ECONOMIC IMPACTS OF COLLABORATIVE PROJECT DELIVERY + TOTAL INSTALLED COST OF OFF-SHORE QUANTITIES

FINAL REPORT

For the Alberta Steel Manufacturers
November 2018

GROUND STATE
MARKET SOLUTIONS

INDEX

SUMMARY

The Alberta Major Projects environment has for two Growth Cycles underperformed relative to Investor expectations. In both cycles the maturity of Organizational Behaviours related to Planning and Execution have been noted to be significantly lower than international benchmarks.

The economics of AB Resource development is suited to Large/Major Projects, of which high levels of complexity and risk are inherent. The combination of high complexity/ high risk projects with low organizational maturity has resulted in significant economic loss of opportunity across the value chain.

During the Second cycle (2009-2014) frame many in the market neglected the challenge of maturing Organizational Behaviours, however did attempt to optimize on their Procurement Strategy to the perceived by implementing Out-of-Region/Off-Shore procurement initiatives. This necessarily added greater complexity to processes that were already challenged.

Analysis of the economic drivers of the relevant Major Projects demonstrates that such a procurement strategy would not result in positive outcomes on a Total Installed Cost basis, and moreover even in the most optimistic case is insignificant to the value proposition associated with the much larger benefits available by engaging enhanced Organizational Behaviours, and specifically Collaborative Project Delivery.

Thesis Statement 1:

The most impactful way to ensure large and highly probable Total Project Value optimization in the AB Major Projects environment requires the adoption of Enhanced Project Strategies. Specifically risk/complexity management is core to success. The two main critical items are as follows a. Collaborative Project Delivery models, and b. Project/Asset Scale selection (Size of Project).

Thesis Statement 2 (Pending Empirical Data Responses):

Out-of-Region/Off-Shore procurement has been a valueless/negative value exercise either because the Reward sought was insignificant in light of aggregate Project Spend and in particular Project Value and/or because as a stand alone savings exercise, Off-Shore procurement was forecast to fail at producing the anticipated savings. Recent empirical research has proven those forecasts to be accurate.

PROJECT DELIVERY + VALUE CREATION ANTHROPLOGY

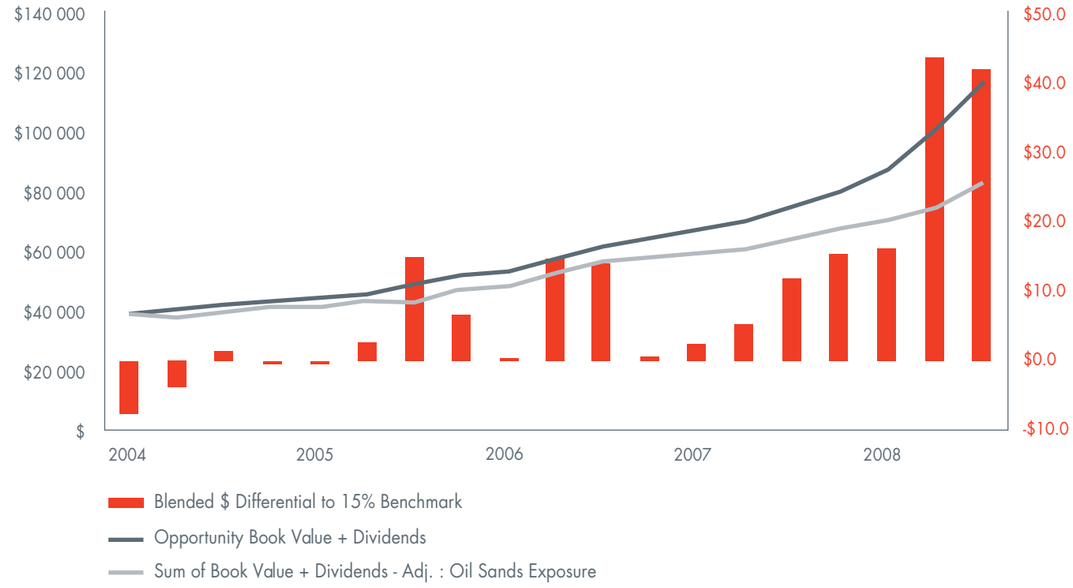
a. Analysis of Market Underperformance – 2004 - 2008

The early 2000's saw the inception of a tremendous Bull Market in Oil prices, marked by a steadily increasing price across Oil products culminating in a peak in early July of 2018 of $147+ USD for the WTI Benchmark.

Oil Sands producers were compelled to develop their production profiles in an environment that provided economic prices for the primary Canadian products WCS and SCO, from Q1 of 2004 to Q3 2008, averaging $53.64 and $75.10 respectively.

Corporate Development offices, using Hurdle Rates of 15%, promised investors sustained growth, and though Oil Sands Stocks have seen significant growth and dividend payouts, we posit that relative to the available EBIT due to elevated Oil Prices, the contemplated assets under-performed. Analyzing Actual Book Value + Dividends growth relative to Adjusted Book Value + Dividends adjusted for the additional Net Backs available in the market (Opportunity Book Value) demonstrates a significant delta.

Figure 1 – Oil Sands Producer Actual Book Value + Dividends ($Millions) vs. Opportunity Book Value + Dividends ($Millions) – 2004 - 2008



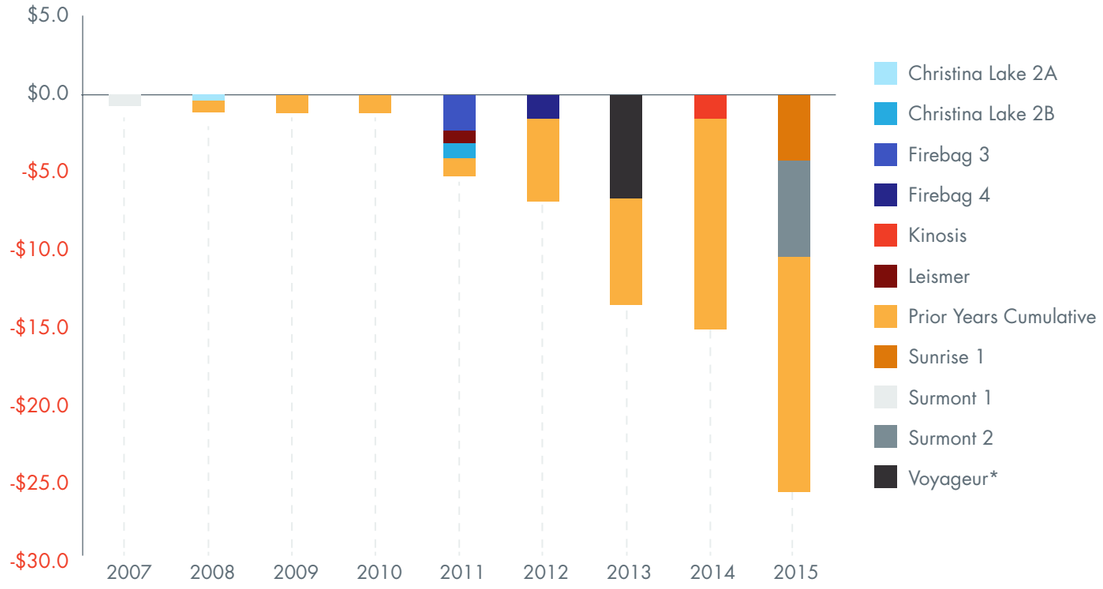
Sources: Ground State Market Solutions and Corporate Financials

Assumptions/Notes:

1. Includes Book Values for CNQ, COS, CVE Est., HSE, IMO, PCA, SHC, and SU.
2. Book Values + Dividends adjusted for Oil Sands exposure based on ratio of Revenues per source;
3. Thermal Asset Economics per 35,000 bpd facility;
4. Operational 'Bath Tub' Curve factors of 0.5, 0.9, and 1.0 in Yrs. 1, 2, and 3 respectively;
5. The Required Return Rate of 15% for Thermal Assets was calculated on a $CAD WCS for each year;
6. Upgrader Asset Economics per 100,000 bpd facility;
7. The Required Return Rate of 15% for Upgraders was calculated on a $CAD SCO for each year;
8. There is an ~ 56/44% production ratio for Alberta SCO/WCS in 2004 which transitions to 50/50 in 2008;
9. 'Steam-to-Oil' Ratio of 2.5 for Thermal/SAGD assets;
10. Eighty-Five (85) operating days per Quarter per Asset.

The cause of the missing value became apparent as many of the projects that were started in the 2004-2008 era came to completion in later years; Cost and Schedule Over-Runs both hurting the existing cash positions, and First Revenue opportunities.

Figure 2 - NPV Impact per Project + Cumulative ($Billions)



Sources: Ground State Market Solutions, JWN, and Corporate Financials

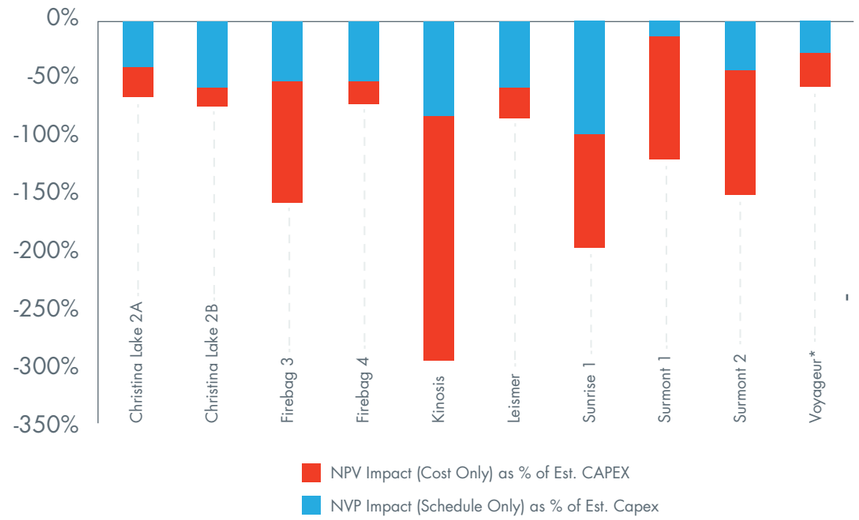
Assumptions/Notes:

1. A Standard CAPEX Benchmark of $35,000 was applied to each Thermal Project, Voyageur per Suncor Estimates;
2. Required Return Rate/Discount Rate per project is 15%;
3. The 15% Required Return Rate was applied to Additional Capital requirements/Cost Over-Runs;
4. *A 'Sunk Cost' of $3.5 Billion was applied to the Voyageur project;
5. Eighty Five (85) operating days per Quarter.

Note : It is important to recognize that the negative impact to Project Valuations was not exclusively a Cost Over-Run issue, as the overwhelming majority of projects incurred Schedule Over-Runs, and in markets with elevated Oil Prices offering excess returns upon First Oil Production.

More significantly, it has been demonstrated in the Alberta Industrial Major Projects arena that Cost and Schedule Over-Runs are highly correlated.

Figure 3 — NPV Impact of Cost + Schedule Over-Runs vs. Estimated CAPEX

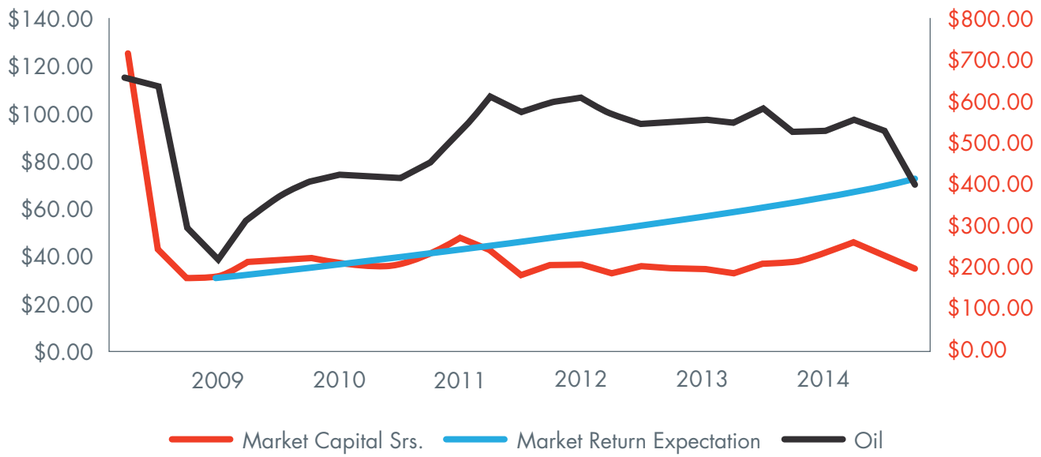


Sources: Ground State Market Solutions, JWN, and Corporate Financials

Project Execution strategies in the 2009-2014 timeframe, which encouraged Off-Shore/Out of Region Procurement, did little to remedy the valuation(s) issue, as Market Capitalization(s) remained flat, while Book Valuation + Dividends had saw a modest increase, in a market that was again providing excess Margin to producers.

Notably, the market was facing Market Access uncertainty, however, the aggregate CAPEX expenditure during this era of Major Project was just as significant as in the prior 2004-2008 timeframe, and we have accounted for Oil by Rail Transport fees in out modelling.

Figure 4 – Market Capitalization ($Millions) Performance of Senior Producers/ Owners vs. Expectations 2008-2014

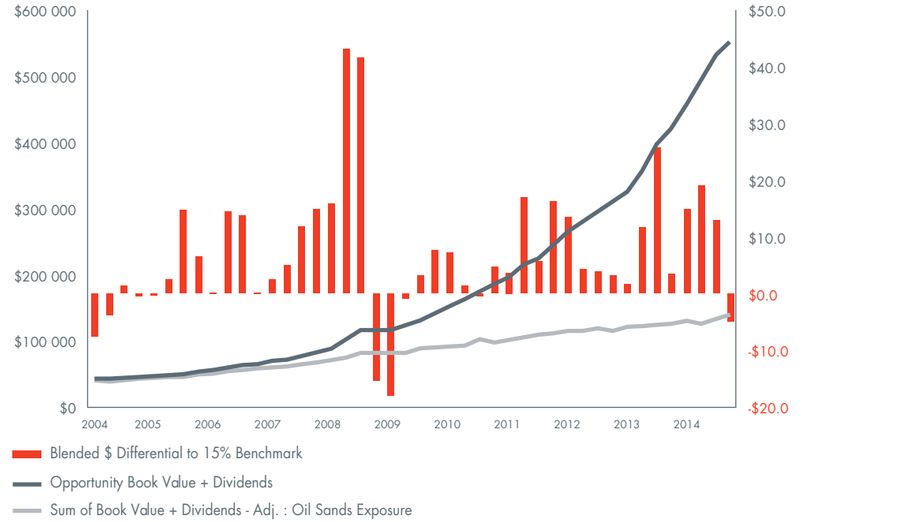


Source: DOE, TMX MiG

Assumptions/Notes:

1. Includes CNQ, COS, CVE, HSE, MEG, IMO, PCA, SU;
2. Oil price is the WTI Benchmark

Figure 5 – Oil Sands Producer Actual Book Value + Dividends ($Millions) vs. Opportunity Book Value + Dividends ($Millions) – 2004 - 2014



Sources: Ground State Market Solutions and Corporate Financials

Assumptions/Notes:

1. Includes Book Values for CNQ, COS, CVE Est.,CVE, HSE, IMO, PCA, SHC, SHC Est, and SU.
2. Book Values + Dividends adjusted for Oil Sands exposure based on ratio of Revenues per source;
3. Thermal Asset Economics per 35,000 bpd facility with an SOR of 2.5;
4. Operational 'Bath Tub' Production Curve factors of 0.5, 0.9, and 1.0 in Yrs. 1, 2, and 3 respectively;
5. The Required Return Rate of 15% for Thermal Assets was calculated on a $CAD WCS basis for each year;
6. Upgrader Asset Economics per 100,000 bpd facility;
7. The Required Return Rate of 15% for Upgraders was calculated on a $CAD SCO for each year;
8. There is an ~ 56/44% production ratio for Alberta SCO/WCS in 2004 which transitions to 40/60 in 2014;
9. 'Steam-to-Oil' Ratio of 2.5 for Thermal/SAGD assets;
10. Eighty-Five (85) operating days per Quarter per Asset;
11. An additional $5 Transportation fee was added to the model from 2011 to 2014.

b. The Proposed Solution from the Consulting Firms and Early Value Analysis of Proposed Solution

The above notwithstanding, in many cases the Owner market responded to the project Over-Runs of the 2004-2008 era by implementing Out-of-Region/Off-Shore procurement initiatives, and many of those advised by EPC and Big Four Consulting firms. The promised discounts on Steel and Pipe procured from Asia often approached 40-50%.

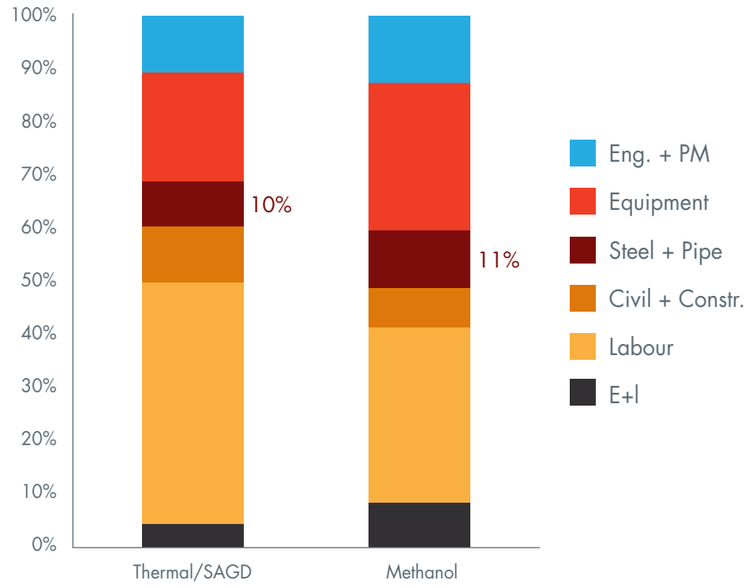
Investors were provided new comfort that the Owner market had viable execution strategies.

The challenge with this strategy always was, that it ignores the Root Cause of Over-Runs, which is inadequate project planning and project team integration, including Tier 3 Supply Chain elements ie. Fabricators.

Moreover, the portion of the Project Spend Profile attributed to 'Off-Shore-able' components at a significant Supply Only discount (ie. Fabricated Structural Steel and Pipe) amount to approximately 10% for Thermal assets, and similar for Petrochemical facilities.

It follows that this strategy was incomprehensive to remedy the larger value destruction challenges, while it added complexity to project execution systems ill equipped to deal with the challenges associated with Major Projects.

Figure 6 – Generic Project Cost Curve – Thermal/SAGD + Methanol Facilities



Sources: Ground State Market Solutions, JWN, and Corporate Financials

Applying simple logic, even if one assumed a 40% discount (which is unachievable on a Total Installed Basis) on 10% of the Spend profile, this totals a mere 4% savings, which is a fraction of the value destruction experience in the First Growth Cycle (2004-2008).

Further, the risks (Schedule + Cost) to the Total Project Value associated with such a strategy result in a Risk / Reward proposition that was never amenable.

> Note : The Specification intensity and associated Intellectual Property per Equipment mitigates discounts available and/or region of supply optionality. Ie. OTSG Markets are generally dominated by US Manufacturers.

Problem #1 – Meeting Cost Reduction Objectives

Assuming Structural Steel and Pipe account for 10.0% of Total CAPEX, and the proposed discount is 40.0% for each, the total economic impact to the project would be 4.0% at best.

Moreover, the 4.0% figure is a Supply Only price(s), and does not account for the additional complexity of transportation and installation associated with 'Off-Shore' supply.

Total Installed Cost economics, in our estimation have been poorly understood by the market place in Alberta.

Ground State performed applicable research for Owner clients in the 2013/2014 time frame, and found the following applicable Cost Adjustments to Supply Only pricing for 'Off-Shore' Steel and Pipe:

- FOREX Hedging – 1-5% depending on Source Location
- Transportation – Conservatively 5%
- Off-Loading & Marshalling – 30% + 8.5% for Steel and Pipe Respectively = approx. 19.25%
- Installation & Completions = 28% + 12% for Steel and Pipe Respectively = approx. 20%.

Resulting in a TOTAL/SUM Adjustment of ~ 45.25% - 49.25% to the Supply Only price(s).

Market Intelligence/Research demonstrated this to be a slightly value negative exercise at best, while incurring the risks associated with higher complexity.

Note that this does not include Non-Conformance Items.

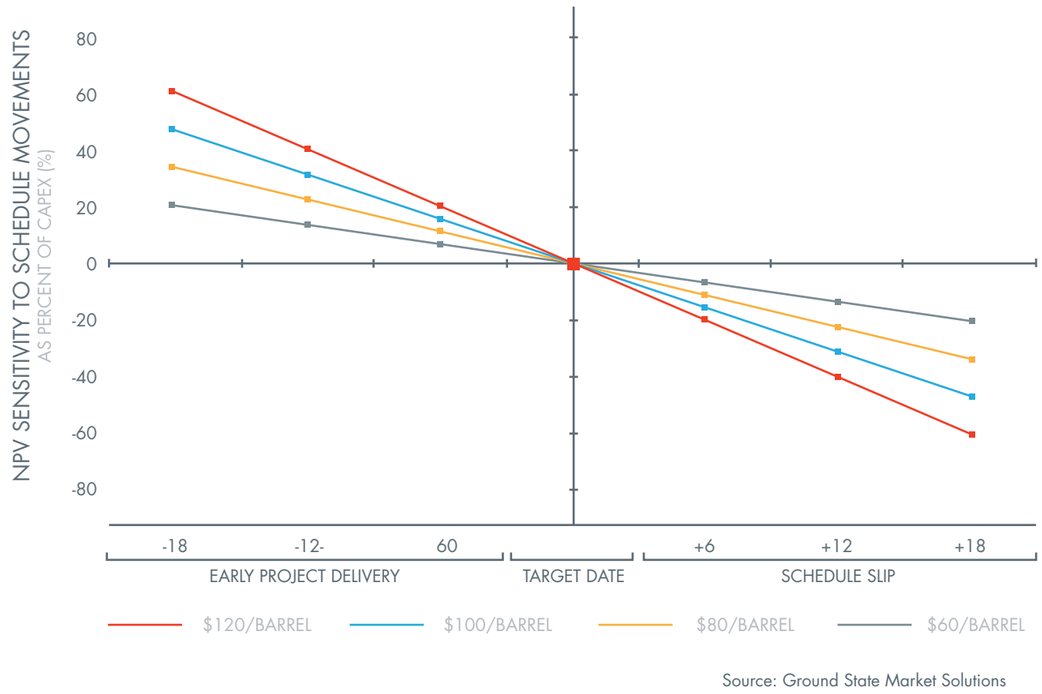
Problem #2 – Managing Schedule Impact on Total Project Value

The above 'Off-Shore' strategy incurs a minimum ten (10) weeks in Schedule Slippage, while we note, that the Industrial Major Projects in Alberta have been predominantly Schedule Driven from a Total Project Value perspective, for the majority of the past two decades; something that Procurement Strategies have largely ignored.

Schedule and/or First Revenue Opportunity has had a significantly more meaningful/significant impact on Total Project Value than CAPEX Cost Increases/Savings.

For a typical Thermal/SAGD Facility, in a $80 CAD WCS environment, a Schedule Slip of Twelve (12) months, would require an ~ Twenty (20) percent CAPEX savings across the entire Spend Profile to be Value Neutral per the original NPV and Target Schedule and Target CAPEX.

Figure 7 – Typical Thermal/SAGD Facility - Schedule and CAPEX Relationship



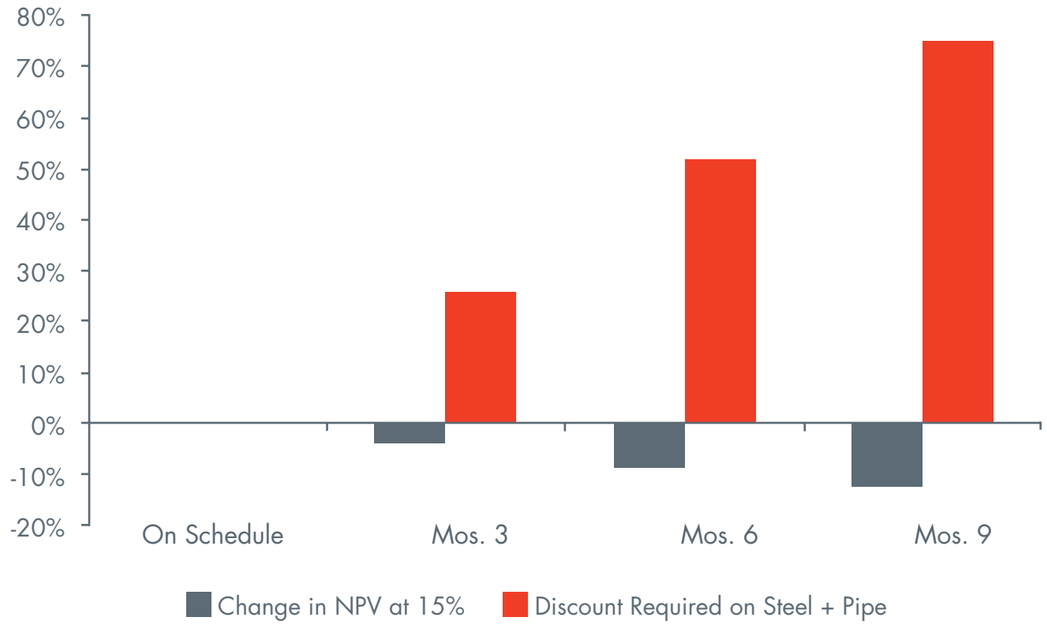
Source: Ground State Market Solutions

Assumptions:

1. CAPEX of $40,000 per Nameplate Barrel;
2. 'Bath Tub' Curve duration of twelve (12) months;
3. Sustained production at ~90% of Nameplate.

Relative to the Steel and Pipe Spend profile, where significant 'Supply Only' discounts are available, a Three (3) Month Schedule Slip requires a Twenty Six (26) percent Cost reduction, to maintain Value Neutrality. (Ten (10) weeks requiring Twenty Two (22) percent).

Figure 8 – Typical Thermal/SAGD Facility - Schedule and CAPEX Relationship Relative to Steel and Pipe Spend



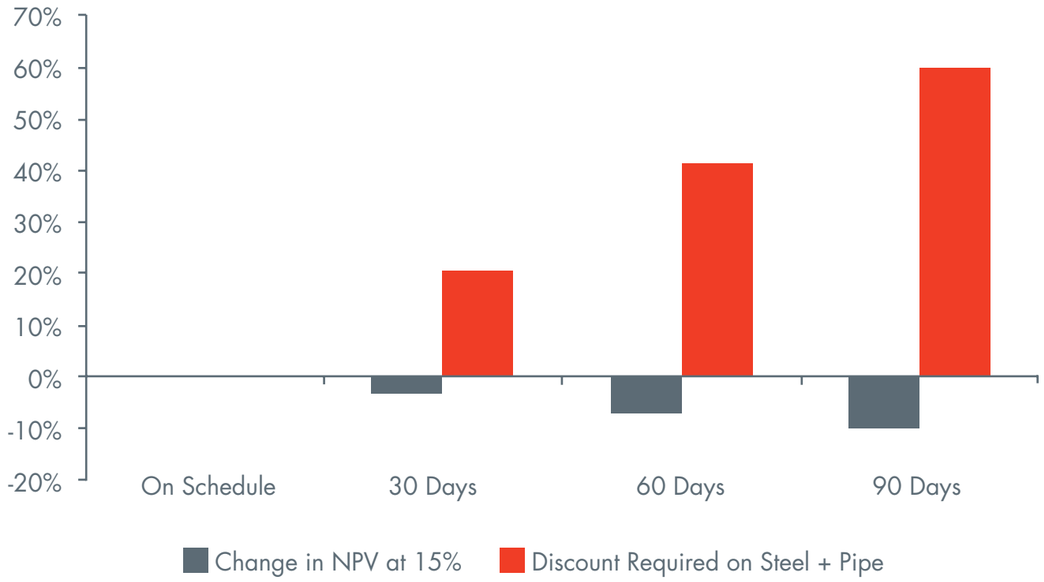
Source: Ground State Market Solutions

Assumptions/Notes:

1. NPV is Calculated at a 15% Discount Rate;
2. Scale of Facility is 30,000 bpd;
3. Steel & Pipe account for 10% of Project Spend profile;
4. Model uses a $70 CAD WCS Price;
5. Model accounts for a $25 All-In Variable Cost (Lifting, Royalties, Transportation, Sustaining).

Methanol/Petrochemical facilities have a similar economic relationship b/w Schedule and CAPEX.

Figure 9 – Typical Methanol Facility - Schedule and CAPEX Relationship Relative to Steel and Pipe Spend



Source: Ground State Market Solutions

Assumptions/Notes:

1. NPV is Calculated at a 15% Discount Rate;
2. Scale of Facility is 1,700 MT per Annum;
3. Steel & Pipe account for 10% of Project Spend profile;
4. Model uses a $490 USD/$640 CAD Methanol Price;
5. Model accounts for all transport fees to Asia.

Problem #3 – Dumping Subsidies and CBSA Penalties

There have been numerous successful Complaints filed with the Canadian Borders Services Agency over the past couple five (5) years regarding dumping activities into the Canadian market for Steel and Pipe. Notably, the 2017 finding that, in particular, Chinese Steel fabrication suppliers, the preferred source of 'Off-Shore' Steel strategies, were guilty of Dumping product into the Canadian market place at a 32.9% rate for Bao Steel, and a 45.8% rate for all other Exporters.

This is congruent with Ground State's intelligence per Wage Rates and Productivities in the China market place; wages being approximately 1/3 of Canadian wages for Western Certified Welders and productivity being approximately 1/3 of Canadian productivity. It was our assessment that Dumping must be occurring, in order to reconcile the Supply Only pricing being

offered.

The above necessarily means that the comparison between Alberta Supply Only pricing and 'Off-Shore' Chinese Supply Only pricing for Steel was/is not 'Apples to Apples', and more importantly requires adjustment on a Go-Forward basis to account for Penalties imposed to protect the Canadian markets from predatory pricing.

STEEL

The 2017 Canadian Border and Services Agency (CBSA) determination per Exporter/Region below:

Country of Origin or Export	Exporter	Weighted Avg. Margin of Dumping as % of Export Price
China	Bao Steel Construction Co. Ltd.	32.9%
	Modern Heavy Industries (Taicang) Co., Ltd.	45.8%
	United Steel Structures Ltd.	45.8%
	All Other Exporters	45.8%
Korea	SK Engineering & Const. Ltd.	2.4%
	Hanmaek Heavy Industries Co., Ltd.	1.9%
	All Other Exporters	45.8%
Spain	Cintasa	0%
	All Other Exporters	45.8%

PIPE

Similarly, there has been activity regarding pipe products, and broad regional representation including China, India, and South Korea.

Recent CBSA Files of interest:

Dumping File #: 4214-36 (also 4214-16)
Dumping Case #: AD/1396 (also AD 1373)
Subsidy File #: 4218-34 (also 4214-24)
Subsidy Case #: CV/132 (also CV/123)

Applicable carbon welded pipe commonly identified as standard pipe, in the nominal size range from ½ inch up to and including 6 inches (12.7mm to 168.3mm in outside diameter) inclusive, in various forms and finishes, usually supplied to meet ASTM A53, ASTM A135, ASTM 252, ASTM A589, ASTM A795, ASTM F1083 or Commercial Quality, or AWWA C200-97 or equivalent specifications.

Exporter	Provisional Duty Payable
Chinese Taipei	
Chung Hung Steel Corporation	0.0%
Shin Yang Steel Co. Ltd.	0.5%
Yieh Phui Enterprise Co. Ltd.	4.4%
All Other Exporters	8.4%
Republic of India	
Manu International	23.9%
All Other Exporters	138.7%
Saltanate of Oman	
All Other Exporters	118.6%
Republic of Korea	
All Other Exporters	84.0%
Thailand	
Pacific Pipe Public Co. Ltd.	6.0%
Saha Thai Steel Company Ltd.	9.2%
All Other Exporters	84.0%
Republic of Turkey	
Borusan Mannesmann Boru Sanayi Ve Ticaret A.S.	25.7%
Erbosan Erciya Boru Sanayii Ve Ticaret A.S.	13.0%
All Other Exporters	84.0%
United Arab Emirates	
Conores Metal Supply Ltd.	5.7%
All Other Exporters	102.5%

c. Empirical Analysis of Off-Shore Items Received

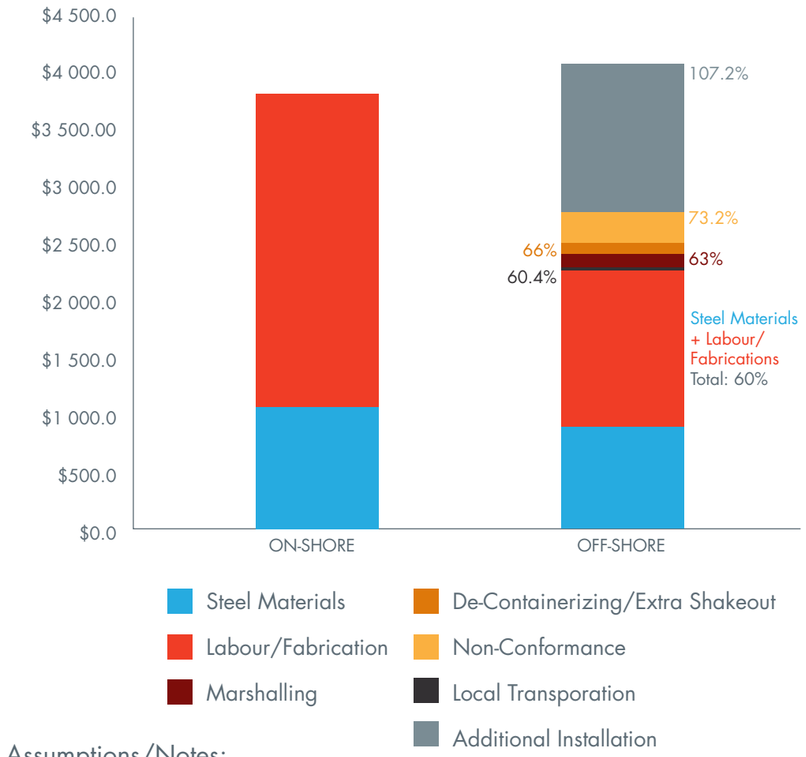
Empirical data from the market for projects from 2008 forward demonstrates that the above analysis was conservative, with the normalized Supply Only + Installation Adjustments cost of Off-Shore/Out-of-Region Steel and Pipe costing107.2% and 178.9% (All Market Items) of the Local Supply Only cost respectively.

The analysis accounts for 17,168 Tonnes of Steel, 96,874 Linear Metres of Pipe.

Overall Methodology:

- General Contractor/Fabricator had data applicable to the full Scope of the materials included per complete Construction Work Packages;
- Data Represents Costs applicable across the material applicable to the full Scope of materials per complete Construction Work Packages;
- Additional Third Party firms were consulted per Marshalling, De-Containerizing, and/or Local Transportation Costs;
- Figures are Weighted Averages per Costs incurred per data sample per Project.

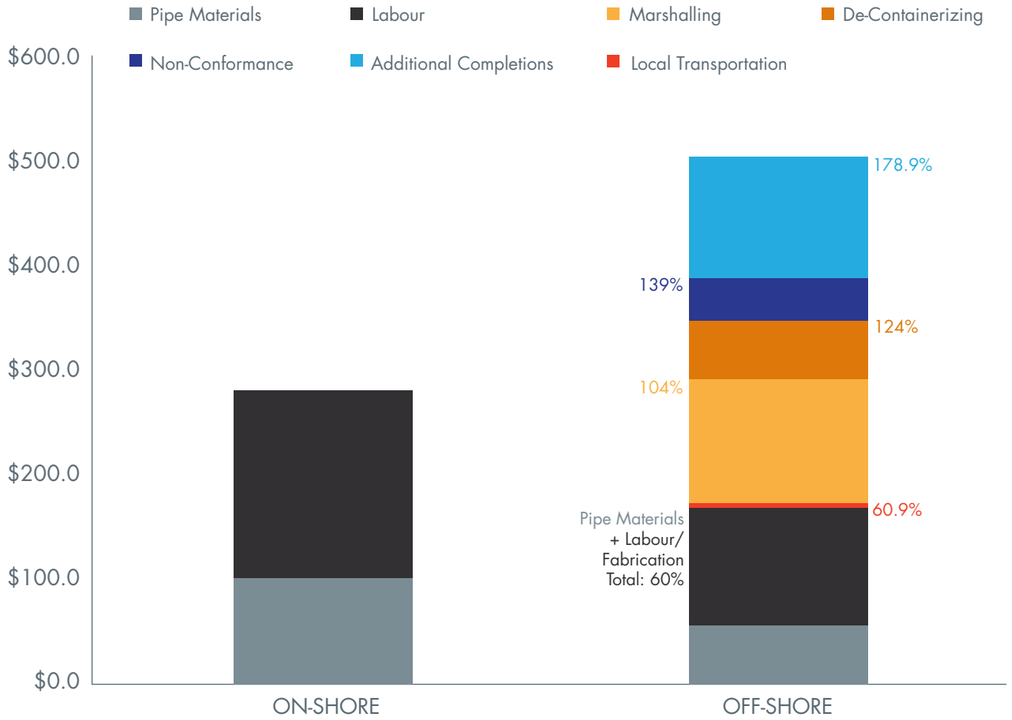
Figure 10 – Comparison of Local Steel Supply Only Cost to Off-Shore Supply Only + Incurred Additional Costs



Assumptions/Notes:

1. Data from Three (3) Contractors and representing Three (3) observations of Two (2) discrete projects.
2. Projects represented from the 2008-2014 Time Frame;
3. On-Shore cost structure data from Ground State data is dated 2015, and was Grossed Up by a factor of 1.1 to account for Inflation, while the Additional Installation factor was reduced by same.

Figure 11 – Comparison of Local Pipe Supply Only Cost to Off-Shore Supply Only + Incurred Additional Costs



Source: Ground State Market Solutions

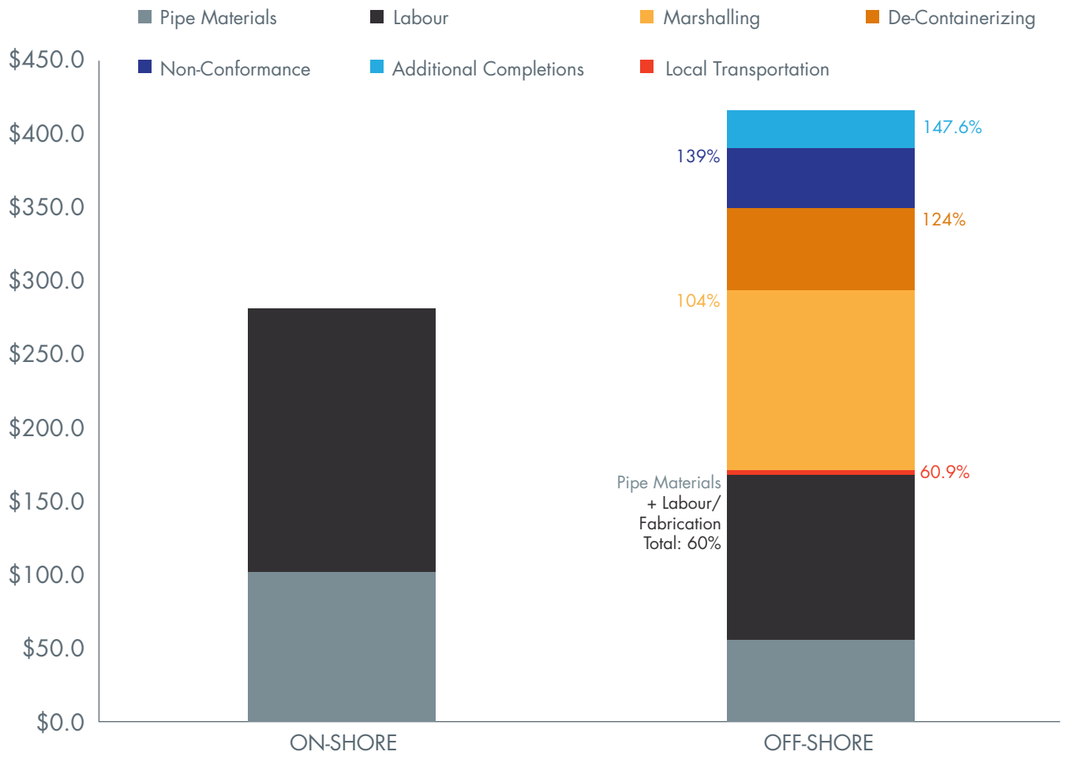
Assumptions/Notes:

1. Data from Three (3) Contractors and representing Four (4) observations of Three (3) discrete projects;
2. Projects represented from the 2008-2014 Time Frame;
3. Local cost structure data from Ground State data.

The above includes Project with different Pipe size tendencies. Projects with Large Bore Pipe had much higher Additional Completions work per Linear Metre due to the more broken down nature of the spools (E.g. on a 48" or 60" spool, an overseas fabricator is not able to fit a Spool with welded elbow in the transport crate), and Large Bore Spools have been transported Direct to Field for installation, where Labour on a Fixed Unit Rate is far more expensive.

Projects that selected predominantly Small Bore Pipe for Shop and/or Yard installation, faired better, however, the Net Result was still more expensive than a Local Solution.

Figure 12 – Comparison of Local Pipe Supply Only Cost to Off-Shore Supply Only + Incurred Additional Costs – Projects with Predominantly Small Pipe (Under 6 Inch Diameter)



Source: Ground State Market Solutions

Assumptions/Notes:

1. Data from Two (2) Contractors representing Two (2) Projects and Two (2) Project Silos representing 47,419 Linear Metres of Pipe;
2. Projects represented from the 2008-2014 Time Frame;
3. On-Shore cost structure data from Ground State data is dated 2015, and was Grossed Up by a factor of 1.2 to account for Inflation.

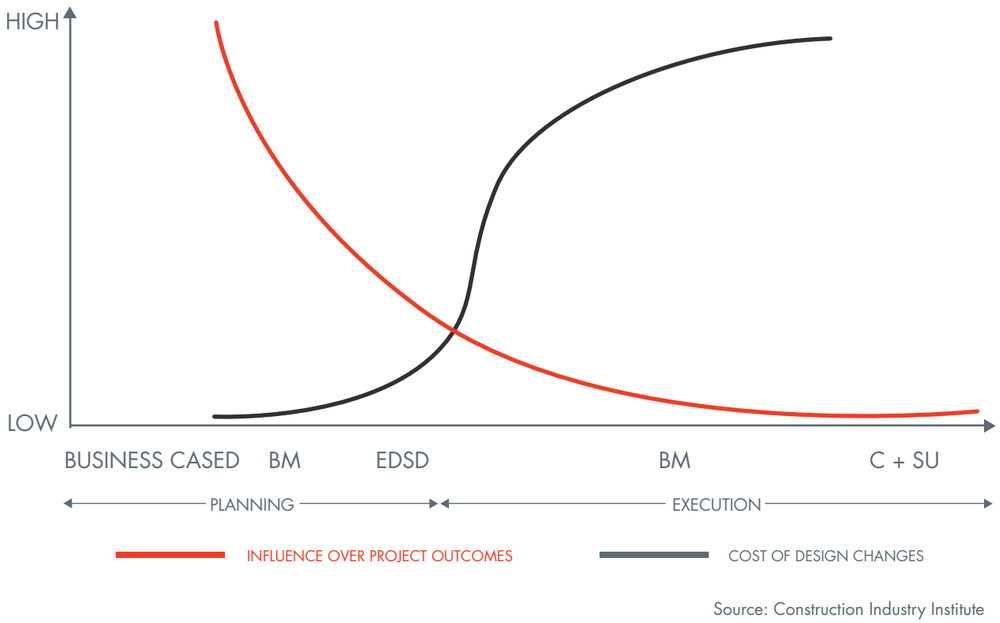
Collaborative Delivery: Project System Management

a. Conceptual Summary - Project Influence Model

Team Integration leads to the optimization of the relationship between Schedule (First Revenue Opportunity), Capital Spend, Operational Efficiency, and Decommissioning considerations.

Fundamentally, this is possible/happens because of the expanded circle of co-operation involved in the planning cycle; the most critical opportunity to efficiently affect the outcome of a project.

Figure 14 – Project Influence Model (Simplified)



Source: Construction Industry Institute

b. Projects as Complex Systems

Projects, and in Particular Major Projects are Innately Complex Systems due to the large number of Interacting System Elements.
The local supply markets in aggregate are inherently a much larger Complex System, being the cumulative product of the multiple projects (or lack thereof) occurring at any given time.

What we understand about Complex Systems is that they are Emergent, demonstrating non-linear properties, meaning that both the positive outcomes of beneficial interactions and the negative outcomes of negative interactions can have exponential effect. Power Laws apply, not Linearity, meaning that beneficial Collaboration can add significant Project Value, while lack thereof can leads to extension past the system limits and consequently cascading failure, as we have seen numerous times in the AB Major Projects Arena.
Planning and Managing for Complexity is paramount to Project success, and requires that the capacity of the system be known, and steps taken to avoid reaching it. This becomes challenging in the local arena, from a broader markets perspective, as the majority of projects have historically used in excess of 140%+ of required fabrication supply capacity due to poor Scope Definition ie. any given Owner may be 'Beggared' out of supply optionality due the behaviour or the crowd.

None the less, the individual Owner is left with decisions that they can control, that have the latter effect on the aggregate supply markets.

Complex System Management requires that actors first and foremost Understand the Capacity of the system, and Set Bounds to Actions that provide enough Degrees of Freedom for Self-Organization within that system. This applies to the contemplated project and the supply markets in which the project will be executed.

Collaborative Project Scoping and Planning is precisely that.

Individual Owner mandates to optimize on Project Value include, the following Core activities:

- Defining Scope;
- Defining the Path of Construction;
- Developing proper Market Intelligence and Market Strategies;
- Engaging Commercially Collaborative Alignment.

Typically, Owners have spent too little effort and/or resources during early/ Up-Front Scoping & Planning, living close the limits of those resources, while dangerously leaving the remaining scope undefined.

The Good News is that upside is significant for both individual projects and the broader supply markets.

c. Collaborative Functional Model

Managing for Complexity requires involving the Key Project Team Participants early in the process to allow System Definition in co-ordination with the timely opportunity for Team Members to Self-Organize.

Throughout all project phases, Interface Management is a critical function, selecting and managing relevant parties and the lines of communication/ collaboration. The balance of this responsibility rests predominantly with the Owner during project Scoping and Planning, and migrates to the General Contractor during/through the Construction phase(s).

Developing the Path of Construction, one of the major deliverables during Front End Loading, via Pull Planning is advantageous. This mandates that the Path of Construction be developed from the requirement(s) of the last activity in the schedule. Collaborative Front End Loading offers the optimal venue for this robust development methodology as it necessarily involves all Relevant Stakeholders including the End User/Operations, and all prior affected Stakeholders in the planning process, providing 'real' visibility of the detailed requirements along the Critical Path. (Note: The current planning and execution model that is primarily used in Alberta has a Front-End focus, and is developed in the absence of Relevant Stakeholders.)

Facilitators of Collaborate Project Execution include developing a Core Group / Steering Committee, as separate from the Project Execution Team, chosen from Key Project Member organizations, as a decision making body during execution of the project, a Communications Protocol, and Information/Design Technology Integration .

The Collaborative model below outlines the Key Project Execution Team Members, Defined Outcomes, and Defined Roles/Interaction.

Note that the below is a separate and more advanced approach than Design-Build, which prematurely limits those that would be considered a Key Project Team Member, necessarily resulting in a less than optimal Design Process and inhibiting the desired inter-organizational accountability.

FEL (Front End Loading) 1

Key Deliverables:

- Conceptual Project Economic Model Development
  - Cost Estimate Class 5
  - Schedule Estimate Level 1
  - OPEX Estimate Class 5
- Potential Site and Technologies selection

Activities per Key Project Team Member:

FEL 1	Interface Management	Scope Definition	Constructability	Engineering	Project Outcomes
Owner Corporate Development	Manages external stakeholders	Project economic drivers and gerneral understanding of project.			
Owner PM Team	Manages the interface between team participants.	Provides understanding of project scope, design, and area plan.		Provides engineering guidance to contractors (specs, guidelines).	Provides required dates per scenario.
Engineering Contractor		Provides costed options to deliver economic drivers.	Constructability strategy option recommendations	Engineering & estimating support per design scenario.	
General Contractor			Constructability strategy option recommendations	Construcability support per design scenario	
Fabricator and/or Assembler		Provides CWP options. Input to cost Estimates(s).	Inputs as required	Provide feedback on feasibility of scenarios.	
Owner Operations		Operating strategy inputs/requirments.	Provides operating guidelines for design.	Input to scenarios	
Procurement		Provides market intelligence/market strategy options		Provides market intelligence/market strategy options	
C+SU Team					Provides basic commissioning + start-up strategy.

FEL 2

Key Deliverables:

- Site and Technology selected
- Scope Finalization / Freeze
- Single Economic Project selected
    - Cost Estimate Class 4
    - Schedule Estimate Level 2
    - OPEX Estimate Class 4
- Engineering Completion ~ 10%
- Execution Plan for FEL3 frozen
- Long Leads Items identified and purchased
- Major contracts for FEL3 committed

Activities per Key Project Team Member:

FEL 2	Interface Management	Scope Definition	Constructability	Engineering	Project Outcomes
Owner Corporate Development	Manages external stakeholders	Provides commercial business case for selected option			Provides production targets and cost limits for project. Selects project and approves financial memorandum.
Owner PM Team	Manages the interface between team participants.	Approves final scope for FEED.		Oversees cost and schedule generation for entire project.	
Engineering Contractor		Details scope.	Provides constructability strategy for selected option and plan.	Provides engineering support to cost and design scenarios.	
General Constractor			Provides constructability strategy for selected option and plan.		
Fabricator and/or Assembler		Provides strategy to deliver project alternatives, inputs to cost estimate	Provides guidance on module fabrication methods	Assists engineering in high level scoping of chosen option for modularization	
Owner Operations		Operating strategy completion.	Provides operating requirements for design.		
Procurement		Completion of procurement plan for FEL3 and EPC.		Procurement plan for selected outcome. Issues contracts for FEL3.	Long lead itmes ordered.
C+SU Team		Defines high level scope of start-up plan.		Provide guidance per start-up requirements and system definition.	Commissioning + start-up plan completion.

FEL 3

Key Deliverables:

- Projected Execution frozen and an Overall Cost and Schedule understood:
  - Cost Estimate Class 3
  - Schedule Estimate Level 3
  - OPEX Estimate Class 3
- Engineering Completion ~ 30%
- Execution Plans, including RACIs
- Risk Management and Mitigation Plans
- Procurement Plans including defined pricing and awards prior to project sanction
- Operating Plans
- Commissioning and Start-up plans and resultant P&ID impacts
- Organizational and Staffing Plans.

Activities per Key Project Team Member:

FEL 3	Interface Management	Scope Definition	Constructability	Engineering	Project Outcomes
Owner Corporate Development	Manages external stakeholders			Support design specifications if required.	Approves FID for EPC.
Owner PM Team	Manages the interface between team participants.	Frozen scope approved for EPC.		Oversees cost and schedule generation for entire project.	
Engineering Contractor	Ensure input of GC, fab/assembly, C+SU team, corporate development and operations into design.	Engineering ~ 25-30% scope frozen and understood by all team particiapnts.	Constructability plan approval.	Complete engineering deliverables and issue DBM, frozen PIDs.	
General Contractor	Planning to manage construction site.	GC high level scope understood and frozen.	Constructability plan approval.	Assist design implementation of construction plan; co-located staff with engineering contractor.	
Fabricator and/or Assembler		Fabrication plan and module scope defined.	Construction plan approval.	Assist design implementation of modularization plan; co-located staff in place with engineering contractor.	
Owner Operations		Operating plan finalized	Participate in constructability reviews.	Support design; co-located staff with engineering contractor	
Procurement		Defines high level scope of start-up plan.		Contracts in place for EPC. Expediting underway to meet schedule	
C+SU Team		System limits and start-up plan finalized.		Support design with any requirements prior to frozen PIDs for start-up.	

d. Commercial

Alignment of Commercial interests facilitates a Collaborative Project Delivery Model; Shared Risk/Reward between Project Organizations towards properly conceived Project Objectives.

Note that Commercial misalignment, paired with poor project definition, has led to copious Change Order activity leading to severe trust degradation over the past two (2) decades.

At minimum the Design Consultant and the General Contractor, in addition to the Owner, ought to be in alignment Commercially with the objectives of the project. Additional Project Team Members may be included depending on the type of project, and the ability of the General Contractor to Self-Perform (Mechanical, Fabrication, and Commissioning and Start-Up in particular).

This fundamentally requires:

- Contractual Alignment;
- Trusting behaviour of the Parties;
- Transparent and Accurate disclosure of Project Objectives;
- Agreement of Parties to Project Objectives, and to concept that those Objectives can be/will be best met via Collaborative Delivery.

The Contractual Elements outlined below per Project Phase may be Multi-Party or Individual, but in any case ought compel inter-organizational accountability:

Scoping + Early Design (FEL 1 - FEL 3)
- Cost Reimbursable + Not To Exceed format to be established by Owner and agreed to by Key Project Team Members.

Note that It is incumbent on the Owner and/or Owner Governance to allow for Early Involvement of the Project Team Members that does not prejudice Full Execution ie. Design, General, or Fabrication Contractors, are likely to perform optimally during in FEL 1 – 3 if the Owner has a history of fidelity to those relationships and allows the Contractors to participate during Construction. Otherwise, those Contractors may be very much less inclined to be involved early and/or to provide their best and most innovative efforts.

Execution – (Detailed Design + Construction)
- Contractual Options:
  - Target Value Contract – Fixed Fee + Fixed Unit Rate + Reward Mechanism per Cost + Schedule
  - Lump Sum + Reward Mechanism per Schedule Only
- Target Value Pricing to be developed Collaboratively and Confirmed by Owner Consultants
- May or May Not include Liquidated Damages items.

Note : The Risk Premium associated with either contract type should be lower than typically experience in the market place, due to a more robust development of the Estimate, which is commensurate with the lower Risk Exposure to the Contractor(s).

Commissioning & Start-Up
- Same as Execution.

e. Typical Functional Model in Local Market

Problem #1 - Understanding the Value Proposition

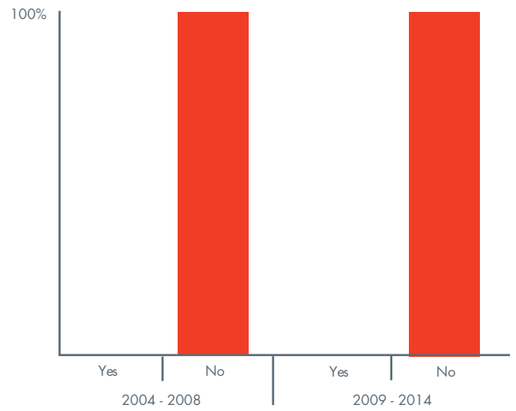
Adopting Collaborative Project Delivery models in the local market will first require a proper understanding of Total Project Value, by both Owner Procurement professionals and Supplier Business Development professionals.

Ground State recently surveyed Ten (10) industry professionals, in the local AB Major Projects market, regarding the markets understanding and implementation of Value Based Analysis in the Owner/Contractor contracting process. Each had Twenty (20)+ years of experience. We balanced the survey between Owner procurement personnel and Contractor/Fabricator Business Development personnel, and asked questions targeting the Value Proposition associated with the projects with which they were engaged.

Question #1:

For projects executed in the below time frames, in the AB market, that you've been involved with have you and/or your Procurement team (BD Team for Contractors) understood the NPV/IRR Calculations and the Economic Drivers associated with your project? Ie. Those professionals developed and/or were conversant with those Economic Calculations, and understood the Critical Path elements that affect the Economics of the Project.

Figure 15 – Does Your Team Understand the Project Economic Drivers ?



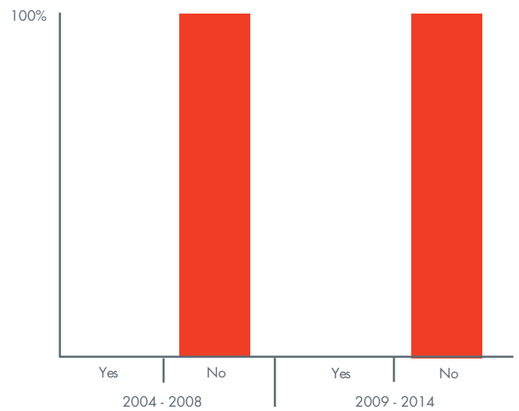
Source: Ground State Market Solutions

It follows that they additionally were in general unable to articulate the value proposition associated with each Discipline/Key Quantity.

Unsurprisingly, when asked to provide estimated occurrences of Collaborative Project Execution they had experienced or seen in the market place and/or the level of Integrated/Value Bargaining in the market, the responses indicated that the market is focused on compelled Competitive Devaluation (even in Schedule Driven markets) in the Supply Markets instead of maximizing Total Project Value.

Question #2:

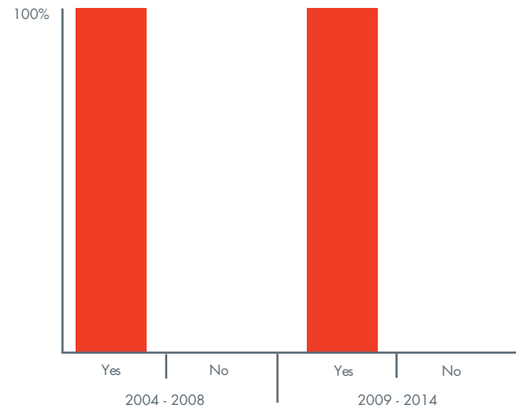
Figure 16 - Do You and/or Your Procurement Team (Owner) use those Economics to drive your Procurement Strategies?



Source: Ground State Market Solutions

Question #3:

Figure 17 - Confirm that You and/or Your Procurement Team Focus(ed) on Relative Market Pricing / Competitive Bid Pricing rather than Project Value considerations.



Source: Ground State Market Solutions

Problem 2 - Existing Market Functionality

Typically, Owner Project Organizations drive a Segregated Execution model, defined as 'Design-Bid-Build' (DBB) in industry literature (common between the two Growth Cycles outline above). The Owner adjudicates between the Engineering firm, and the Contractors. 'The Owner contracts with the designer (EPC), and then when the design is 100% complete (in theory), the Owner contracts separately with a General Contractor (GC), [and in some cases Fabricators and Equipment Vendors] to build the facility.'

In addition, the EPC market locally works in segregated fashion within their own firm(s) (each discipline working in silos).

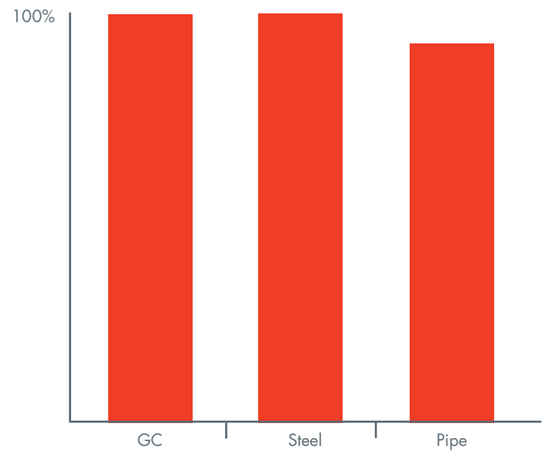
And because the cost of changes increases as schedule progresses, this approach means that by the time the relevant project participants are involved, any Standardization/Constructability changes that they would recommend to the design team that would result in significant Cost/Schedule Over-Runs and consequently Total Project Value degradation.

General Contractors, Steel Fabricators, and Pipe Fabricators responses to our recent survey regarding their typical engagement experience with clients demonstrate the systemic lack of Early Involvement.

Returning to the Functional Execution conversation, we note that the Alberta

market is failing to engage the integration required to succeed; involving the influence of GC's, and Fabricators in the Design and Planning phases.

Figure 18 – Industrial Project Supplier Early Engagement



Source: Ground State Market Solutions

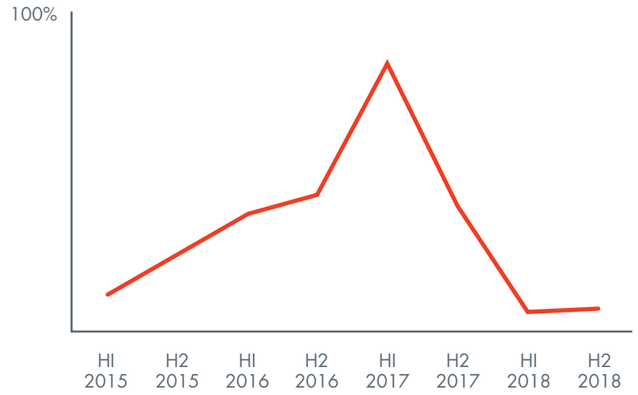
Assumptions/Notes:

1. Data from Two (2) General Contractors and representing Thirteen (13) discrete projects;
2. Data from Two (2) Steel Fabricators and representing Thirteen (13) discrete projects;
3. Data from Three (3) Pipe Fabricators and representing Twenty One (21) discrete projects;
4. Projects represented from the 2008-2014 Time Frame.

Supply Market(s)

Backlog Items – Structural Steel & Pipe Fabrication

Figure 19 - Structural Steel Backlog – AB Market

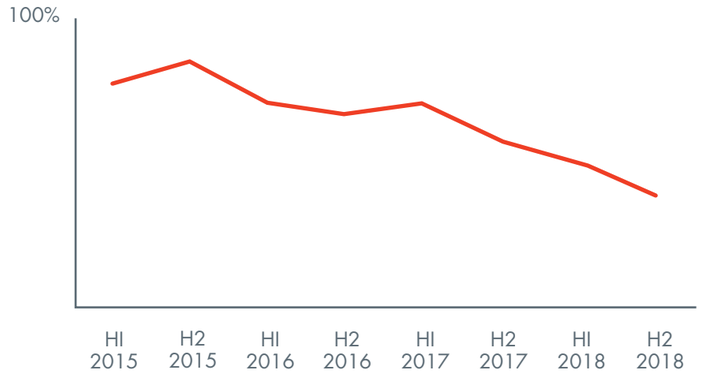


Source: Ground State Market Solutions

Assumptions/Notes:

1. Represents data for ~ 60% of the Market Capacity.

Figure 20 – Pipe Fabrication Backlog – AB Market



Source: Ground State Market Solutions

Assumptions/Notes:

1. Represents data for ~ 40% of the Market Capacity.

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