CANADIAN ENERGY RESEARCH INSTITUTE

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EXAMINING THE EXPANSION POTENTIAL OF THE PETROCHEMICAL INDUSTRY IN CANADA

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Executive Summary

The Petrochemical industry in Canada is dominated by the production of ethylene from ethane and then downstream derivatives produced from ethylene. These derivatives are precursors to a wide range of useful consumer and industrial products. The sector has seen some investment in the recent past but much less than other regions globally including the US and the Middle East. This research reviews the current economic conditions of the industry and provides observations regarding the challenges for expansion.

In Canada, there are three producing regions: 1) Alberta, 2) Ontario, and 3) Québec. Seventy five percent of installed capacity is used to convert ethane to ethylene. This is only in Alberta and Ontario. Québec's petrochemical industry is quite limited, focused on feestocks obtained from crude oil refining that are further converted to produce more complex products. As such, much of the market discussion would not be a major consideration in the Québec market at this time.

The study demonstrates that the principle consideration in determining whether a region is cost competitive is the feedstock price, and second, feedstock availability in sufficient quantity. North America has this advantage over the rest of the world. The advantage is increased when there is a large price differential between natural gas and oil. The reason is that the rest of the world uses mainly oil-based feedstocks for their petrochemical production. North America and the Middle East predominantly use natural gas.

The Middle East and in particular Saudi Arabia is able to meet this cost challenge through incentives that reduce the feedstock price. Those incentives along with tidewater access and proximity to the growing Asian market makes this region globally competitive.

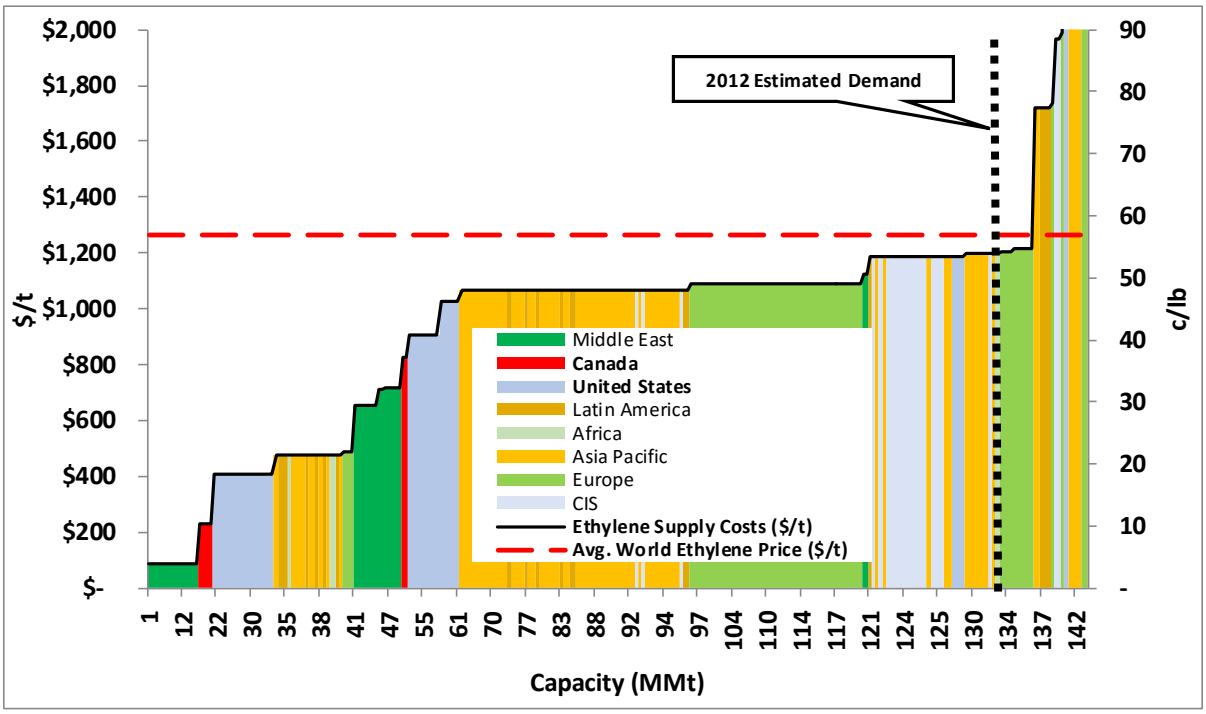
Japan and South Korea are also in competition with North America for the Chinese market in particular and their much closer proximately allows those nations to compete based on very low transportation costs.

In North America, the US Gulf Coast is developing a number of petrochemical expansion projects. This region is likely the strongest competition for Canadian manufacturers. Location incentives and co-location with derivative plants makes this area attractive for investment. In Canada, both Alberta and Ontario face challenges in comparison. There is an added expense in transporting to tidewater to access non-US export markets.

Access to feedstock is another important consideration. In Canada, CERI forecasts upwards of 350,000 barrels per day (bbl/d) of ethane availability for processing. This could support two or three world-class ethylene crackers. However, as the current infrastructure is well matched for current domestic and export demand, new infrastructure including natural gas processing and ethylene derivative plants would need to be considered at the same time as ethylene cracker units.

Overall, as Figure E.1 shows, Canada is cost competitive with the rest of the world. The Middle East has the greatest cost advantage but this is due to incentives making their feedstocks artificially low. Canada and the US are the next most competitive regions, followed by Latin America and some parts of the Asia Pacific region. This cost information is from 2012, and recent information regarding investment costs indicates the cost differentials between Canada and the US and globally between ethane and naphtha based processes are narrowing.

Figure E.1: 2012 Cost comparisons of Ethylene Supply Costs



Sources: Data from ADOE, Dewitt & Company, EIA, Federal Reserve Bank, GAE, HKEMSD, IEA, IMF, OECD, OGJ, PWC,[1] SGL, UNEP,[2] World Bank, and CERI estimates. All figures by CERI

Therefore, with suitable access to natural gas and associated liquids at a cost competitive price, there is potential to expand the petrochemical sector in this country.

Challenges that need to be addressed include:

- developing off-shore markets for natural gas to increase the supply of natural gas liquids, especially ethane,

[1] PWC, Shale gas, Reshaping the US chemicals industry: http://www.pwc.com/en_US/us/industrial-products/publications/assets/pwc-shale-gas-chemicals-industry-potential.pdf
[2] United Nations Environmental Programme, Global Chemicals Outlook (2013): http://www.unep.org/hazardoussubstances/Portals/9/Mainstreaming/GCO/The%20Global%20Chemical%20Outlook_Full%20report_15Feb2013.pdf

- added infrastructure for separating sufficient ethane from incremental natural gas production, and
- adequate logistics support for getting product to markets.