

# From Research to Commercial

## *Vaulting the Valley of Death*

Scaling Up Bio

Fairmont Château Laurier

Ottawa

November 16, 2016

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# Inco Voisey Bay Nickel Project



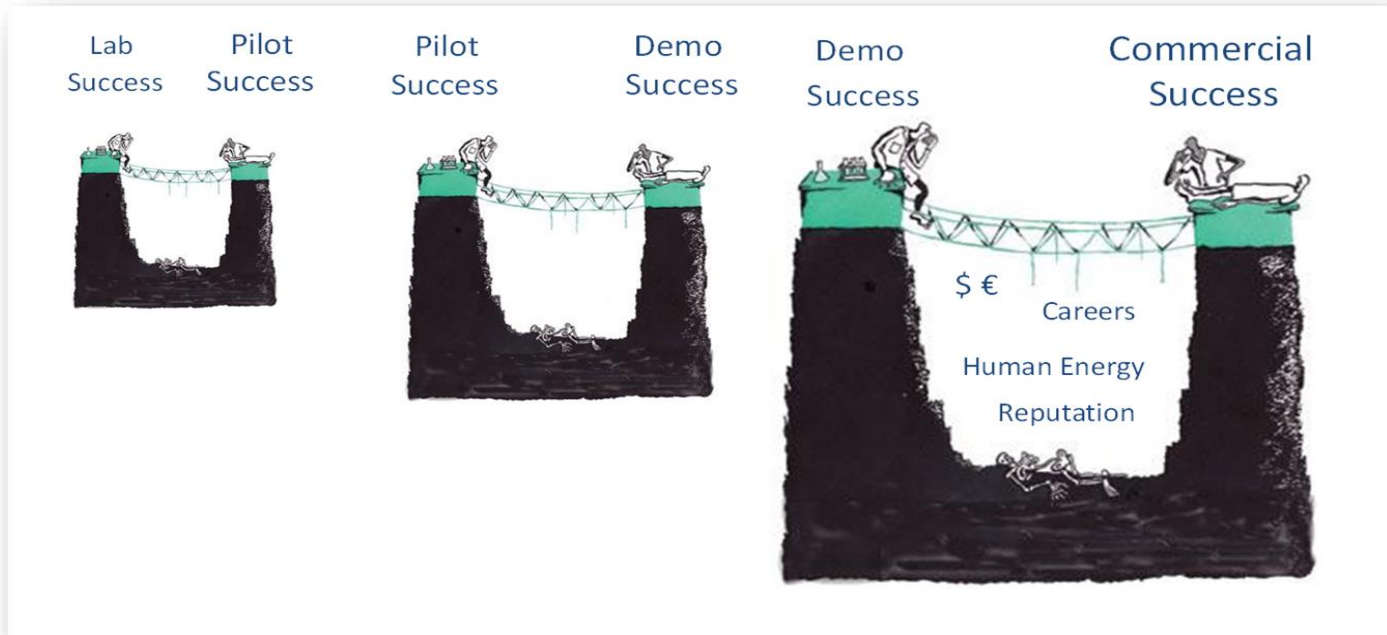
100 X



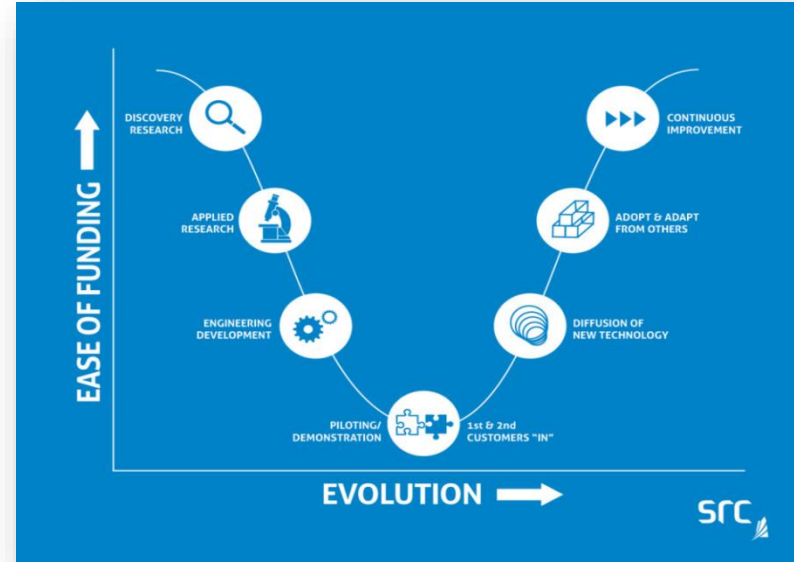
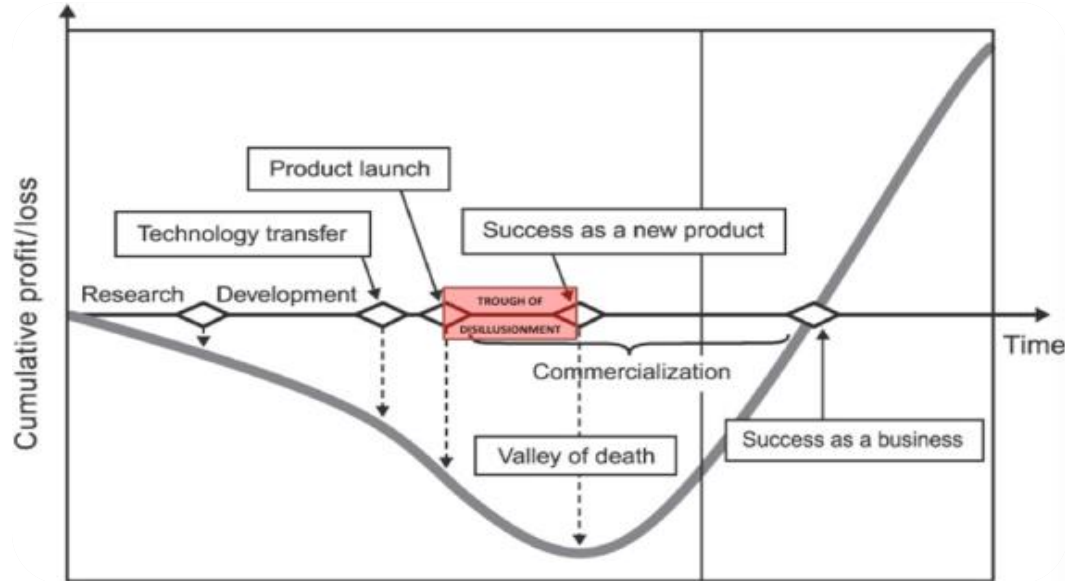
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# Commercialization Obstacles



# What is the Valley of Death?



# Zeton's Unique Perspective



❖ Unique project execution

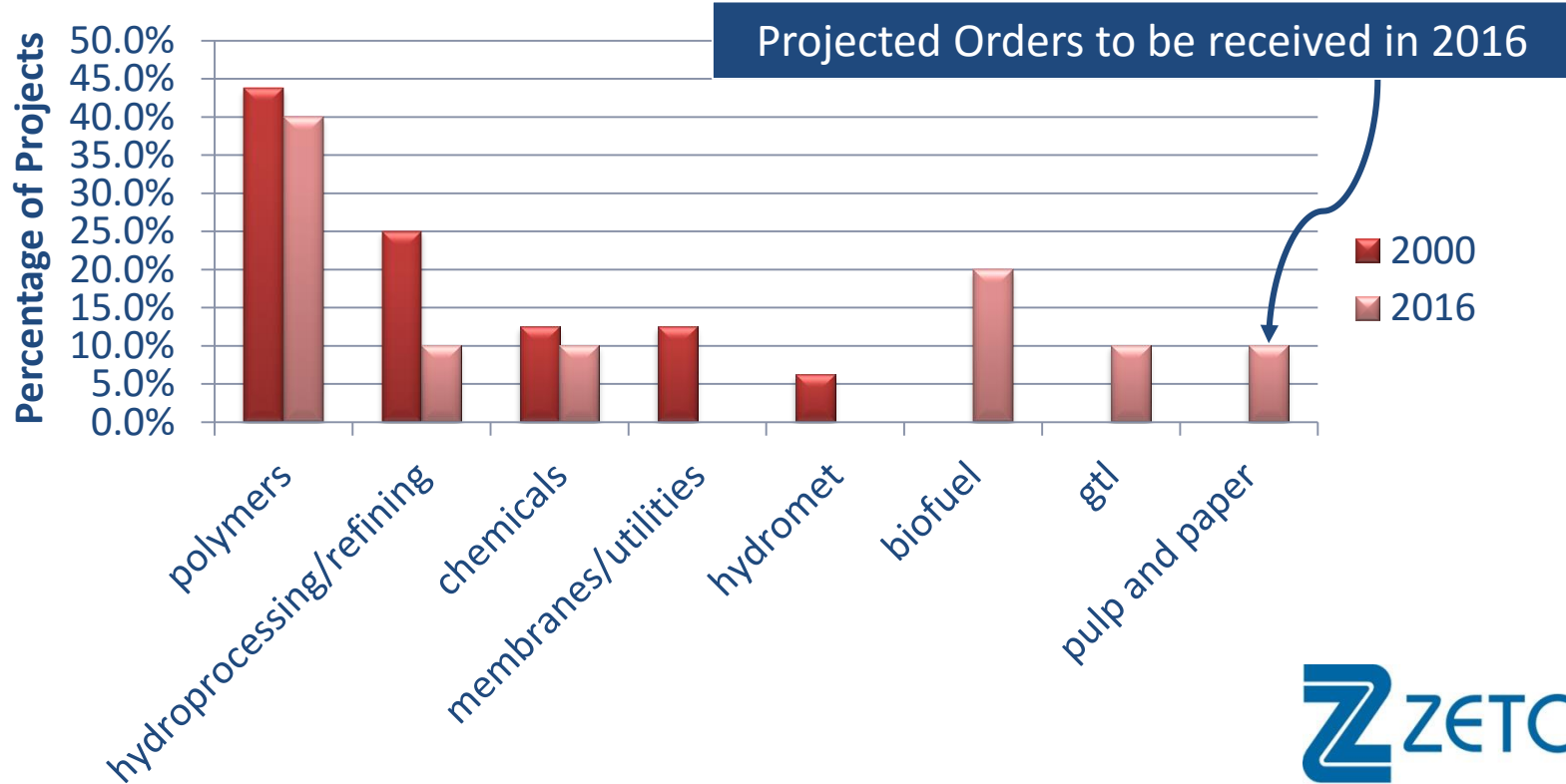
❖ Co-located design  
and fabrication teams



❖ Testing  
capability

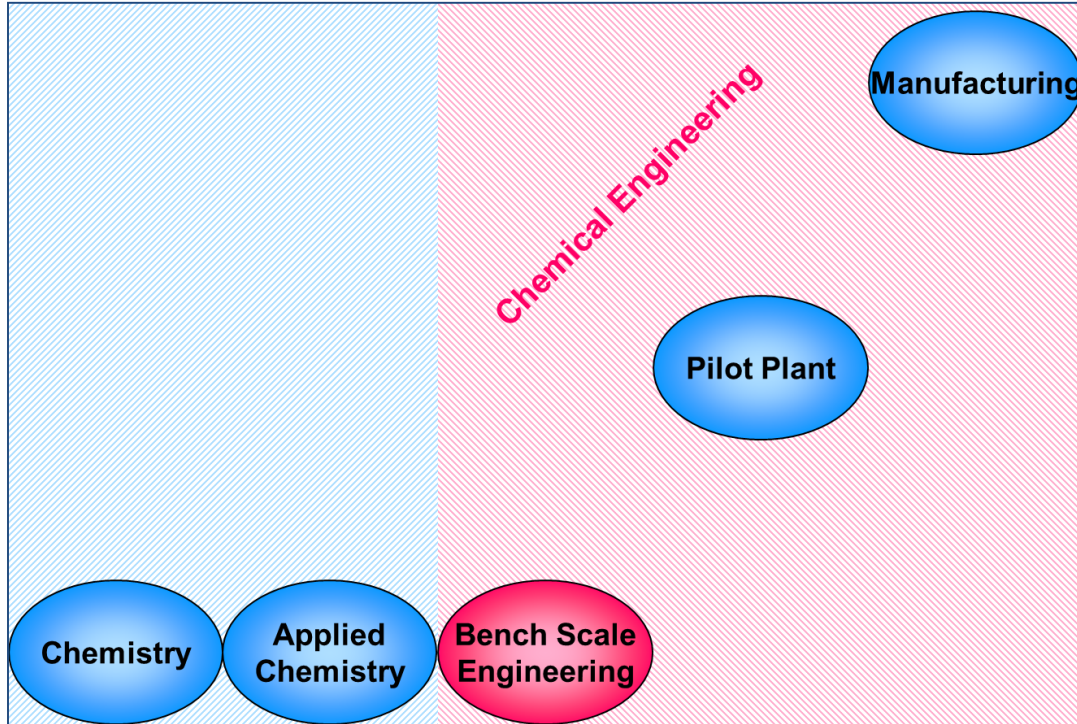


# Recent Zeton Project Profile

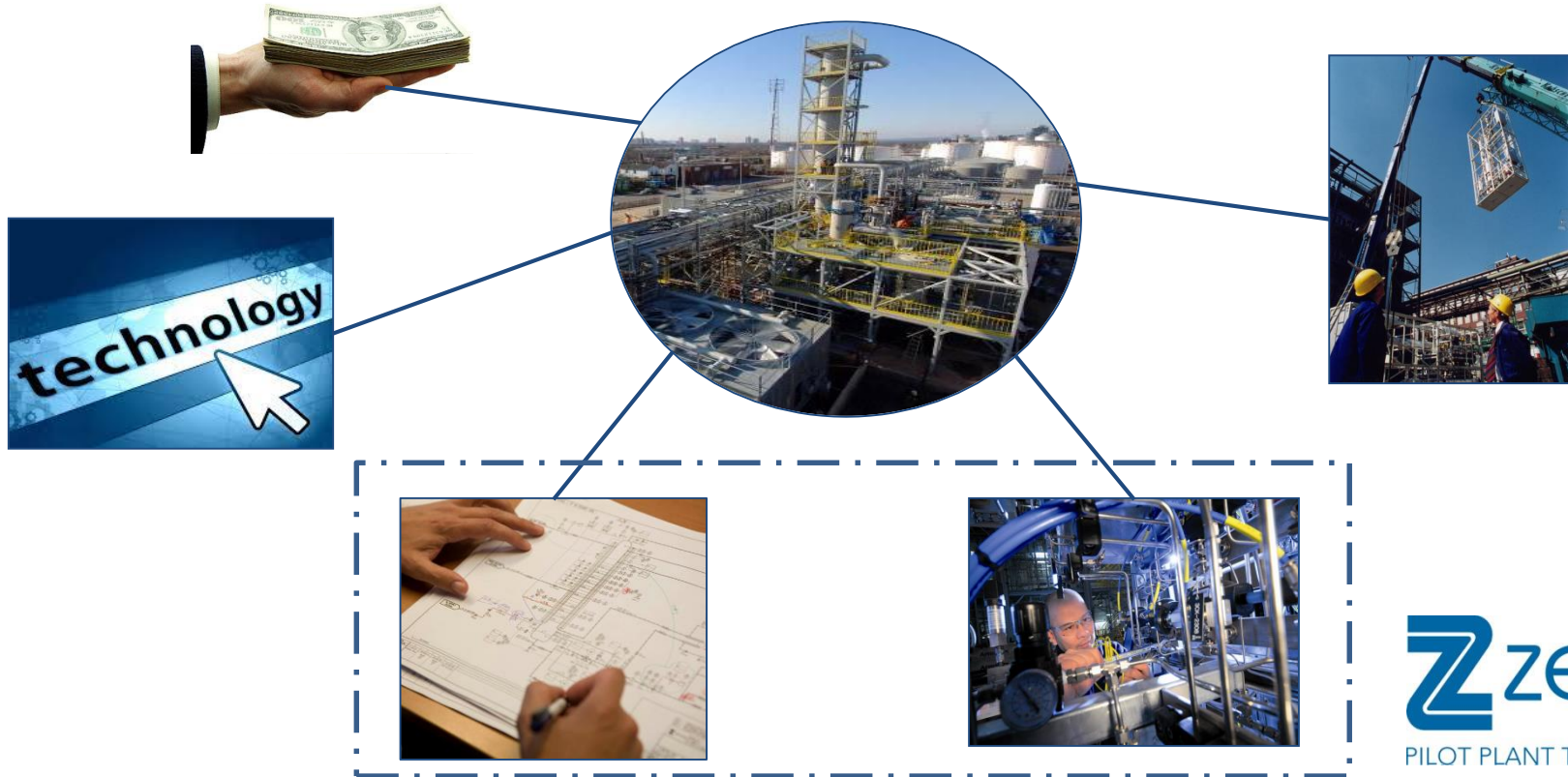




# The Dominant Discipline



# Select the Right Partners





# How can I get my pilot plant faster?

- Access to pilot plant **metrics** – allows schedule to be reduced 4 – 14 weeks
- Locate **design and fabrication** teams under the same roof – improves communication , errors and rework
- **Test** at the specialty pilot plant facility
- Added benefit: improved safety

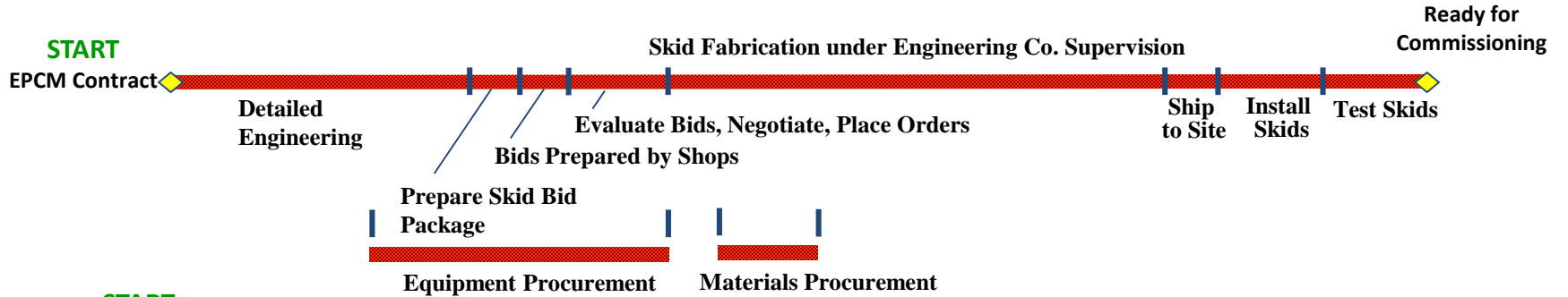
# Specialty Pilot Plant Metrics

“rarely is there enough information available for pilot plant projects to make an intelligent estimate of these costs, unless one has a great deal of historical data.” P. 52

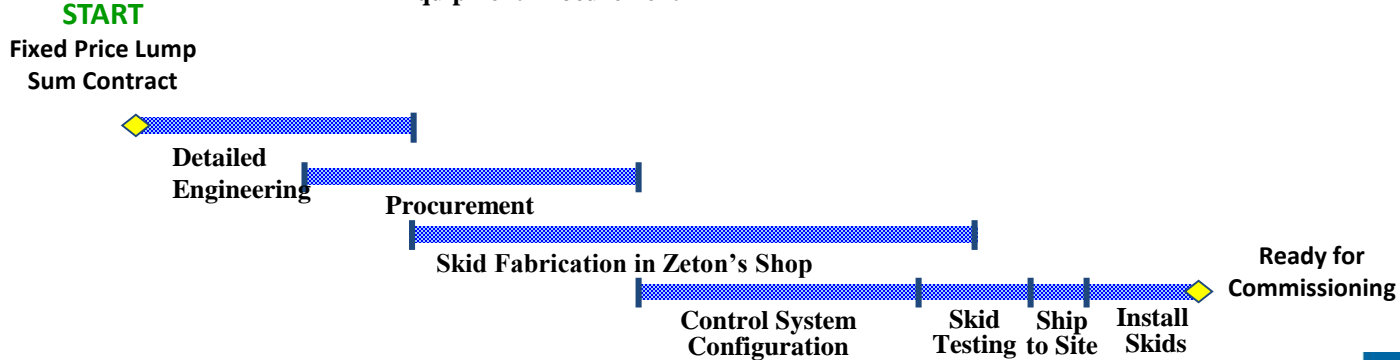
Palluzi, R. (2004). Pilot plant cost estimating: Make intelligent use of contingency. *Chemical Engineering, Volume (Issue), 52 – 56.*

# Traditional vs. Integrated Approach

Traditional approach



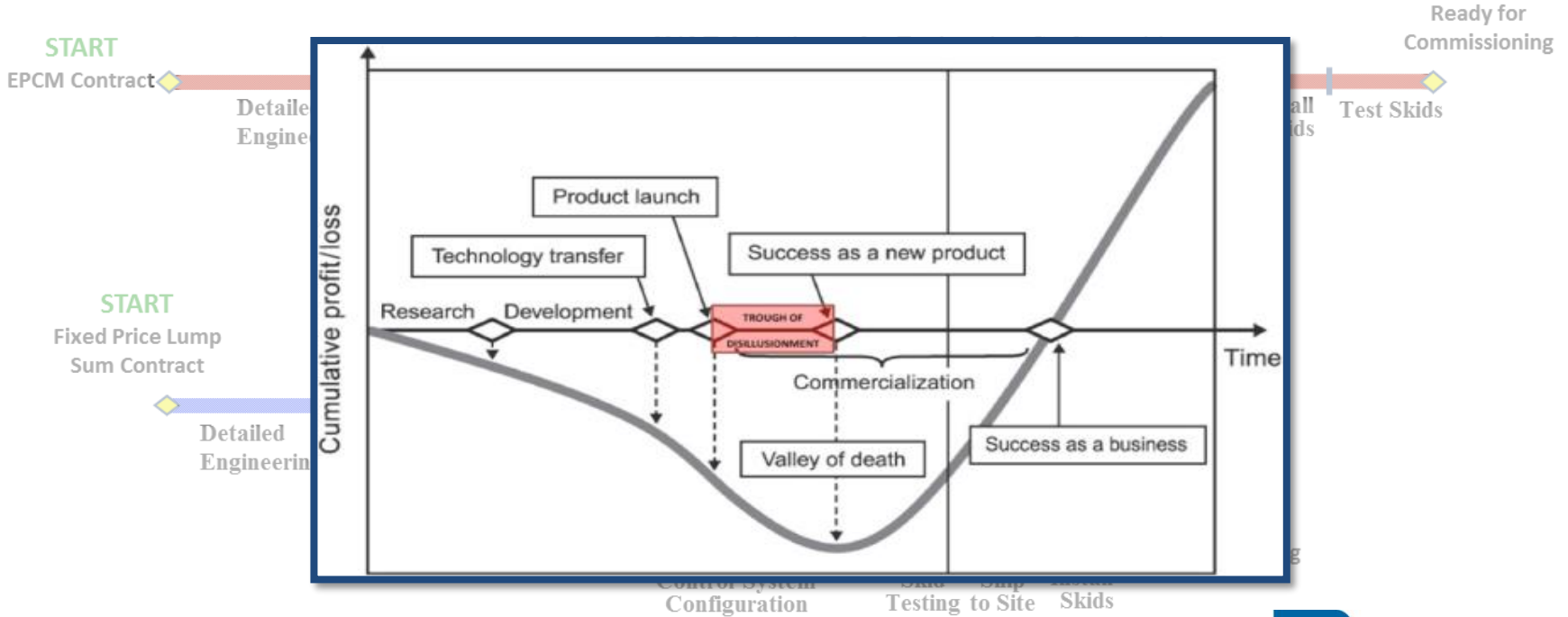
Integrated approach



# Traditional vs. Integrated Approach

Traditional approach

Integrated approach



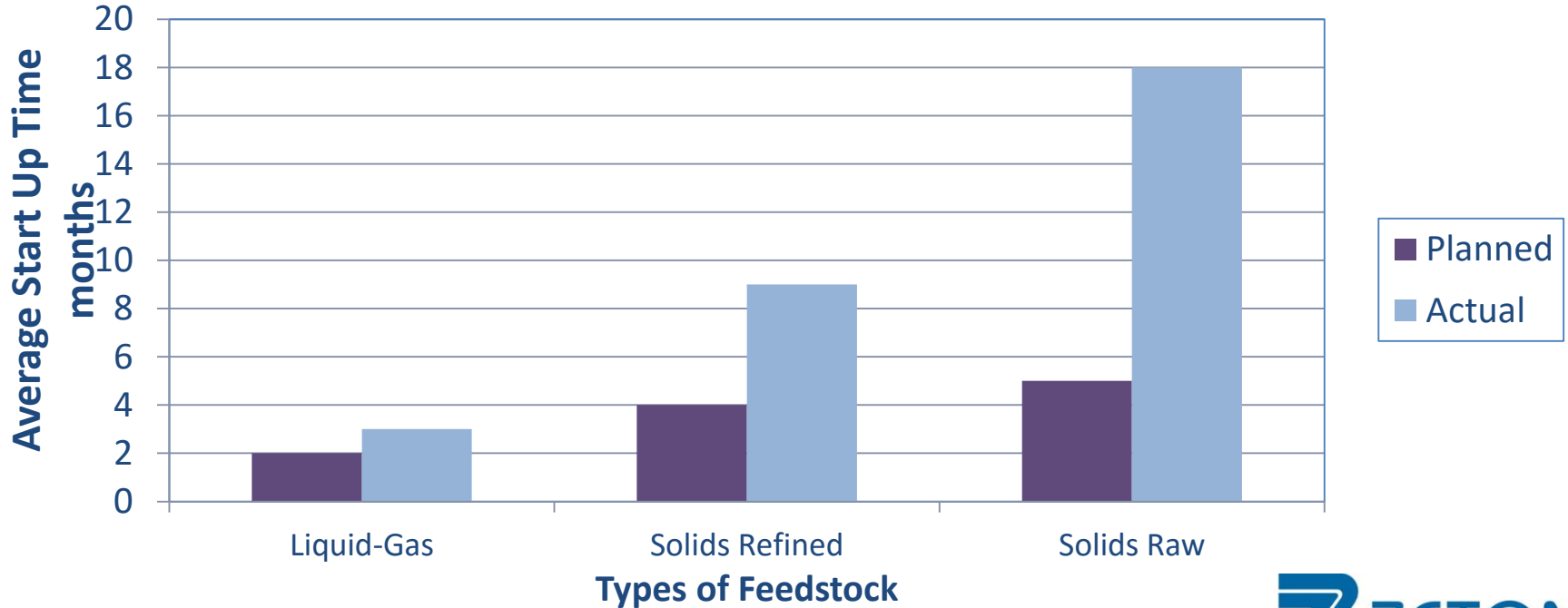
# Scaling Factors

## Chemical vs Bio-Chemical Processes

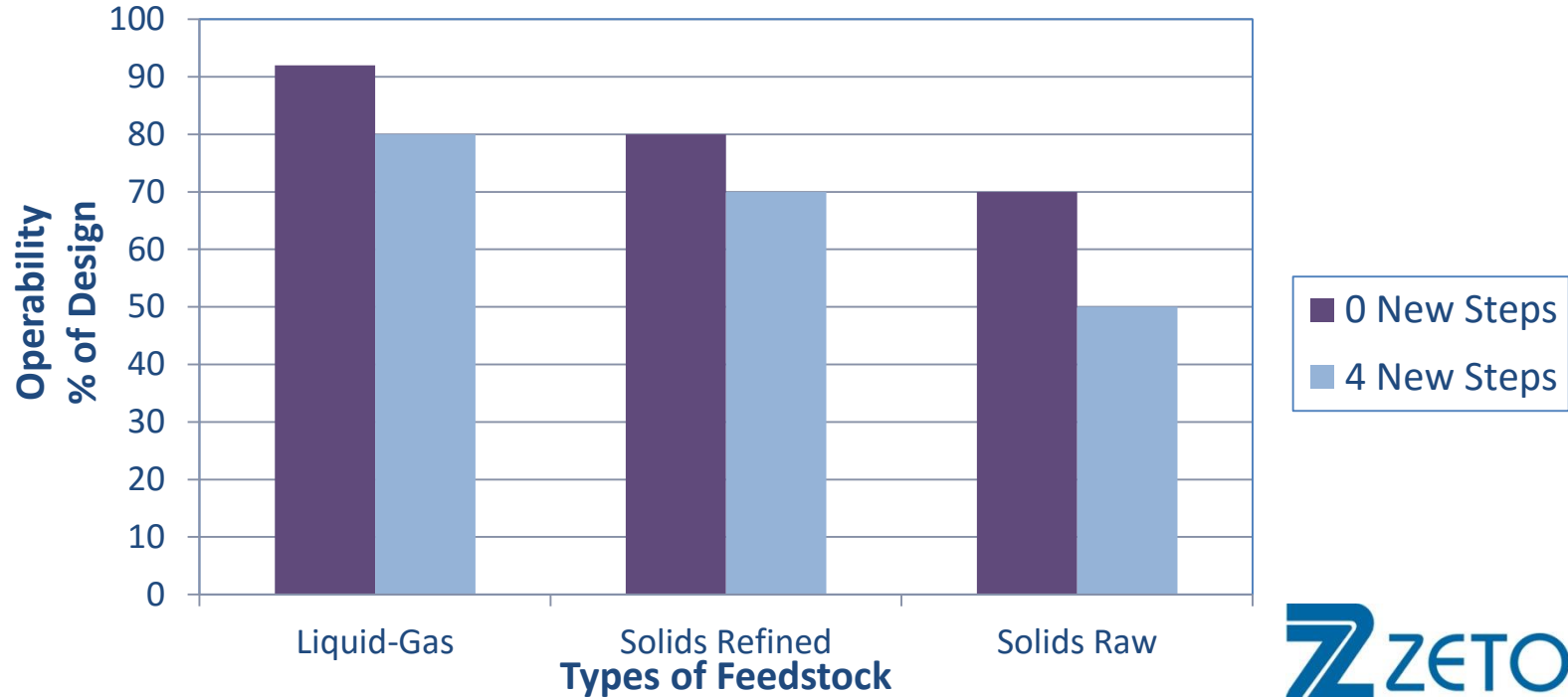
Scale	Traditional CPI Gas-Liquid Process (Nominal Throughput)	Bioenergy Process with Solid Biomass Handling (Nominal Throughput)
Bench/Lab	0.001 - 0.1 <i>(1 - 10 ml/min)</i>	0.01 - 0.1 <i>(1 - 10 g/hr)</i>
Pilot	1 <i>(1 - 5 l/hr)</i>	1 <i>(1 - 5 kg/hr)</i>
Demonstration	100 - 1,000 <i>(5 - 100 bbl/day)</i>	10 - 100 <i>(1 - 5 t/hr)</i>
Commercial	10,000 - 30,000 <i>(30,000 - 100,000 bbl/d)</i>	1,000 - 5,000 <i>(200 - 1,000+ t/d)</i>



# Planned vs Actual Start Up Times

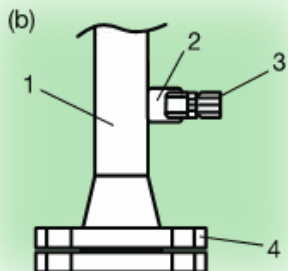
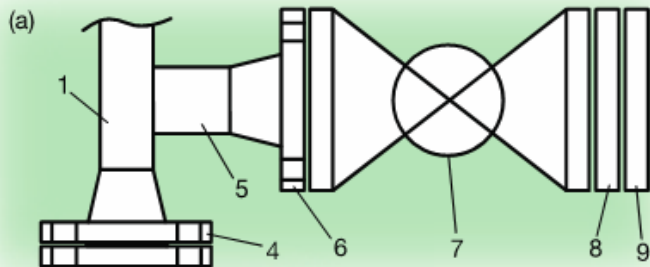


# Operating Capacities after Start Up

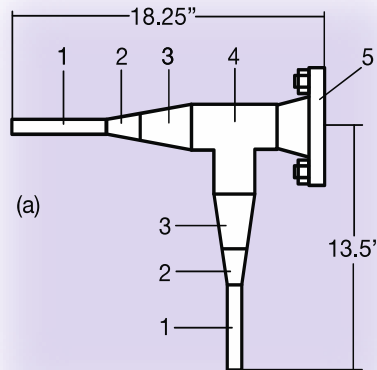


<b>Pilot Plant Objectives</b>	<b>Commercial Plant Objectives</b>
<ul style="list-style-type: none"><li>❖ data collection</li><li>❖ expose problems and test alternative solutions</li><li>❖ assess the effect of impurities buildup</li><li>❖ optimize the process</li><li>❖ flexibility for frequent reconfigurations</li><li>❖ easy start-up and shutdown</li><li>❖ run intermittently</li></ul>	<ul style="list-style-type: none"><li>❖ produce product to maximize revenue and minimize costs</li><li>❖ reproducible product quality</li><li>❖ efficient operation</li><li>❖ use assets efficiently</li><li>❖ reduce costs through preventive maintenance</li><li>❖ run continuously</li><li>❖ troubleshoot without shutting down</li></ul>

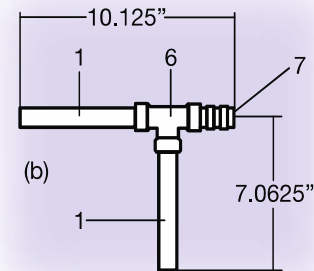
# Two Case Studies



1. 1.5" pipe
2. 0.5" Class 3000 half coupling
3. Swagelok male connection
4. 1.5", Class 300 flange
5. 2" pipe
6. 2", Class 300 flange
7. 2", Class 300 ball valve
8. Class 300 flushing ring
9. Diaphragm seal



1. 0.5" diameter, 6" long pipe
2. 1" x 0.5" reducer
3. 2" x 1" reducer
4. 2" tee
5. 2", Class 300 flange
6. 0.5" tee
7. Swagelok male pipe weld connector



# Vaulting the Valley of Death



- ❖ Partner with the right people
- ❖ Ensure an appropriate level of funding
- ❖ Lean project execution
- ❖ Apply scale appropriate specifications



# Questions



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