# Micro Nano Breakthrough Conference

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**Architects, Engineers and Constructors**

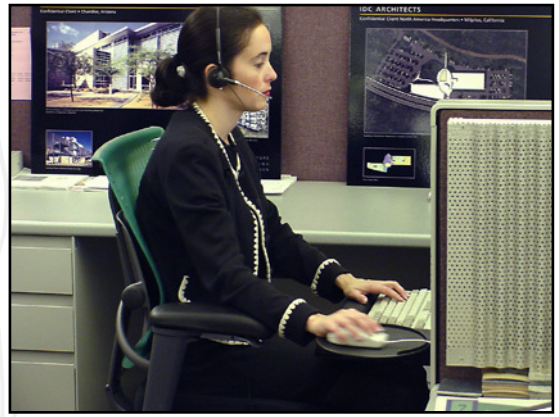
A TOTAL PROJECT DELIVERY RESOURCE

CH2MHILL

IDC

Industrial Design & Construction

18 Offices Worldwide



100% Employee Owned
Incorporated 1985
Workforce of 1,000

Part of CH2M HILL Family of Companies

# Why Do We Do R&D?

- Search for Knowledge
- Betterment of Humanity
- Save the Planet
- Make Money
- Economic Development
- Military

# Nano Research Objectives Matrix

| | Knowledge | Humanity | The Planet | Money | EconomicDevelopment | Military |
|---|---|---|---|---|---|---|
| **Scientists** | X | | | | | |
| **Environmental Groups** | | | X | | | |
| **Humanitarians** | | X | | | | |
| **Capitalists** | | | | X | | |
| **Local Government** | | | | | X | |
| **U.S. Government** | X | X | X | | | X |

# Nano Research Funding

| | Knowledge | Humanity | The Planet | Money | EconomicDevelopment | Military | |
|---|---|---|---|---|---|---|---|
| Scientists | X | | | | | | No Money |
| Environmental Groups | | | X | | | | Little Money |
| Humanitarians | | X | | | | | |
| Capitalists | | | | X | | | $ |
| Local Government | | | | | X | | $ |
| U.S. Government | X | X | X | | | X | Big Money |

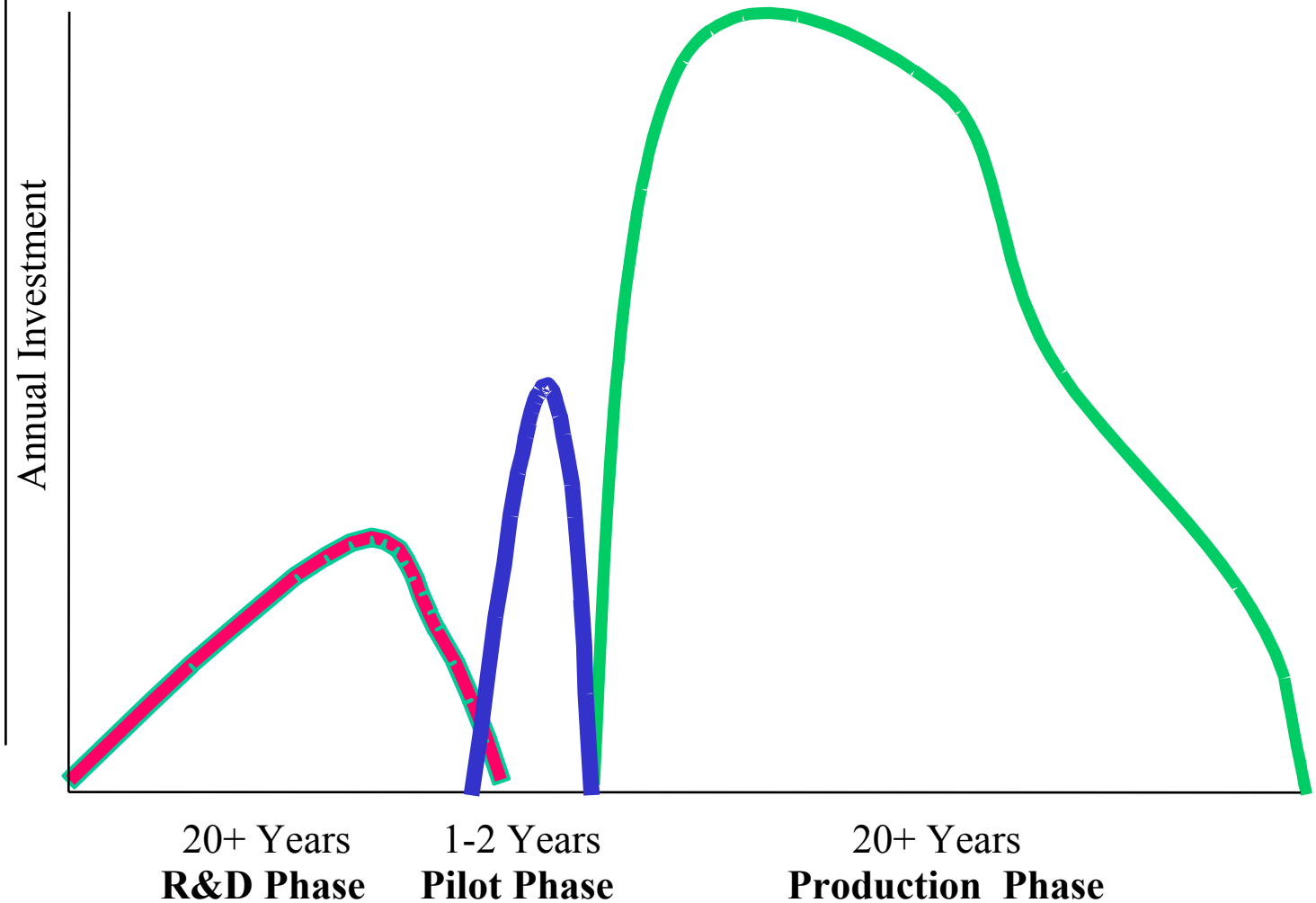
# Barriers to Job Movement

- Job is dependant on non-movable natural resource (timber, oil, coal …)
- Transportation cost or distribution system restricts job transfer (bartender, cook, retail…)
- Special infrastructure is needed (sea port)
- High factory capital investment restricts ability to move jobs (semiconductor mfg., auto plants)

# R&D to Manufacturing transition

- R&D organization
  - 20% to 50% PhDs
  - Flexible tools
  - Variable processes
  - Knowledge driven
- Manufacturing organization
  - <1% PhDs
  - Inflexible tools
  - Stable processes
  - Cost and Market driven

# Technology Product Life Cycle

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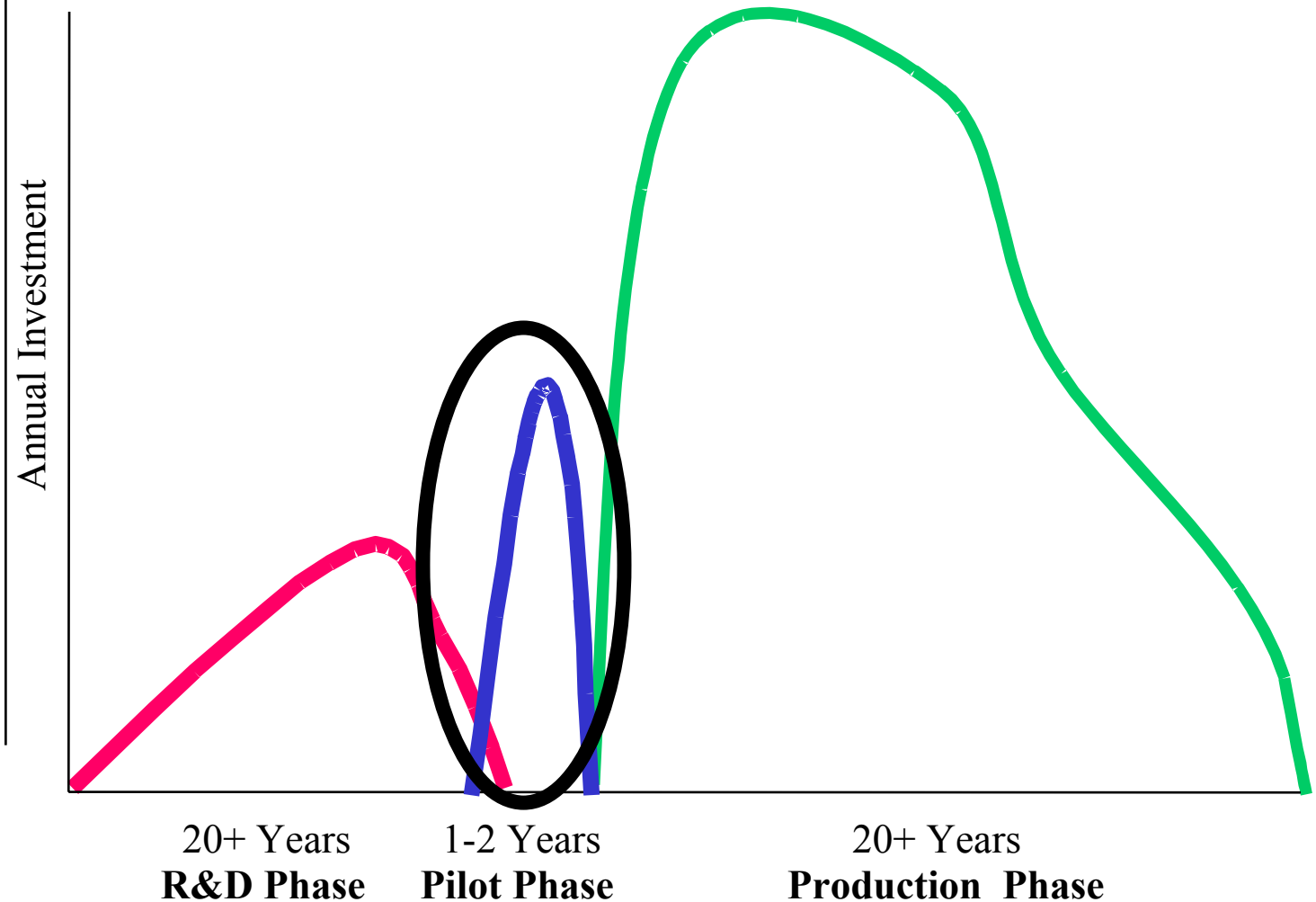
# Critical Transition Step

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# Logic flow

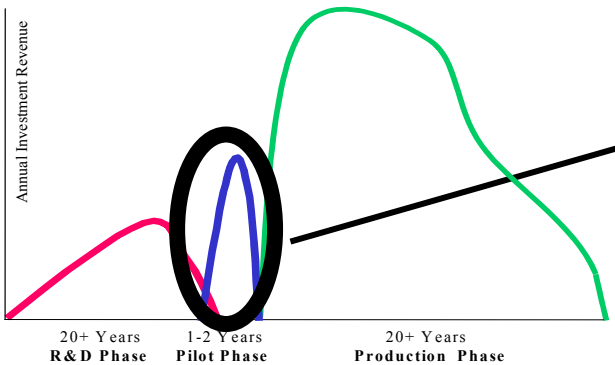
| | Knowledge | Humanity | The Planet | Money | Economic | Military |
|---|---|---|---|---|---|---|
| **Scientists** | X | | | | | |
| **Environmental** | | | X | | | |
| **Humanitarians** | | X | | | | |
| **Capitalists** | | | | X | | |
| **Local Government** | | | | | X | |
| **U.S. Government** | X | X | X | | | X |

Local Governments
Invest to Create Good Jobs

Barriers

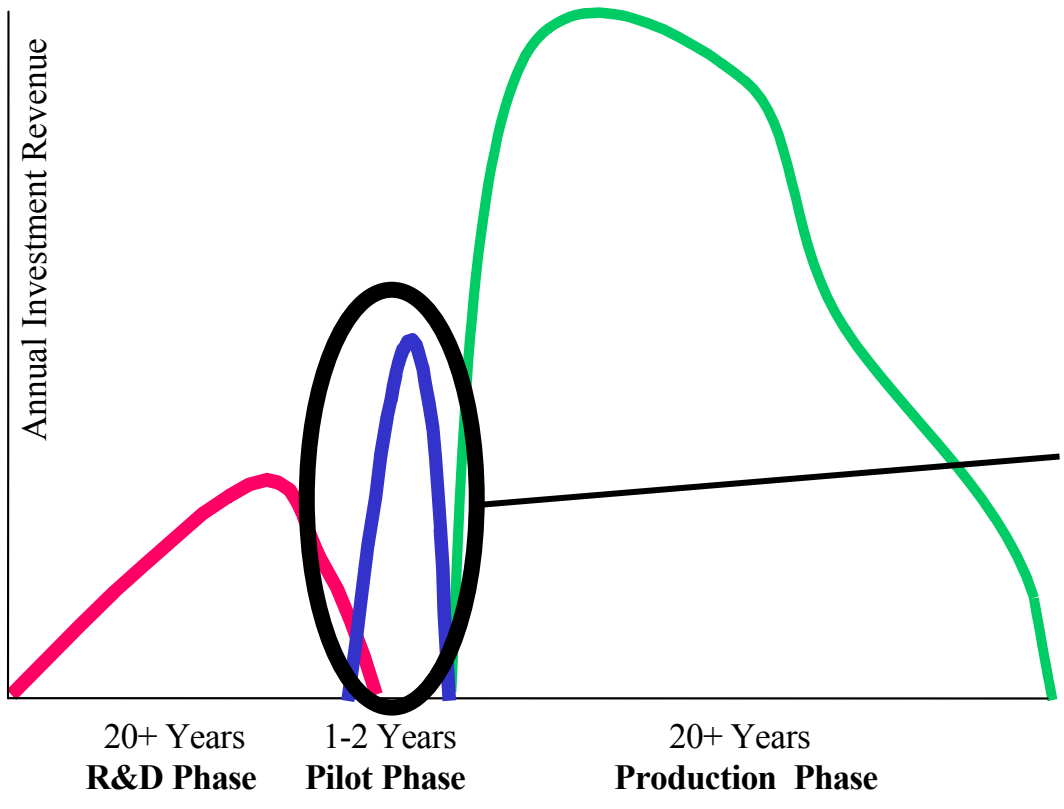
- Natural Resources
- Transportation
- Special Infrastructure
- High Capital Investment

High Capital Investment is a barrier to job movement




The Pilot/Development Step is a Critical to transition from R&D to volume

# Critical Transition Step




Pilot/Development Step is the Critical Transition Component