Savannah River National Laboratory®

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Digital Transformation Journey:
Constant Change

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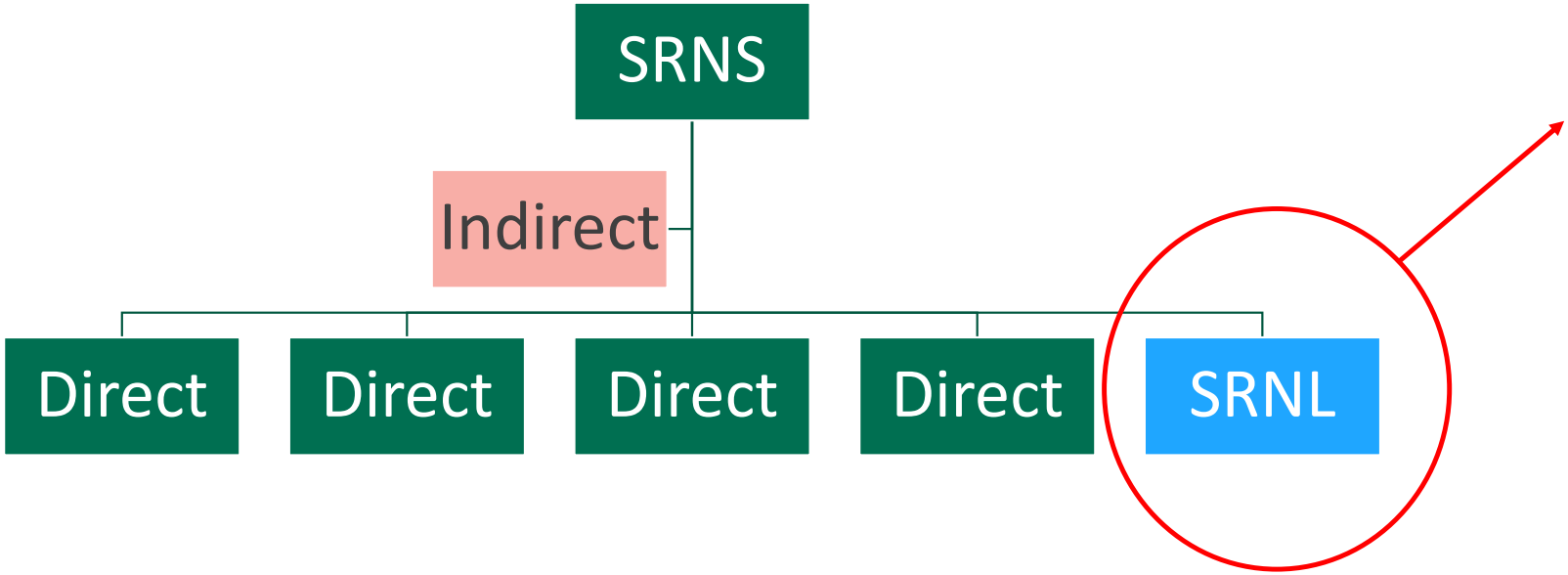
U.S. DEPARTMENT OF ENERGY

Managed and operated by Battelle Savannah River Alliance, LLC for the U. S. Department of Energy.

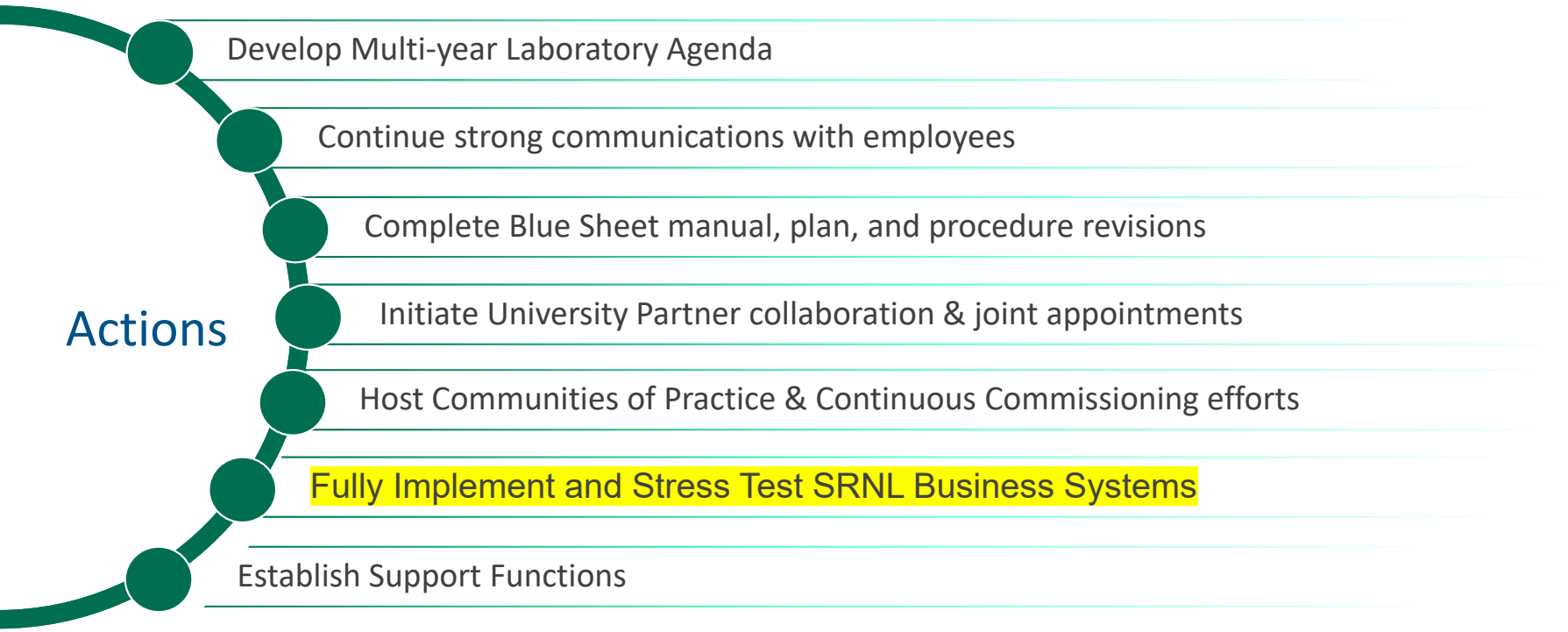
BSRA Battelle Savannah River Alliance, LLC

2020

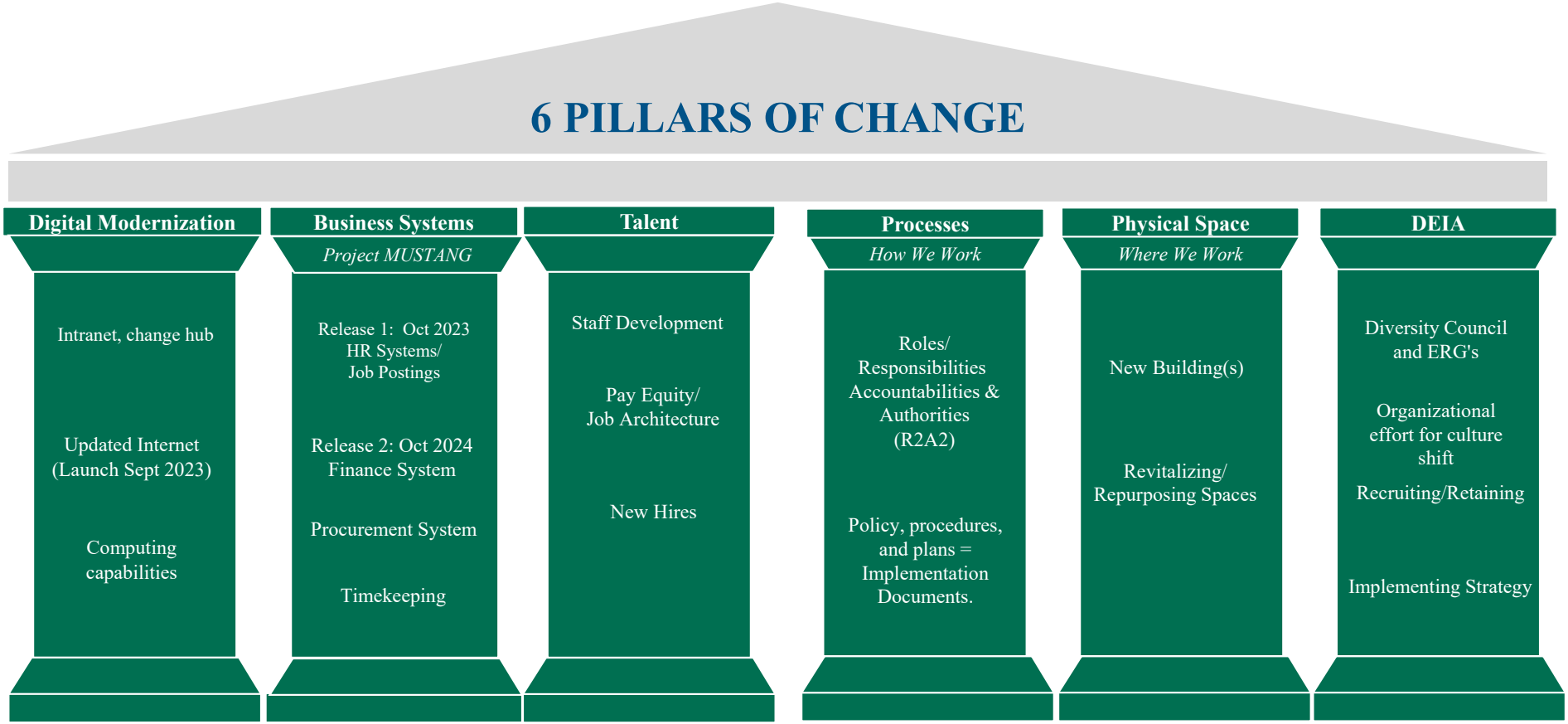
- DOE Decision to stand SRNL as an independent National Laboratory



Post-transition priorities for SRNL



6 PILLARS OF CHANGE



CULTURE CHANGE

Progress Toward Independence

Self Performing

Hazardous materials shipping certification

Classification Office

Website management (within 3 months)

Travel Audit

IT functions

Self Perform or Subcontract within 1-2 Years

Export Control

Travel Administration

Procurement, payroll and accounting

Design Engineering

Process Applications

Longer Term Evaluations

Construction

Nuclear Safety

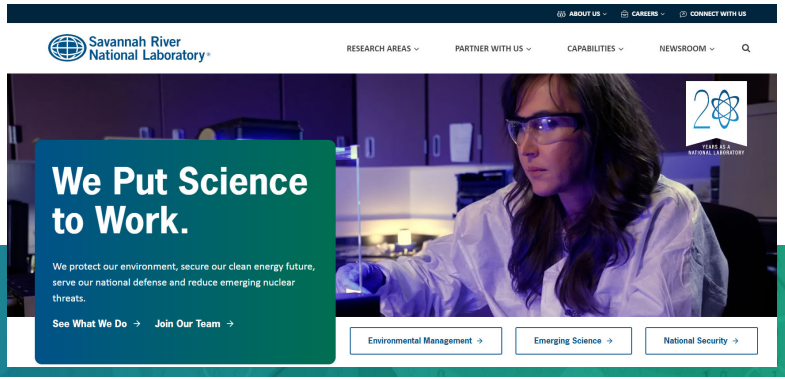
Benefits Administration

Site Training

Radiological Instrumentation

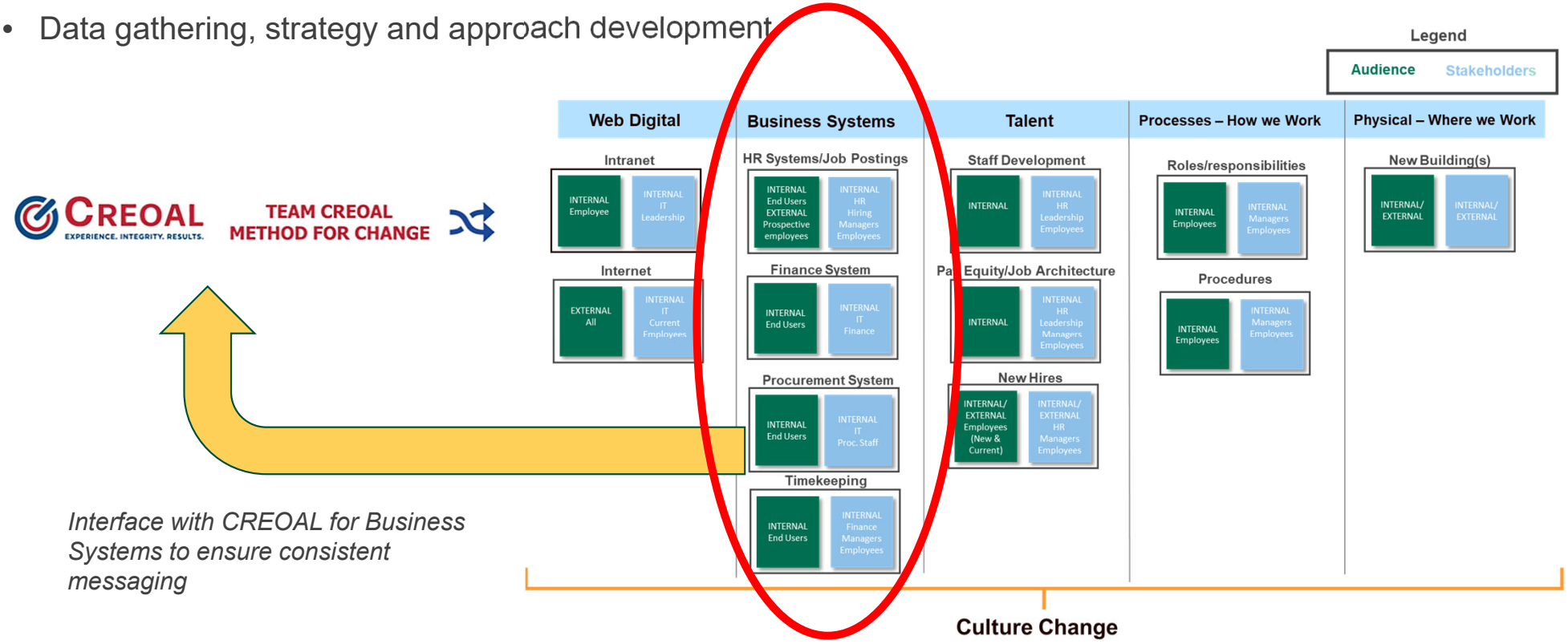
Digital Modernization Journey:

- Upgrade on-prim HPC hardware 2019
- Obtain IT Boundary Approval from DOE 2022
- Acquire Modern Software 2022-
- Redesign Internal/External Websites 2023
- Migrate to Cloud 2024-
- Implement Modern Enterprise System 2025
- Internalize Hardware Ownership 2026



Change Management

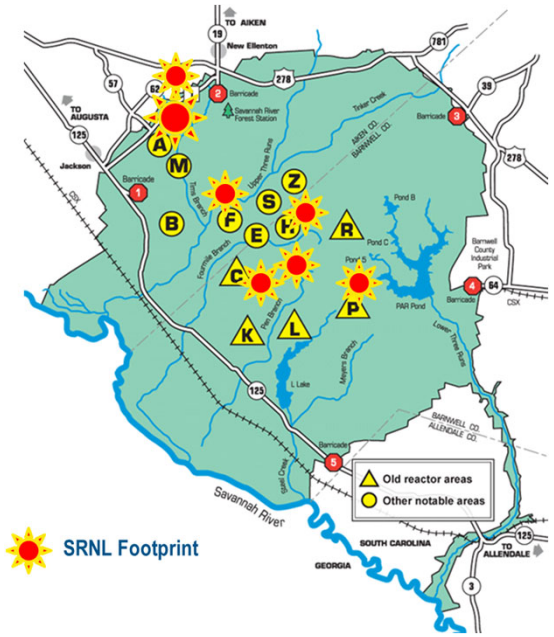
- Change Management small business consulting firm on board
- Data gathering, strategy and approach development



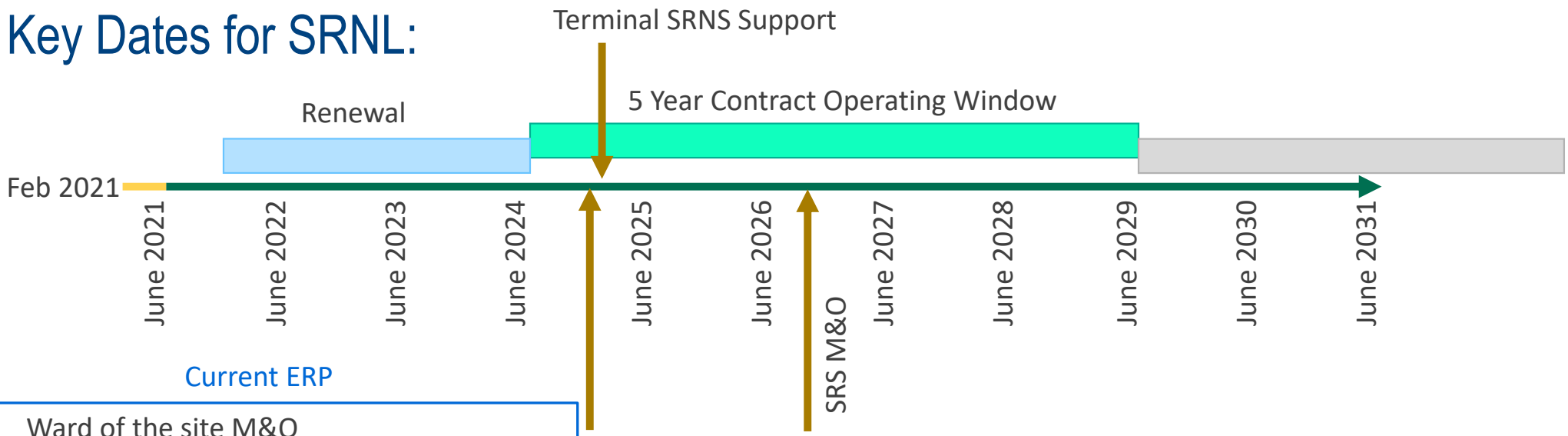
Interface with CREOAL for Business Systems to ensure consistent messaging

SRNL and the Savannah River Site (310 SQM): 10/2024

- **Federal**
  - Department of Energy:
    - Savannah River Operations Office (EM)
    - National Nuclear Security Administration
  - U.S. Forest Service
  - U.S. Army Corps of Engineers
- **Contractors**
  - Battelle Savannah River Alliance, LLC
    - Management and Operations of Savannah River National Laboratory
  - Savannah River Nuclear Solutions, LLC
    - Management and Operations of SRS
  - Savannah River Mission Completion, LLC
    - Liquid Waste Operations
    - Salt Waste Processing Facility
  - Centerra Group, LLC
    - SRS Security
  - University of Georgia
    - Savannah River Ecology Laboratory
  - Ameresco



Key Dates for SRNL:



Current ERP

- Ward of the site M&O
  - SRNL does not own checkbook
  - SRNL does not write checks
  - Timely balance not available
  - Use of site M&O procurement program
  - Site M&O management of benefits
  - Cost of the above is increasing
  - NNSA funding channels
- EM sponsor mitigates

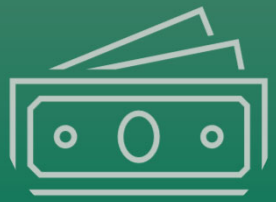
- Independence

ORACLE
ENTERPRISE RESOURCE PLANNING CLOUD

AI: Accelerating innovation across SRNL mission space

- DOE has defined pillars to enable new frontiers in artificial intelligence for science, security, and technology (FASST) https://www.energy.gov/fasst
  - ✓ Data
  - ✓ Models
  - ✓ Platforms
  - ✓ Applications
- SRNL is using these AI enabling components to accelerate:
  - ✓Design of complex systems that support legacy clean-up and environmental stewardship
  - ✓Modernization of the nuclear deterrent
  - ✓Response to emerging threats fully utilizing all multi-modal intelligence
  - ✓Discovery in support of next-generation energy security opportunities
  - ✓Transformation of manufacturing and operations using fully AI enabled approaches

Potential Return On Investment



Cost*

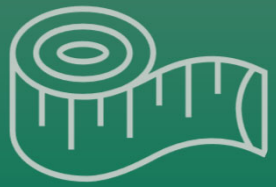
- ~$1-5M/day saved for early or on time completion at facilities
- ~$12-20K/year/groundwater monitoring well reduced

Safety

- Hazard elimination through use of online monitoring (e.g., fewer sampling events)
- Environmental protection

Schedule

- Risk-informed decision making
- Increased throughput



Footprint

- Reduction in # of canisters
- Accelerated D&D

What opportunities exist across DOE to reduce cost and improve efficiency?

*Costs are based on approximate estimates for SRS facilities and groundwater sampling

AI Advisory Board:
Enabling Safe, Secure, and Trustworthy AI Research Across SRNL Mission Spaces

The rapid growth and development of AI and Large Language Models (e.g., ChatGPT) necessitates the prompt implementation of policies, guidance, and committees to support the prolonged safe and secure use of these technologies at SRNL.

SRNL AI Advisory Board

ADVANCE AI GOVERNANCE AND INNOVATION
- Executive order (EO) outcomes

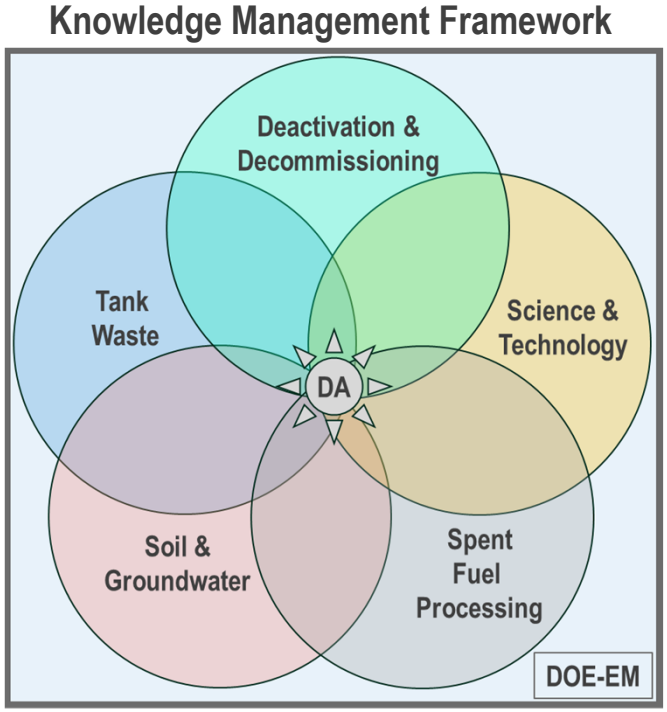
COMMITTEES AND WORKING GROUPS
- Complex-wide participation (e.g., GenAI Tiger Team,)

SITE CONTRACTORS POLICIES AND GOVERNANCES
- SRNS AI User Group

LAB AND INDUSTRY DRIVERS
- 8 times increase in requests for AI software

- ✓ Actively composed of SMEs.
- ✓ Effectively and efficiently build a trustworthy foundation.
- ✓ Thoroughly include contribution from all areas of the laboratory.
- ✓ Clearly define guidance for research community.
- ✓ Strategically build an AI innovation nexus

SRNL AI Innovation Nexus



Multi-domain knowledge bases containing multi-modal data that enhance workflows when made accessible.

- **Knowledge Management (KM)**: a collection of tools for creating, sharing, analyzing, and managing information to achieve organizational objectives by making the best use of knowledge
- **Data analytics (DA)** are the tools within KM systems that enable cross-cutting collaboration between programs

Vision: *Accelerate delivery of solutions to DOE-EM and DOE-LM and ensure resiliency in the workforce of the future through the development of an AI-driven knowledge management and integration framework.*

AI/ML Workflow for Accelerated Mission Completion

Example 1: AI-enabled remote sensing

- *Soil/Groundwater, air pathways*
- *Waste processing*
- *Process monitoring*

Example 2: Optimization

- *Liquid waste retrieval*
- *Sequencing/Batch planning*
- *Glass formulation*
- *Space utilization*

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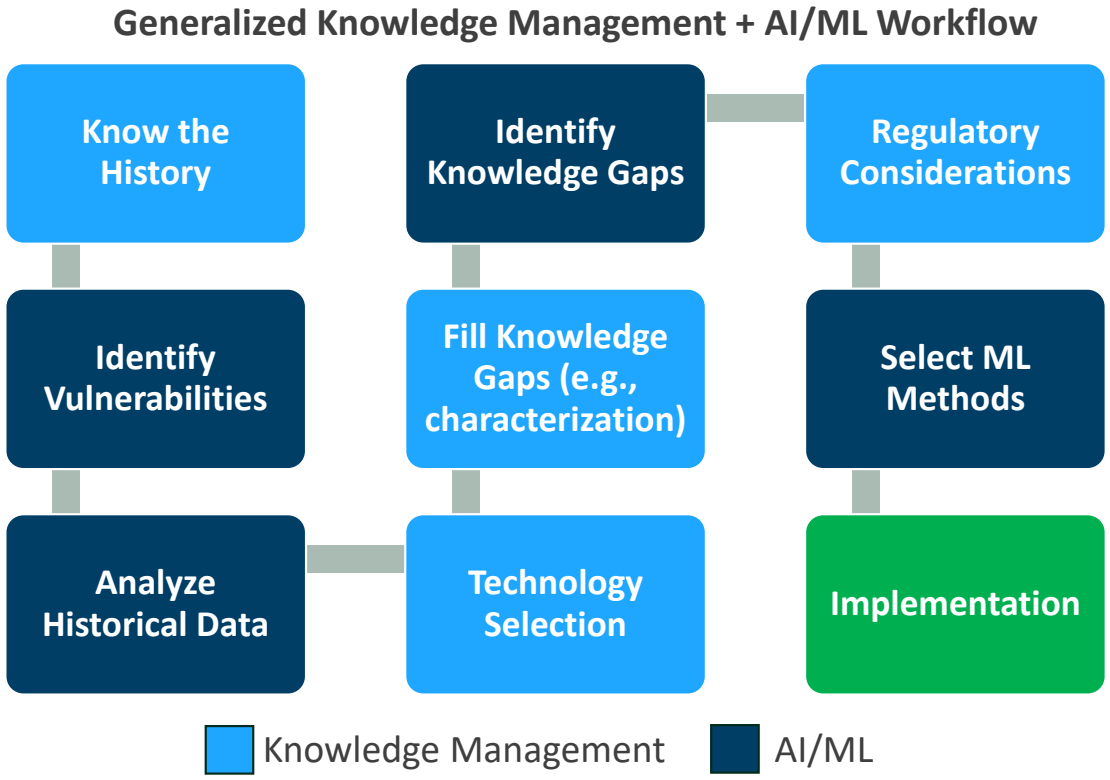


Applying AI to reduce the cost of DOE's environmental legacy

Critical Opportunity: The nation's liability for DOE environmental legacy is expected to exceed $550 billion, where human hours involved in long-term monitoring (LTM) of contaminant migration are a large component of the cost. DOE-EM is developing **Advanced Long-Term Environmental Monitoring Systems (ALTEMIS),** which uses integrated, passive sensor networks and AI/ML to enable remote, autonomous monitoring.

Expected Impacts:

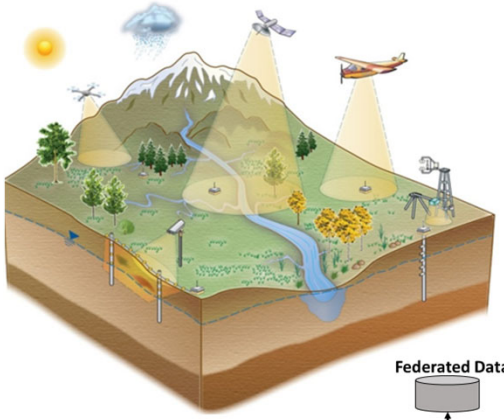
- Reduce environmental monitoring costs by 75-90%
- Enhanced response times when anomalies are detected, especially in remote locations
- Increased public safety through greater monitoring coverage and rapid response

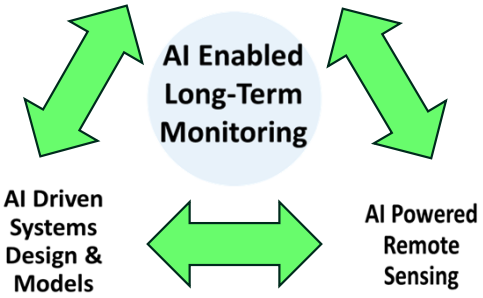
Required R&D:

- Federated data sets for fine tuning foundation models that effectively represent environmental complexity
- More robust, consistent, and user-friendly AI/systems design frameworks
- Low powered AI-enabled edge sensing technology to minimize calibration requirements

Timeline:

- Near term: 1-3 years – ALTEMIS field demonstration of integrated AI/sensing technology
- Mid term: 3-5 years – Foundation models for information discovery, extraction, and fusion
- Long term: 5-10 years – Generalized human-guided and AI-enabled LTM systems design





[ALTEMIS - Savannah River National Laboratory (Fact Sheet)]
[ALTEMIS SRNL (Video Overview)]

Assuring Fusion Safety and Accountancy using Artificial Intelligence

Critical Opportunity: Tritium, a radioactive isotope of hydrogen, is a fuel option for fusion power. Unmonitored tritium releases from fusion energy plants pose exposure risks to workers, local populations and the environment while also increasing operations costs. Applying AI to design a **real-time accountancy framework** for tritium monitoring in a continuously operating fusion fuel cycle brings unprecedented opportunities to maximize safety, efficiency, and cost savings.

Expected Impacts:

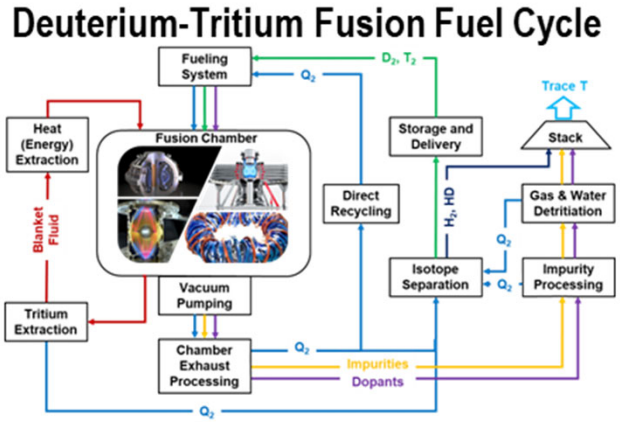
- Improved accuracy for tritium monitoring by minimizing measurement uncertainties during plant operations
- Enable response mechanisms for system anomalies to mitigate losses to the environment while maximizing plant operations
- Increased radiation protection for personnel and surrounding communities

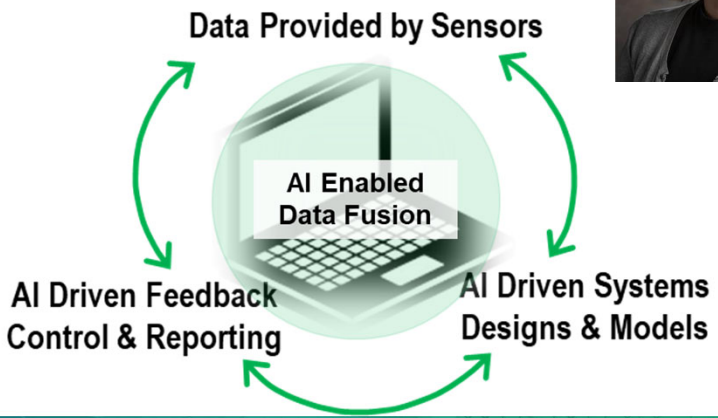
Required R&D:

- Data sets from fully integrated fuel cycle systems during tritium operations to optimize framework
- Identify and close gaps for advanced sensing needs to enable the AI framework
- Advances in AI-adaptable models to handle calibration upsets in extreme conditions

Timeline:

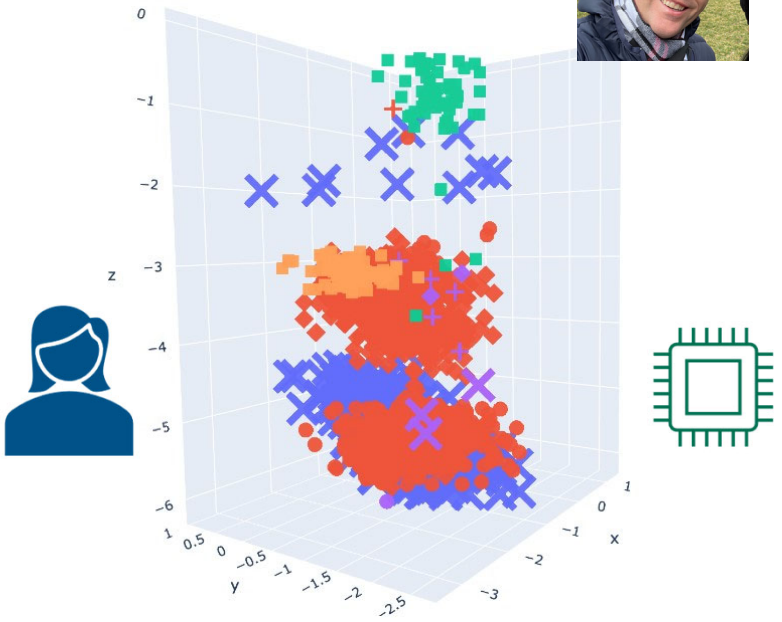
- Near term: 1-3 years – Quantify uncertainties and establish sensing needs
- Mid term: 3-5 years – Demonstrate AI- and sensing-enabled framework
- Long term: 5-10 years – Enable an AI-framework for the continuous operation, monitoring, and control of a fusion device





Energy Security Through Human-Machine Collaboration

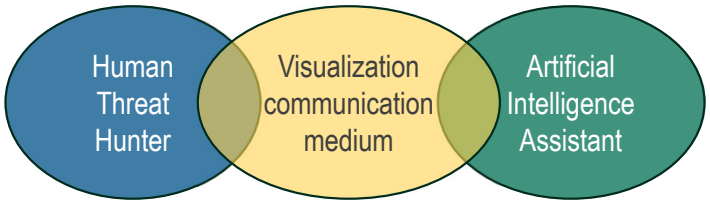
Critical Opportunity: The nation's energy security depends on millions of embedded controllers and the computational infrastructure that supports them. Cybersecurity threat hunters are faced with the overwhelming task of searching these unmapped infrastructures for unknown cyber adversaries. In response to this pressing need, DOE-EM is developing **Threat Hunting Representations for Embedded-system Anomaly Tracking (THREAT)** which uses integrated, passive network monitoring and AI/ML to enable defenders to understand what is normal in these systems and when cyber malice changes the game.



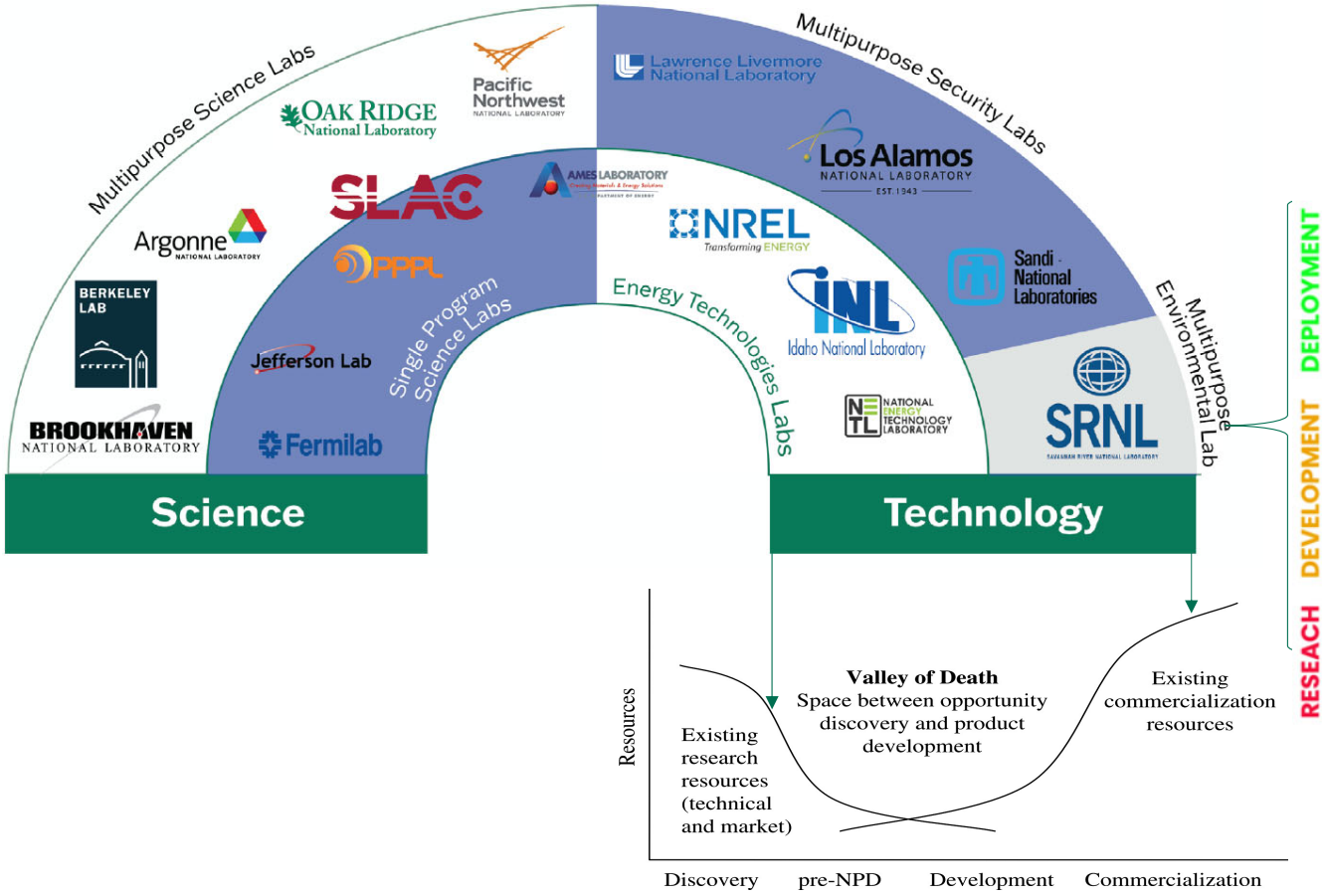
Expected Impacts:
- Reduce costs of monitoring for cyber threats by half
- Enable mapping and normality characterization of large networks
- Increased public safety through enhanced monitoring of critical infrastructures and rapid response

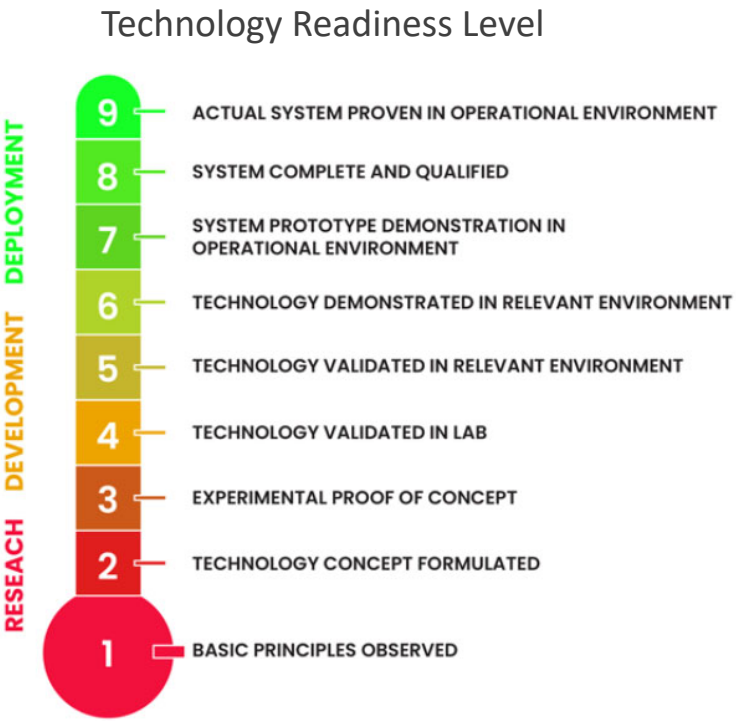
Required R&D:
- Collection of cyber-physical data sets that represent critical infrastructure with fidelity
- Combining artificial Intelligence, visualization, and human expertise for sense-making
- Creation of human-computer teaming technologies for enhanced threat hunting

Timeline:
- Near term: 1-3 years – THREAT field demonstration of integrated AI/Visualization/human analyst capabilities
- Mid term: 3-5 years – Advanced sense-making technologies enabling dialogue with AI systems for threat hunters
- Long term: 5-10 years – Generalized mixed-initiative threat hunting in real time on fielded systems



DOE National Laboratories: Strategy is Aligned with Function





Questions: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