Office of River Protection Technology Alternatives

Savannah River/Hanford/Idaho Technical Exchange

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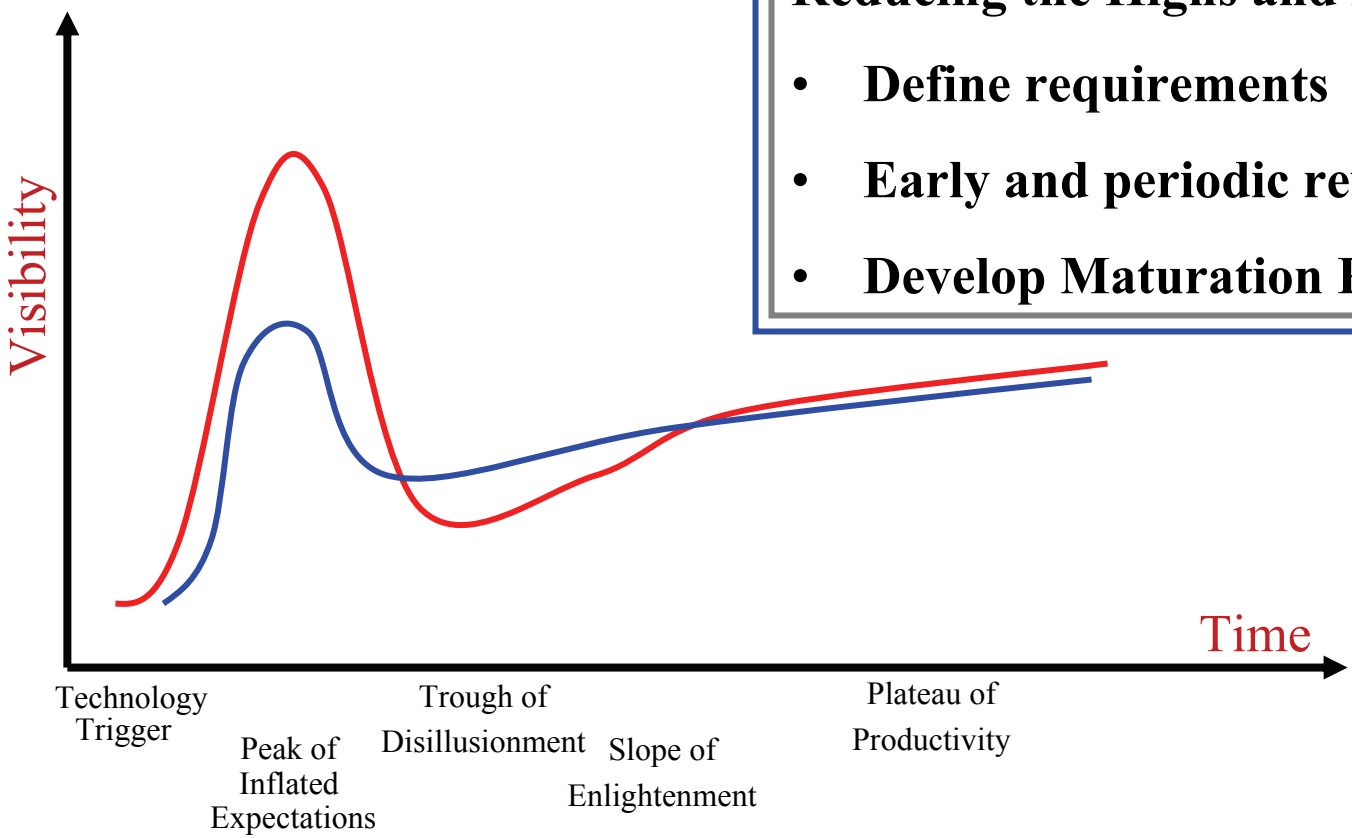
Office of River Protection

CH2MHILL Hanford Group, Inc. | Advanced Technologies and Laboratories International, Inc. | Bechtel National, Inc. | Washington Group International

EM Environmental Management

safety ❖ performance ❖ cleanup ❖ closure

Gartner Hype Cycle of Emerging Technologies



Reducing the Highs and Lows

- **Define requirements**
- **Early and periodic reviews**
- **Develop Maturation Plans**

Purpose of the TRAs

- Assess the maturity of Critical Technology Elements to:
  - Identify immature technologies and components (for tracking of maturity of development)
  - Identify technology development needs for immature technologies
  - Determine readiness of proceeding/continuing with design and construction
  - Develop a Maturation Plan for deployment

- Apply and refine TRL process for potential use by EM Design/Construct Projects

Methodology for Completion of TRAs

TRAs based upon method described in *Department of Defense, Technology Readiness Assessment (TRA) Handbook*, May 2005

Steps in TRA

1. Identification of Critical Technology Elements (CTEs)
2. Completion of TRL Assessment for each CTE
3. Completion of Technology Maturation Plan for technologies with TRL less than 6

ORP TRA Approach (1)

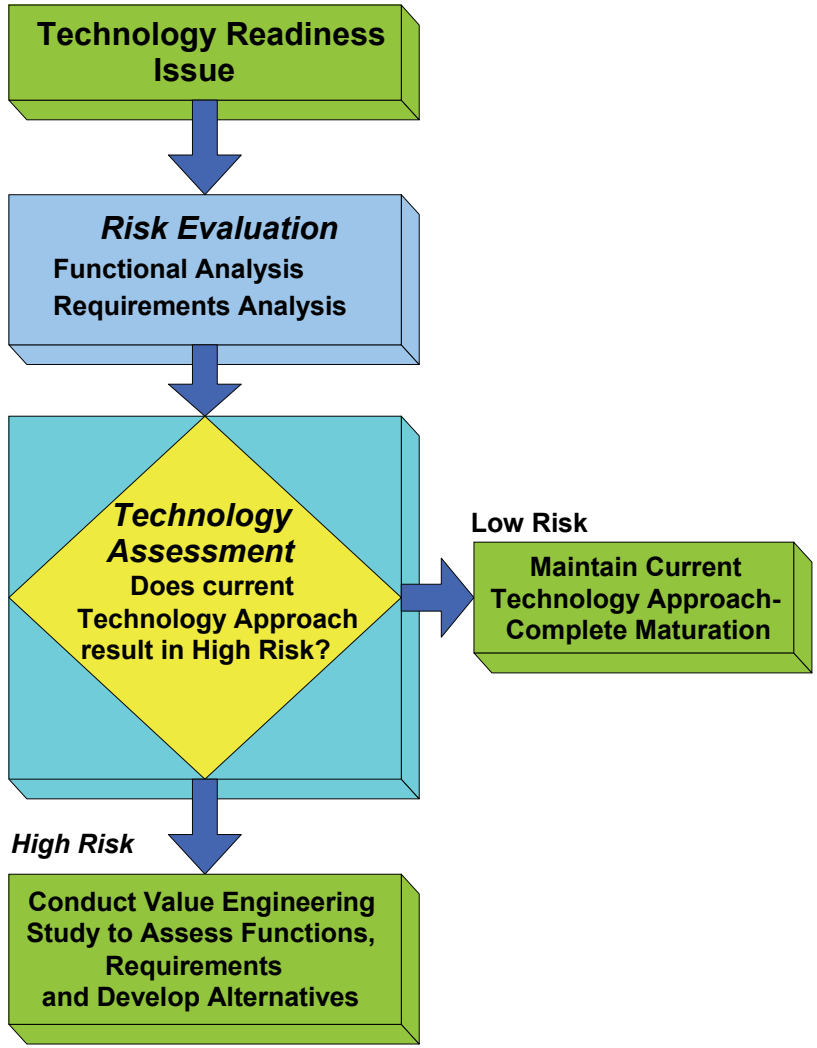
1. Critical Technology Element determination completed in 2 steps
   - Candidate CTE's identified by Assessment Team (DOE/Independent Contractor)
   - Final determination made using DoD criteria
2. Revision of TRL Level definitions for Radiochemical Processing
   - Comparison of NASA, DoD and DOE-EM scale prepared
3. TRLs determined using modified "Nolte" calculator (Level 1-6)
   - All criteria to be met to complete level
   - Software systems not evaluated

ORP TRA Approach (2)

4. Process involved due-diligence prior to, during, and following TRL scoring
   - Treated criteria scoring as a "finding of fact"
   - Performing Contractor involving in initial scoring
   - Final scoring done following additional due diligence by Assessment Team
5. TRA Report provided to Performer for factual accuracy review.
6. Technology Maturation Plan prepared for CTEs < 6 in WTP Reviews; TMP's for Tank Farm TRA reviews not complete

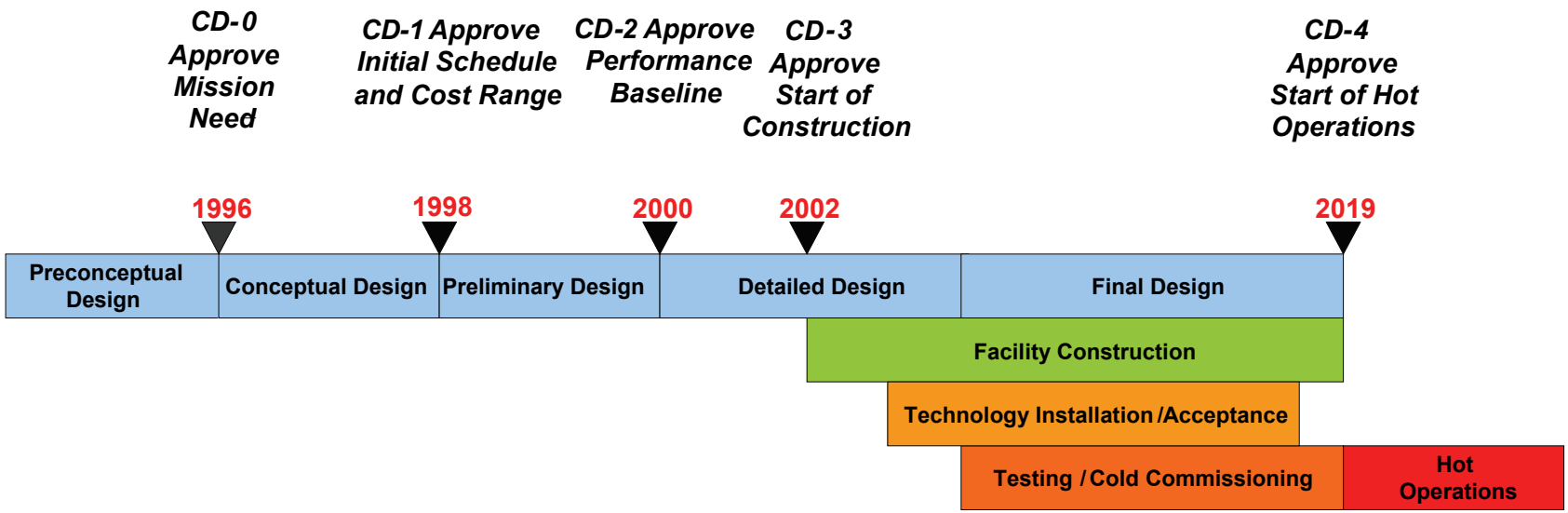
Development of Technology Maturation Plan

- CTE's < 6 were subjected to risk assessment to determine impact if not matured
- CTEs with significant consequence required technology maturation plans
- CTE < 4 required identification of alternative technology
- Principles of Systems Engineering and Value Engineering used in Development of Maturation Plan
  - Reassessment of Requirements
  - Reassessment of Functions

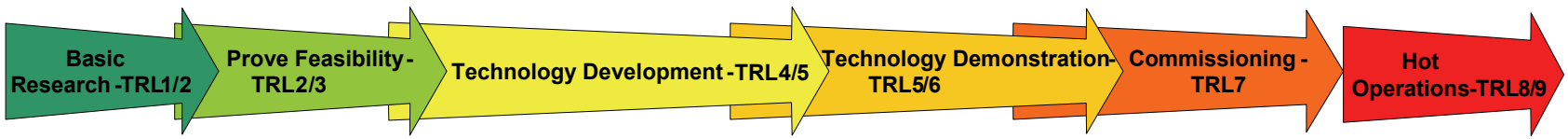


Technology Maturation Sequence and WTP Critical Decisions

DOE's Project Management Process as Applied to WTP



Technology Maturation



- WTP design concept is flexible and supports technology insertion (new/modified technology) after start of Construction
- Small number of CTEs rated less than TRL 6
- Cost of WTP delay would exceed cost risk of maturation
  - Maturity schedule will be managed within the current construction schedule

Observations on TRA Process

- DoD TRA provides structured, objective and clearly documented process
  - Helps identify specific actions needed to reduce programmatic risk
  - Complements DOE Design Oversight Process
- TRAs are a "finding of fact".
  - Specified criteria (e.g. "Nolte Calculator") essential to ensure consistency in assessments
- TRL Levels usually higher when strong technology program is completed, e.g. "make technology".
  - Choices to "buy technology" or "engineer technology" without testing have led to lower TRLs.
- "Relevant Environment" and "Prototypic Testing" are critical concepts in TRA.
  - Practical difficulties and limitations of large scale testing with actual wastes with increased cost, complexity and risk may outweigh its value
  - Project design must mature with technology to ensure that testing is relevant.

ORP TRAs Performed

Three TRA's Completed for WTP

- **Technology Readiness Assessment for the Waste Treatment and Immobilization Plant (WTP) Analytical Laboratory, Balance of Facilities and LAW Waste Vitrification Facilities**

- **Technology Readiness Assessment for the Waste Treatment and Immobilization Plant (WTP) HLW Waste Vitrification Facility,**

- **Technology Readiness Assessment for the Waste Treatment and Immobilization Plant (WTP) Pretreatment Facility**

Eight TRA's In-process for Tank Farms

- **Bulk Vitrification**
- **Steam Reforming**
- **Cementation of LAW**
- **Tank-side Ion Exchange**
- **Fractional Crystallization**
- **Caustic Recycle**
- **Selective Dissolution**
- **Spintek Filter**

ORP Technical Opportunities To Meet Project Risks

Identified Risks

- Supplemental LAW Treatment (also EM-20 Support) (also EM-20 Support)
- Waste Management Area Closure (Tank Farm Closure)
- Single Shell Tank Waste Retrieval (also EM-20 Support)
- Single Shell Tank Closure
- DST Space Availability for Mission
- Hydrogen Accumulation in Pipes and Ancillary Vessels
- Viability of Remote and Contact Handled TRU Path to WIPP
- Melter Failures
- Yucca Mountain Availability
- WTP Operational Readiness Review
- Worker Health and Safety
- Disposition of WTP Failed Melters
- Residual Tank Waste Determination (also EM-20 Support)
- WTP Waste Acceptance

ORP Technical Opportunities To Meet Project Risks

Potential New Risks

- **Increased Sodium Loading in Tank Waste**
- **WTP Feed Specification**
- **WTP Technology Maturity**
- **Technetium and Iodine Concentrations in Secondary Wastes**
- **Changes in schedule of Soils and Groundwater Cleanup**
- **Non-WTP Pretreatment Processes**
- **Availability of Specialty Materials for WTP Melters**