



# **Benchmarking and the Alberta Report – a Government/Industry Partnership**

Patricia Armitage, M.Eng., P.Eng.  
Director, Architecture/Engineering/Construction  
Industry Development Branch  
Alberta Finance and Enterprise

Larry Sondrol  
Stephen Revay FCJC CCC  
COAA Co-Chairs  
Benchmarking Committee

# Importance of the Oil Sands to the Canadian Economy



- **Canada's oil reserves are second in the world behind Saudi Arabia**
- **Of 179 billion barrels of Canada's oil reserves, the oil sands represents 97%**
- **For each permanent oil sands related job, 9 additional direct, indirect and induced jobs are created in Canada**
- **Currently 240,000 jobs in Canada are directly or indirectly linked to the oil sands**
- **Between 2000 and 2020, oil sands development has the potential to generate at least \$124B (Cdn) in royalty and tax revenues for Canada's federal and provincial governments**

## Why Benchmarking in Alberta ?



- Alberta was experiencing major cost overruns on its mega-projects
- Many of these mega-projects were in Alberta's oil sands sector
- Oil sands are an important and growing sector of Alberta's economy
- Something had to be done to rein in rising construction costs, Alberta was being viewed as a high cost jurisdiction in which to do business

# Alberta Government Involvement



- **Due to rising costs for developing the oilsands, the Alberta government could see the province's competitive advantage being eroded and was having trouble attracting foreign investment**
- **The Alberta government supports the oil sands sector in its pursuit of higher productivity and lower development costs**
- **Alberta always compared unfavourably to the US Gulf Coast for costs and productivity**
- **What gets measured gets improved!**

## Development of Benchmarking in Alberta



- **Benchmarking initiative started in 2003 with the development of Alberta specific metrics (isolated, camp conditions, winter weather, size)**
- **The Construction Industry Institute (CII) chosen for their expertise in benchmarking**
- **Phase I now complete**
  - Company reports generated for participants
  - Alberta Report done
- **About to embark on Phase II**
  - Many enhancements added
  - Alberta Report 2

# Alberta Report



- **37 (out of a total of 78) projects were analyzed in August 2008 resulting in the “Alberta Report”**
- **27 of the 37 oil and gas, half are grassroots**
- **Total installed costs range from less than \$5M (Cdn) to over \$100M (Cdn), with eight projects over \$1B (Cdn). Average = \$368M (Cdn)**
- **In general, Alberta not so bad with respect to measures of construction productivity when compared to US projects**

# Alberta Report – An Overview



- **Productivity metrics assessed both engineering and construction productivity (overall and in specific disciplines)**
  - Metrics are defined as ratios of work hours to quantities
  - Performance metrics used included cost, schedule, safety, change and re-work
- **14 Best Practices assessed for impact on performance metrics**
- **18 COAA specific metrics for Alberta included**
  - Direct and indirect costs
  - Use of modularization
  - Peak workforce
  - Overtime
- **Comparisons made between Alberta projects and comparable projects in the CII database for the USA**

# Alberta Report - Costs



- **19% average cost growth for Alberta projects (actual costs exceeded initial planned cost by 19%).**
- **Cost growth lower as % detailed engineering complete increased** ■
- **Use of Project Risk Assessment Best Practice reduced project cost growth**
- **High indirect costs (additional supervision, bussing, camps, etc.)** ■
  - Averaged 21% of total project costs
  - Indirect cost growth increased as project size increased
- **Best Practice of Planning for Startup reduced cost growth in startup**



# Alberta Report - Schedule



- **Average schedule growth was 17%**
- **Constructability Assessments led to reduced schedule growth**

# Alberta/USA Comparisons



- **US database 353 projects, 250 Gulf Coast projects**
- **Similar industrial projects - no adjustments made for differences in project size, economic conditions or other significant project drivers.**
- **Median project size in Alberta dataset is \$186M (Cdn) vs. \$40M (Cdn) in the US dataset**
- **Project cost growth much higher in Alberta (19%) vs. US (3%)**
- **Alberta project cost growth had much wider range (-27% to 69%)**
- **Development and scope changes similar between Alberta and the US**

## Alberta/Gulf Coast Comparisons – Engineering Productivity



- **Engineering productivity measured as the ratio of direct engineering hours per installed quantity in the field**
- **Comparisons based on weighted averages (ie: larger projects count more in the average productivity than smaller projects)**
- **Engineering productivity for concrete better in Alberta than in US**
- **Structural steel engineering productivity worse in Alberta**
- **Engineering productivity for piping comparable.**

## Alberta/Gulf Coast Comparisons – Construction Productivity



- **Construction productivity measured as the ratio of field direct work hours per installed quantity**
- **Comparisons based on weighted averages**
- **Construction productivity for concrete slightly worse in Alberta**
- **Instrumentation devices construction productivity much worse in Alberta (non-weighted average between the two was comparable, further research is warranted)**
- **Construction productivity for structural steel was comparable**
- **Insulation construction productivity was better for the Alberta dataset**

## Economy of Scale may not be equal



# Construction Approach is Similar



# Alberta Report - Results



- **Before this study it was perceived that Alberta's productivity was much worse overall than similar US based projects**
- **Productivity similar between Alberta and US**
- **So why the higher cost growth in Alberta vs. US data?**
  - Average wage rates are higher in Alberta than where most of the US projects occur
  - Indirect costs are higher on mega-projects than on smaller projects
  - Initial cost estimates on mega projects weak
  - Starting projects with very low % engineering complete

# Alberta Report - Appreciation



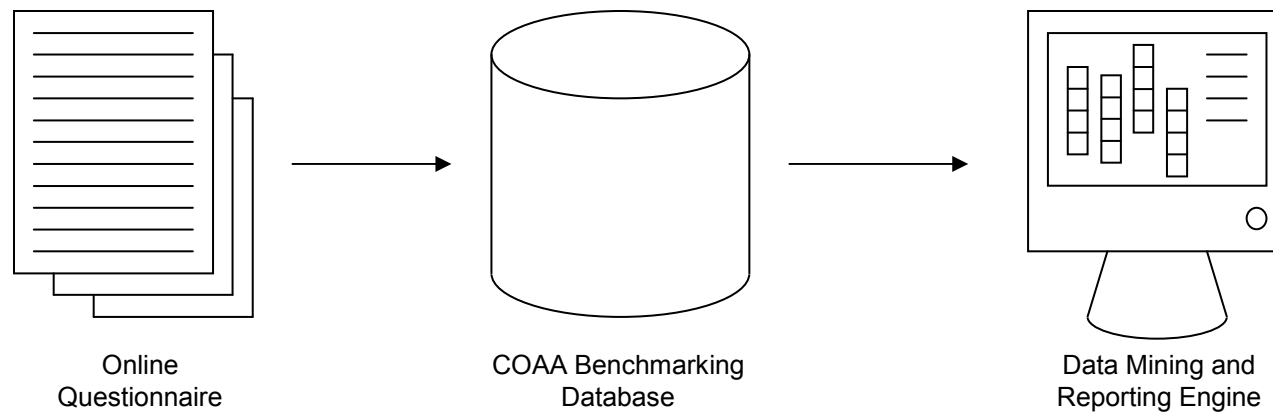
- **Phase 1 Funding Partners**
  - Alberta Finance and Enterprise
  - Construction Owner's Association of Alberta
  - Several Owners & Contractors
  
- **Construction industry Institute (CII)**
  - Dr. Stephen Mulva
  - Research Students



# COAA Benchmarking Phase II



- **3-Step Process**



# Phase II Features



- **Customized Questionnaire Development**
  - Absolute Metrics
  - Indirect Costs
  - Pipeline Projects
  - Modularization (Productivity in Fab Yard)
  
- **Alberta-Based Benchmarking Lab**
  - Full-Time Alberta-Based Support
  - Real-Time (OTJ) Training
  
- **Alberta Report #2**

## Phase II System Enhancements

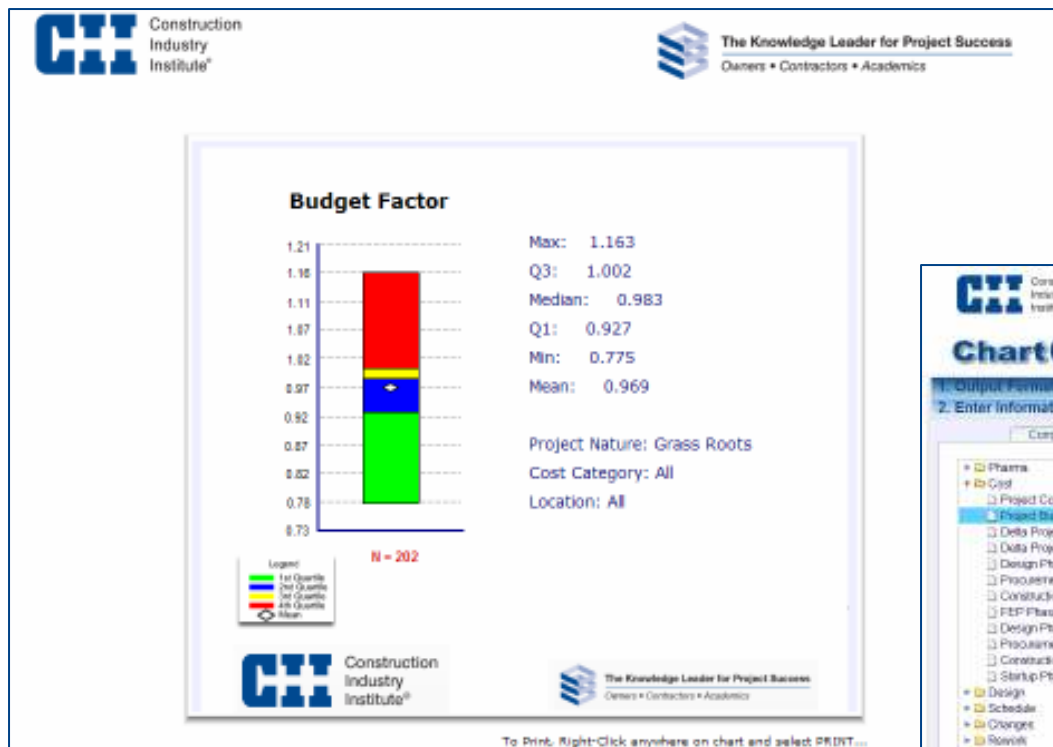


- **Internal (Process Unit, Project specific) Benchmarks**
- **Automated Key Reports**
- **Company-Level Reports**
- **Executive Dashboard**
- **Full Data Mining Capability**
  - Comparisons with CII (U.S.) Database
  - “Level 1” Productivity Metrics (All Disciplines)

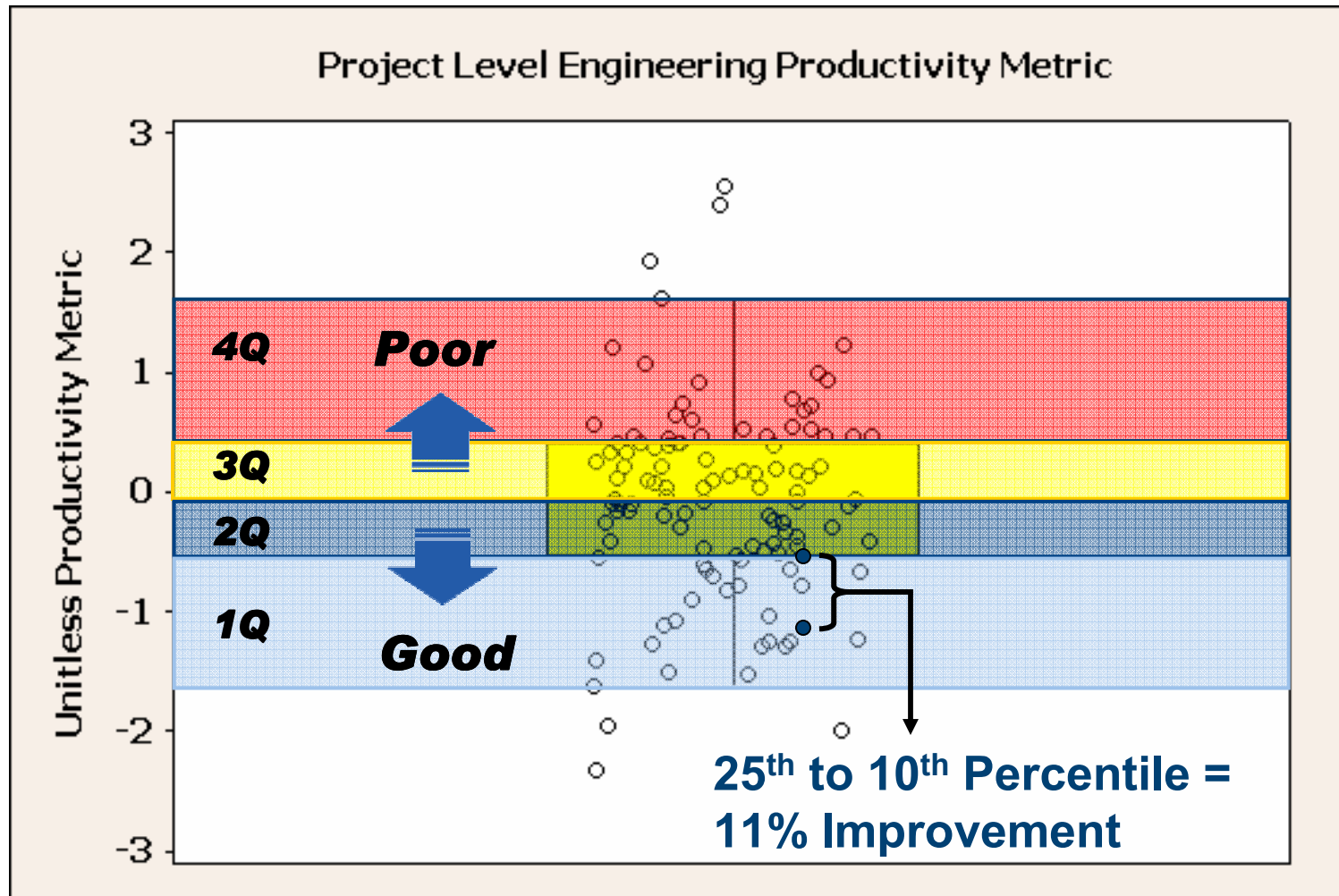
# Phase II Data Mining



- Web-Enabled Queries



# Project-Level (Eng) Productivity



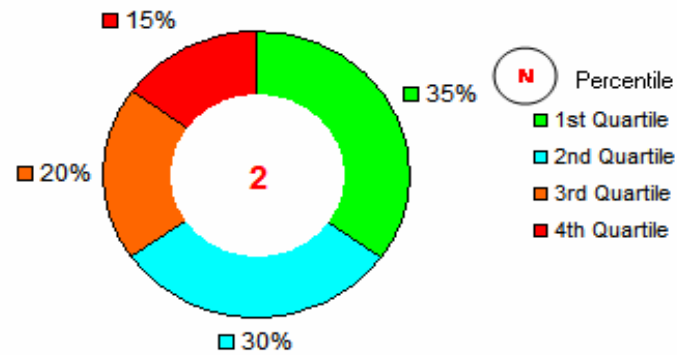
# Executive (Portfolio) Dashboard



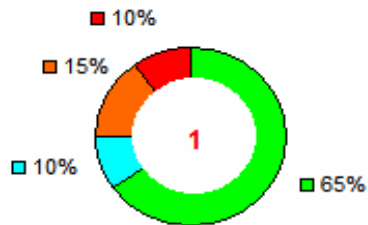
## All Projects

Number of Project : 20

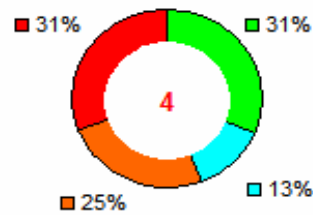
### Overall Project Performance



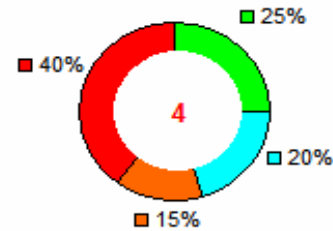
### Cost Performance



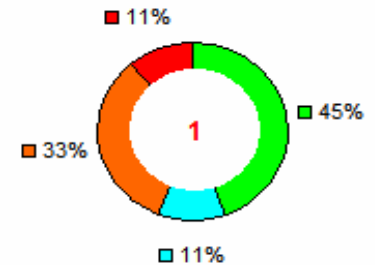
### Schedule Performance



### Dimension Performance



### Practice Use Performance



# Project Key Report- Construction Productivity- Structural Steel



Structural Steel						
Metric	Wk-Hrs	Installed Quantity (MT)	Unit Rate (Wk-Hrs/MT)	Weighted Database Mean	4Q 3Q 2Q 1Q	n
Structural Steel	62,067	744.8	83.33	49.961		<a href="#">S</a>
Pipe Racks & Utility Bridge	20,765	261.3	79.48	33.628		<a href="#">S</a>
Miscellaneous Steel	13,230	114.3	115.74	116.256		<a href="#">S</a>
<b>Total Structural Steel Productivity</b>	<b>96,062</b>	<b>1,120.4</b>	<b>85.74</b>			<a href="#">S</a>
<b>Estimated Total Structural Steel Productivity Rates</b>	Est. Wk-Hrs	Est. Quantity (MT)	Est. Unit Rate (Wk-Hrs/MT)	28.267	4Q 3Q 2Q 1Q	n
	79,684	1,038.7	76.71			<a href="#">S</a>
<b>Total Installed Unit Cost</b>	Actual (\$/MT)	Estimated (\$/MT)	Actual DB Mean (\$/MT)		4Q 3Q 2Q 1Q	n
	9,628.5	9,265.4	C		C	C

# Project Key Report- Best Practices



Practices				
Metric	Project Score	Database Mean	4Q 3Q 2Q 1Q	n
Front End Planning	1.350	6.745		<a href="#">S</a>
Project Risk Assessment	10.000	7.813		<a href="#">S</a>
Team Building	8.906	7.019		<a href="#">S</a>
Alignment during Front End Planning	9.375	7.952		<a href="#">S</a>
Design for Maintainability	8.929	7.206		<a href="#">S</a>
Constructability	10.000	8.946		<a href="#">S</a>
Materials Management	8.333	6.589		<a href="#">S</a>
Project Change Management	8.958	7.696		<a href="#">S</a>
Safety (Zero Accidents)	7.273	7.848		<a href="#">S</a>
Quality Management	6.893	6.584		<a href="#">S</a>
Automation/Integration (AI) Technology	9.615	5.683		<a href="#">S</a>
Planning for Startup	9.731	7.885		<a href="#">S</a>
Pre Fabrication, Pre Assembly, Modularization and Offsite Fab. (PP_MOF)	9.167	9.427		<a href="#">S</a>
Workface Planning	N/A	6.865	N/A	<a href="#">S</a>



# Phase 2 - Appreciation



## ■ Phase 2 Partners thru 2010

- Alberta Finance and Enterprise
- Construction Owner's Association of Alberta (COAA)
- Construction Industry institute (CII)
- Owners & Contractors
  - Nexen Inc.
  - Shell Canada Energy
  - Suncor Energy Inc.
  - StatoilHydro Canada Ltd.
  - MEG Worley Ltd.
  - Bantrel
  - Enbridge Inc.
  - JV Driver Projects Inc.
  - Boilermaker Contractor Association (BCA)
  - Electrical Contractors Association of Alberta (ECAA)
  - Industrial Contractors Association of Alberta (ICA)

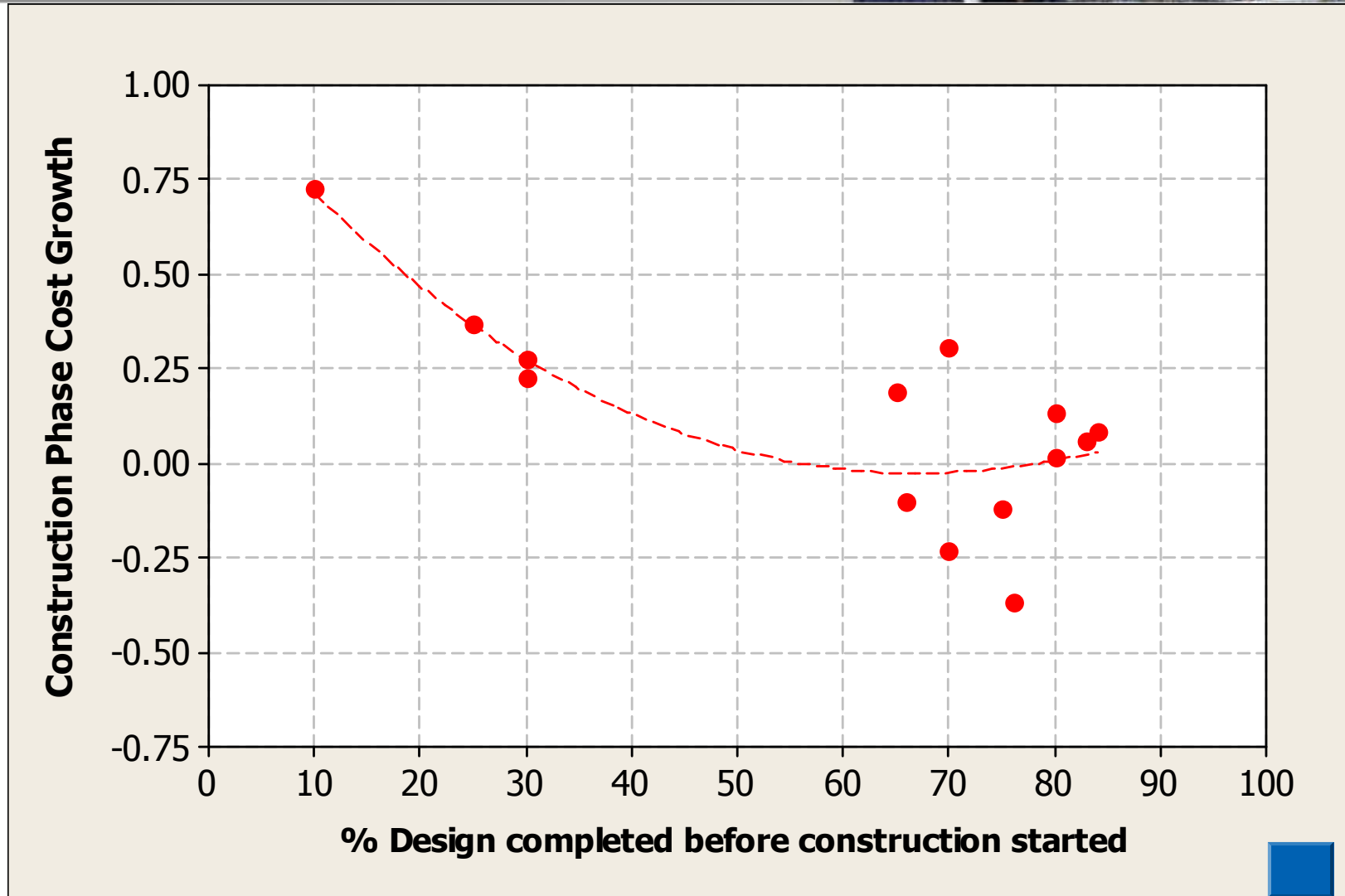
**MORE PROJECTS REQUIRED!!**

# Workshops



- **Workshop Sessions @12:45 and 2:30**
- **Benchmarking - Phase 2 Plan**
- **Alberta Report – Overview of Results**

# Engineering Complete Before Construction Start



# Construction Indirect Cost Growth

