

**ASSESSING METHANOL PRODUCTION IN CHINA FOR
METHANEX**

by

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ABSTRACT

Methanex is the world leader in methanol production and marketing. China is an important market; by 2014 it is forecasted to account for 50% of global demand. The purpose of this project is to determine whether Methanex should invest in methanol production in China. The project approach uses a multi-goal analysis focusing on three goals: (1) Consistent with Corporate Vision, (2) Sustainment of Existing Competitive Advantages, and (3) Profitability.

Based on the analysis, the project concludes that Methanex should not produce methanol in China until coal to methanol technology is more profitable and environmentally feasible. The project also proposes a hybrid alternative that focuses on increasing market share and footprint in China, while continuing to monitor developments in coal technology.

EXECUTIVE SUMMARY

China is an increasingly important market. In 2009, China unseated Japan as the world's second largest economy, overtook Germany as the world's largest exporter, and surpassed the U.S. as the world's largest automobile market. Many foreign multinational firms are struggling to define their China strategy in the quickly changing macro business landscape. Methanex Corporation, a producer and marketer of methanol, is no different. China is methanol's fastest growing market and, by 2014, will account for 50% of the world's methanol demand. Methanex, with 15% market share of the global methanol demand, is the world's leading methanol producer and marketer. With no methanol production in the fastest growing and soon to be largest market, Methanex is questioning whether to invest in methanol production in China.

Methanex is guided by its corporate vision, Global Methanol Leadership, which can be achieved by successful attainment of leadership in three areas: (1) Market Share Leadership, (2) Standards Leadership and (3) Industry Leadership. The three pillars of corporate strategy that drive the company toward this vision are (1) Global Leadership, (2) Operational Excellence and (3) Low Cost. Two competitive advantages chosen by Methanex to execute these strategies are (1) Secure Global Supply and (2) Responsible Care Ethic.

The approach used in this project is a multi-goal analysis. The analysis focuses on three goals. The purpose of the multi-goal approach is an analysis that considers the corporate strategy, existing strengths, and maximizing returns. Interviews and discussions with senior managers, managers and analysts provided the depth of information required to analyze coal to methanol

technology in China, Responsible Care, marketing and logistics, present Chinese operations, and Methanex's corporate strategy.

The first goal is ensuring consistency with Methanex's corporate vision: Global Methanol Leadership. The second goal is to sustain Methanex's existing competitive advantages. The third is to maximize profits. From the multi-goal analysis, the final assessment is that Methanex should not proceed with methanol production in China. However, maintaining the status quo is not the best option. Rather, Methanex should proceed with a hybrid alternative. Three independent but related recommendations are proposed for this alternative. First, Methanex should focus on increasing market share in China. Second, it should increase its footprint in the country through joint ventures, specifically in fuel blending. Third, the company should keep a close eye on coal technology to be ready for game changing technologies that can make coal to methanol production competitive.

DEDICATIONS

This project is dedicated to the Methanex family and the 2008 MBA MOT cohort. Special thanks to Shaun Malough, Gary Rowan, David Trent, and John Gordon for consistently giving me their support, direction, and confidence. My adopted family – my 2008 MBA MOT cohort – for sharing the process of self-learning as well as finding the balance between work, life, and school, and providing me comfort in knowing that I am not alone in this program.

Most of all, this project is dedicated to circles of supporting friends and family. I have been fortunate to be surrounded over past two years by you all despite my absences. Thank you for your understanding and being there! Thank you Mom, Dad, Bern and family, you have instilled in me the values to drive my education further and maintain my curiosity that kept me going. Elizabeth, my niece, your laughter made me forget that the MBA was work but rather it was my gift to you. It is my tool to help shape a better world for you.

ACKNOWLEDGEMENTS

The wealth and depth of information, and the ideas that form the basis of this project came not from academic articles or industry publications, but from the many hours of interviews, discussions, and debates with senior managers, managers, and analysts at Methanex. These sources are individuals close to the action in the areas analyzed in the multi-goal analysis. Without their patience, time, support, and willingness to share their information, this project would be a soulless and purely academic paper.

At Methanex, I would first like to thank Don Tough, Peter Ho, Ben Iosefa, and Paul Daoust for their support and the hours of discussion about China. Just when I thought I had formulated an approach, you made me go back to the drawing board and look at things from a different perspective. Many thanks also go to Brad Neuman, Louise McMahon, and Diane Li for your invaluable insight on the challenges of coal to methanol in China in relation to Methanex's Responsible Care policy. I would like to thank Rochelle Presgrave and Peter Gunn for their dedication and time in assisting me with the pricing models of natural gas and coal-based methanol production.

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GLOSSARY

| | |
|----------------------|---|
| Dead Weight Capacity | This is the capacity of a vessel, including cargo, people, fuel etc. less the actual weight of the vessel |
| DME | Dimethyl Ether is a gas that can be used as an aerosol propellant or a clean fuel |
| ENAP | Empresa Nacional del Petroleo (ENAP) is a Chilean state energy company |
| ETBE | Ethyl Tertiary Butyl Ether is commonly used as an additive for gasoline production to offer air quality benefits |
| KMT | Kilo Metric Tonnes |
| LNG | Liquefied Natural Gas is natural gas that has been converted temporarily to liquid form to facilitate ease of storage and transport |
| MMT | Million Metric Tonnes |
| MTO | Methanol- to-Olefins, also known as polypropylene, is an industrially produced polymer synthetic fibre used in manufacturing household products and clothing. |
| MTP | Methanol-to-Propylene is the process of creating propylene from methanol, and is an industrially produced chemical compound often used in solvents and plastics. |
| MTBE | Methyl Tert-Butyl Ether is a chemical compound that is used as a gasoline additive to raise octane levels |
| Responsible Care | Responsible Care is the chemical industry's global voluntary initiative under which companies, through their national associations, work together to continuously improve their health, safety and environmental performance, and to communicate with stakeholders about their products and processes (Responsible Care, nd). |

1: METHANEX CORPORATION

1.1 Introduction to Methanex and Methanol

Based in Vancouver, Canada, Methanex Corporation is the world leader in the production and marketing of methanol. Methanex was incorporated in 1992 and is an amalgamation of Ocelot Industries' methanol and ammonia business after the business was split into three separate entities. The company is a Responsible Care company, with global production and marketing operations in Canada, the U.S., Chile, Trinidad & Tobago, New Zealand, Europe, China, Hong Kong, Egypt, Dubai, Korea, and Japan, employing approximately 800 employees (personal communication, March 30, 2010). Methanex's sales account for 15% of the world's 40 million metric tonne (MMT) market (Methanex, 2010b). Figure 1 shows Methanex's global operations.

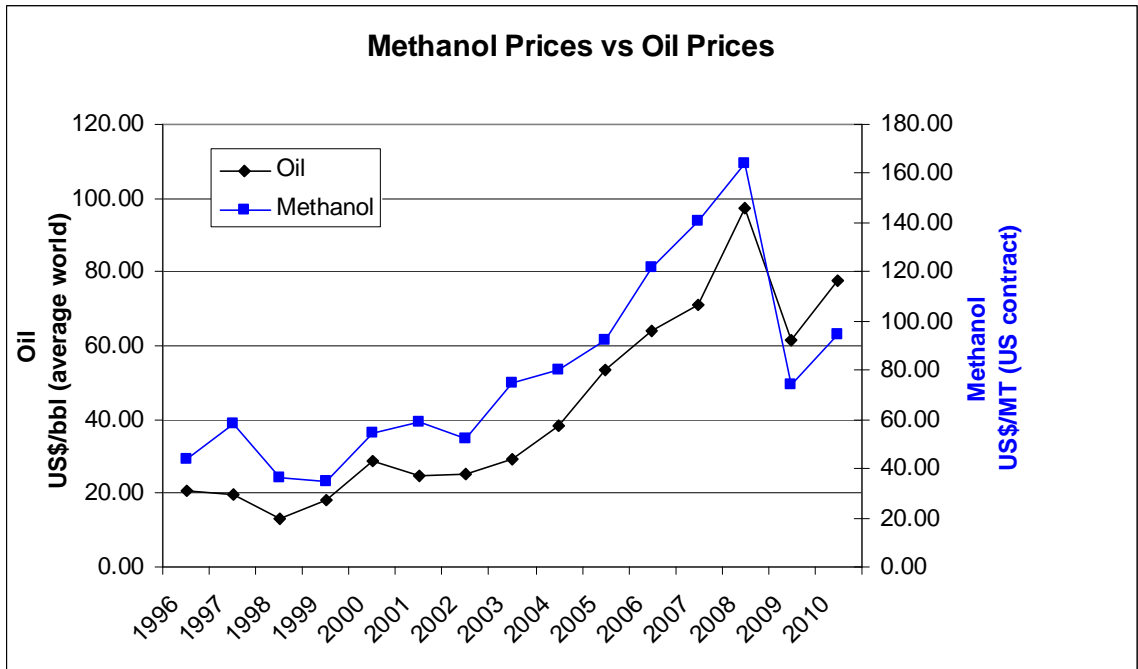
Figure 1 Methanex Global Operations



Source: Methanex Annual report, (2009a)

Methanol is a petrochemical that is used in many products, both industrial and consumer. With properties that make it a chemical building block, it is versatile and critical ingredient of derivative chemicals and products such as acetic acid, formaldehyde, methyl methacrylate, and silicone. Increasingly, methanol is used for derivative products with energy applications. These include methyl tert-butyl ether (MTBE), dimethyl ether (DME), fuel blended gasoline, and bio-diesel, all of which have applications for energy use for domestic heating, cooking, and transportation. The energy value of methanol is a reason its price is closely correlated to the price of oil, as shown in Figure 2 below.

Figure 2 Methanol vs Oil Prices



Source: Oil and Methanol Prices, (2010)

1.1.1 Production

Methanol is Methanex's only commercial product. Production is from its active sites in Trinidad & Tobago, Chile, and New Zealand. By mid 2010, Methanex's Egypt site will go live, with a combined annual production capacity of 8MMT (see Table 1).

While the company is involved in joint ventures for the production of DME, Methanex's obligation in those partnerships is to supply methanol. The principle feedstock for methanol is natural gas, which contains the carbon element necessary to produce methanol used in the catalytic process. The other key element required in the production of methanol is hydrogen, which is obtained from water in the form of steam.

Table 1 Methanex Production Capacity

| Site | Volume in KMT | | |
|-------------------|----------------------------|-----------------|-----------------|
| | Annual Production Capacity | Produced (2009) | Produced (2008) |
| Chile | 3,800 | 942 | 1,088 |
| New Zealand* | 900 | 822 | 570 |
| Trinidad & Tobago | 2,050 | 1,779 | 2,005 |
| Egypt | 750 | - | - |
| Total | 7,500 | 3,543 | 3,663 |

Source: Methanex Annual report, (2009a)

* only includes the 900KMT Montunui facility restarted in 2008

Since 2004, Methanex has been adjusting its New Zealand operations according to methanol demand and the availability of natural gas. While Methanex continues to own sites in Kitimat and Medicine Hat in Canada, production at both sites halted by 2005. High natural gas prices in North America prohibited sustained production activity there and was misaligned with the company's Low Cost strategy. The production facility at the Kitimat site has been converted to a terminal facility used to store methanol.

Production capacity at the Chilean site forms approximately 50% of Methanex's total capacity. Sixty-two percent of the natural gas required for the Chilean site is sourced from Argentina. Output has been impacted by the Argentinean government. In 2006, it passed legislation increasing the existing duty on natural gas exports that is paid by Methanex's Argentinean natural gas exporters (Methanex, 2007a). Exports of natural gas supplies to the Chilean site were curtailed in 2007. This situation demonstrates the fragile nature of internationally recognized contracts and the critical nature of feedstock security.

1.1.2 Marketing and Logistics

Marketing and Logistics is responsible for taking produced and purchased product, and delivering it to Methanex's customers. Dotting the globe, Marketing and Logistics offices help enable Methanex to be the world's largest supplier of methanol by finding and managing customers, and supplying them with methanol. In the Western Hemisphere, North and South American Marketing and Logistics operations run out of the Dallas, U.S., and Santiago, Chile offices. Offices in Billingham and Brussels, in England and Belgium respectively, are responsible for Marketing and Logistics operations in Europe. The company has several offices in Hong Kong, Shanghai, Seoul and Tokyo to manage Methanex's sales and logistics operations in Asia, its largest regional market.

Methanex's global supply chain is a seamless network of strategically placed production facilities and storage terminals connected by the world's largest methanol tanker fleet (Methanex, 2010a). Within this network, the company has 1.4MMT of storage capacity throughout Europe, Asia, North America, and Latin America. The storage terminals are integral to the supply chain system. These facilities, such as the Yeosu Terminal in Republic of Korea, are strategically located to ensure reliability, flexibility, and on time delivery of supply to customers. Within each region, Marketing and Logistics integrates these different components of the supply chain giving Methanex the capability to unload methanol from vessels at storage facilities and then, using various modes of land and water transportation, deliver the product by rail, truck or barge directly to customers.

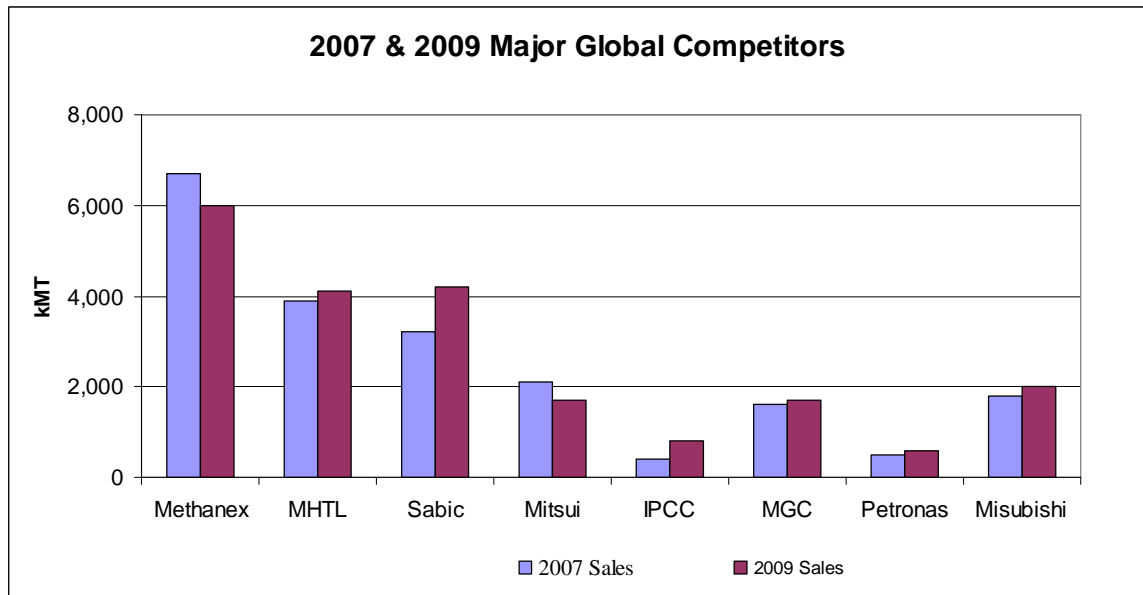
The proximity of the current production sites to the coast allows Methanex to leverage this tanker fleet effectively. Waterfront Shipping is a wholly owned subsidiary of Methanex that manages the tanker fleet. It is responsible for managing the over 200 vessels that Methanex either owns or charters, including the world's largest methanol tanker, the Millennium Explorer. With the exception of the Millennium Explorer, which has a dead weight capacity of 100KMT, these vessels have an average dead weight capacity of 45KMT of methanol,

1.1.3 Sales

Based on sales volume, Methanex is the world's largest methanol company.

Figure 3 shows the 2007 and 2009 sales figures of the major global methanol competitors.

Figure 3 2007 & 2009 Major Competitor Sales



Source: 2010 to 2014 Strategic Plan, (2010h)

Most of Methanex’s sales are satisfied by product produced at its own sites. However, Methanex also sells product where exchange partners are involved in the transaction. These agreements benefit both Methanex and the exchange partner. If a Methanex partner has better access to a customer, the partner will satisfy the order. In exchange, Methanex will satisfy delivery of the same quantity for one of the partner’s orders. Methanex will also purchase product on the spot market to satisfy contract commitments or take advantage of arbitrage opportunities. Another variation of this is called “off takes” where Methanex has a long-term licensed agreement to purchase methanol from a producer. Table 2 below provides a breakdown of Methanex’s sales in 2009.

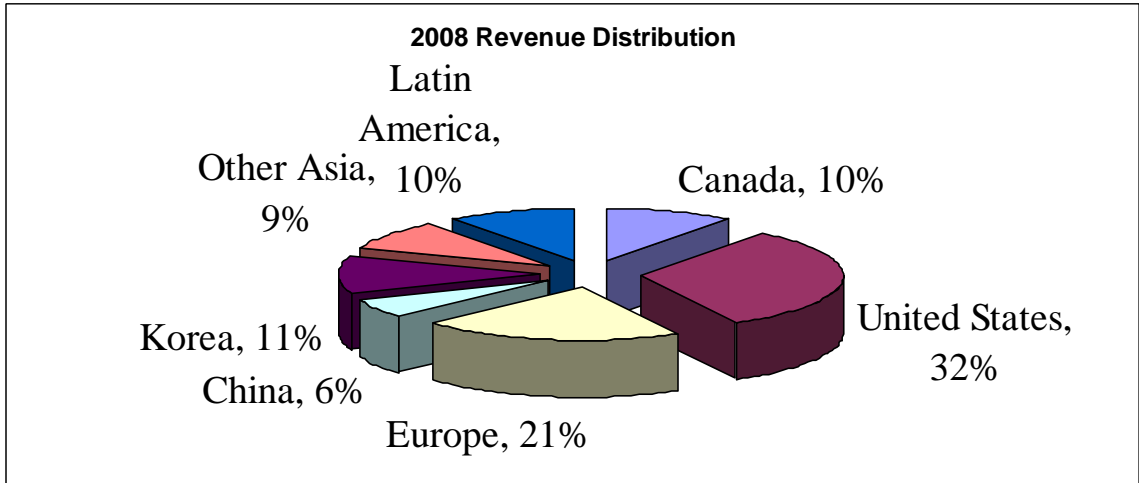
Table 2 2009 Sales Volume

| Source of Sale | 2009 Sales Volume (thousands of tonnes) |
|-----------------------|--|
| Produced Methanol | 3,764 |
| Purchased Methanol | 1,546 |
| Commission Sales | 638 |
| Total | 5,948 |

Source: Methanex Annual report, (2009a)

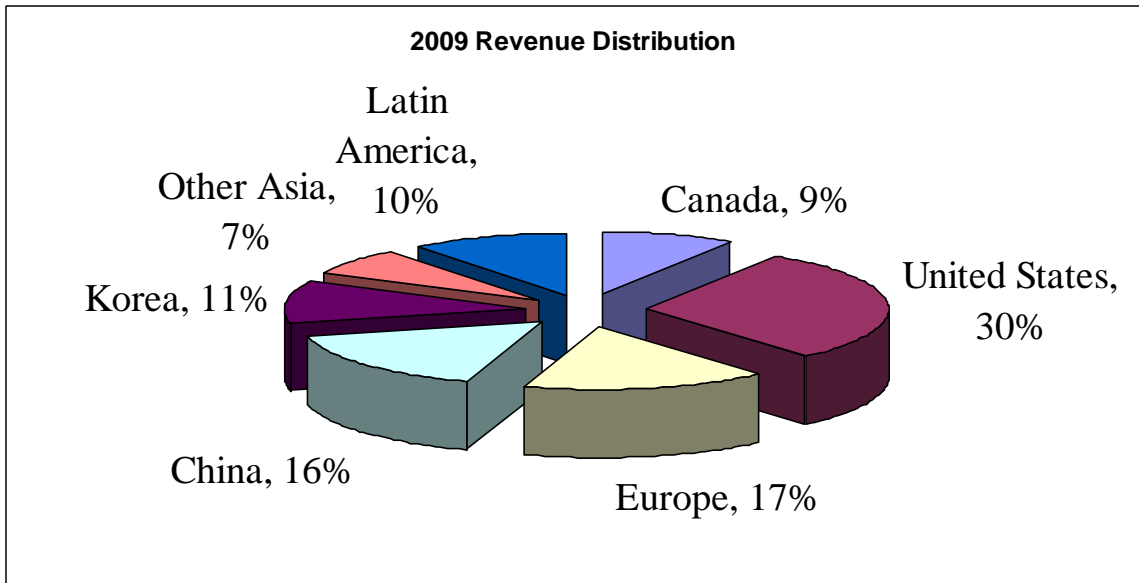
From 2008 to 2009, the majority of Methanex’s sales came from the U.S. as seen in the following two figures, Figure 4 and Figure 5. However, there are two noticeable trends. First is Europe’s decline in the proportion of Methanex’s overall sales, from 21% to 17%. Second is the growth in Asia, particularly in China where the proportion of total sales increased by 10%, highlighting the growing demand from the developing economies.

Figure 4 2008 Revenue Distribution



Source: Methanex Annual report, (2009a)

Figure 5 2009 Revenue Distribution



Source: Methanex Annual report, (2009a)

1.2 Methanex History

1.2.1 Growth by Acquisition

Upon entering the market in 1991, Methanex goal was to become the world leader in its industry and it began a series of aggressive expansion moves. Within its first year, Methanex acquired interests in North America from the German conglomerate Metallgesellschaft AG via an agreement that would allow Methanex to purchase a portion of the methanol production from a plant in Texas. A year later, in 1992, Methanex purchased Metallgesellschaft AG's Caribbean interests, including 10% equity in the Caribbean Methanol Company and exclusive rights to market methanol produced from the Titan Plant in Trinidad (Methanex, 2007c). Methanex would later gain ownership of the Titan Plant in 2003. The deal in 1992 also included exclusive future marketing rights to a percentage of the methanol produced from this plant. Metallgesellschaft AG continued divesting itself of its methanol business to Methanex later that year by selling both its European methanol marketing and trading operations as well as 70% of its stake in a Louisiana based company, Fortier Methanol. In 1994, Methanex purchases Nova Chemical's methanol business and operations including its Medicine Hat facility.

Methanex also acquired assets from the incumbent world leader in methanol production, Fletcher Challenge, which was trying to recuperate its investments in various assets. These acquisitions, in 1993, gave Methanex production facilities in Waitara Valley and Montunui in New Zealand, and Punta Arenas in Chile. All of these sites continue to be active production sites for Methanex.

1.2.2 Continued Expansion

Mergers, acquisitions and the construction of additional facilities form Methanex's current production capacity. Between 1993 and 1995, Methanex began and completed the construction of two additional distillation units at its larger Montunui facility in New Zealand, bringing the total distillation facilities to four. Three capital expansion projects also commenced and were completed between 1996 and 2005 in Chile (Methanex, 2007c). With natural gas prices in North America making the cost structure for production prohibitive, Methanex undertook two projects to take advantage of low cost natural gas in the southern hemisphere. These projects included the third expansion project in Chile, and the 2001 joint venture project between BP Trinidad and Tobago LLC (BPTT) and Methanex to construct the 1.7 MMT Atlas facility next to the Titan Plant. When Atlas was completed in 2004, it was the largest methanol plant in the world (Methanex, 2007c).

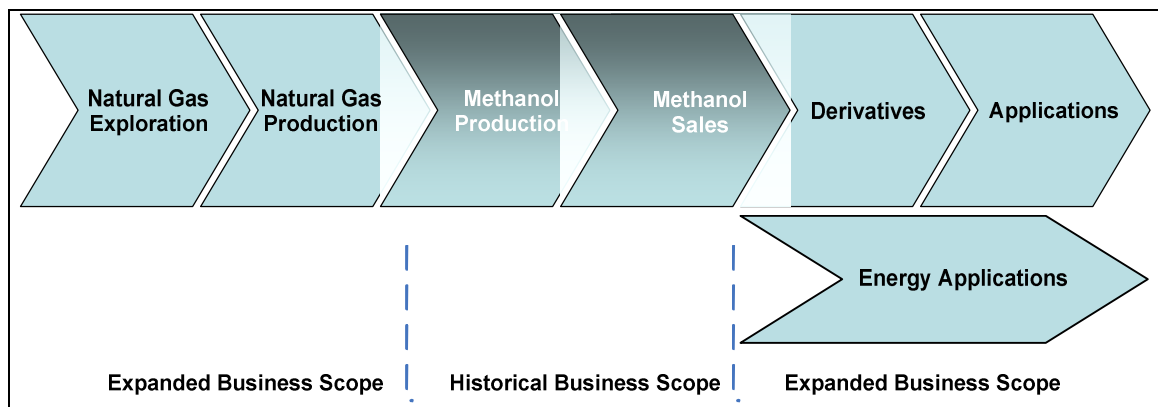
The most recent expansion project is the new site in Egypt, which is a joint venture with the Egyptian government and the Arab Petroleum Investments Corporation (ARICORP). Methanex will have a 60% interest in the venture (Methanex, 2010d). At the time of writing Methanex will operate the methanol production and participate with ENN Group (formerly XinAo Group Company Limited) in the DME portion of the Egypt investment (Methanex, 2007d). ENN, a Chinese firm, is Methanex's DME partner in a Chinese joint venture near Shanghai. ENN is involved in developing, processing and distributing natural gas and energy related chemical products, such as LNG and DME. Moreover, it is also involved in the full development lifecycle of natural gas systems and equipment.

1.3 Corporate Strategy

1.3.1 Business Scope

Until 2006, Methanex's scope of business in the value chain of methanol lay within production, sale and delivery, as shown in Figure 6. The representation of this value chain borrows from Michael E. Porter's value chain concept (Porter, 1985). Due to the changing business environment and risks, Methanex's strategy has evolved out of this historical business scope with expansion towards both ends of the value chain.

Figure 6 Methanol Value Chain



Source: Author

One catalyst for the expansion of the business scope was the curtailment of natural gas from its Chile sites. The Argentinean government demonstrated the true risks to business continuity when feedstock to the plant sites was cut. As a result, to secure the feedstock, Methanex's strategy has evolved to include supporting the exploration and development of natural gas resources. Currently, the company is actively engaged with Empresa Nacional del Petroleo (ENAP) in Chile, and has successfully begun to replace the Argentinean supply with supply from their exploration and development (Methanex, 2009a). The company is also researching innovative and non-traditional approaches to

methanol production that give the capital investment greater flexibility. In addition to securing natural gas supplies, the company is also seeking to gain knowledge on alternative feedstock, like coal, that frees the company from being tied to one feedstock type, and opens the company to green field opportunities where natural gas is inaccessible.

The evolution of Methanex's strategy is also occurring further down the value chain. As methanol is a chemical compound used in derivative products, Methanex is actively developing the derivatives markets that use methanol, especially in energy applications. The company is involved in encouraging the demand for methanol through its industry associations as well as through dialogue with different levels of government in countries such as China. Methanex's joint ventures in Egypt and China provide opportunities for the company to gain valuable knowledge in these new markets.

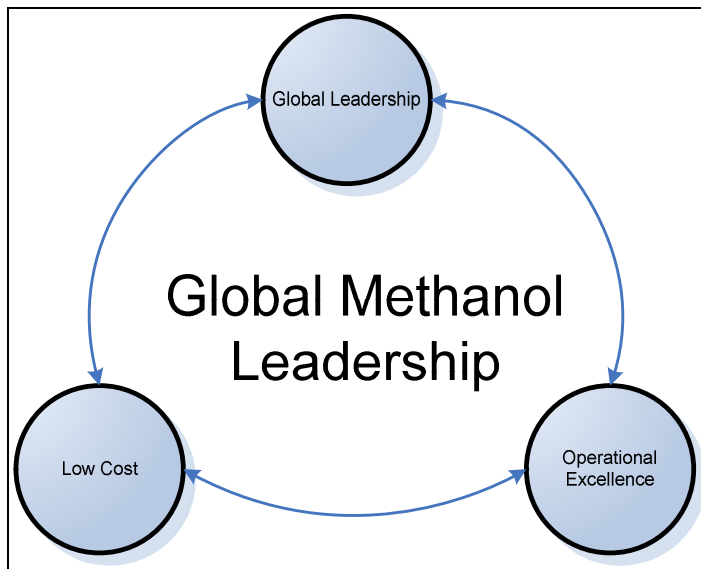
1.3.2 Corporate Vision

The corporate vision that Methanex strives to achieve is Global Methanol Leadership. The vision of Global Methanol Leadership can be interpreted as being comprised of three leadership areas. Market Share Leadership simply means having the largest share of the methanol sales pie. Standards Leadership is defined as having a contributing role in setting high operational and safety standards in the industry. Industry Leadership is having a contributing role in guiding the industry in matters of interest such as the growth of derivatives in new markets and as well as fighting against substitute products.

1.3.3 Corporate Strategies

Three pillars of corporate strategy guide the company: (1) Global Leadership, (2) Value Creation and (3) Operational Excellence. Figure 7 presents an interpretation of Methanex's vision and corporate strategies.

Figure 7 Methanex Corporate Strategy



Source: Author

Global Leadership

The Global Leadership strategy aims to position Methanex as the leader in several key success factors of the methanol industry. The strategy targets positioning Methanex to have the best global supply chain, industry knowledge, technology and reliability, while targeting customers who are leaders in their industry. Another focus of the Global Leadership strategy is to sustain the largest market share in the methanol market.

Low Cost

Methanol is a commodity product and, as such, cost control and reduction is a critical element to developing cost advantage over competitors. In the methanol industry, the three long run cost drivers are (1) capital investment, (2) feedstock cost and, (3) freight cost. Thus, the focus of Methanex's low cost strategy is on ensuring a competitive cost advantage over its competitors.

Operational Excellence

The Operational Excellence strategy focuses on maintaining operational excellence in all aspects and functions of the business. As a methanol producing company, this strategy translates into ensuring that processes and assets support reliable manufacturing and supply operations. Moreover, operational excellence ensures that human resources procedures continue to retain a skilled and engaged workforce. The Operational Excellence strategy also requires a commitment to Responsible Care and Social Responsibility policies. As will be discussed in the following section, these policies lay the foundation for ensuring safe and reliable processes as well as establishing and maintaining relationships with stakeholders.

1.4 Competitive Advantages

Methanol is a commodity product. However, Methanex is able to take this commodity and differentiate it by adding value for its customers. The sources of these differentiations are its competitive advantages, another concept from Michael E. Porter (Porter, 1985). Methanex's competitive advantages are, Secure Global Supply and its Responsible Care Ethic.

1.4.1 Secure Global Supply

Methanex's primary strategy is to target leaders in the derivative markets as their customers and to add value to their methanol product by providing the required product quality and, more importantly, the security of methanol supply. Most customers produce chemicals for which methanol is a vital and irreplaceable component. Hence, these Methanex's customers are willing to pay a premium to be assured of their methanol supply.

A concept from Prahalad and Hamel (Prahalad, 1990) is core competencies, the roots of competitiveness in an organization. Two core competencies form the pillar of support necessary to provide security in global supply for methanol. These are Industry Knowledge and Reliable Supply Chain. Methanex's core competency in Industry Knowledge provides management with a superior understanding of its competitors and the market, thereby allowing the marketing teams to target customers and seek out potential new demand. It also allows the company's supply chain to position or acquire assets, such as vessels and terminals, or work with other methanol producers or marketers to ensure supply to those customers. Methanex's core competency in Reliable Supply Chain is critical to ensuring that components within the supply chain have high reliability and contribute to the security of supply to customers.

Methanex's relationship with one of the world's large global chemical company is an example that demonstrates the company's proven ability to deliver to its customers. Chemical company is a multinational chemical manufacturing firm operating in the U.S. and Europe. They produce ethyl tertiary butyl ether (ETBE) in the U.S. and both ETBE and Methyl tertiary butyl ether (MTBE) in Europe (personal communication, May 17,

2010). Depending on legislation governing production levels of MTBE and ETBE in Europe, the company will switch production between MTBE and ETBE. This can result in a reduced or increased demand for methanol of approximately 50% of their regularly contracted volume. Methanex is their sole methanol supplier because it has the global production capacity and supply chain flexibility to follow and support their ever changing needs.

1.4.2 Responsible Care Ethic

Methanex's secondary differentiation comes from its Responsible Care Ethic. This ethic consists of two components: Responsible Care Policy and Social Responsibility Policy. Responsible Care is a voluntary initiative of the International Council of Chemical Associations (ICCA) under which chemical companies collaborate to improve safety, health, and environmental performance of their products and processes. Responsible Care is a directive that Methanex has chosen to follow to minimize the risk to the environment, communities and people during the product lifecycle and distribution of methanol. The ethic has two areas of interest (1) stewardship of product and (2) accountability to the public. The scope of stewardship of product includes the safe production, use and transportation of chemicals by the member company. It also encourages close co-operation with stakeholders throughout the supply chain. For example, raw material providers and customers are pre-screened for acceptability with respect to their processes and practices. A Responsible Care Clause in contracts represents a Methanex requirement that all its contractual business associates align with the company's view on Responsible Care. In addition, as part of the product stewardship focus, Methanex provides safe methanol handling seminars through the

Methanol Institute¹ to ensure that stewardship of its product adheres to the highest level of standards through the entire lifecycle.

Accountability to the public encompasses external stakeholders. In its commitment to Responsible Care, Methanex works closely with local governments and local communities to ensure that high safety and environmental standards are met. This transparency and co-operation with external stakeholders helps to position Methanex as a preferred methanol partner with governments. In addition to positioning the company as the preferred methanol supplier, the Responsible Care Ethic is a differentiator and a competitive advantage that customers are willing to pay a premium for. Furthermore, it forces the company to improve operational and safety standards continuously, which helps to ensure high reliability of its operations.

Responsible Care is a key part of the Methanex culture. Methanex implemented Responsible Care in 1997, becoming the first chemical company in the world to receive global verification. As a relatively new company with many newly acquired production sites from multiple sources, Responsible Care became the common thread between all the manufacturing facilities and bonded the company as a whole (personal communication, June 9, 2010). The Responsible Care culture is reflected in the offshoot Social Responsibility Policy that includes ethics, accountability, governance, business relationships, community involvement and environmental protection. This policy is implemented by an employee-led Social Responsibility Committee, which exists at each Methanex location (Methanex, 2010g). Through the Social Responsibility policy, Methanex aims to continue the development of goodwill, and “social license to operate”

¹ <http://methanol.org>

in the community external to its business of producing and marketing methanol. Some examples include the funding of university scholarship programs and the hiring of MBA candidates for internship positions, and establishing disaster relief programs through partnerships with employees, such as for the Chile earthquake in 2010. The Social Responsibility Policy also involves employees directly through volunteer work in the community and partnerships with employees. Partnerships include both employees' initiatives to raise funds for charities as well as employees' participation in charitable activities for charities.

The "social license to operate" in a community is earned through the Responsible Care and Social Responsibility policy and has a real economic value. This is evident in the recent project in Egypt. Methanex's Responsible Care approach ensured early consultations with local residents and the government in Damietta. Transparent two-way dialogues on social sustainability issues allowed Methanex to understand and resolve these issues in a timely matter, mutually benefiting all stakeholders. As a result, Methanex won the support of both the government and community to proceed with construction of their Egypt site (Methanex, 2010j). In contrast, Agrium Inc, a Calgary based firm, was forced to abandon a plan to build a \$1.4 billion nitrogen facility in Damietta when local residents raised objections after construction had started (Bahnasawy, 2008), despite having the legal backing to proceed.

1.5 Existing Presence in China

In 2009, China's proportion of Methanex's sales increased from 10% to 16% over a single year (Methanex, 2009a). Having recognized the growing importance of China, Methanex relocated its Asia Pacific Marketing and Logistics office from Auckland, New

Zealand to Hong Kong in 2006, to be closer to this market. The Hong Kong office is the head office in the Asia Pacific region, overseeing the region's marketing and logistics operations and managing human resources, Responsible Care, customer service operations, and finance and accounting in the region. In mainland China, Methanex has two offices, in Shanghai and Beijing (Methanex, 2010c). Marketing operations are conducted in the Shanghai office, while the Beijing office, being located in the China's capital, is the representative office to interface with the government. The Beijing office was established in 2009 during the financial crisis, when other multinationals were delaying or re-evaluating their China strategy. This was important in demonstrating Methanex's commitment and good faith in its engagement with the Chinese government as a long-term investment partner (personal communication, April 14, 2010).

In 2005, Methanex entered into a joint venture with ENN to invest in a new DME production facility near Shanghai. Methanex's investment in the joint venture is a 20% stake in the facility, with a Methanex manager on the board of the joint venture. Methanex is not involved in day-to-day operations and has no management on the ground. The company's agreement is to supply the DME facility with 300KMT of methanol per year once the facility came online in 2007.

1.5.1 The China Strategy

China is a part of Methanex's global strategy. There is no separate or unique China strategy aside from functionally focussed marketing and logistics to address the growing China phenomenon. Methanex's partnership with ENN is visible step toward addressing this phenomenon. Methanex chose to collaborate with ENN because of its established position as one of the chemical industry's leaders. It is also a developer of

clean coal energy, aimed at reducing the environmental impact of energy generated by coal and other energy chemicals such as DME, all which are strategic fits for Methanex's expanded business scope (Bloomberg Businessweek, 2010). ENN's investment in clean coal is especially attractive considering China's abundant supply of coal and shortage of oil and natural gas.

Methanex had several objectives in mind when entering into the joint venture with ENN. Most notably was to have a production presence in the burgeoning Chinese market and to learn its business environment. Finding a local partner such as ENN gave Methanex safe entry into the country. Furthermore, the joint venture allowed Methanex the opportunity to learn about production operations in China and experience the business environment with the assistance of a reputable local partner.

In line with the strategy of Global Leadership, the physical operation also offered Methanex the opportunity to transfer its experiences and standards and help to establish international standards for the local methanol industry. With an active Responsible Care program and locally implemented Social Responsibility Policy, Methanex is hoping to raise operation standards and establish itself as a leader in the country.

“Guanxi” is the Chinese concept of relationships in business. The concept includes networking and relationships where the parties cooperate and support each other. Having an investment on the ground allowed Methanex to begin developing and building “guanxi” in the chemical industry. This network and presence in China also allowed Methanex to develop relationships with different levels of government. Through this network, Methanex looked to encourage growth of derivative markets, which would translate into a greater demand for methanol. Equally important, this network would help

Methanex gain an understanding of the rules and regulations in China and assist the company to navigate the business environment.

1.5.2 The Lessons

The Chinese experience has yielded some results and uncovered some challenges. By being in China, Methanex has developed meaningful relationships with different levels of government, producing indirect access to players in the energy applications industry and yielding knowledge about the methanol and derivatives industries in China (personal communication, April 14, 2010). The joint venture has also highlighted the complications associated with such partnerships. Visibility in the DME production process and market was limited and the partnership, thus far, has provided limited new insights into this energy application. Moreover, without management on the ground, Methanex encountered barriers to implementing higher standards in safety and operations.

1.5.3 The Question

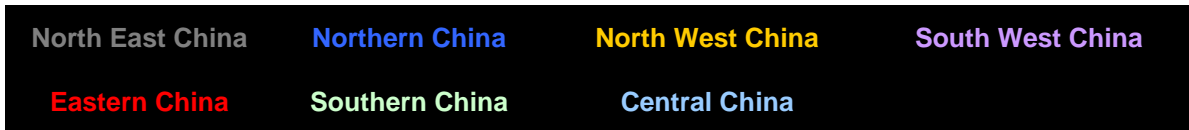
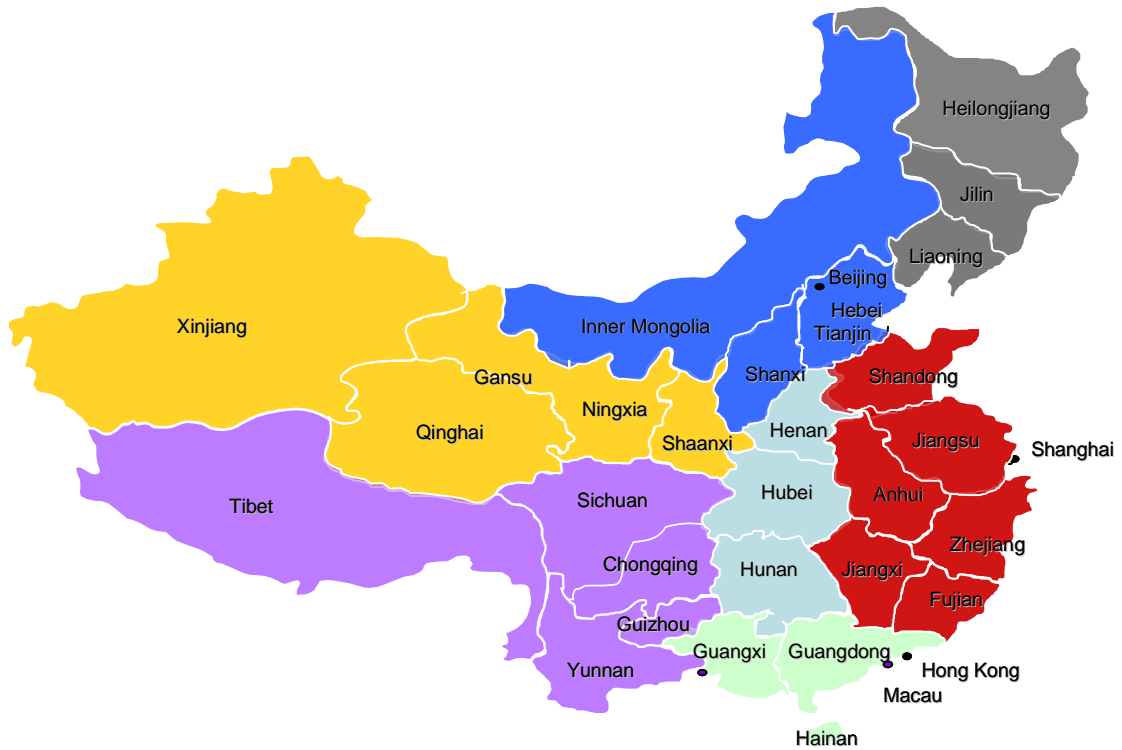
China is a fast growing market, and is important to Methanex's overall growth and strategy. Nowhere is methanol demand growing faster than in China, and nowhere is the projected demand for energy derivatives growing faster. Now, three years after the start of the joint venture with ENN, Methanex needs to decide whether to invest in methanol production in China.

2: METHANOL INDUSTRY IN CHINA

2.1 Growth of Demand and Supply

Understanding the dynamics of China's methanol industry requires some familiarity with its geographical regions. There are six geographical regions in China. The Eastern China and North East China regions are referred to generically as the coastal provinces. All other regions are referred to as inner provinces. Figure 8 below shows the regional segmentations in China. An enlarged version of the map is available in Appendix A – Enlarged Maps and Graphs

Figure 8 Chinese Regions



Source: China and Global Cost Curve, (2010i)

2.1.1 Demand

According to 2009 forecasts from Chemical Market Associates Inc. (CMAI), the global demand for methanol was slightly more than 40MMT in 2009 and will reach over 65 MMT by 2014. China represented 35% of overall global demand in 2009 and will surpass 50% by 2014 (see Figure 9). The overall demand for methanol in China is above global average growth for use in formaldehyde, acetic acid, and fuels (CMAI, 2010).

Ninety percent of China’s demand comes from the country’s coastal provinces. Table 3

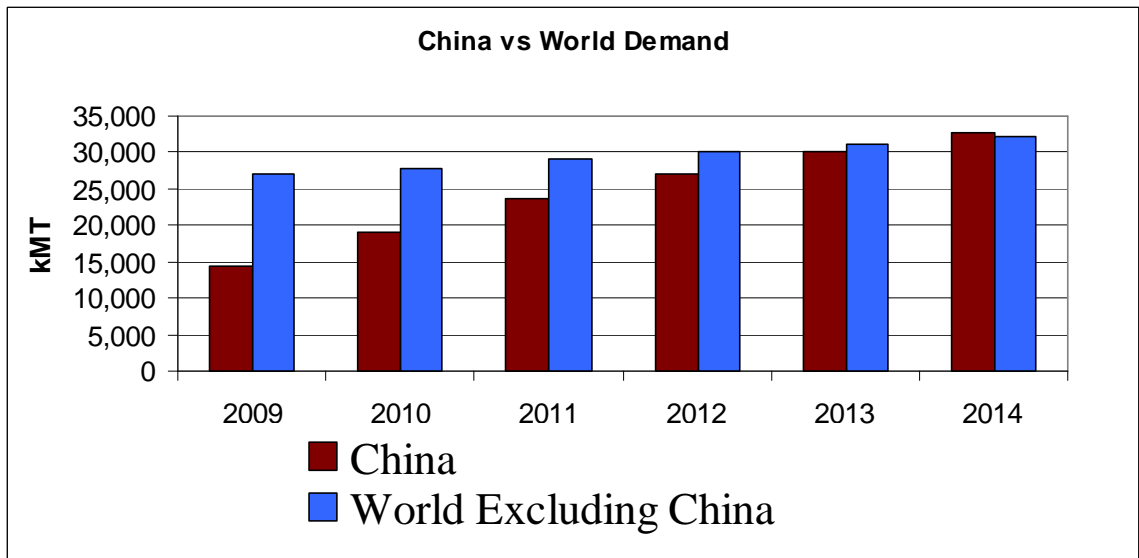
shows the growth of methanol demand in China and Table 4 highlights the imbalance of supply and demand in the country. Figure 10 provides a visual perspective of the regional imbalance.

Table 3 China vs World Demand

| | Volume in KMT | | | | | |
|----------------|---------------|--------|--------|--------|--------|--------|
| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| China | 14,292 | 19,036 | 23,677 | 27,098 | 30,255 | 32,797 |
| World ex China | 27,047 | 27,905 | 28,948 | 30,078 | 31,073 | 32,058 |
| Total World | 41,339 | 46,941 | 52,625 | 57,176 | 61,328 | 64,855 |

Source: 09 World Summary, (2009e), 15 North East Asia, (2009f)

Figure 9 China vs World Demand



Source: 09 World Summary, (2009e), 15 North East Asia, (2009f)

Figure 10 China Methanol Imbalance

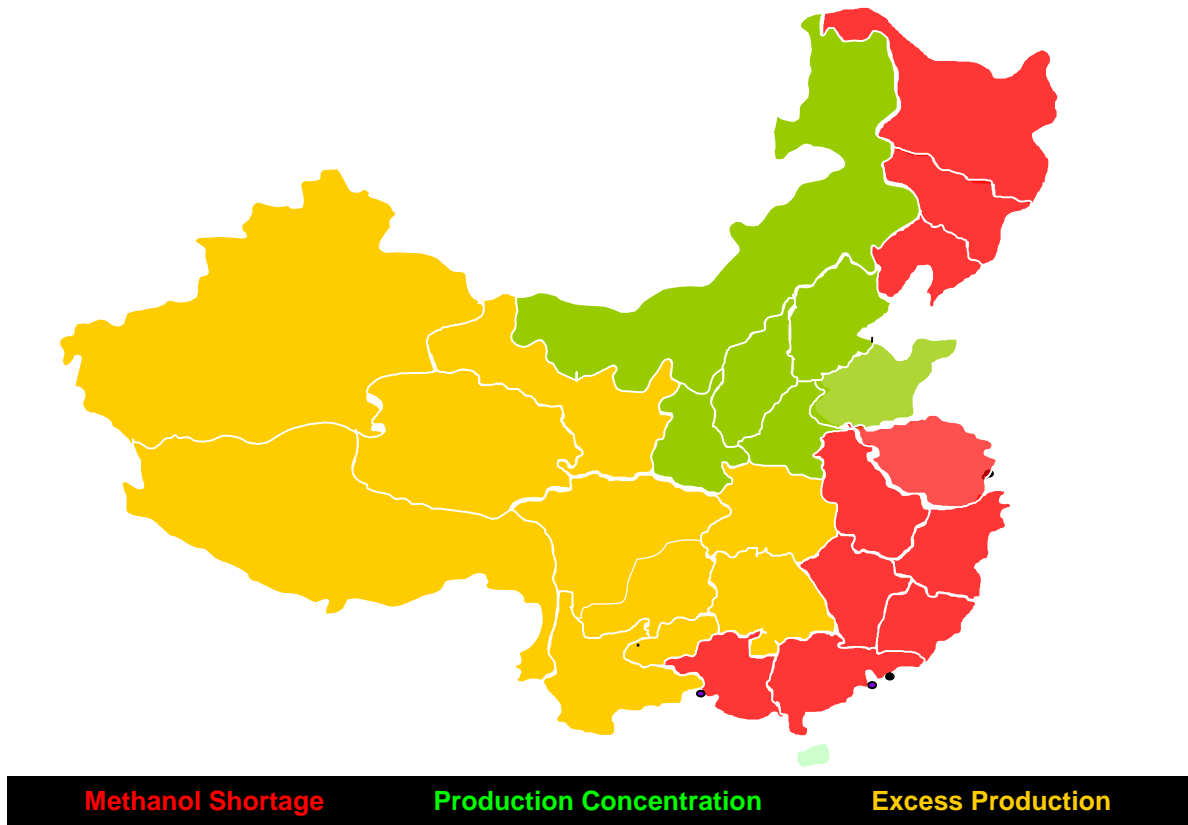


Table 4 Chinese Methanol Imbalance

| Volume (2008) KMT | Inland Regions | Coastal China |
|--|----------------|---------------|
| Production | 5,765 | 2,639 |
| Demand | 5,173 | 8,300 |
| Excess Production (Methanol Shortage) | 592 | (5,661) |

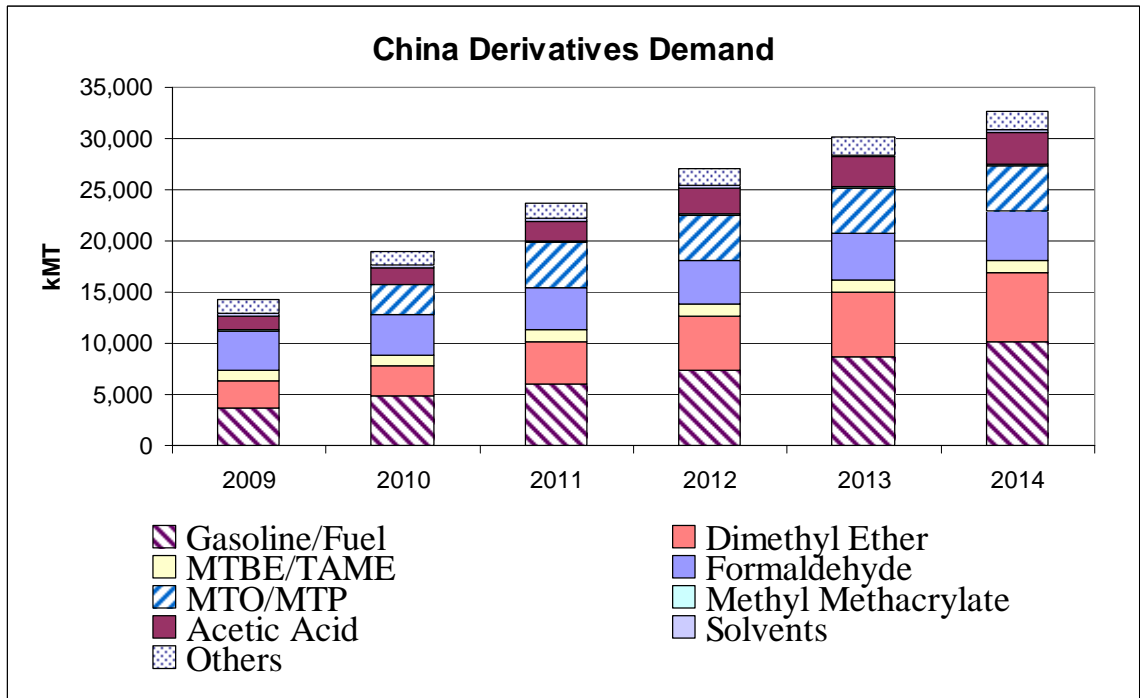
Source: China and Global Cost Curve, (2010i)

The energy application of methanol will be China’s biggest driver in its thirst for methanol in the coming years. One of the main reasons for the use of methanol for energy applications is China’s strategy to reduce dependence on foreign oil, and achieve energy

independence, which it is executing through fuel blending. In December 2009, China developed national standards for M85, a blended gasoline consisting of 85% methanol. As China looks to supplement its gasoline pool, CMAI expects China to utilize 10MMT exclusively for fuel blending by 2014 (CMAI, 2010f). The other reason for the growth in demand by energy applications is production of DME. This derivative is being used aggressively as an economic fuel additive to LPG (liquefied petroleum gas) for heating fuel and has the capability for use as automobile fuel.

Demand for methanol in China will also be encouraged by other derivatives such as methanol-to-olefins (MTO) and methanol-to-propylene (MTP) for manufacturing and consumer goods. China had also publicly announced ambitious plans for new MTO and MTP facilities requiring an additional 3.2MMT towards the end of 2009 and growing to 4.3MMT in 2010. The majority of these facilities will be in Inner Mongolia (CMAI, 2010f). Chinese demand for derivatives from 2009 to 2014 is represented in Figure 11.

Figure 11 China Derivatives Demand



Source: 15 North East Asia, (2009f)

2.1.2 Supply

In the methanol industry, China is considered a swing supplier because its production capacity is high cost and occurs only when methanol prices are high enough for production to be economically viable. As a result, production in China is largely determined by the international price of methanol. The high cost of production in China is attributable to two factors: (1) use of coal as a feedstock and (2) the location of methanol production. Compared to coal, natural gas is cheaper, but the capital costs associated with the construction of a coal facility are considerably higher than a natural gas facility. The abundance of coal is mainly in the inner provinces, far from the coastal provinces, making the freight charges for shipping methanol a material component of the total cost.

Due to the high cost in China, when the prices are high in the global market, many of China's methanol production facilities become economical to operate. However, when prices are depressed, such as in 2009, many of China's methanol production facilities shutdown. Importing becomes more economically viable because local producers cannot compete with the low cost methanol regions, such as the Middle East (CMAI, 2010f). For example, approximately 70% of China's methanol production capacity sat idle in January 2009 (Economides, 2009).

Most of China's methanol imports come from Saudi Arabia, Iran, Qatar, Oman, New Zealand, Malaysia and Indonesia. The 2009 and 2010 volumes of imports from these countries are listed in Table 5 below. Iran, the second largest importer into China, was not named in the Chinese anti-dumping investigation and has taken advantage of that position in 2010. Qatar and Oman were also not named in the investigation. The remaining four countries are currently being investigated for anti-dumping activities.

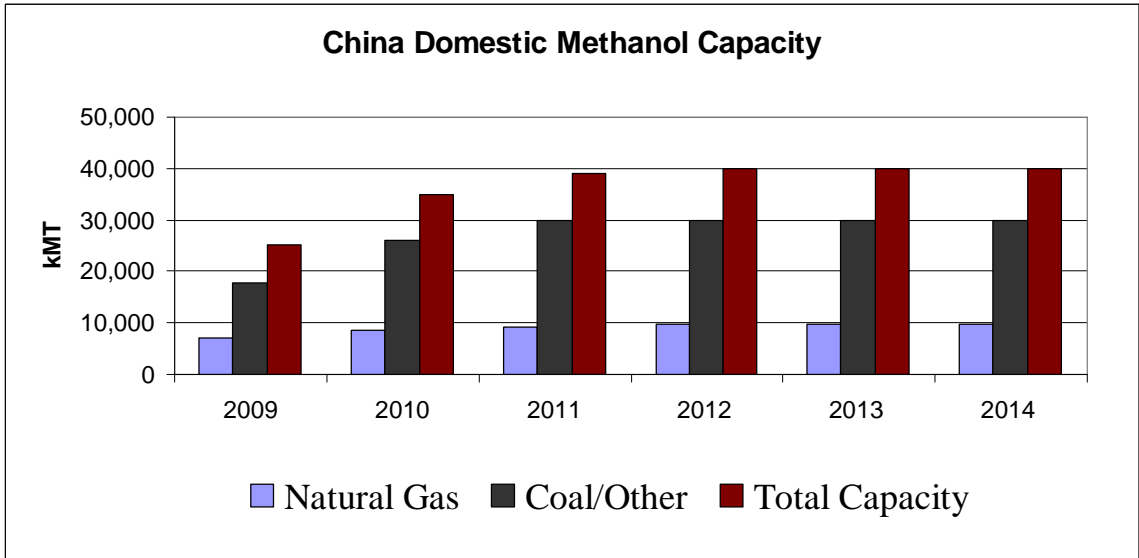
Table 5 Chinese Imports

| Country | 2009 Imports (MT) | 2010 (January – April) (MT) |
|----------------|------------------------------|--|
| Saudi Arabia | 1,061,759 | 256,651 |
| Iran | 275,239 | 625,486 |
| Qatar | 174,980 | 129,351 |
| Oman | 189,287 | 121,397 |
| New Zealand | 114,027 | 52,726 |
| Malaysia | 108,295 | 67,063 |
| Indonesia | 52,353 | 67,409 |

Source: JJ&A Global Methanol Report, (2010)

Despite competition from lower cost countries, domestic online production capacity in China will continue to grow as a result of the initiatives to build integrated MTO, MTP and DME facilities. In 2010 approximately 10-11MMT of methanol production capacity will be added in China, followed by another 3-4MMT in 2011 (CMAI, 2010f). The growth of domestic Chinese capacity is shown in Figure 12.

Figure 12 China Domestic Methanol Capacity



Source: 15 North East Asia, (2009f)

2.2 Industry Analysis

2.2.1 The Business Environment

The Chinese government plays a large role in shaping and directing the methanol business environment. It is involved through national energy strategies, resource utilization and economic development programs, foreign ownership regulations, and domestic methanol protectionism (Chen, 2010).. The government’s arm extends into the regulation of energy prices through the National Development and Reform Commission (NDRC), which is responsible for setting prices of resources such as natural gas. The NDRC has kept natural gas prices artificially low, despite the shortage of natural gas in China, to support fertilizer manufacturers. In the winter of 2009, central and southern China rationed natural gas for transportation and industrial uses to allow homes to be heated by the resource (Chen, 2010). A recent price increase for natural gas in China demonstrates the supply constraints.

The business of methanol production is hampered currently by the government's decision to restrict licenses for chemical production. Due to the shortage, natural gas is now restricted for new business applications in chemical production. Moreover, because of the concentration of wealth, and the generally wealthier population, in the coastal provinces, the government has restricted the construction of new chemical facilities in those provinces. Furthermore, the government has begun restriction of new, dedicated methanol facilities that produce methanol from coal. In an attempt to develop value added production in local economies, the trend appears to be an integration of coal production with methanol derivatives. Not only is this intended to create greater economic value and local employment from a single ton of coal, it is potentially also to control the supply of methanol produced. These restrictions translate into a requirement for new methanol production to be coal based, integrated into the production of a derivative, and away from the coastal provinces (personal communication, April 15, 2010).

2.2.1.1 National Energy Strategy and Resource Development

With an economy that is growing and industrializing, China has been seeking natural resources to fuel that growth and subsequent consumer demand. One such consumer demand is for vehicles. In 2009, China surpassed the U.S. as the largest vehicle market in the world (Schwartz, 2010). One of the natural resources that it lacks domestically to support this growth is oil. Because China sees methanol as an answer to its foreign fuel dependence, and as a "clean" fuel for transportation, it has sought means to protect its methanol industry. Seventy percent of China's domestic methanol is produced from coal, (Economides, 2009), and sharp declines in methanol prices since 2008 have forced approximately 70% of Chinese capacity to become idle. Recently, the

Chinese government has embarked on two parallel strategies (1) anti-dumping investigation and (2) the promotion of methanol-blended gasoline. In 2009, China invoked World Trade Organization (WTO) regulations and initiated anti-dumping investigations on several countries that export methanol to China. These countries included Indonesia, Malaysia, Saudi Arabia, and New Zealand. As well, in an attempt to create a market for its domestic production, China set ambitious national standards in late 2009 for M85 blended gasoline, which is 85% methanol.

The government's hand in resource utilization is evident in the announcements to exploit the coal deposits in Inner Mongolia to produce MTO, MTP and DME. Additional evidence of government intervention is demonstrated by China's national energy strategy and the use of methanol to achieve independence from foreign energy resources. These government initiatives are a way to develop the inner provinces and maintain social and political stability. In recent years, economic development in the coastal provinces has brought prosperity to those regions. Comparatively little wealth was being generated in the interior provinces, further widening the economic gap. To quell potential domestic problems fuelled by economic disparity, the government is seeking to develop the interior provinces that are rich in resources such as coal (personal communication, April 16, 2010).

2.2.1.2 Foreign Ownership

Rules and regulations governing foreign ownership in the chemical industry and resources are different. Foreign firms are allowed to own a majority share of chemical companies (personal communication, April 16, 2010). On the other hand, a foreign firm cannot own valuable energy resources, such as coal deposits, or natural gas or oil reserves

in the country. Hence, for Methanex to establish an integrated coal to methanol site, it would need to collaborate with a local Chinese firm that owns the coalmine.

2.2.2 Up the Value Chain – The Feedstock

Coal is the main feedstock supply for China’s methanol plants. Approximately 70% of China’s methanol capacity is coal based. This is mainly the result of its abundance when compared to the other two energy resources, oil and natural gas. Table 6 highlights China’s energy resource imbalance, and its dependence on foreign resources.

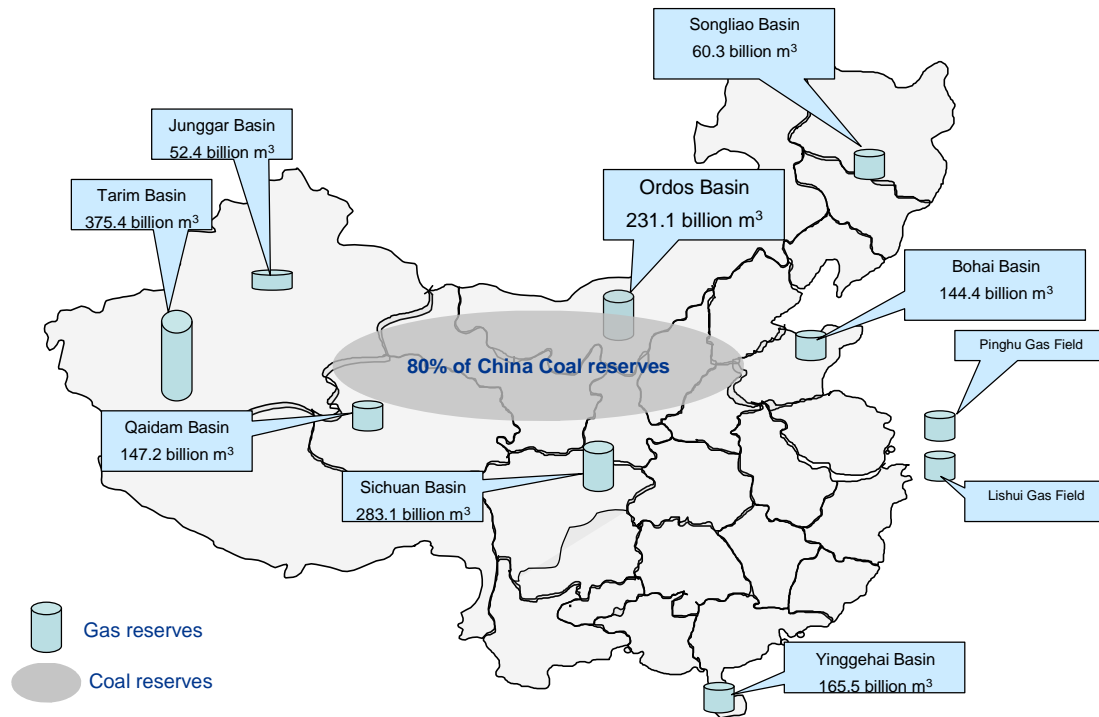
Table 6 China Energy Production vs Consumption

| Energy Resource | Proven Reserves | Production | Consumption |
|------------------------|------------------------|--------------------------|--------------------------|
| Oil | 16 million barrels | 3,973 barrels / day | 7,849 barrels / day |
| Coal | 114.5 billion tons | 2,795 million tons | 2,773 million tons |
| Natural Gas | 80 trillion cubic feet | 2,446 billion cubic feet | 2,490 billion cubic feet |

Source: U.S. Energy Information Administration, (2009)

Despite its abundance, especially from a supply perspective, coal presents many challenges. Compared to oil and natural gas, coal is actively mined and subject to a greater number of accidents due to the close human interaction in the process. Mines are no strangers to floods and explosions that can effectively halt the supply of coal as a feedstock to methanol sites. As Figure 13 below shows, most of the coal is located in the province of Inner Mongolia, far from the concentration of methanol consumers along the coast. The enlarged map can be found in Appendix A – Enlarged Maps and Graphs.

Figure 13 China Methanol Feedstock



Source: Natural Gas in China, (2003)

As a feedstock for methanol, coal poses several environmental challenges. Coal to methanol processing is highly carbon intensive, emitting 4.4MT of carbon for each metric tonne of methanol produced, ten times the amount for natural gas. In the process of adding oxygen into the mix, three times more oxygen than natural gas is used to produce the same volume of methanol. Nevertheless, perhaps the biggest environmental impact is the use of fresh water. Methanol production via coal requires three times more fresh water to produce a single metric tonne of methanol than is required for natural gas (Methanex, 2010k). Coal also presents a challenge with respect to costs. Unlike natural gas contracts, long term contracts are unavailable in China. With only short term contracts of up to 3 years, it creates a situation where long run costs for methanol producers are uncontrollable (personal communication, April 14, 2010).

In the past ten years, China has tripled its consumption of natural gas. This growth in natural gas consumption creates a potential for further shortages of this resource. The shortage could cripple a methanol site if the government decides to ration natural gas for industry use, as it did in central and southern China in the winter of 2009. The shortage of natural gas in China is also the reason behind the government's refusal to license any new methanol plant that requires this feedstock.

2.2.3 Buyers, Substitutes, and Local Competition

Buyers

Methanol is a critical component in the derivatives for which it is used. The inability for other components to substitute for methanol in the specific derivative produced gives methanol producers seemingly greater bargaining power. However, while there are differing quality grades of methanol, by definition, it is a commodity with little product differentiation and hence price becomes a key factor in the buyer's sourcing decision. Until the anti-dumping allegations, Chinese and foreign chemical firms operating in China had unrestricted access to the cheaper imported methanol supply, which was occasionally supplemented by more expensively produced local product.

Substitute

In China, the fastest growing methanol derivative market is in energy applications. Energy applications such as DME and fuel blending in gasoline are two of the fastest growing derivatives. In the winter of 2009, China developed national standards for M85 blended gasoline. In this arena of energy applications, and fuel blending in particular, the substitute product for methanol in China is ethanol. Ethanol is a

petrochemical made from grain feedstock and is an energy derivative for the agricultural industry. Either methanol or ethanol, or both, can be blended into gasoline. Moreover, ethanol's derivative ETBE is a substitute for methanol's MTBE. Both chemicals are gasoline additives. In the U.S., the agriculture lobbyists were successful in lobbying for the removal of MTBE as a gasoline additive, which opened the way for ethanol to be the preferred additive.

Local Competition

Generally, the domestic Chinese methanol industry is characterized as highly fragmented and inefficient. Most methanol produced in China does not meet International Methanol Producers and Consumers Association (IMPCA) specifications, which would push costs even higher. There are over 365 sites (personal communication, June 14, 2010), most of which are small producers with capacity under 600KMT. For reference, world scale methanol facilities, which can achieve economies of scale and are cost competitive, can produce 1MMT/year. World scale facilities are Coal facilities, with higher capital costs and capacity of only 600KMT/year, are not achieving economies of scale. In China, only four domestic producers have capacity over 600KMT. One explanation for China's fragmented methanol supply is that many are integrated methanol facilities that supply derivative production lines directly. China's five largest producers are Shandong Yankuang, Yuanxing Energy, CNOC-Kingboard, Shanghai Coking, and Henan Bluesky. Most of their capacity is coal based, and, in 2009, operating rates amongst these producers were consistently under 50% capacity (personal communication, June 14, 2010).

3: ASSESSING METHANOL PRODUCTION IN CHINA

This section begins the analysis and assessment of methanol production in China. For the purpose of the analysis, three options will be compared: (1) status quo, (2) methanol production in China, and (3) hybrid option. The status quo option implies maintaining the marketing of methanol as the sole business operation in China. The second option is to invest in methanol production in China, also referred to as “Steel in the Ground in China.” The third option is to focus on a marketing presence and to find other opportunities in China without producing methanol there. This could involve increasing joint venture partnerships in derivative products, entering into licensing agreements with local producers to purchase product at an option price, and investing in new production capacity or expanding capacity.

To analyze methanol production in China, three dimensions are considered: Methanex’s corporate vision, existing competitive advantages, and investment return. These dimensions seek to answer three questions: (1) Does Methanex need to have “Steel in the Ground in China” to achieve its vision of Global Methanol Leadership? (2) Will “Steel in the Ground in China” enhance or erode existing competitive advantages? and (3) Is “Steel in the Ground in China” the best investment for Methanex’s strategy to approaching China? As a result, these dimensions are translated into three goals against which the options are measured: (1) consistent with corporate vision, (2) sustainment of existing competitive advantages, and (3) profitability. However, the option of “Steel in the Ground in China” will be the focus of the analysis.

For the first goal, consistency with Methanex's corporate vision, each area of leadership is weighted against the others based on importance relative to achieving Global Methanol Leadership. The weighted leadership areas are used to assess whether production in China is necessary to achieve the vision. The weight of the three leadership areas total 100%. Each option is also scored for each leadership area out of 10. The score represents Methanex's perceived result relative to competitors under each option.

For the second goal, sustaining existing competitive advantages, both competitive advantages, Responsible Care Ethic and Secure Global Supply, are weighted against each other. The weighting is based on customers' willingness to pay for that advantage and the value that investors associate with it. The weighted competitive advantages are used to assess the impacts on competitive advantage. Each option is scored for each core competency out of 10.

The third goal, profitability, is assessed based on long run cost drivers and net present value (NPV) between production in China and the Middle East. Again, each option is scored out of 10. All the scores assigned for each alternative under each goal are plotted in a multi-goal matrix to compare and contrast the advantages and disadvantages of each option. Results from the matrix will help formulate this project's recommendation.

3.1 Strategic Need for Global Methanol Leadership

3.1.1 Market Share Leadership

To answer the question of whether production in China is required for Methanex to have the leading market share, the analysis considers three questions: (1) What is the

importance of China to Methanex to maintaining market share dominance? (2) What are the risks to Methanex’s existing business model in China? (3) Is there sufficient demand to support the existing business model?

Importance of China to Maintaining Market Share

China will account for approximately 50% of the total methanol demand by 2014. By that year, the total global demand is forecast at approximately 65MMT (figures have been rounded) and for Methanex to maintain its 17% of the market share it would need to increase its sales to approximately 11MMT. Sales in China will be vital to maintaining this market share. Without sales into China, Methanex would be required to capture 34% of the total market outside of China. Between 2009 and 2014, this market is anticipated to grow 24%, from 27MMT to 32MMT. Therefore, Methanex would need to capture the entire growth in order to maintain its current market share. Table 7 and Table 8 below help to illustrate this point.

Table 7 China and World ex China Growth

| | China | World ex China |
|-------------|--------------|-----------------------|
| 2009 Demand | 14MMT | 27MMT |
| 2014 Demand | 32.5MMT | 32.5MMT |
| Growth | 18.5MMT | 5.5MMT |

Source: 09 World Summary, (2010e), 15 North East Asia, (2010f)

Table 8 2014 vs 2009 Sales

| | Volume |
|--|---------------|
| 2014 Methanex Sales (17% Market Share) | 11MMT |
| 2009 Methanex Sales | 5.9MMT |
| Difference | 5.1MMT |

Source: Author

Risks to Existing Business Model

Without a production site in China, Methanex currently sells methanol that it imports, either Methanex produced or purchased, and purchases from local Chinese producers or marketers. Methanex can continue this tactic to maintain or increase its sales into China to sustain its global market share position. The threats to Methanex's market share position are not so much the local Chinese competition, which is fragmented and inefficient. The primary risk is Methanex's ability to market only methanol in China. This is a credible risk, considering the Chinese instigated anti-dumping investigations into several countries including New Zealand, where Methanex produces, and threatened trade tariffs. If China carries through with its threats and imposes tariffs on lower cost imported methanol, then Methanex would find itself competing at a higher cost of production. An even greater threat to Methanex's existing business model is if China initiated a second round of anti-dumping investigations on other Methanex production sites such as Chile and Trinidad.

Chinese Supply for Domestic Demand

Even if China imposes tariffs, Methanex would not necessarily need to produce methanol in China to maintain its market share. The reason is that China may not be able to supply its demand sufficiently through its own local production. The CMAI forecasts China to have a total capacity of 40MMT by 2014, exceeding the estimated demand of 32.5MMT. However, the full utilization of this capacity to satisfy the demand assumes that (1) methanol prices exceed the cost of production, (2) all plants are operating at 100%, (3) all production is dedicated to methanol, and (4) Chinese producers generate IMPCA grade methanol. The follow discusses how these assumptions are not satisfied.

Using Chinese methanol spot prices from CMAI in 2009, the estimated price of methanol will be approximately USD \$299 in 2014. However, the delivered cash cost of methanol is USD \$309/MT plus freight to the coast (see Table 23), exceeding the market price of methanol. New MTB, MTO and DME facilities in the interior of China may be supplied profitably by the integrated facilities in the inner provinces. However, demand in the coastal provinces will remain unmet. This will push the cost of methanol up in China and may increase the number of restarted plants because it will have become economically feasible to operate them. However, the majority of the new 15MMT of capacity in the interior, forecast to be online in 2010 and 2011, is integrated production with DME, MTO and MTP. Moreover, Chinese produced methanol does not meet IMPCA specifications, and would require expensive retrofitting of equipment and processes to attain that grade. Taking these factors into account, and estimating that Chinese plants operate at 65% capacity (CMAI, 2010f), there would still be a significant methanol shortfall that would need to be imported in order to satisfy the demand.

The threat of China initiating a second anti-dumping investigation on other countries where Methanex operates could be a serious risk especially if China decides to block all imports from those countries. While Methanex could still maintain market leadership if tariffs are imposed, it would need to find new markets for its lost Chinese customers. In the process it will likely lose its market share leadership if China continues its forecasted rate of growth. If China does pursue such bans, having “Steel in the Ground in China”, and not just a single production facility, would be necessary for Methanex to maintain market share leadership. Suppose that China decides to exempt or relax bans on companies that have investments in China. In this scenario, Methanex would still be able to maintain market share leadership through importing from its existing production facilities.

But the question is how realistic is it that China will impose import bans. Any such bans will not resolve its methanol shortage issue. As in the case of imposing tariffs, China would still be required to import methanol. These bans would simply redirect the imports to come from other lower cost producers outside the country. China could in fact worsen things by triggering trade wars or other problems while still not addressing and improving their methanol trade balance. Hence, it is more realistic that the Chinese government will guide the local industry to focus on reducing their cost structures and improving operational efficiencies in order to compete with the importing nations.

Assessment

Market Share Leadership can be attained without having “Steel in the Ground in China.” Even if the Chinese government pursues further anti-dumping investigations on other countries where Methanex operates, the existing business model of importing and

marketing local Chinese product can allow Methanex to capture enough of the demand to maintain the single largest share of the dedicated methanol market for the next few years. It is also not anticipated that China would pursue such actions. Similarly, a focus on marketing in China, while increasing supply into China through off takes or increased production capacity outside the country, can also allow Methanex to maintain market share dominance.

Table 9 Summary: Market Share Leadership

| Global Methanol Leadership Criteria | Summary | | Assessment of “Steel in the Ground in China” |
|--|---|-------------------------------------|--|
| Market Share Leadership | <ul style="list-style-type: none"> • China will play a large role in Methanex maintaining its market share dominance • Methanex sells methanol that is imported; either produced or purchased outside of China, or purchased domestically • Risk to this business model is anti-dumping tariffs • China’s domestic suppliers will be unable to satisfy the demand | | Methanol production in China is not necessary to maintain market share dominance |
| | Options | | |
| | Status Quo | Steel in the Ground in China | Hybrid Option |
| Score | 9 | 9 | 9 |

Source: Author

3.1.2 Standards Leadership

Just as companies like the Japanese automobile manufacturers Toyota and Honda became leaders in the automobile industry in the early 1980’s for standards of quality,

leadership in the methanol industry in the area of standards, such as operations and safety is an aim of Methanex. By 2014, China's production capacity will make up approximately 25% of the world's total capacity. With so much supply coming on line in China, does Methanex need to produce in China to lead the development and adoption of its standards? To analyze this, an example from the automobile industry is considered.

Prior to the success of Japanese imports in the U.S., American automobile manufacturers did not recognize the consumer and cost savings value that was inherent in processes that adhered to standards for high quality. When they saw the value generated through quality, they quickly embraced the concept and adopted the practices of the Japanese automobile manufacturers (Hoseus, 2008). In the context of the methanol industry, Methanex must demonstrate the economic values from its reliable operations and high safety standards, such as increased productivity and operating rates, lowered accident rates and associated costs.

Assessment

“Steel in the Ground in China” is not a requirement to attain leadership in standards in the methanol market. If Methanex can demonstrate that its operations and safety standards result in material economic benefits, it can be the leader in this area. As such, both the status quo and hybrid option scenarios are just as effective to achieve this goal.

Table 10 Standards Leadership Attainment

| Global Methanol Leadership Criteria | Summary | Assessment of “Steel in the Ground in China” | |
|--|--|--|----------------------|
| Standards Leadership | <ul style="list-style-type: none"> Demonstration of economic worth to implement high standards of operations and safety | Methanol production in China not required to achieve leadership in Standards | |
| | Options | | |
| | Status Quo | Steel in the Ground in China | Hybrid Option |
| Score | 7 | 7 | 7 |

Source: Author

3.1.3 Industry Leadership

With close to half of the world’s demand for methanol coming from in China, to be a leader in the industry, it seems that Methanex would need to have an effective voice at the table in China, where decision-making will have a significant impact on the industry. This section will explore this argument.

Derivatives growth, the source of methanol demand, is greatest in China. Energy applications form the fastest growth area for derivatives, and decisions and policies that direct them will be strongest in China, which is the largest market. To contribute to the direction the methanol and derivatives industries take in China, Methanex would need to have an effective voice at the table with the Chinese government and domestic methanol and derivatives producers. Presently, as only a marketer of methanol in China, Methanex capacity to have its voice heard is limited. In contrast, with capital investment in China, the company would be seen as a partner in the local market and could potentially gain a

greater capacity to contribute to the future direction of the methanol and derivatives industries.

Capital investment on its own certainly offers no guarantees and can be immaterial. A foreign multinational chemical company has indicated that, even with their capital investments in tens of subsidiaries and employment of over tens of thousands of workers in China, they are excluded from decision making that affects their industries. In the U.S., a similar example can be found in the automobile industry. In 1993, Bill Clinton's administration invited universities, government agencies, and Detroit's Big Three to collaborate through the Partnership for a New Generation of Vehicles (PNGV) to increase fuel efficiency in vehicles. However, Toyota, the largest of the Japanese manufacturers, with automobile production facilities in the U.S. was excluded from the group (FuelEconomy, n.d.).

Without capital investment in China, Methanex can only go so far with respect to having an effective voice. By remaining a methanol marketer in China, Methanex will only have two avenues to contribute to the decision making process concerning methanol and its derivatives. Aside from its dialogue with the Chinese government and other industry leaders, it could depend on industry associations to provide achieve common industry objectives. While investing in methanol production in China will not guarantee a greater voice at the Chinese table of decision makers, it is necessary to have that greater voice.

Assessment

“Steel in the Ground in China” will be necessary to ensure an effective voice at the table in China, and, subsequently, be a go-to company in the industry. Simply being a

marketer of methanol in China will likely not be sufficient. The hybrid option may provide better results than sticking with the status quo, although only marginally better. Additional joint ventures may give Methanex a better standing with Chinese business and political circles than if it continues only to sell methanol into China.

Table 11 Industry Leadership Attainment

| Global Methanol Leadership Criteria | Summary | Assessment of “Steel in the Ground in China” | |
|--|--|--|----------------------|
| Industry Leadership | <ul style="list-style-type: none"> • Being a producer in China will provide stronger voice than as strictly a marketer • No guarantee that the investment will result in a voice at the decision making table • Leadership in the industry thus far has been through industry associations • China is a different business environment | Methanol production in China is required to achieve Leadership in the industry | |
| | Options | | |
| | Status Quo | Steel in the Ground in China | Hybrid Option |
| Score | 7 | 8 | 7.5 |

Source: Author

Global Methanol Leadership – Assessment

Of the three leadership areas, Market Share Leadership plays the largest role in achieving Global Methanol Leadership because it can create bargaining power over customers and distribution network facilities and perpetuate an even larger market share.

Standards Leadership also plays a large role in defining a leadership position in the

overall industry. Toyota did it with its operations and Methanex can play a role in setting a high bar for domestic Chinese competitors and improve overall efficiency and safety in the industry. Industry Leadership received the lowest weighting of the leadership areas. While leadership that contributes to the direction of the industry is important, the industry in China already has the support of the government, which has laid out the strategic use of methanol in its national energy plan. Table 12 below shows the weighting and summarized assessment of each leadership area. The three options are presented in Table 13. This table highlights the marginal benefit of “Steel in the Ground in China” to achieving the goal of Global Methanol Leadership. The final assessment is that Methanex would marginally improve its ability to achieve its corporate vision by having “Steel in the Ground in China”. However, it is worth noting that Industry Leadership is the only area where methanol production is required, and it is lightly weighted. Overall, Global Methanol Leadership can be attained without methanol production in China.

Table 12 Summary: Analysis Global Methanol Leadership Attainment

| Global Methanol Leadership Criteria | Weighting | Summary of Assessments |
|--|------------------|----------------------------------|
| Market Share | 40% | Production in China not required |
| Standards Leadership | 35% | Production in China not required |
| Industry Leadership | 25% | Production in China is required |

Source: Author

Table 13 Summary: Global Methanol Leadership Scores

| Global Methanol Leadership Criteria | Weighting | Options | | |
|-------------------------------------|-----------|------------|--------------------------------|---------------|
| | | Status Quo | “Steel in the Ground in China” | Hybrid Option |
| Market Share | 40% | 9 | 9 | 9 |
| Standards Leadership | 35% | 7 | 7 | 7 |
| Industry Leadership | 25% | 7 | 8 | 7.5 |
| Total score | | 7.8 | 8.05 | 7.93 |

Source: Author

3.2 Impacts on Competitive Advantage

3.2.1 Responsible Care

Competitive advantage is what sets one firm apart from another, and allows it to capture more economic benefits from its competitors. Everything else remaining equal in the business environment, a company such as Methanex would not want to see its competitive advantage eroded. Rather it would want to see its competitive advantage enhanced. The question is whether methanol production in China will enhance or erode Methanex’s competitive advantage in Responsible Care. To analyze this, answers to the following questions are sought: (1) How is Responsible Care value derived? (2) What are the risks to Responsible Care?

Derivation of Responsible Care Value

The basis of Methanex’s competitive advantage is the “social license to operate”. Through Responsible Care, this is derived from two areas. The first is goodwill, which is

based on the company's history and reputation for committing to high standards, and transparent stakeholder involvement. The second is based on high reliability, which is a result of high standards in operational efficiency and safety. These two areas are directly related to Responsible Care's focus on product stewardship and public accountability. Methanex's competitive advantage through Responsible Care is a combination of historical and present execution of practices and its commitment to the principles that drive them.

The goodwill, and subsequent value in "social license to operate", is also directly related to the Social Responsibility policy. Investment in the community through grants and scholarships and employee engagement in charity and volunteerism has furthered Methanex's value as a partner in the communities where it operates and intends to operate. The company is not only a preferred supplier for customers, but its Social Responsibility Policy also makes it a preferred investor and partner for governments and communities.

Risks and Challenges

Any methanol production in China will almost certainly be coal-based, and directly challenge Methanex's Responsible Care approach to business operations, especially to the practice of product stewardship. Due to the impact on the environment, utilizing today's coal technology would represent a complete 180 degree turn away from Methanex's Responsible Care values, and be counter productive to its priorities to reduce its carbon intensity. In addition, carbon intensity results are recorded and are accessible publicly and have an impact on Methanex's recognition as a leader in the industry. However, the greatest risk is the impact from water usage. In China, fresh water is a

luxury commodity. Rapid, unchecked industrialization has made it even more valuable as a source of life. Coal to methanol production would essentially take this valuable resource from people who need it to survive, at three times the rate as natural gas to methanol production. There is no doubt about the impact this would have on the communities where Methanex would be operating, and would be a clear violation of the Responsible Care ethic.

Another challenge is the safety of coal. Due to the increased human interaction with the feedstock, and increased processing required to refine the methanol, there is generally a higher rate of accidents at coal-based facilities than at natural gas facilities. Methanex has little familiarity with coal-based technology and processes. Therefore, there will be a learning curve and heightened requirements to innovate and tighten standards that meet Methanex's Responsible Care ethic. Along with carbon intensity results, lost time injuries and fatalities are also published within the industry.

The third challenge is product stewardship up and down the value chain of methanol production by Methanex's partners. Due to the requirements to integrate coal production with methanol derivatives, Methanex would need to find Chinese coal-producing partners and downstream derivatives partners that meet the company's high environmental, safety and operational standards. Foreign ownership rules restricting majority control over coal production, and similar restrictions on derivative producers, will limit Methanex's authority to ensure that stewardship meets Responsible Care standards. To this end, transparency between the Responsible Care member company and its stakeholders is important. However, Chinese companies traditionally have not been transparent, making it difficult for Responsible Care companies to assess potential

Chinese business associates and their alignment with the Responsible Care approach to business operations. The risk of collaborating with a business associate that has misaligned values is that actions of the business associate can damage Methanex's goodwill and reputation.

Assessment

Methanex derives its Responsible Care competitive advantage from its social license to operate. In China, this could be destroyed in regions with fresh and clean water shortages, through the increased consumption of fresh water to produce coal-based methanol. This increased use of fresh water and increased carbon intensity can also pose a risk to the culture at Methanex. Employees may question the company's commitment to Responsible Care. Employee engagement is correlated to employees' perception of the company's corporate social responsibility (Hall, 2010). Perceived decline in the company's corporate social responsibility or inconsistencies with its corporate social responsibilities strategies can threaten their engagement.

The hybrid solution is essentially a continuation of Methanex's business operations in China, with the exception that it increases its exposure to partnerships that have misaligned values. However, because Methanex will not be actively producing methanol via coal, the erosion of its Responsible Care competitive advantage will be minimal, if any at all. Table 14 shows the summary of the Responsible Care Ethic assessment and scores of the options.

Table 14 Responsible Care Ethic Assessment

| Competitive Advantage | Summary | | Assessment of “Steel in the Ground in China” |
|------------------------------|--|-------------------------------------|--|
| Responsible Care | <ul style="list-style-type: none"> • Goodwill and high reliability will be maintained through transparency with stakeholders and continuous improvement • Social license to operate can be lost where there is water shortage • External stakeholders’ stewardship cannot easily be controlled • Coal to methanol production can reduce employee engagement due to perceived mis-alignment with environmental commitment | | Methanol production in China will erode this competitive advantage |
| | Options | | |
| | Status Quo | Steel in the Ground in China | Hybrid Option |
| Score | 9 | 6 | 9 |

Source: Author

3.2.1 Secure Global Supply

Industry Knowledge and Reliable Supply Chain, the two core competencies that support the competitive advantage of Secure Global Supply, are analyzed in this section.

Industry Knowledge

Methanex has superior industry knowledge that is derived from its stakeholders within the industry, access to organizations that provide a source of industry information, and information technology systems to support the storage, sharing and reporting of data.

Currently, with a marketing presence in China via its Shanghai office, and a government relations office in Beijing, Methanex has an established physical presence in China. Existing and potential customers also provide a valuable source of competitive information on competitors and other customers in China. Industry watchers like the CMAI, and industry associations are agents that provide Methanex with supplementary information on competitors, customers and the industry.

Having production in China can bring Methanex in contact with additional stakeholders and potentially increase the quality of its industry knowledge. Because Methanex would be required to integrate coal and derivative production, Methanex would gain direct access to industry stakeholders and potentially to intelligence on its competitors and the market. Potentially, it could also gain improved intelligence from the government, which would see the company as willing to invest in China rather than simply another foreign multinational firm selling into the market and not creating a lasting impact on the local economy. With its influence on the industry in the form of policy, regulations, and strategic direction for energy, the Chinese government is a valuable source of information in the Chinese methanol market.

While Methanex can obtain good information through industry associations, investment on Chinese soil will confer greater access to the local stakeholders and the government, and magnify the quality of industry knowledge. Guanxi is crucial to the business environment, and “steel in the ground” will provide incremental industry knowledge. The question is whether this incremental industry knowledge is material to providing secure global supply. Can this information give Methanex an advantage to capture new customers, or secure storage facilities in strategic locations ahead of

competitors, or significantly affect the re-direction of supply to China due to fluctuations in demand or supply? The answer to all of these questions is “yes”.

Assessment

“Steel in the Ground in China” will improve industry knowledge and strengthen the competitive advantage of Secure Global Supply. The hybrid option, whereby Methanex is in a joint venture partnership, can also provide marginal benefits in this area. However, the benefit is expected to be less than if there was actual production of methanol in China. Table 15 below provides a summary, and assessment of the options of the Industry Knowledge core competency.

Table 15 Industry Knowledge Assessment

| Competitive Advantage | Summary | | Assessment of “Steel in the Ground in China” |
|------------------------------|--|-------------------------------------|--|
| Industry Knowledge | <ul style="list-style-type: none"> Incremental, and material industry knowledge can be gained | | Methanol production in China will enhance this core competency |
| | Options | | |
| | Status Quo | Steel in the Ground in China | Hybrid Option |
| Score | 7 | 8 | 7.5 |

Source: Author

Reliable Supply Chain

Methanex can attribute its core competency in maintaining a reliable supply chain to factors that include a portfolio of strategically placed assets of production sites and distribution terminals, and the world’s largest fleet of methanol vessels, which provides

distribution flexibility and economies of scale. Impacts to reliability of the supply chain and secure feedstock supply will be areas of analysis. The two assumptions made are (1) methanol production must be integrated into the value chain, and (2) the transportation infrastructure is mature.

With production restricted to the interior regions of China, the existing cost structure of freight would severely limit Methanex's ability to supply any methanol to other provinces, especially the coastal provinces, assuming there is a balance left over after usage by the integrated derivative production. The addition of production in China would, therefore, strategically contribute to providing reliable supply to local provincial regions, and minimally, if at all, to coastal provinces, unless the price of methanol is high enough. If there is surplus methanol, the direct contribution to the reliability of the global supply would be to reduce the demand from alternative Methanex production sites that provide imported methanol to China. However, it is unlikely that methanol produced in China will be exported due to the existing cost structure of coal-based methanol. In contrast, an alternative methanol production site outside of China, following the existing Methanex model of a coastal port site, can contribute more to the core competency of reliable supply and the secure global supply competitive advantage.

An advantage of methanol production in China over an alternative natural gas based methanol production site is that Methanex can diversify its feedstock dependency from natural gas and improve reliability. Alternative natural gas derivatives such as liquefied natural gas (LNG) can yield higher returns than methanol. Thus, LNG can cause natural gas to become a potentially higher cost feedstock in the future. A higher price for natural gas can erode the low cost strategy that Methanex employs. Experience with coal-

based methanol in China can provide Methanex future options to proceed with other coal-based sites that have strategic importance and thus contribute to its overall supply chain reliability while not being bound to a specific production technology.

Assessment

Methanol production in China has incremental advantages and contributes to the core competency of reliable supply chain compared to additional natural gas based production outside of China. Methanol production in China is aligned with the corporate strategy of Operational Excellence. Methanol production in China, even with the assumed constraints, will strengthen Methanex's competitive advantage of secure global supply of methanol. The hybrid option, whereby Methanex utilizes real option purchases of methanol in China, can also improve its competitive advantage of secure global supply of methanol without having production in China. However, this is a short-term strategy as the cost to execute the option over the long term can represent opportunity costs that could have been applied to capital investment in a production site or increased capacity at an existing site. Table 16 provides a summary and assessment of the options of the Reliable Supply Chain core competency.

Table 16 Reliable Supply Chain Intelligence

| Competitive Advantage | Summary | Assessment of “Steel in the Ground in China” | |
|------------------------------|---|--|----------------------|
| Reliable Supply Chain | <ul style="list-style-type: none"> • Can improve reliability of supply within China • Increase feedstock security through diversification into coal | Methanol production in China will enhance this core competency | |
| | Options | | |
| | Status Quo | Steel in the Ground in China | Hybrid Option |
| Score | 8 | 9 | 8.5 |

Source: Author

Competitive Advantage Assessment

Between Responsible Care Ethic and Secure Global Supply, the latter competitive advantage is weighted more heavily. Since methanol is a critical feedstock for downstream derivatives, customers would more likely pay a premium for having security in their supply. However, the weighting for Responsible Care is only marginally less. From a company value perspective, the safety and environmental practices give investors and stakeholders’ security by avoiding injury loss time and environmental disasters, like the recent BP blown oilrig incident in the Gulf of Mexico, which could have significant financial impacts to Methanex. Table 17 below shows the weighting and assessment of the competitive advantages. The scores of each option in relation to each core competency are displayed in Table 18. The assessment is that, overall, Methanex’s existing competitive advantage will be eroded if it has “Steel in the Ground in China”.

Table 17 Competitive Advantage Impacts Summary

| Competitive Advantage | Weighting | Summary of Assessments |
|------------------------------|------------------|--|
| Responsible Care | 45% | Production in China erode competitive advantage |
| Secure Global Supply | 55% | Production in China will enhance competitive advantage |

Source: Author

Table 18 Competitive Advantage Option Scores

| Global Methanol Leadership Criteria | Weighting | Options | | |
|--|------------------|-------------------|---------------------------------------|----------------------|
| | | Status Quo | “Steel in the Ground in China” | Hybrid Option |
| Responsible Care | 45% | 9 | 6 | 9 |
| Secure Global Supply | 55% | 7 + 8 | 8 + 9 | 7.5 + 8.5 |
| Total score | | 12.3 | 12.05 | 12.85 |

Source: Author

3.3 Profitability

To assess profitability, the three main long run cost drivers of the methanol industry are analyzed for coal and natural gas based methanol. Four assumptions apply for this analysis (1) Methanol production must be integrated into the value chain, (2) Use of existing coal to methanol technology, (3) Use of existing transportation infrastructure and (4) Methanol produced meets IMPCA specifications comparable to that currently

produced at other Methanex locations. A NPV comparison between production in China and the Middle East will also be conducted.

Capital Costs

The three main long run cost drivers for methanol production are capital costs, freight costs and feedstock costs. The high cost to produce methanol from coal is due to several factors. Coal to methanol technology is monopolized by a few companies providing them the ability to charge high premiums to license the technology. Coal is a solid element that needs to be converted into a gas for methanol production. This requires land and equipment for the processing. The equipment, however, requires more shutdowns due to the accumulation of coal by products, and also from greater wear and tear. Subsequently, redundant equipment and processes are required to enable a higher rate of operation. Furthermore, more equipment is needed for the coal to methanol process as a result of the additional refining to remove impurities. This explains the need for redundant processes and equipment. Moreover, for Methanex to meet its IMPCA specifications required for chemicals and products such as acetic acid, and silicon, the capital cost is significantly higher than the capital cost for natural gas produced methanol.

The cost analysis compares a site in the Middle East to a site in China. The Middle East site produces natural gas based methanol and the Chinese site produces coal based methanol. Both sites have 1.75MMT/year production capacity. The site in the Middle East would cost USD \$1 billion (CMAI, 2010a) to construct. The site in China would cost USD \$1.75 billion (personal communication, June 21, 2010). Table 19 shows the per metric tonne breakdown of the capital costs. For assumptions used to derive the capital cost, refer to Appendix B - Capital Cost Assumptions.

Table 19 Capital Cost Comparison (USD)

| Capital Cost Break Down (1.75MMT/year site) | Middle East (Natural Gas to Methanol) | China (Coal to Methanol) | Summary |
|--|--|-------------------------------------|-------------------------------|
| Total Capital Cost (USD) | \$1 billion | \$1.75 billion | Coal costs \$750 million more |
| Capital Cost Per MT (USD) | \$571 | \$750 | Coal costs \$149/MT more |
| Annualized Capital Cost Per MT (USD) | \$127 | \$166 | Coal costs \$39/MT more |

Source: Author

Table 19 above demonstrates the disadvantage of coal to methanol in terms of capital costs, both non-annualized and annualized over 20 years. The annualized capital cost clearly shows that before even beginning production of methanol, each future metric tonne of methanol produced at the coal to methanol site is USD \$39 more expensive to finance.

Freight Cost

Freight cost for methanol transport within China is relatively expensive. Today, rail and truck operations largely satisfy the transportation needs of methanol from the inner provinces to the coast. Assuming that the integrated methanol facility has surplus methanol to market to the coastal provinces, the cost to deliver methanol is approximately USD \$35/MT (personal communication, June 18, 2010). Other estimates come close at around USD \$40/MT (Ahmed, 2010). Freight costs to export out of China to Europe can be an additional USD \$35 - \$50/MT (Ahmed, 2010). In contrast, the freight cost to deliver methanol from the Middle East to China via 45KMT vessels ranges from USD \$35 to \$50 (personal communication, June 19, 2010). The main reason is the economies

of scale that large vessels create over rail or trucks. Table 20 documents the comparison between freight costs in China and the Middle East.

Table 20 Freight Cost Comparison (USD)

| Freight Cost to Chinese Coast | Middle East (via vessel) | China (via rail or truck) | Coal's Disadvantage |
|--------------------------------------|---------------------------------|----------------------------------|----------------------------|
| Per MT Cost (USD) | \$35 - \$50 | \$35 - \$40 | almost even |

Source: Methanex – Undervalued Even at Floor Prices, (2010), Personal Communication (2010)

Feed Stock Cost

The one advantage of coal is that it is a cheap source of feedstock to produce methanol. At the historical prices of USD \$40/MT, the coal required to create 1MT of methanol costs only USD \$80. Producing the same amount using natural gas would cost USD \$158.60, based on current natural gas prices of USD \$5.2/MMBtu in China (refer to Table 21). However, two considerations should be taken into account. First, Chinese coal prices have broken the USD \$100 barrier, and as recent as June 2010, reached USD \$117 (Ahmed, 2010). Second, the cost of natural gas in China is inflated due to the shortage of the resource and the need to import most of it. For example, Middle Eastern countries such as Saudi Arabia sells natural gas at USD \$0.75/MMBtu (CMAI, 2010f) and most natural gas sites based on remote gas fields have long term contracts with their gas suppliers, with prices set at USD \$1.00 for natural gas. Contracts with natural gas producers usually involve profit sharing when methanol prices rise. Hence, the real cost, or adjusted sharing price, of natural gas is approximately USD \$3.00/MMBtu.

Table 21 Feedstock Cost (USD)

| Feedstock | Conversion factor (1 MT methanol) | Cost per MT (USD) | Feedstock Cost (1 MT methanol) |
|--------------------------------|--|----------------------------|---------------------------------------|
| Coal | 2 MT | \$40 (historical price) | \$100 |
| Coal | 2 MT | \$117 (recent price) | \$234 |
| <hr/> | | | |
| Natural Gas (Saudi Arabia) | 30.5 MMBTU | \$0.75 | \$22.87 |
| Natural Gas (remote gas field) | 30.5 MMBTU | \$3 | \$91.5 |
| Natural Gas (China) | 30.5 MMBTU | \$5.2 | \$158 |

Source: Methanex – Undervalued Even at Floor Prices, (2010), 15 North East Asia (2010)

The data shows that while coal as a feedstock is competitive to natural gas, it is only true if the production is in China. Yet, even at its historical price of USD \$40, it is not competitive with natural gas as a feedstock in the Middle East or where long term natural gas contracts can be acquired. In addition, as mentioned earlier is that there is no ability to enter into long term contracts for coal, hence restricting ability to control long run costs.

Delivered Cash Cost Comparison

The cost analysis continues the comparison between the Middle East site and the China site. The cost comparison focuses on the total cost per metric tonne to produce and deliver the methanol, also known as the delivered cash cost. It includes both variable and

fixed costs and is a standard basis for comparison because facilities normally would operate if its delivered cash cost is below the market price of methanol. For this comparison, the assumption is made that methanol from both sites is imported to China's coastal customers. The Middle East cost model is based on CMAI's production economics, which excludes freight and capital costs. It is also based on the assumption that there is a rise in the cost of natural gas to USD \$1.00/MMBtu with an adjusted sharing price of USD \$3.00/MMBtu. The China coal to methanol model is based on Alembic's model, which also excludes freight and capital costs. For the purpose of the comparison, both freight and capital costs are included to determine the cost in the Middle East and China.

Table 22 and Table 23 below compare the costs for methanol production from natural gas and coal at differing feedstock prices. The comparison shows that, even at the height of expected 2011 natural gas prices of USD \$5.85/MMBtu, it is still cheaper to produce and ship from the Middle East than it is to produce in China, at the current coal price of USD \$117/MT. For coal-based methanol to be competitive, coal prices in China will need to fall by 23%, with no downward natural gas price adjustments. However, because both resources are energy resources, the likely scenario is that if coal adjusts downwards, natural gas will probably also follow.

Table 22 Delivered Cash Cost for the Middle East (USD)

| Costs | Natural Gas Price Per MMBtu (USD) | | |
|-------------------------------|--------------------------------------|--------------|-------------------|
| | \$3 | \$5.2 | \$5.85 (2011*) |
| Feedstock | \$91.50 | 158.60 | \$178.42 |
| Variable Cost ex Feedstock | \$2.50 | \$2.50 | \$2.50 |
| Fixed Costs | \$24.30 | \$24.30 | \$24.30 |
| Freight | \$50 | \$50 | \$50 |
| Delivered Cash Cost | \$168 | \$235 | \$255 |

Source: Author

* CMAI December 2011 estimate (CMAI, 2010)

Table 23 Delivered Cash Cost for China (USD)

| Costs | Coal Price Per MT (USD) | | |
|-------------------------------|----------------------------|--------------|--------------|
| | \$40 | \$60 | \$117 |
| Feedstock | \$91.50 | \$121 | \$234 |
| Sulphur Credits | -\$7.50 | -\$7.50 | -\$7.50 |
| Variable Cost ex Feedstock | \$33.10 | \$33.10 | \$33.10 |
| Fixed Costs | \$14.10 | \$14.10 | \$14.10 |
| Freight | \$35 | \$35 | \$35 |
| Delivered Cash Cost | \$166 | \$196 | \$309 |

Source: Author

NPV Comparison

For the NPV comparison, USD \$5.85/MMBtu and USD \$117/MT prices for natural gas and coal were used respectively. Methanol prices for 2010 to 2014 are based on CMAI price forecasts (CMAI, 2010). All other prices are based on the 2008 high price of USD \$378/MT (CMAI, 2010). Some of Methanex's constraints for capital investments have been applied and are documented in Table 24 below. For example, Methanex applies a maximum capital financing of 55% on projects such as the Egypt project (personal communication, July 19, 2010). It is assumed that plants will only produce methanol if the price of methanol meets or exceeds the operating costs.

Table 24 NPV Calculation (USD)

| | China | Middle East |
|---|------------------|--------------------|
| Total Capital Cost | \$1.313billion | \$1billion |
| Initial Investment | \$590.850million | \$450million |
| Financed | \$722.150million | \$550million |
| NPV time frame | 20 years | |
| Cost of Feedstock (coal / natural gas) | \$117/MT | \$5.85/MMBtu |
| NPV | \$(768million) | \$95million |

Source: Personal Communication (2010)

* Refer to Table 28 and Table 29 in Appendix B for calculations

From the NPV calculation, the Middle East investment of USD \$1 billion into a 1.75MMT/year site would return an NPV of approximately USD \$95 million over 20 years. A similar investment in China of USD \$1.313billion would return an NPV of

approximately USD -\$768 million over 20 years. While this calculation is limited to the forecast methanol prices up to year 2014 and makes several assumptions, the comparison highlights the difference in profitability between an investment for production inside China and an alternative investment outside of China.

Assessment

The delivered cash cost and NPV comparisons demonstrate the challenge of maximizing returns from an investment in Chinese production. Constraints in capital and human resources make new construction projects mutually exclusive and prevent the company from engaging in parallel projects. Selecting a construction project, either a new site outside of China, or even expansion projects at existing sites, would seem to provide higher returns and profitability than a methanol production site in China.

Technology could be a game changer as innovations can potentially reduce the capital requirements for coal to methanol production. However, while coal will continue to be important as a driver in the country's economic development, because of its abundance, Chinese investment in research and development to improve coal to methanol technology will not be a priority.

Table 25 Economic Feasibility Assessment

| | | Options | | |
|--|------------------|-------------------|---------------------------------------|----------------------|
| Global Methanol Leadership Criteria | Weighting | Status Quo | “Steel in the Ground in China” | Hybrid Option |
| Economic Feasibility | 100% | 8 | 4 | 9 |
| Total score | | 8 | 4 | 9 |

Source: Author

4: THE ASSESSMENT AND PATH FORWARD

To answer the question whether Methanex should invest in methanol production in China, three dimensions were considered. These dimensions were translated into three goals against which three options, including methanol production in China, could be assessed. Table 26 below provides a visual summary of the multi-goal analysis that facilitates a comparison of the options.

Table 26 Multi-goal Summary of Analysis

| | | | | Options | | |
|--|-------------|-----------------------------------|-------------------------------|-------------|--------------------------------|---------------|
| | Goal Weight | Leadership Area / Core Competency | Area / Core Competency Weight | Status Quo | “Steel in the Ground In China” | Hybrid Option |
| Goal 1: Consistent with Corporate Vision | 30% | Market Share | 40% | 9 | 9 | 9 |
| | | Standards | 35% | 7 | 7 | 7 |
| | | Industry | 25% | 7 | 8 | 7.5 |
| | | Leadership Score | | 7.8 | 8.05 | 7.93 |
| Corporate Vision Goal Score | | | | 2.34 | 2.42 | 2.38 |
| Goal 2: Sustainment of Existing Competitive Advantage | 25% | Responsible Care | 45% | 9 | 6 | 9 |
| | | Secure Global Supply | 55% | 15 | 17 | 16 |
| | | Core Competency Score | | 12.3 | 12.05 | 12.85 |
| Competitive Advantage Goal Score | | | | 3.08 | 3.01 | 3.21 |
| Goal 3: Profitability | 45% | | 100% | 8 | 4 | 9 |
| Profitability Goal Score | | | | 3.6 | 1.8 | 4.05 |
| TOTAL SCORE | | | | 9.02 | 7.23 | 9.64 |

Source: Author

4.1 The Options

4.1.1 Option: Status Quo

The status quo option represents no additional investments in China. Rather it is simply to continue marketing methanol to Chinese customers and supplying Methanex's existing joint venture. The multi-goal analysis summary shows that this option produces the second highest score of the three. However, it never yields the highest score for any of the goals and falls short of the hybrid option for sustainment of existing competitive advantages and profitability. Moreover, the status quo scores the lowest of the three options when compared for consistency with the corporate strategy. This is because the status quo does not address the changes in the macro environment and the shift towards China as the future of the methanol market.

4.1.2 Option: "Steel in the Ground in China"

"Steel in the Ground in China" is faced with several challenges. The most notable is its poor return on investment compared against the other options. Furthermore, it will diminish Methanex's Responsible Care Ethic competitive advantage, and subsequently Methanex's overall existing competitive advantage. While its sole advantage over the other three options is consistency with the corporate vision, "Steel in the Ground in China" provides only a marginal improvement over even the status quo. Considering the opportunity costs and costs of capital required to construct a methanol production site in China, it is difficult to justify this investment, even strategically, when NPV considered. The potential erosion of employee engagement and negative returns overwhelmingly overrides any marginal strategic benefits gained.

4.1.3 Option: Hybrid Option

The hybrid option represents variations of the options that Methanex can implement. When compared to the other options, the hybrid option scores materially highest in both the sustainment of existing competitive advantages and profitability. The reason for the higher overall score is that this option provides flexibility, and would allow Methanex to avoid the challenges of producing in China and capture the benefits without actually producing methanol in China. For example, by using options contracts with a local Chinese methanol producer and investing in production in the Asia Pacific region outside of China, Methanex can enhance its Secure Global Supply competitive advantage. At the same time, the company can avoid diminishing its Responsible Care advantage.

4.2 The Assessment

Based on the multi-goal summary analysis, the assessment is that Methanex should not produce methanol in China. Production of methanol in China, while a logical proposition on the surface, does not represent Methanex's best strategy in addressing China as the emerging future market for the methanol industry. "Steel in the Ground in China" has many challenges that make it neither a profitable investment nor an investment that will strengthen existing competitive advantages. While there are opportunities for coal to methanol technology to improve, there are several barriers to overcome before any of the discussed game changers will allow production in China to be competitive. However, China has demonstrated recently that it can be the source of innovation in technology. It has shown this capability to compete in the market economy

with its pig iron technology, which is changing the nickel industry (Hoffman, June 13, 2010).

4.3 Recommendations

The multi-goal analysis demonstrates that the hybrid option provides the best strategy for Methanex. Methanex should neither continue its current business strategy in China nor start putting steel into the ground in that country. The hybrid option can give Methanex a strategy that fits the changing industrial landscape. The three proposed recommendations for executing the hybrid option are consistent with the existing strategies of Global Leadership, Low Cost and Operational Excellence. All three recommendations can be executed independently, but are part of a single solution.

4.3.1 Recommendation: Increasing Market Share in China

Market share is an important aspect of overall Global Methanol Leadership. For Methanex to maintain its traditional market share of 17%, by 2014, it would need to have sales of 11.05MMT. Essentially, Methanex needs to double its 2009 sales. The first recommendation is to focus on increasing market share in China, where the methanol demand is growing the fastest. While the following sections presents an overview of the available options for Methanex in the Asia Pacific region, further research and analysis would be required to determine which option is best for the company.

In the immediate term, Methanex can increase its off takes from regional manufacturers to meet the new demand. For the medium to long-term strategy, the company would need to combine increased off takes with increased production capacity. It can do this through several means. For example, it can restart existing assets or

construct new capacity at its New Zealand sites. Both of these options will require Methanex to find affordable natural gas. The former is potentially cheaper but more limited in production capacity and likely operationally less efficient than a new facility with newer equipment. The benefits of these two options is that there is less risk to Methanex because it is already operating in New Zealand, and time to market can be quick. The Chile II and Chile III plant addition projects were both completed within three years of their announcement (Methanex, 2007c). The other option available is for Methanex to look for a green field project to construct a new site. This option is likely more capital intensive than restarting or expanding an existing site, and likely has a longer time to market. Methanex's last option is to purchase an existing site. Again, the value of such an option depends on the age of the facility and its equipment.

4.3.2 Recommendation: Increasing a Position in China

Based on the assessment presented in the preceding sections, it is not necessary to have methanol production in China in order to achieve the vision of Global Methanol Leadership. However, it is important to have a position in China to be an industry leader in the methanol market. Investments in joint ventures and partnerships, such as the one with ENN, in China are small steps to building a position in China, even if only as a marketer. The second recommendation is for Methanex to increase these types of investments, provided they yield a positive return.

While such an investment should be a secondary priority to the solution for increasing methanol supply to China, joint ventures should not be ignored. They can be an extremely cheap way to build a footprint in China without constructing a methanol site. Consider that Methanex's Egypt project costs approximately USD \$500 million, and

that estimates to construct a 1.75MMT/year site in China would cost USD \$1.313 billion. In contrast, Methanex's joint venture with ENN in China cost USD \$5.4 million (The Star, 2010). A portfolio of a handful of similar sized joint ventures can potentially cost less than a single full-scale methanol plant and create a significant footprint in the most important market. This footprint can generate an effective voice at the table of decision makers and elevate Methanex's position and role in China for the industry, ultimately aligning with its Global Leadership strategy.

In choosing where to invest, Methanex should continue to focus on energy application opportunities in China, which is consistent with its business strategy evolution of expansion down the value chain. Gasoline fuel blending and DME are two obvious choices. Of the two, DME is more mature and established, and a safer option for expansion into downstream derivatives, particularly considering that Methanex is already involved in a DME joint venture. In contrast, fuel blending is less mature. While there is a larger potential market, due to the Chinese government setting national standards for M15 fuel, lack of government subsidies and insufficient support from China's large national petroleum players, like PetroChina and Sinopec, has so far hampered the potential growth of fuel blending (Suratman, 2009).

From Moore's marketing perspective (Moore, 1946), blended gasoline is a continuous product, whereas DME is a discontinuous product. While blended gasoline, such as M85, requires retrofitting cars with engines that are designed for that type of gasoline, other methanol blends such as M15 does not. In comparison, DME as a fuel would require retrofitting of automobiles and need larger infrastructure changes -- from auto manufacturers to changes to service stations (Rapier, 2009). As a continuous

product, adoption of blended gasoline would be easier and hence a less risky investment for Methanex in the Chinese energy derivatives market, considering also the development of national standards for M85.

To execute this strategy, Methanex must overcome several challenges. First, Methanex will need to collaborate with the behemoth Chinese energy and petroleum players, such as PetroChina and SinoChem. As a small multinational firm, Methanex will have little bargaining power. Methanex can mitigate this risk by bringing a larger foreign multinational firm that shares its goal and values into the arrangement. Methanex should position itself as the partner in the joint venture that will provide the methanol and methanol technology expertise while the other two parties, a Chinese energy company and a large foreign multinational, focus on the more capital-intensive fuel blending processes. Such an arrangement will control the financial risks borne by Methanex. Leveraging the weight of the larger multinational firm, Methanex should negotiate transparency in the fuel blending process under Responsible Care methanol stewardship practices to protect its goodwill interest. This can also help Methanex gain visibility in the fuel blending processes and industry.

4.3.3 Recommendation: Keep an Eye on Coal

The game changing drivers for China will focus improvements on existing coal technologies. With enough desperation and need to drive innovation, China can achieve either or both economically competitive coal to methanol cost structures and environmentally justifiable coal to methanol technologies. The third recommendation for Methanex is to be prepared for game changing innovations and be ready to adopt coal as a potential feedstock. The company needs access to expertise in the latest in coal

technology and to keep a close eye on the emerging innovations. The risk to operating a coal to methanol facility today is not only the Responsible Care impacts but also that Methanex would be investing in existing, and potentially sunset, technologies and equipment.

Research and development is an obvious way to be involved in coal technology. However, unlike larger chemical entities, such as Total and Dow Chemicals with the capital capability to fund research and development teams, as a small company Methanex would be unable to justify this type of expenditure on a technology that is not part of its core business. Instead, a practical means to achieve the goal of obtaining access to coal to methanol innovations is to retain a resident expert on coal. Moreover, building on Methanex's Social Responsibility Policy, Methanex should look at funding academic research or college programs in China centring on coal to methanol technology, and lend the expert as a liaison to develop commercial experience and establish feasibility. This strategy will help to increase the company's goodwill in China and provide information about developing coal technologies, yet maintain Methanex's focus on its core business of producing and marketing methanol. Such a strategy also ties in with all of Methanex's corporate strategies. Its investment move into coal will allow it to be knowledgeable about competing and developing technologies, ensuring its place as an industry leader. Moreover, its increase in goodwill supports the Responsible Care component of Operational Excellence. Finally, by avoiding unnecessary coal based capital investment in China, Methanex would be aligning with its Low Cost strategy.

4.4 Conclusion

The purpose of this project is to answer the question “should Methanex invest in methanol production in China?”. Using a multi-goal analysis process, the project examined the question in relation to three goals, and compared and contrasted three possible options for a strategy in China. The project determined that Methanex should not invest in coal-based production in China until the technology is more profitable and environmentally viable. Instead, the analysis suggests proceeding with the hybrid option that focuses on increasing market share in China, and increasing production in the Asia Pacific region to meet increasing demand. At the same time, Methanex should increase its joint ventures in China in energy application derivatives and keep a close eye on coal technology.

China is an important market for many foreign multinational firms and offers up an investment opportunity. For Methanex, this is a shared challenge. The project’s multi-goal approach to analyze the investment opportunity is a simple framework that can be applied to future opportunities prior to further in depth analysis and can fit into a broader framework to support Methanex’s investment decisions.

APPENDIX A – ENLARGED MAPS AND GRAPHS

Figure 14 Enlarged Map - Chinese Regions

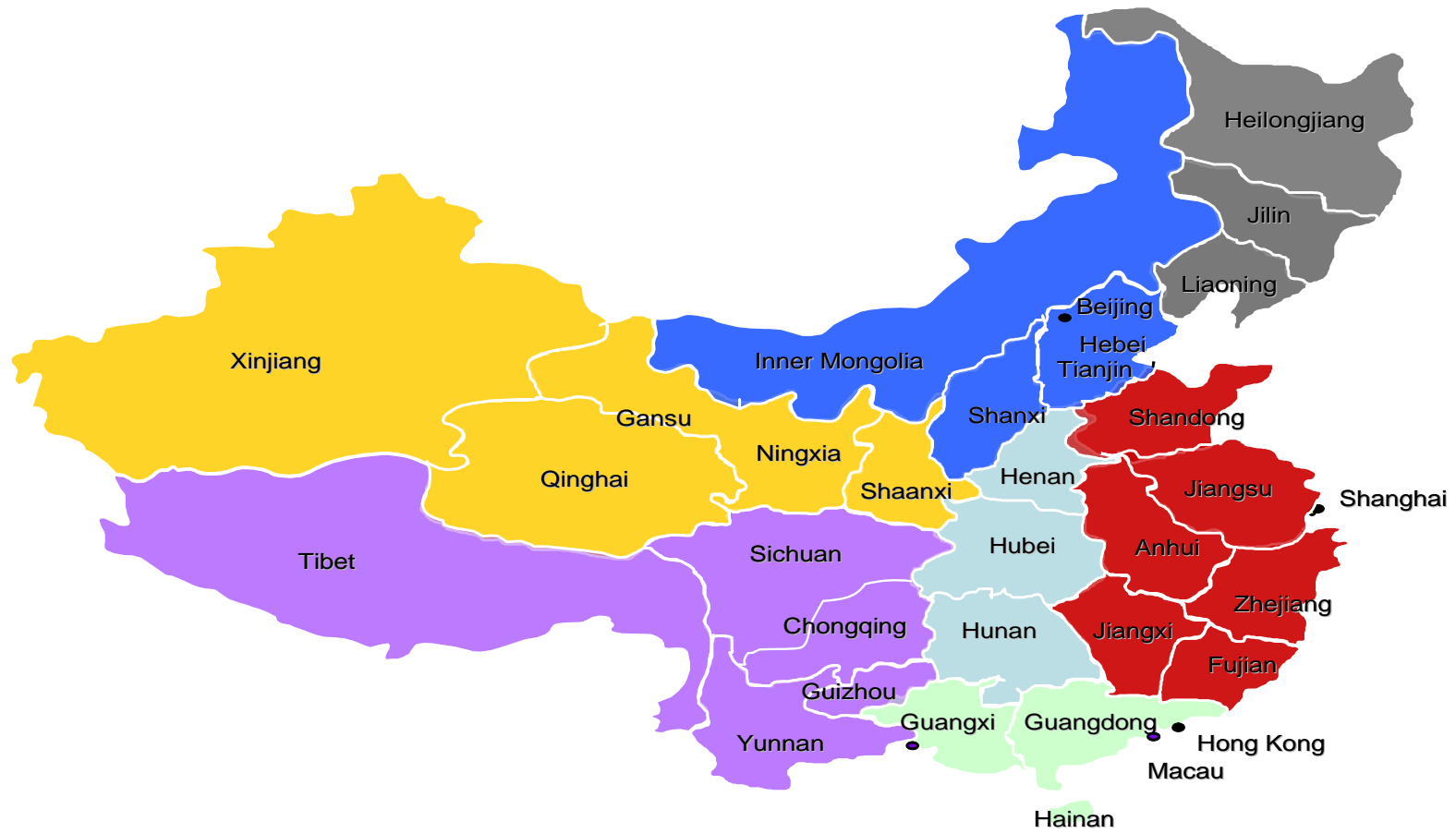


Figure 15 Enlarged Graph - Chinese Derivatives Demand

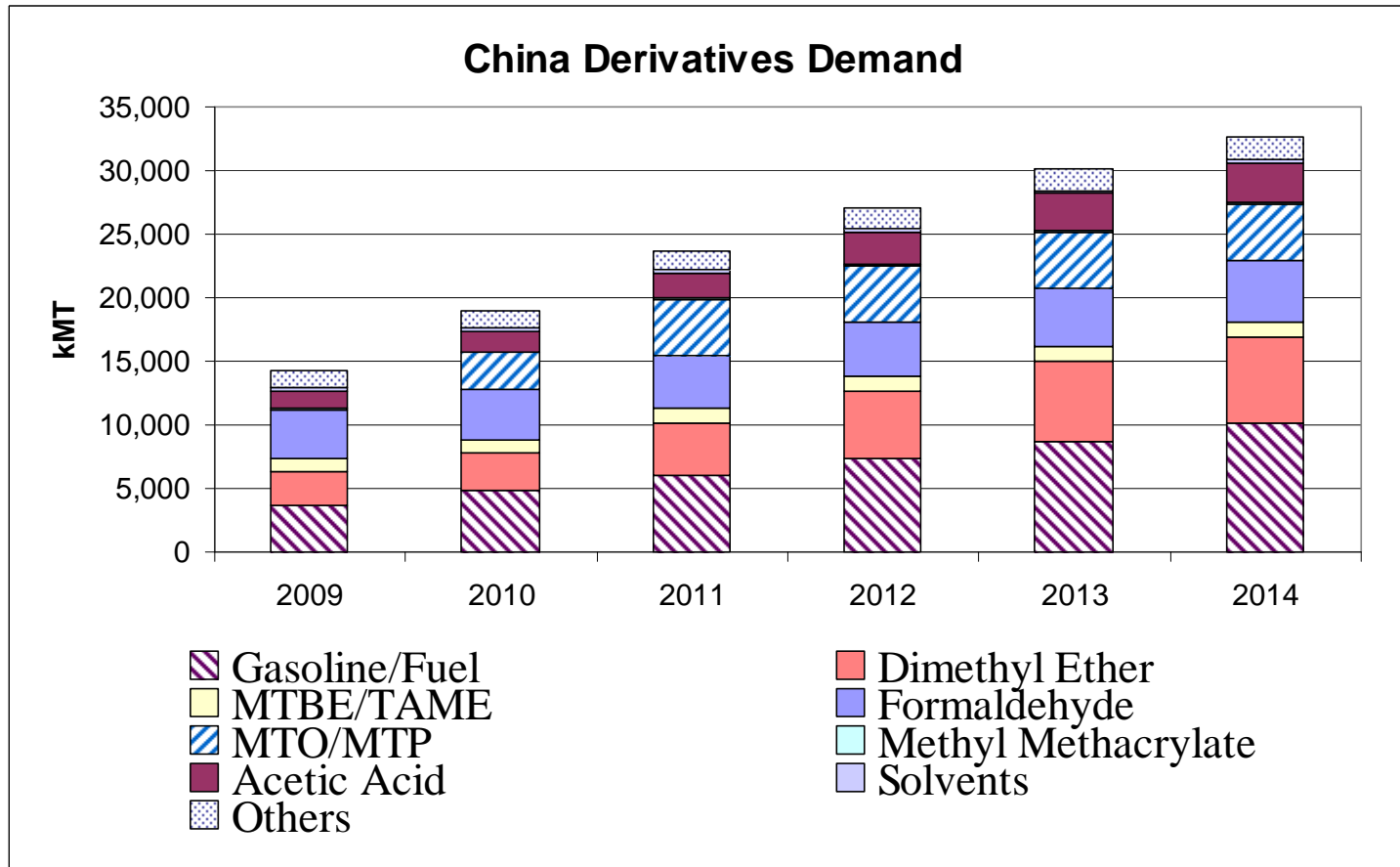
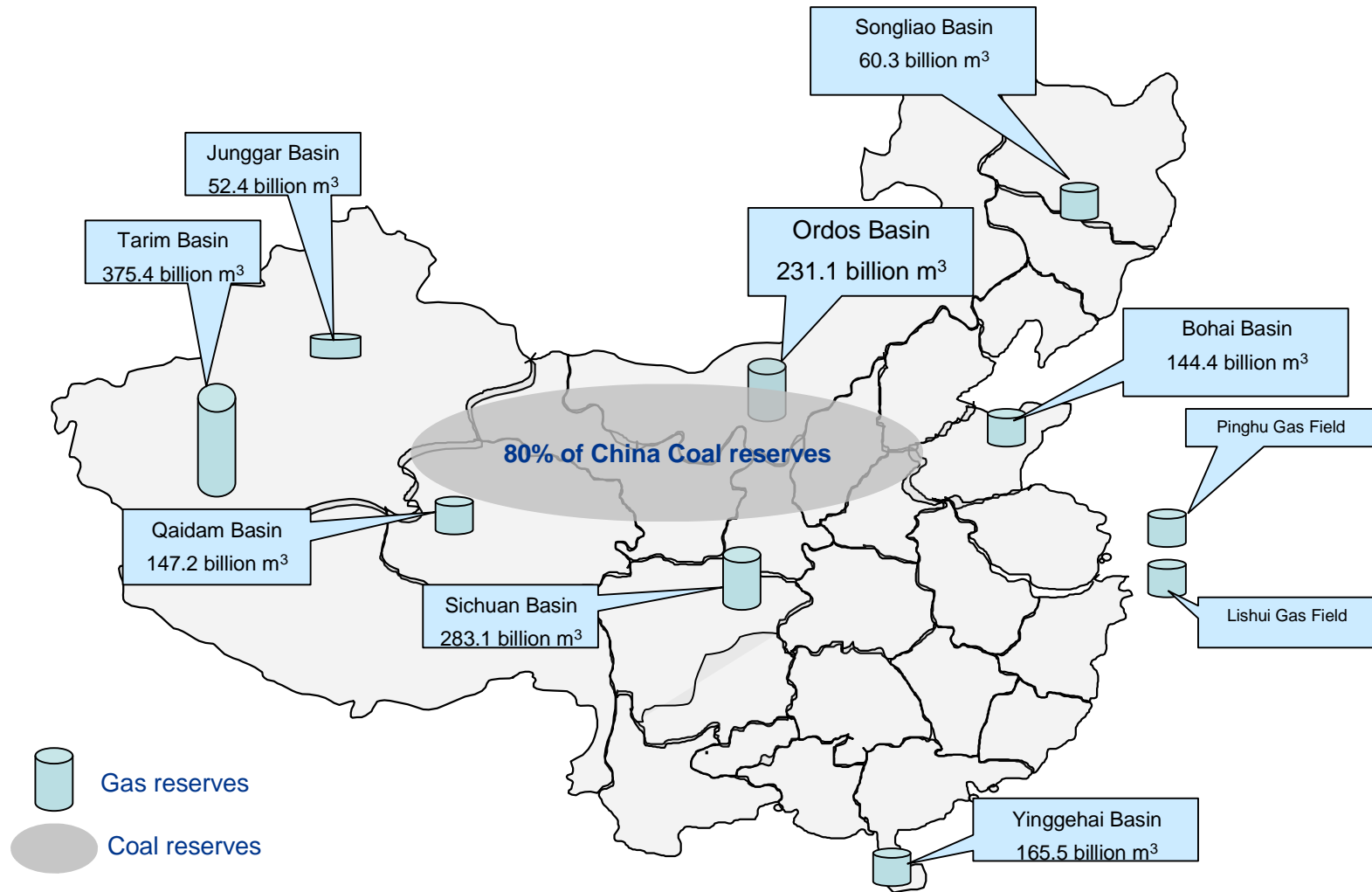


Figure 16 Enlarged Map - Chinese Methanol Feedstock



APPENDIX B - PROFITABILITY

Table 27 Capital Cost Assumptions

| Factor | Assumption | Justification |
|--------------------------------------|---------------|---|
| Life of Facility | 20 years | |
| Depreciation Method | Straight line | Simple depreciation method |
| Tax on Total Capital | 1.50% | CMAI estimate |
| Internal Rate of Return (pre-tax) | 11% | This rate allowed the cash cost to match the estimates of an existing project |

Source: Appendix-Production Economics, (2010), Personal communication (June 21, 2010)

Table 28 Middle East NPV Calculation (USD)

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2032 |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Methanol Price (\$/MT) | \$228 | \$269 | \$280 | \$289 | \$299 | \$316 | \$335 | \$356 | \$853 |
| Operating Cost (\$/MT) | \$231 | \$231 | \$231 | \$231 | \$231 | \$231 | \$231 | \$231 | \$231 |
| Operating Rate | - | - | - | 95% | 95% | 95% | 95% | 95% | 95% |
| Annual Production Capacity (MT) | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 |
| Annual Production (MT) | 1,662,500 | 1,662,500 | 1,662,500 | 1,662,500 | 1,662,500 | 1,662,500 | 1,662,500 | 1,662,500 | 1,662,500 |
| Revenue * | - | - | - | \$455,175,000 | \$470,925,000 | \$499,180,500 | \$529,131,330 | \$560,879,210 | \$1,344,179,666 |
| Variable Costs ** | - | - | - | \$(363,825,000) | \$(363,825,000) | \$(363,825,000) | \$(363,825,000) | \$(363,825,000) | \$(363,825,000) |
| Operating Costs *** | - | - | - | \$(42,525,000) | \$(42,525,000) | \$(45,076,500) | \$(47,781,090) | \$(50,647,955) | \$(121,380,772) |
| Capital Cost **** | \$(333,333,333) | \$(333,333,333) | \$(333,333,333) | \$(6,000,000) | \$(6,000,000) | \$(6,000,000) | \$(6,000,000) | \$(6,000,000) | \$(6,000,000) |
| Net Revenue | \$(333,333,333) | \$(333,333,333) | \$(333,333,333) | \$42,825,000 | \$58,575,000 | \$84,279,000 | \$111,525,240 | \$140,406,254 | \$852,973,893 |
| NPV | \$95,761,970 | | | | | | | | |

Source: 05 Price Forecasts, (2010), Author

* Revenue = Annual Production x Methanol Price (prices increasing at 6% per year starting from 2015. Operating only if methanol price is 15% above operating costs)

** Variable Costs = Annual Production * (Feedstock Cost + Variable Cost + Freight) (Refer to Table 22 for costs)

*** Operating Costs = Fixed Costs * Annual Production Capacity (costs increasing at 6% per year starting from 2015. Refer to Table 22 for costs)

**** Capital Costs for 2010 to 2012 is the total cost \$1billion over 3 years. Subsequent capital costs refer to equipment maintenance

Table 29 China NPV Calculation

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2032 |
|---------------------------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|----------------|-----------------|-----------------|
| Methanol Price (\$/MT) | \$228 | \$269 | \$280 | \$289 | \$299 | \$316 | \$335 | \$356 | \$853 |
| Operating Cost (\$/MT) | \$295 | \$295 | \$295 | \$295 | \$295 | \$295 | \$295 | \$295 | \$295 |
| Operating Rate | - | - | - | 65% | 65% | 65% | 65% | 65% | 65% |
| Annual Production Capacity (MT) | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 | 1,750,000 |
| Annual Production (MT) | 1,137,500 | 1,137,500 | 1,137,500 | 1,137,500 | 1,137,500 | 1,137,500 | 1,137,500 | 1,137,500 | 1,137,500 |
| Revenue * | - | - | - | - | - | - | - | \$560,879,210 | \$1,344,179,666 |
| Variable Costs ** | - | - | - | - | - | - | - | \$(363,825,000) | \$(363,825,000) |
| Operating Costs *** | - | - | - | \$(42,525,000) | \$(42,525,000) | \$(45,076,500) | \$(47,781,090) | \$(50,647,955) | \$(121,380,772) |
| Capital Cost **** | \$(437,666,667) | \$(437,666,667) | \$(437,666,667) | - | - | - | - | \$(6,000,000) | \$(6,000,000) |
| Net Revenue | \$(437,666,667) | \$(437,666,667) | \$(437,666,667) | \$(42,525,000) | \$(42,525,000) | \$(42,525,000) | \$(42,525,000) | \$140,406,254 | \$852,973,893 |
| NPV | \$(768,183,875) | | | | | | | | |

Source: 05 Price Forecasts, (2010), Author

* Revenue = Annual Production x Methanol Price (prices increasing at 6% per year starting from 2015. Operating only if methanol price is 15% above operating costs)

** Variable Costs = Annual Production * (Feedstock Cost – Sulphur Credits + Variable Cost + Freight) (Refer to Table 23 for costs)

*** Operating Costs = Fixed Costs * Annual Production Capacity (costs increasing at 6% per year starting from 2015. Refer to Table 23 for costs)

**** Capital Costs for 2010 to 2012 is the total cost \$1billion over 3 years. Subsequent capital costs refer to equipment maintenance only when the plant is operating

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