U.S. DEPARTMENT OF ENERGY | Environmental Management

Office of Engineering and Technology

Immobilization Research

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Objectives

- Perform research and development to advance the waste stabilization technology options by through closely-coupled theory, experimentation, and modeling
- Develop solutions for Hanford, Idaho, Savannah River, and Oak Ridge wastes challenges (along with facilitating management of future wastes)

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General Approach

- Balance between near-term *incremental* technology improvements and long-term *transformational* solutions
- Address the requirements for high risk waste streams
  - high-level tank waste (RPP, SRS)
  - low-level tank waste (RPP, SRS)
  - high-activity tank waste (INL)
  - high-level calcine waste (INL)
  - secondary low-level wastes (INL, RPP, SRS, ORNL)
- Research organized into three initiatives:
  - 1.5.1: *Develop Next Generation Melter Technology*
  - 1.5.2: *Develop Advanced Glass [or waste form] Formulations*
  - 1.5.3: *Develop Supplemental Treatment Technologies*

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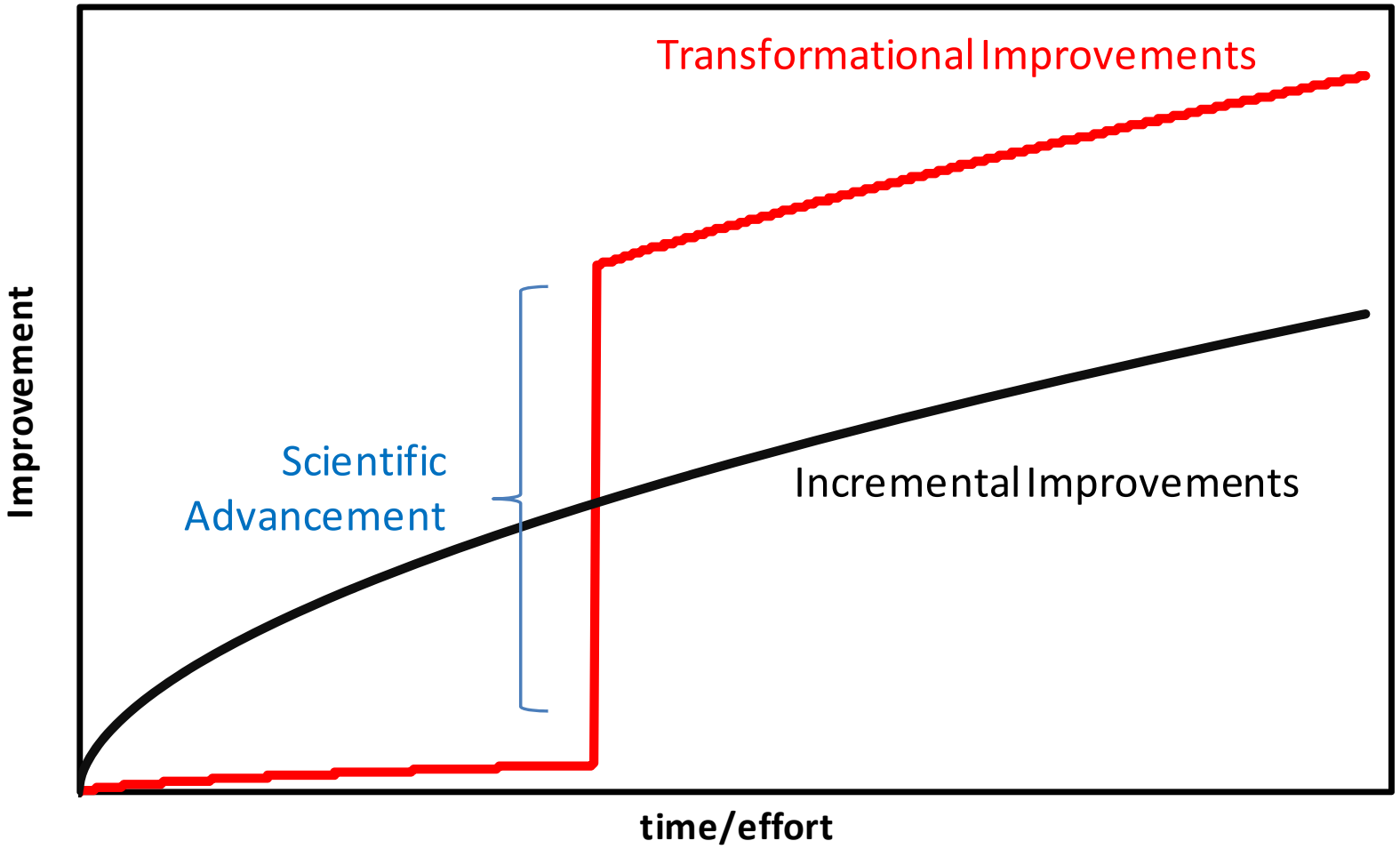
Incremental vs Transformational Solutions



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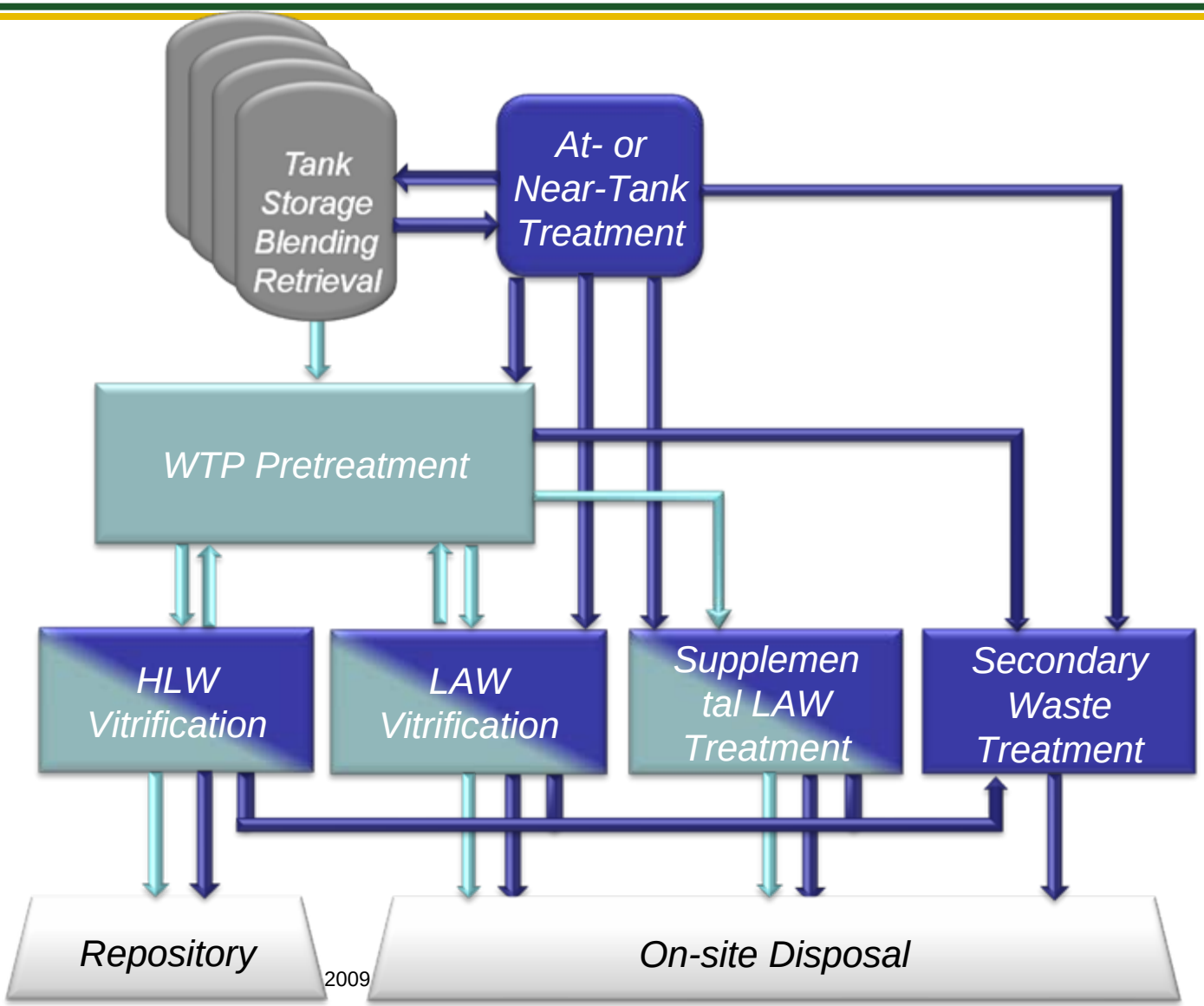
Waste Streams – RPP



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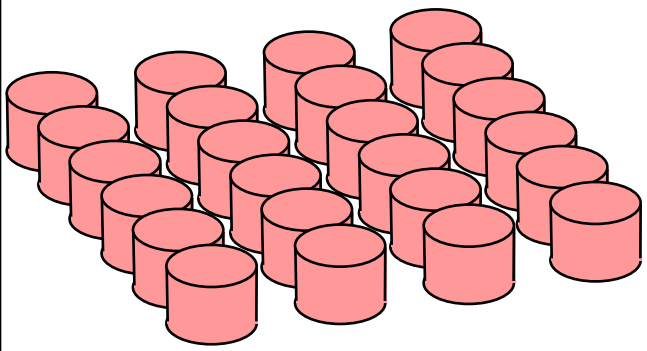
Waste Streams - SRS LWO

Tank Farm Storage & Evaporation

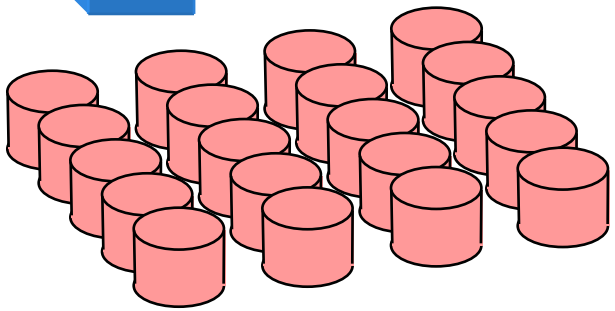


H Area Tanks

2 F Evap

2H Evap

3H Evap



F Area Tanks

Waste Retrieval & Pretreatment

Extended Sludge Processing

Washed Sludge

Sludge

Waste Removal

Salt

Cesium & Actinides

Salt Processing

Low Level Filtrate

Tank Closure

Pretreated Waste Stabilization

DWPF

Canisters of Vitrified Glass

GWSB (Awaiting Federal Repository)

Saltstone

Grout

Vaults

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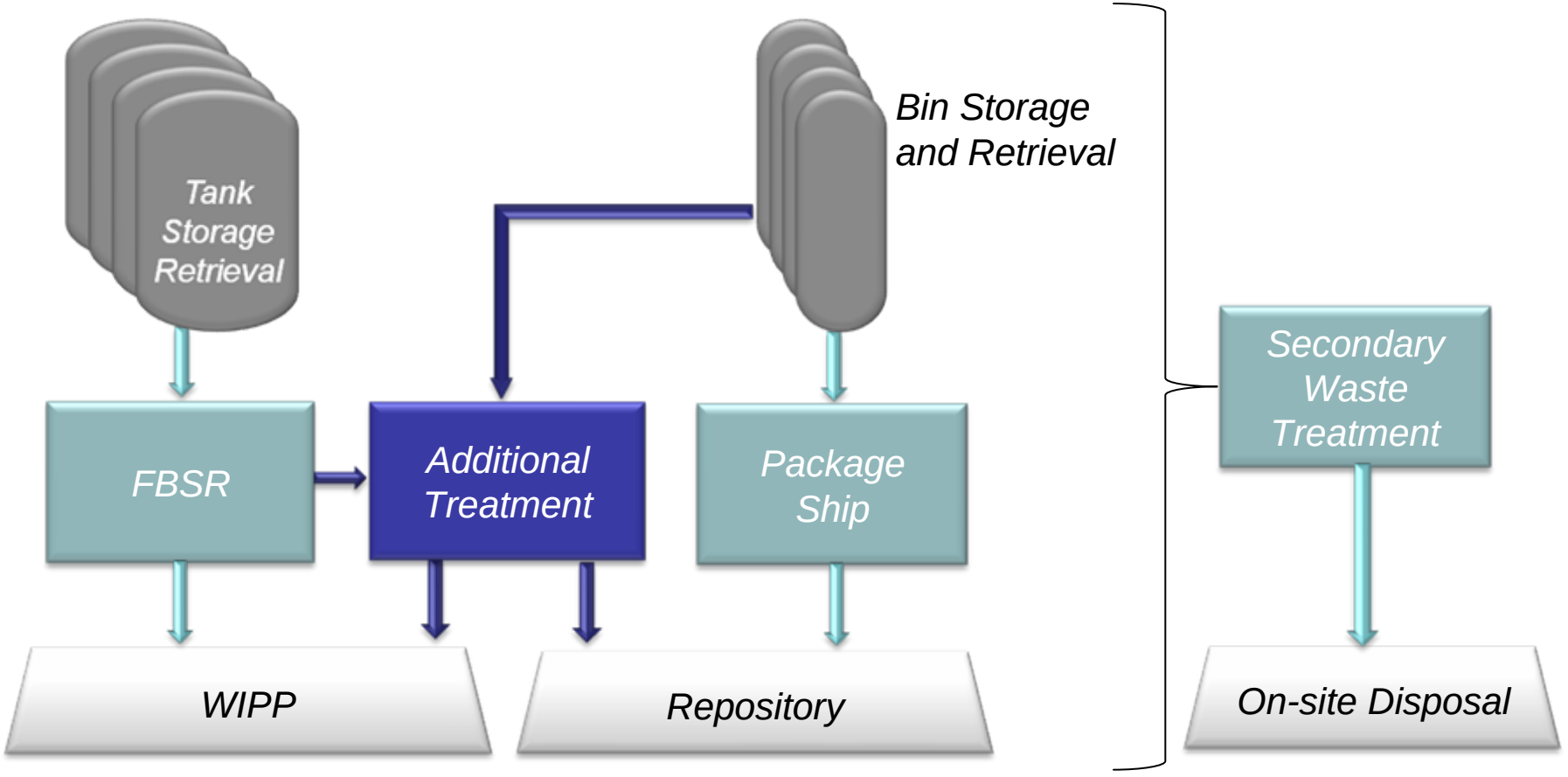
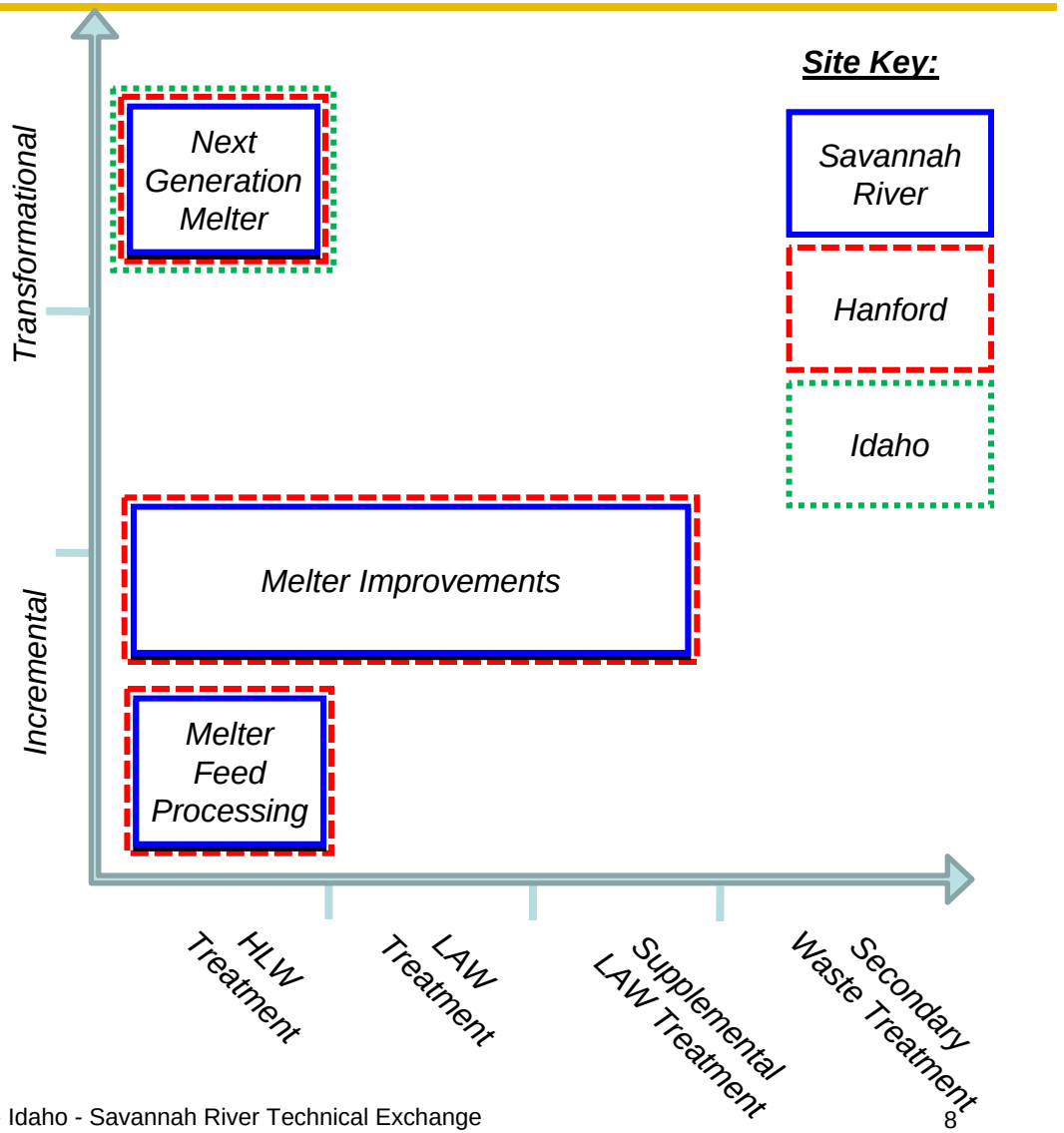
Waste Streams – INL



Research Activities - 1.5.1

- **Develop Next Generation Melter Technology**
  - incremental melter improvements
    - *materials of construction*
    - *operating temp*
    - *bubblers/stirrers*
    - *diagnostics/instruments*
  - next generation melter initiative
    - *induction or hybrid heating*
  - melter feed processing
    - *SRAT/SME or MFPV process*
    - *rheological modifiers, etc.*



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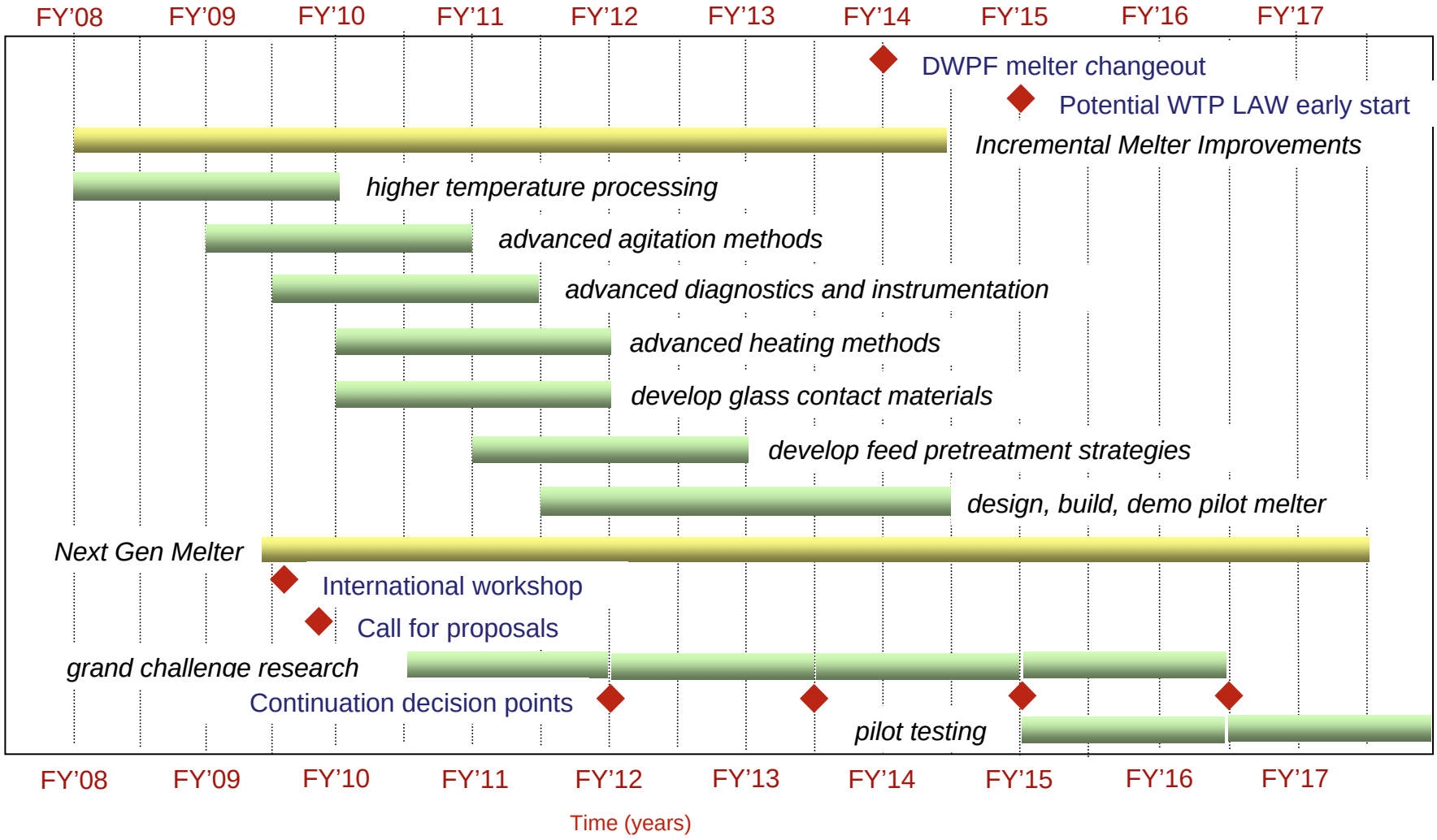
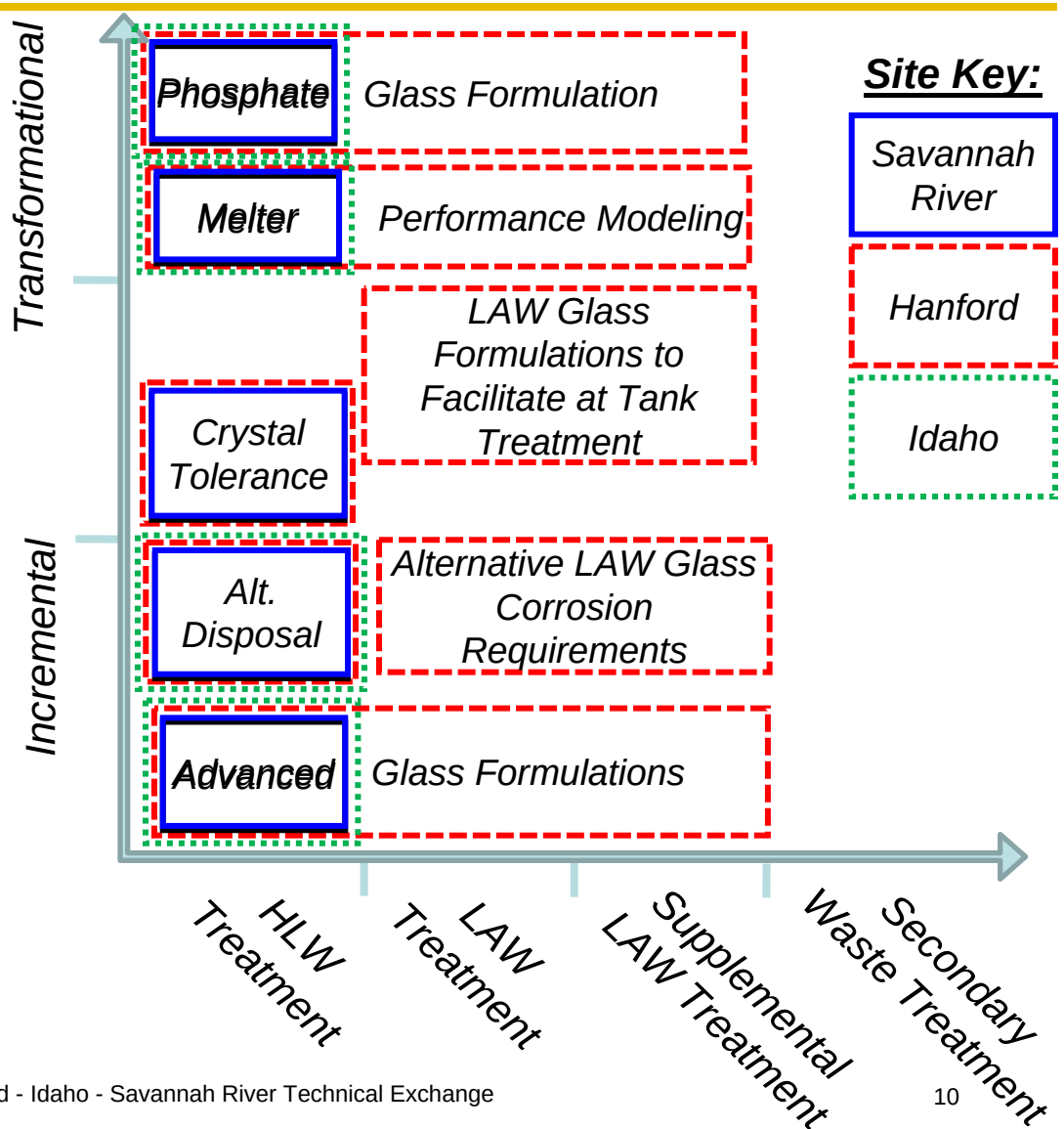
Schedule - 1.5.1



Research Activities - 1.5.2

- **Develop Advanced Glass/ Waste-form Formulations**
  - Advanced glass formulations
    - *broader composition range*
    - *glass property models*
    - *nepheline constraints*
    - *high sulfur/soda LAW*
  - Alt. disposal methods
  - Crystal tolerant glasses
  - Melter performance models
  - Phosphate glasses



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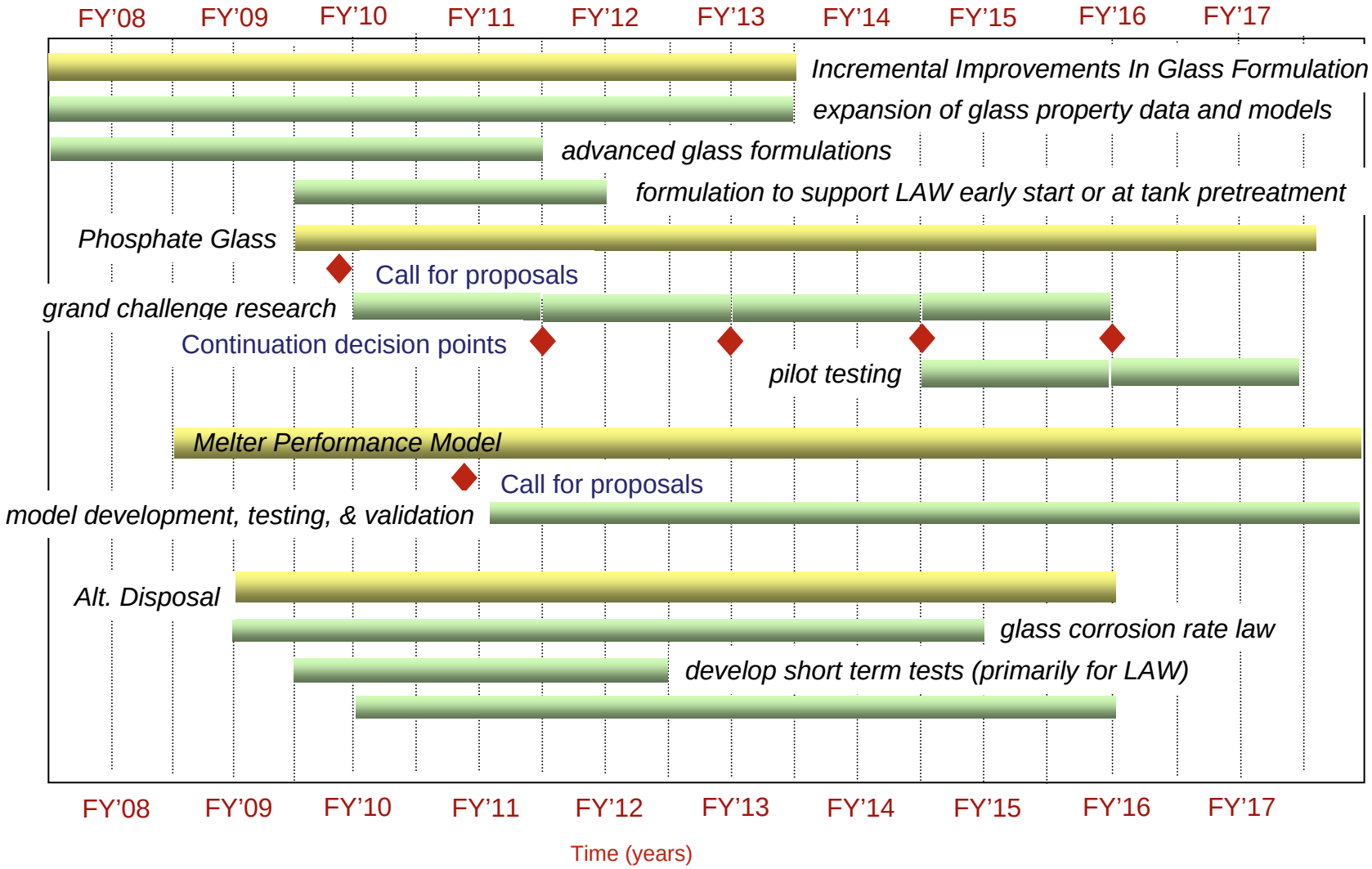
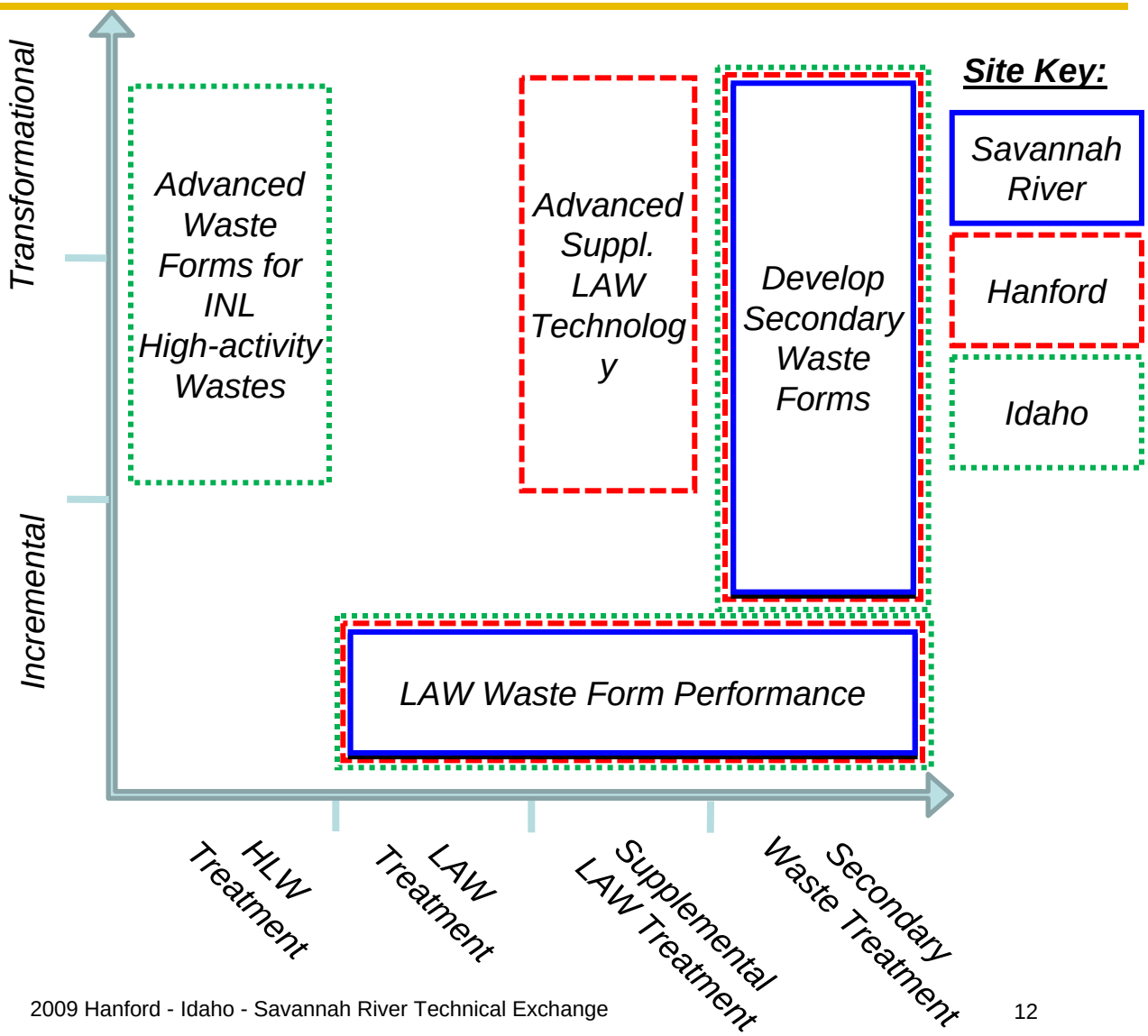
Schedule - 1.5.2



Research Activities - 1.5.3

- ***Develop Supplemental Treatment Technologies***
  - Advanced waste forms for INL HAW, RPP LAW, Secondary Wastes
  - LAW waste-form performance



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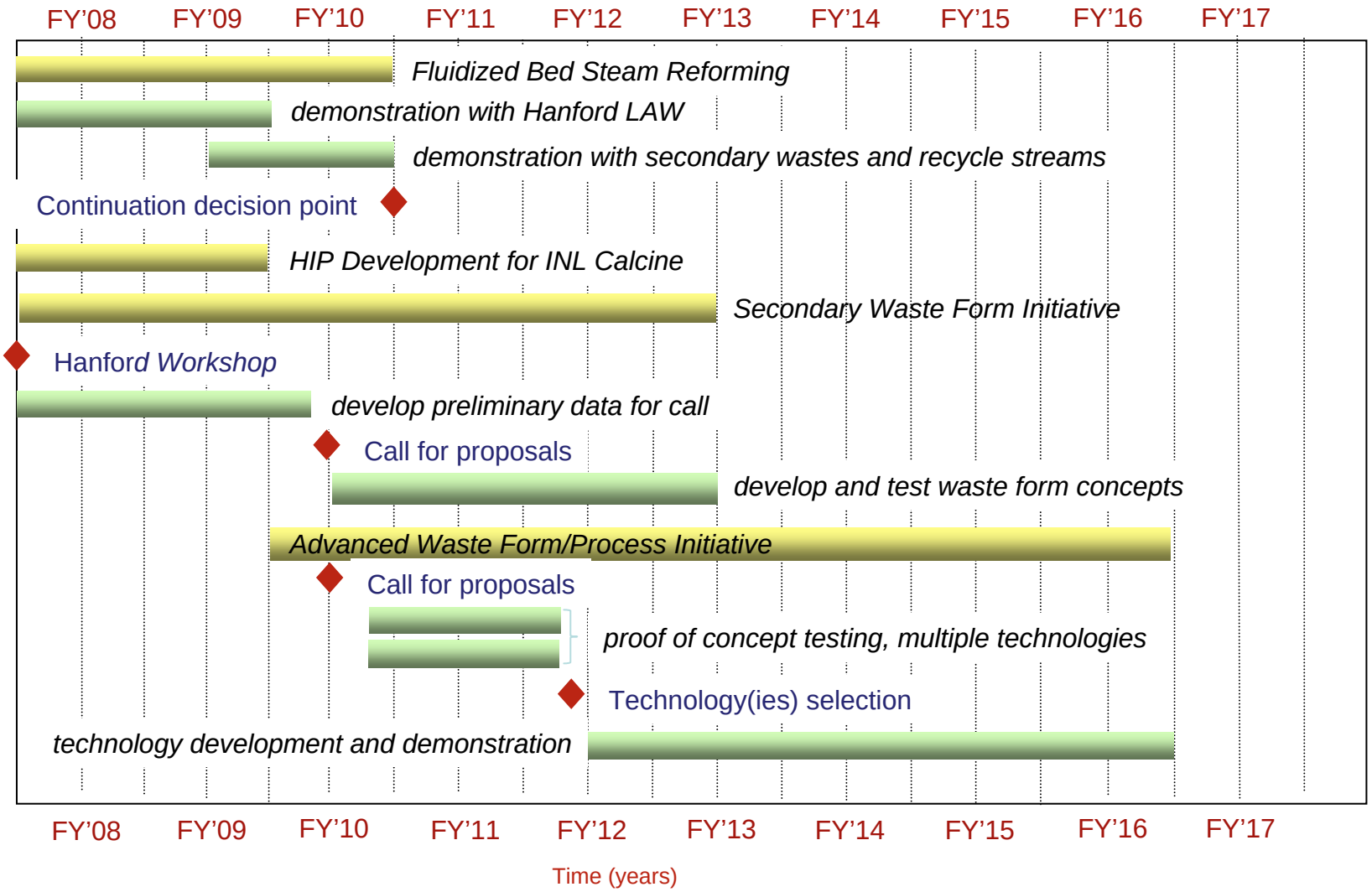
Schedule - 1.5.3



Summary and Conclusions

- **An integrated research program was developed for EM waste stabilization:**
  - balance between transformational and incremental improvements
  - multi-site benefit in activities
  - augments site specific research (performed by sites)
  - collaborative research being and to be performed my multiple institutions: PNNL, SRNL, VSL, ANSTO, MST, and completive research calls to universities, laboratories, and companies
  - priorities and programs for FY10 to be evaluated shortly

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Summary and Conclusions, Cont.

- **Significant accomplishments:**
  - high waste loaded glasses (RPP-HLW, RPP-LAW, SRS-HLW)
  - melting rate models/improvements (RPP-HLW, LWO-HLW)
  - HIP demonstration (INL-calcine)
  - FBSR demonstration (RPP-LAW, RPP-secondary waste)
  - CCIM demonstration and design (LWO-HLW)
  - crystal tolerant glass formulation (RPP-HLW)
  - initial work on rheological modifiers (RPP-HLW, LWO-HLW)
  - broader property models (RPP-HLW)
  - secondary waste requirements workshop (RPP-secondary waste)
- **Detailed descriptions in poster session**