Code Modernization and Consolidation

Pacific Northwest NATIONAL LABORATORY
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Fall 2020 RAMP USERS GROUP VIRTUAL MEETING

October 30, 2020

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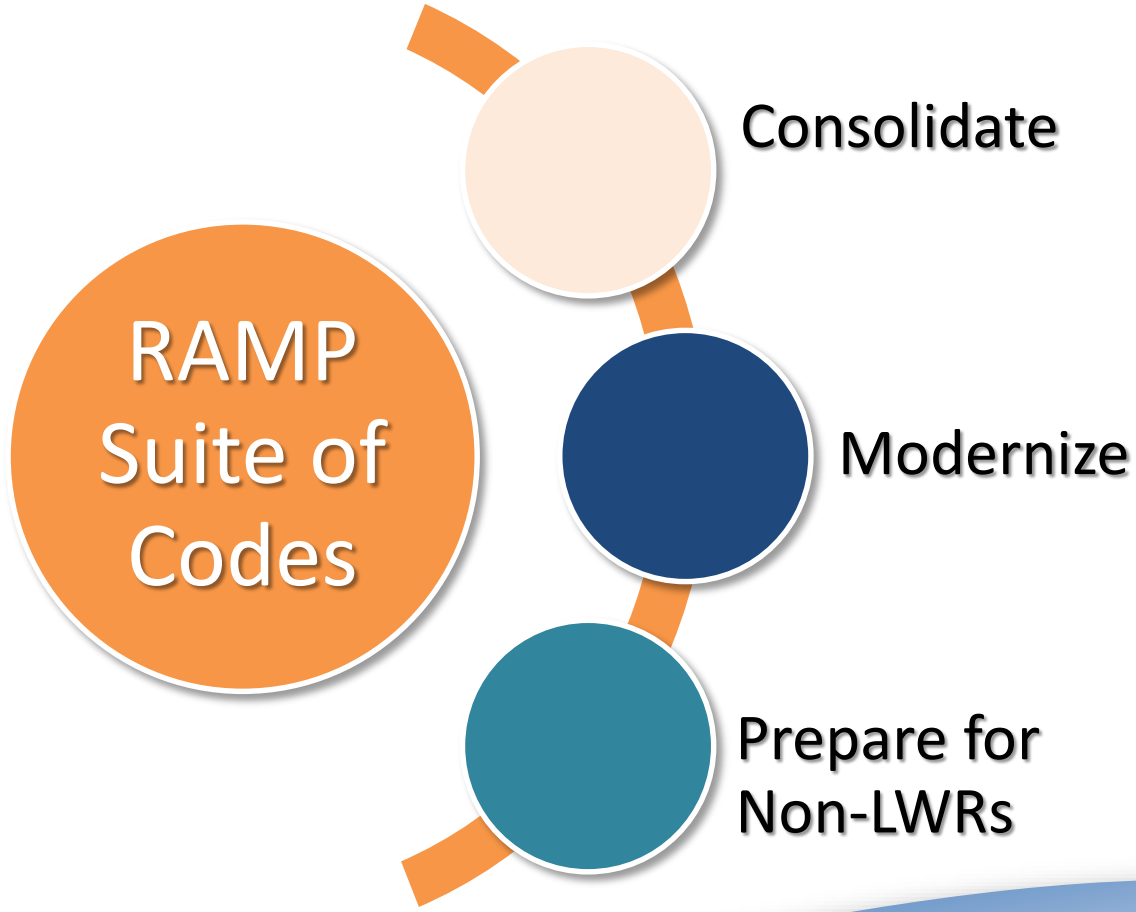
Pacific Northwest National Laboratory

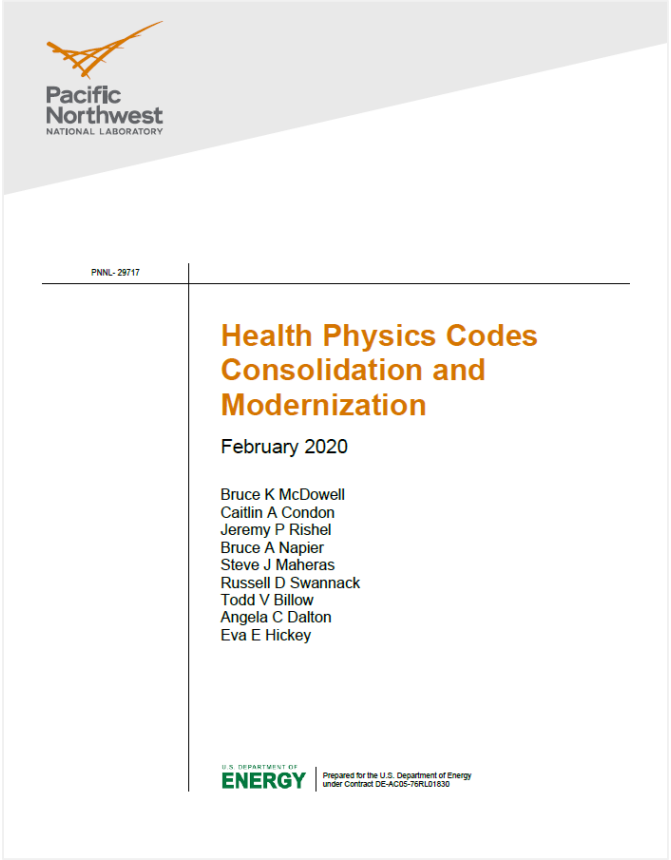
PNNL-SA-157363

High Level Scope



Options Paper for RAMP Code Modernization and Consolidations

- 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 existing suite of single-purpose radiation protection and dose assessment computer codes into 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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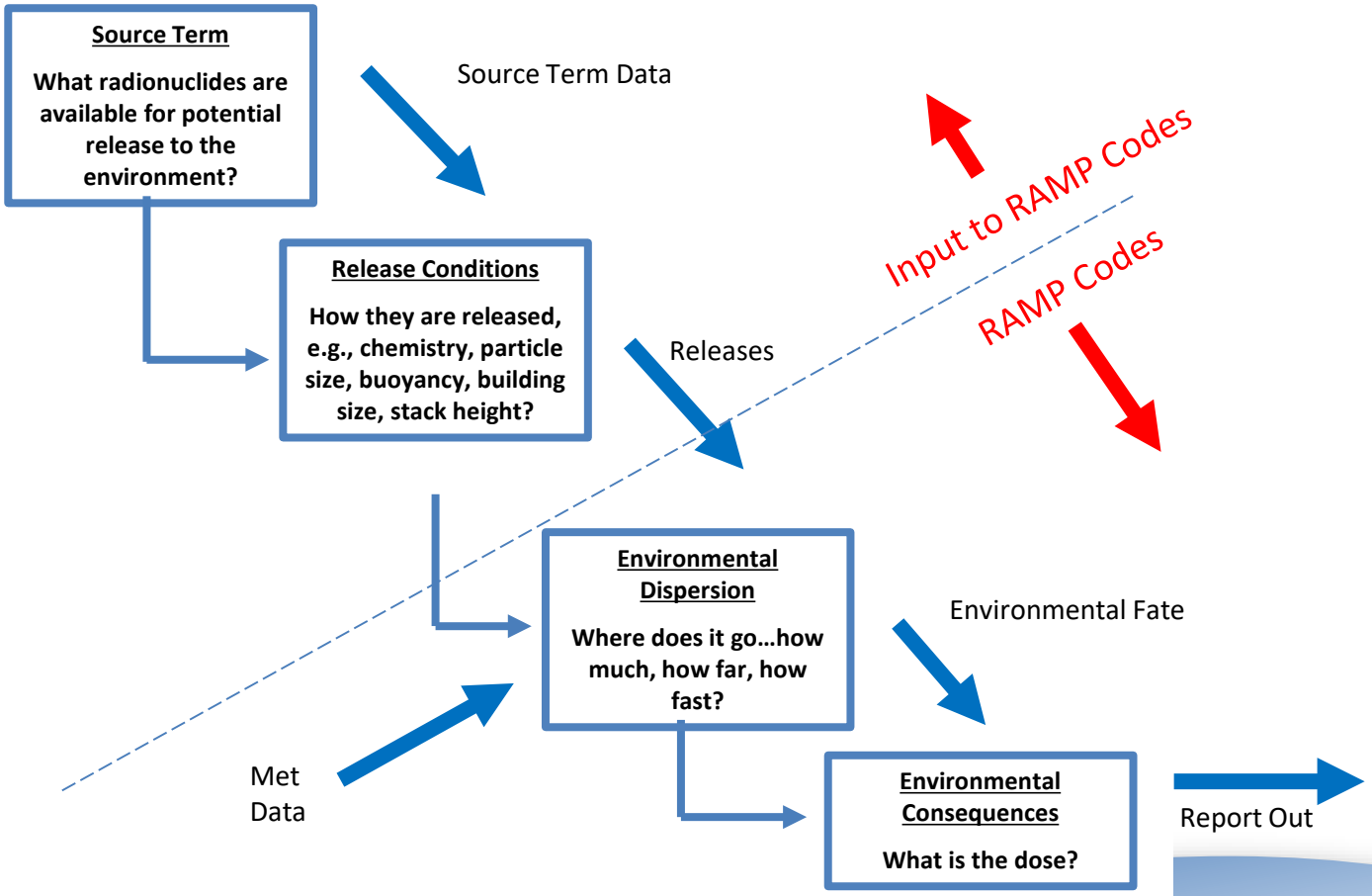
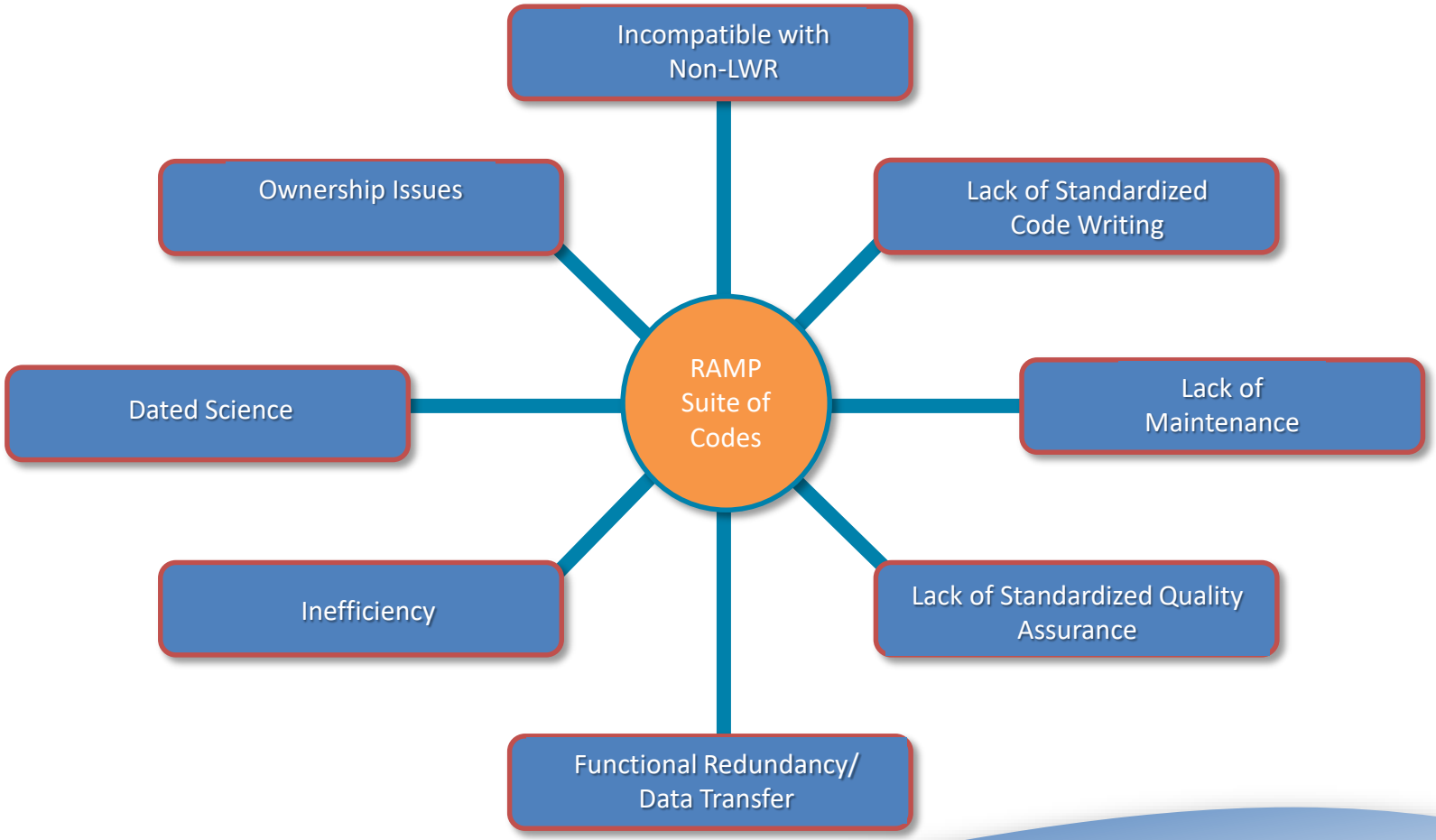
Code Functions and Data Flow

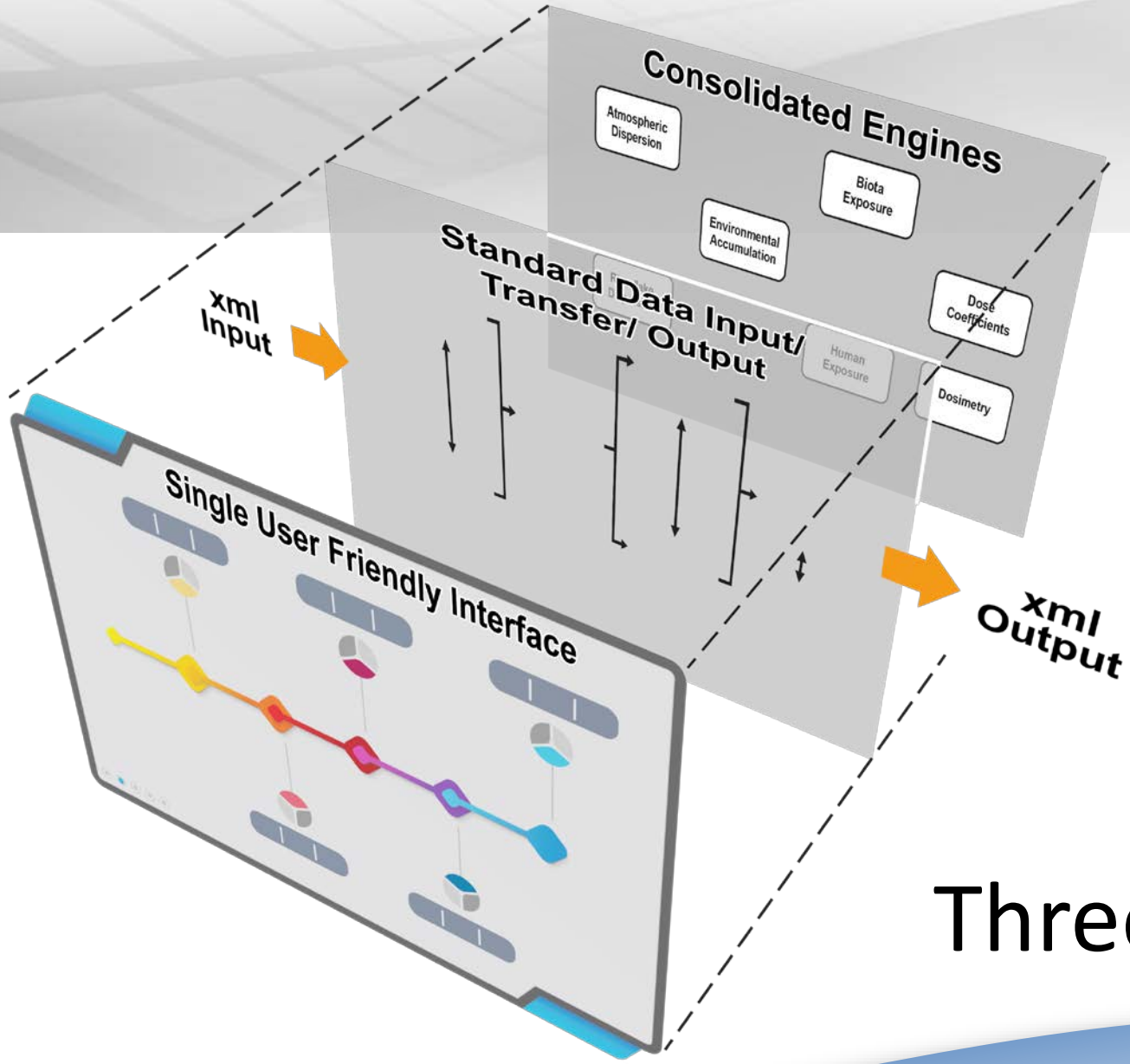


What are the Issues Facing the RAMP Suite of Codes?



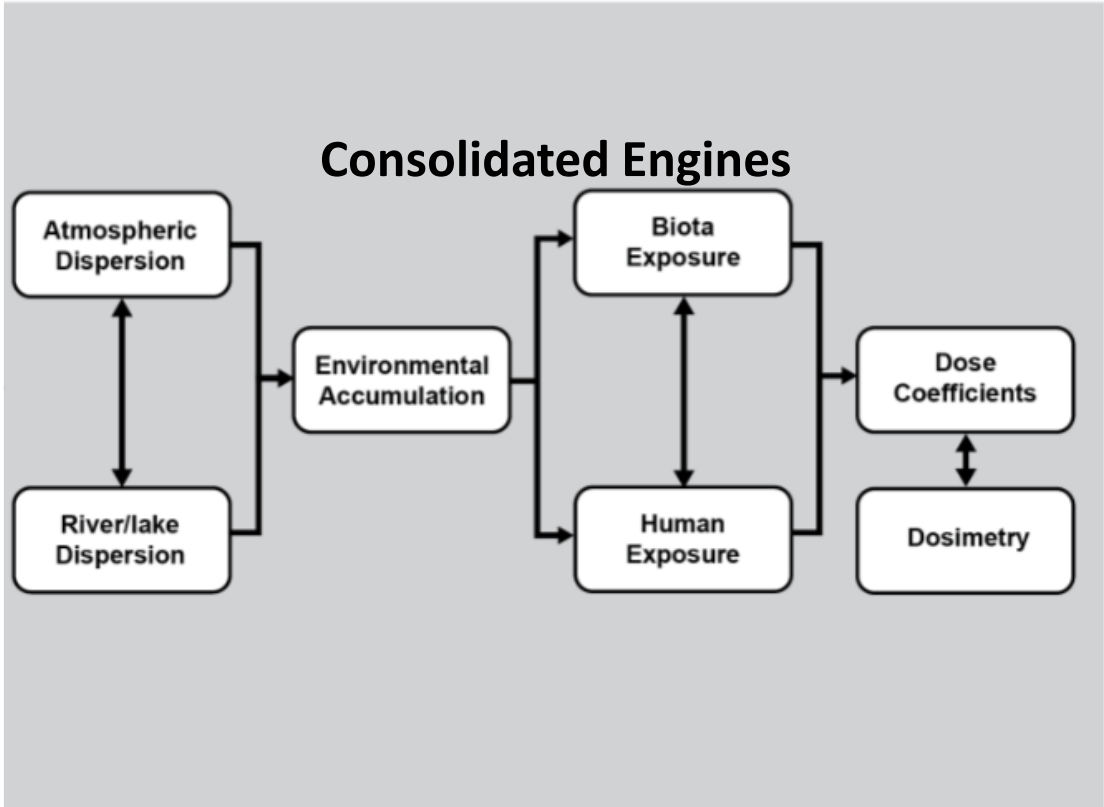
What are the Goals of a Code Modernization and Consolidation Effort?

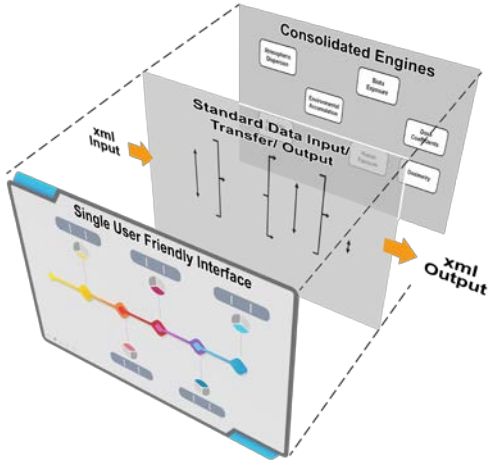
- Simplify, consolidate and reduce redundant capabilities
- Improve flexibility
  - Allow easy transfer of data into and out of the code and between functional “engines” in the code
  - Maintain a user interface separate from the data transfer and functional capabilities of the codes



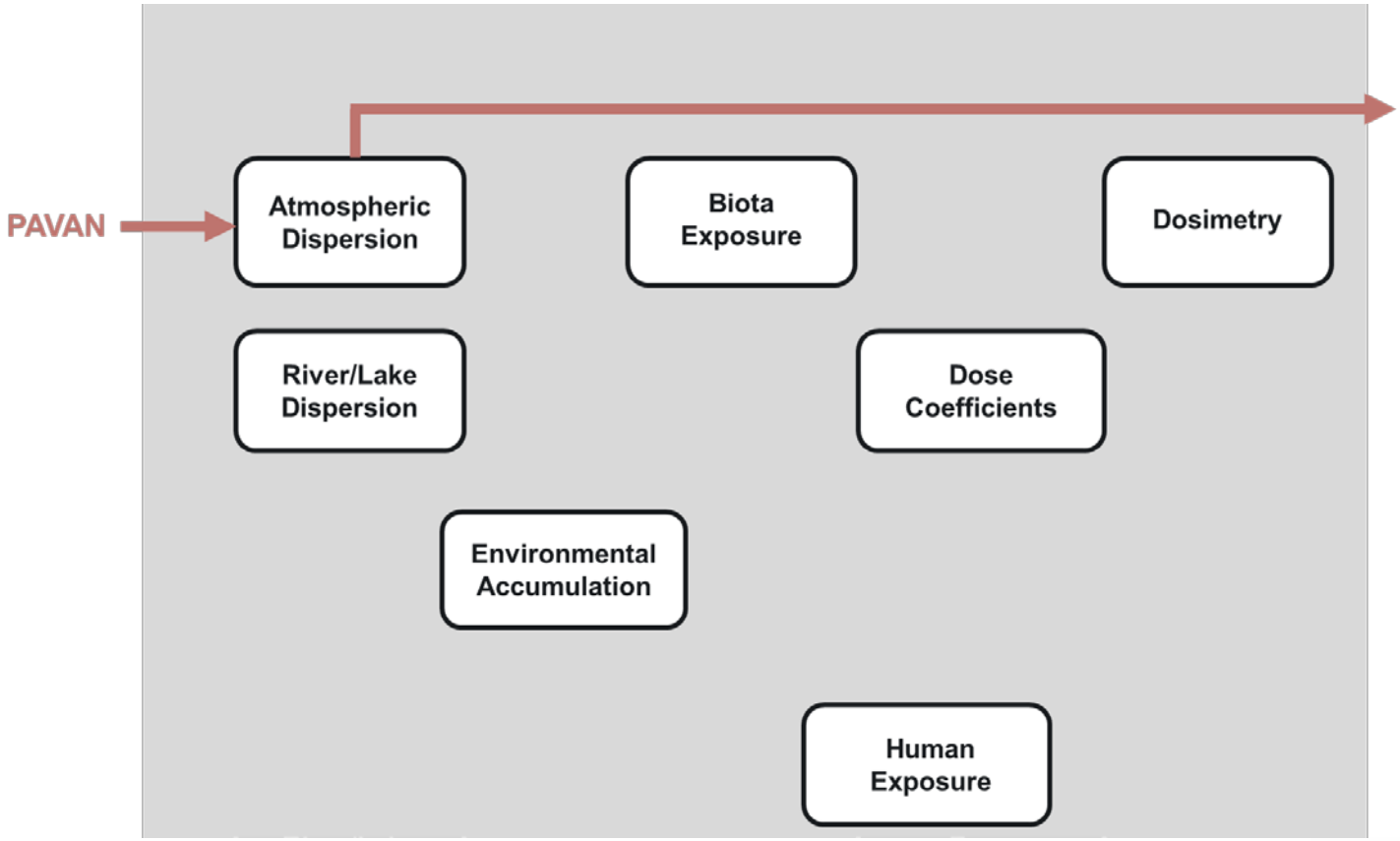
Three Pillars

Pillar 1: Proposed Functional Engines will consolidate code functions





Code Functional Capability Examples



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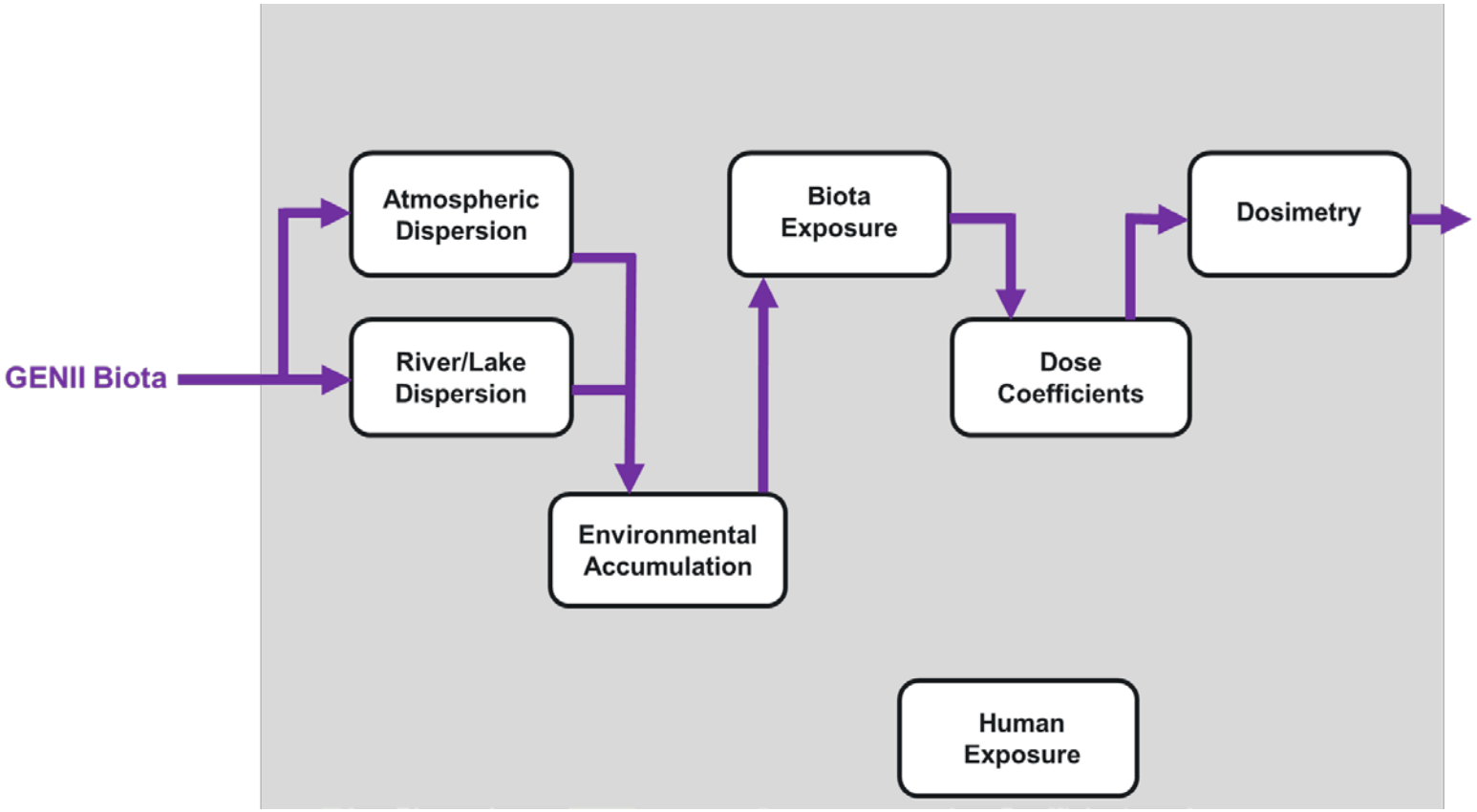

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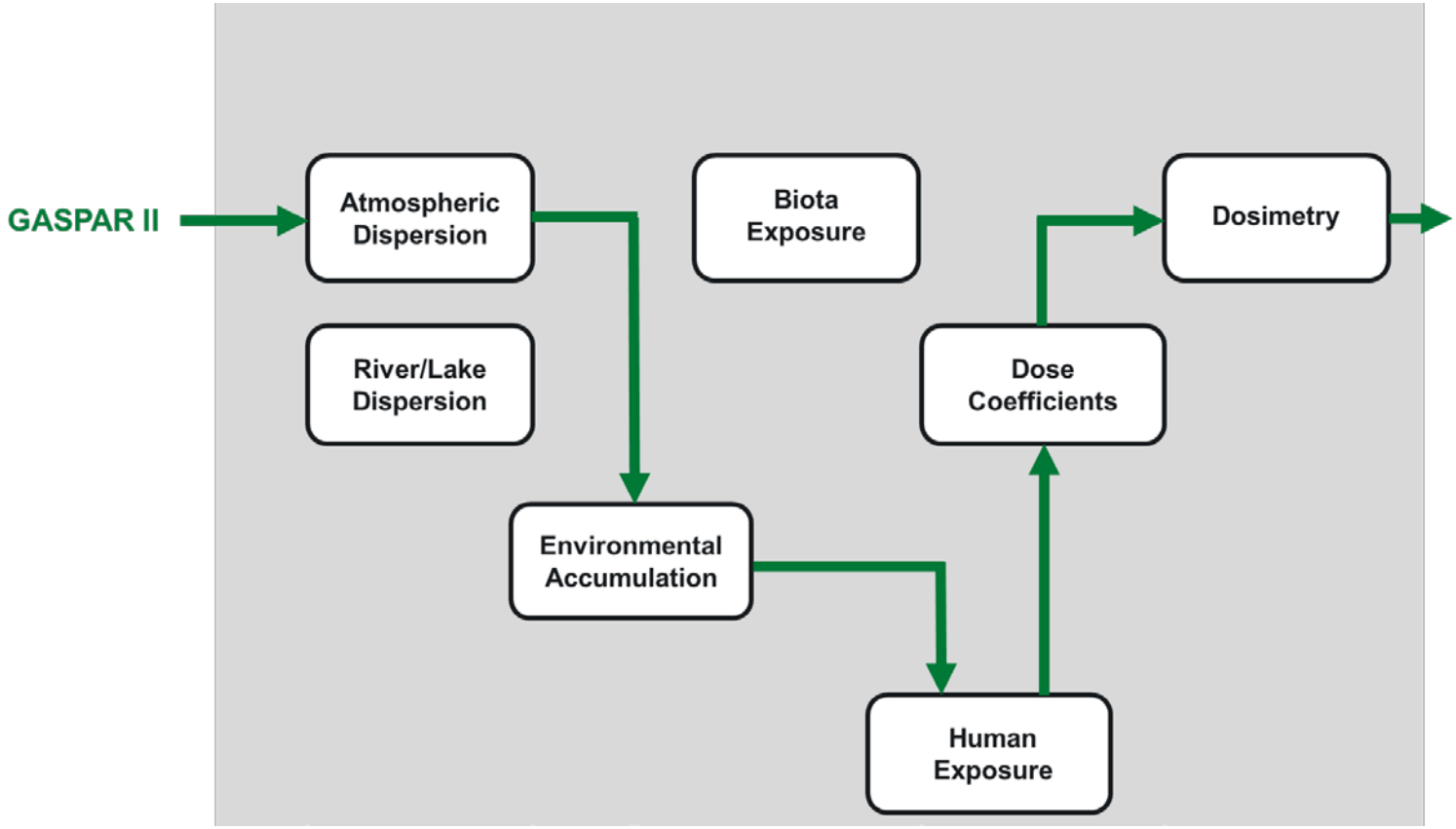
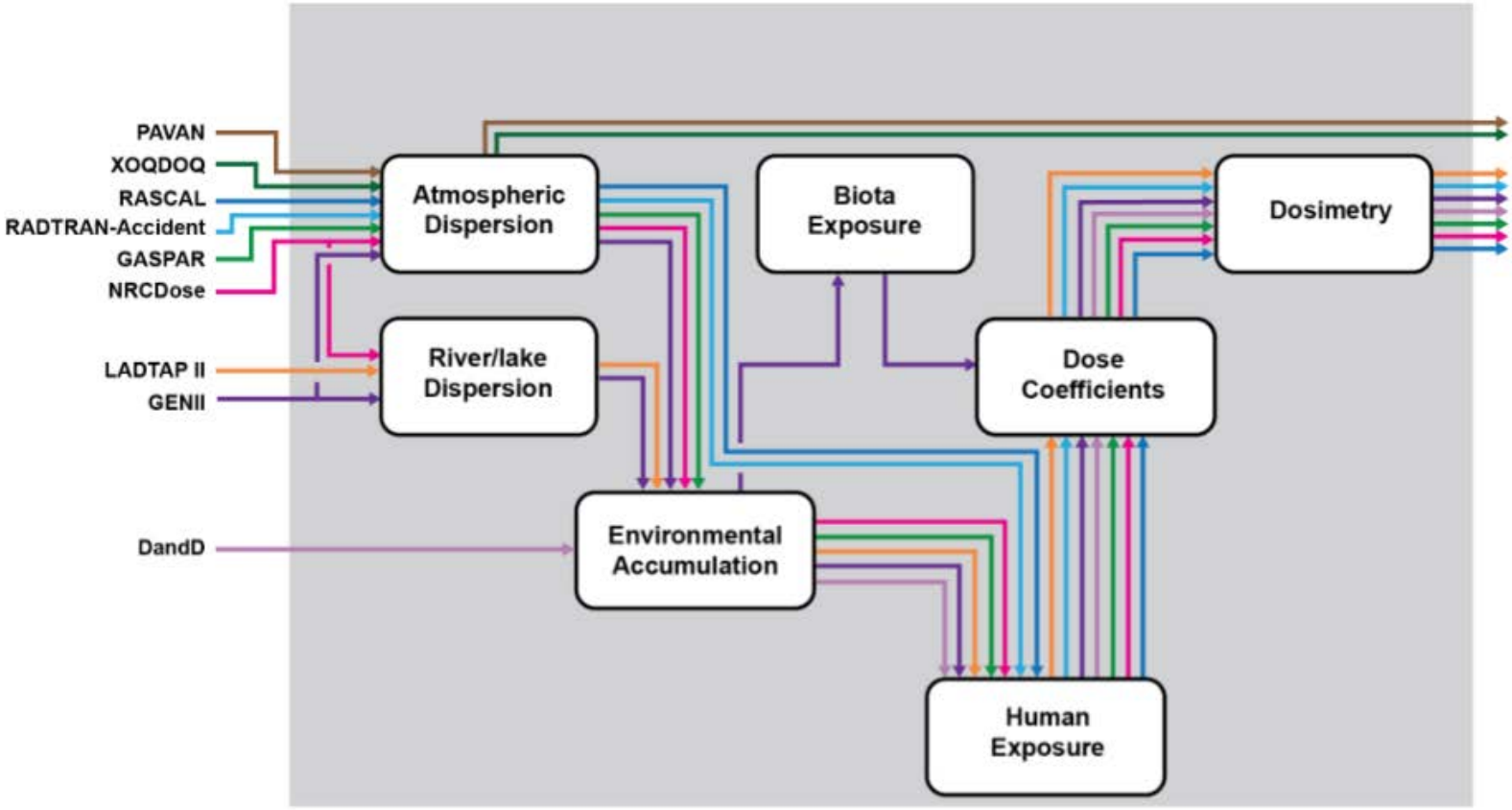
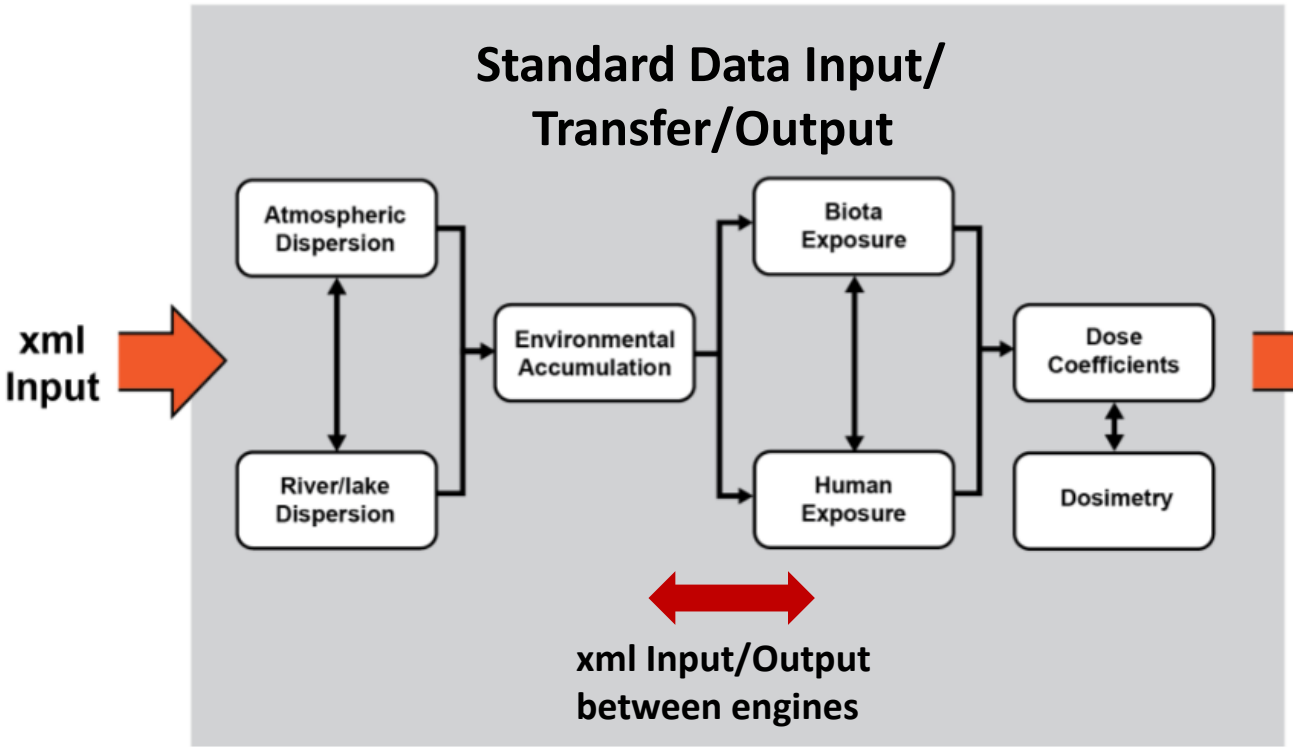
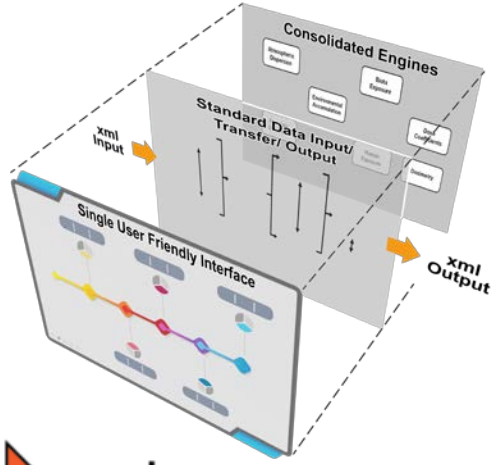


Overlapping Capabilities in Example RAMP Codes



Pillar 2: Standardized Input/Transfer/Output will simplify data transfer





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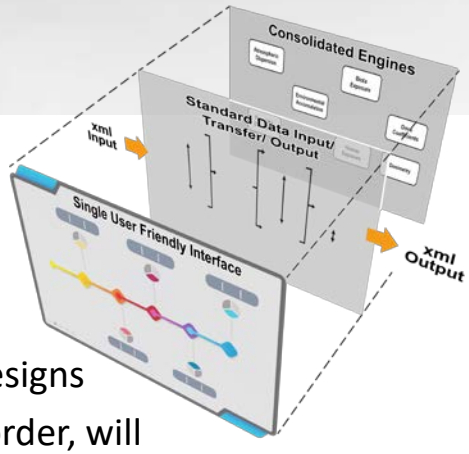
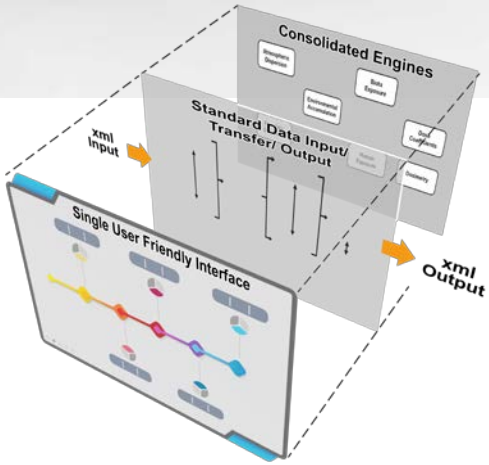
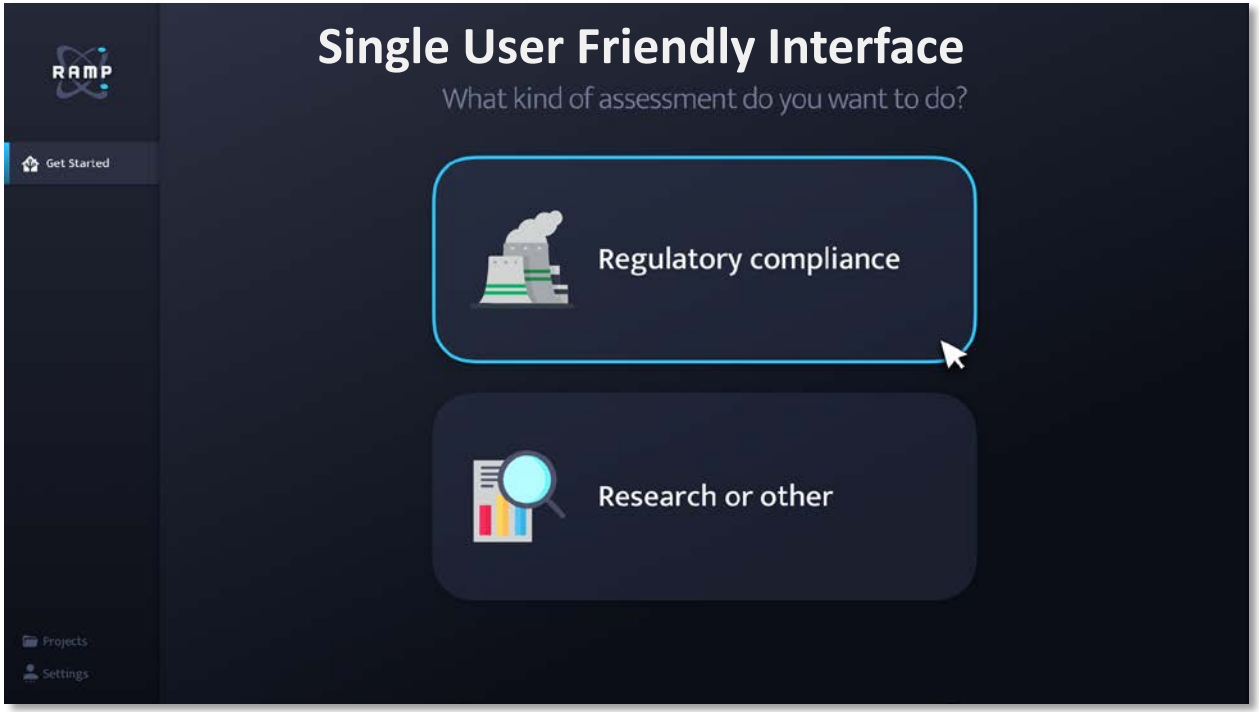


- An xml schema for the RAMP suite of codes will be
  - **Flexible**
    - Will allow additions of new variables yet unknown for advanced reactor designs
    - Variable data will not need to appear in the data transfer file in a particle order, will only need to be in the xml format and have the associated 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
    - Proven – adopted by National Atmospheric Release Advisory Center (Lawrence Livermore Lab) as the input/output format in the NARAC web.

Pillar 3: A Single Modern User Interface will improve the User Experience





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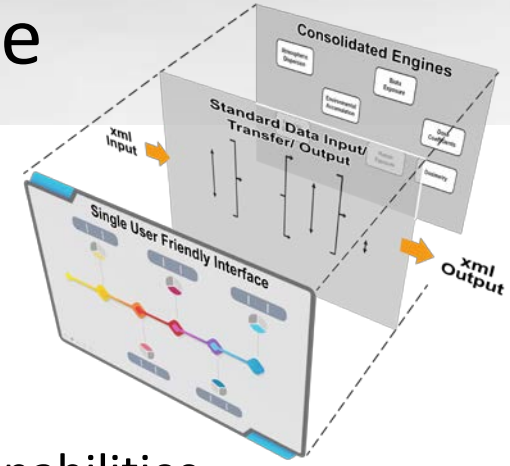
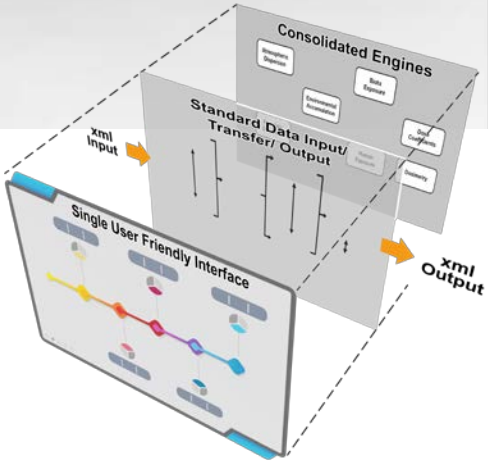
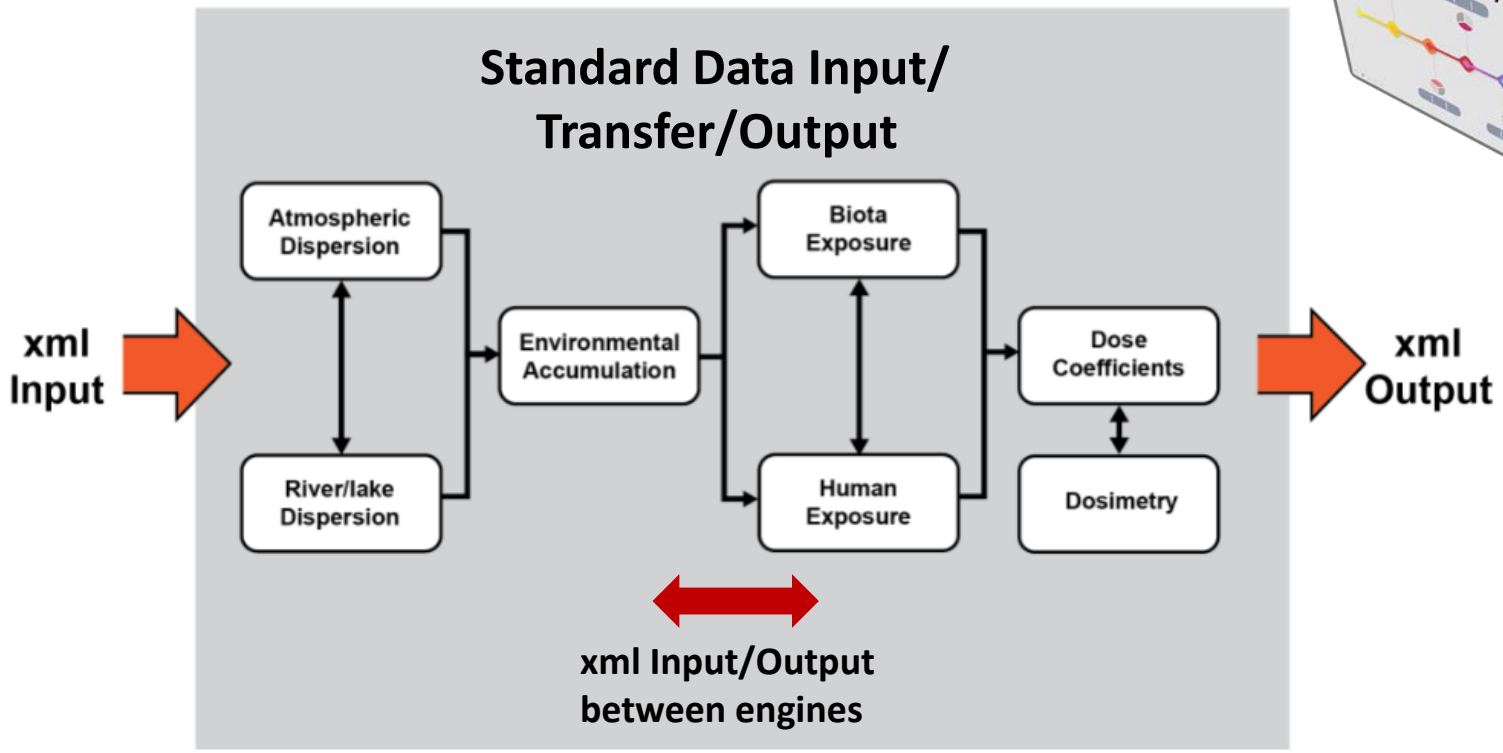


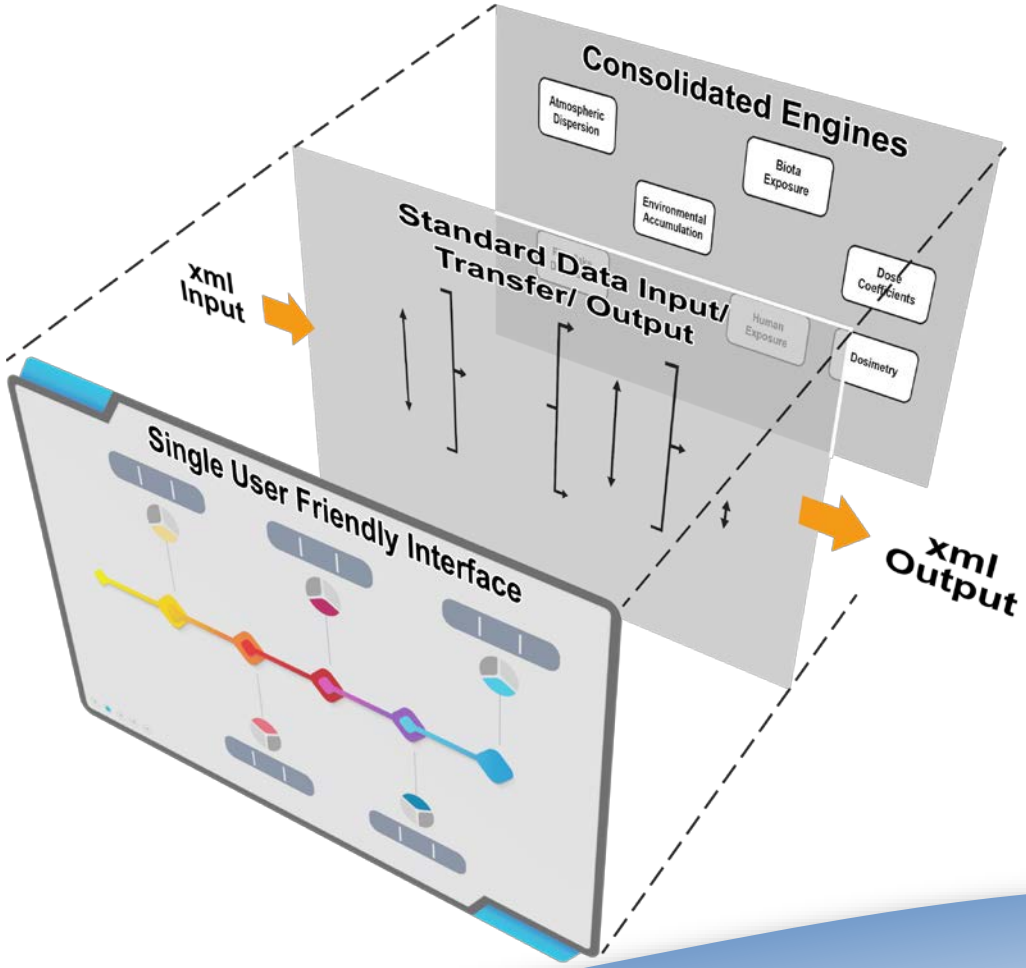
- User interface will be completely separate from the functional engines
  - Updating or changing the user interface will not inadvertently affect the quality of the functional capabilities
  - Allows for the possibility of developing a web-based user experience
  - User interface will require updates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

Functional Engines with xml input/output





Three Pillars

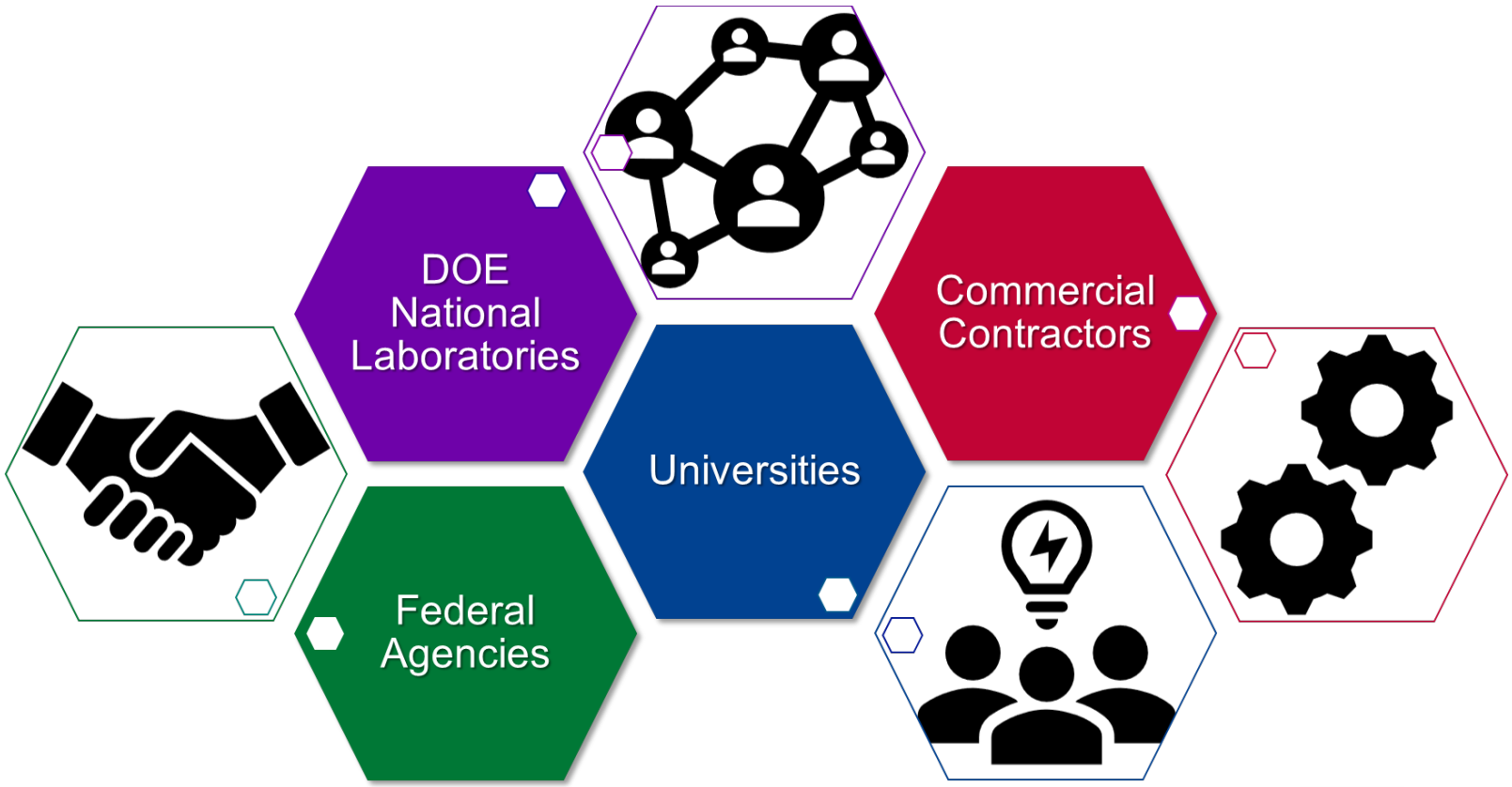


The new approach would be flexible enough to address non-LWR requirements

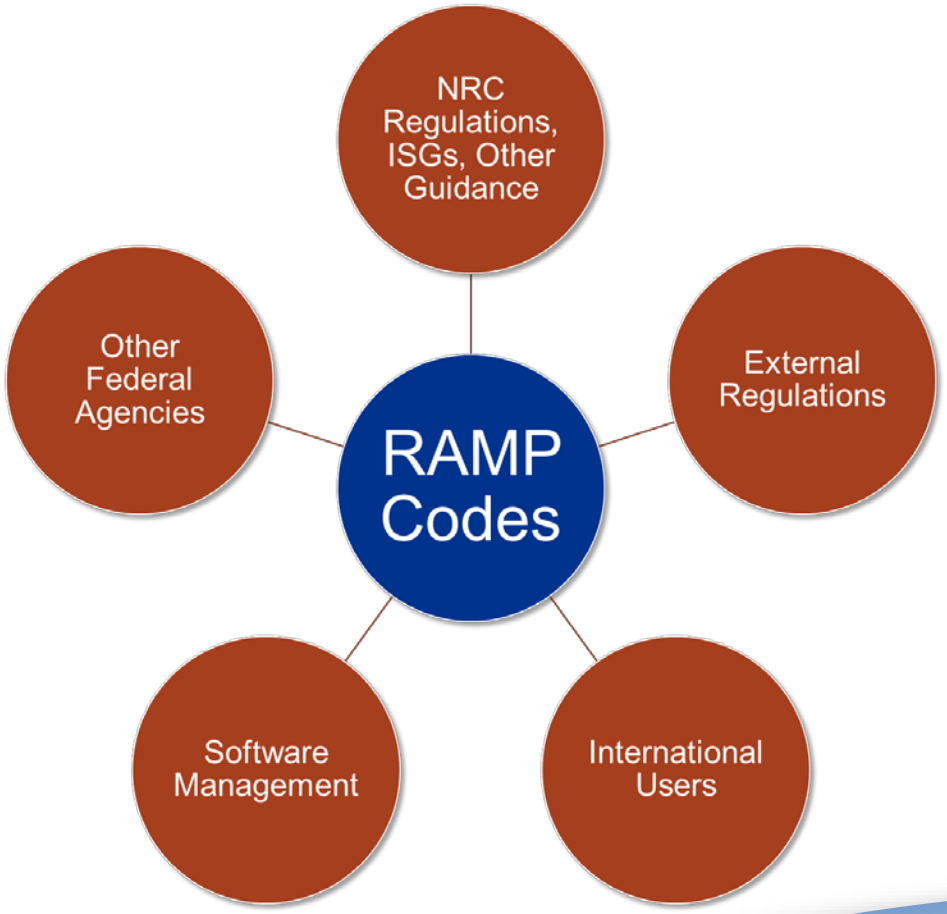
Six technical issues were identified in NRC Non-Light Water Reactor (Non-LWR) Vision and Strategy, Volume 4 — Licensing and Siting Dose Assessment Codes:

1. Core radionuclide inventory determination accounting for fuel form, geometry and other relevant characteristics (source term)
2. Near-field atmospheric dispersion modeling
3. Selection of relevant and applicable Dose Coefficients
4. Environmental exposure pathways including tritium and carbon-14 modeling
5. Chemical transport modeling
6. Fuel reprocessing

Who are Potential Participants?



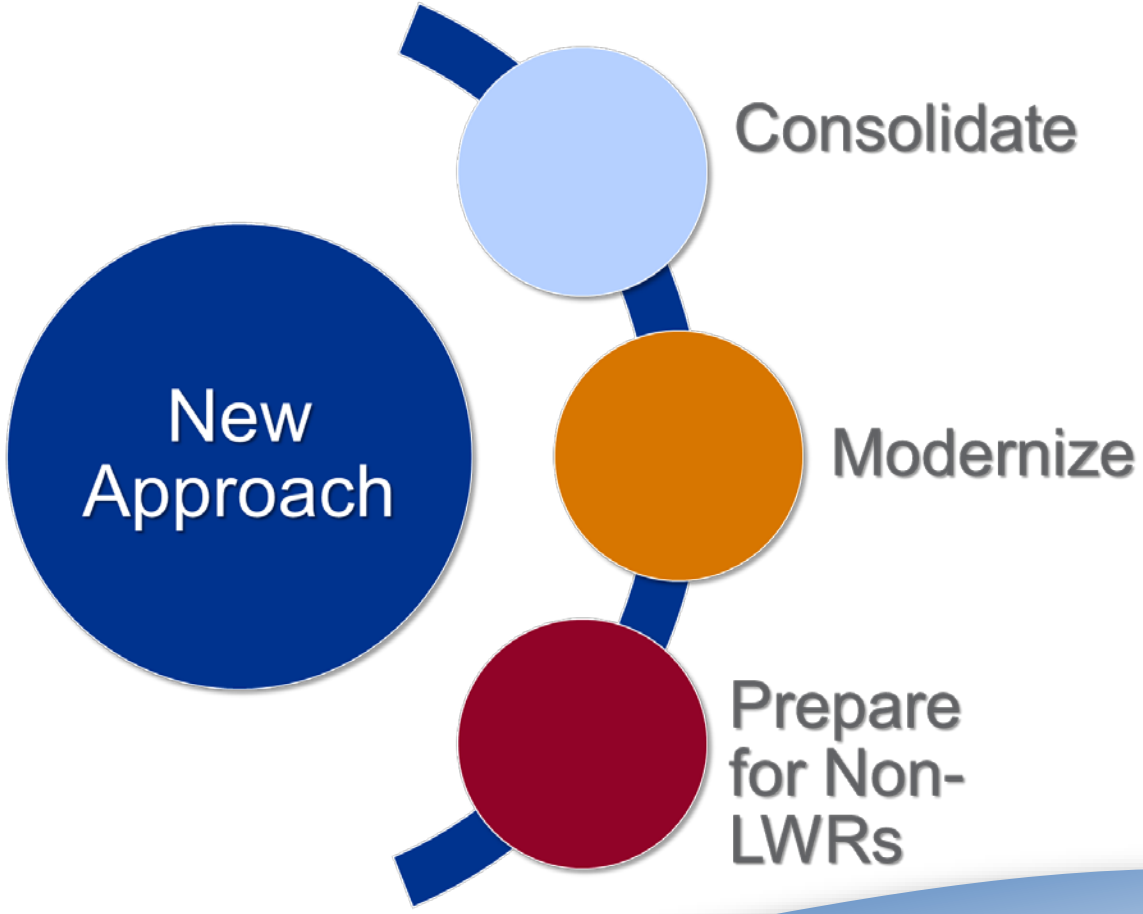
What are some of the other considerations?



What are the Benefits of the Approach?

- ✓ Simplifies RAMP's current suite of codes
- ✓ 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

High Level Scope



Questions?

Thank You!