

Integrated Nuclear Archaeology

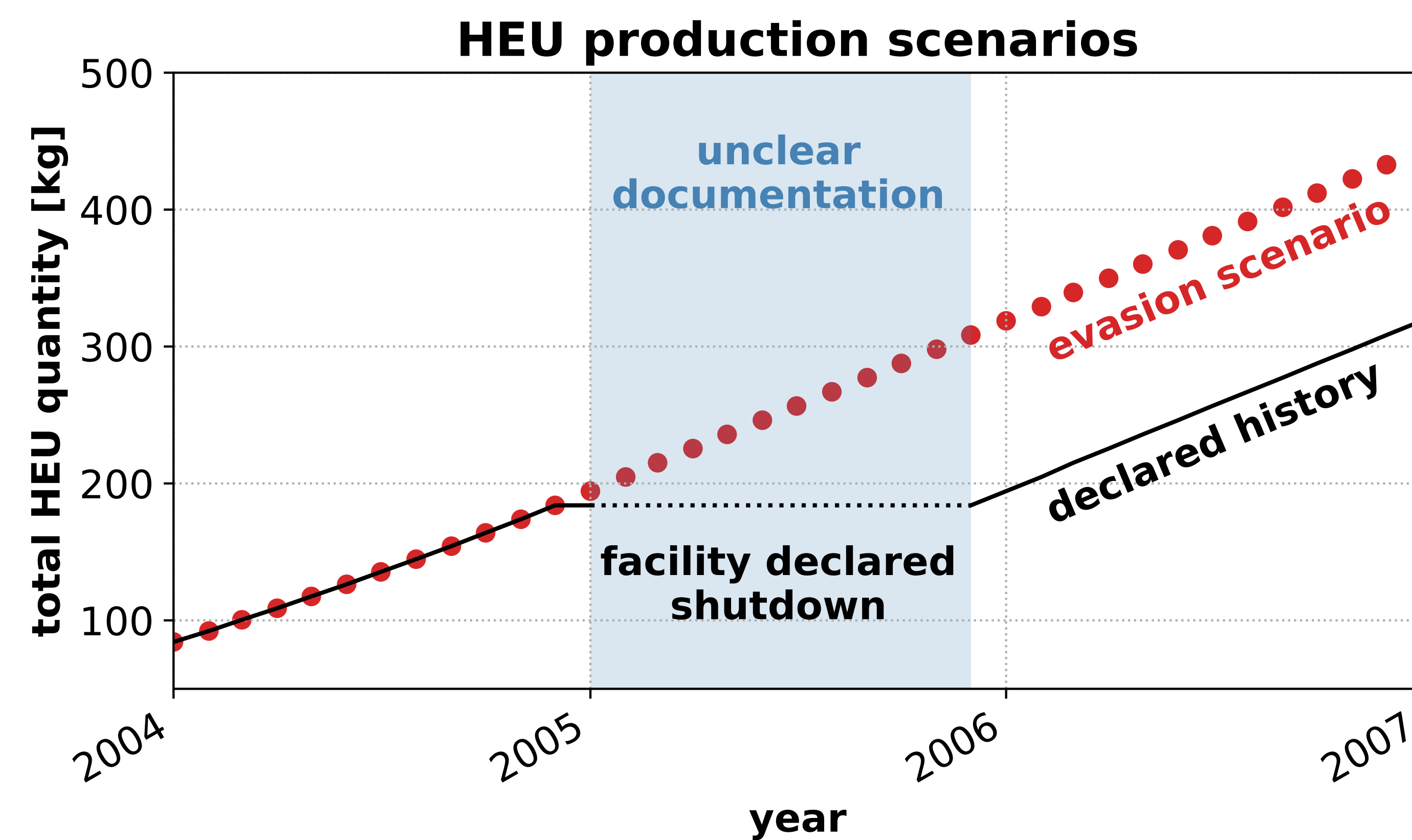
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Introduction

- Long term nuclear disarmament verification requires examination of **fissile material inventories** by reconstructing their **production history**.
- We develop **techniques** to address these verification challenges.

Techniques

- **Fuel Cycle Analysis:** Unclear information can limit verification of fissile material stocks. For this, we use fuel cycle simulations to estimate produced material inventories under plausible scenarios.



Estimated HEU inventory under unclear historical records

References

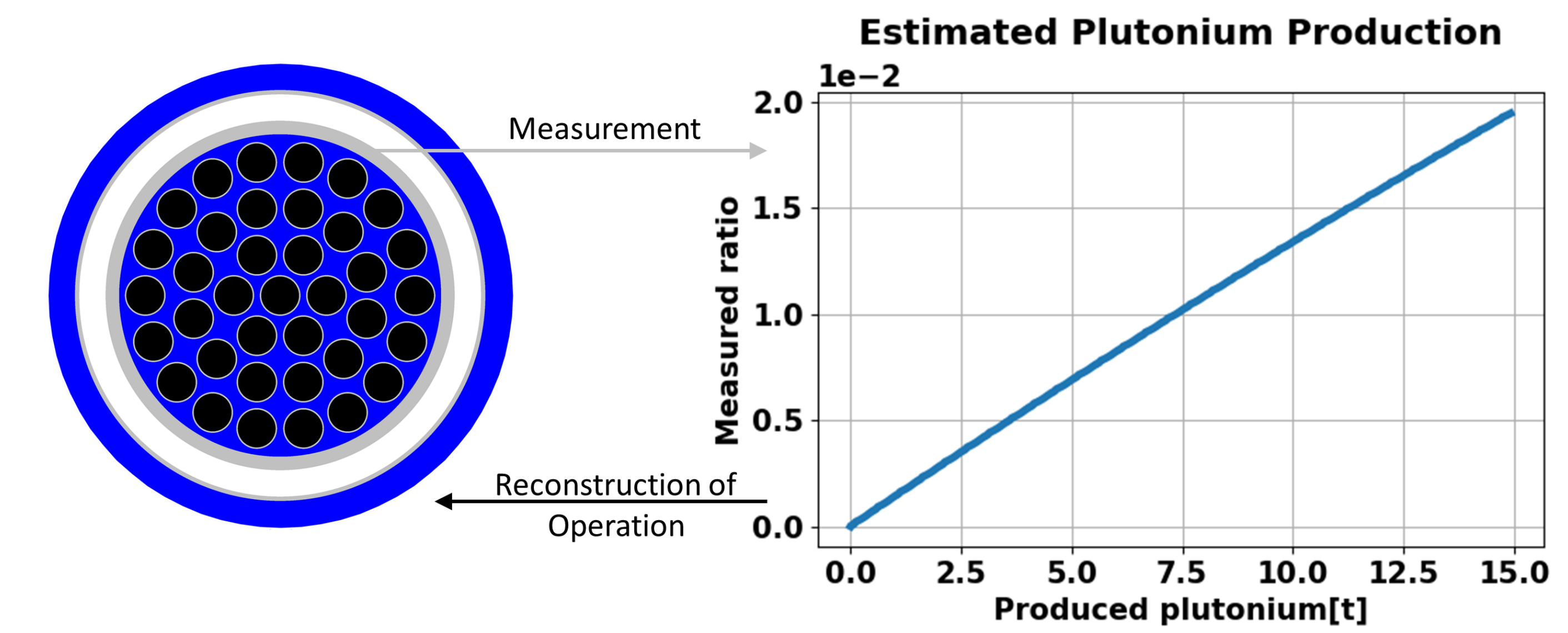
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Combined analysis of *historical documentation* on fuel cycle operations and *measurements* of its byproducts facilitates the *verification* of fissile material inventories, even *without direct access*, by reconstructing their *production and removal history*



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- **Reactor Structural Analysis:** Even after shutdown measurement of reactor materials can provide information about its history, operation and plutonium production [1][2].



Deducing lifetime plutonium production of shutdown reactors

- **Reprocessing Waste Analysis:** Radioactive waste contains a fingerprint of nuclear reactors operations, useful for verifying declared activities as well as uncovering undeclared operations [3].

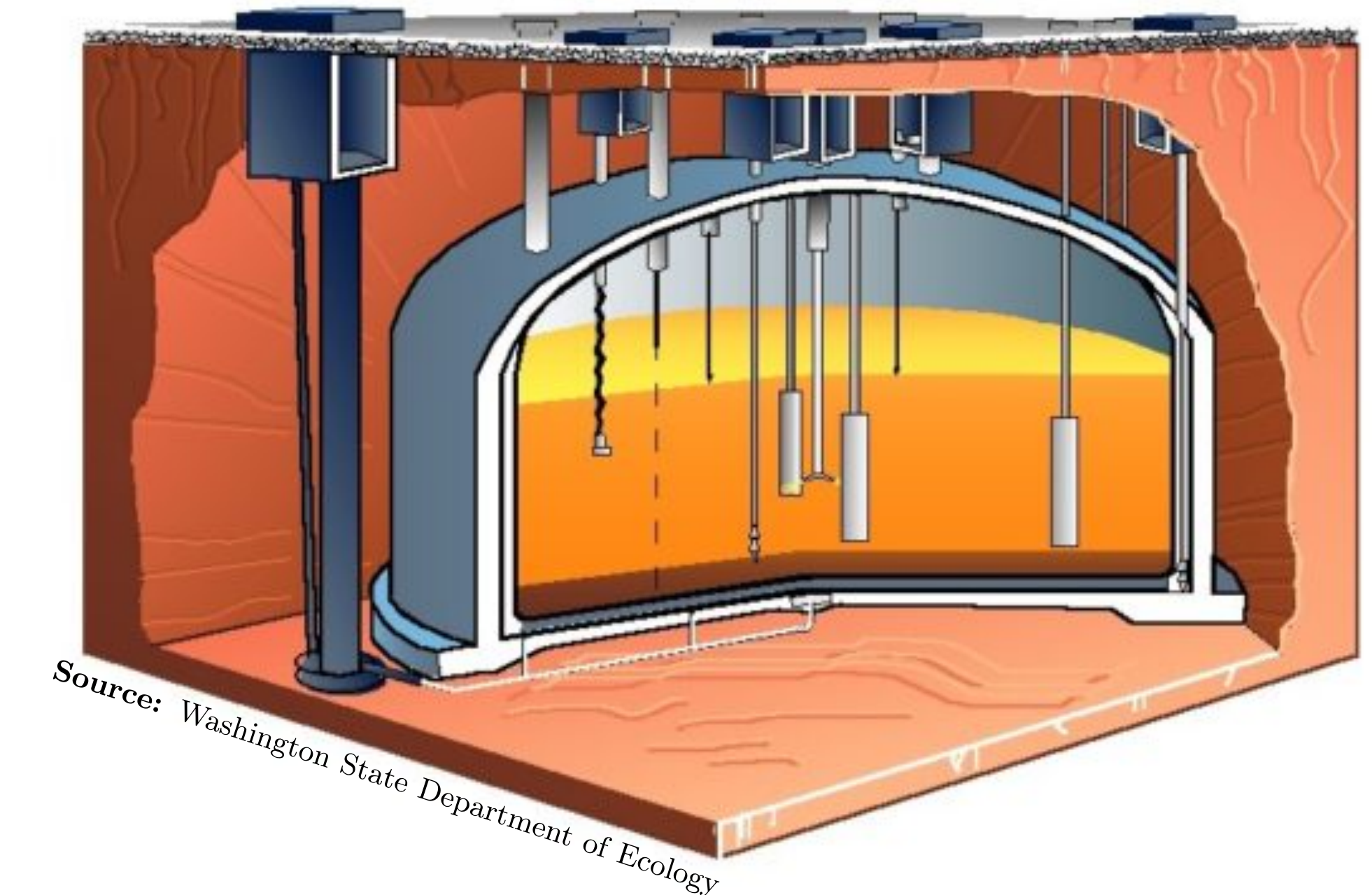


Diagram of a nuclear reprocessing waste tank

Data Analysis & Integration

Documentation and measurements are integrated in a Data Fusion framework, resulting in comprehensive verification capabilities [4].

