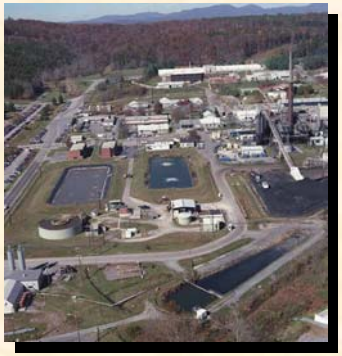
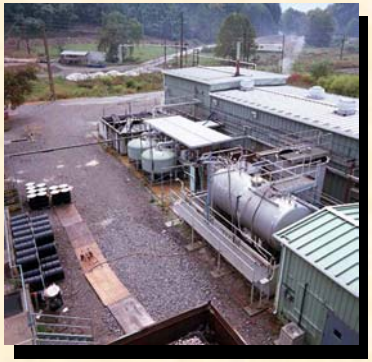
Oak Ridge National Laboratory

Liquid & Gaseous Waste Treatment System (LGWTS) Re-Engineering Project

March 17, 2004





Sharon Robinson, LGWTS Re-Engineering Project Manager
Dirk Van Hoesen, Environmental Management Program (Legacy) Manager
Carlo Melbihess, Infrastructure Consolidation Program Manager

Why Is Liquid Gaseous Waste Treatment System (LGWTS) Re-Engineering Needed?

It is DOE's policy that generators should be responsible for managing their wastes.

Key Drivers

- Support ORNL's DOE-SC mission for the next 50 years
- Disconnect DOE-SC facilities from existing DOE-EM facilities by 2010 (start of major EM Bethel Valley remediation)
- "Final" DOE-EM TRU sludge removal in FY05 – FY07 timeframe
- New ANSI standard for gaseous waste systems
- Reduce DOE-SC shared funding of DOE-EM treatment system operation (targeted to begin in 2005)

Waste Type	*UT-B Annual Operating Costs ($M)*	*BJC Annual Operating Costs ($M)*	*Total Annual Operating Costs ($M)*
Sanitary Waste	0.5		0.5
Process Waste	7	4	11
Liquid Low-Level Waste	0.5	4.3	4.8
Gaseous Waste	1	0.6	1.6
Total	9	8.9	17.9

Condition of ORNL's Liquid & Gaseous Waste Systems

Gaseous System

- *Central stack constructed in 1950*
  - Structural issues
- *Underground ducts constructed between 1950 - 1956*
  - Ducts leak and have structural/ integrity issues
- *Above-ground vents, scrubber, filter houses upgraded in 1986, fans upgraded in 1997*

Process System

- *Rad treatment portion constructed in 1975*
  - 1996 upgrade increased Sr-90 capacity
  - Installing additional zeolite columns for Cs-137
- *Non-rad treatment constructed in 1989*
- *Main lines insitu-formed in early 1990s*
- *Drain lines installed from the 1950s to 1987*
  - vulnerabilities identified

Sanitary/Sewage System

- *Constructed in 1985*
- *Lagoons used for surge capacity during heavy rains*
- *Main lines insitu-formed in 1990s*
  - Performing activities to reduce in-leakage
- *Potential vulnerabilities in 3000 Area drain lines*

LLLW System

- *Collection piping and tanks upgraded in mid-1990s*
- *2 evaporators*
  - 1st installed in 1965, 2nd installed in 1979 & replaced in 1994
  - 2 service tanks installed in 1964 & 3 installed in 1979
- *Concentrate storage*
  - 8 Melton Valley Storage Tanks installed in 1980
  - 6 Capacity Increase Tanks installed in 1998

LGWTS Re-Engineering Strategy…..
Eliminate Use Of Outdated Central Systems By 2010

Gaseous Waste

1. Treat and release at site of generation (e.g., local stacks)

Liquid Waste

1. Eliminate/redirect once-through cooling water from process and sanitary/sewage systems
2. Segregate radiological and hazardous liquids for local treatment
3. Redirect “incidental” process wastewater to sanitary/sewage treatment system
4. Provide treatment system for newly generated liquid low-level waste that produces solid TRU and low-level waste products

Strategy	Benefits
Once-Through Cooling Water •Eliminate discharges to process and sanitary systems	• Eliminates unnecessary treatment • Reduces costs
Sanitary/Sewage Waste System •Expand capacity •Upgrade surge system	• Provides additional capacity for future growth • Eliminates potential for partially treated sewage waste to reach watershed
Process Waste System • Eliminate use of system	• Eliminates significant costs associated with system operations • Eliminates potential for release to the environment • Eliminates use of ~ 50,000 linear feet of underground piping
Gaseous Waste System • Replace central system • Upgrade local stacks	• New local stacks eliminate use of centralized aging duct system • Upgrades reduce potential for widespread releases to the environment and contamination of personnel and property • New local stacks help insure continuous hot cell R&D operations • All stacks will meet or exceed new regulatory requirements
LLLW System • Replace existing LLLW system • Implement localized LLLW pretreatment • Implement centralized solidification of pretreated LLLW	• Pretreatment reduces waste disposal costs • Solidification provides a path forward for waste disposal to meet DOE requirements • Eliminates use of ~ 18,000 linear feet of underground piping • Eliminates long-term storage of large volumes of LLLW

Sanitary Waste/Sewage System

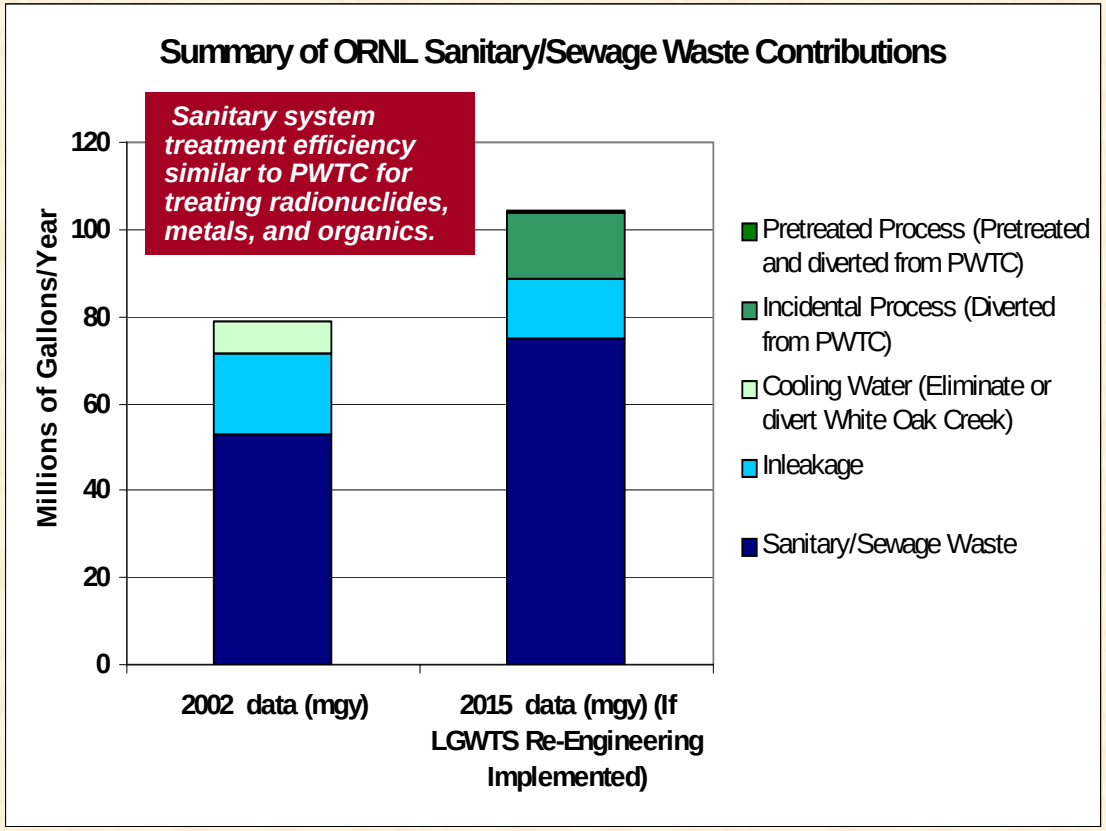
(Kitchen and bathroom drains, etc.)

Re-Engineering Goal: Provide increased capacity and tank-based system for sanitary/sewage waste and incidental process wastewater by 2010

System Specific Drivers: Additional sewage collection and treatment capacity is needed to handle future R&D facilities

Proposed Approach

- Eliminate once-through cooling water from sanitary/sewage system
  - *included in Bethel Valley process waste system GPP in FY05-FY08*
- Increase sanitary/sewage treatment plant capacity and upgrade to a tank-based system
  - *Treatment capacity increase GPP - $4M in FY05 – FY06*
  - *Surge capacity increase GPP (tank-based) - $4.3M in FY07 – FY08*
    - Close existing lagoon in place



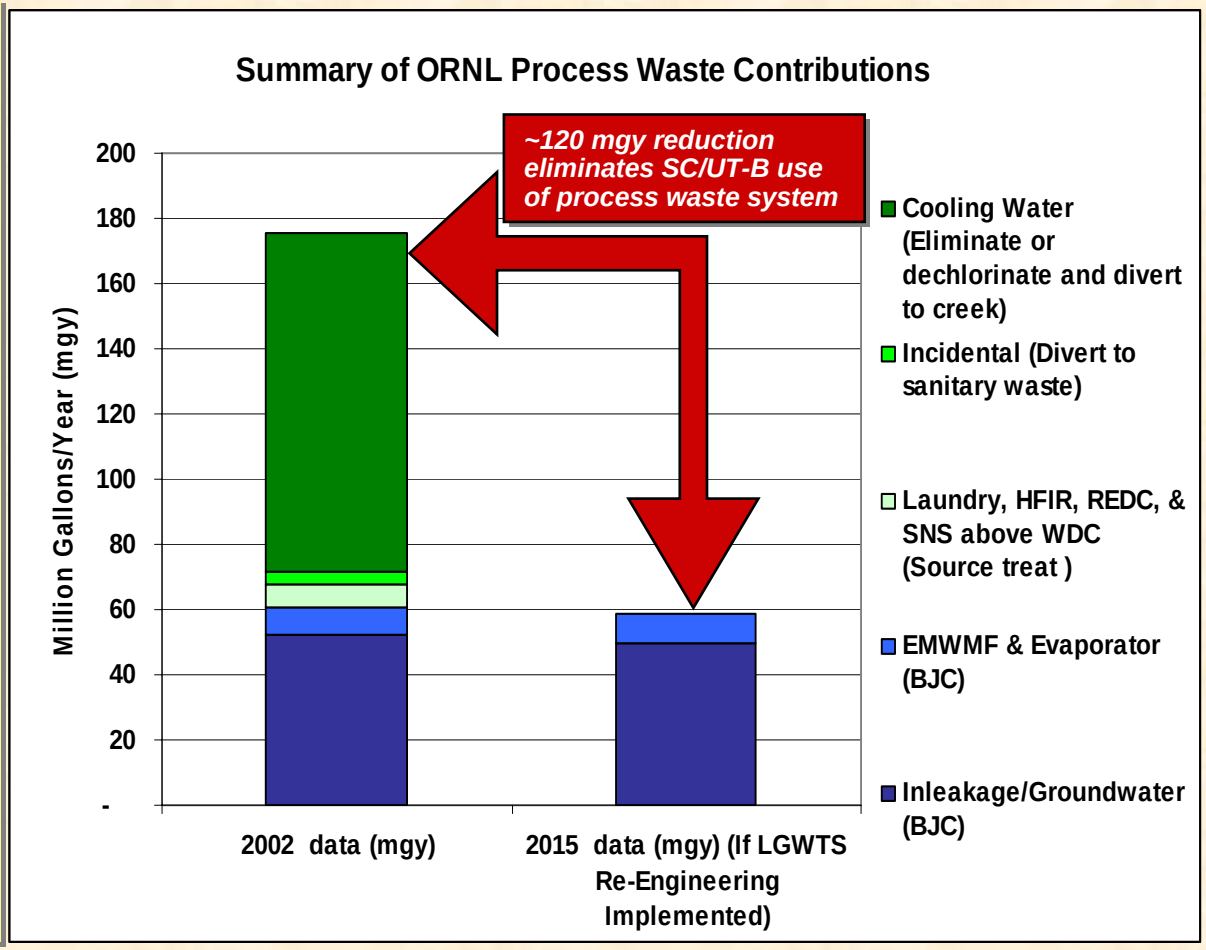
Process Waste System Complex (PWTC)

(Laboratory drains {UT-B} and groundwater {BJC})

Re-Engineering Goal: Eliminate use of process waste drains and DOE-SC/UT-B use of Process Waste Treatment Complex (PWTC) by 2010

Proposed Approach

- Reroute once-through cooling water to storm water system and incidental process waste to sanitary/sewage system
- Implement pretreatment of waste streams above ORNL Waste Discharge Criteria
- $2M General Plant Project (GPP) for elimination of Bethel Valley cooling water discharge in FY05-FY07
- $4M GPP for rerouting Bethel Valley process waste drains to sanitary/sewage waste system in FY07-FY09
- $1.7M GPP for elimination of Melton Valley discharge in FY08-FY09



Gaseous Waste System

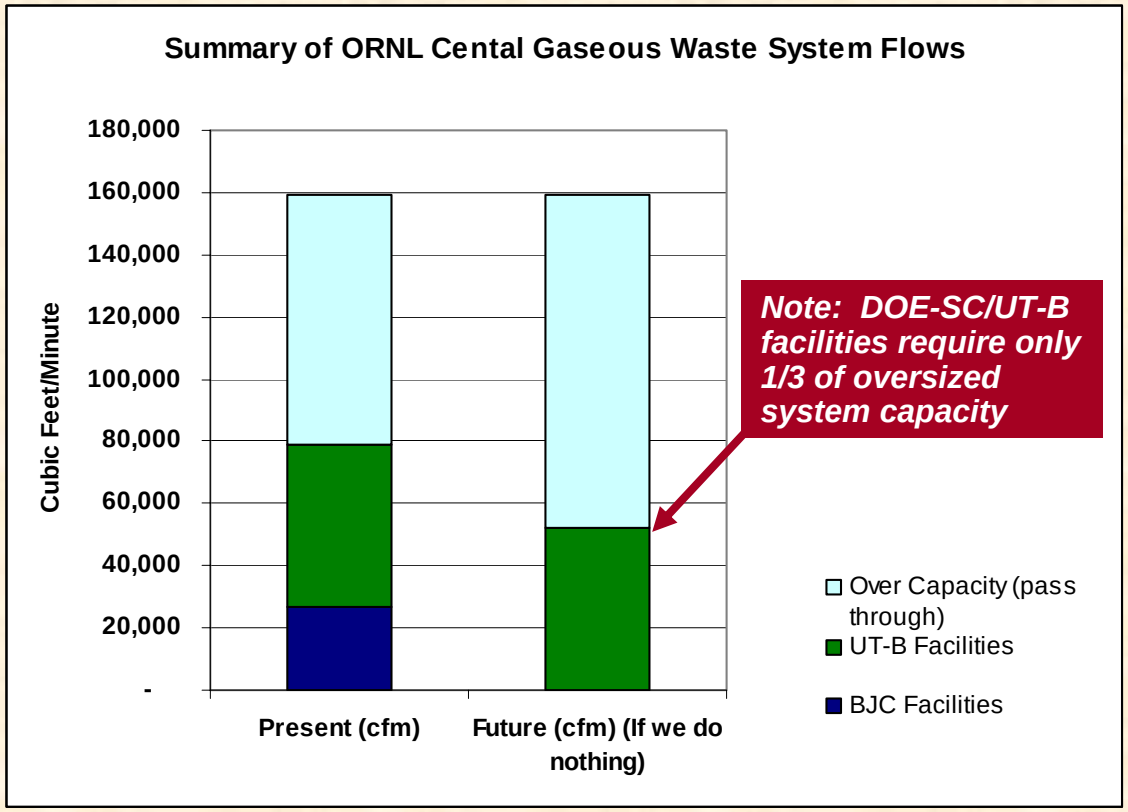
(Ventilation from lab hoods, hot cells, process equipment and some facilities)

Re-Engineering Goal: Disconnect from existing aged centralized treatment system by establishing new local treatment systems for SC/UT-B facilities

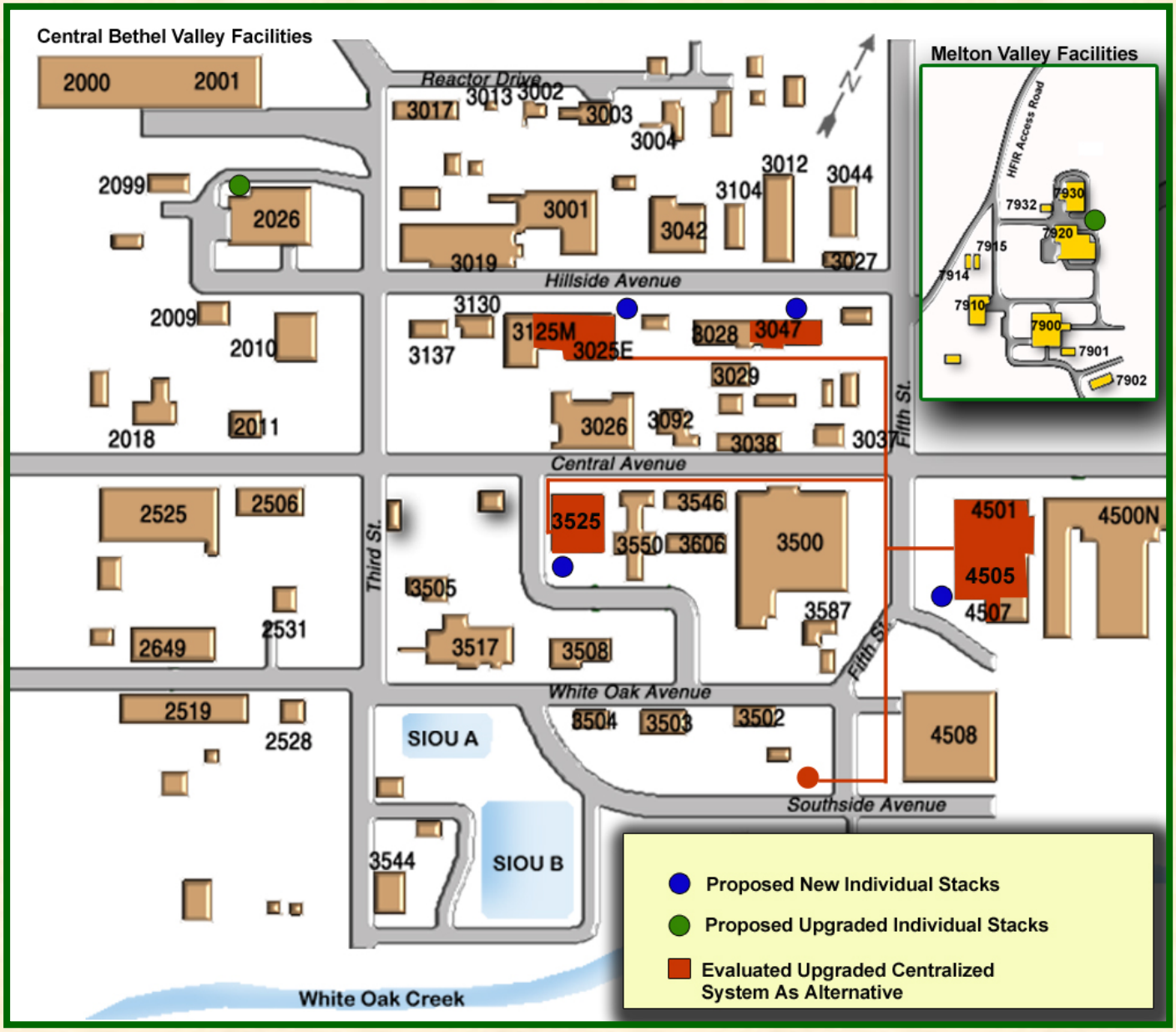
System Specific Drivers: Meet new ANSI NESHAPS standards and reflect hotcell consolidation decisions

Proposed Approach

- **Discontinue use of central system as soon as possible, but no later than 2010**
- **Provide local off-gas treatment capabilities for strategic facilities with $27.3M Line Item in FY05 – FY11**
- **Assumes major source stack for Cat. 2/3 nuclear facilities**
  - ***Buildings 2026, 3047, 3025E, 3525, 4501/4505/4500N, 7911***



Gaseous Waste System Concepts



LLLW System

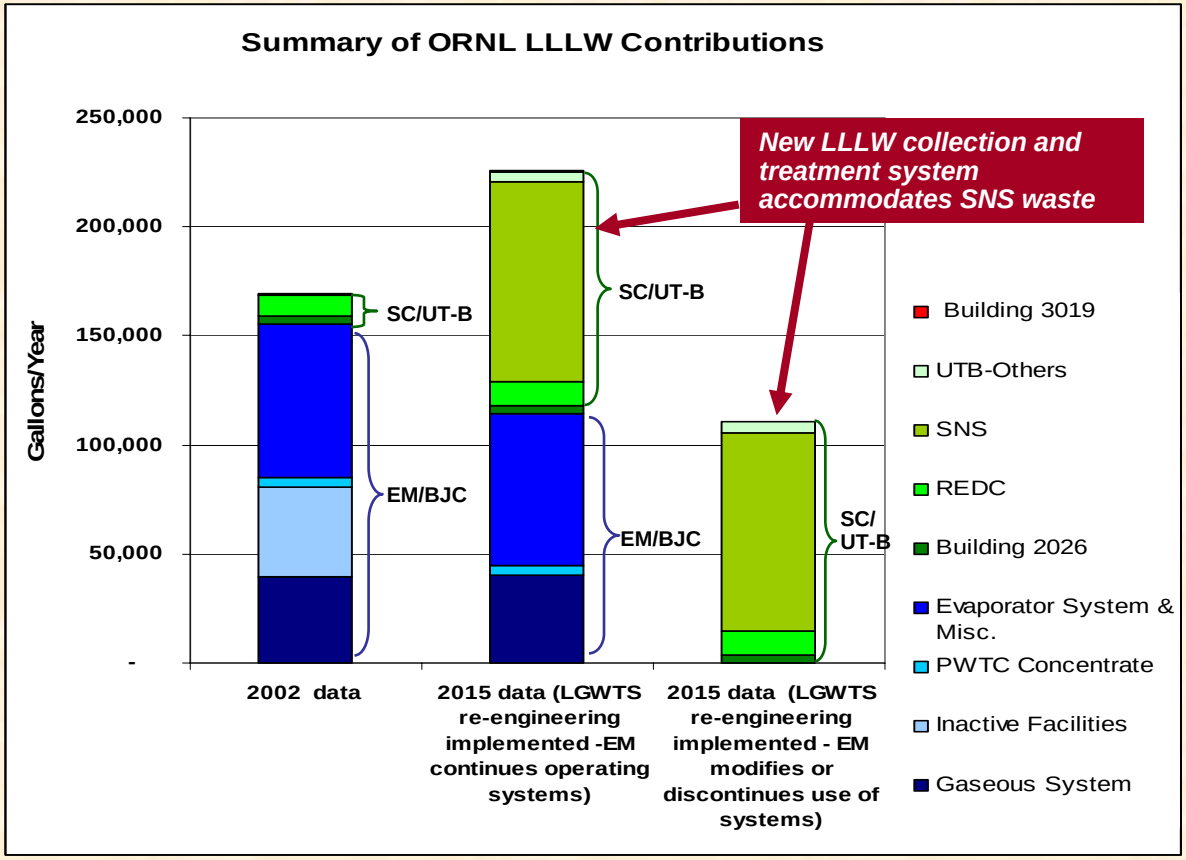
("Remote-handled" LLLW from hotcells and labs)

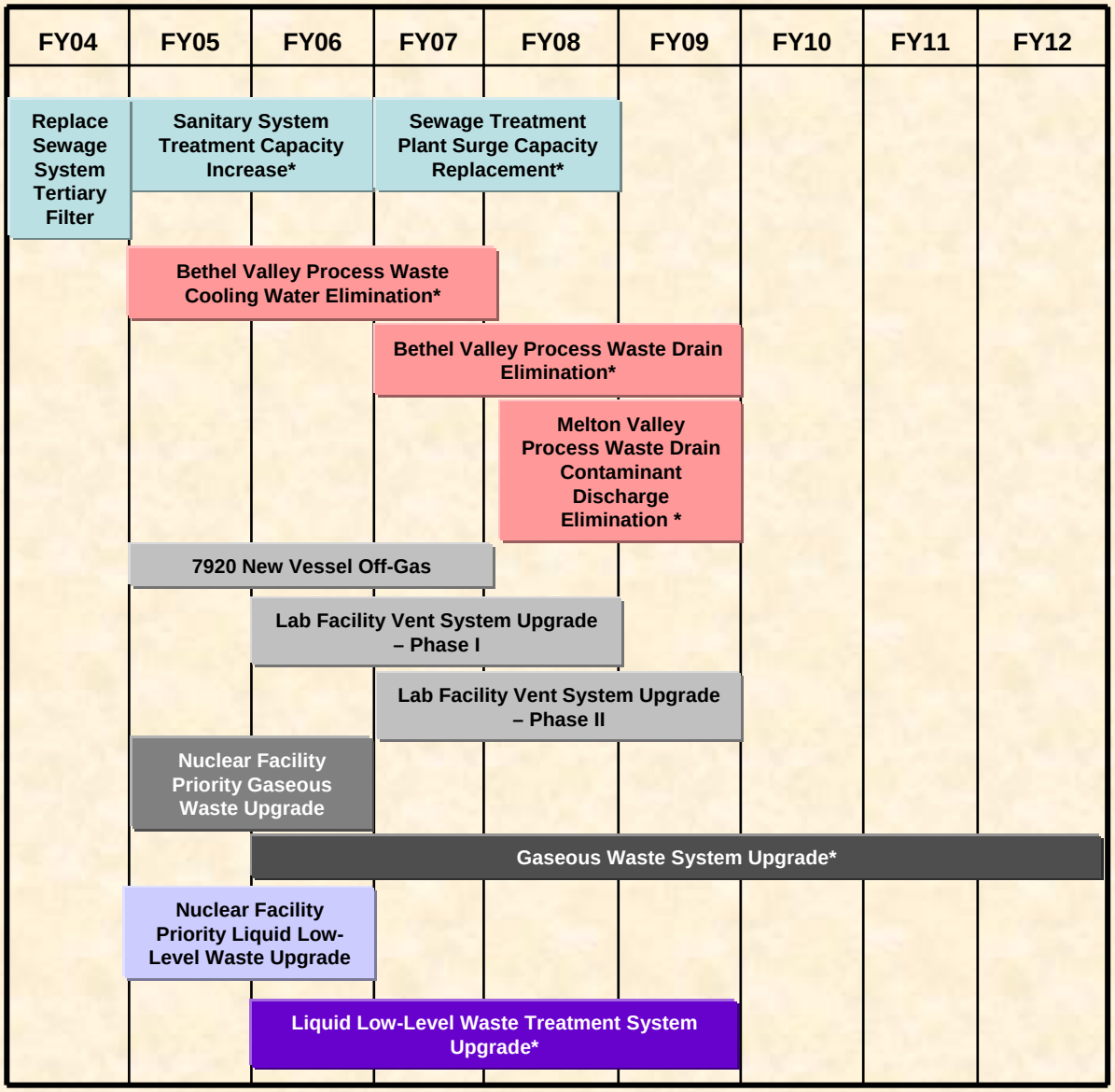
Re-Engineering Goal: Provide treatment system that produces solid TRU and low-level waste products to support strategic programs generating LLLW

System Specific Drivers: Treatment/disposal of TRU waste funded by EM through ~2008

Proposed Approach

- New DOESC/UT-B LLLW Waste Treatment System ($9.75M Line Item complete in FY09)
  - *Provide centralized solidification capability in Melton Valley*
  - *Pretreat REDC waste*
  - *Install truck/transfer station for Building 2026*
  - *Disconnect from existing collection system*





Estimated Re-Engineering/ Revitalization Costs

Sanitary/ Sewage System	$8.5 Million
Process Waste System	$7.7 Million
Vent/Off-Gas System	$21 Million
Gaseous Waste System	$27 Million
Liquid Low-Level Waste System	$9.5 Million

Capital cost recovery in less than 6 years, based on present operational costs.

Sanitary/Sewage System General Plant Project	Process Waste System General Plant Project	Vent/Off-Gas System	Gaseous Waste System General Plant Project	Gaseous Waste System Line Item Project	Liquid Low-Level Waste System General Plant Project	Liquid Low-Level Waste System Line Item Project

* Projects that must be implemented by 2010, the planned start date for the Bethel Valley Remediation Project.

SNS Waste Management Planning is Critical to LGWTS Re-Engineering FY04 Activities

Sanitary System

- *Evaluate impacts of FY04 SNS Waste Management Plan and ORNL Ten-Year Site Plan on sanitary waste*
- *Begin negotiations for NPDES permit modifications*
- *Draft capital project documentation*

Process System

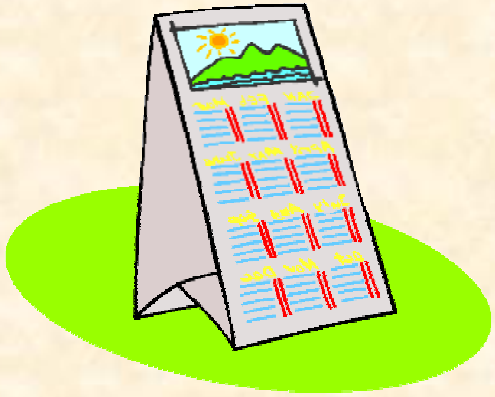
- *Evaluate impacts of FY04 SNS Waste Management Plan and ORNL Ten-Year Site Plan on process waste*
- *Draft capital project documentation*

Gaseous System

- *Evaluate impacts of Hot Cell Consolidation and Nuclear Initiatives*
- *Identify facilities as major or minor source*
- *Define design requirements for new stacks*
- *Interface project scope with NNFD capital projects*
- *Evaluate long-term upgrades required for 2026/7911*
- *Perform life-cycle cost analyses*
- *Draft capital project documentation*

LLLW System

- *Evaluate impact of FY04 SNS, Nuclear Initiatives, and Building 3019 Waste Management Plans on LLLW*
- *Evaluate REDC pretreatment options*
- *Evaluate options for new LLLW solidification facility*
- *Define approach, capability and costs for resulting RH-TRU and RH-LLW solids*
- *Perform life-cycle cost analyses*
- *Draft capital project documentation*

LGWST Re-Engineering FY04 Schedule

Action	*Complete By*
Revise baseline programmatic planning assumptions	**January 31, 2004**
Define system requirements	**April 15, 2004**
Develop capital project cost estimate	**June 30, 2004**
Develop capital project document	**August/September 2004**
Deliver reports to DOE ORO (PEP Milestone)	**August/September 2004**