, a command line window is briefly displayed, and then the UI automatically displays the Outputs Panel
- A summary of the output is presented in tabular form
- The model output files (in text format) can also be viewed from the interface
- Output files are also available from C:\SIERRA\Users\Username\Simulation CaseName\DateTime\outputs

SIERRA ATD Routine Analysis (I)

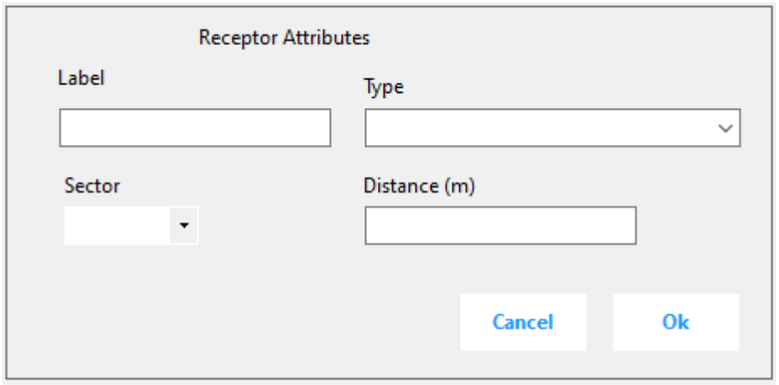
- The user interface layout is similar for each model

- Source Panel
  - Input variables are available/unavailable depending on Release Type (Ground vs Elevated)

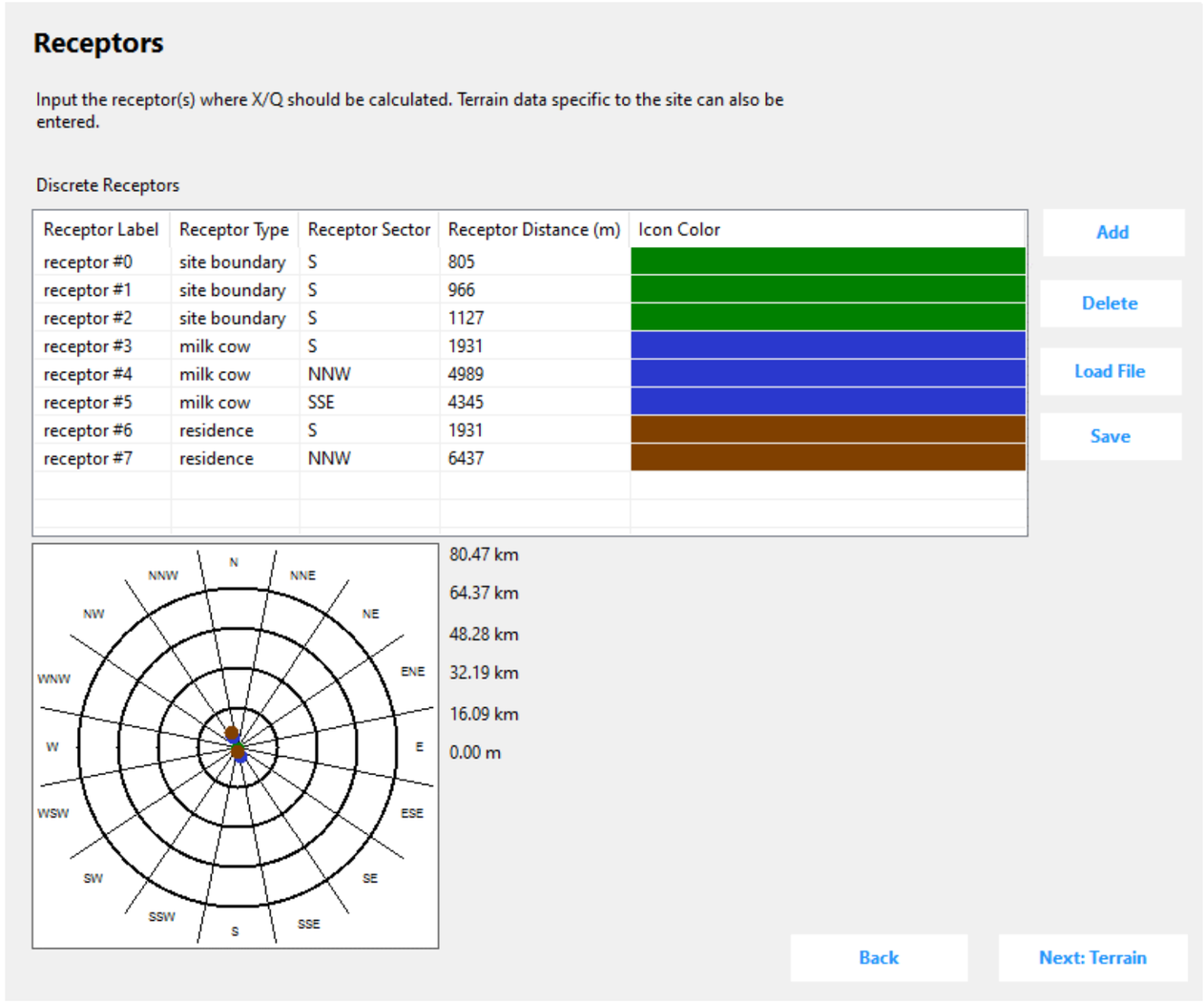


SIERRA ATD Routine Analysis (II)

- Add – used to create a new Receptor entry in the table

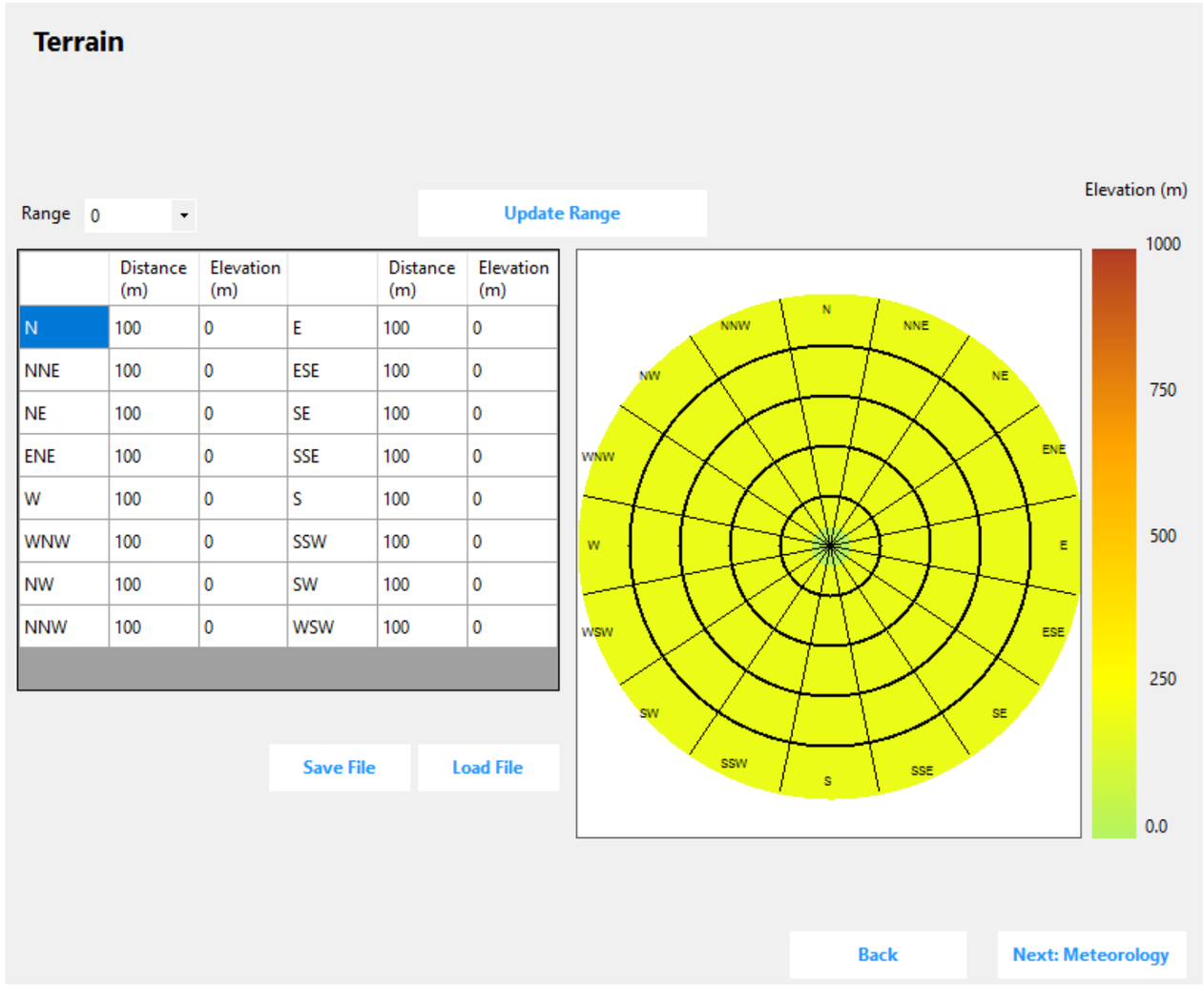


- Receptor Type is either a pre-defined type (milk cow, milk goat, meat animal, residence, vegetable garden, site boundary) or user entry



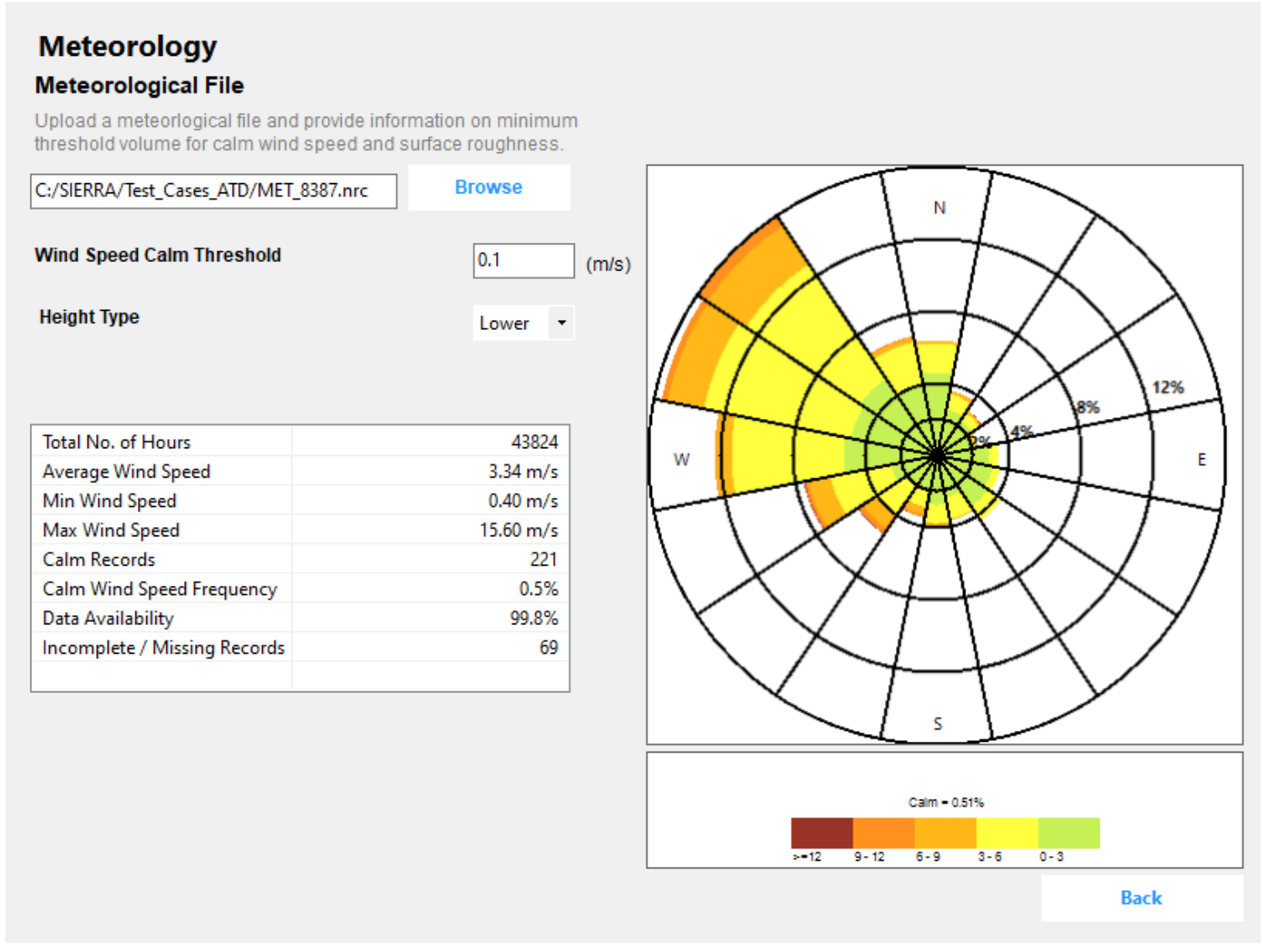
SIERRA ATD Routine Analysis (III)

- Distance and elevation entries for Range 0 through Range 10
- Users can save the terrain entries alone (by using the "Save File" button) for use in another simulation (by using the "Load File" button)



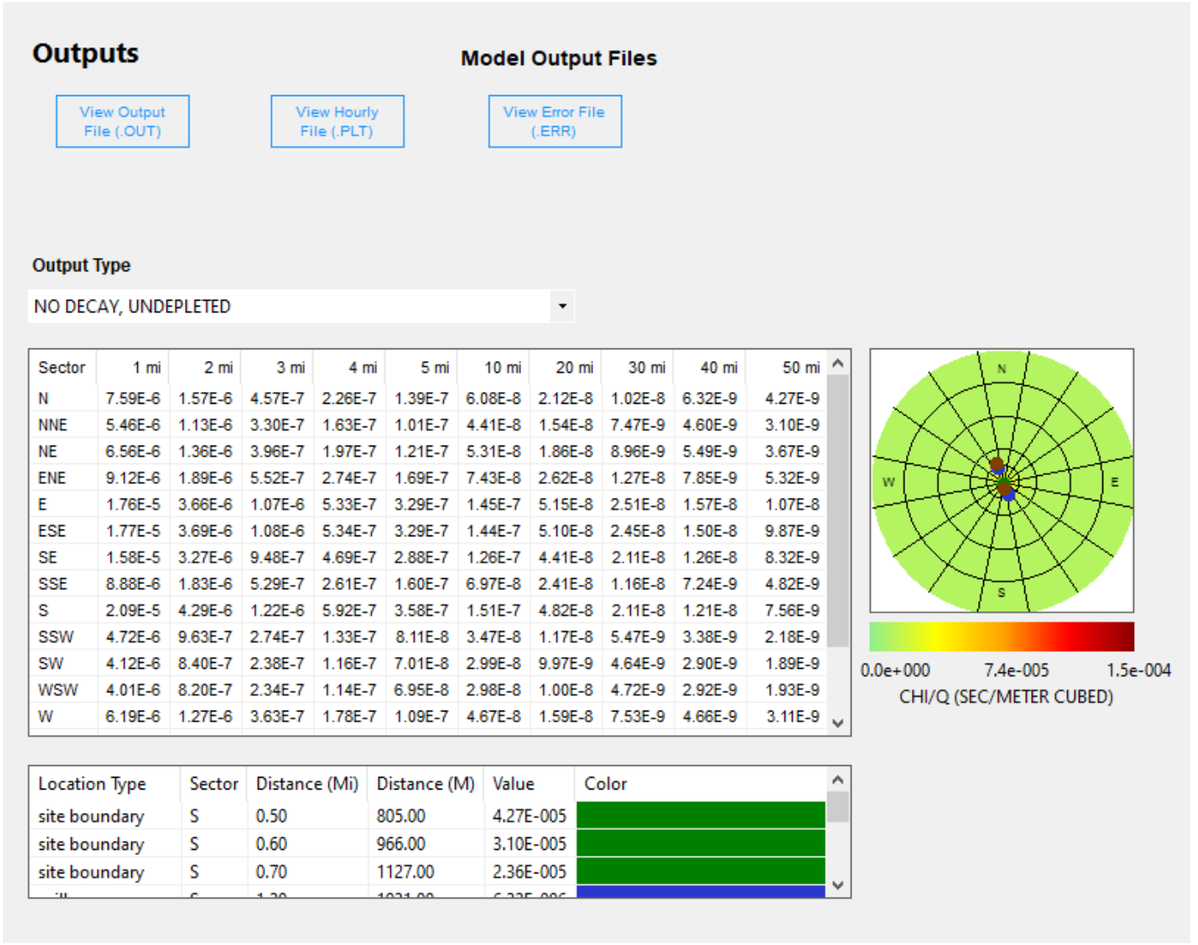
SIERRA ATD Routine Analysis (IV)

- Users select an existing meteorological data file that is in RG 1.23 format (hourly data)
- Users define the wind speed calm threshold (0-1 m/s) to be used within the simulation
- Users select Height Type (lower or upper) to change polar plot display
- Statistical summary of the meteorological data also changes with Height Type and wind speed calm threshold



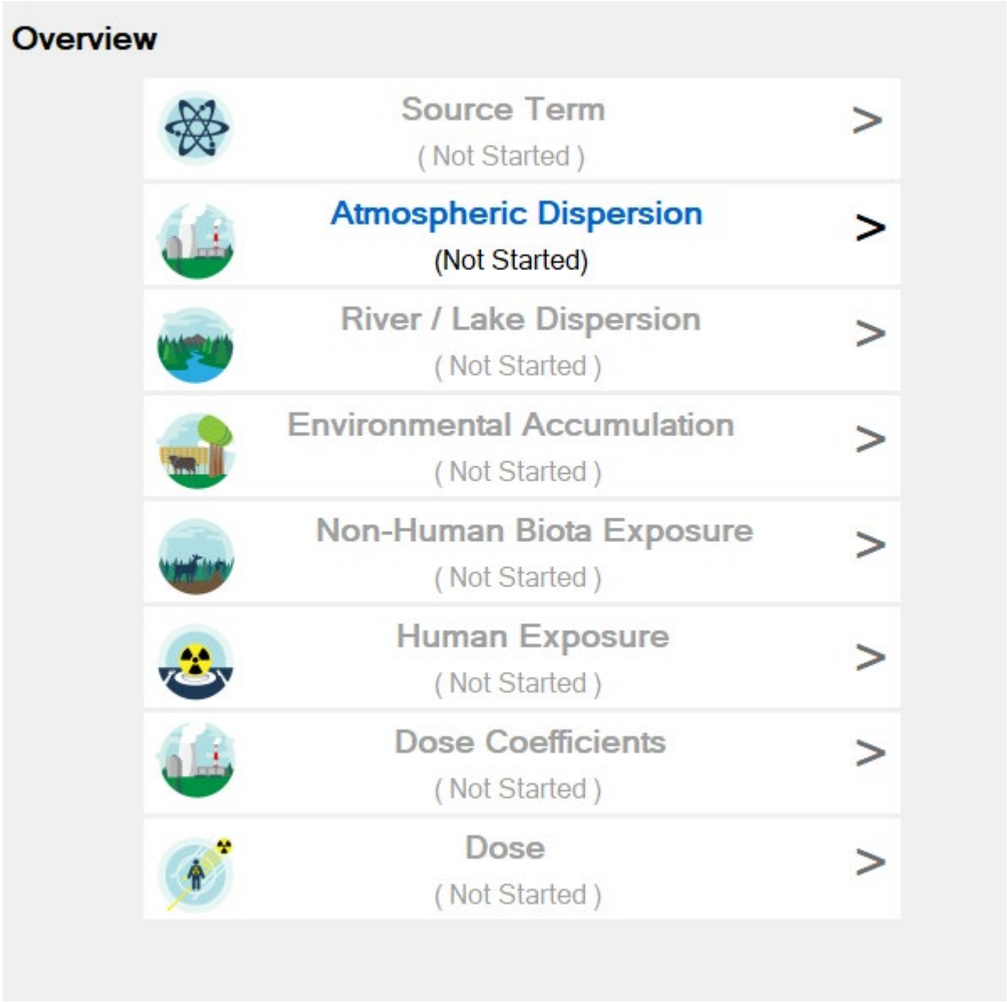
SIERRA ATD Routine Analysis (V)

- When the “Run Analysis” button is selected, a command line window is briefly displayed, and then the UI automatically displays the Outputs Panel
- A summary of the output is presented in tabular form
- The model output files (in text format) can also be viewed from the interface
- Output files are also available from C:\SIERRA\Users\Username\SimulationCaseName\DateTime\outputs



Next Steps

- ATD Beta testing is underway
- Software improvements as an outcome of beta testing will be implemented in CY24
- SIERRA ATD projected to be available from RAMP in winter 2024

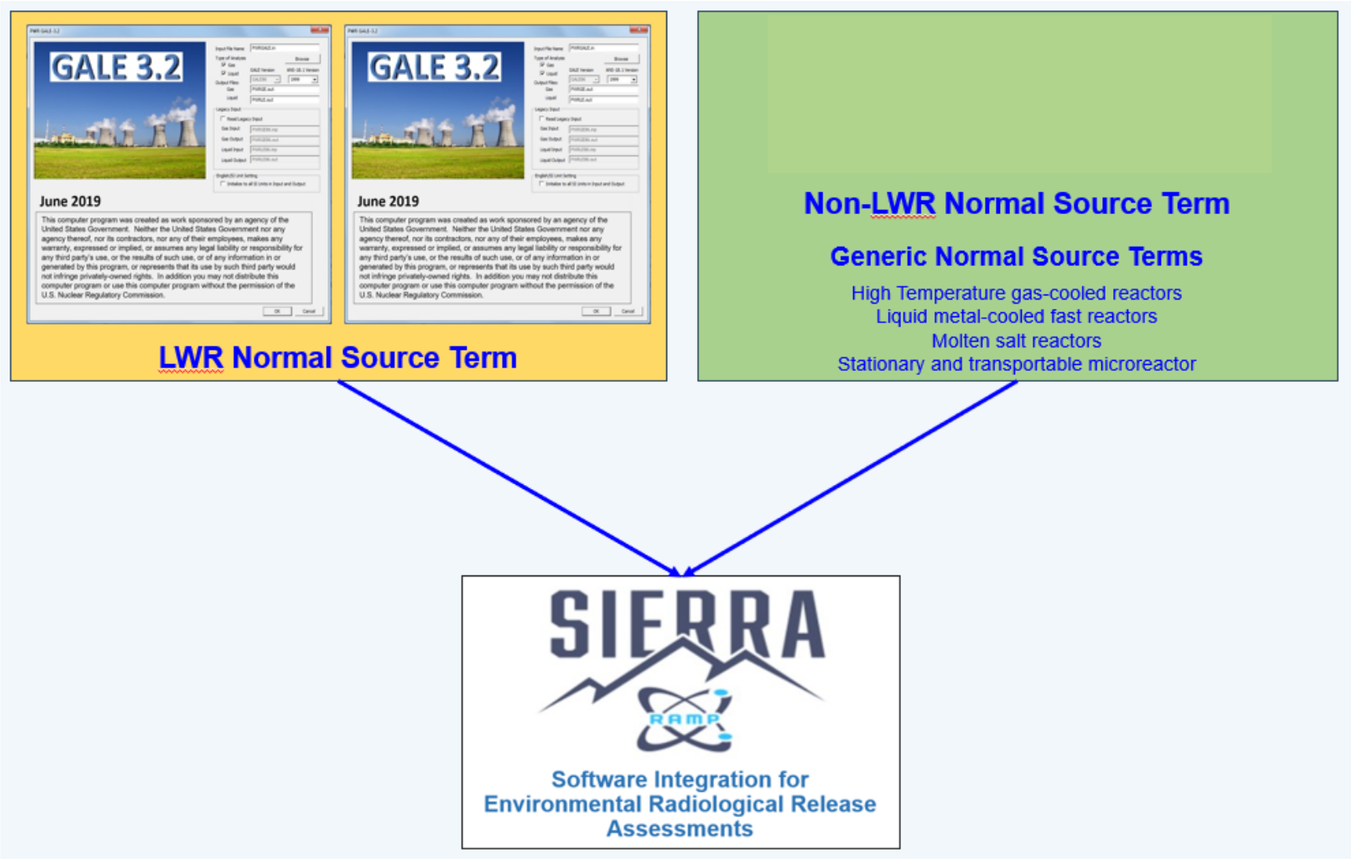


GALE

- Gaseous and Liquid Effluents (GALE) → calculate radioactive gaseous and liquid effluents from LWRs
- Calculations based on:
  - Operating Reactors,
  - Field and Lab Tests, and
  - Plant specific design considerations
- Latest live version 3.2 released 2020:
  - Two separate executables for BWRs and PWRs

GALE (cont.)

- Three phase development approach:
  - Phase 1: Incorporate GALE LWR source terms
  - Phase 2: Develop generic non-LWR source terms
  - Phase 3: non-LWR design basis, severe accidents, and transportation source terms



Source Term Module: Phase 1

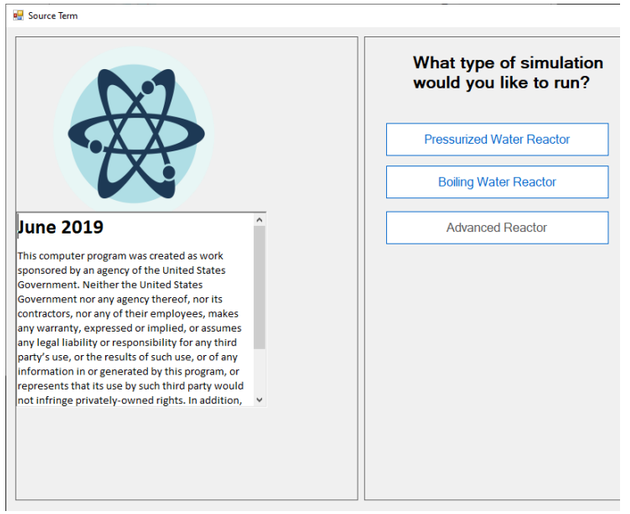
- Provides Source Term data from Light Water Reactors (LWRs):
  - Boiling Water Reactors (BWRs)
  - Pressurized Water Reactors (PWRs)
- From reactor inputs pertaining to normal operational fluxes and processing values, two outputs files are created outlining the gaseous and liquid effluents for any given scenario
- Based intrinsically on the prior functionality of GALE 3.2

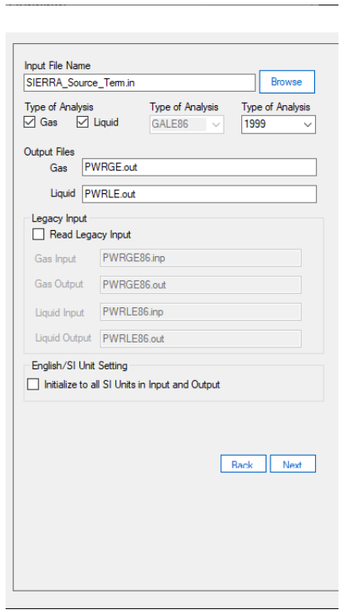
Source Term Module: Phase 1 (cont.)

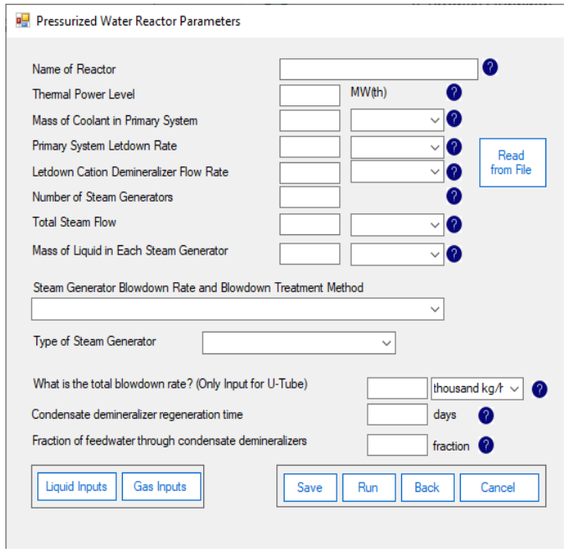
- Phase I - Input GALE code into SIERRA:
  - Incorporating functionality of GALE (BWR and PWR) into the source term module
  - Status of GALE incorporation into SIERRA:
    - ✓ Release Assessments (SIERRA) code with source term module (Phase-1) to be available in August 2024

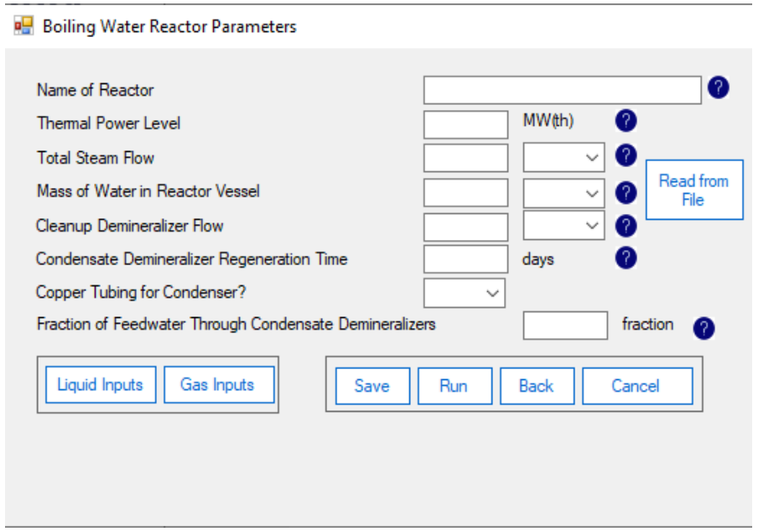
Source Term Module: Phase 1 (cont.)

- UI designed to match SIERRA-ATD module within the broader SIERRA framework
- Real-time checks of input values
- Single executable file as opposed to GALE
- Enhanced range buttons on the UI





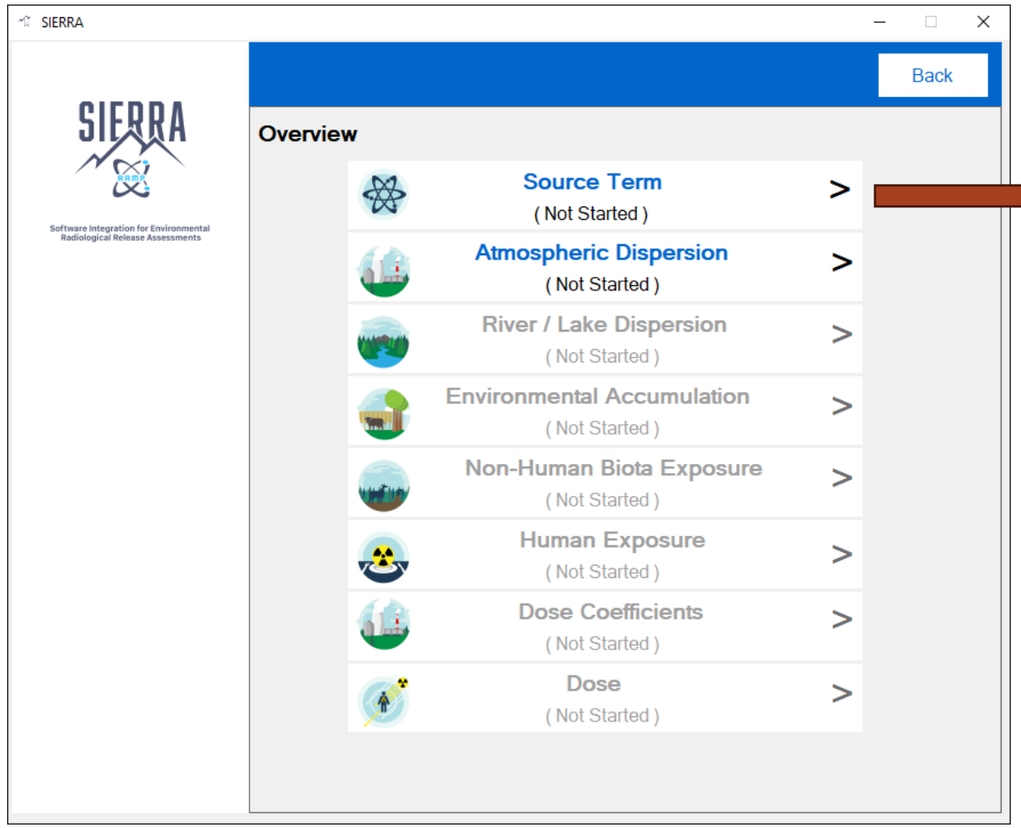


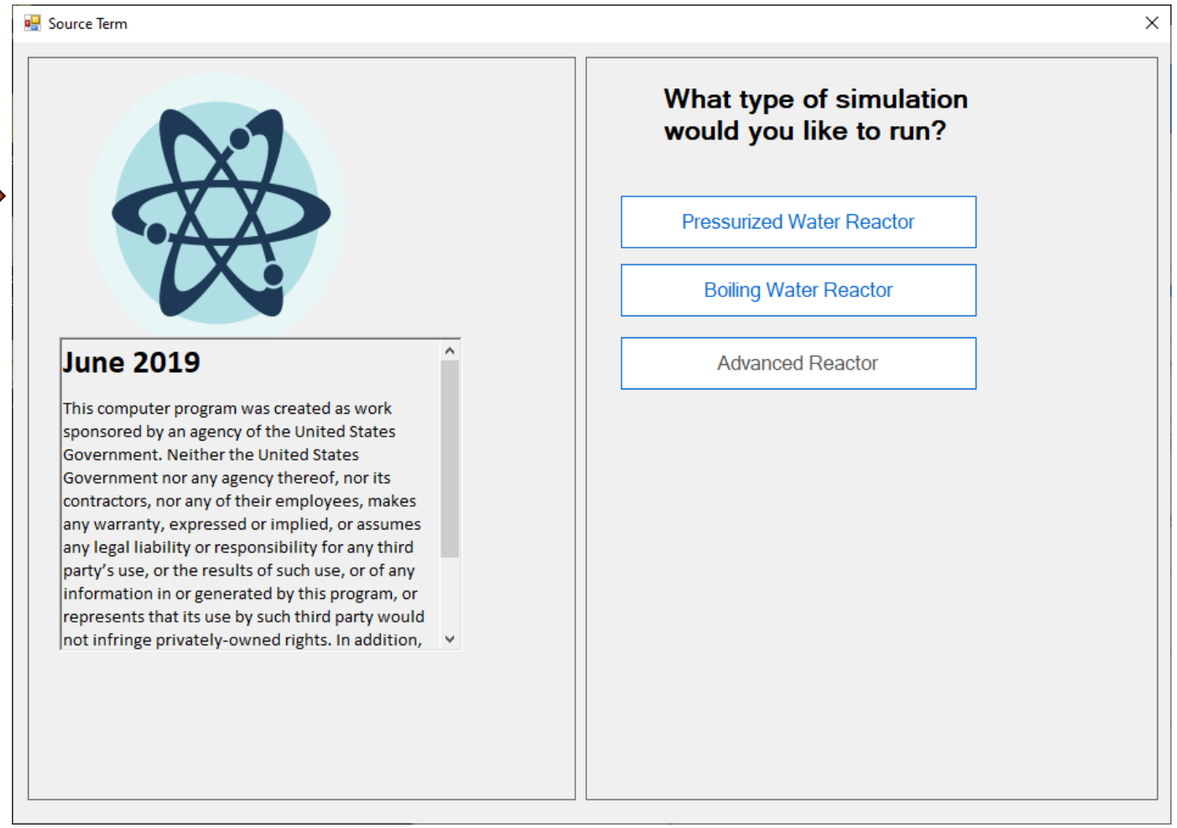


Source Term Module: Phase 1 (cont.)

- Coding changes implemented for compatibility in C# language
- File structure changed on back-end to match SIERRA format
- The GUI and the FORTRAN based back-end decouple for ease of future development activities
- Input files can be present outside SIERRA executable directory as opposed to the existing GALE format

Source Term Module: Phase 1 (cont.)





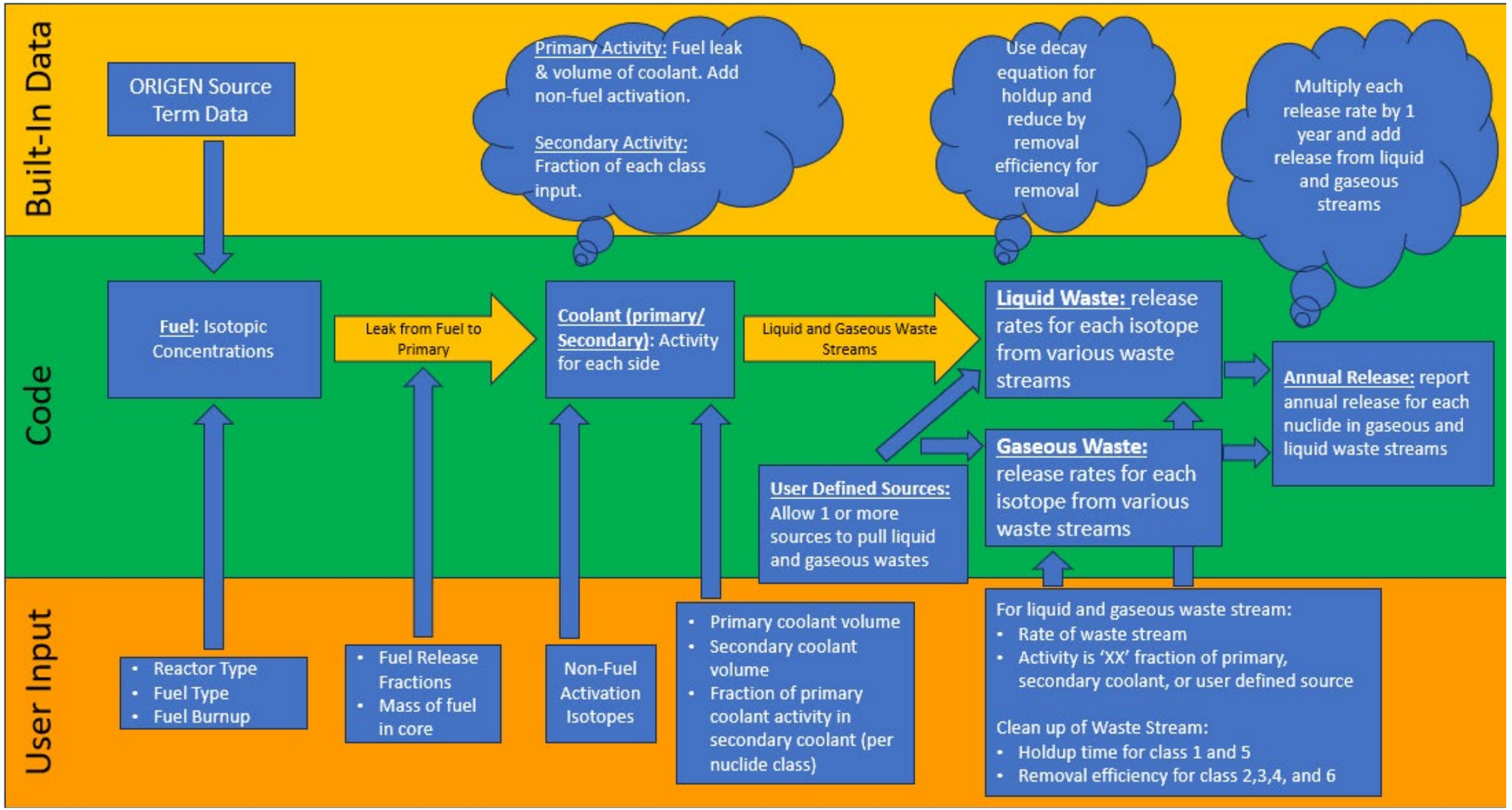
SIERRA
Splash Screen

Source Term
Startup Screen

Source Term Module Additional Changes and Fixes

- Source Term Module Testing:
  - Graphical User Interface (GUI) testing – Complete
  - Numerical value testing – Ongoing
- Bug fixes anticipated to be completed first week of May 2024
- User Acceptance Testing (UAT) starting: June 2024
- Feedback, NRC Reviews: June – July 2024
- Update/ Revise documentation: June – July 2024
- Final product delivery: August 2024

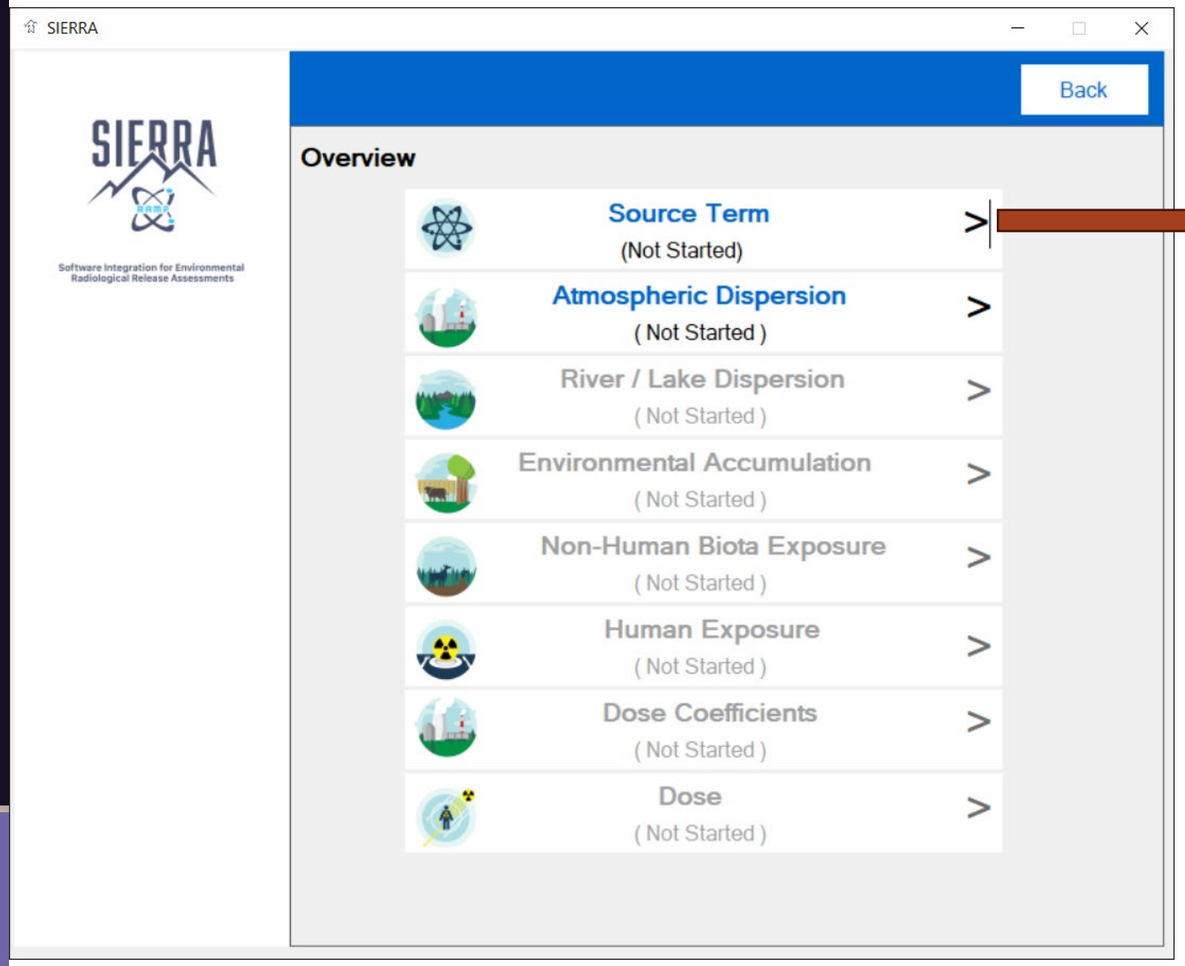
Phase 2 Concept

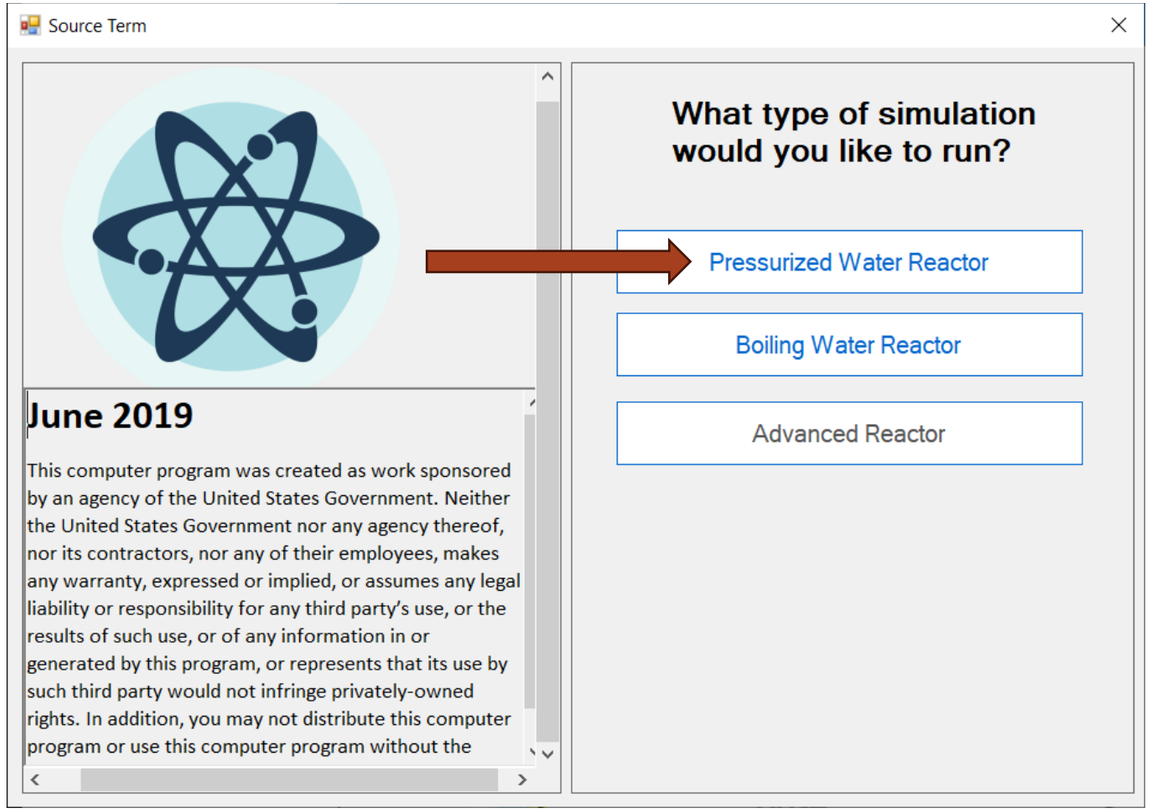


Advanced Reactor Concepts of Interest

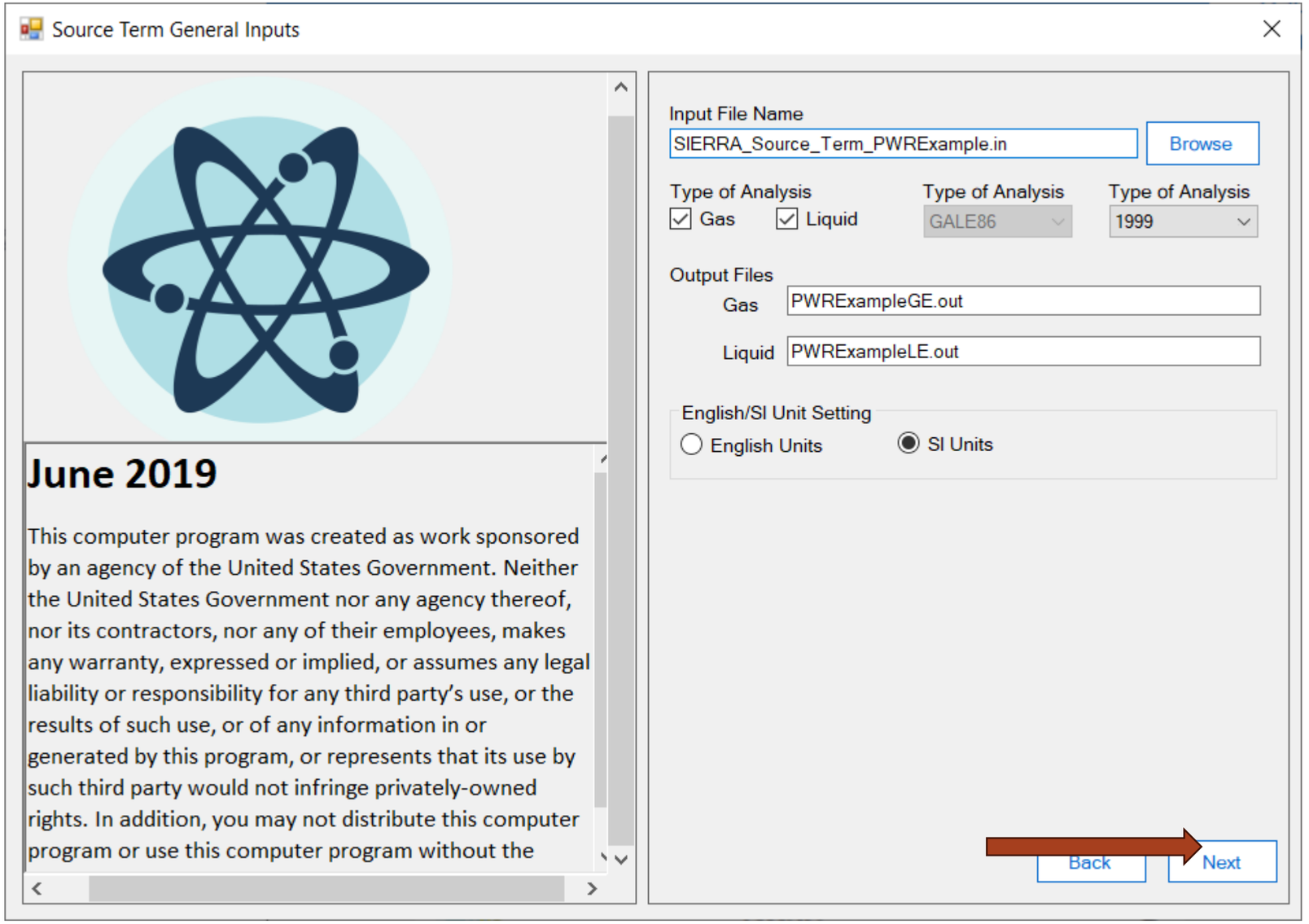
- High Temperature Gas Cooled Reactors
- Liquid metal-cooled fast reactors
- Molten Salt Reactors
- Stationary or transportable microreactors

Example Use Cases: PWR

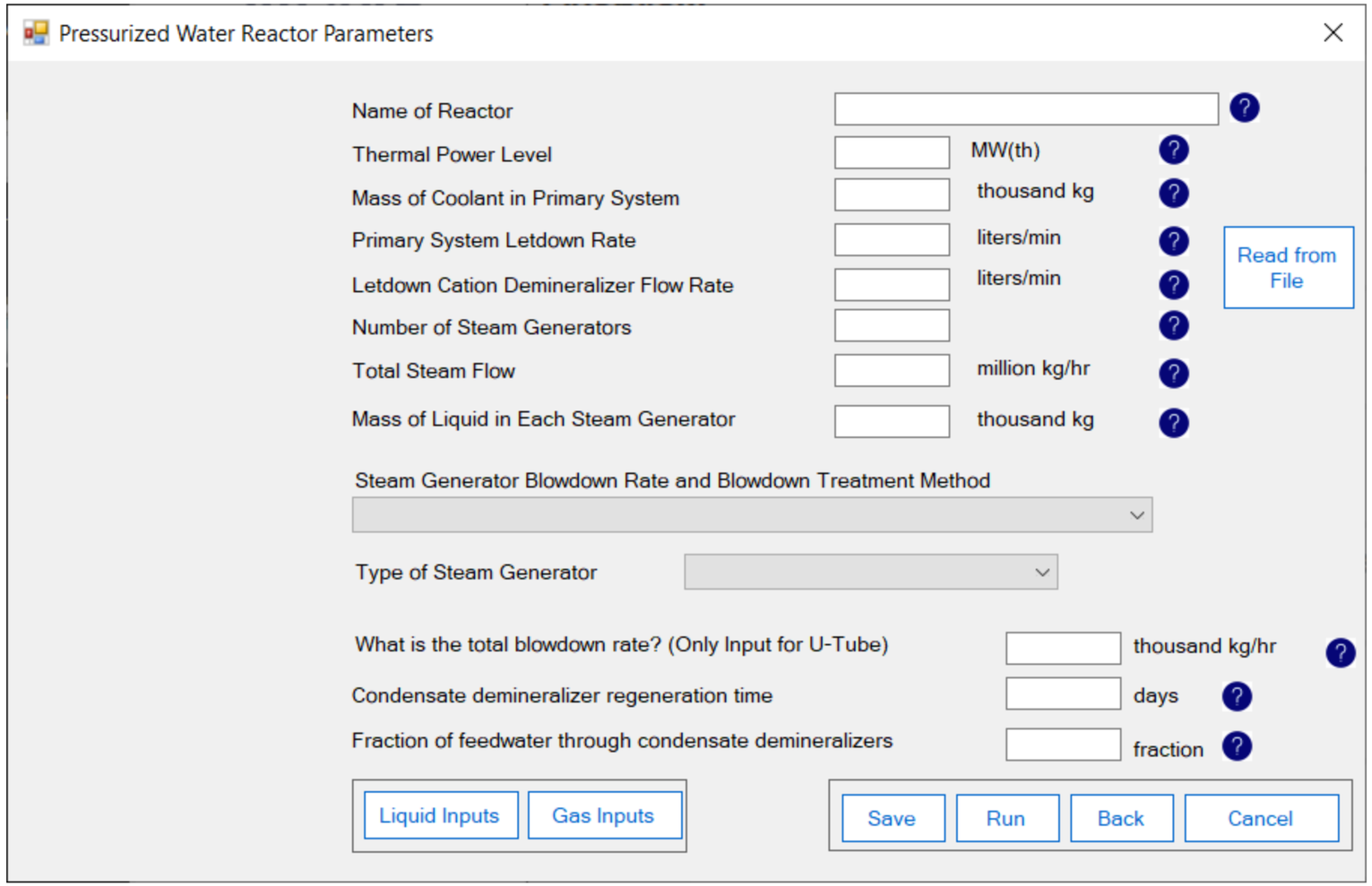




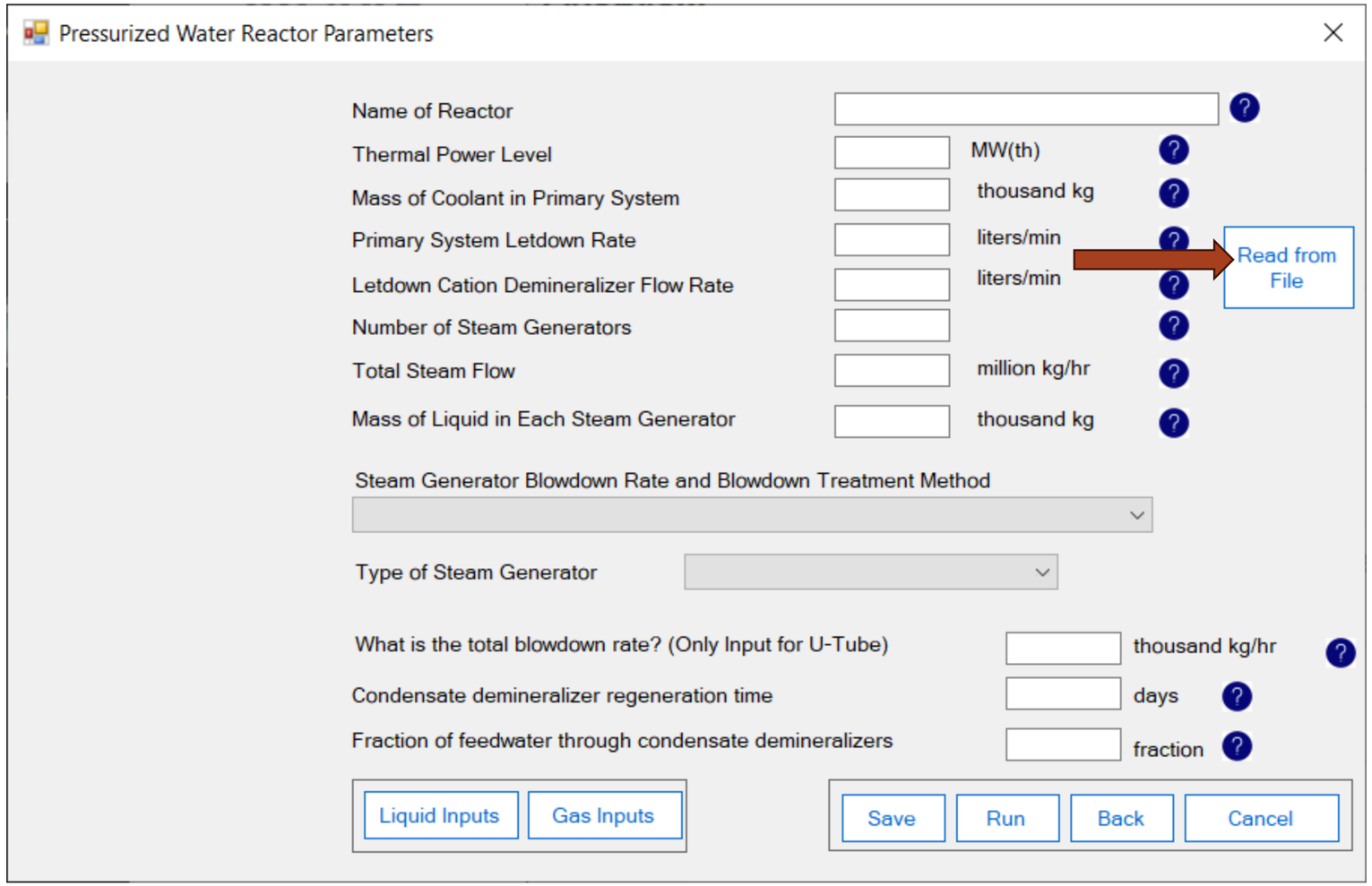
Example Use Cases: PWR



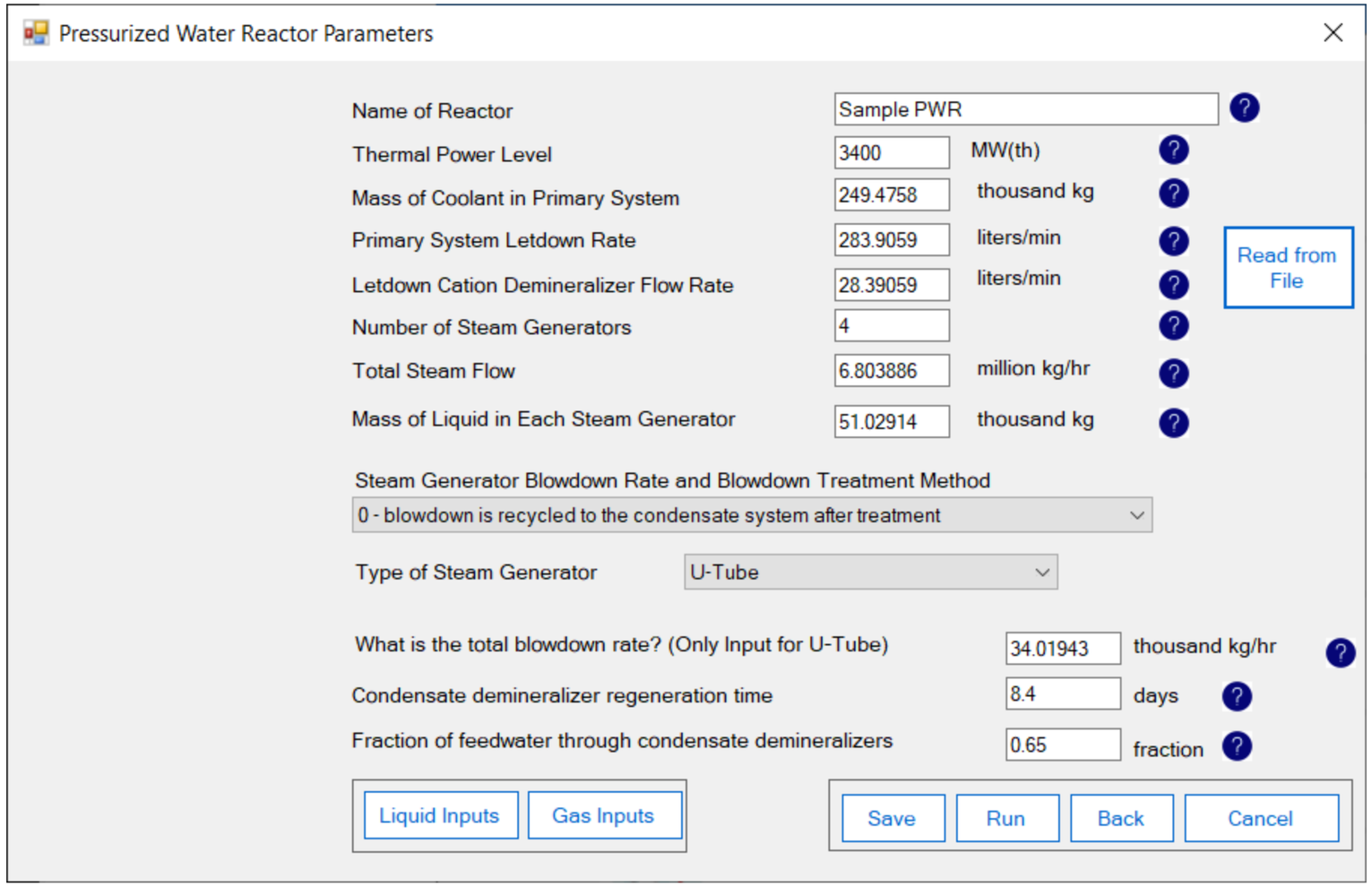
Example Use Cases: PWR



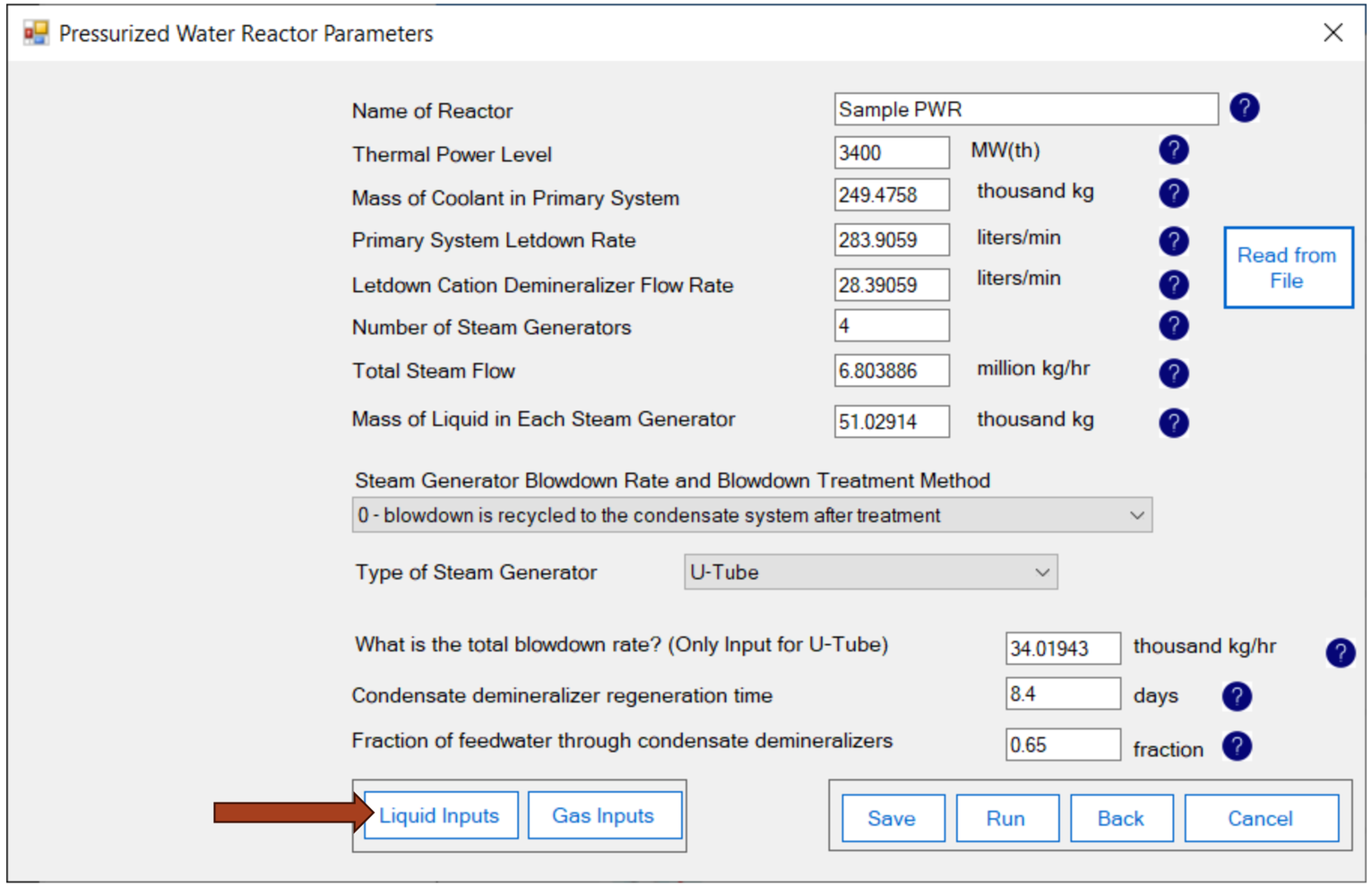
Example Use Cases: PWR



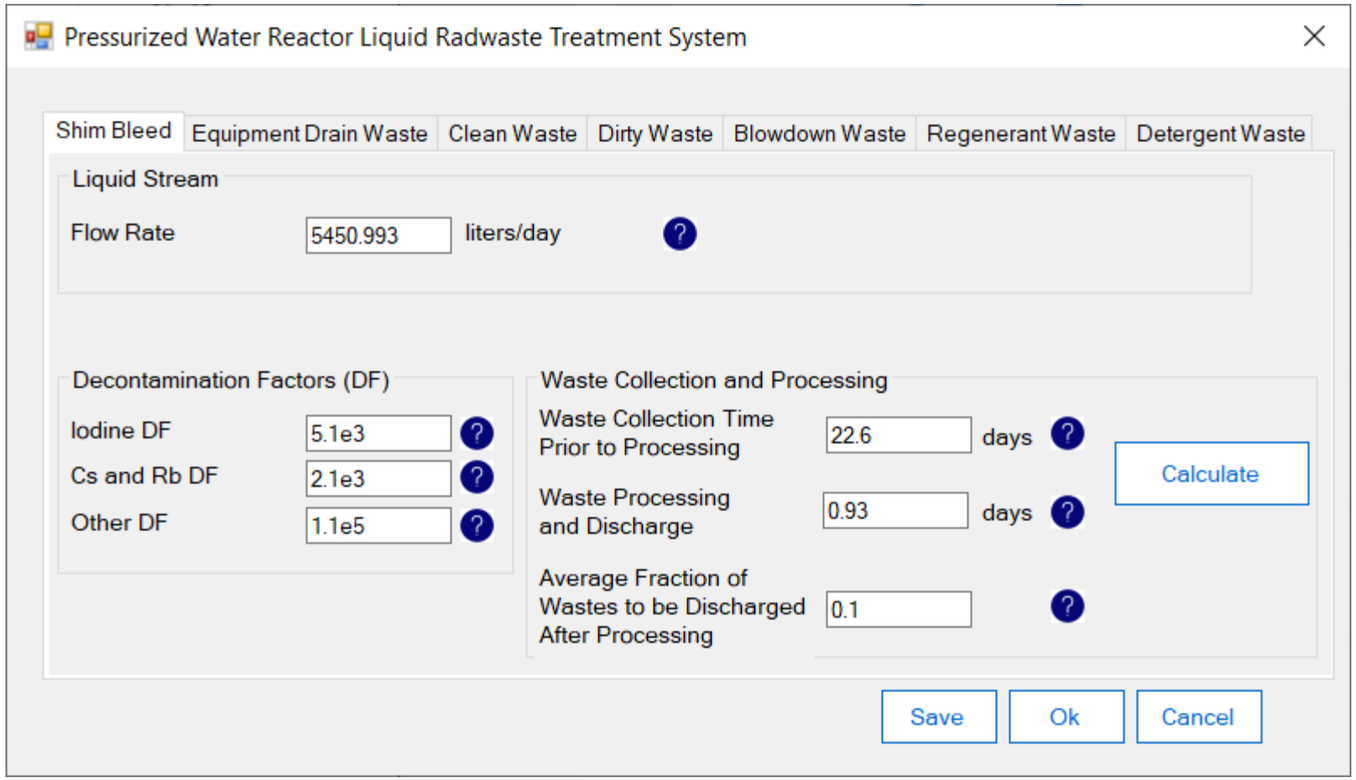
Example Use Cases: PWR



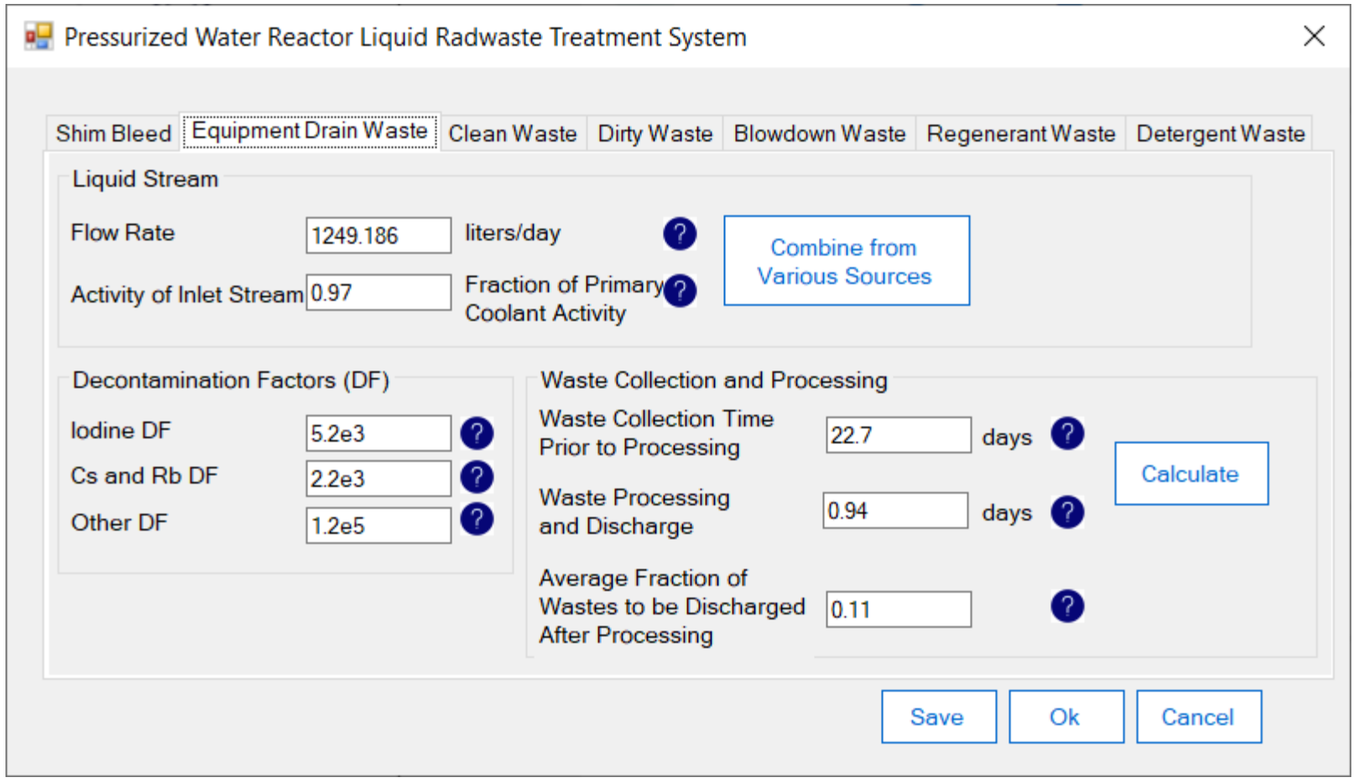
Example Use Cases: PWR



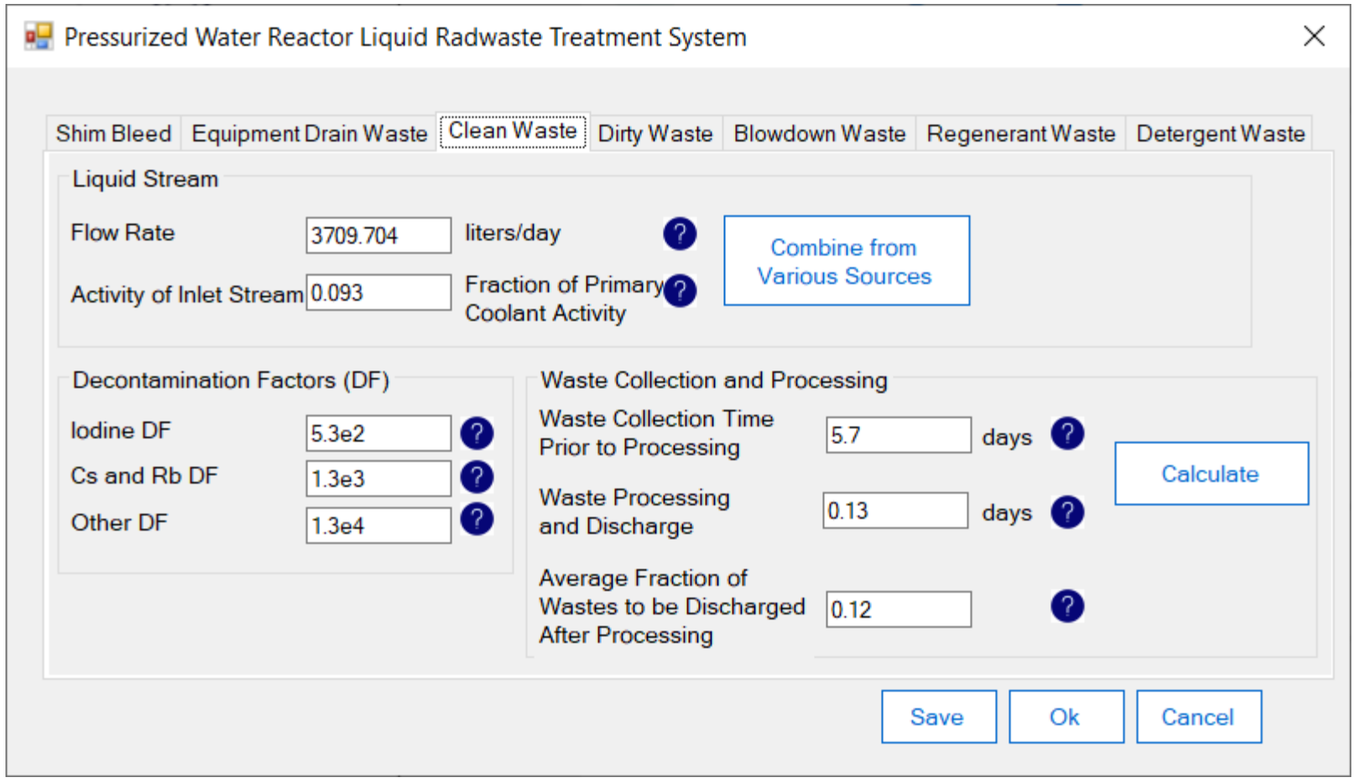
Example Use Cases: PWR



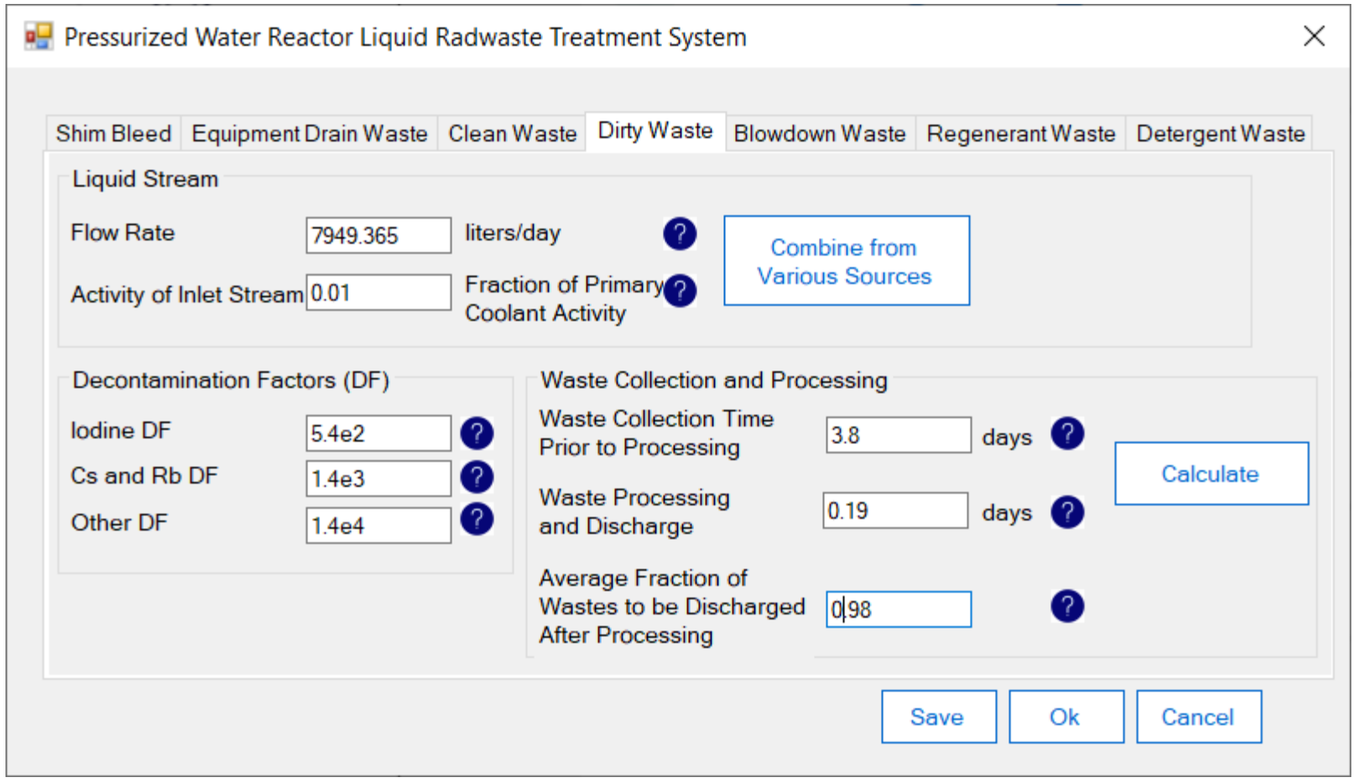
Example Use Cases: PWR



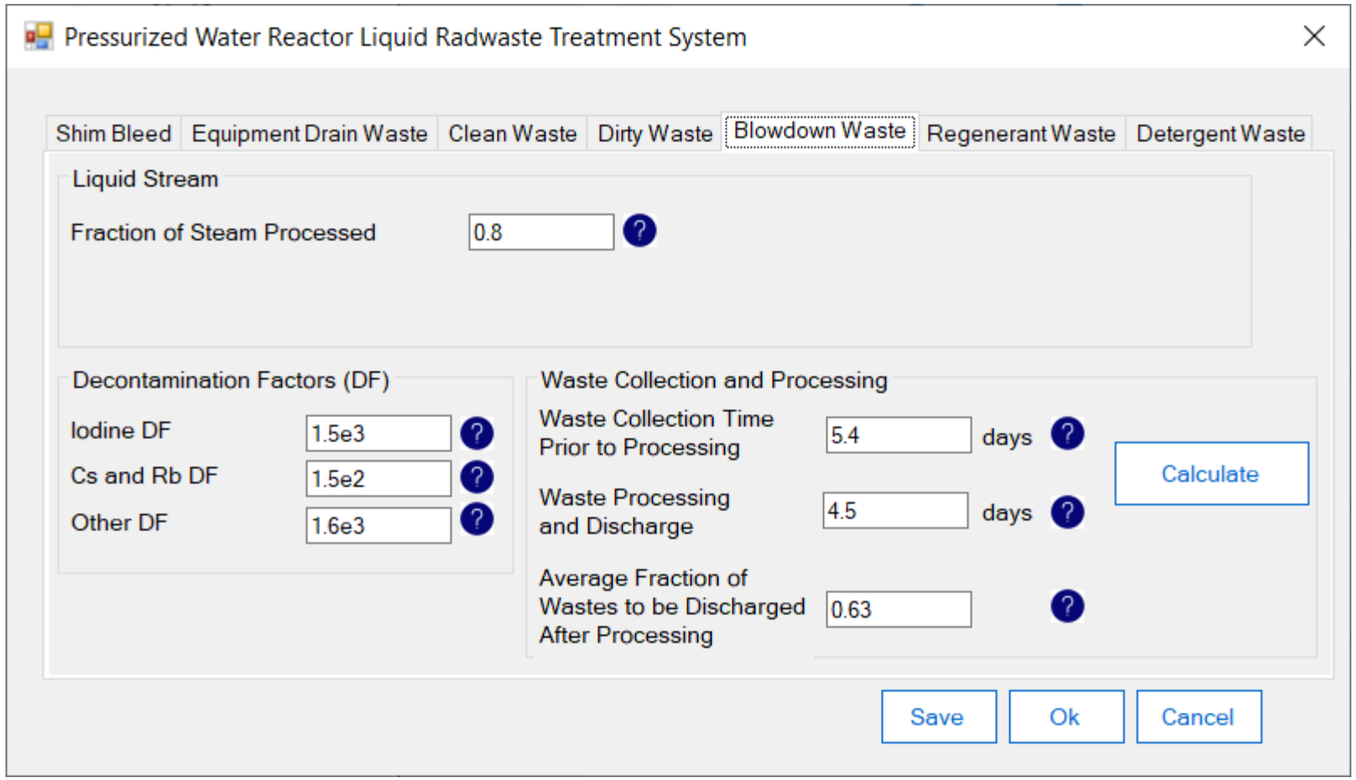
Example Use Cases: PWR



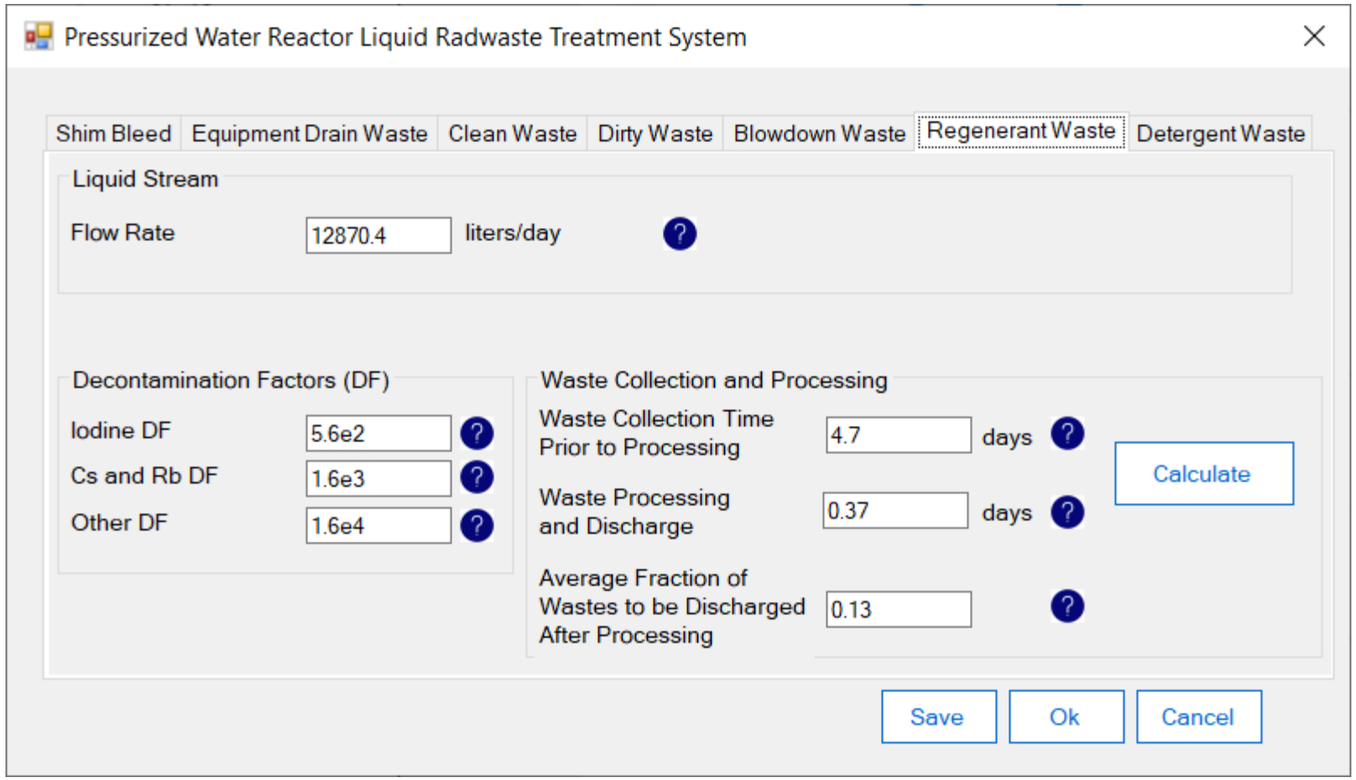
Example Use Cases: PWR



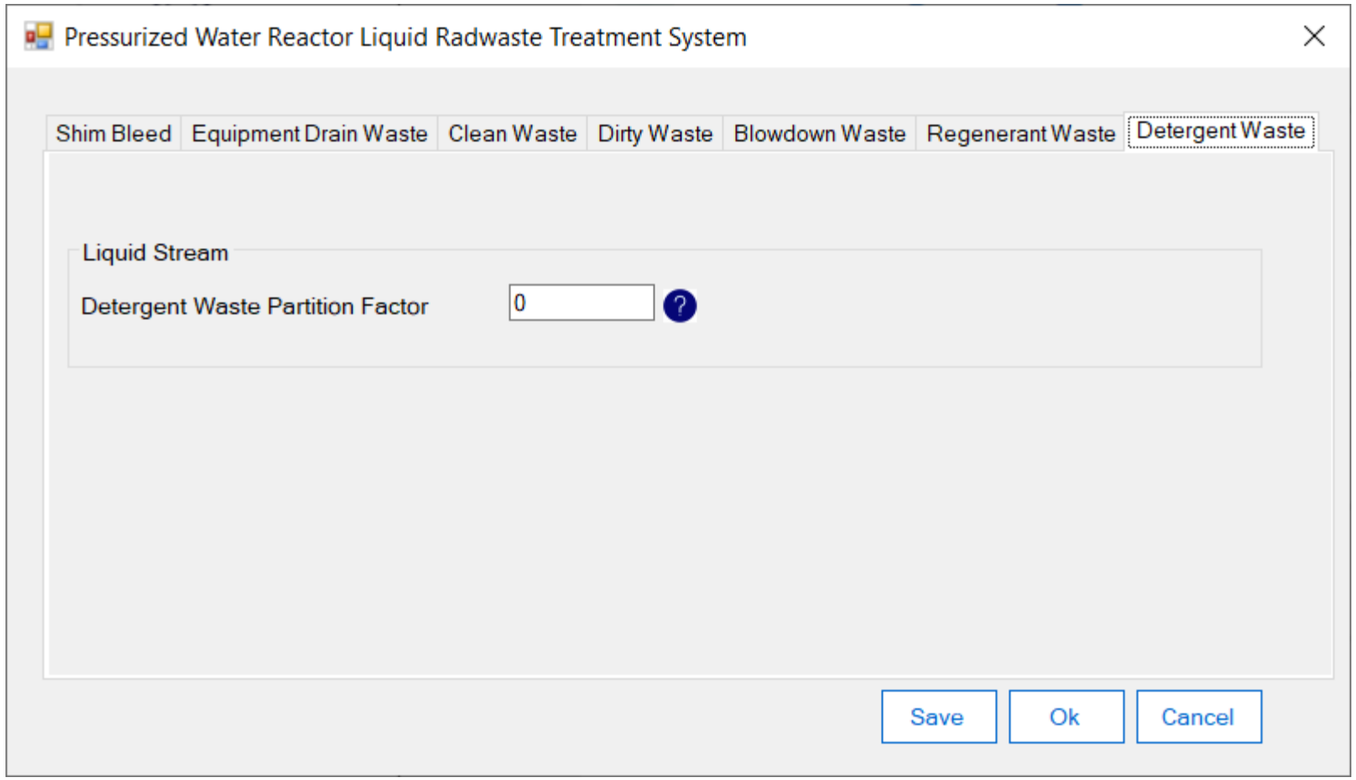
Example Use Cases: PWR



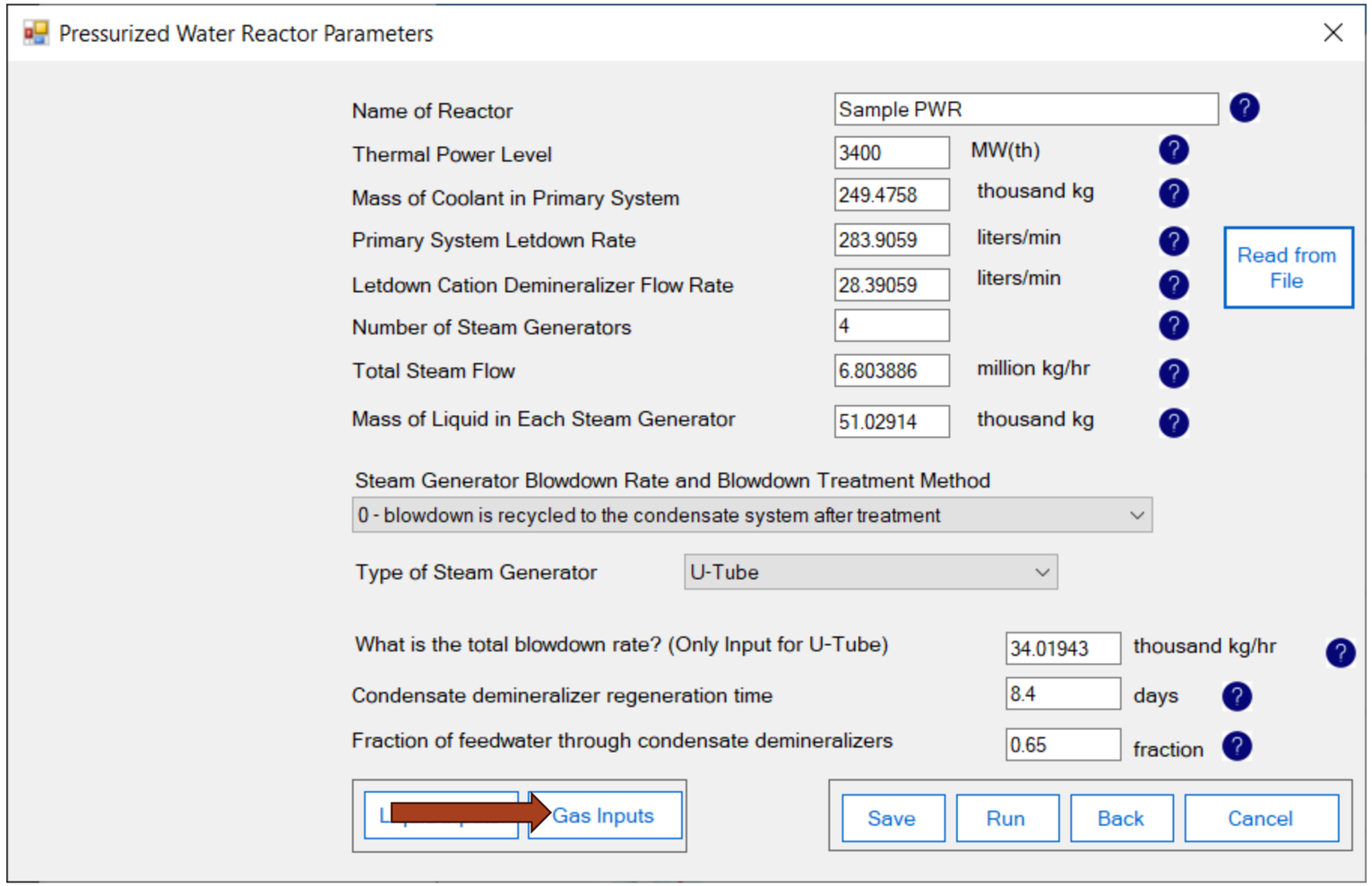
Example Use Cases: PWR



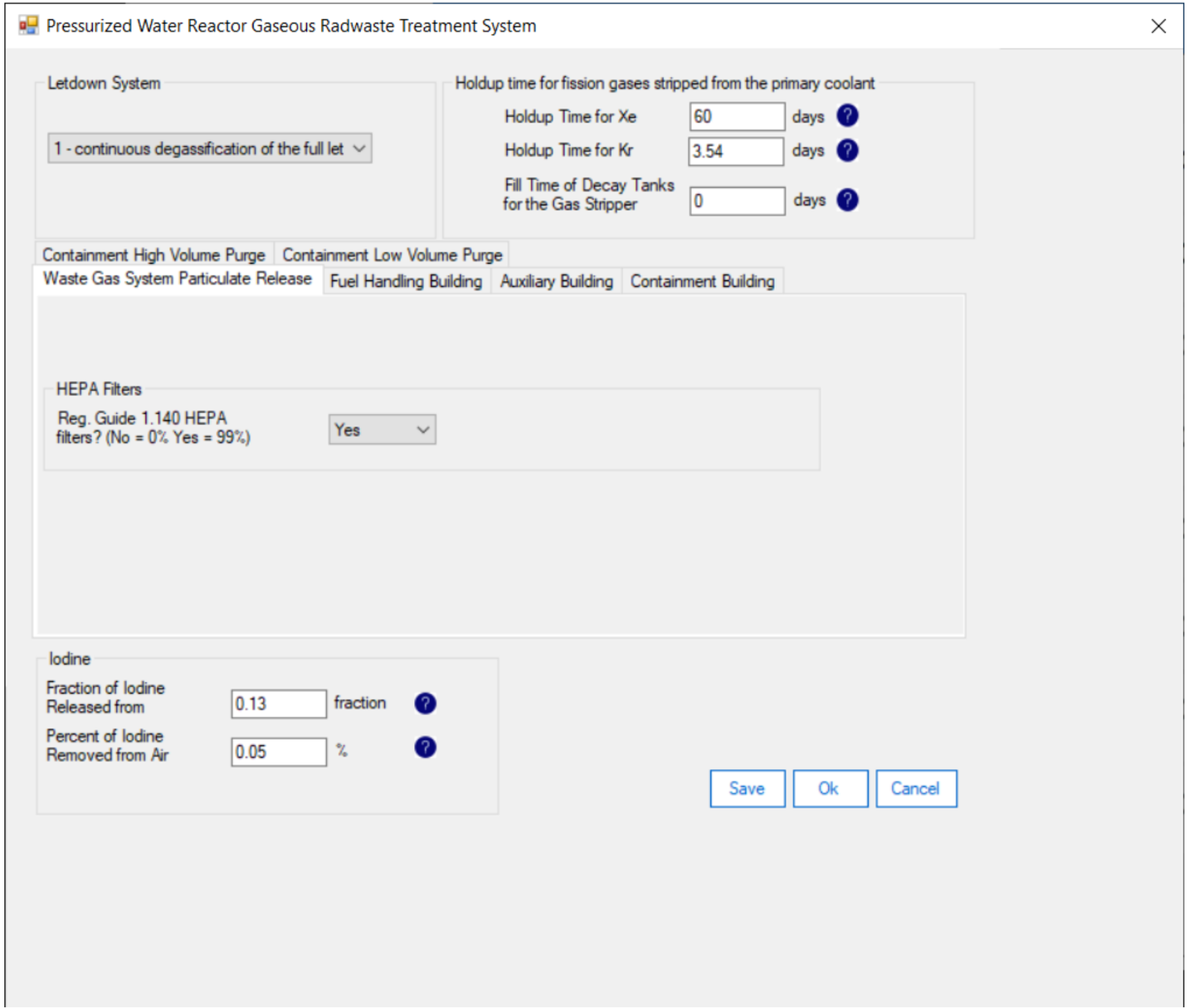
Example Use Cases: PWR



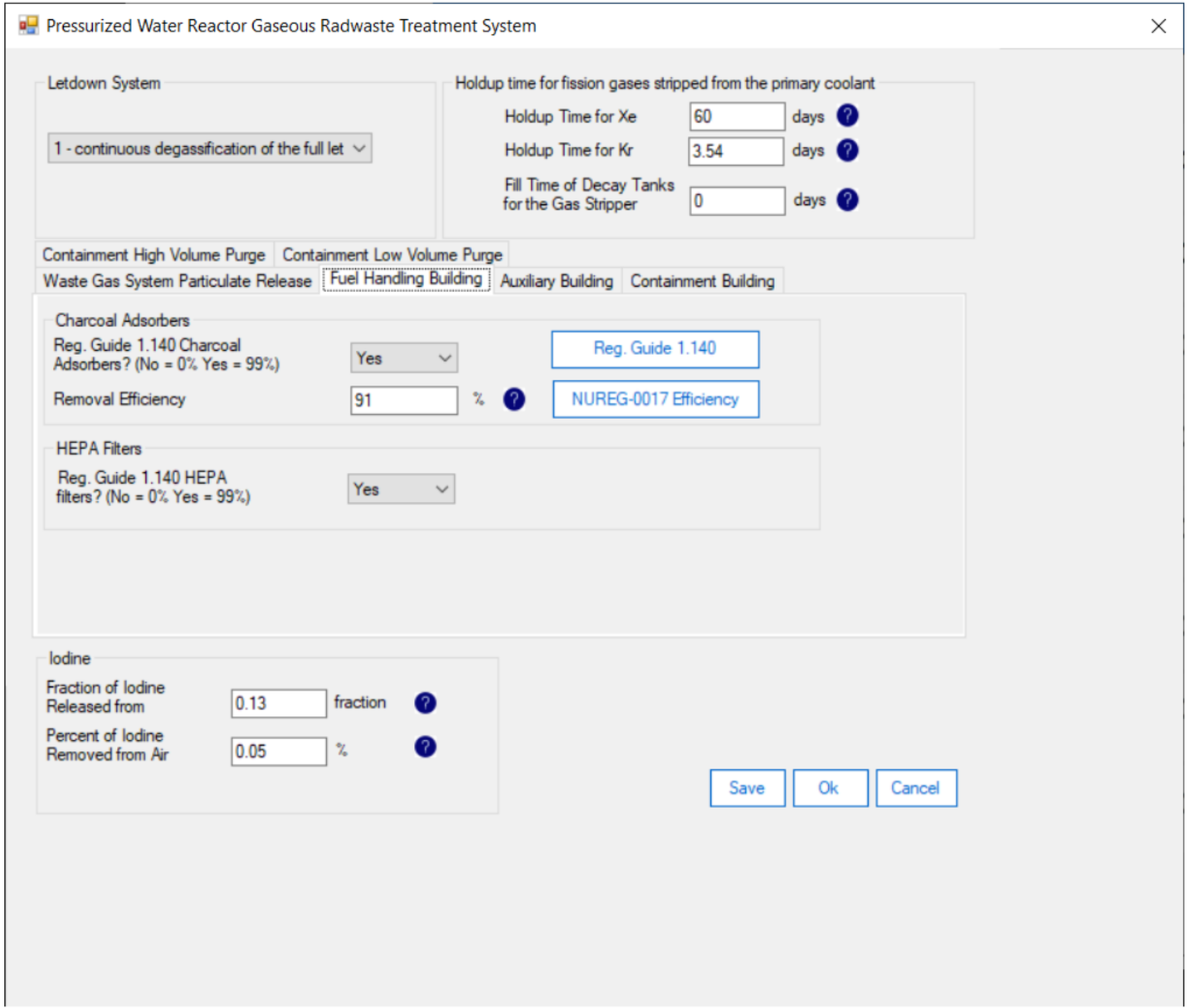
Example Use Cases: PWR



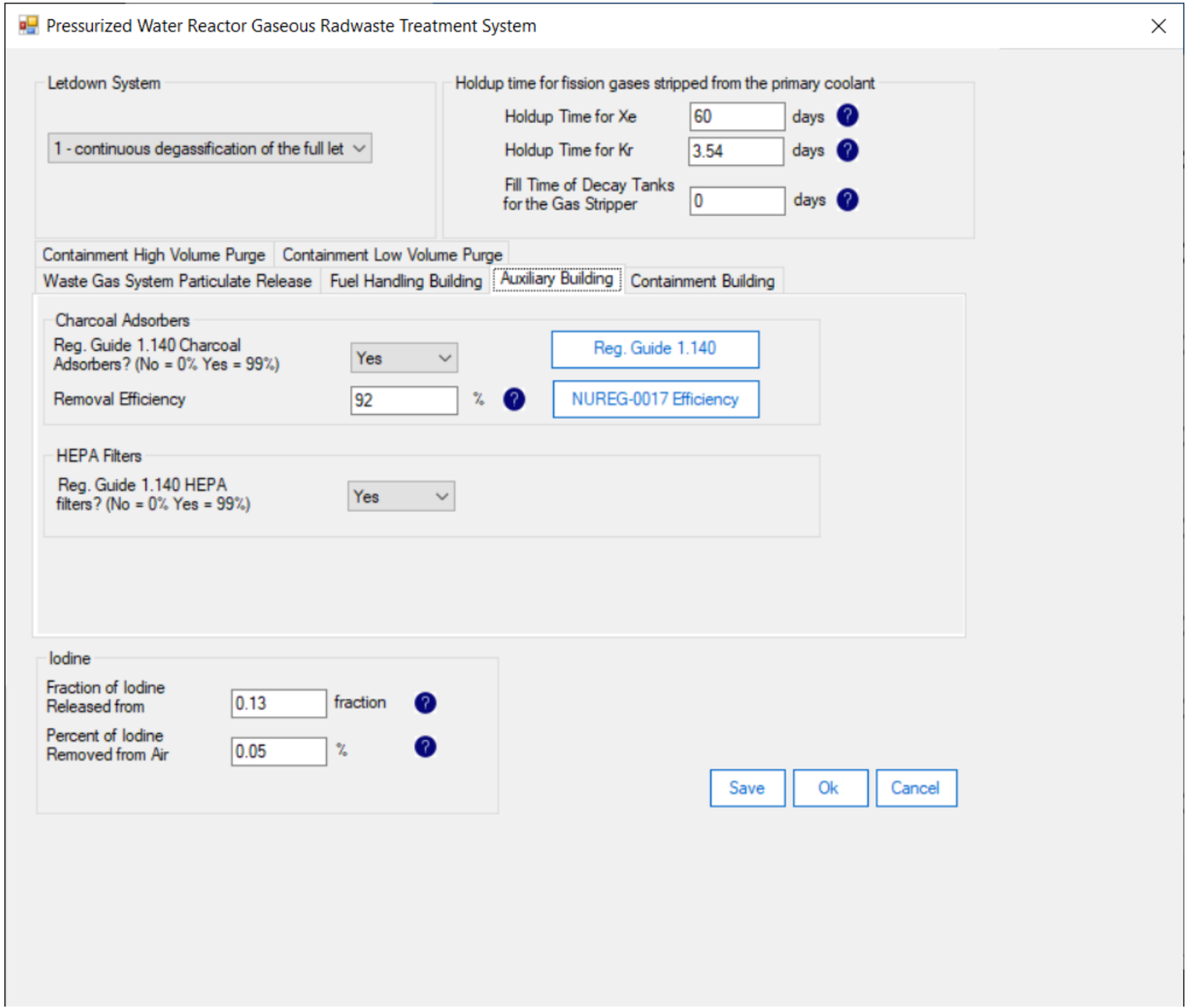
Example Use Cases: PWR



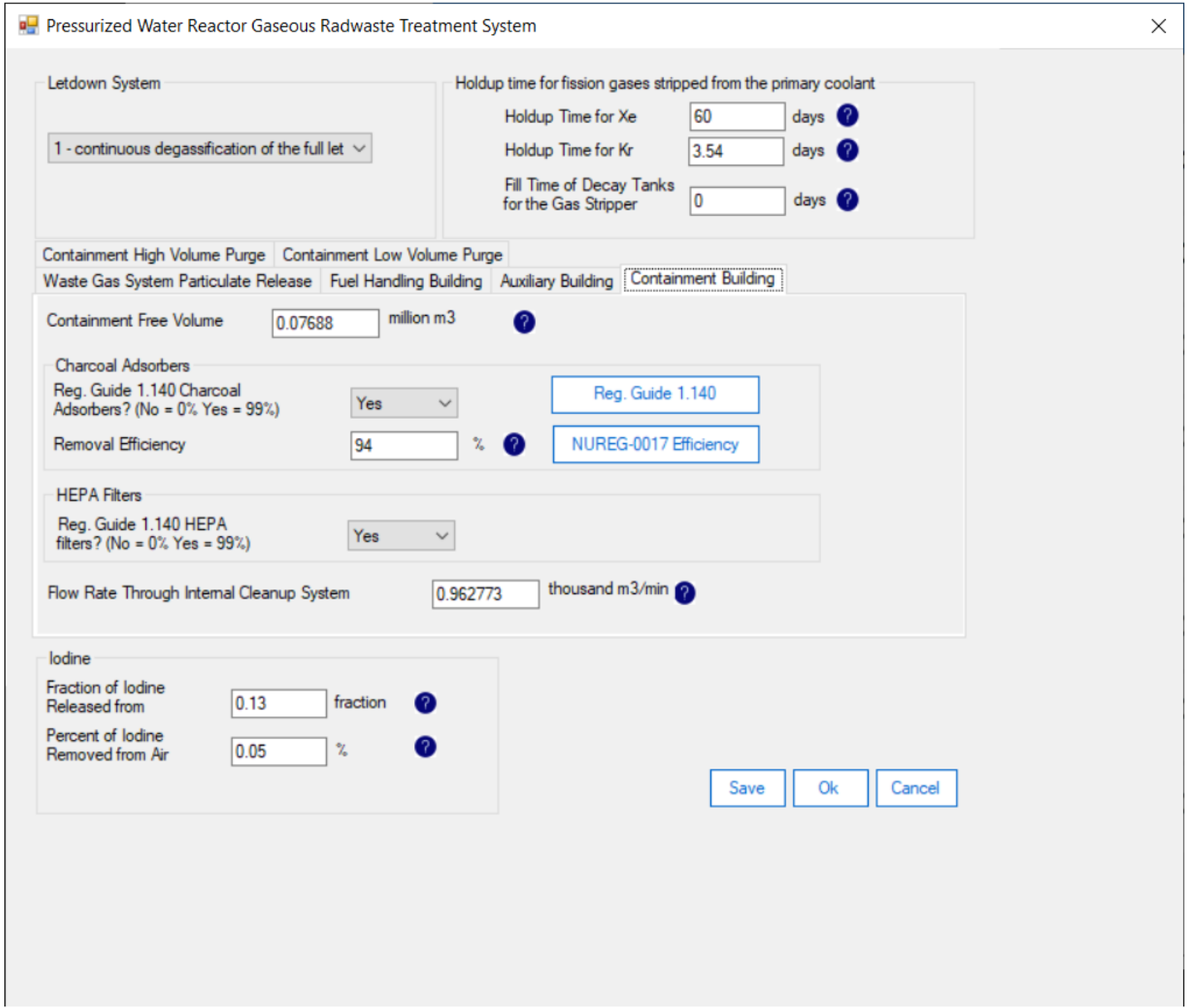
Example Use Cases: PWR



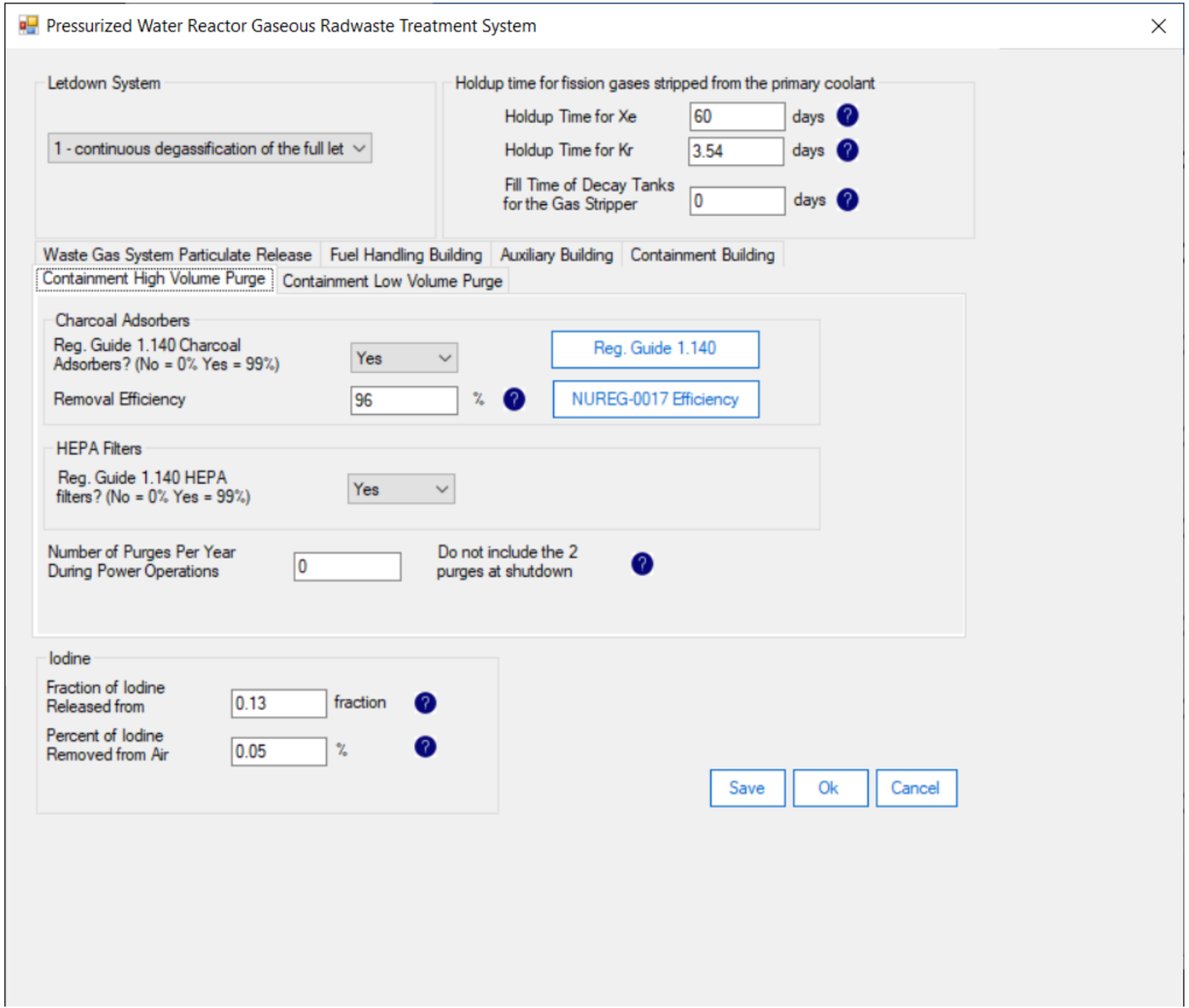
Example Use Cases: PWR



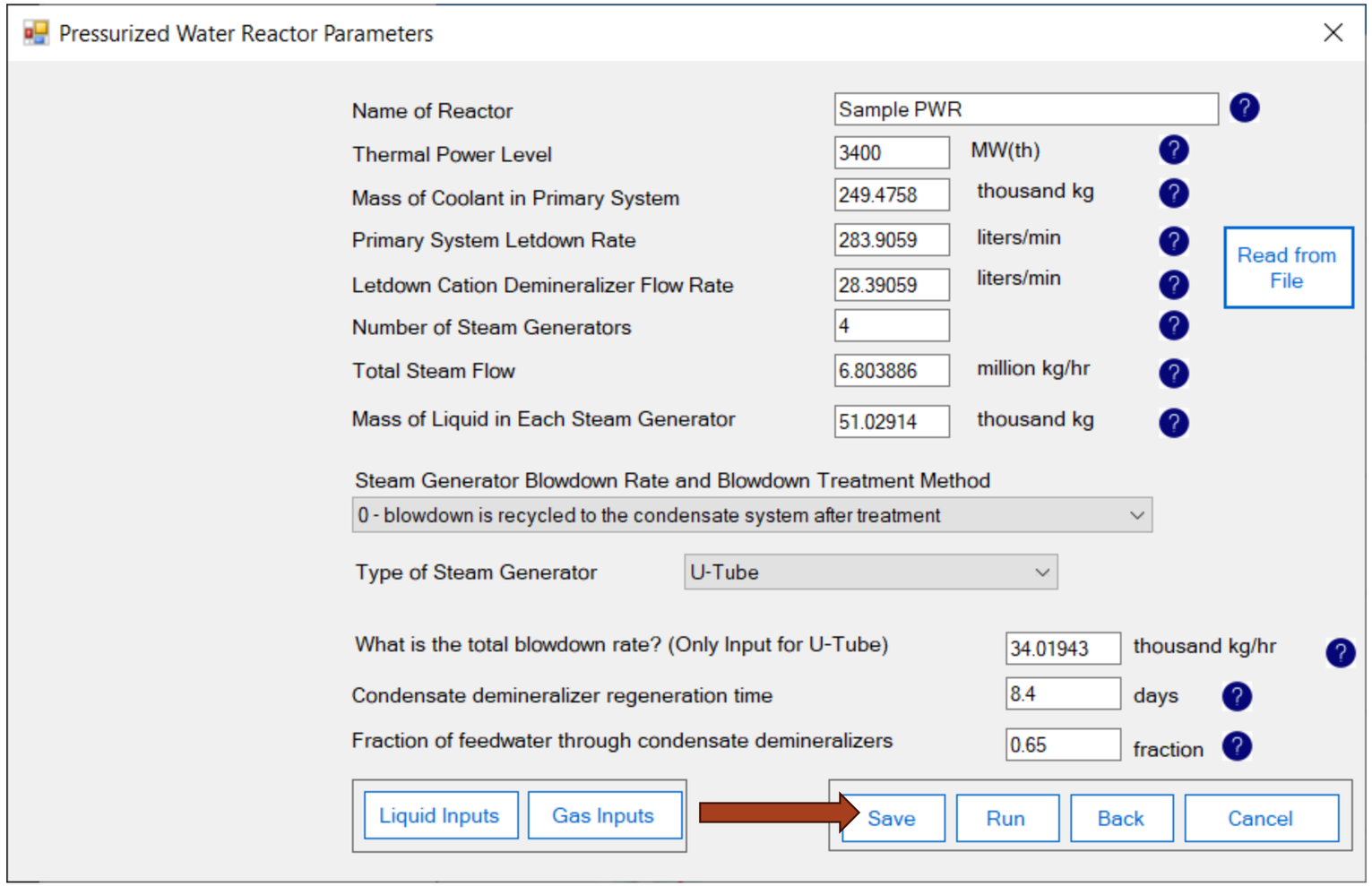
Example Use Cases: PWR



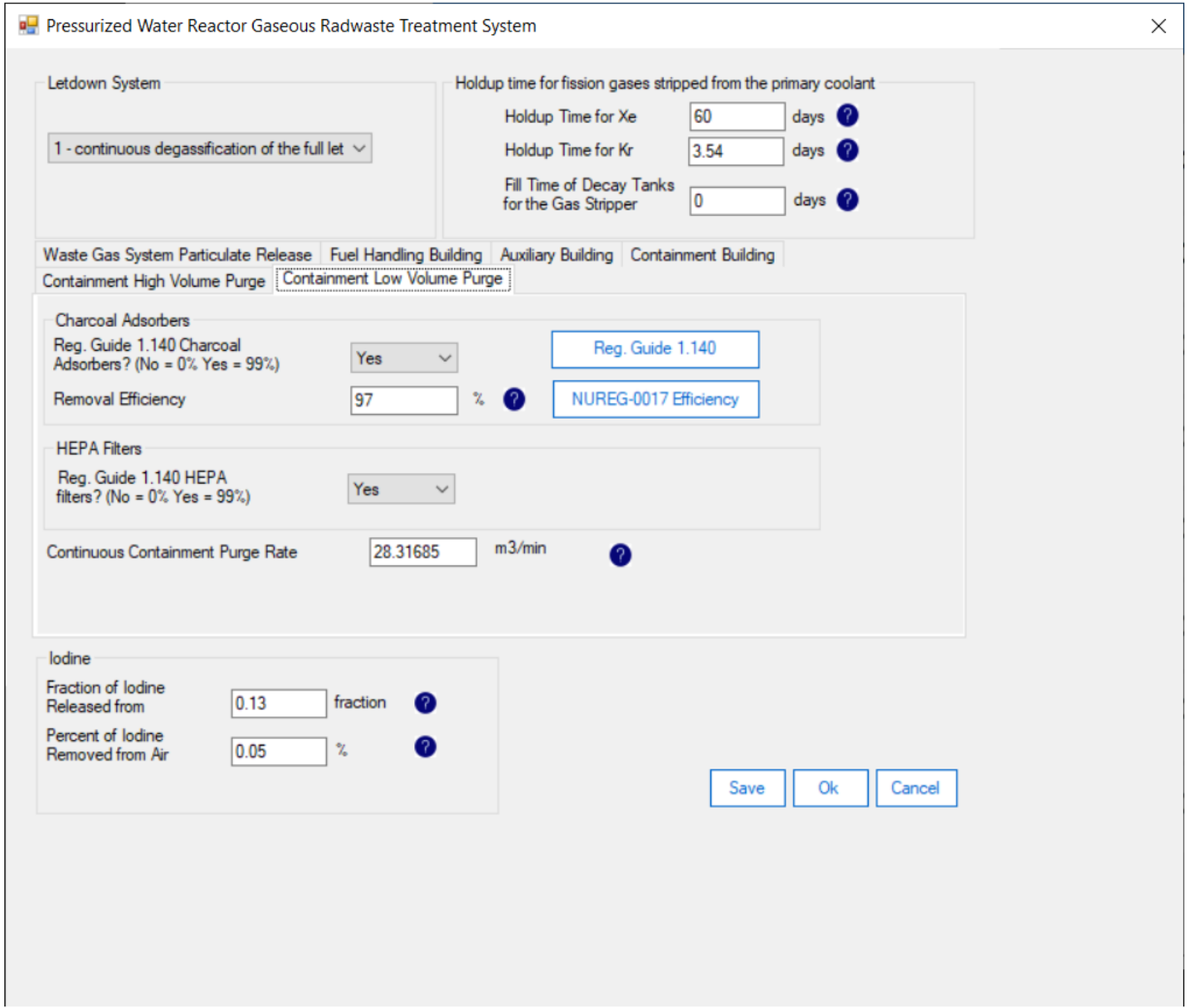
Example Use Cases: PWR



Example Use Cases: PWR



Example Use Cases: PWR



Example Use Cases: PWR - GE

```
******** GALE version: GALE86 *********
********  ANS-18.1 version: 1999 *********


                        Sample PWR                                    PWR
               THERMAL POWER LEVEL (MEGAWATTS)                        3.40000E+03
               PLANT CAPACITY FACTOR                                  8.00000E-01
               MASS OF PRIMARY COOLANT (THOUSAND LBS)                 5.50000E+02
               PRIMARY SYSTEM LETDOWN RATE (GPM)                      7.50000E+01
               LETDOWN CATION DEMINERALIZER FLOW (GPM)                7.50000E+00
               NUMBER OF STEAM GENERATORS                             4.00000E+00
               TOTAL STEAM FLOW (MILLION LBS/HR)                      1.50000E+01
               MASS OF LIQUID IN EACH STEAM GENERATOR (THOUSAND LBS)  1.12500E+02
               BLOWDOWN RATE (THOUSAND LBS/HR)                        7.50000E+01
               CONDENSATE DEMINERALIZER REGENERATION TIME (DAYS)      8.40000E+00
               CONDENSATE DEMINERALIZER FLOW FRACTION                 6.50000E-01

 LIQUID WASTE INPUTS
                                    FRACTION      FRACTION     COLLECTION      DECAY
      STREAM         FLOW RATE      OF PCA       DISCHARGED       TIME          TIME            DECONTAMINATION  FACTORS
                     (GAL/DAY)                                    (DAYS)        (DAYS)         I              CS          OTHERS
 ---------------------------------------------------------------------------------------------------------------------------
 SHIM BLEED RATE    1.44000E+03  1.00000E+00  1.00000E-01  2.26000E+01  9.30000E-01  5.10000E+03  2.10000E+03  1.10000E+05
 EQUIPMENT DRAINS   3.30000E+02  9.70000E-01  1.10000E-01  2.27000E+01  9.40000E-01  5.20000E+03  2.20000E+03  1.20000E+05
 CLEAN WASTE INPUT  9.80000E+02  9.30000E-02  1.20000E-01  5.70000E+00  1.30000E-01  5.30000E+02  1.30000E+03  1.30000E+04
 DIRTY WASTES       2.10000E+03  1.00000E-02  9.80000E-01  3.80000E+00  1.90000E-01  5.40000E+02  1.40000E+03  1.40000E+04
 BLOWDOWN           1.72612E+05               6.30000E-01  5.40000E+00  4.50000E+00  1.50000E+03  1.50000E+02  1.60000E+03
 UNTREATED BLOWDOWN 4.31530E+04               1.00000E+00  0.00000E+00  0.00000E+00  1.00000E+00  1.00000E+00  1.00000E+00
 REGENERANT SOLS    3.40000E+03               1.30000E-01  4.70000E+00  3.70000E-01  5.60000E+02  1.60000E+03  1.60000E+04
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GASEOUS WASTE INPUTS
               THERE IS CONTINUOUS STRIPPING OF FULL LETDOWN FLOW
               FLOW RATE THROUGH GAS STRIPPER (GPM)                          7.52292E+01
               HOLDUP TIME FOR XENON (DAYS)                                  6.00000E+01
               HOLDUP TIME FOR KRYPTON (DAYS)                                3.54000E+00
               FILL TIME OF DECAY TANKS FOR THE GAS STRIPPER (DAYS)          0.00000E+00
               PRIMARY COOLANT LEAK TO AUXILIARY BLDG (LB/DAY)               1.60000E+02
               GAS WASTE SYSTEM     PARTICULATE RELEASE FRACTION             1.00000E-02
               FUEL HANDLG BLDG     IODINE RELEASE FRACTION                  9.00000E-02
                                    PARTICULATE RELEASE FRACTION             1.00000E-02
               AUXILIARY BLDG       IODINE RELEASE FRACTION                  8.00000E-02
                                    PARTICULATE RELEASE FRACTION             1.00000E-02
               CONTAINMENT VOLUME (MILLION FT3)                              2.71500E+00
               FREQUENCY OF PRIMARY COOLANT DEGASSING (TIMES/YR)             2.00000E+00
               PRIMARY TO SECONDARY LEAK RATE (LB/DAY)                       7.50000E+01
               THERE IS A KIDNEY FILTER
                   CONTAINMENT ATMOSPHERECLEANUP RATE (THOUSAND CFM)         3.40000E+01
                   PURGE TIME OF CONTAINMENT (HOURS)                         1.60000E+01
               FRACTION IODINE BYPASSING CONDENSATE DEMINERALIZER            3.50000E-01
               IODINE PARTITION FACTOR (GAS/LIQUID) IN STEAM GENERATOR       1.00000E-02
               FREQUENCY OF CNTMT BLDG HIGH VOL PURGE(TIMES/YR)              2.00000E+00
               CNTMT-HIGH VOL PURGEIODINE RELEASE FRACTION                   4.00000E-02
                                    PARTICULATE RELEASE FRACTION             1.00000E-02
               CNTMT LOW VOL PURGE RATE(CFM)                                 1.00000E+03
               CNTMT LOW VOL PURGE IODINE RELEASE FRACTION                   3.00000E-02
                                    PARTICULATE RELEASE FRACTION             1.00000E-02
               STEAM LEAK TO TURBINE BLDG (LBS/HR)                           1.70000E+03
               FRACTION IODINE RELEASED FROM BLOWDOWN TANK VENT              1.30000E-01
               PERCENT OF IODINE REMOVED FROM AIR EJECTOR RELEASE            5.00000E-02
               THERE IS NOT AN ON-SITE LAUNDRY
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Example Use Cases: PWR - GE

Sample PWR

	PRIMARY COOLANT (MICRO-CI/GM)	SECONDARY COOLANT (MICRO-CI/GM)	GASEOUS RELEASE RATE - CURIES PER YEAR BUILDING VENTILATION FUEL HANDLING	REACTOR	AUXILIARY	TURBINE	GASEOUS RELEASE RATE - CURIES PER YEAR BLOWDOWN VENT OFFGAS	AIR EJECTOR EXHAUST	TOTAL
I-131	1.98363E-03	6.10073E-08	0.00000E+00	0.00000E+00	5.00000E-04	0.00000E+00	1.90000E-03	0.00000E+00	2.40000E-03
I-132	5.99038E-02	7.95718E-07	7.10000E-04	8.20000E-04	1.50000E-02	0.00000E+00	2.50000E-02	0.00000E+00	4.20000E-02
I-133	1.39188E-01	3.75488E-06	1.60000E-03	2.70000E-03	3.50000E-02	1.60000E-04	1.20000E-01	0.00000E+00	1.60000E-01
I-134	3.39759E-01	2.26814E-06	4.00000E-03	4.40000E-03	8.60000E-02	0.00000E+00	7.00000E-02	0.00000E+00	1.60000E-01
I-135	2.59109E-02	5.47555E-07	3.10000E-04	4.00000E-04	6.60000E-03	0.00000E+00	1.70000E-02	0.00000E+00	2.40000E-02

0.00000E+00 APPEARING IN THE TABLE INDICATES RELEASE IS LESS THAN 0.0001 CI/YR FOR I

TOTAL H-3 RELEASED VIA GASEOUS PATHWAY = 1.10000E+03 CI/YR

C-14 RELEASED VIA GASEOUS PATHWAY = 7.30000E+00 CI/YR

AR-41 RELEASED VIA CONTAINMENT VENT = 3.40000E+01 CI/YR

Sample PWR

	PRIMARY COOLANT (MICRO-CI/GM)	SECONDARY COOLANT (MICRO-CI/GM)	GASEOUS RELEASE RATE - CURIES PER YEAR GAS STRIPPING SHUTDOWN	CONTINUOUS	BUILDING VENTILATION REACTOR	AUXILIARY	TURBINE	GASEOUS RELEASE RATE - CURIES PER YEAR BLOWDOWN VENT OFFGAS	AIR EJECTOR EXHAUST	TOTAL
KR-85M	1.12298E-02	2.38634E-09	0.00000E+00	0.00000E+00	3.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.00000E+00
KR-85	5.71525E-03	1.18292E-09	3.00000E+00	6.70000E+02	1.30000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	6.90000E+02
KR-87	1.51391E-02	8.90536E-09	0.00000E+00	0.00000E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E+00
KR-88	1.41622E-02	2.98979E-09	0.00000E+00	0.00000E+00	3.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.00000E+00
XE-131M	3.45671E-02	7.10283E-09	0.00000E+00	1.20000E+02	6.80000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.90000E+02
XE-133M	1.18169E-02	2.53219E-09	0.00000E+00	0.00000E+00	1.60000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.60000E+01
XE-133	2.50634E-03	5.18553E-10	0.00000E+00	0.00000E+00	4.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.00000E+00
XE-135M	1.26796E-01	2.63345E-08	0.00000E+00	0.00000E+00	2.00000E+00	3.00000E+00	0.00000E+00	0.00000E+00	1.00000E+00	6.00000E+00
XE-135	3.55501E-02	5.85531E-10	0.00000E+00	0.00000E+00	1.80000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.80000E+01
XE-137	3.37855E-02	7.05520E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
XE-138	5.96281E-02	1.27076E-08	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E+00
TOTAL NOBLE GASES										9.30000E+02

0.00000E+00 APPEARING IN THE TABLE INDICATES RELEASE IS LESS THAN 1.0 CI/YR FOR NOBLE GAS

Example Use Cases: PWR - GE

Sample PWR

NUCLIDE	AIRBORNE PARTICULATE RELEASE RATE-CURIES PER YEAR WASTE GAS SYSTEM	BUILDING VENTILATION FUEL HANDLING	REACTOR	AUXILIARY	TOTAL
CR-51	1.40000E-07	1.80000E-06	9.00000E-05	3.20000E-06	9.50000E-05
MN-54	2.10000E-08	3.00000E-06	5.20000E-05	7.80000E-07	5.60000E-05
CO-57	0.00000E+00	0.00000E+00	8.10000E-06	0.00000E+00	8.10000E-06
CO-58	8.70000E-08	2.10000E-04	2.50000E-04	1.90000E-05	4.80000E-04
CO-60	1.40000E-07	8.20000E-05	2.60000E-05	5.10000E-06	1.10000E-04
FE-59	1.80000E-08	0.00000E+00	2.70000E-05	5.00000E-07	2.80000E-05
SR-89	4.40000E-07	2.10000E-05	1.30000E-04	7.50000E-06	1.60000E-04
SR-90	1.70000E-07	8.00000E-06	5.10000E-05	2.90000E-06	6.20000E-05
ZR-95	4.80000E-08	3.60000E-08	0.00000E+00	1.00000E-05	1.00000E-05
NB-95	3.70000E-08	2.40000E-05	1.80000E-05	3.00000E-07	4.20000E-05
RU-103	3.20000E-08	3.80000E-07	1.60000E-05	2.30000E-07	1.70000E-05
RU-106	2.70000E-08	6.90000E-07	0.00000E+00	6.00000E-08	7.80000E-07
SB-125	0.00000E+00	5.70000E-07	0.00000E+00	3.90000E-08	6.10000E-07
CS-134	3.30000E-07	1.70000E-05	2.50000E-05	5.40000E-06	4.80000E-05
CS-136	5.30000E-08	0.00000E+00	3.10000E-05	4.80000E-07	3.20000E-05
CS-137	7.70000E-07	2.70000E-05	5.40000E-05	7.20000E-06	8.90000E-05
BA-140	2.30000E-07	0.00000E+00	0.00000E+00	4.00000E-06	4.20000E-06
CE-141	2.20000E-08	4.40000E-09	1.30000E-05	2.60000E-07	1.30000E-05

Example Use Cases: PWR - LE

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******** GALE version: GALE86 *********
******** ANS-18.1 version: 1999 *********
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Sample PWR	PWR
THERMAL POWER LEVEL (MEGAWATTS)	3.40000E+03
PLANT CAPACITY FACTOR	8.00000E-01
MASS OF PRIMARY COOLANT (THOUSAND LBS)	5.50000E+02
PRIMARY SYSTEM LETDOWN RATE (GPM)	7.50000E+01
LETDOWN CATION DEMINERALIZER FLOW (GPM)	7.50000E+00
NUMBER OF STEAM GENERATORS	4.00000E+00
TOTAL STEAM FLOW (MILLION LBS/HR)	1.50000E+01
MASS OF LIQUID IN EACH STEAM GENERATOR (THOUSAND LBS)	1.12500E+02
MASS OF WATER IN STEAM GENERATORS (THOUSAND LBS)	4.50000E+02
BLOWDOWN RATE (THOUSAND LBS/HR)	7.50000E+01
PRIMARY TO SECONDARY LEAK RATE (LBS/DAY)	7.50000E+01
CONDENSATE DEMINERALIZER REGENERATION TIME (DAYS)	8.40000E+00
FISSION PRODUCT CARRY-OVER FRACTION	5.00000E-03
HALOGEN CARRY-OVER FRACTION	1.00000E-02
CONDENSATE DEMINERALIZER FLOW FRACTION	6.50000E-01

LIQUID WASTE INPUTS

STREAM	FLOW RATE (GAL/DAY)	FRACTION OF PCA	FRACTION DISCHARGED	COLLECTION TIME (DAYS)	DECAY TIME (DAYS)	DECONTAMINATION FACTORS I	CS	OTHERS
SHIM BLEED RATE	1.44000E+03	1.00000E+00	1.00000E-01	2.26000E+01	9.30000E-01	5.10000E+03	2.10000E+03	1.10000E+05
EQUIPMENT DRAINS	3.30000E+02	9.70000E-01	1.10000E-01	2.27000E+01	9.40000E-01	5.20000E+03	2.20000E+03	1.20000E+05
CLEAN WASTE INPUT	9.80000E+02	9.30000E-02	1.20000E-01	5.70000E+00	1.30000E-01	5.30000E+02	1.30000E+03	1.30000E+04
DIRTY WASTES	2.10000E+03	1.00000E-02	9.80000E-01	3.80000E+00	1.90000E-01	5.40000E+02	1.40000E+03	1.40000E+04
BLOWDOWN	1.72612E+05		6.30000E-01	5.40000E+00	4.50000E+00	1.50000E+03	1.50000E+02	1.60000E+03
UNTREATED BLOWDOWN	4.31530E+04		1.00000E+00	0.00000E+00	0.00000E+00	1.00000E+00	1.00000E+00	1.00000E+00
REGENERANT SOLS	3.40000E+03		1.30000E-01	4.70000E+00	3.70000E-01	5.60000E+02	1.60000E+03	1.60000E+04

GASEOUS WASTE INPUTS

THERE IS CONTINUOUS STRIPPING OF FULL LETDOWN FLOW		
HOLDUP TIME FOR XENON (DAYS)		6.00000E+01
HOLDUP TIME FOR KRYPTON (DAYS)		3.54000E+00
FILL TIME OF DECAY TANKS FOR THE GAS STRIPPER (DAYS)		0.00000E+00
GAS WASTE SYSTEM	PARTICULATE RELEASE FRACTION	1.00000E-02
AUXILIARY BLDG	IODINE RELEASE FRACTION	8.00000E-02
	PARTICULATE RELEASE FRACTION	1.00000E-02
CONTAINMENT VOLUME (MILLION FT3)		2.71500E+00
FREQUENCY OF CNTMT BLDG HIGH VOL PURGE (TIMES/YR)		2.00000E+00
CNTMT-HIGH VOL PURGE	IODINE RELEASE FRACTION	4.00000E-02
	PARTICULATE RELEASE FRACTION	1.00000E-02
CNTMT LOW VOL PURGE RATE(CFM)		1.00000E+03
CNTMT LOW VOL PURGE	IODINE RELEASE FRACTION	3.00000E-02
	PARTICULATE RELEASE FRACTION	1.00000E-02
STEAM LEAK TO TURBINE BLDG (LBS/HR)		1.70000E+03
FRACTION IODINE RELEASED FROM BLOWDOWN TANK VENT		1.30000E-01
PERCENT OF IODINE REMOVED FROM AIR EJECTOR RELEASE		5.00000E-02
THERE IS NOT AN ON-SITE LAUNDRY		

Example Use Cases: PWR - LE

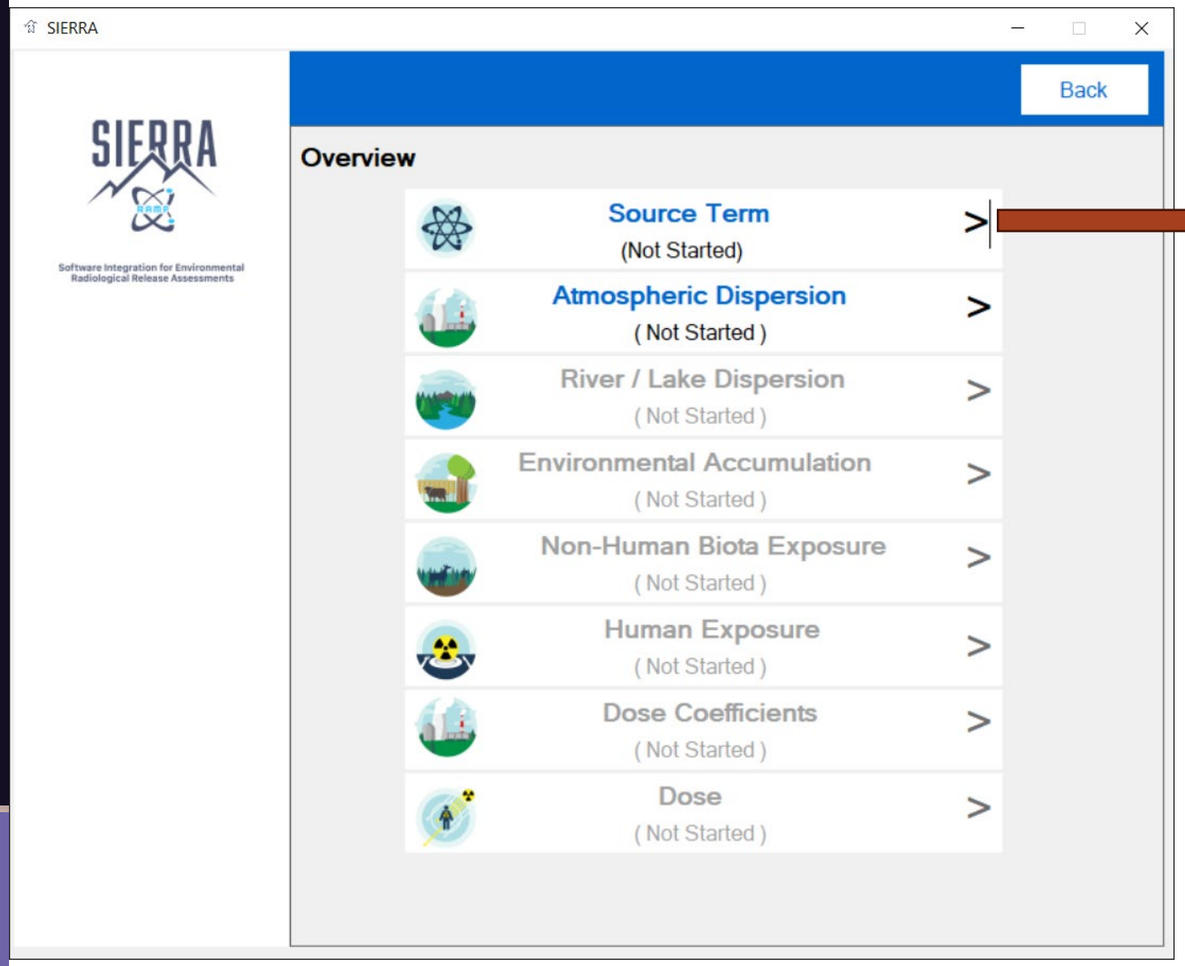
LIQUID EFFLUENTS
ANNUAL RELEASES TO DISCHARGE CANAL

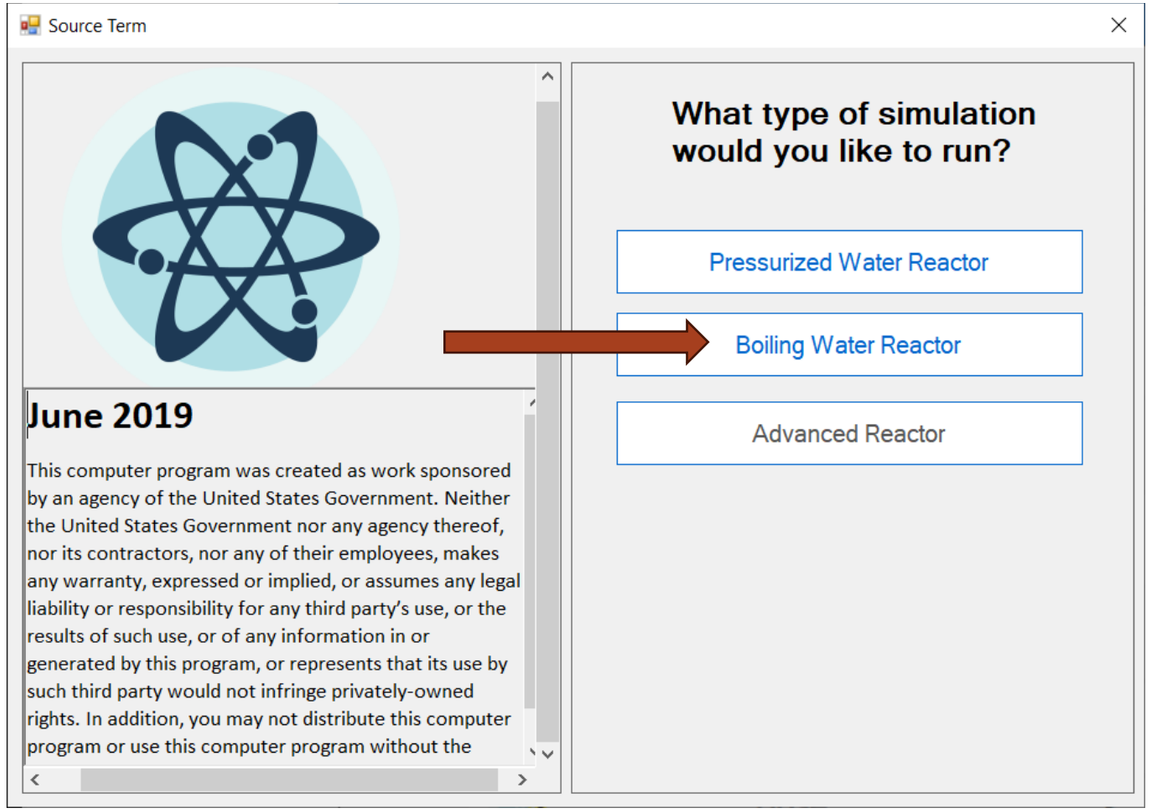
NUCLIDE	HALF-LIFE (DAYS)	COOLANT CONCENTRATIONS PRIMARY (MICRO CI/ML)	COOLANT CONCENTRATIONS SECONDARY (MICRO CI/ML)	BORON RS (CURIES)	MISC. WASTES (CURIES)	SECONDARY (CURIES)	TURB BLDG (CURIES)	TOTAL LWS (CURIES)	ADJUSTED TOTAL (CI/YR)	DETERGENT WASTES (CI/YR)	TOTAL (CI/YR)
CORROSION AND ACTIVATION PRODUCTS											
NA 24	6.25000E-01	4.70000E-02	0.00000E+00	0.00000E+00	3.00000E-05	0.00000E+00	5.00000E-05	8.00000E-05	4.65000E-03	0.00000E+00	4.70000E-03
CR 51	2.77997E+01	3.10000E-03	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05	2.00000E-05	9.60000E-04	0.00000E+00	9.60000E-04
MN 54	3.02996E+02	1.60000E-03	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	0.00000E+00	1.00000E-05	5.20000E-04	0.00000E+00	5.20000E-04
FE 55	9.49624E+02	1.20000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	3.90000E-04	0.00000E+00	3.90000E-04
FE 59	4.49994E+01	3.00000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	9.00000E-05	0.00000E+00	9.00000E-05
CO 58	7.12991E+01	4.60000E-03	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05	3.00000E-05	1.46000E-03	0.00000E+00	1.50000E-03
CO 60	1.92116E+03	5.30000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.70000E-04	0.00000E+00	1.70000E-04
ZN 65	2.44997E+02	5.10000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	1.00000E-05	7.20000E-04	0.00000E+00	7.20000E-04
W187	9.95833E-01	2.50000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	3.30000E-04	0.00000E+00	3.30000E-04
NP239	2.34997E+00	2.20000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	4.40000E-04	0.00000E+00	4.40000E-04
FISSION PRODUCTS											
SR 89	5.19994E+01	1.40000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.00000E-05	0.00000E+00	4.00000E-05
SR 91	4.02917E-01	9.60000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.00000E-05	0.00000E+00	7.00000E-05
Y 91M	3.47234E-02	4.60000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.00000E-05	0.00000E+00	4.00000E-05
Y 93	4.25000E-01	4.20000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	3.10000E-04	0.00000E+00	3.10000E-04
ZR 95	6.49992E+01	3.90000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.20000E-04	0.00000E+00	1.20000E-04
NB 95	3.49996E+01	2.80000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	9.00000E-05	0.00000E+00	9.00000E-05
MO 99	2.79167E+00	6.40000E-03	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05	2.00000E-05	1.36000E-03	0.00000E+00	1.40000E-03
TC 99M	2.50000E-01	4.70000E-03	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05	2.00000E-05	1.13000E-03	0.00000E+00	1.10000E-03
RU103	3.95995E+01	7.50000E-03	0.00000E+00	0.00000E+00	2.00000E-05	0.00000E+00	1.00000E-05	4.00000E-05	2.35000E-03	0.00000E+00	2.30000E-03
RH103M	3.95847E-02	0.00000E+00	0.00000E+00	0.00000E+00	2.00000E-05	0.00000E+00	1.00000E-05	4.00000E-05	2.34000E-03	0.00000E+00	2.30000E-03
RU106	3.66995E+02	9.00000E-02	0.00000E+00	4.00000E-05	2.90000E-04	0.00000E+00	1.70000E-04	5.00000E-04	2.91300E-02	0.00000E+00	2.90000E-02
RH106	3.47219E-04	0.00000E+00	0.00000E+00	4.00000E-05	2.90000E-04	0.00000E+00	1.70000E-04	5.00000E-04	2.91300E-02	0.00000E+00	2.90000E-02
AG110M	2.52997E+02	1.30000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	4.20000E-04	0.00000E+00	4.20000E-04
AG110	2.82405E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.00000E-05	0.00000E+00	5.00000E-05
TE129M	3.39996E+01	1.90000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	6.00000E-05	0.00000E+00	6.00000E-05
TE129	4.79183E-02	2.40000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	6.00000E-05	0.00000E+00	6.00000E-05
TE131M	1.25000E+00	1.50000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.30000E-04	0.00000E+00	2.30000E-04
TE131	1.73617E-02	7.70000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.00000E-05	0.00000E+00	4.00000E-05
I131	8.04990E+00	2.00000E-03	0.00000E+00	1.00000E-05	1.40000E-04	0.00000E+00	1.00000E-05	1.60000E-04	9.34000E-03	0.00000E+00	9.30000E-03
TE132	3.25000E+00	1.70000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	3.80000E-04	0.00000E+00	3.80000E-04
I132	9.58333E-02	6.00000E-02	0.00000E+00	0.00000E+00	7.00000E-05	0.00000E+00	2.00000E-05	9.00000E-05	5.26000E-03	0.00000E+00	5.30000E-03
I133	8.75000E-01	2.60000E-02	0.00000E+00	1.00000E-05	5.20000E-04	0.00000E+00	6.00000E-05	5.80000E-04	3.41100E-02	0.00000E+00	3.40000E-02
I134	3.66679E-02	1.00000E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.90000E-04	0.00000E+00	2.90000E-04
CS134	7.48742E+02	4.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.20000E-04	0.00000E+00	2.20000E-04
I135	2.79167E-01	5.50000E-02	0.00000E+00	0.00000E+00	2.70000E-04	0.00000E+00	6.00000E-05	3.30000E-04	1.95900E-02	0.00000E+00	2.00000E-02
CS136	1.29998E+01	8.70000E-04	0.00000E+00	3.00000E-05	2.00000E-05	0.00000E+00	0.00000E+00	6.00000E-05	3.49000E-03	0.00000E+00	3.50000E-03
CS137	1.09572E+04	5.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	3.20000E-04	0.00000E+00	3.20000E-04
BA137M	1.77089E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	3.00000E-04	0.00000E+00	3.00000E-04
BA140	1.27998E+01	1.30000E-02	0.00000E+00	0.00000E+00	4.00000E-05	0.00000E+00	2.00000E-05	6.00000E-05	3.72000E-03	0.00000E+00	3.70000E-03
LA140	1.67500E+00	2.50000E-02	0.00000E+00	0.00000E+00	6.00000E-05	0.00000E+00	4.00000E-05	1.00000E-04	5.94000E-03	0.00000E+00	5.90000E-03
CE141	3.23996E+01	1.50000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.00000E-05	0.00000E+00	5.00000E-05
CE143	1.37500E+00	2.80000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	4.40000E-04	0.00000E+00	4.40000E-04
PR143	1.36998E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.00000E-05	0.00000E+00	4.00000E-05
CE144	2.83996E+02	4.00000E-03	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05	2.00000E-05	1.28000E-03	0.00000E+00	1.30000E-03
PR144	1.20143E-02	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05	2.00000E-05	1.28000E-03	0.00000E+00	1.30000E-03
ALL OTHERS		2.06020E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05
TOTAL (EXCEPT TRITIUM)		7.09890E-01	1.00000E-05	1.60000E-04	1.89000E-03	0.00000E+00	7.30000E-04	2.78000E-03	1.62780E-01	0.00000E+00	1.60000E-01

TRITIUM RELEASE 2.90000E+02 CURIES PER YEAR

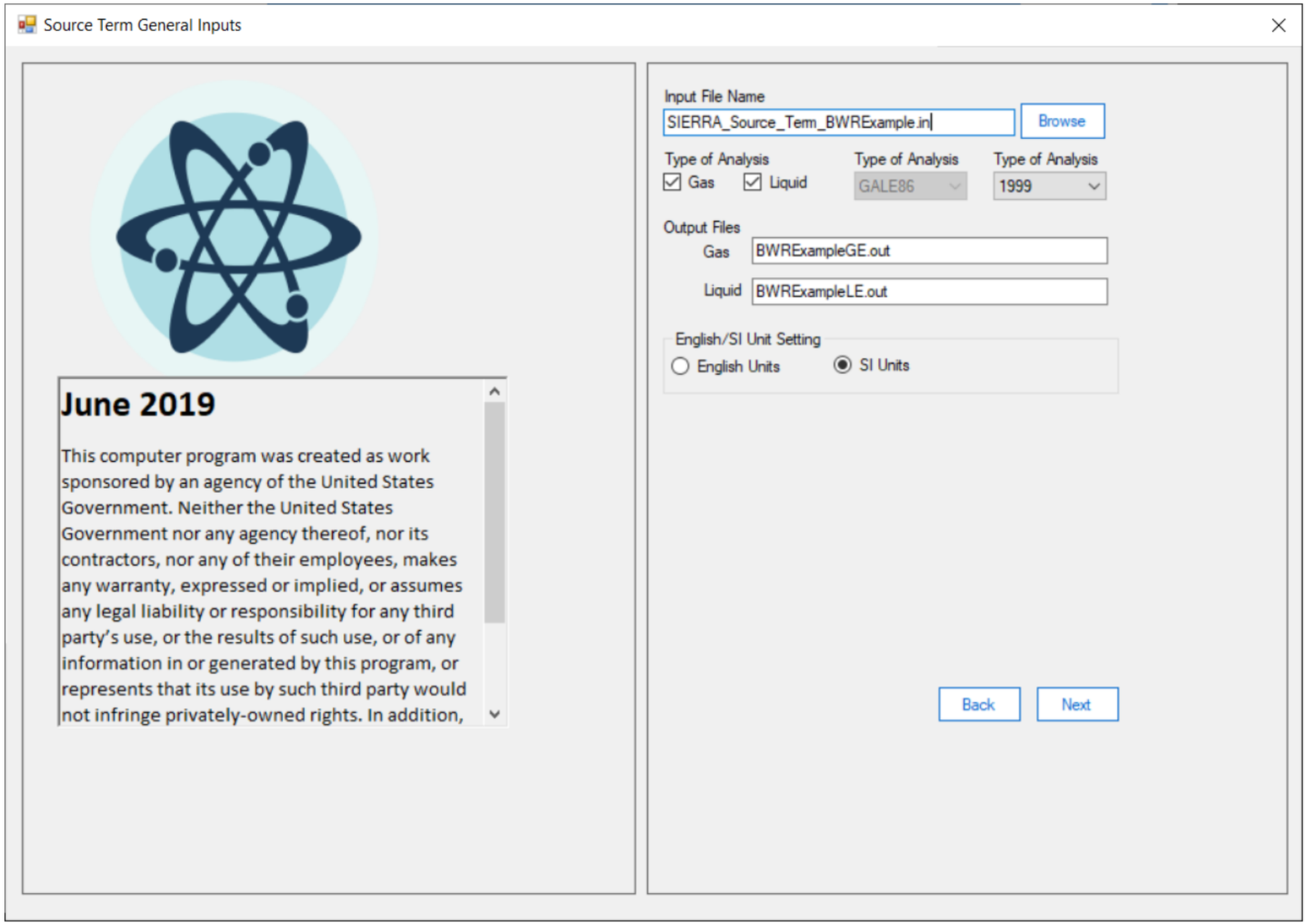
NOTE: 0.00000E+00 INDICATES THAT THE VALUE IS LESS THAN 1.00000E-05.

Example Use Cases: BWR

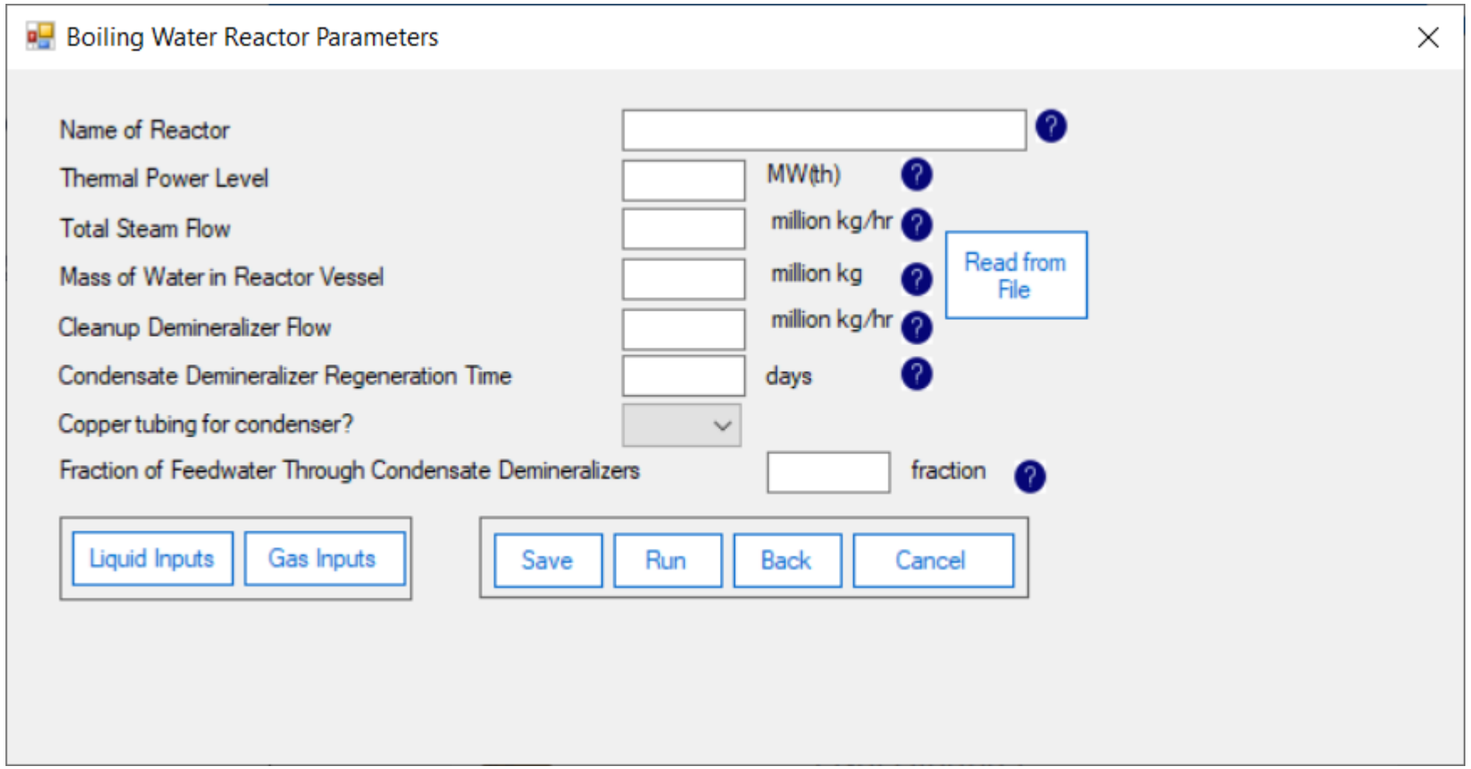




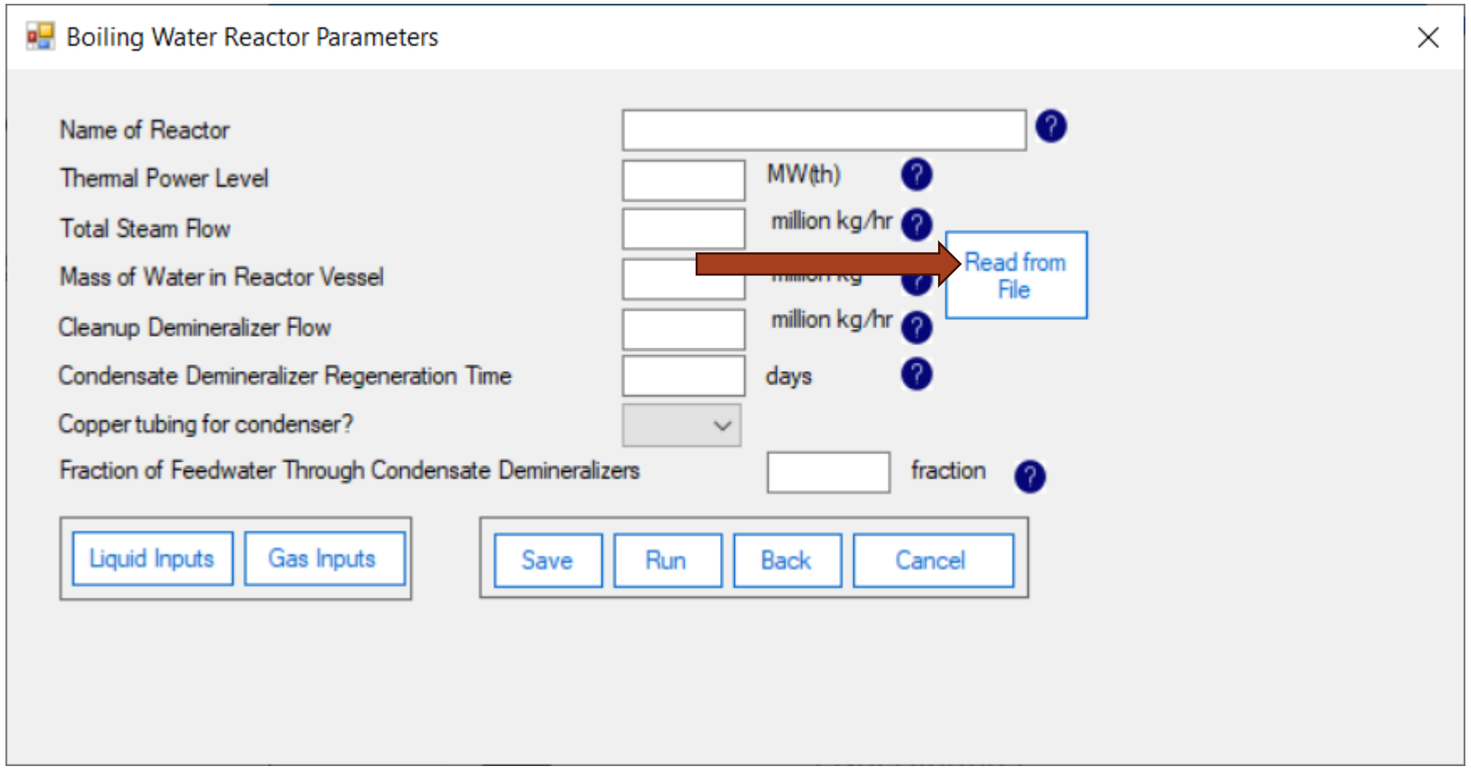
Example Use Cases: BWR



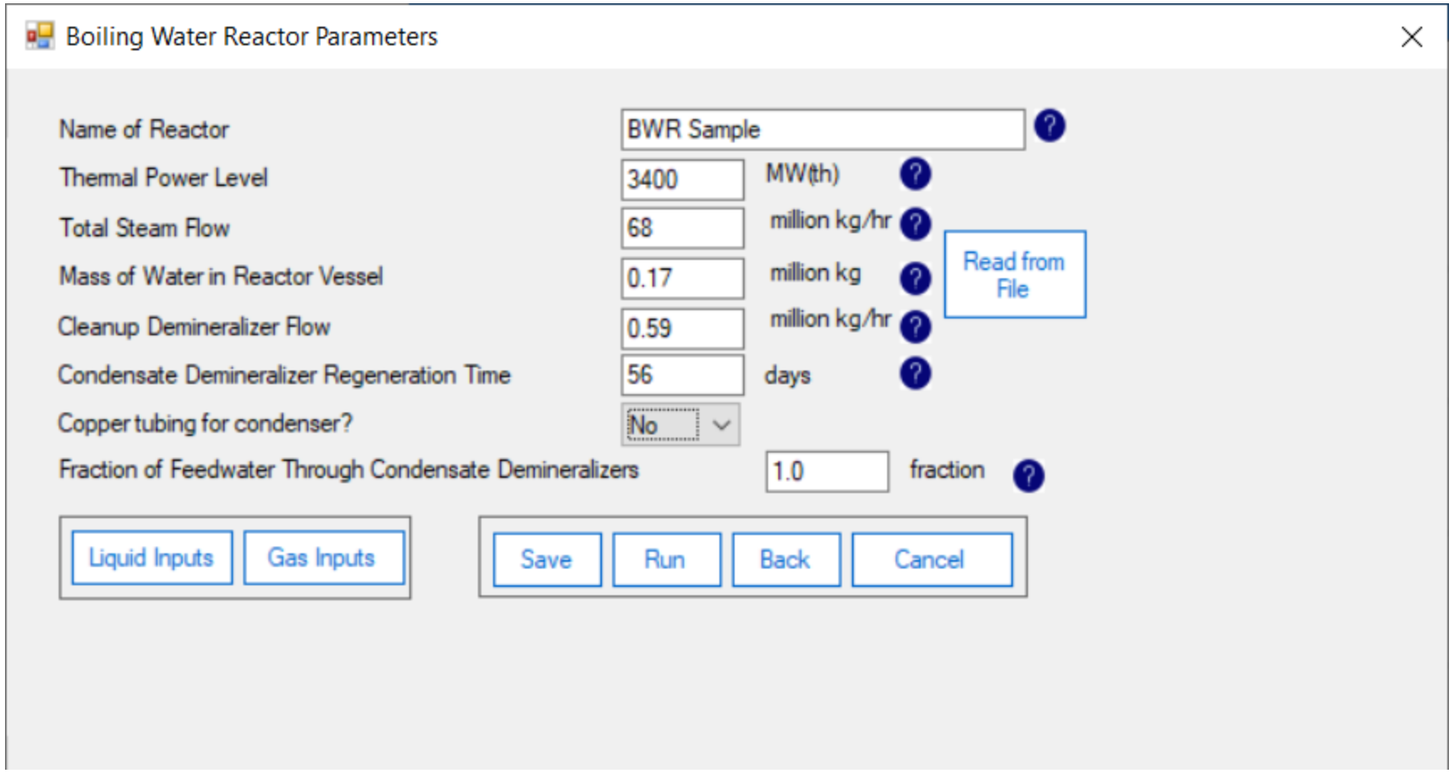
Example Use Cases: BWR



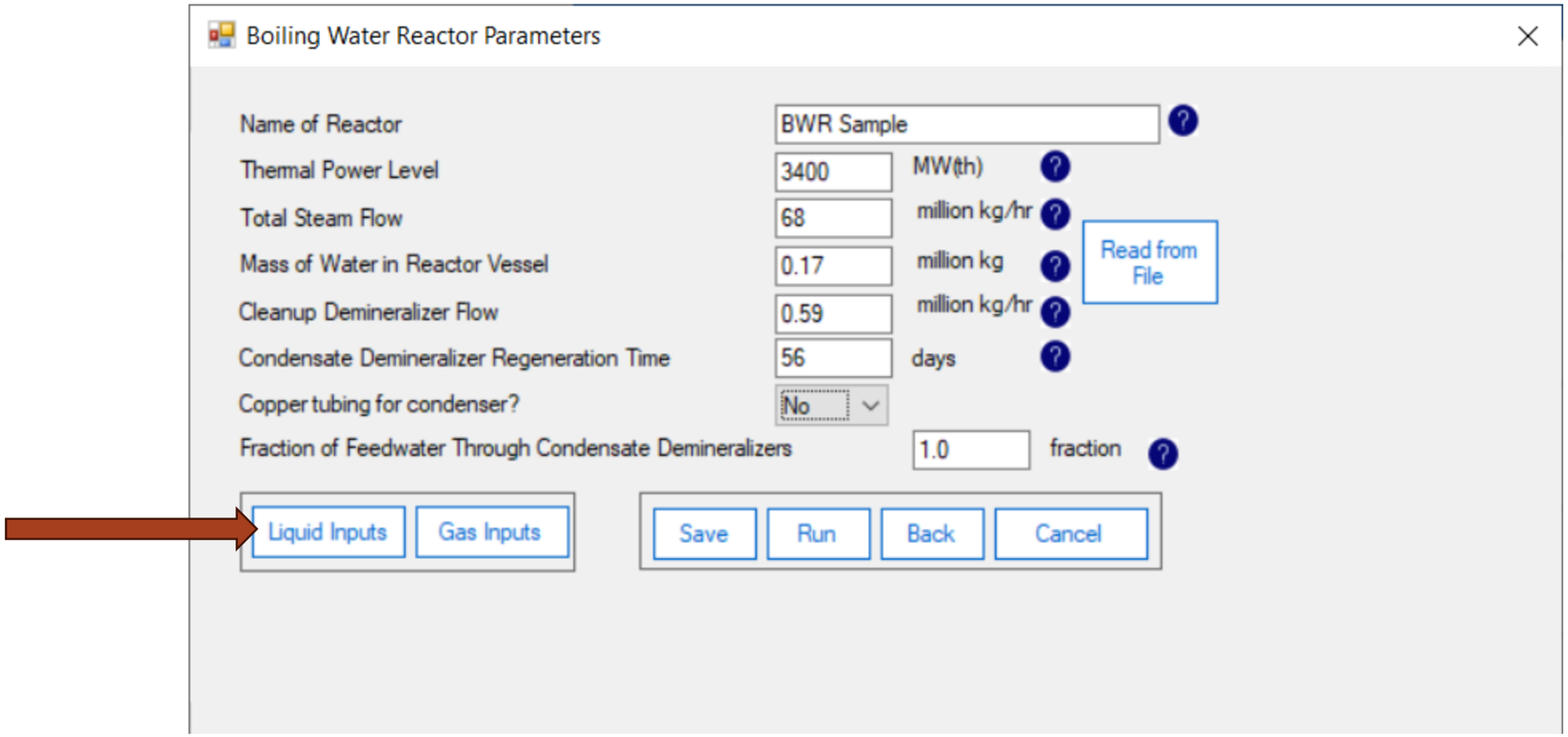
Example Use Cases: BWR



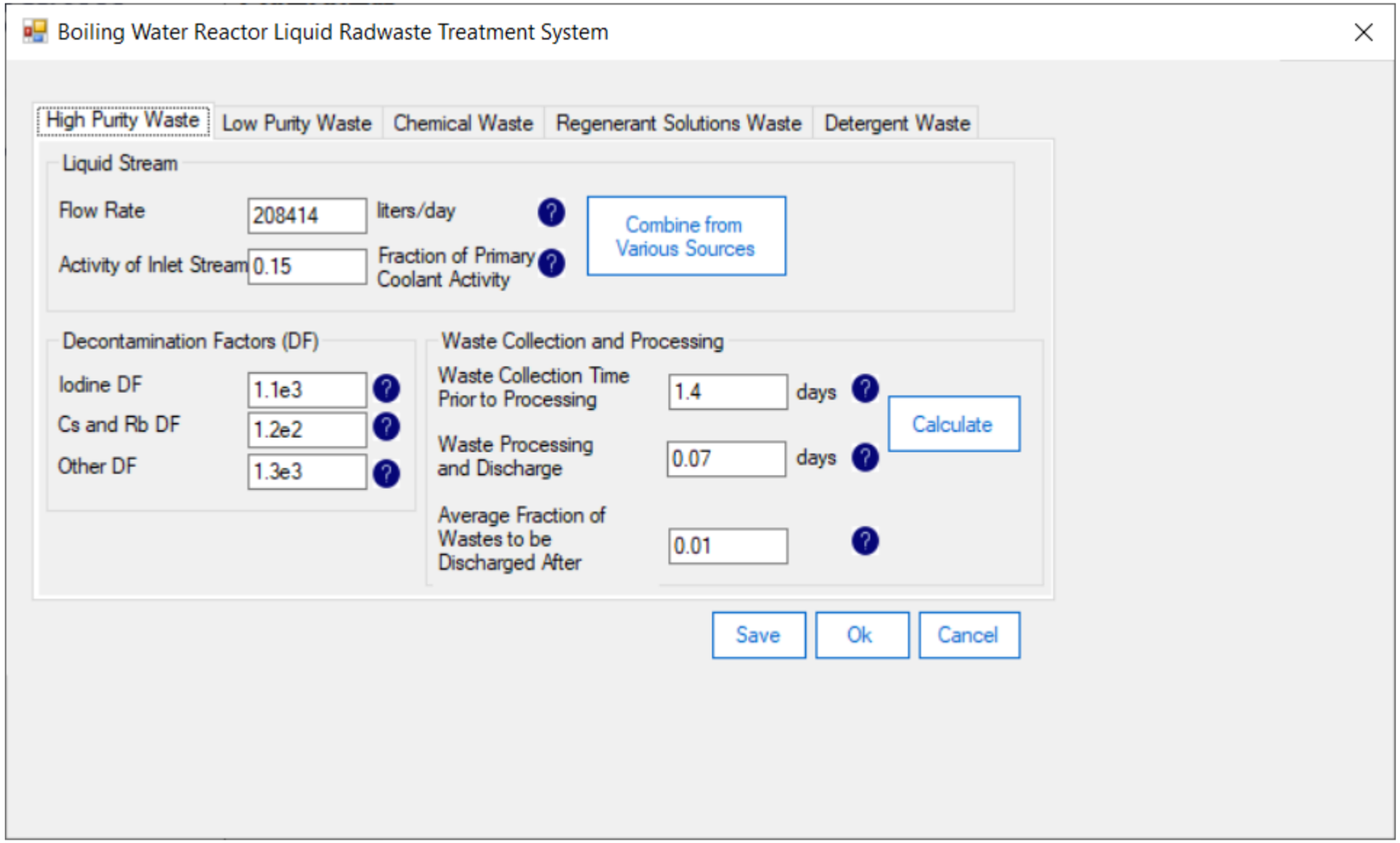
Example Use Cases: BWR



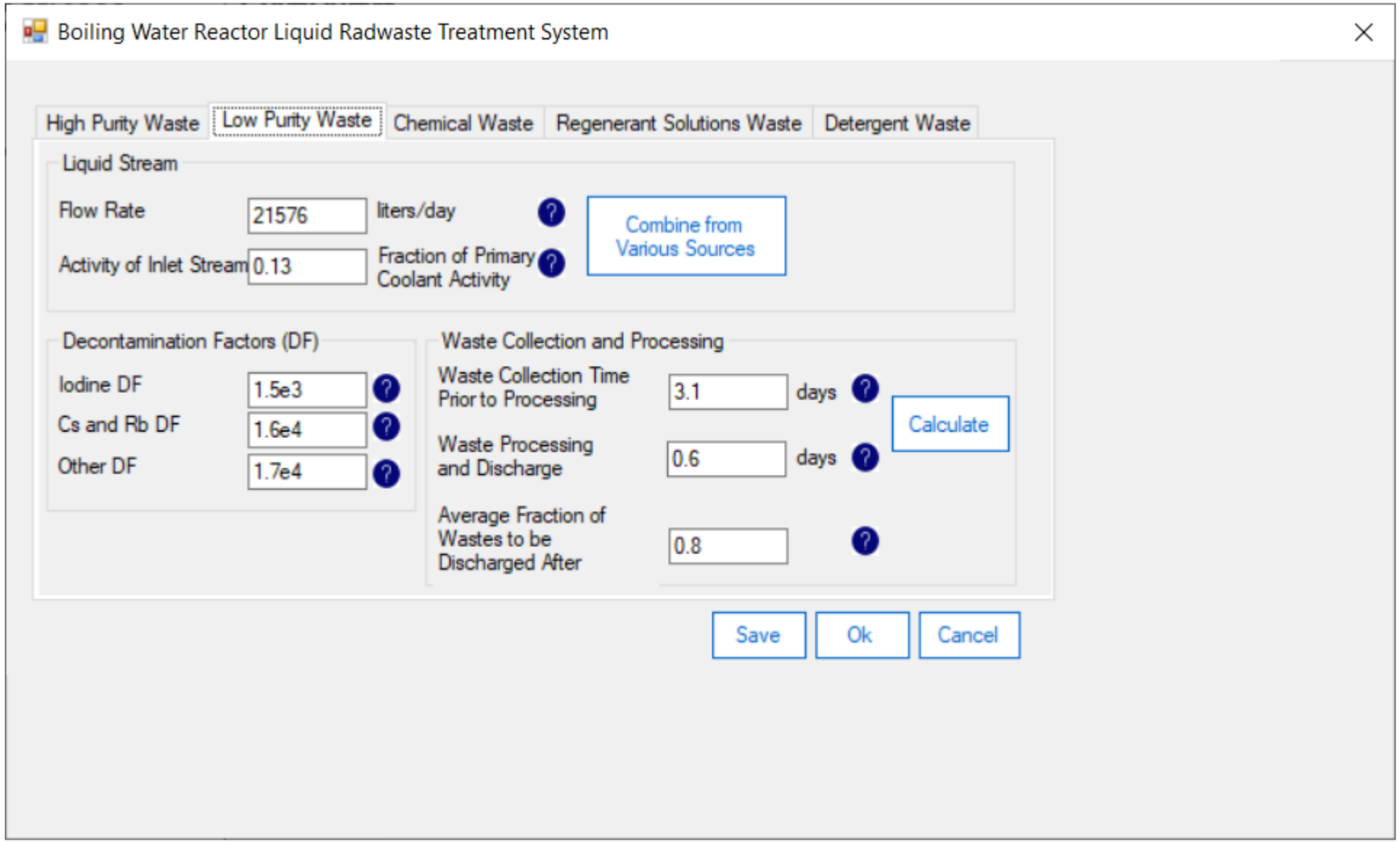
Example Use Cases: BWR



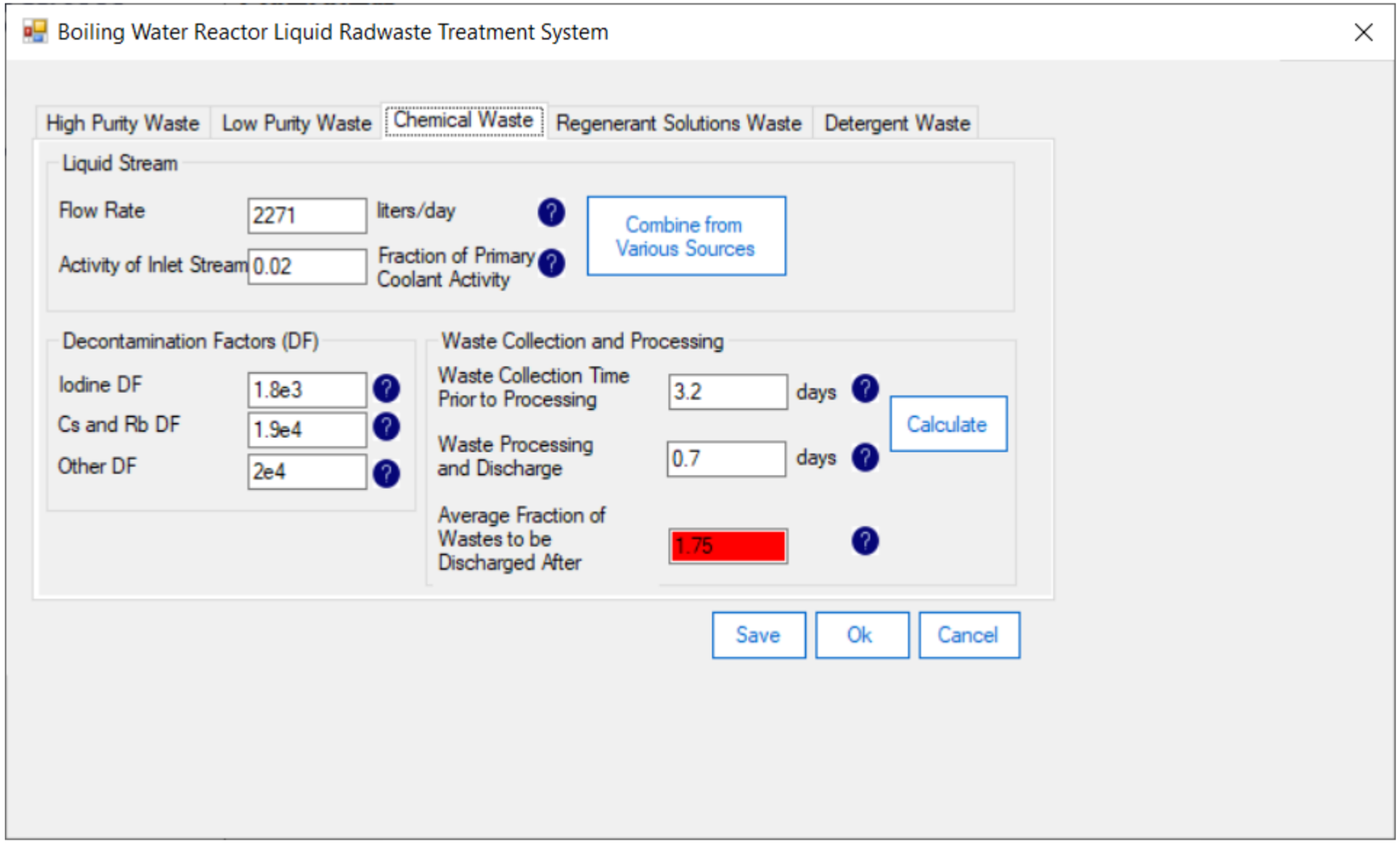
Example Use Cases: BWR



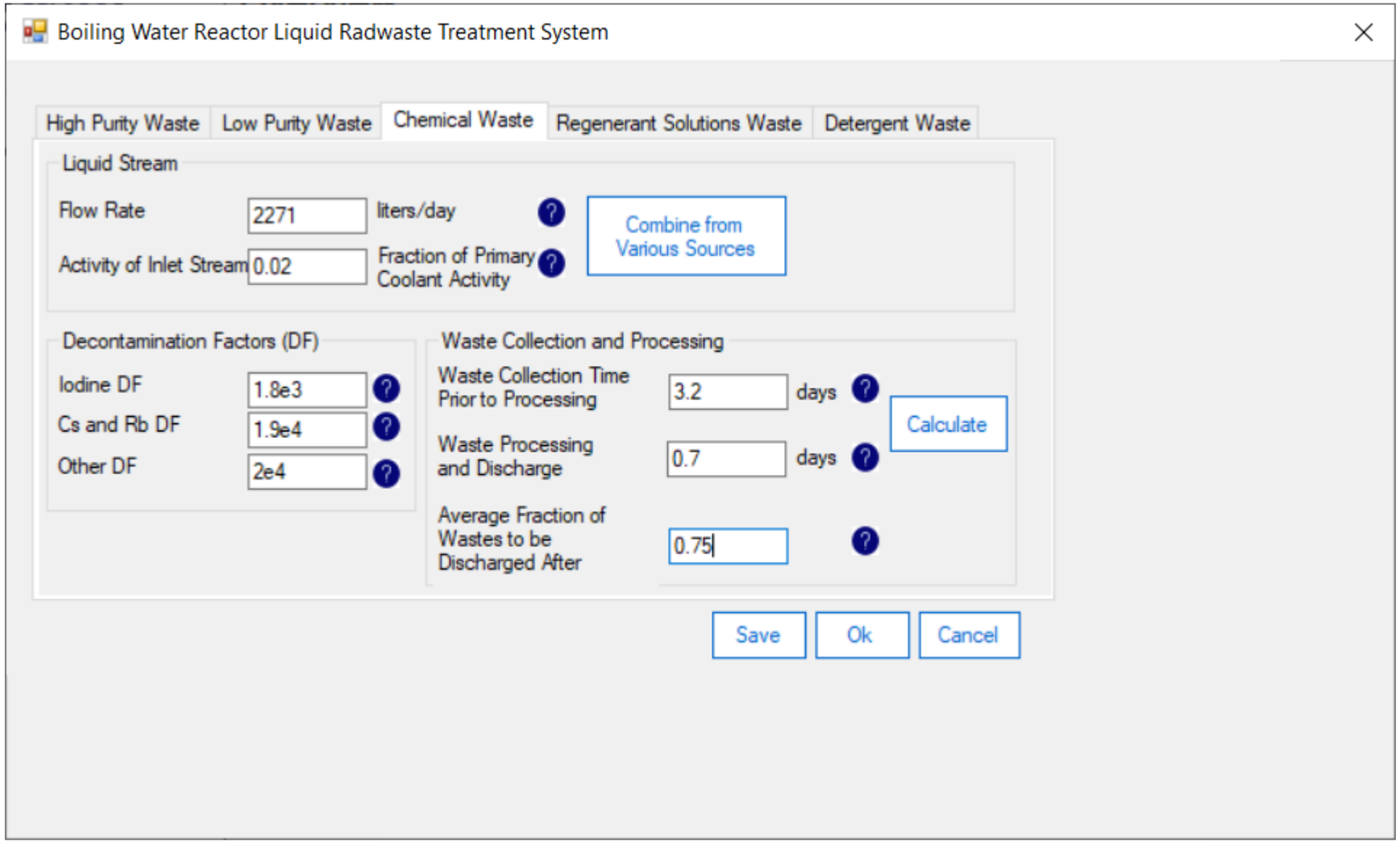
Example Use Cases: BWR



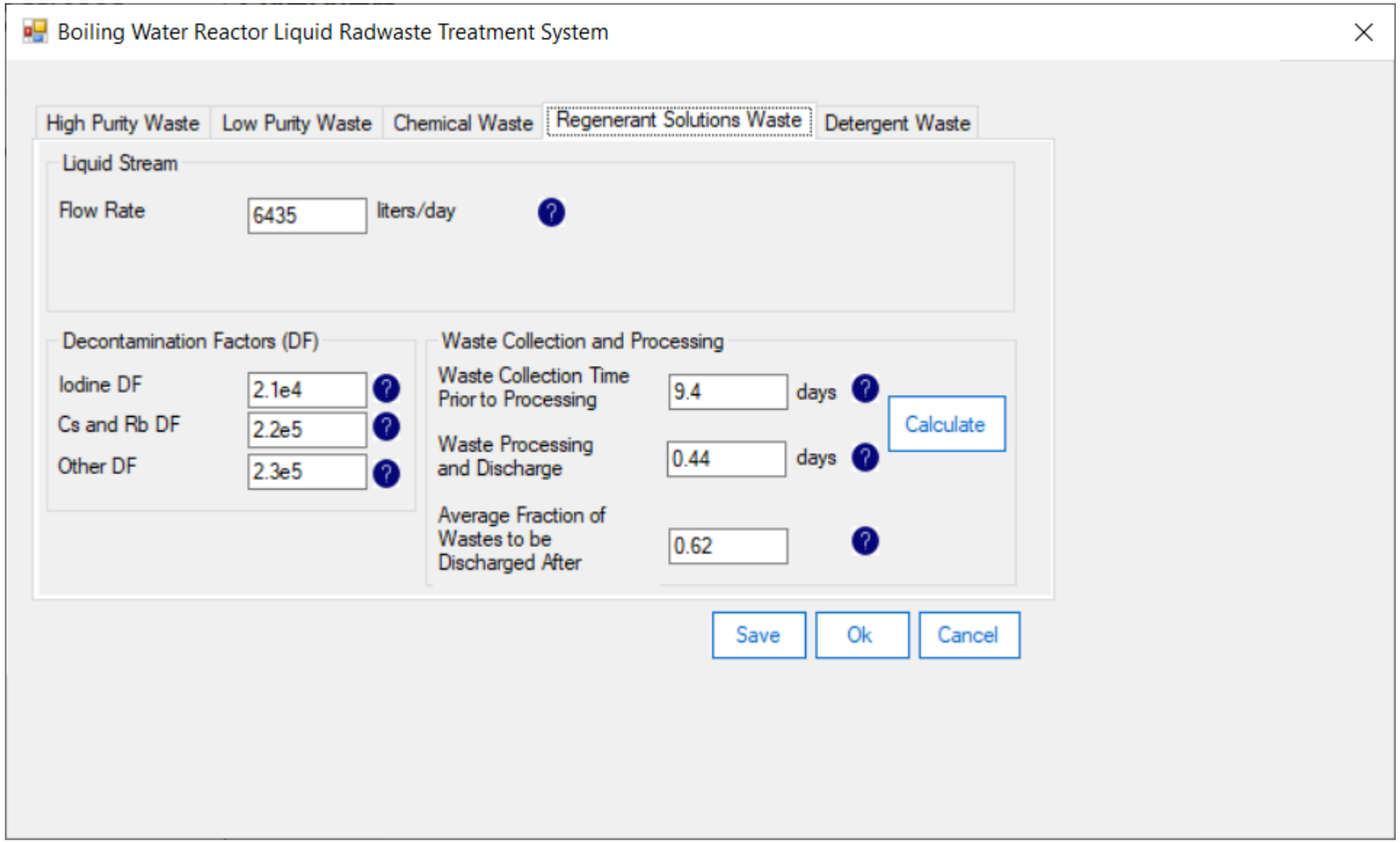
Example Use Cases: BWR



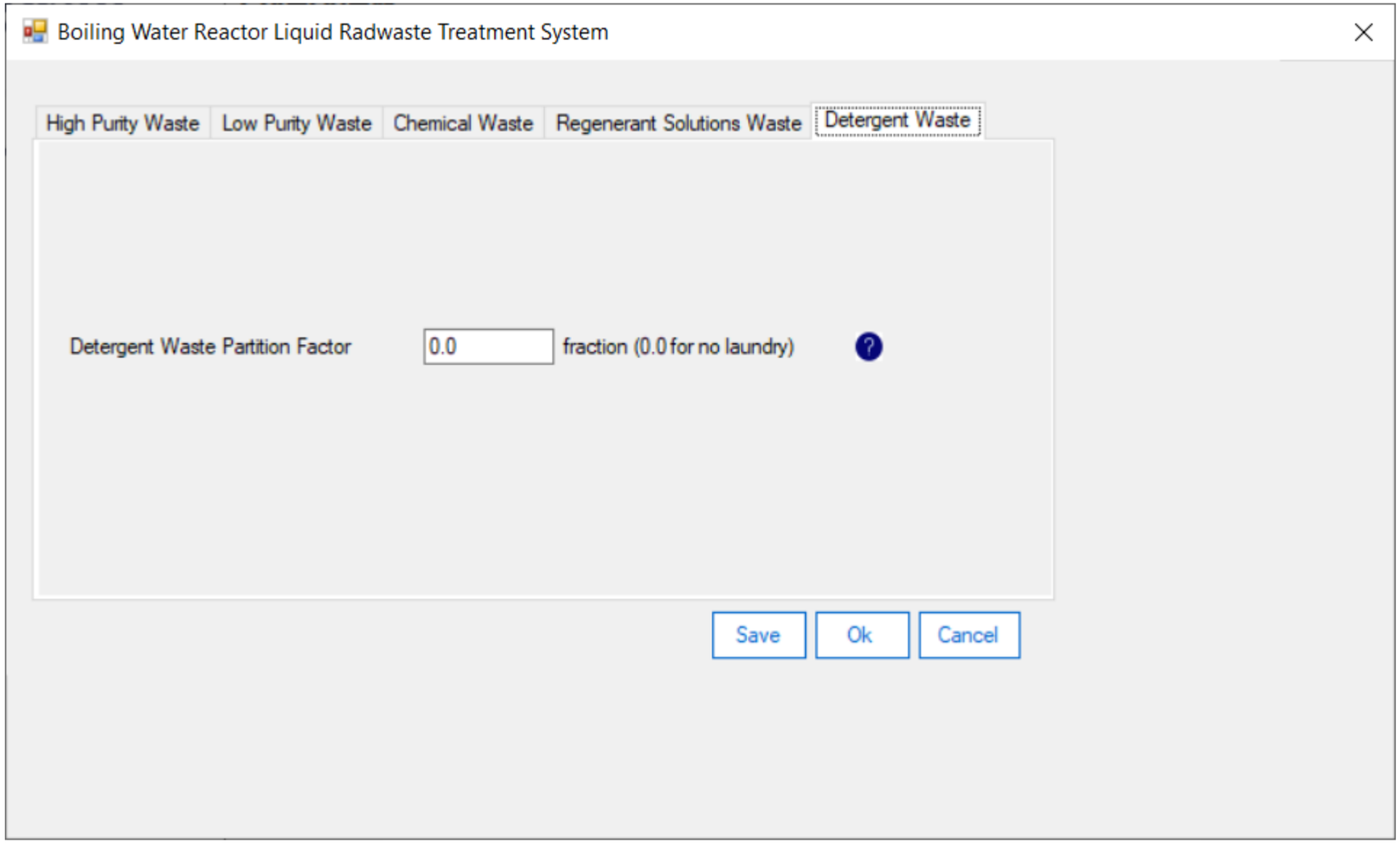
Example Use Cases: BWR



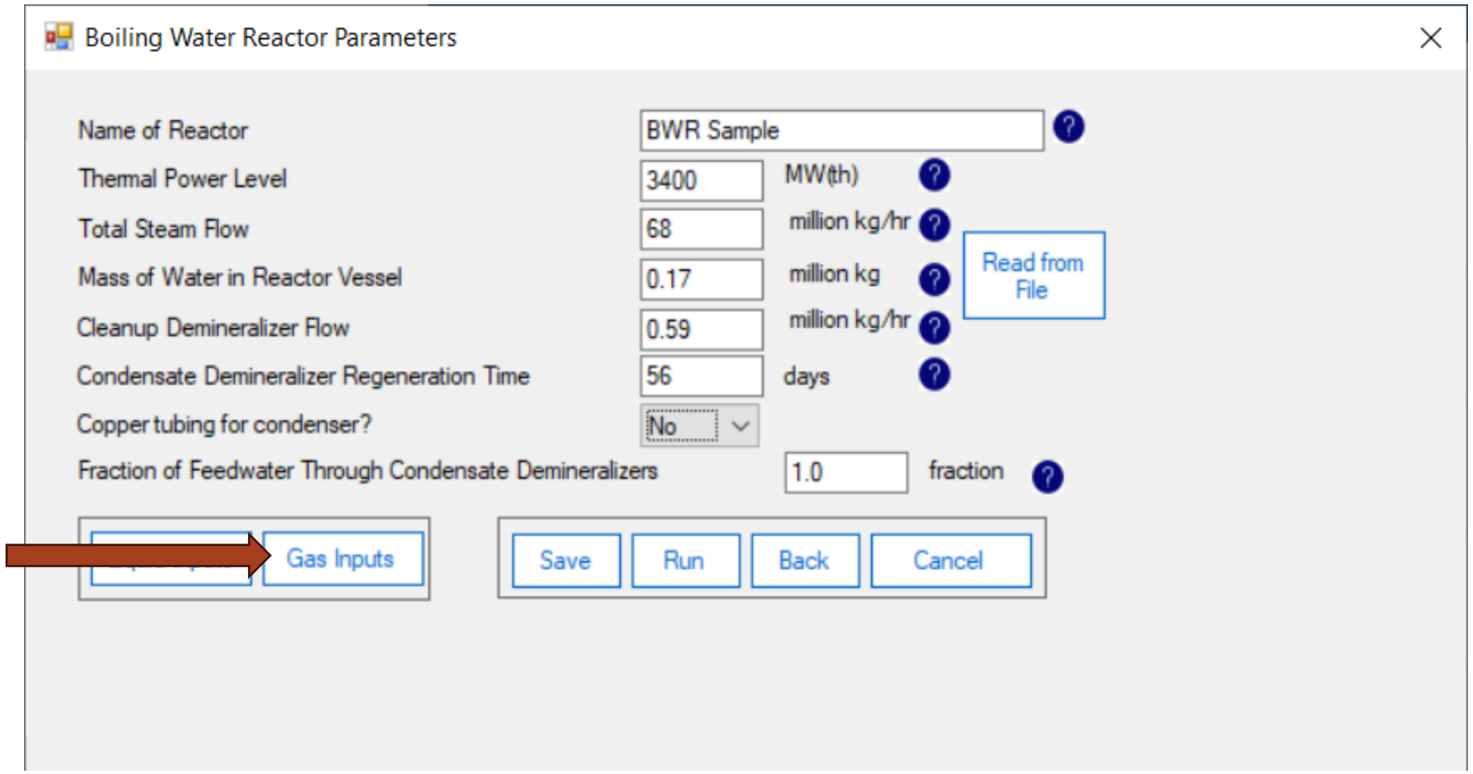
Example Use Cases: BWR



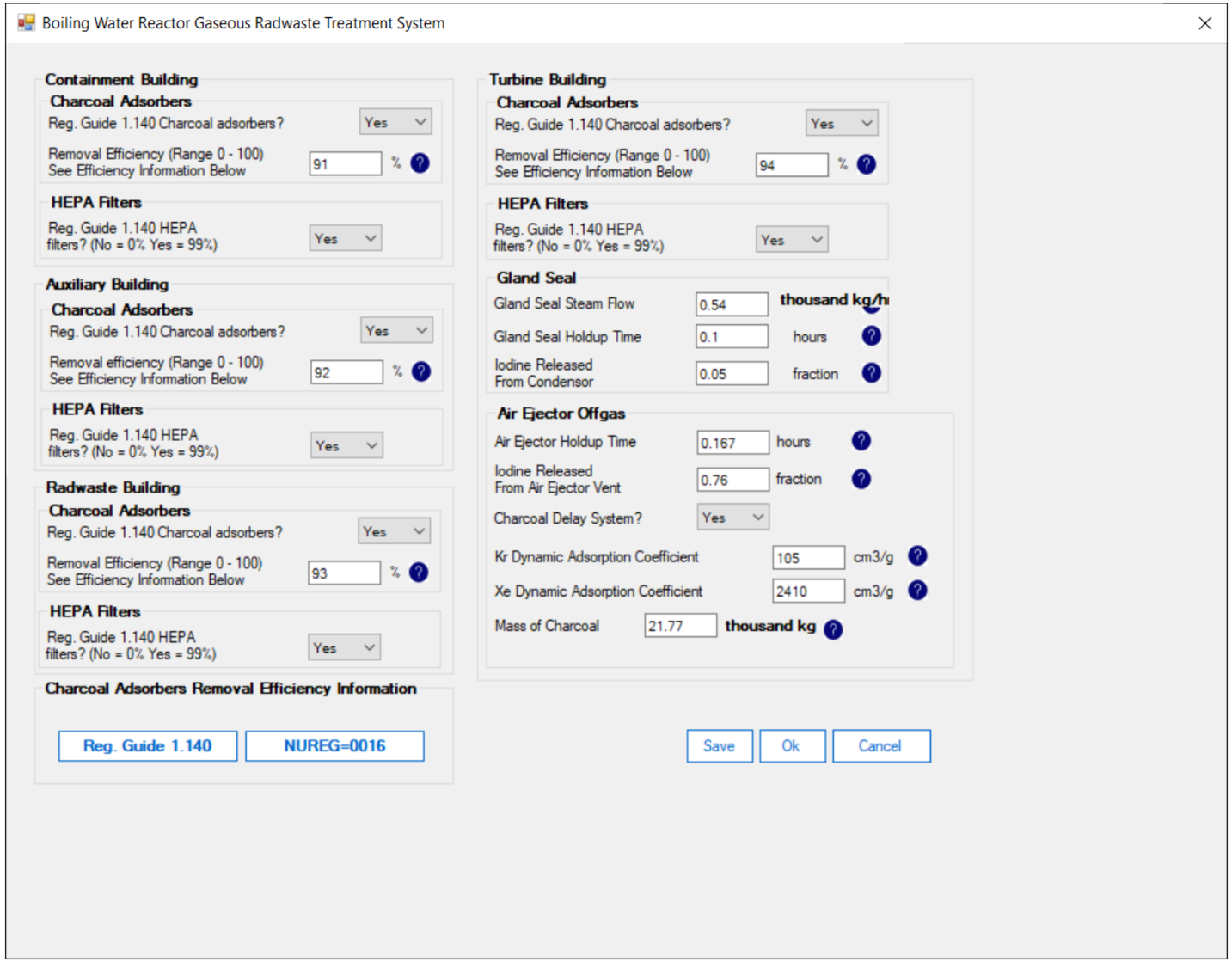
Example Use Cases: BWR



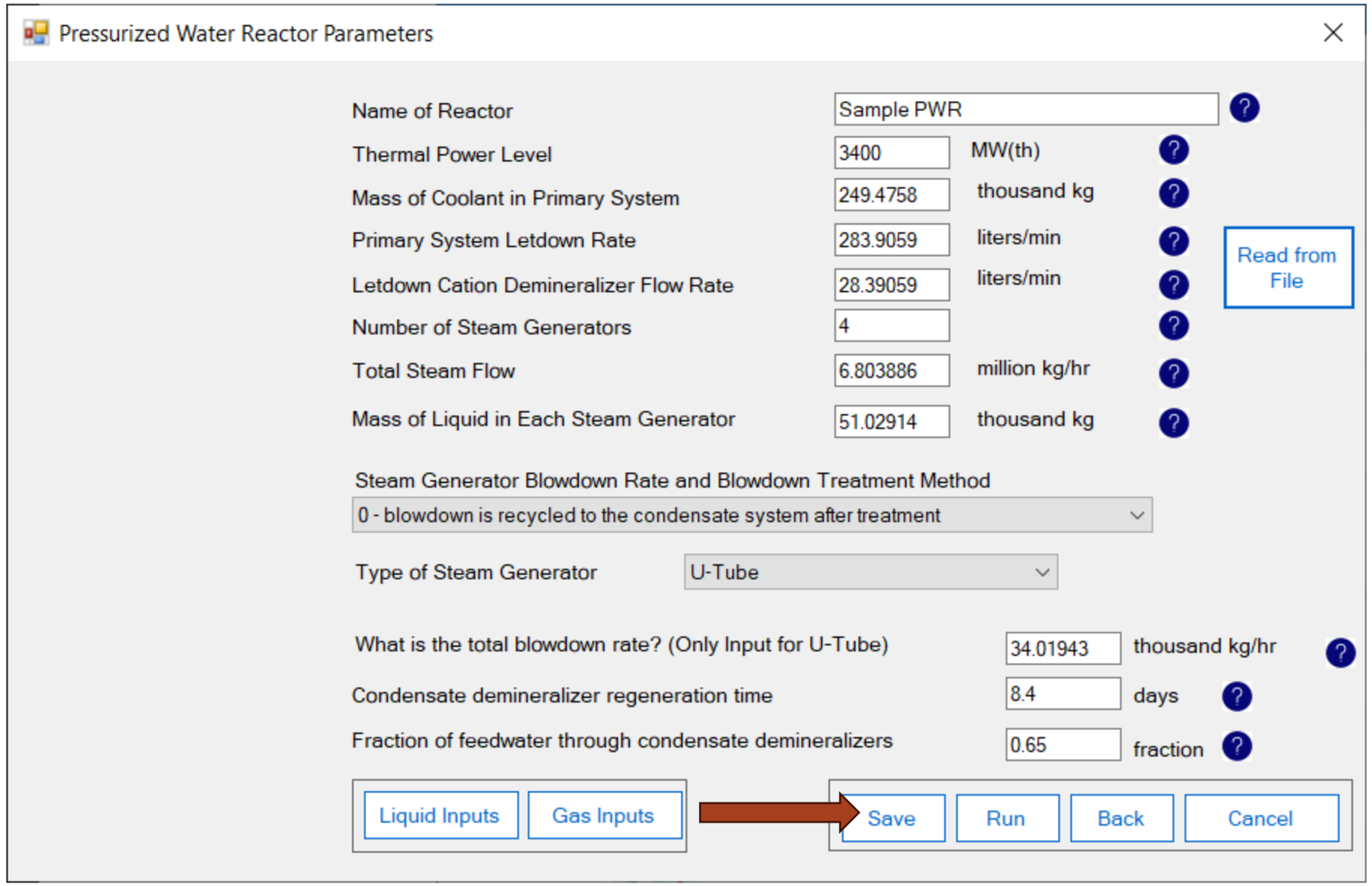
Example Use Cases: BWR



Example Use Cases: BWR



Example Use Cases: PWR



Example Use Cases: BWR - GE

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******** GALE version: GALE86 *********
******** ANS-18.1 version: 1999 *********
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BWR Sample	BWR
THERMAL POWER LEVEL (MEGAWATTS)	3.40000E+03
PLANT CAPACITY FACTOR	8.00000E-01
TOTAL STEAM FLOW (MILLION LBS/HR)	1.50000E+01
MASS OF WATER IN REACTOR VESSEL (MILLION LBS)	3.80000E-01
CLEAN-UP DEMINERALIZER FLOW (MILLION LBS/HR)	1.30000E-01
CONDENSATE DEMINERALIZER REGENERATION TIME (DAYS)	5.60000E+01
FRACTION FEED WATER THROUGH CONDENSATE DEMIN	8.30000E-01
REACTOR VESSEL HALOGEN CARRYOVER FACTOR	2.00000E-02

LIQUID WASTE INPUTS

STREAM	FLOW RATE (GAL/DAY)	FRACTION OF PCA	FRACTION DISCHARGED	COLLECTION TIME (DAYS)	DECAY TIME (DAYS)	DECONTAMINATION FACTORS I	CS	OTHERS
HIGH PURITY WASTE	2.86400E+04	1.50000E-01	1.00000E-02	1.40000E+00	7.00000E-02	1.10000E+03	1.20000E+02	1.30000E+03
LOW PURITY WASTE	5.70000E+03	1.30000E-01	8.00000E-01	3.10000E+00	6.00000E-01	1.50000E+03	1.60000E+04	1.70000E+04
CHEMICAL WASTE	6.00000E+02	2.00000E-02	1.75000E+00	3.20000E+00	7.00000E-01	1.80000E+03	1.90000E+04	2.00000E+04
REGENERANT SOLS	1.70000E+03		6.20000E-01	9.40000E+00	4.40000E-01	2.10000E+04	2.20000E+05	2.30000E+05

GASEOUS WASTE INPUTS

GLAND SEAL STEAM FLOW (THOUSAND LBS/HR)		1.20000E+00
GLAND SEAL HOLDUP TIME (HOURS)		1.00000E-01
AIR EJECTOR OFFGAS HOLDUP TIME (HOURS)		1.67000E-01
CONTAINMENT BLDG	IODINE RELEASE FRACTION	1.00000E+00
	PARTICULATE RELEASE FRACTION	1.00000E+00
TURBINE BLDG	IODINE RELEASE FRACTION	6.00000E-02
	PARTICULATE RELEASE FRACTION	1.00000E-02
GLAND SEAL VENT, IODINE PF		9.50000E-01
AIR EJECTOR OFFGAS IODINE PF		2.40000E-01
AUXILIARY BLDG	IODINE RELEASE FRACTION	8.00000E-02
	PARTICULATE RELEASE FRACTION	1.00000E-02
RADWASTE BLDG	IODINE RELEASE FRACTION	7.00000E-02
	PARTICULATE RELEASE FRACTION	1.00000E-02
THERE IS NO CHARCOAL DELAY SYSTEM		

BWR Sample

NUCLIDE	COOLANT CONC. (MICROCURIES/G)	GASEOUS RELEASE RATE (CURIES PER YEAR) CONTAINMENT BLDG.	TURBINE BLDG.	AUXILIARY BLDG.	RADWASTE BLDG.	GLAND SEAL	AIR EJECTOR	MECH VAC PUMP	TOTAL
I-131	2.20000E-03	1.30020E-02	1.11144E-02	2.03984E-03	9.24000E-04	1.70000E-03	1.40000E+00	1.34640E-01	1.56342E+00
I-133	1.50000E-02	8.86500E-02	7.57800E-02	1.39080E-02	6.30000E-03	3.10000E-03	9.80000E+00	7.35000E-01	1.07227E+01

H-3 RELEASED FROM TURBINE BLDG. VENTILATION SYSTEM	2.60000E+01	CI/YR
H-3 RELEASED FROM CONTAINMENT BLDG. VENTILATION SYSTEM	2.60000E+01	CI/YR
TOTAL H-3 RELEASED VIA GASEOUS PATHWAY	5.20000E+01	CI/YR
C-14 RELEASED VIA MAIN CONDENSER OFFGAS SYSTEM =	9.50000E+00	CI/YR

Example Use Cases: BWR - GE

BWR Sample

NUCLIDE	COOLANT CONC. (MICROCURIES/G)	GASEOUS RELEASE RATE (CURIES PER YEAR) CONTAINMENT BLDG.	TURBINE BLDG.	AUXILIARY BLDG.	RADWASTE BLDG.	GLAND SEAL	AIR EJECTOR	MECH VAC PUMP	TOTAL
AR-41	0.00000E+00	1.50000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	9.40000E+02	0.00000E+00	9.53712E+02
KR-83M	5.90000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.00000E+00	2.60000E+04	0.00000E+00	2.64607E+04
KR-85M	1.00000E-03	1.00000E+00	2.50000E+01	3.00000E+00	0.00000E+00	4.00000E+00	4.60000E+04	0.00000E+00	4.65179E+04
KR-85	4.00000E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.90000E+02	0.00000E+00	1.90896E+02
KR-87	3.30000E-03	0.00000E+00	6.10000E+01	2.00000E+00	0.00000E+00	1.20000E+01	1.40000E+05	0.00000E+00	1.43810E+05
KR-88	3.30000E-03	1.00000E+00	9.10000E+01	3.00000E+00	0.00000E+00	1.20000E+01	1.50000E+05	0.00000E+00	1.51215E+05
KR-89	2.10000E-02	0.00000E+00	5.80000E+02	2.00000E+00	2.90000E+01	2.20000E+01	1.10000E+05	0.00000E+00	1.13521E+05
XE-131M	3.30000E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.60000E+02	0.00000E+00	1.57425E+02
XE-133M	4.90000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.30000E+03	0.00000E+00	2.33349E+03
XE-133	1.40000E-03	2.70000E+01	1.50000E+02	8.30000E+01	2.20000E+02	5.00000E+00	6.70000E+04	1.30000E+03	6.85379E+04
XE-135M	4.40000E-03	1.50000E+01	4.00000E+02	4.50000E+01	5.30000E+02	1.30000E+01	1.30000E+05	0.00000E+00	1.35930E+05
XE-135	3.80000E-03	3.30000E+01	3.30000E+02	9.40000E+01	2.80000E+02	1.40000E+01	1.80000E+05	5.00000E+02	1.80338E+05
XE-137	2.60000E-02	4.50000E+01	1.00000E+03	1.35000E+02	8.30000E+01	3.30000E+01	2.00000E+05	0.00000E+00	2.02739E+05
XE-138	1.50000E-02	2.00000E+00	1.00000E+03	6.00000E+00	2.00000E+00	4.30000E+01	4.40000E+05	0.00000E+00	4.39881E+05
TOTAL NOBLE GASES									1.50000E+06

0.00000E+00 APPEARING IN THE TABLE INDICATES RELEASE IS LESS THAN 1.0 CI/YR FOR NOBLE GAS

BWR Sample

NUCLIDE	AIRBORNE PARTICULATE RELEASE RATE (CURIES PER YEAR) CONTAINMENT BLDG.	TURBINE BLDG.	AUXILIARY BLDG.	RADWASTE BLDG.	MECH VAC. PUMP	TOTAL
CR-51	2.00000E-04	9.00000E-06	9.00000E-06	7.00000E-06	1.00000E-06	2.30000E-04
MN-54	4.00000E-04	6.00000E-06	1.00000E-05	4.00000E-05	0.00000E+00	4.60000E-04
CO-58	1.00000E-04	1.00000E-05	2.00000E-06	2.00000E-06	0.00000E+00	1.10000E-04
FE-59	9.00000E-05	1.00000E-06	3.00000E-06	3.00000E-06	0.00000E+00	9.70000E-05
CO-60	1.00000E-03	1.00000E-05	4.00000E-05	7.00000E-05	5.60000E-07	1.10000E-03
ZN-65	1.00000E-03	6.00000E-05	4.00000E-05	3.00000E-06	3.40000E-07	1.10000E-03
SR-89	3.00000E-05	6.00000E-05	2.00000E-07	0.00000E+00	0.00000E+00	9.00000E-05
SR-90	3.00000E-06	2.00000E-07	7.00000E-08	0.00000E+00	0.00000E+00	3.30000E-06
NB-95	1.00000E-03	6.00000E-08	9.00000E-05	4.00000E-08	0.00000E+00	1.10000E-03
ZR-95	3.00000E-04	4.00000E-07	7.00000E-06	8.00000E-06	0.00000E+00	3.20000E-04
MO-99	6.00000E-03	2.00000E-05	6.00000E-04	3.00000E-08	0.00000E+00	6.60000E-03
RU-103	2.00000E-04	5.00000E-07	4.00000E-05	1.00000E-08	0.00000E+00	2.40000E-04
AG-110M	4.00000E-07	0.00000E+00	2.00000E-08	0.00000E+00	0.00000E+00	4.20000E-07
SB-124	2.00000E-05	1.00000E-06	3.00000E-07	7.00000E-07	0.00000E+00	2.20000E-05
CS-134	7.00000E-04	2.00000E-06	4.00000E-05	2.40000E-05	3.20000E-06	7.70000E-04
CS-136	1.00000E-04	1.00000E-06	4.00000E-06	0.00000E+00	1.90000E-06	1.10000E-04
CS-137	1.00000E-03	1.00000E-05	5.00000E-05	4.00000E-05	8.90000E-06	1.10000E-03
BA-140	2.00000E-03	1.00000E-04	2.00000E-04	4.00000E-08	1.10000E-05	2.30000E-03
CE-141	2.00000E-04	1.00000E-04	7.00000E-06	7.00000E-08	0.00000E+00	3.10000E-04

Example Use Cases: BWR - LE

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******** GALE version: GALE86 *********
******** ANS-18.1 version: 1999 *********


                        BWR Sample                                  BWR
                THERMAL POWER LEVEL  (MEGAWATTS)                  3.40000E+03
                PLANT CAPACITY FACTOR                              8.00000E-01
                TOTAL STEAM FLOW (MILLION LBS/HR)                  1.50000E+01
                MASS OF WATER IN REACTOR VESSEL (MILLION LBS)      3.80000E-01
                CLEAN-UP DEMINERALIZER FLOW (MILLION LBS/HR)       1.30000E-01
                CONDENSATE DEMINERALIZER REGENERATION TIME (DAYS)  5.60000E+01
                FISSION PRODUCT CARRY-OVER FRACTION                1.00000E-03
                HALOGEN CARRY-OVER FRACTION                        2.00000E-02
                FRACTION FEED WATER THROUGH CONDENSATE DEMIN       8.30000E-01

LIQUID WASTE INPUTS
                                 FRACTION     FRACTION    COLLECTION     DECAY
      STREAM        FLOW RATE    OF PCA     DISCHARGED      TIME         TIME          DECONTAMINATION FACTORS
                    (GAL/DAY)                               (DAYS)       (DAYS)        I            CS          OTHERS
-------------------------------------------------------------------------------------------------------------------------------
HIGH PURITY WASTE  2.86400E+04  1.50000E-01  1.00000E-02  1.40000E+00  7.00000E-02  1.10000E+03  1.20000E+02  1.30000E+03
LOW PURITY WASTE   5.70000E+03  1.30000E-01  8.00000E-01  3.10000E+00  6.00000E-01  1.50000E+03  1.60000E+04  1.70000E+04
CHEMICAL  WASTE    6.00000E+02  2.00000E-02  1.75000E+00  3.20000E+00  7.00000E-01  1.80000E+03  1.90000E+04  2.00000E+04
REGENERANT SOLS    1.70000E+03               6.20000E-01  9.40000E+00  4.40000E-01  2.10000E+04  2.20000E+05  2.30000E+05
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GASEOUS WASTE INPUTS
                GLAND SEAL STEAM FLOW (THOUSAND LBS/HR)            1.20000E+00
                GLAND SEAL HOLDUP TIME (HOURS)                     1.00000E-01
                AIR EJECTOR OFFGAS HOLDUP TIME (HOURS)             1.67000E-01
                CONTAINMENT BLDG IODINE RELEASE FRACTION           1.00000E+00
                                 PARTICULATE RELEASE FRACTION      1.00000E+00
                TURBINE BLDG     IODINE RELEASE FRACTION           6.00000E-02
                                 PARTICULATE RELEASE FRACTION      1.00000E-02
                GLAND SEAL VENT, IODINE PF                         9.50000E-01
                AIR EJECTOR OFFGAS IODINE PF                       2.40000E-01
                AUXILIARY BLDG   IODINE RELEASE FRACTION           8.00000E-02
                                 PARTICULATE RELEASE FRACTION      1.00000E-02
                RADWASTE BLDG    IODINE RELEASE FRACTION           7.00000E-02
                                 PARTICULATE RELEASE FRACTION      1.00000E-02
                THERE IS NO CHARCOAL DELAY SYSTEM
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Example Use Cases: BWR - LE

LIQUID EFFLUENTS

NUCLIDE	HALF-LIFE (DAYS)	CONCENTRATION IN PRIMARY COOLANT (MICRO-CI/ML)	ANNUAL RELEASES TO DISCHARGE CANAL: HIGH PURITY (CURIES)	LOW PURITY (CURIES)	CHEMICAL (CURIES)	TOTAL LWS (CURIES)	ADJUSTED TOTAL (CI/YR)	DETERGENT WASTES (CI/YR)	TOTAL (CI/YR)
CORROSION AND ACTIVATION PRODUCTS									
NA 24	6.25000E-01	2.00000E-03	4.00000E-05	1.00000E-05	0.00000E+00	6.00000E-05	8.40000E-04	0.00000E+00	8.40000E-04
P 32	1.42998E+01	4.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.00000E-05	1.80000E-04	2.30000E-04
CR 51	2.77997E+01	3.00000E-03	1.30000E-04	1.40000E-04	1.00000E-05	2.80000E-04	4.05000E-03	4.70000E-03	8.70000E-03
MN 54	3.02996E+02	4.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.00000E-05	3.80000E-03	3.80000E-03
MN 56	1.07500E-01	2.50000E-02	8.00000E-05	0.00000E+00	0.00000E+00	8.00000E-05	1.19000E-03	0.00000E+00	1.20000E-03
FE 55	9.49624E+02	1.00000E-03	5.00000E-05	5.00000E-05	0.00000E+00	1.00000E-04	1.41000E-03	7.20000E-03	8.60000E-03
FE 59	4.49994E+01	3.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.00000E-05	2.20000E-03	2.20000E-03
CO 58	7.12991E+01	1.00000E-04	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	1.40000E-04	7.90000E-03	8.00000E-03
CO 60	1.92116E+03	2.00000E-04	1.00000E-05	1.00000E-05	0.00000E+00	2.00000E-05	2.80000E-04	1.40000E-02	1.40000E-02
NI 63	3.36021E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.70000E-03	1.70000E-03
NI 65	1.06667E-01	3.00000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05
CU 64	5.33333E-01	3.00000E-03	6.00000E-05	2.00000E-05	0.00000E+00	7.00000E-05	1.08000E-03	0.00000E+00	1.10000E-03
ZN 65	2.44997E+02	1.00000E-04	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	1.40000E-04	0.00000E+00	1.40000E-04
ZN 69M	5.75000E-01	2.00000E-03	4.00000E-05	1.00000E-05	0.00000E+00	5.00000E-05	7.70000E-04	0.00000E+00	7.70000E-04
W187	9.95833E-01	3.00000E-04	1.00000E-05	0.00000E+00	0.00000E+00	1.00000E-05	1.80000E-04	0.00000E+00	1.80000E-04
NP239	2.34997E+00	8.00000E-03	2.90000E-04	2.10000E-04	1.00000E-05	5.10000E-04	7.46000E-03	0.00000E+00	7.50000E-03
FISSION PRODUCTS									
BR 83	1.00417E-01	6.00000E-03	2.00000E-05	0.00000E+00	0.00000E+00	2.00000E-05	3.40000E-04	0.00000E+00	3.40000E-04
BR 84	2.20841E-02	7.00000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05
SR 89	5.19994E+01	1.00000E-04	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	1.40000E-04	9.00000E-05	2.30000E-04
SR 90	1.02632E+04	1.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	1.00000E-05	2.00000E-05
SR 91	4.02917E-01	4.00000E-03	6.00000E-05	1.00000E-05	0.00000E+00	7.00000E-05	1.09000E-03	0.00000E+00	1.10000E-03
Y 91	5.87993E+01	4.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	9.00000E-05	8.00000E-05	1.70000E-04
SR 92	1.12917E-01	1.00000E-02	3.00000E-05	0.00000E+00	0.00000E+00	4.00000E-05	5.10000E-04	0.00000E+00	5.10000E-04
Y 92	1.47083E-01	6.00000E-03	8.00000E-05	1.00000E-05	0.00000E+00	9.00000E-05	1.25000E-03	0.00000E+00	1.20000E-03
Y 93	4.25000E-01	4.00000E-03	6.00000E-05	1.00000E-05	0.00000E+00	8.00000E-05	1.15000E-03	0.00000E+00	1.10000E-03
ZR 95	6.49992E+01	1.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	1.10000E-03	1.10000E-03
NB 95	3.49996E+01	1.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	1.90000E-03	1.90000E-03
NB 98	3.54179E-02	4.00000E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.00000E-05	0.00000E+00	3.00000E-05
MO 99	2.79167E+00	2.00000E-03	8.00000E-05	6.00000E-05	0.00000E+00	1.40000E-04	1.98000E-03	6.00000E-05	2.00000E-03
TC 99M	2.50000E-01	2.00000E-03	7.00000E-05	6.00000E-05	0.00000E+00	1.30000E-04	1.92000E-03	0.00000E+00	1.90000E-03
RU103	3.95995E+01	2.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.00000E-05	2.90000E-04	3.20000E-04
TC104	1.25004E-02	8.00000E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05
RU105	1.85000E-01	2.00000E-03	1.00000E-05	0.00000E+00	0.00000E+00	1.00000E-05	2.10000E-04	0.00000E+00	2.10000E-04
RU106	3.66995E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.90000E-03	8.90000E-03
AG110M	2.52997E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.20000E-03	1.20000E-03
TE129M	3.39996E+01	4.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.00000E-05	0.00000E+00	5.00000E-05
TE131M	1.25000E+00	1.00000E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.00000E-05	0.00000E+00	7.00000E-05
I131	8.04990E+00	2.20000E-03	1.10000E-04	1.01000E-03	9.20000E-04	2.03000E-03	2.96900E-02	1.60000E-03	3.10000E-02
TE132	3.25000E+00	1.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.00000E-05	0.00000E+00	1.00000E-05
I132	9.58333E-02	2.20000E-02	7.00000E-05	1.00000E-05	0.00000E+00	8.00000E-05	1.15000E-03	0.00000E+00	1.10000E-03
I133	8.75000E-01	1.50000E-02	4.60000E-04	1.90000E-03	5.00000E-05	2.41000E-03	3.51900E-02	0.00000E+00	3.50000E-02
I134	3.66679E-02	4.30000E-02	2.00000E-05	0.00000E+00	0.00000E+00	2.00000E-05	3.40000E-04	0.00000E+00	3.40000E-04
CS134	7.48742E+02	3.00000E-05	1.00000E-05	0.00000E+00	0.00000E+00	2.00000E-05	2.40000E-04	1.10000E-02	1.10000E-02
I135	2.79167E-01	2.20000E-02	2.80000E-04	3.50000E-04	1.00000E-05	6.40000E-04	9.32000E-03	0.00000E+00	9.30000E-03
CS136	1.29998E+01	2.00000E-05	1.00000E-05	0.00000E+00	0.00000E+00	1.00000E-05	1.50000E-04	3.70000E-04	5.20000E-04
CS137	1.09572E+04	8.00000E-05	4.00000E-05	0.00000E+00	0.00000E+00	4.00000E-05	6.40000E-04	1.60000E-02	1.70000E-02
CS138	2.23619E-02	1.00000E-02	1.00000E-05	0.00000E+00	0.00000E+00	1.00000E-05	1.90000E-04	0.00000E+00	1.90000E-04
BA139	5.75714E-02	1.00000E-02	1.00000E-05	0.00000E+00	0.00000E+00	1.00000E-05	1.70000E-04	0.00000E+00	1.70000E-04
BA140	1.27998E+01	4.00000E-04	2.00000E-05	2.00000E-05	0.00000E+00	4.00000E-05	5.20000E-04	9.10000E-04	1.40000E-03
CE141	3.23996E+01	3.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.00000E-05	2.30000E-04	2.80000E-04
LA142	6.38911E-02	5.00000E-03	1.00000E-05	0.00000E+00	0.00000E+00	1.00000E-05	1.20000E-04	0.00000E+00	1.20000E-04
CE143	1.37500E+00	3.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.00000E-05	0.00000E+00	2.00000E-05
PR143	1.36998E+01	4.00000E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.00000E-05	0.00000E+00	5.00000E-05
CE144	2.83996E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.90000E-03	3.90000E-03
ALL OTHERS		1.14010E-01	1.50000E-04	4.00000E-05	0.00000E+00	2.00000E-04	2.90000E-03	0.00000E+00	2.90000E-03
TOTAL (EXCEPT TRITIUM)		4.16290E-01	2.39000E-03	3.97000E-03	1.00000E-03	7.35000E-03	1.07350E-01	8.93300E-02	2.00000E-01
TRITIUM RELEASE		5.10000E+01	CURIES PER YEAR						

NOTE: 0.00000E+00 INDICATES THAT THE VALUE IS LESS THAN 1.00000E-5.

Thank you

Example Use Cases: Extra Source Term Screens