Federal Remediation Technologies Roundtable

The Early Years

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Background at EPA

- Superfund Law passed in 1980
- Superfund Law amended in 1986—over 300 pp.
- Technology Innovation Office created from staff office to advocate for new technologies
  - 90 day study to talk to consultants, Fed Agencies, Regions, states, universities

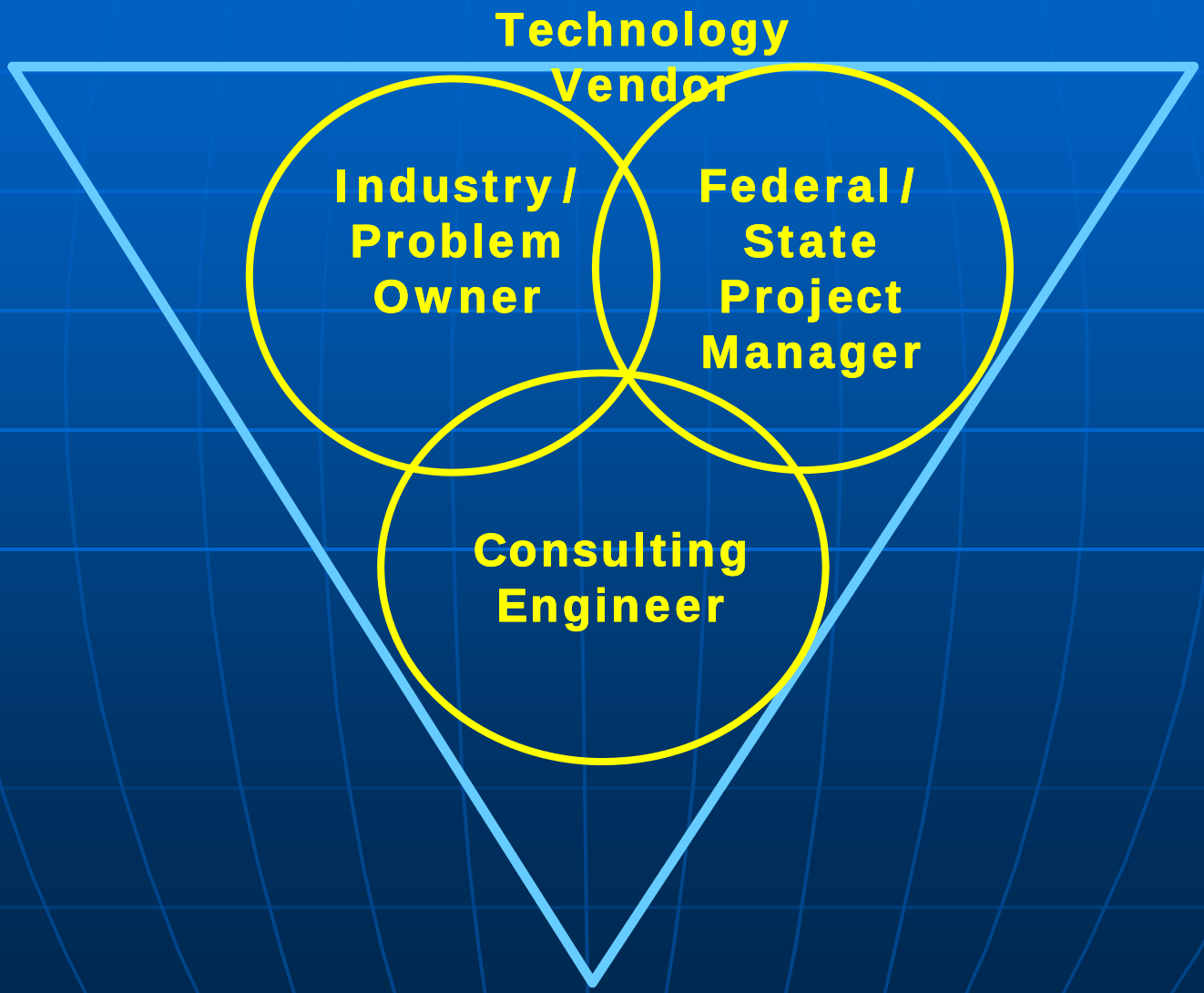
Context in 1980s-1990s

- June 1988
  - ”Right Train, Wrong Track: Failed Leadership in SF Program”—from public interest groups
  - “Are We Cleaning Up? 10 Superfund Case Studies”—Office of Technology Assessment
  - Criticisms: only capping and containing; incineration
- 1989—First U.S. commercial internet provider—grew in 1990’s
  - Information sharing with publications and conferences
  - “Bulletin boards” available early 1990s
  - NO Google or Wikipedia!

Context (cont.)

- March 1989—EXXON Valdez spilled ~11 million barrels in Prince William Sound
  - Bioremediation “Summit” hosted by EPA with 60 participants from all sectors
- SITE (demo program at EPA) began in 1986; first results in 1990s
- Incineration and physical containment were the only familiar answers
- The era of “dig and haul” and “pump and pray”

Dynamics of Solving Environmental Problems



Barriers to Implementing Innovative Technologies

Federal Agency Situation

- Relatively new law with need for new budgets for clean up
- Sole “face” of EPA was “enforcement”
  - No partnerships
  - Revitalization and reuse were not even heard of
  - Lack capacity for effective citizen involvement
- Dependent on same consultants with little remediation training/expertise

Environmental Technology (Bazaar) Marketplace

- Traditional commercialization issues
- Market is driven and constrained by regulations
- Enforcement is critical
- Stakeholder receptivity/fragmented state markets
- Transactions mediated by consulting engineers
- Risk-laden milieu
- Verification and testing needed
- Procurement/financial considerations

Convening the Roundtable

- EPA motivation: Public funds were being spent by Federal agencies and experience (i.e. cost and performance data) could be gleaned for all to use
- Problems: Distrust of EPA, little motivation to “mine” data, no efficient way to exchange info

Covening (cont.)

- Sent letters/met with each Agency
- “Roundtable” chosen to signify equal stakes/participation/ benefits
  - Proposed rotating meeting chairs
  - EPA supplied contractor support
- Explained mutual benefits
  - Keep up on current technology (and policy developments)
  - EPA attendees from SF, RCRA, ORD and enforcement offices as attraction for information gathering

Early FRTR Developments

- Easy—Compile existing information
  - **Bibliography of Federal Reports and Publications** Describing Alternative and Innovative Treatment Technologies For Corrective Action and Site Remediation, 1991
  - **Synopses of Federal Demonstrations** of Innovative Site Remediation Technologies, Third Edition, August 1993
  - **Accessing Federal Data Bases** for Contaminated Site Clean-Up Technologies, Fourth Edition, October 1995
  - Federal **Publications on Alternative and Innovative Treatment Technologies** for Corrective Action and Site Remediation, Fourth Edition, October 1995
- Focus on building trust, participation, and value

  N.B. Dec. 1991 decision to follow technologies for site characterization and monitoring!

Later FRTR Developments

- Allowed dialogue with Agencies and EPA enforcement on policy for demonstrating innovative technologies
- Work groups—formed on mutual interests and built on single agency efforts
  - Jointly developed cost and performance templates to document case studies--1994
    - Allowed Agencies to showcase their work (and build in templates as costs to document projects)
- FRTR Remediation **Technologies Screening Matrix** and Reference Guide, Version III, November 1997
- Internet/web site allowed widespread document availability and searchable data bases

FRTR—Later (cont.)

- Specialty conferences allowed FRTR “brand” to be more public
- Meetings opened channels of communication between EPA and Federal agencies for resolving problems/enabling technology efforts
- Agencies “owned” meeting chairmanship, agendas, and funding of admin. support
- Topics broadened to include groundwater assessment and remediation, decision support tools, cost analysis, systems optimization, nanotechnology, green remediation, and more

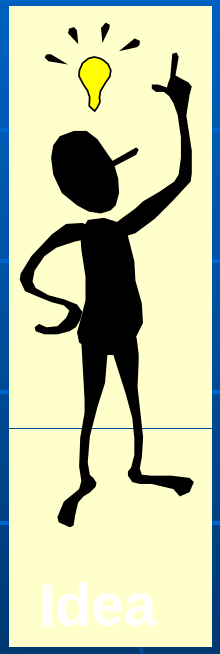
FRTR and Collaboration

- FRTR—forum/platform to engage with other entities
  - Clean Sites—private sector PRP organization
  - AAEES—Consulting engineers professional organization
  - ITRC—joint effort of states re: contaminated sites
  - NATO—FRTR projects tapped for highlighting to other countries

1990-2015

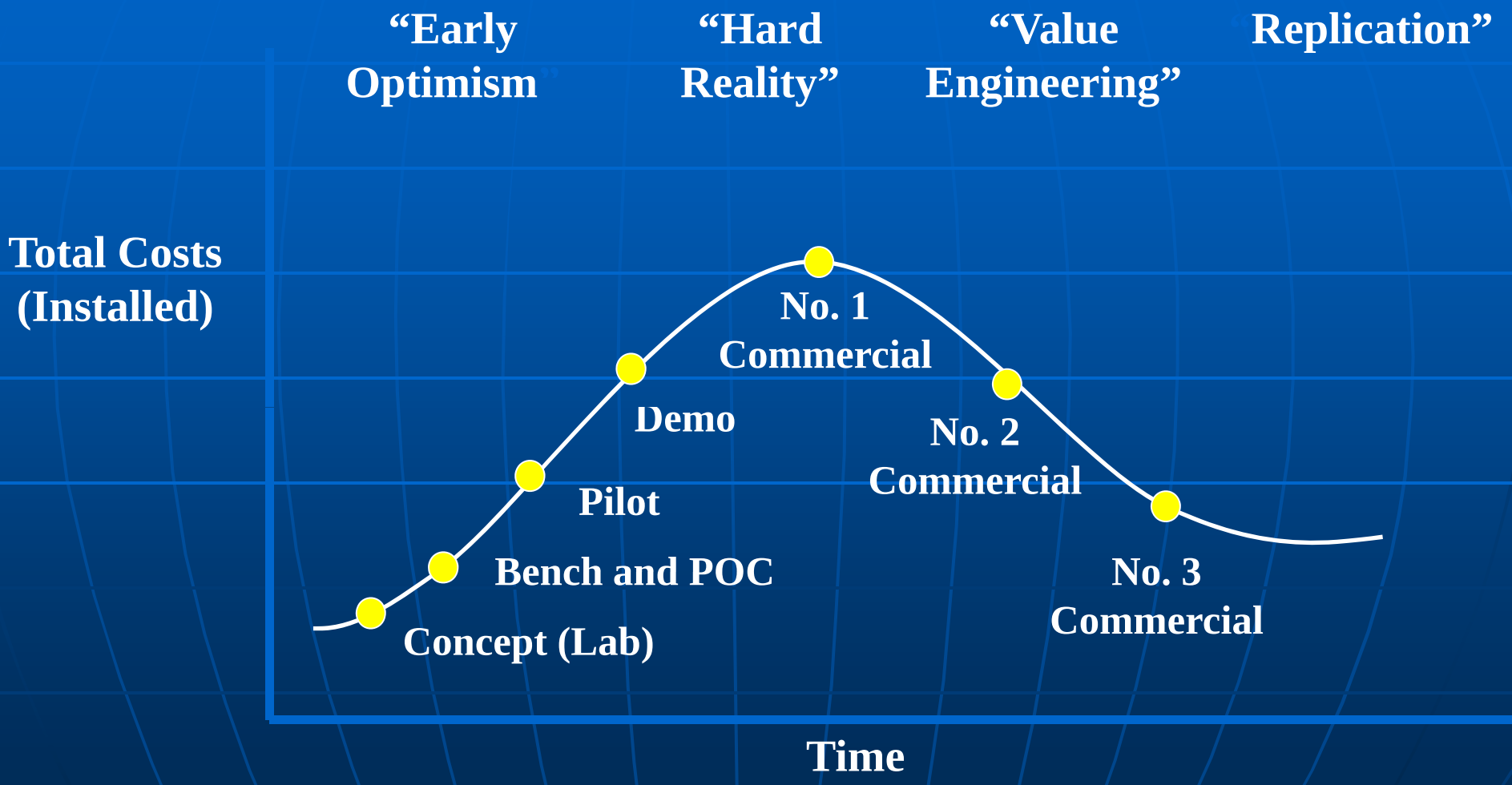
25 YEARS AND COUNTING

Environmental Technology Development Cycle

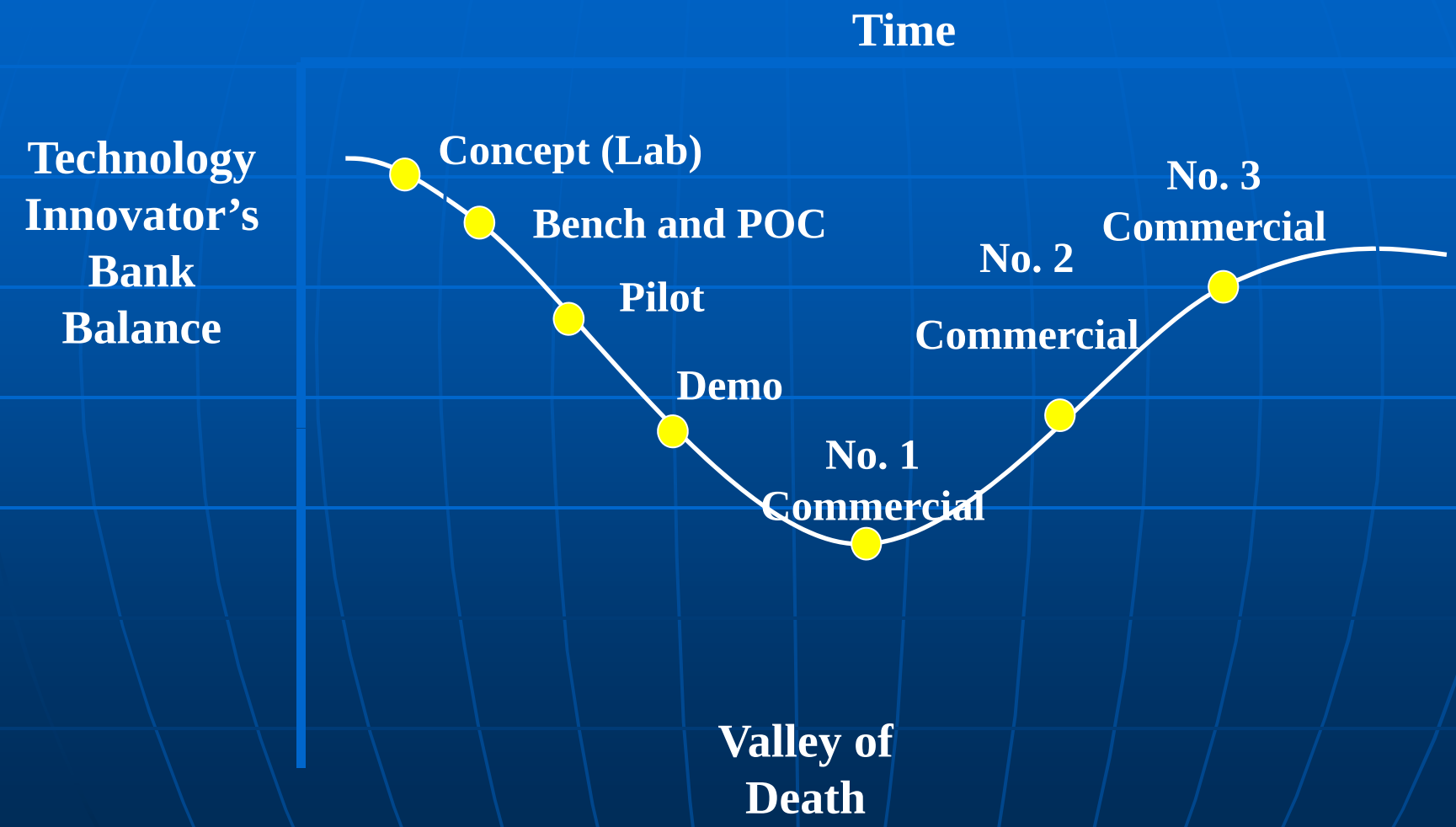


Proof of Concept → Bench Scale → Pilot Scale → Demon-stration → Commer-cialization

Stages of Technology Commercialization



Technology Innovator's View of Commercialization Process



Ranking Criteria for Difficulty in Remediating Ground Water

TIO Update to NRC Table, October 2002

Hydrogeology	Mobile Dissolved (Degrades/ Volatilizes)	Mobile Dissolved	Strongly Sorbed, Dissolved	Strongly Sorbed, Dissolved (Degrades/ Volatilizes)	Separate Phase LNAPL	Separate Phase DNAPL
Homogeneous, Single Layer	1	1-2	2	2-3	2-3 ?	1-2
Homogeneous, Multiple Layers	1	1-2	2	2-3	2-3	2 ?
Heterogenous, Single Layer	2	2	3	3	3	3
Heterogenous, Multiple Layers	2	2	3	3	3	4
Fractured Bedrock	3	3	3	3	4	4

least difficult = 1 / most difficult = 4