



# Value-Added Project Opportunities from Natural Gas Liquids (NGLs) Produced in North Dakota for the Minot Community

IHS Chemical

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MADC, Minot

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# Executive Summary

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- The mission of the Minot Area Development Corporation is to facilitate the retention, expansion, start-up and relocation of primary sector businesses and to recruit workforce to the Minot area in order to ultimately diversify and grow the region's economy
- With ease of access to rail systems, Minot, North Dakota has an “advantaged geographic” location relative to the U.S. Gulf Coast for supplying commodity polymers and end users e.g., for the fabrication of automotive and consumer-related parts and components
- North Dakota has essentially no commodity chemical business and technical infrastructure (except ammonia and fertilizers); thus market entry into “new” commodity chemicals and polymers will have challenges on many levels, including availability of skilled and professional labor
- The rapid growth in crude oil associated gas production in the Bakken drives the growth in *contained* NGLs and natural gas
- If new cracking demand were constructed in the Minot area, ethane extraction from the Bakken play could be increased significantly

## Executive Summary (cont'd)

- The associated gas has a high liquids content so new processing plants will be required
- Based on information available to date, there is plentiful natural gas supply and water to meet the feedstock/water requirements for a new ammonia plant in Minot, ND
- Raising the extraction of Bakken ethane could provide an additional 75,000 bd of additional ethane feedstock to grassroots ethylene crackers in the Minot area by 2020, and over 85,000 bd by 2030
- Additional cryogenic capacity and a new pipeline would be required to deliver ethane to Minot
- To be successful, North Dakota must aggressively solicit world-class private chemical companies who can bring proven project development expertise, financial strength, chemical process technology and access to customer marketing channels and customers
- IHS has identified ten (10) companies for further analysis as potential  $C_1$  &  $C_2$  value chain investors in Minot, ND. Together these companies account for the majority of ethylene market share in the U.S

## Scope of Work

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- Identify and relate Minot's advantages to potential value-added projects
- Identify Minot's weaknesses/limitations and assess impact on potential value-added projects
- Assess the expected supply of ethane and other by-products to be available in the Minot location
- Assess options for delivering NGLs feedstock to Minot
- Identify a listing of value-added energy companies that would be a best fit for the value added projects in Minot
- Assist MADC in developing a presentation (business case)
- Participate in the presentations to prospective clients to ensure all questions can be answered by MADC

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## Minot's Advantages and Weaknesses/limitations

# Minot SWOT ANALYSIS

Strengths	Opportunity
<ul style="list-style-type: none"><li>• Abundant natural resources (energy and agriculture)</li><li>• Major market reach and connectivity via the great corridors</li><li>• Transportation infrastructures - rail and port connectivity for easy transportation and access of feedstock/products (BNSF and CP lines)</li><li>• Sufficient space to build oil/gas/chemical processing plant</li><li>• New infrastructures such as schools, hospitals, and airports are being built</li><li>• Sufficient and varied work force</li></ul>	<ul style="list-style-type: none"><li>• Growth in energy products</li><li>• Availability of abundant NGLs from the Bakken area</li><li>• Access to rail systems (GNC and Ports to Plains) that connect Minot with customers within North America and even transport to international ports</li><li>• Flood of young labor force coming into ND area for job opportunities related to oil &amp; chemicals business</li><li>• Large Tax Incentives for incoming companies</li></ul>
Weakness	Threat
<ul style="list-style-type: none"><li>• Price volatility and changing trends in energy</li><li>• Lack of infrastructure to extract ethane from natural gas</li><li>• Pipeline needs to be established to gain access to feedstock from Bakken shale oil reserves</li><li>• Low gas prices, low per well gas production, lack of legacy gas infrastructure, and the differing field-to-market gathering and distribution systems for gas compared with oil</li><li>• No commodity chemical business and related technical infrastructure exist in North Dakota</li></ul>	<ul style="list-style-type: none"><li>• Federal environmental regulations may hinder or restrict production plans, capacities, and operating rates</li><li>• Sustained low oil price could discourage companies to produce oil in ND leading to lower NGLs production</li><li>• Public perceptions of railroad safety and fracking</li><li>• Occurrence of accidents could result in property loss, damage, and casualties.</li><li>• Work force development, training and availability as most residents hold GED</li></ul>

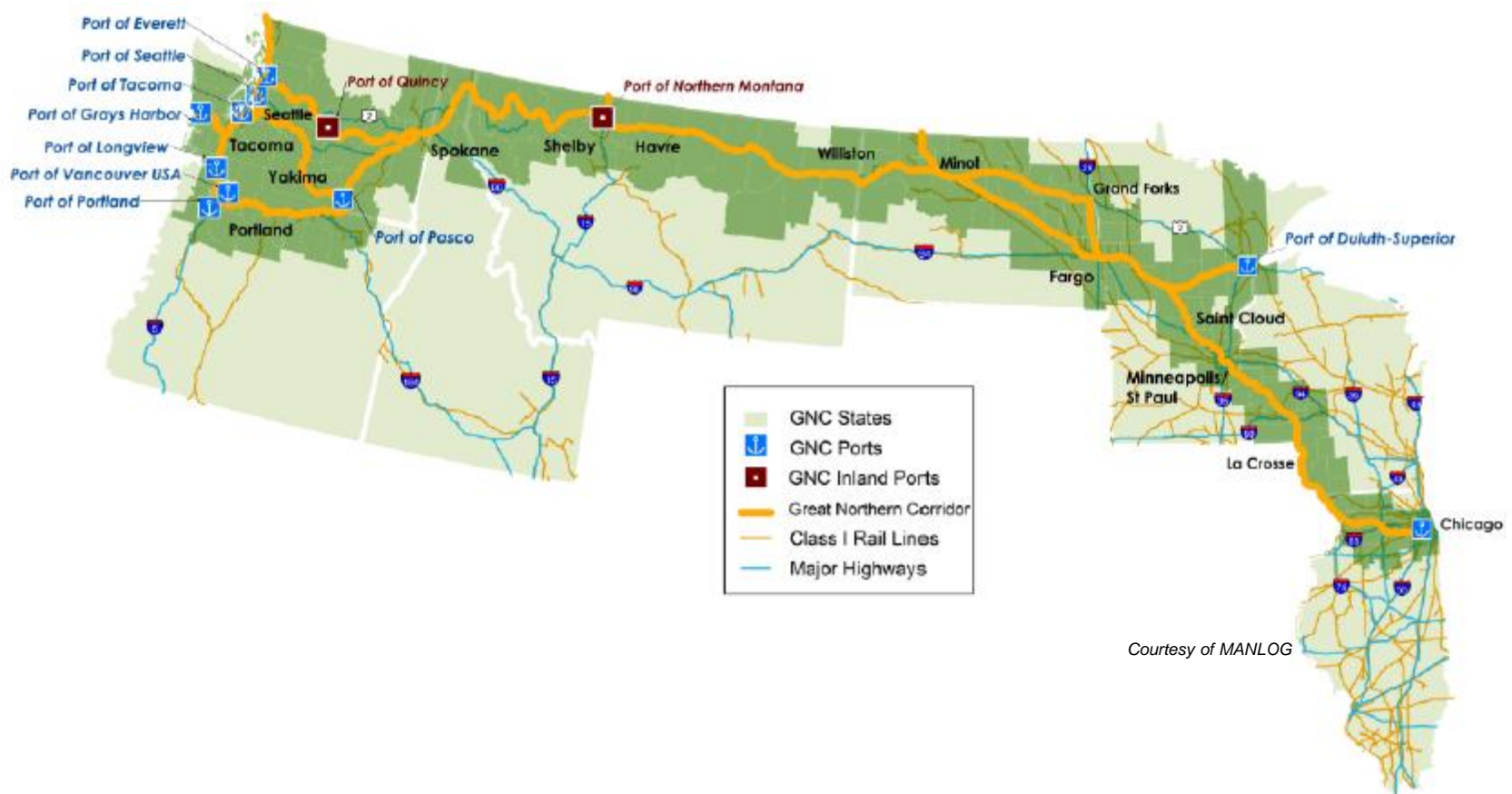


## Existing and New Infrastructure Development in Minot



- New airport terminal being constructed, to open in Jan 2016
- Downtown redevelopment – ongoing through 2017
- Ongoing building of retail, commercial and residential
- Minot State University
- Minot Air Force Base
- Quality of Life – schools/recreation/shopping

Minot is well positioned to ship finished chemical products to primary markets in central United States and Asia



- The Great Northern Corridor connects Minot with the Western U.S Ports and Chicago area, a major U.S demand center for PE

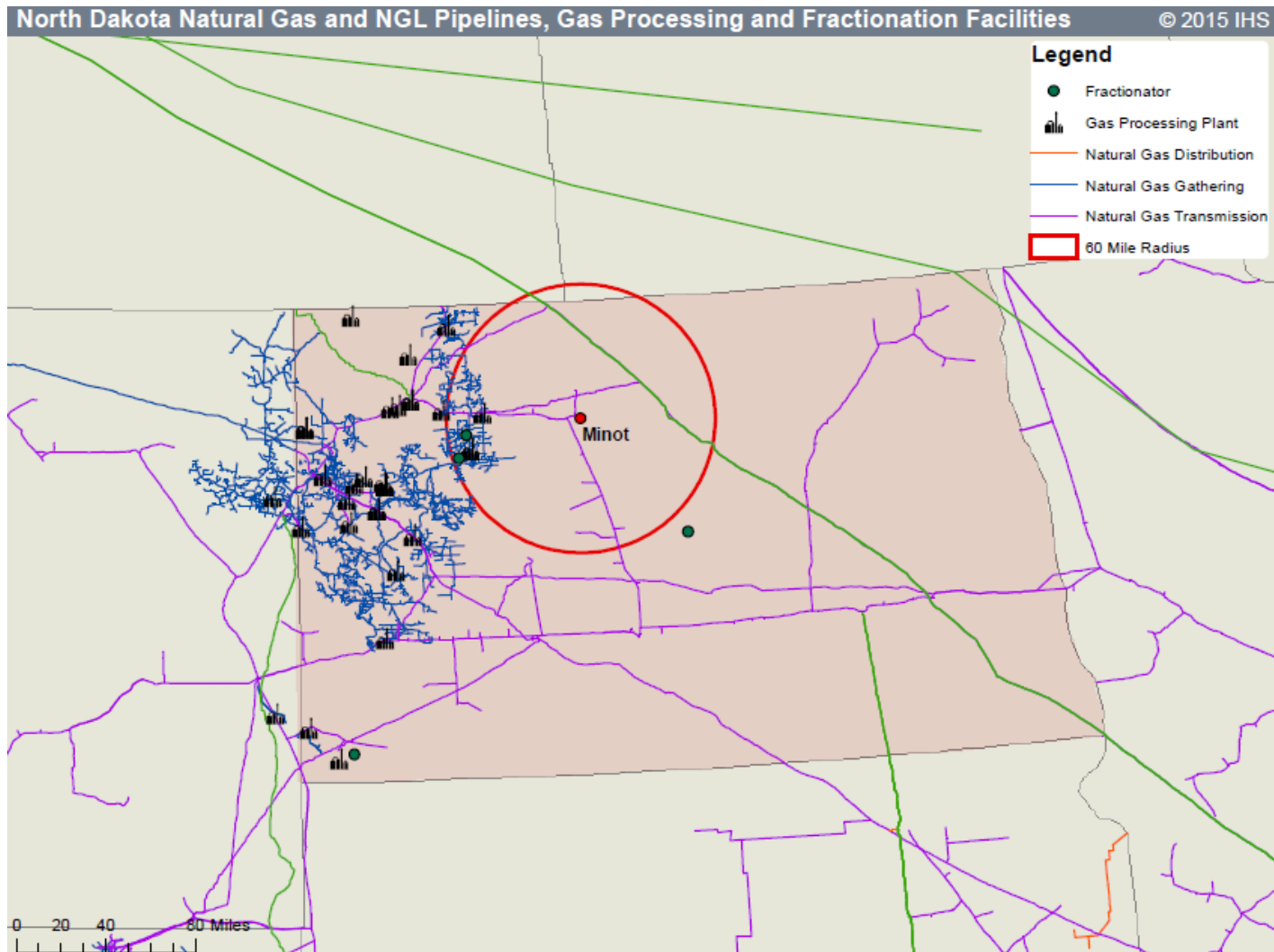
## Ports-to-Plains Corridor exists to promote commerce in North America's Energy and Agricultural Heartland



This transportation infrastructure connects North Dakota with Canada and Mexico to support North American energy development

While this corridor may offer a path to markets in Mexico and South America, USCG producers will have a freight advantage over producers in Minot.

Minot is located within 60 miles from some of the North Dakota gas processing and fractionation facilities



# Minot Demographics

## Labor Force Facts

- Estimated Population in Commute Area: 95,000 (Labor shed area)
- Estimated Population: 62,821 (Including Minot Air Force Base & Minot State University)
- Total Employment in Commute Area: 34,675 (Ward County)
- Hire Rate: 15.5%
- Active Resumes: 1,222
- Unemployment: 3.7% (January 2015)
- Median household income: \$56,580
- Median Age: 30.4

## Educational/Demographics Background

Figure 7. PJSS Educational Attainment

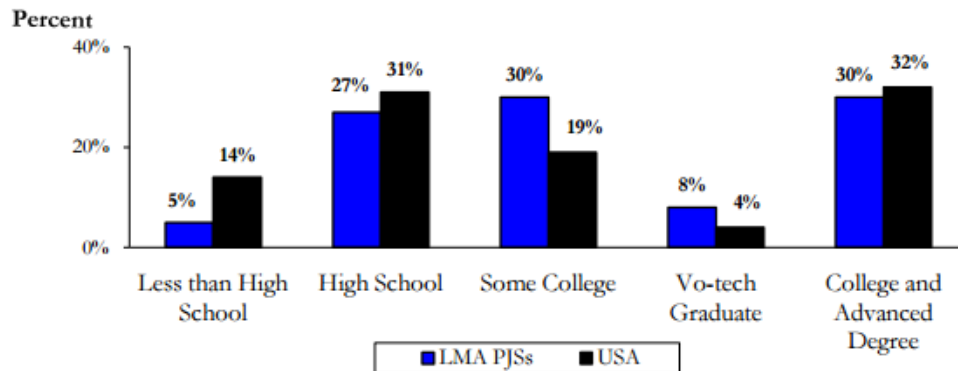
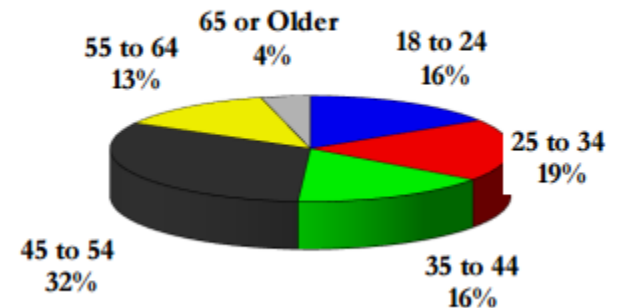


Figure 2. Workforce Age Groups





## Minot has access to the largest transportation hub between Seattle and Chicago via rail



### Key Features of the ND Port Expansion

- 3000+ acres
- Zoned in City – M2 District; City services include water, sewer, electric, and gas
- Provides 2 class 1 Railroads with accessibility from coast to coast
- Drop-Hook-Pull
- Rail sliding
- Rail to Truck; Truck to Rail
- Utility infrastructure
- Ability to transload a wide range of commodities
- Owned and operated by North Dakota Port Services

### Advantages

- Largest distribution hub between Seattle and Chicago in BNSF Railroad Territory
- Build to suit
- MADC has a strong partnership with North Dakota Port Services
- North Dakota Port Services has up to four dedicated 8000+' intermodal tracks

## North Dakota Port Services



- Energy and agricultural exports (i.e. crude, LNG's, bulk ag, etc.)
- Energy and agricultural imports (i.e. fertilizer, chemical, proppants, pipe, etc)
- Aggregates
- Indoor storage
- Multiple commodities

# Tax Incentives for Potential Investors

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## **Tax Credits for Producing or Blending**

- A corporation is allowed an income tax credit for adapting or adding equipment to retrofit a facility or to construct a new facility in ND that either produces or blends biodiesel fuel or green diesel fuel or crushes soybeans or canola

## **Wage and Salary Credit**

- 1% of wages and salaries paid during the tax year for each of the first three tax years of operation and 0.5% of wages and salaries paid during the tax year for the fourth and fifth tax years

## **Oil Tax Incentives**

- Was unavailable during high oil price period; however it could change with projected low price of oil

## **Sales Tax Exemptions**

- A new or expanding plant may exempt machinery or equipment from sales and use taxes
- Sales and use tax exemption may be granted for purchasing building materials, equipment, and other tangible personal property used in the expansion or construction of a oil/gas facilities



## Minot Water Supply Sources

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- The city of Minot gets its water from two underground sources : Sundre Aquifer and the Minot Aquifer
- In 2013, 60% of water supply came from the Sundre Aquifer and 40% from Minot Aquifer
- Wells located in the Valley along the Souris River draw water from aquifers to raw water transmission lines and to the Water Treatment Plant.
- Water is treated at the City of Minot Water Plant and distributed through high service pumps to the Water Distribution System.
- The Water Distribution System includes trunk mains, booster stations, and water storage reservoirs, which provide the water supply and pressure to the system.
- The Minot water system is divided between three pressure zones: North, South, and Valley.
- The Northwest Area Water Supply (NAWS) will ultimately supply and distribute water to northwestern North Dakota, which includes Minot. The water supply is from Lake Sakakawea as part of the Missouri River.
- When fully completed, NAWS is designed to provide 26 million gallons of Missouri River water per day to northwest North Dakota.

## Does Minot have enough water capacity to bring in value added energy companies?

- The total water consumption for a typical ammonia plant (500,000 metric tons/yr) located in the U.S. Gulf Coast area was estimated to be around 5 million gallons per day.
- This figure includes process water and the make-up cooling water, which accounts for nearly 90% of the total water requirement for the ammonia plant
- In North Dakota, where water is not as plentiful as the U.S. Gulf Coast, air cooling could be utilized to reduce the cooling water consumption, but at a higher capital cost
- Based on the information to date, water from the existing aquifers and Lake Sakakawea (NAWS), if available, is expected to satisfy the water requirement of an ammonia plant (500-1000 KTA) in Minot, North Dakota.

Ammonia Plant Based in USGC						
	Plant size (Tons per year)	Process water consumption (gal/lb of NH <sub>3</sub> )	Process water required (gal/day)	Cooling water consumption (gal/lb of NH <sub>3</sub> )	Cooling water makeup (gal/day)	Total water consumption (gal/day)
Ammonia	500,000	0.11	331,507	28.5	4,294,521	4,626,027

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Assess the expected supply of NGLs to be available in the  
Minot region

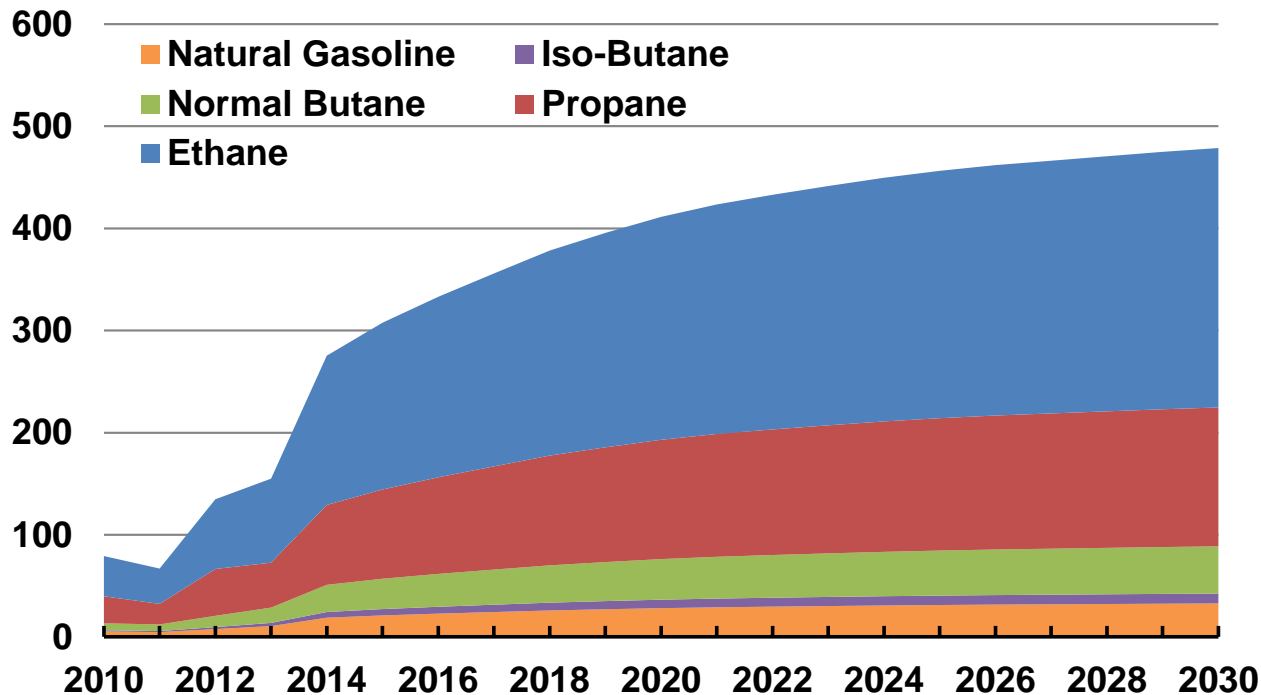
# Contained NGL Production Potential in Bakken Play

- The availability of natural gas liquids (NGL) products (including ethane, propane, butane, iso-butane, and natural gasoline) depends on several factors:
  - ✓ the level of natural gas production
  - ✓ the composition of the wet gas produced
  - ✓ level of processing and fractionation
- Natural gas production can be either *non-associated* gas, which involves the production of gas from a gas well, or *associated* gas, which is gas that is produced in conjunction with oil in an oil well. The natural gas production occurring in the Bakken play is primarily associated gas.
- Nearly all of the heavier NGL components of natural gas (propane, butanes, pentanes, etc.) must be extracted from *wet* gas in order to comply with pipeline Btu and Wobbe *dry* gas specifications.
- However, ethane, the lightest gas liquid product, can be left in the 'dry' gas stream when there is no market for ethane or the market value of ethane is below its cost of extraction. When this occurs, the producer is **rejecting** ethane.
- The rapid growth in crude oil associated gas production in the Bakken drives the growth in *contained* NGL.

# Contained NGL in Bakken Processable Gas

## Contained NGL in Bakken Processable Natural Gas

Thousand Barrels per Day

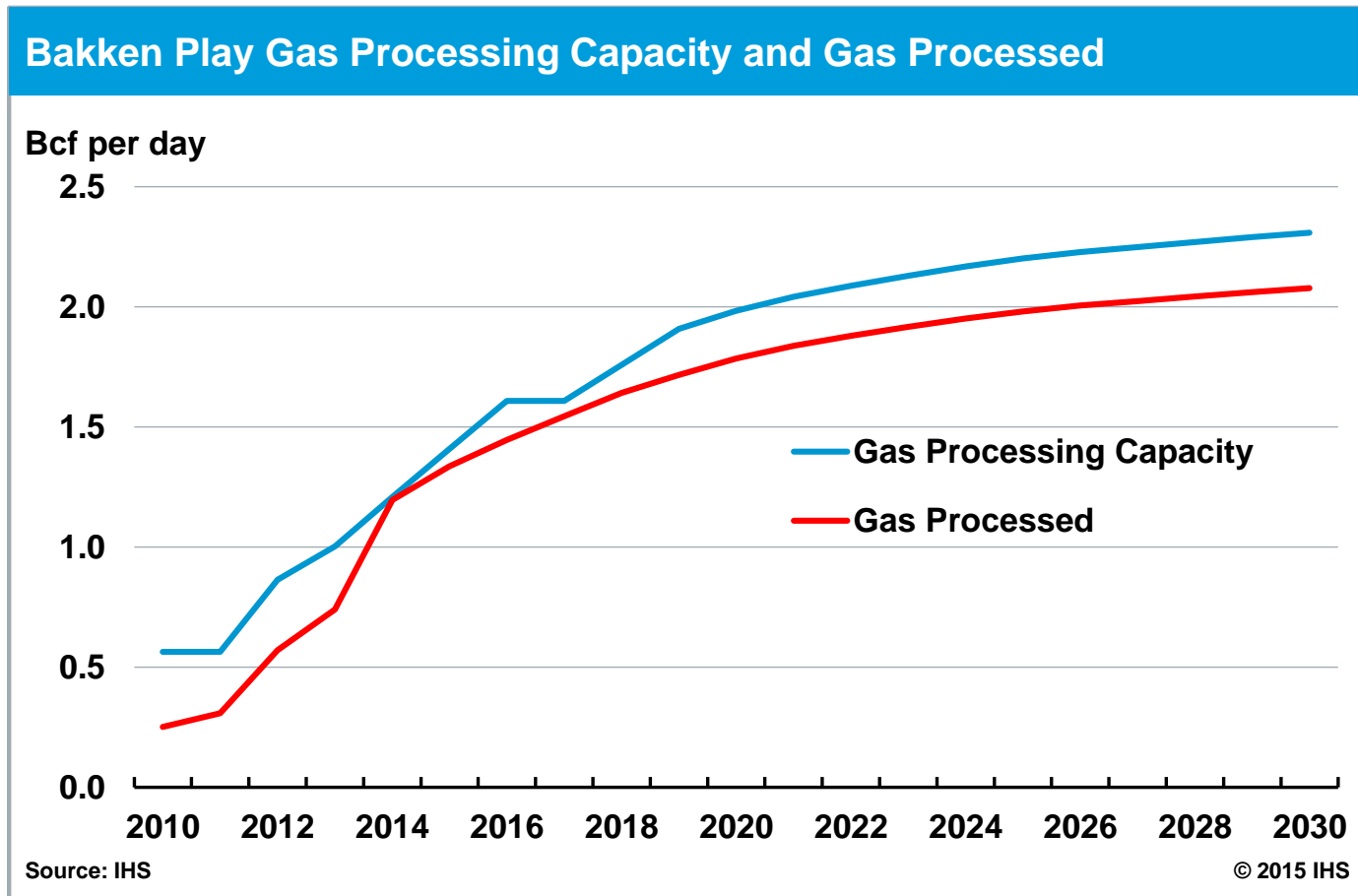


Source: IHS

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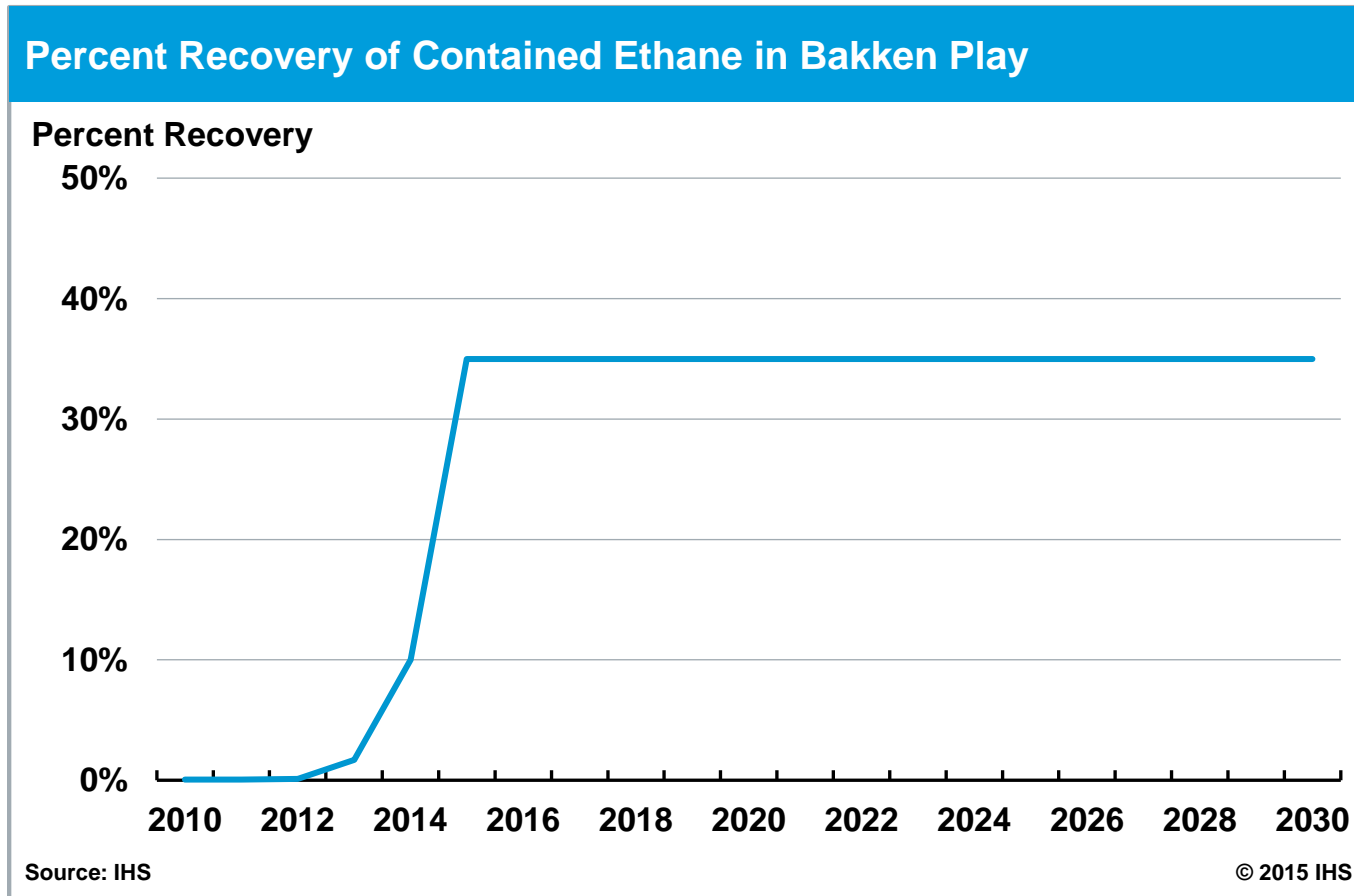
- The increase in crude oil production will result in large quantities of associated gas containing large volumes of NGL which become available for processing.

# Bakken Gas Processing Capacity and Gas Processed



- The associated gas has a high liquids content so new processing plants will be required.

# Percent Recovery of Ethane from Bakken Processed Gas



- The percent recovery of Bakken ethane is about 35% but the recovery could increase if new markets for ethane are developed in the region.

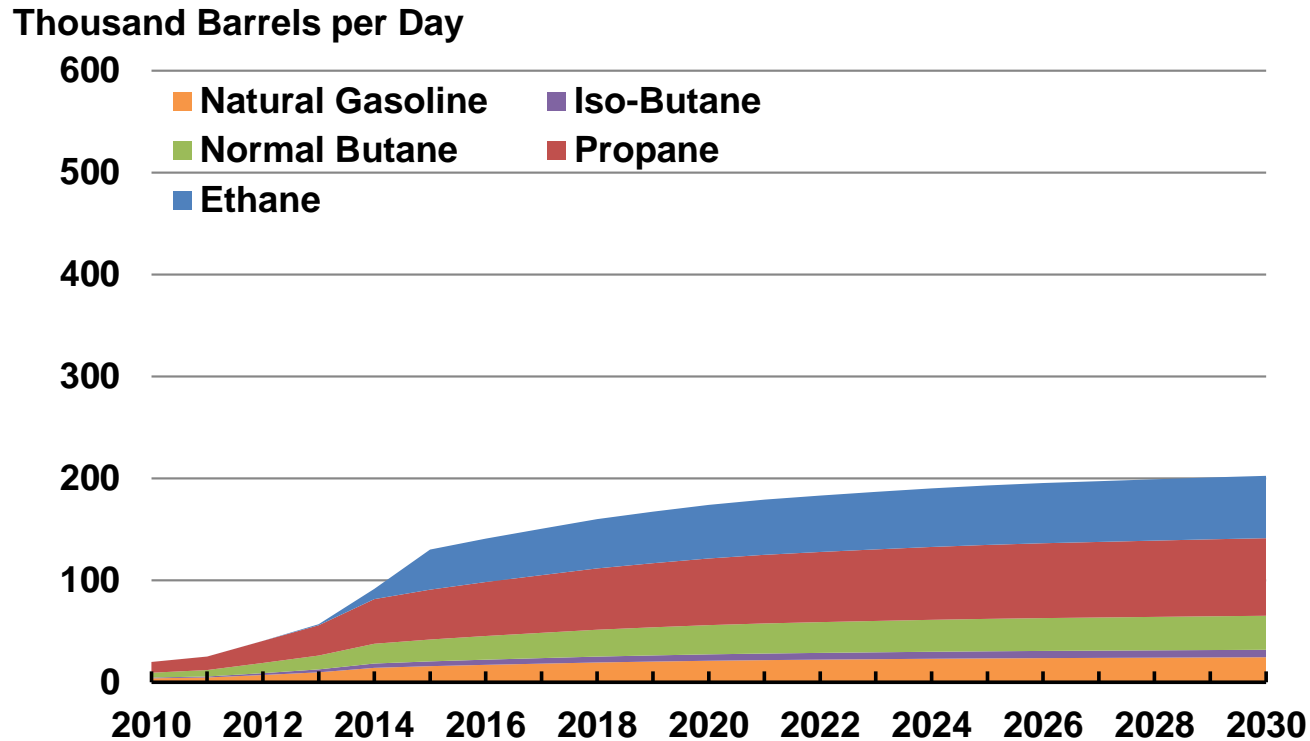
# Ethane extraction potential from Bakken

- IHS' outlook calls for growth in ethane extraction to supply the Vantage pipeline which ships ethane to Canada to increase to over 50,000 bd by 2020, rising to above 60,000 bd by 2030.
- However, additional cryogenic extraction capacity could easily increase the recovery potential of contained ethane. Raising the extraction of Bakken ethane could provide an additional 75,000 bd of additional ethane feedstock to grassroots ethylene crackers in the Minot area by 2020, and over 85,000 bd by 2030.
- Additional cryogenic capacity and a new pipeline would be required to deliver ethane to Minot.
- A new petrochemical project proposed by Badlands NGL could increase demand for Bakken ethane (startup date unannounced), requiring investment in a new cryogenic extraction facility, as well as new pipeline and storage infrastructure.
- Other projects may also be envisioned to take advantage of the availability of the potentially large supply of low-cost ethane feedstock.



# NGL Production from Bakken Natural Gas Processing

## Bakken Play NGL Production from Gas Processing



Source: IHS

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- If new cracking demand were constructed in the Minot area, ethane extraction from the Bakken play could be increased significantly.

# North Dakota (Bakken) Gas Processing Plants

## North Dakota Gas Processing Plants

Plant Name	Owner	Unit Name	Status	Gas Intake Capacity (MMscfd)	On Line Year
Demicks Lake	ONEOK Partners GP LLC	Demicks Lake 1	Deferred	200	2016
Lonesome Creek	ONEOK Partners GP LLC	Lonesome Creek 1	Under Construction	200	2015
Tioga	Hess Corp	Tioga 2	Operating	130	2014
Tioga	Hess Corp	Tioga 1	Operating	120	1954
Garden Creek	ONEOK Partners GP LLC	Garden Creek 1	Operating	100	2011
Garden Creek	ONEOK Partners GP LLC	Garden Creek 2	Operating	100	2014
Garden Creek	ONEOK Partners GP LLC	Garden Creek 3	Operating	100	2014
Grasslands Complex	ONEOK Partners GP LLC	Grasslands Complex 1	Operating	100	
Stateline I	ONEOK Partners GP LLC	Stateline I 1	Operating	100	2012
Stateline II	ONEOK Partners GP LLC	Stateline II 1	Operating	100	2013
Watford (Hiland)	Hiland Partners LP	Watford (Hiland) 1	Operating	90	2011
Bear Creek	ONEOK Partners GP LLC	Bear Creek 1	Planned	80	2016
Palermo (ex Stanley)	Aux Sable Midstream LLC	Stanley 1	Operating	80	2010
Manitou	Plains All American Pipeline LP	Manitou 1	Under Construction	75	2015
Robinson Lake	Whiting Oil and Gas Corp	Robinson Lake 1	Operating	60	
Glass Bluff	Hiland Partners LP	Glass Bluff 1	Operating	50	2011
Tioga	Hess Corp	Tioga DB	Planned	50	
Badlands	Hiland Partners LP	Badlands 1	Operating	40	
Badlands (Targa Resources)	Targa Resources Partners LP	Badlands (Targa Resources) 3	Operating	40	2015
Belfield	Whiting Petroleum Corp	Belfield 1	Operating	35	2011
Little Knife	Petro-Hunt LLC	Little Knife 1	Operating	32	1975
Badlands (Targa Resources)	Targa Resources Partners LP	Badlands (Targa Resources) 1	Operating	30	
Robinson Lake	Whiting Oil and Gas Corp	Robinson Lake 2	Operating	30	2012
Norse	Hiland Partners LP	Norse 1	Operating	25	

Source: IHS Energy

# North Dakota (Bakken) Gas Processing Plants (continued)

## North Dakota Gas Processing Plants (continued)

Plant Name	Owner	Unit Name	Status	Gas Intake Capacity (MMscfd)	On Line Year
Badlands (Targa Resources)	Targa Resources Partners LP	Badlands (Targa Resources) 2	Operating	20	2013
Garden Creek	ONEOK Partners GP LLC	Garden Creek 1 Exp	Under Construction	20	2015
Garden Creek	ONEOK Partners GP LLC	Garden Creek 2 Exp	Under Construction	20	2015
Garden Creek	ONEOK Partners GP LLC	Garden Creek 3 Exp	Under Construction	20	2015
Robinson Lake	Whiting Oil and Gas Corp	Robinson Lake 3	Operating	20	2014
Stateline I	ONEOK Partners GP LLC	Stateline I 1 Exp	Under Construction	20	2015
Stateline II	ONEOK Partners GP LLC	Stateline II 1 Exp	Under Construction	20	2015
Caliber Midstream		Caliber Midstream 1	Operating	10	2014
Nesson	Nesson Gathering System LLC	Nesson 1	Operating	10	
Ray	Whiting Oil and Gas Corp	Ray 1	Operating	10	
Marmarth	ONEOK Rockies Midstream LLC	Marmarth 1	Operating	8	
Lignite	ONEOK Rockies Midstream LLC	Lignite 1	Operating	6	
Red Wing Creek	True Oil LLC	Red Wing Creek 1	Operating	4	
Ambrose	Sterling Energy	Ambrose 1	Operating	1	1984
<b>Total</b>				<b>2,155</b>	

Source: IHS Energy

- Oneok Partners and Hess account for a majority of the gas processing capacity in the Bakken region, with Hess' Tioga plant supplying most of the ethane shipped by the Vantage Pipeline to Alberta.

# North Dakota (Bakken) Fractionation Plants

## North Dakota Fractionators

Facility Name	Company	Region	County	State	Capacity (MBPD)
McKenzie/Grasslands Plant	Bear Paw Energy (ONEOK-owned)	Bakken	Natrona	ND	15
Sydney/Bakken	Hiland Partners, LP	Williston	Bowman	ND	7
Casper	Tallgrass Energy	Powder River	Mountrail	ND	2
Robinson Lake	Whiting Oil & Gas Corporation	Bakken	Mountrail	ND	8
Casper Expansion	Tallgrass Energy	Powder River	Mountrail	ND	2
<b>Total</b>					<b>33</b>

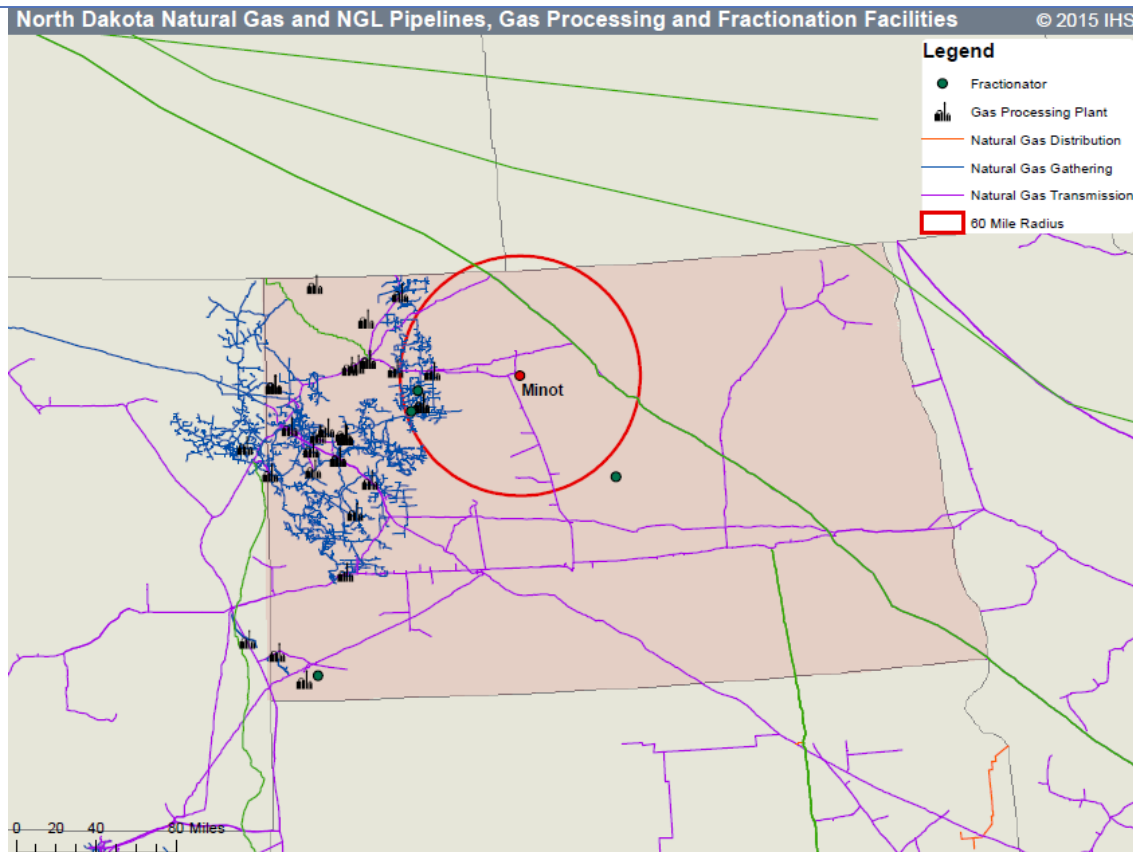
Source: IHS Energy

- Fractionator capacity in North Dakota is limited and not much additional fractionator capacity is anticipated unless a petrochemical industry develops in North Dakota to use NGL as feedstock.
- A 60,000 bpd de-ethanizer was added at Hess' Tioga gas processing plant to recover ethane to be shipped by the Vantage Pipeline to Alberta.

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## Assess options for delivering NGL feedstock to Minot

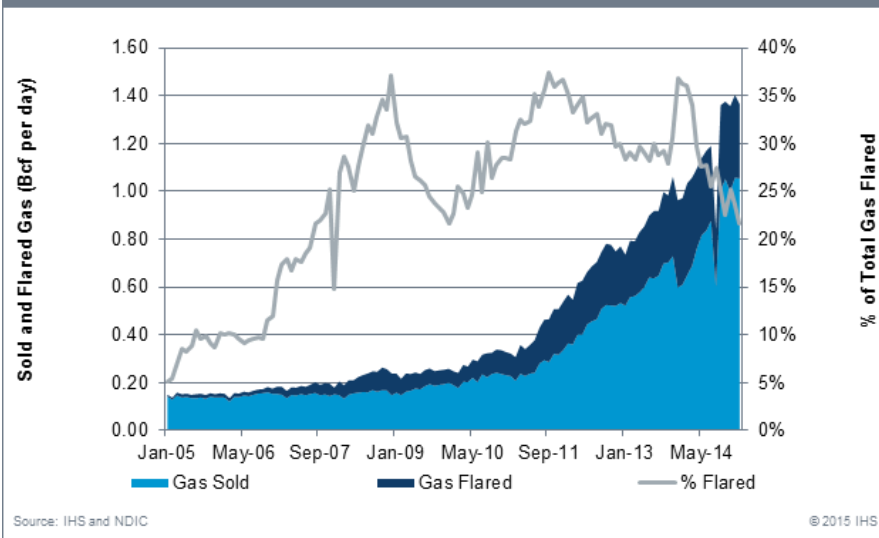
# North Dakota NGL Pipeline Infrastructure



- Natural gas from the Bakken formations is gathered and sent to Minot via the natural gas transmission lines, shown in purple
- IHS expects that the supply of natural gas to Minot can be scaled up with increased demand by increasing the compression pressure

# There is plentiful natural gas supply in North Dakota to meet the feedstock requirement for an ammonia plant in Minot

North Dakota wet gas (wellhead) production: Sold, flared and % flared



Ammonia Plant Size (Tons/yr)	Natural gas consumption (MMBTU/Ton of NH <sub>3</sub> )	Natural gas requirement (BCF/day)	Natural gas production in ND (BCF/day)
500,000	21	0.03	1.2

Only a small fraction (~2.4%) of the available natural gas supply in North Dakota would be needed for a 500,000 ton ammonia plant.

- The production of tight oil in the Bakken also generates, as a by-product, significant natural gas. The Three Forks and Sanish formations are the main producing formations in the North Dakota Bakken and accounted for more than 90% of the state's gross gas production in 2012, reaching an average of 0.7 billion cubic feet (Bcf) per day
- Today, approximately 1.2 Bcf per day gross gas is withdrawn from the Bakken Shale, and approximately 0.24 Bcf per day is flared
- Due to high transportation costs, it is most economical to consume natural gas near the source
- This presents opportunities to convert natural gas to value added chemicals (e.g. ammonia/urea or other fertilizers) in Minot, ND

# NGL Pipelines Out of North Dakota

**Major NGL Pipelines Passing Through North Dakota**

Pipeline Name	Company	Type	Length (miles)	Diameter (inches)	Capacity (MBPD)	Completion Date	Origination	Destination
Cochin	Kinder Morgan	Propane & Butane	1900	12	95		Fort Saskatchewan, AB	Windsor, Ontario
Bakken Pipeline	ONEOK Partners	Y-Grade	600		135	2Q13	Williston Basin	Overland Pass, Colorado
Vantage	Pembina	Ethane	432	10	40	1Q14	Tioga, ND	Empress, Alberta, CAN
<b>Total</b>					270			

Source: IHS Energy

- The Bakken NGL pipeline (owned by Oneok) can ship 60,000 bpd of unfractionated NGL south to Conway and Mont Belvieu.
- The Bakken NGL pipeline connects to the Overland Pass NGL pipeline and is being expanded by 60,000 bpd to 255,000 bpd to accommodate the Bakken raw NGL.
- The only pipeline out of North Dakota which ships specification LPG product is the Vantage Pipeline, which ships ethane north to Edmonton. The initial rate will be 40,000 bpd, but will increase to 60,000 bpd by year-end 2014.
- The Prairie Rose pipeline ships dense phase gas to the Alliance pipeline after the heavy fractions are stripped out at the Stanley gas processing plant.
- The Tioga Lateral also ships dense phase gas to Alberta after the stream has been de-ethanized at Tioga.



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## Potential Value Added Investor Screening

# Potential Investors for C<sub>1</sub>-C<sub>6</sub> Chemical Value Chains

## STRATEGIC INVESTORS

### C1 - METHANOL

- Methanex
- Celanese
- BASF SE
- DuPont
- SABIC
- Mitsui & Co. Ltd
- Mitsubishi Corp.
- BP

### C1 – AMMONIA

- CF Industries
- Koch Industries
- BASF SE
- SABIC
- PCS Fertilizers
- Yara International
- Jsc Togliattiazot
- Agrium

### C2-ETHYLENE

- Dow
- ExxonMobil Corp
- Lyondell Basell
- Ineos
- Chevron Phillips
- Shell Chemicals
- Reliance Industries
- Nova Chemical (IPIC)
- Formosa Group
- LG Group
- Lotte Group (Honam PC)
- Sasol
- SABIC
- Total
- BASF SE
- Braskem
- PTT
- Hanwha
- Oxy

### C3 – PROPYLENE

- Dow
- ExxonMobil Corp
- Lyondell Basell
- Ineos
- Shell Chemicals
- Reliance Industries
- Total
- Formosa Group
- LG Group
- Chevron Phillips
- Lotte Group (Honam PC)
- Mitsui Chemical Inc
- Sasol
- SABIC
- BASF SE
- Mitsubishi Chemical Corp.
- BP
- Nova Chemical (IPIC)
- Braskem
- PTT
- Mitsui Chemical Inc

### C4

- Ashland Oil
- Chang Chun PC
- Huntsman Group
- Koch Industries
- Mitsubishi Chemical Corp
- Shell Chemical Corp
- LG Group
- JSR
- Lanxess
- TPC Group
- ExxonMobil Corp.
- Ineos
- Lyondell Basell
- SABIC
- Sasol
- BASF SE
- Formosa Group
- Total

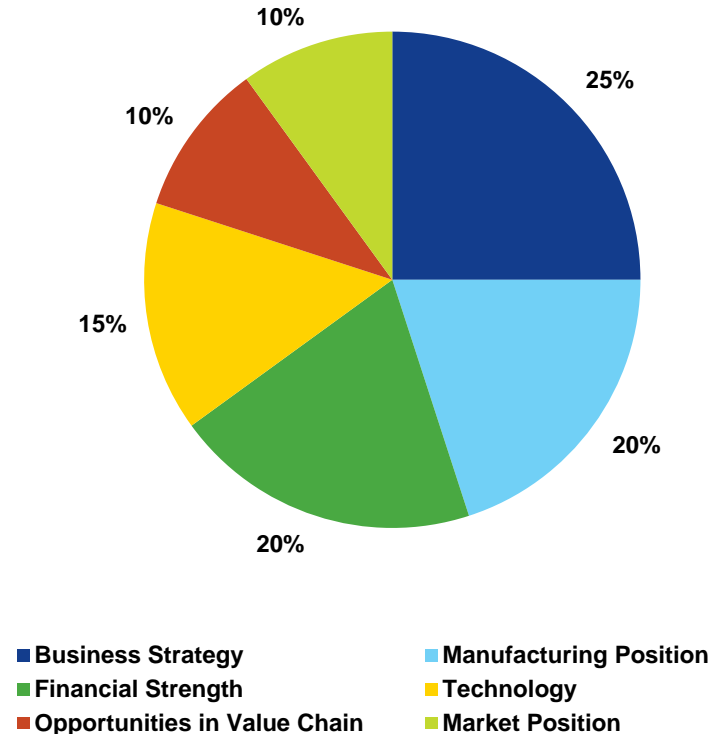
### C6+

- ExxonMobil Corp
- Reliance Industries
- BP
- SK Global Chemical
- Total
- ShellChemical
- Dow
- Formosa Group
- Koch Industries
- Chevron Phillips
- Sunoco
- SABIC
- BASF SE
- Ineos
- Lyondell Basell
- Mitsubishi Chemical Corp.

## Potential Investor Screening & Ranking Methodology

- A number of companies were selected as potential investors for C<sub>2</sub> value chain opportunity (ethylene and monoethylene glycol) in Minot area.
- Potential investors were screened based on the six categories: **global market position, value chain opportunities, manufacturing position, technology, strategy, and financial strength.**
- Each category had a different weighting for the ranking where business strategy had the highest weighting followed by manufacturing position, financial strength, technology, opportunities in value chain, and market position.
- IHS utilized and examined our internal database, recent publications about company's project expansion and strategy, company financials, technological capabilities, and value chain integration to determine the ranking for each company.

Investor Ranking Category Weighting



## Ranking System



A number between 1 and 10 was assigned to each of the six categories for each company. In each criterion, companies with weaker position was assigned a lower number vs. companies with stronger position were assigned a higher number. Each assigned number was multiplied by the weight of each category. The total weighted ranking for each company is the sum of the six categories.

## C<sub>2</sub> Value Chain Chemical Producers & Product Breadth

Chemical Producers (C2 ETH) Product Breadth						
	Ethylene	HDPE	LDPE	LLDPE	Ethylene Oxide	Ethylene Glycol
BASF SE	•		•		•	•
Braskem	•	•	•	•		
Chevron Phillips	•	•	•	•		
Dow	•	•	•	•	•	•
ExxonMobil	•	•	•	•	•	•
Formosa Group	•	•	•	•	•	•
Ineos	•	•	•	•	•	•
LG Group	•	•	•	•	•	•
Lotte Group (Honam PC)	•	•	•	•	•	•
Lyondell Basell	•	•	•	•	•	•
Nova Chemical (IPIC)	•	•	•	•		
PTT	•	•	•	•	•	•
Reliance Industries	•	•	•	•	•	•
SABIC	•	•	•	•	•	•
Sasol	•	•	•	•	•	•
Shell Chemical	•	•	•		•	•
Hanwha			•	•		
Oxy						
Total	•	•	•	•	•	•

## C<sub>2</sub> Value Chain Potential Investor Initial Screening

Investor Screening Matrix													
Market Positioning			Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
Ranking*	Total		Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
10%			25%		10%		20%		15%		20%		
C2 - Ethylene Value Chain													
BASF SE	5	0.5	6	1.5	8	0.8	5	1	7	1.1	10	2.0	6.9
Braskem	5	0.5	5	1.3	6	0.6	5	1	5	0.8	7	1.4	5.5
Chevron Phillips	10	1.0	8	2.0	8	0.8	10	2	9	1.4	10	2.0	9.2
Dow	10	1.0	9	2.3	9	0.9	10	2	10	1.5	10	2.0	9.7
ExxonMobil	10	1.0	10	2.5	8	0.8	10	2	10	1.5	10	2.0	9.8
Formosa Group	8	0.8	8	2.0	9	0.9	8	1.6	8	1.2	8	1.6	8.1
Ineos	7	0.7	7	1.8	7	0.7	8	1.6	8	1.2	7	1.4	7.4
LG Group	4	0.4	3	0.8	4	0.4	7	1.4	4	0.6	7	1.4	5.0
Lotte Group (Honam PC)	4	0.4	3	0.8	4	0.4	7	1.4	4	0.6	7	1.4	5.0
Lyondell Basell	10	1.0	9	2.3	10	1	10	2	10	1.5	8	1.6	9.4
Nova Chemical (IPIC)	8	0.8	6	1.5	6	0.6	7	1.4	6	0.9	7	1.4	6.6
PTT	5	0.5	6	1.5	6	0.6	8	1.6	4	0.6	9	1.8	6.6
Reliance Industries	3	0.3	8	2.0	5	0.5	5	1	5	0.8	7	1.4	6.0
SABIC	5	0.5	8	2.0	7	0.7	6	1.2	7	1.1	10	2.0	7.5
Sasol	5	0.5	8	2.0	7	0.7	6	1.2	6	0.9	8	1.6	6.9
Oxy	5	0.5	7	1.8	5	0.5	5	1	5	0.8	6	1.2	5.7
Hanwha	4	0.4	7	1.8	6	0.6	5	1	5	0.8	6	1.2	5.7
Shell Chemical	10	1.0	10	2.5	7	0.7	10	2	10	1.5	10	2.0	9.7
Total PC	7	0.7	8	2.0	8	0.8	8	1.6	8	1.2	8	1.6	7.9
Average Ranking	6.6		7.2		6.8		7.4		6.9		8.2		7.3

## Potential C<sub>2</sub> Value Chain Investors in Minot, ND.

	Investor Screening Matrix												
	Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
	10%		25%		10%		20%		15%		20%		
C2 - Ethylene Value Chain													
Chevron Phillips	10	1.0	8	2.0	8	0.8	10	2	9	1.4	10	2.0	9.2
Dow	10	1.0	9	2.3	9	0.9	10	2	10	1.5	10	2.0	9.7
ExxonMobil	10	1.0	10	2.5	8	0.8	10	2	10	1.5	10	2.0	9.8
Formosa Group	8	0.8	8	2.0	9	0.9	8	1.6	8	1.2	8	1.6	8.1
Ineos	7	0.7	7	1.8	7	0.7	8	1.6	8	1.2	7	1.4	7.4
Lyondell Basell	10	1.0	9	2.3	10	1	10	2	10	1.5	8	1.6	9.4
SABIC	5	0.5	8	2.0	7	0.7	6	1.2	7	1.1	10	2.0	7.5
Shell Chemical	10	1.0	10	2.5	7	0.7	10	2	10	1.5	10	2.0	9.7
Total PC	7	0.7	8	2.0	8	0.8	8	1.6	8	1.2	8	1.6	7.9

- 19 companies were screened as potential C<sub>2</sub> value chain (ethylene and MEG) investors in Minot, ND. IHS examined producer's C<sub>2</sub> production capabilities in the U.S. and monitored their recent business activities/plans for new C<sub>2</sub> project expansion within the U.S.
- Producers with large ethylene capacity in the U.S. with announced expansion plan were ranked higher than those without the capacity and delay in their plans due to low oil price. Foreign companies such as LG Group, Lotte Group, PTT, Reliance, Hanwha, and Sasol were generally ranked lower as they have delayed their project plans in the U.S.
- The financial strengths were assessed from company's overall performance last year. Opportunities and market position were assessed based on the company's overall market presence, integration, and product offerings.
- IHS selected these eight companies for further analysis as potential C<sub>2</sub> value chain investors in Minot, ND. Except SABIC, each of these companies has 5-15% of total ethylene market share in U.S. They also have a capacity expansion project to be completed within next 3-5 year.

## Potential Investor Profiles

Chevron Phillips

DOW

ExxonMobil Corp.

Formosa Group

Lyondell Basell

SABIC

Royal Dutch Shell

Total PC

Grupa Azoty

CHS Inc.



Chevron Phillips Chemical Company LLC (CPChem) is one of the leading olefins and polyolefins producers in the world. The company along with its subsidiaries and equity affiliates, is engaged in the manufacture and marketing of a wide range of petrochemicals such as olefins and polyolefins; polyalphaolefins, normal alpha olefins, aromatics and styrenics and specialty chemicals.

### Corporate Overview

- On July 1, 2000, Chevron Corporation and Phillips Petroleum Company, now ConocoPhillips, combined its worldwide petrochemicals business, to form Chevron Phillips Chemical Company LLC (CP Chem). Chevron and ConocoPhillips each own 50 percent of Chevron Phillips Chemical Company LLC.
- CPChem, through its subsidiaries and affiliates, manufactures and markets a range of petrochemicals on a worldwide basis. It is one of the world's top producers of olefins and polyolefins and a leading supplier of aromatics, alpha olefins, styrenics, specialty chemicals, plastic piping and polymer resins.
- The Company operates through three reportable segments: Olefins and Polyolefins; Specialties; Aromatics and Styrenics; and Others. It owns over \$8 billion in assets and employ approximately 5,000 people at 36 manufacturing and research facilities in nine countries.

#### OLEFINS AND POLYOLEFINS

- The segment engages in the production and marketing of ethylene, propylene, and other olefin products through its five olefins and polyolefins production facilities located in Texas, eight domestic pipe production facilities and one domestic pipe fittings production facility.
- Additionally, the company owns interests in a polypropylene facility located at the Pasadena Plastics Complex in Texas and in a high-density polyethylene plant located at its Cedar Bayou facility in Texas. Further, it also has an ethylene, polyethylene and 1-hexene facility in Qatar, and polyethylene facilities in Singapore and China.
- The Olefins & Polyolefin segment of the company accounted for 69% of the total revenue generated by the company during the fiscal year ended 2014.

#### SPECIALTY, AROMATICS and STYRENICS

- This segment is engaged in the manufacture and marketing of aromatics products such as benzene, styrene, paraxylene and cyclohexane, and specialty products. Additionally, it is involved in the manufacture and marketing of polystyrene as well as styrene-butadiene copolymers.
- Its production facilities are located in Mississippi, Singapore, and China. Further, Chevron Phillips Chemical also owned an equity interest in an aromatics facility in Saudi Arabia and in a KResin SBC facility in South Korea.
- The Specialties, Aromatics & Styrenics segment of the company accounted for 31% of the total revenues generated by the company during fiscal year ended 2014.

## Chevron Phillips is expanding its business in USGC

### Strategic Thrust

#### Recent Global Expansion / Acquisitions and Upcoming Projects–

- The company is nearing completion of the expansion of a Natural Gas Liquids (NGL) Fractionator Complex. With the expansion, the NGL fractionation unit will increase capacity by approximately 22,000 barrels per day or a 19 percent increase over current capacity.
- Total ethylene capacity of 4.5 MMT/yr which accounts for 16% of total ethylene production in the U.S. Cedar Bayou facility has 835KMT/yr capacity and Sweeny facility has 1.9MMT/yr capacity.
- Completed the acquisition of polyalphaolefin production facilities of Nestle in Belgium
- Expanding its normal alpha olefin capacity by 100KMT/yr at Cedar Bayou plant in Baytown, TX.
- Building \$6 billion expansion at Cedar Bayou ethane cracking plant to increase PAP olefin capacity
- completion of an ethylene expansion at its Sweeny complex in Old Ocean, Texas. With the addition of a tenth furnace to ethylene unit 33 at the Sweeny complex, the expansion is expected to increase annual production by 200 million pounds. Construction on the expansion began in 2013. The Sweeny complex is one of the world's largest single-site ethylene facilities and is now capable of producing roughly 12 million pounds of ethylene per day, or 4.3 billion pounds annually.
- Saudi Polymers Company (SPCo) and its joint venture partner, National Petrochemical Company (Petrochem) safely achieved start-up and commercial production for its new facilities in Al-Jubail, Saudi Arabia. The integrated SPCo petrochemicals complex includes world-class operating units that are capable of producing Ethylene (1,220 kmta), Propylene (440 kmta), Polyethylene (1,100 kmta), Polypropylene (400 kmta), Polystyrene (200 kmta) and 1-Hexene (100 kmta).
- Chevron Phillips Chemical owns three world-scale plants in the State of Qatar, including Q-Chem, a world-scale ethylene, polyethylene and 1-hexene complex; RLOC, one of the world's largest ethane crackers; and Q-Chem II, a world-scale olefins and polyolefins complex.

The company has geographically diverse manufacturing operations in 9 countries. The bulk of its chemical producing facilities are in the US and Middle East. It's facilities are mostly integrated with the refineries of its parent companies. About 80 percent of revenue is derived from sales in the USA.

### Market Position

- Heavy presence in United States with sales in United States representing about 80 percent of global revenues
- International sales represents only 20 percent of global revenues
- One of the leading global producer of olefins and polyolefins
  - Olefins and polyolefins products represents about 68 percent of total sales
- Leading supplier of alpha olefins, aromatics, styrenics, specialty chemicals, piping, and proprietary plastics
- Largest global producer of cyclohexane, and ranks third in alpha olefins and HDPE
- Serves diversified end users industries such as adhesives and sealants, agricultural, appliances, automotive, building and construction, chemical manufacturing, dry cleaning, electronics, health care and medical; household, imaging and photography, pharmaceuticals; plastics and rubber, etc

### Manufacturing Position

- 34 production facilities in nine countries located in the US, China, Singapore, South Korea, Qatar, Colombia, Saudi Arabia, Brazil and Belgium
- Eight domestic pipe production facilities and one domestic pipe fittings production facility
- Integrated operations with facilities of parent companies refineries—
  - Manufactures bulk of its chemicals at facilities that are attached or adjacent to its parent companies' refineries.
- Self sufficient in almost all of its required basic feedstocks due to help of parent companies

The company's key strategy focuses on running the operations safely and reliably, continuously improving the company's cost structure and realizing organic growth in feedstock-advantaged areas. The company has 4 world class R&D centers and is leader in some of the technologies in its industry. The company is self sufficient in its feedstock due to integration with its parent company's operations.

### Business Strategy

- Product innovation to meet diverse needs of customers
- Cost improvement initiatives including improving asset efficiencies
- Realize organic growth in feedstock-advantaged areas
- New investment initiatives in Middle East
- Invest in profitable renewable energy and energy efficiency solutions
  - Leverage the development of shale gas resources in the United States and Canada – investments in US Gulf coast region due to advantages of shale gas opportunities in USA

### Technology

- 4 research, technology and quality control centers; 2 in United States in Oklahoma and Texas, 1 in Singapore and 1 in Belgium
- Strong technological capability
- Developed several products and unique technologies.
  - Loop slurry process for polyethylene production is one of the most widely licensed processes in the world.
  - Aromax® process, catalyst and technology is the lowest-cost process for on purpose benzene production.
  - Other technological achievements include proprietary normal alpha olefin technology, on-purpose hexene-1 technology, methyl mercaptan process and technology, etc.

### Opportunities in Value Chain

- Shortfall in benzene

### Financials

- Strong balance sheet
- Support of parent group who are financially very strong
- Investment grade debt rating

SWOT Analysis – CP Chem is overly dependent on its olefins and polyolefins business and also on the US market. The company's revenue declined by 32 percent in 2009 due to slow down in US market. It has strong opportunities in emerging markets and the company has invested in new assets in Middle East to cater to growing demand in Asia. Further, due to advantageous shale gas position in the USA, the company has also initiated expansion activities in the US Gulf Coast region.

### Strengths

- Integrated chemical operations with refineries of parent companies
- Geographic diversification in manufacturing operations
- Leading positions in number of products
- Strong R&D capability
- Product innovations and enhancements

### Opportunities

- Growth opportunities in emerging markets
- Expansion activities in North America due to shale gas advantages

### Weaknesses

- Strong US market focus with about 80 percent of revenues coming from US

### Threats

- Stringent environment regulations
- Competitive pressures
- Fluctuations in raw materials prices
- Plant Shutdowns

CP Chem has a strong market position in USA as the majority of its sales are in USA. However, it has geographically diverse manufacturing operations with the bulk of its production facilities in the USA and Middle East. It is self sufficient in terms of feedstock supply due to its integration with the refineries of the parent companies.

Investor Screening Matrix													
Market Positioning			Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
Ranking*	Total		Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
10%			25%		10%		20%		15%		20%		
Chevron Phillips	10.0	1.0	8.0	2.0	8.0	0.8	10.0	2.0	9.0	1.4	10.0	2.0	9.2

- CP has a strong market position in US with about 80 percent of the revenues being derived from domestic market. The company is one of the leading producer of olefins and polyolefins and these products generate about 69 percent of global revenues. However, the company is focusing on expanding its presence in growth markets such as Asia.
- The strategy of the company is to achieve growth by taking initiatives such as cost improvement including asset efficiency, expansion of global market presence by product innovation and investing in growth markets, and making investments in feedstock advantaged areas. Accordingly, the company has invested in petrochemicals facilities in Saudi Arabia and plans to shut down some old polypropylene facilities in USA. It plans to invest in North America, specially in US Gulf Coast, in new world class petrochemical facilities owing to advantages of shale gas feedstock opportunities in USA. The company has also invested in shale gas opportunities in Alberta, Canada.
- Due to integrated operations with its parent companies, the company is self sufficient in most of its feedstock requirements in USA and outside USA. The company has shortfall on benzene which it generally purchases from market.
- The company has manufacturing positions in nine countries but bulk of its chemical production facilities are in USA and Middle East. The company has been making investments in large world scale projects outside USA for past few years.
- The company has developed some of the leading technological process in the world. It has strong R&D base across the globe. The company has investment grade rating of its debt and enjoys the security of strong financial position of its parent companies.
- The company is exploring opportunities of realizing growth in feedstock advantaged areas. Similar to its investments in US Gulf coast owing to shale gas advantageous in USA, there may be opportunities, in the long term, to invest in North Dakota also due to its shale gas advantages and other benefits offered by the region.

## Potential C<sub>2</sub> Value Chain Investor Profiles

### Potential Investor Profiles

Chevron Phillips

**DOW**

ExxonMobil Corp.

Formosa Group

Lyondell Basell

SABIC

Royal Dutch Shell

Total PC

Dow operates through six business divisions which includes eight business segments. Advanced materials include two segments - electronic and specialty materials segment and coatings and infrastructure segment. Performance products and systems include two segments – performance systems and performance products.

## Corporate Overview

- The Dow Chemical Company (Dow) is one of the leading science and technology companies in the world. The company provides a wide range of chemical, plastic and agricultural products and serves numerous consumer markets such as oil and gas, food, transportation, health and medicine, personal and home care, and building and construction.
- It has 188 manufacturing sites in 35 countries. Its product range extends from basic chemicals and polymers to performance and specialty applications as well as agricultural chemicals. Foreign operations account for roughly two thirds of global revenues. Almost 40 percent of revenues comes from highly cyclical commodity businesses while the less cyclical specialty products account for remaining 60 percent of revenues. The company's broad customer base, with food/packaging and personal/household care markets representing almost 40 percent of sales provides it with some stability in demand.
- The company's emphasis on differentiated, technology-driven and customer-focused product areas is reflected in its current business model that acknowledges different priorities and resource requirements for those businesses that are innovation-intensive and specialty in nature versus those that are commodity oriented. The recent acquisition of Rohm & Haas and ensuing asset sales has shifted Dow's portfolio from the more competitive commodity chemicals and polymers towards specialty and performance applications.
- The company operates three integrated business models. At the top are Health and Agricultural Sciences and Electronic and Specialty materials. These are highly differentiated, technology rich, market driven businesses with high customer intimacy. Next is Coatings and Infrastructure and Performance systems consisting of industry leading technology driven businesses with unmatched R&D capabilities. At the bottom is the basics chemical business which depend on affordable and secure feedstocks to deliver basic chemicals and plastics to customers across the globe, as well as a unique integration advantage to downstream product portfolio.

### ADVANCED MATERIALS

- The acquisition of Rohm & Haas in 2009 led to the establishment of the Electronic and Specialty Materials segment that contains a large part of the Rohm & Haas businesses.
- Other former Rohm & Haas segments, such as Coatings and Building Materials, are now part of the new Coatings and Infrastructure segment that also includes the former Dow Building Solutions business. Together, these two segments form the Advanced Materials division.

### HEALTH & AGRICULTURAL SCIENCES

- Health and Agricultural Sciences expanded with the addition of Rohm & Haas" AgroFresh, which manufactures products used for maintaining the freshness of fruits, vegetables, and flowers.
- Dow Agro Sciences provides pest management, agricultural and crop biotechnology products and solutions. The business develops, manufactures and markets products for crop production; weed, insect and plant disease management; and industrial and commercial pest management.

### PERFORMANCE PRODUCTS & SYSTEMS

- This division combines two segments: Performance Systems and Performance Products. This division contains most of Dow's former performance businesses. Performance systems segment operates a number of businesses including: Dow automotive, Dow elastomers, Dow wire and cable, Dow Fiber Solutions, Dow Oil & Gas and a portion of the Siam Cement Group – Dow joint venture results.
- Performance products segment includes businesses such as amines; emulsion polymers; epoxy; oxygenated solvents; performance fluids, polyglycols, and surfactants; performance monomers, and polyurethanes.

### PERFORMANCE PLASTICS

- The Plastics division has become smaller with the divestiture of Styron (Trinseo), which included Dow's styrenics and polycarbonate businesses. Currently, the Plastics division comprises Dow's polyolefins and related technology and catalyst licensing. Plans exist to transform the division into a performance-oriented business that would include parts of the current Performance Systems and Advanced Materials divisions.



## Corporate is not a business division but a reporting segment which includes results of ventures, venture capital, insurance operations etc

### CHEMICALS & ENERGY

- The move of the Energy unit from Hydrocarbons to Chemicals in August 2010 created the current Chemicals & Energy division. Currently, businesses include Ethylene Oxide/Ethylene Glycol and also Energy comprising power, steam and other utilities. Output is primarily used internally, and includes both wholly-owned facilities and joint ventures, such as MEGlobal.
- The Chemicals segment also includes a portion of the results of EQUATE Petrochemical Company K.S.C. and the Kuwait Olefins Company K.S.C., all joint ventures of Dow. .

### HYDRO CARBONS

- The Hydrocarbons division encompasses the procurement of natural gas liquids and crude oil-based raw materials, as well as the supply of monomers, principally for use in Dow's global operations. The business regularly sells its byproducts; the business also buys and sells products in order to balance regional production capabilities and derivative requirements. The business also sells products to certain Dow joint ventures. Products include: Benzene; butadiene; butylene; cumene; ethylene; propylene; styrene.
- The Hydrocarbons division also includes the results of Compañía Mega S.A., and a portion of the results of the Kuwait Olefins and Styrenics Companies K.S.C. and SCG-Dow Group, all joint ventures of the Company.

### CORPORATE

- Corporate includes the results of Ventures (which includes new business incubation platforms focused on identifying and pursuing new commercial opportunities); Venture Capital; non-business aligned technology licensing and catalyst activities; the Company's insurance operations and environmental operations; and certain overhead and other cost recovery variances not allocated to the operating segments.

## Most of Dow's strategic thrust is positioning itself in high value specialty businesses

### Strategic Thrust

#### Recent Global Expansion / Acquisitions and Upcoming Projects–

- Establishment of Geographic Leadership Council and dedicated leaders in key geographies including expansion of operations in emerging markets like Africa and Western China
- Investing in a portfolio of technology integrated and market driven performance businesses to enter into new markets and enhance product portfolio in key applications such as coatings, water, electronics and agriculture. Some examples are:
  - 50:50 joint venture with Aksa-Akrilik Kimya Sanayii A.S. to manufacture and commercialize carbon fiber and derivatives.
  - 50:50 joint venture 'Advanced Electrolyte Technologies LLC' with Ube Industries, Ltd., to manufacture formulated electrolytes for lithium-ion battery cell manufacturers in the energy storage market.
  - Formation of a joint venture with Mitsui & Co in Brazil for production biopolymers made from renewable, sugarcane derived ethanol in Brazil.
  - Development and marketing license agreement with Gowan to allow Gowan to develop the fungicide meptyldinocap active for use in fruits and vines in the U.S. and Canada.
  - Strengthen the basic businesses by continuing to seek strategic joint ventures and preserve the unique integration strength that provides the Company with the building blocks to create sustainable growth in performance based and market driven businesses.
  - Dow entered into a 50:50 joint venture with Saudi Arabian Oil Company to form 'Sadara Chemical Company' to build and operate a world scale fully integrated chemicals complex in Jubail, Saudi Arabia. Total investments for the project is approximately \$20 billion.
  - New world scale ethylene facility planned in US Gulf Coast with tentative start date of 2017; restart of steam cracker unit in Taft, St Charles in 2012; improve ethane feedstock flexibility at the steam crackers in Plaquemine, LA (2014) and Freeport, TX (2016).
  - New world scale propane-dehydrogenation plant at Freeport scheduled to start by 2015. Also exploring a second on purpose propylene project that would use proprietary technology developed by Dow.
  - Investment on renewable energy source such as wind and solar
- Invest in innovation and research & development to fuel organic growth in the industries with highest growth opportunities

Dow is a widely diversified company with strengths in both basic chemicals and downstream products. It has a strong presence in emerging geographies and most of the future capital projects are focused on these emerging geographies.

### Market Position

- Broad range of technology based products and solutions in approximately 160 countries – strong in both organic and inorganic chemicals.
- Geographically diversified - About 68 percent of revenues from outside USA.
- Strong presence in emerging geographies – target to increase revenues from 30 percent in 2010 to 35 percent by 2012.
- Leading producer of olefins and ethylene derivatives, especially LLDPE, and also ethylene oxide and derivatives.
- More than 20 percent share for about 10 products such as propylene oxide/glycol, perchloroethylene, epichlorohydrin, glycol ethers (E- & P-series), methyl chloride, polyether polyols, and methyl isobutyl carbinol
- Positioned for growth in key industries such as healthcare and medical, transportation, food, utilities, electronics, agriculture etc.

### Manufacturing Position

- 188 manufacturing sites in 35 countries - extremely well integrated starting with production of olefins, aromatics, and working down through the derivative chains to polymers, elastomers, foams, and formulated/performance products as well as agrochemicals and other specialties.
- Bulk and intermediate chemical production is relatively streamlined compared to other large companies.
- Feedstock security
- Acquiring more extensive network of smaller specialty production sites in close proximity to their customer base
- Future capital projects will focus on the Middle East and Asia where low feedstock cost and strong demand growth provide competitive advantages
- Closures and divestitures of non strategic assets in North America and West Europe to continue
- 4 manufacturing locations in 3 provinces in Canada – focused on ethylene derivatives including LLDPE and ethylene oxide/glycol, small emulsion plant and STYROFOAM insulation plant.

Dow is managed through an integrated business model consisting of market driven, performance products and basics chemicals. It is focused on expansion of portfolio downstream towards infrastructure & transportation, energy, consumerism and health and nutrition.

### Business Strategy

- Invest in a portfolio of technology integrated, market driven performance businesses that create value for shareholders and growth for customers
- Preserve the value of integration along product chains and ensure the supply of key raw materials for performance and advanced materials business
- Invest in projects and businesses that align with the societal and cultural megatrends – infrastructure & transportation, energy, consumerism, and health and nutrition.
- Sale of non strategic assets – Chlor-Alkali assets to Olin for \$5 billion
- Strong focus on emerging geographies
- North America – investments in higher margin and higher growth business
- Latin America – major opportunities from sustainable chemistry
- Europe, Middle East and Africa – significant growth opportunities in performance business and further options for advantaged feedstock
- Asia Pacific – Accelerated growth in performance business to capitalize on megatrends in rapidly emerging markets

### Technology

- Extensive proprietary technological position in a wide variety of products
- Strong partnerships with various companies and organizations for R&D
- Significant investments in R&D to support an expanded specialty and performance product portfolio
- Substantial technology licensing business
- Participation in the entire value chain provides an unique and unprecedented ability to introduce and leverage technology how and where it chooses

### Opportunities in Value Chain

- Possible opportunity for some materials for which it has a shortfall for production of downstream products - benzene, ethylene and propylene.
- Large net deficit of propylene and ethylene in US - announced plans to build new olefins production capacity
- Downstream focus may allow Dow to make more targeted upstream investments
- Future investments including joint ventures will likely be concentrated in the olefins and derivatives segments that together will account for the majority of total capacity additions scheduled from 2012 to 2016.

### Financials

- Financial resources for large investments
- Solid credit rating
- Focused on reducing debt, increasing operating earnings with lower volatility and achieving a higher return on capital and equity.

**SWOT Analysis – Dow has broad diversified operations with strong foothold in chemicals industry. It is focused on downstream high value performance products. It has a long term focus on key industries and emerging markets for growth opportunities.**

### Strengths

- Strong foothold in chemicals industry with large diversified operations – insulating from concentration risks
- Upstream and downstream integration
- Feedstock security
- Strong R&D and product innovations
- Strong presence in emerging geographies
- Presence in high margin specialty markets

### Opportunities

- Focus on four societal and cultural megatrends – infrastructure and transportation, energy, consumerism, and health and nutrition for growth
- Significant focus on market driven and performance products such as health and agricultural sciences, electronic and specialty materials, coatings and infrastructure, performance systems etc
- Securing the feedstock for which it has a shortfall - benzene, ethylene and propylene.
- Asset divestments of non strategic assets to provide financial flexibility to expand core business

### Weaknesses

- Dependency on its suppliers for raw materials
- Involvement in legal lawsuits possibly affecting financial results

### Threats

- Intense competition from major oil companies
- Impact of strict environmental regulations – REACH in Europe, Toxic Substances Control Act in USA, Restriction of Hazardous Substances in China.

Overall, Dow may have strong interest in investing in expansion plan in North Dakota and also secure the feedstock supply for new olefins plant in the US.

Investor Screening Matrix													
Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted	
Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking	
10%		25%		10%		20%		15%		20%			
Dow	10.0	1.0	9.0	2.3	9.0	0.9	10.0	2.0	10.0	1.5	10.0	2.0	9.7

- Has a strong position in ethylene with total capacity of 4MMT/yr accounting for 14% of total ethylene production in the U.S.
- Also has a very strong position as a MEG producer in the U.S. accounting for 16% of total MEG capacity in the U.S.
- Acquired ExxonMobil's ownership share of Univation Technologies which has comprehensive technology programs focused on the UNIPOL™ PE Gas-Phase Process, UCAT™ Conventional Catalysts, XCAT™ Metallocene Catalysts, PRODIGY™ Bimodal HDPE Catalysts and ACCLAIM™ Advanced HDPE Catalysts.
- The key business strategy of the company is to expand its operations in Asia and Middle East and invest in product portfolio that is market driven and technologically integrated to capture the growth in the region. The company is focused to invest in higher margin and higher growth business in North America.
- Dow has strong technological capabilities and financial position for setting up an appropriate operations in any region.
- Dow may have an interest in investing in expansion plan in North Dakota and also secure the feedstock supply for new olefins plant in US.

## Potential C<sub>2</sub> Value Chain Investor Profiles

### Potential Investor Profiles

Chevron Phillips

DOW

**ExxonMobil Corp.**

Formosa Group

Lyondell Basell

SABIC

Royal Dutch Shell

Total PC

ExxonMobil is a leading integrated global oil and gas company. It manages its business through three segments – Upstream, Downstream and Chemicals. The chemical segments is one of the largest chemical business in the world with integrated operations with refineries.

## Corporate Overview

- Exxon Mobil Corporation (ExxonMobil) is a leading integrated global oil and gas company. It is active in the exploration and production of oil and gas; refining, transportation and marketing of oil and natural gas; and manufacture and sale of petroleum products. It also has interests in commodity petrochemicals such as olefins, aromatics, polyethylene and polypropylene plastics and a range of specialty products.
- It operates through three reportable business segments, namely, Upstream, Downstream and Chemical. It offers products and services under various brands such as ExxonMobil, Exxon, Esso and Mobil. It has a presence on six continents with operations in over 200 countries.
- The Chemical segment manufactures and sells petrochemicals and other chemical products. The company carries out chemical activities in North America, Europe, the Middle East and Asia Pacific. The demand for petrochemicals recorded continuous increase in the emerging Asian economies. ExxonMobil expects over 60 percent of global petrochemical demand growth to come from Asia, with China accounting for more than one-third growth. Major investment projects, therefore, have been announced in China, Singapore, and Middle East countries with only minor additions, primarily in aromatics and specialty chemicals in more mature markets of North America and West Europe.
- The product focus of chemical business is comparatively narrow when compared to other chemical producers. However, the integration into refinery and gas processing operations and manufacturing site synergies achieved in the company's large petrochemical complexes provide a strong competitive advantage. Therefore, it will continue to enjoy advantaged feedstock position.

### UPSTREAM

- The company, through its upstream segment, engages in the exploration and production of crude oil and natural gas. The company is also involved in power generation operations. It operates through several global companies and affiliates. These companies are responsible for the exploration, development, production, gas and power marketing, and upstream-research activities. The company has interests in various types of oil and gas assets including conventional, deepwater, heavy oil, oil sands, Arctic, acid/sour gas, LNG and tight gas assets. The company has exploration assets in the US, Canada, South America, Europe, Asia Pacific, Australia, the Middle East, Russia, the Caspian Sea and Africa.

### DOWNSTREAM

- The Downstream segment is engaged in refining and supply; fuel marketing; and lubricants and specialties businesses. ExxonMobil's refining and supply business includes a global network of refineries, manufacturing plants, transportation systems and distribution centers that provide a wide variety of fuels, lubricants, and other high-value products and feedstocks. ExxonMobil has ownership interests in 37 refineries across 21 countries with combined distillation capacity of 6.3 million barrels per day and lubricant basestock manufacturing capacity of about 140,000 barrels per day.

### CHEMICALS

- The Chemical segment manufactures and sells petrochemicals and other chemical products. Its product portfolio consists of paraxylene, olefins, polyethylene, polypropylene, synthetic rubber, oriented polypropylene packaging films, plasticizers, synthetic lubricant base stocks, additives for fuels and lubricants, zeolite catalysts and other petrochemical products. The company carries out chemical activities in North America, Europe, the Middle East and Asia Pacific. In 2010, ExxonMobil Chemical expanded the butyl rubber production capacity of its plant in Kawasaki, Japan by 18,000 tons per year. Recently, the company renewed Mobil 1 Technology partnership with Vodafone McLaren Mercedes.



ExxonMobil Chemical business is focused on capturing the expected growth in the Asia Pacific market.

### Strategic Thrust

#### **Recent Global Expansion / Acquisitions and Upcoming Projects–**

- Increasing production of its high performance hydrocarbon fluids by 10 percent through expansion projects at its Singapore and Antwerp facilities
- Building a multi-billion dollar ethane cracker with capacity of 1.5MMT/yr in Baytown, TX of which will be used to produce two new 650KMT/yr high performance polyethylene lines at the company's Mont Belvieu plastics plant.
- Started the production of 50KMT/yr metallocene polyalphaolefin (mPAO) synthetic lubricant base stocks at its integrated refining and chemical complex in Baytown, TX.
- Planning to build the world's largest hydrogenated tackifier manufacturing facility and halobutyl rubber and hydrogenated hydrocarbon resin facility at its recently expanded petrochemical complex in Singapore.
- Strategic tie ups for exploration and development activities –
  - Rosneft and ExxonMobil signed a Strategic Cooperation Agreement to jointly participate in exploration and development activities in Russia, the United States, and other parts of the world.
  - ExxonMobil signed a Principles of Agreement (POA) with the Government of Indonesia on key terms and conditions for a new Production Sharing Contract for the development of the Natural gas resource
- Capture full benefits of integration across ExxonMobil operations
- Focus on Asia Pacific markets - by 2020, more than 60 percent of global petrochemical demand growth will occur in Asia Pacific, with over one-third in China.

ExxonMobil chemical business is a widely diversified and integrated operations with strong and unique portfolio mix. The company has strong global position in both commodities and specialty chemicals.

### Market Position

- Product portfolio consists of unique combination of commodity and specialty businesses that has been developed primarily through application of proprietary technology rather than via acquisition.
- Strong and unique portfolio mix
  - Commodities - Ranked #2 in benzene, paraxylene, olefins, polyethylene and #4 in polypropylene
  - Specialties – ranked #1 in butyl polymers, fluids, pasticizers, synthetics, oriented polypropylene films, specialty elastomers
  - Strong global position in ethylene and propylene
- Wide geographical presence
- Americas is the largest region for chemical business followed by Asia pacific and Europe, Middle East and Africa (EMEA).
  - Focus on Asia Pacific for future growth as demand growth led by Asia pacific, particularly China and India
  - Well positioned in North America and Europe with highly competitive world class assets
  - Shift in focus away from United States – Non US sales increasing at a healthier rate than US sales
- Focus on specialty chemicals which provides a stable yet growing earning base
  - Significant benefit from the lower-cost structure enabled by feedstock and scale advantages when produced at the same integrated sites as commodity chemicals

### Manufacturing Position

- Wide geographic presence in manufacturing operations - about 66 manufacturing locations in 19 countries; over 17 significant chemical manufacturing locations in USA and 5 in Canada
- Integrated large scale refining business with chemical business
  - common site management, utilities and infrastructure, assets with unparallel feed flexibility, higher value products
  - minimizing feedstock transportation costs
  - substantial flexibility to process a wide range of feedstocks
- Virtually self sufficient for most of its required basic feedstock
- Unique combination of advantaged feedstocks, lower-cost manufacturing processes, and premium products is unmatched in the industry
- Well-positioned to cater to growing Asia Pacific demand from capacity base in the Middle East and Asia Pacific, including production at integrated joint venture in Fujian, China.
  - Major expansion at integrated Singapore complex will increase this advantaged supply position for both commodity and specialty products
  - Asia has largest amount of capital employed followed by North America and Europe & Middle East
- Operational excellence
- Canadian operation produces polypropylene film, allphatic solvents, benzene, C9+ aromatics and aromatics solvents, ethylene, fuel gas, fuel oil, HDPE, LLDPE, propylene, toluene, hydrogen etc.

Strategic focus of ExxonMobil's chemical business is on Asia Pacific region and specialty chemicals. Most of the future investments are directed in Asia Pacific and Middle East region. Though it has advantageous feedstock position, yet it has shortfall in intermediaries in steam cracking of C<sub>4</sub>s where there may be a possible opportunity for securing the supply position.

### Business Strategy

- Focus on businesses that capitalize on core competencies
- Build proprietary technology positions
- Capture full benefits of integration across ExxonMobil operations
- Consistently deliver best-in-class performance
- Selectively invest in advantaged projects
- Strong focus on Asia Pacific region

### Technology

- Extensive technology portfolio in processes for basic chemicals and polymers
  - Technology to optimize feedstock selection and process conditions at integrated complexes to maximize value
  - Proprietary product and application technologies to tailor innovative solutions to meet customers' needs
- Leader in development and application of leading edge technologies for aromatics production
- Pioneer in developing steam cracking technology used to produce olefins
- Significant investments in R&D to support specialty product portfolio

### Opportunities in Value Chain

- Most of the future investments in chemical business are likely to be in the Asia Pacific and Middle East region
- Company has large presence in oil and gas reserves with significant oil refining operations in Canada.
  - Possible opportunities for intermediaries in the steam cracker C<sub>4</sub>s where there is a shortfall in North America
  - Possible opportunity to expand oil and gas operations in North Dakota?

### Financials

- Record earnings in chemicals business reflecting positive impact of advantaged feedstock, high degree of integration, and record earnings from specialty business
- Return on average capital employed in chemical business – one of the highest in industry
- Industry leading returns – high performance in chemicals business
- Financial strength for financing of new projects

SWOT Analysis – ExxonMobil Chemical business is highly integrated with its upstream and downstream operations with benefits of advantageous feedstock position and lower manufacturing costs. Key growth opportunities for chemical business is in the Asia Pacific region and specialized chemicals.

### Strengths

- Balanced portfolio
- Upstream and downstream integration
- Feedstock security – substantial oil and gas reserves
- Strong R&D and product innovations
- High impact technologies
- Wide geographical operations

### Opportunities

- Securing the feedstock for which it has a shortfall – intermediaries in C4s
- Strategic expansion in unconventional oil and gas
- New LNG projects in Middle East and Asia to meet the growing demand in the region
- New specialized products in key growing industries
- Focus on Asia pacific region

### Weaknesses

- Involvement in legal lawsuits possibly affecting financial results

### Threats

- Stringent tax policies
- Impact of strict environmental regulations – REACH in Europe, Toxic Substances Control Act in USA, Restriction of Hazardous Substances in China.

Large amount of shale gas reserves in North Dakota may provide additional opportunities to expand its oil and gas operations in North Dakota on a long term basis. Additionally, shortfall in feedstock for intermediaries in the steam cracker C<sub>4</sub>s in North America may also result in a possible opportunity for investing in North Dakota.

Investor Screening Matrix												
Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
10%		25%		10%		20%		15%		20%		
10.0	1.0	10.0	2.5	8.0	0.8	10.0	2.0	10.0	1.5	10.0	2.0	9.8

- ExxonMobil has strong global and domestic market position with strong and diverse product portfolio mix. It has leading market positions in number of products.
- Has ethylene capacity of 4MMT/yr (14% of U.S. ethylene production) and does not produce MEG
- In 2012, ExxonMobil signed an exchange agreement with Denbury Resources Inc. to acquire 100 percent of Denbury's Bakken shale assets which consist of approximately 196,000 net acres in North Dakota and Montana
- ExxonMobil has strong technological capabilities and financial position for setting up an appropriate operations in any region.
- Large amount of shale gas reserves in North Dakota may provide additional opportunities to expand its oil and gas operations in North Dakota on a long term basis. This may present a possible opportunity for investing in North Dakota on a long term basis.

## Potential C<sub>2</sub> Value Chain Investor Profiles

### Potential Investor Profiles

Chevron Phillips

DOW

ExxonMobil Corp.

**Formosa Group**

Lyondell Basell

SABIC

Royal Dutch Shell

Total PC

Formosa Plastics Group is a Taiwan based conglomerate engaged in the business of oil refining, petrochemicals, plastics, fibers, electronics and textiles. It operates its business through a series of subsidiary companies. The primary manufacturing base of the group is in Taiwan with some of the operations also located in the USA and China. Most of its sales are in domestic market and China.

## Corporate Overview

- Formosa Plastics Group (Formosa) is a Taiwan based conglomerate dealing with several business operations such as oil refining, petrochemicals, plastic raw materials, secondary processing of plastics, fiber and textiles, electronic materials, machinery and transportation. It also operates several large educational and medical organizations.
- The operations of the company can be divided into five main divisions, namely, oil refining, petrochemicals and plastic raw materials; fibers, textiles and carpets; electronic materials; transportation; and machinery products. The company has organized its business through several subsidiaries. Four of the largest subsidiaries include Formosa Plastics Corporation, Nan Ya Plastics Corporation, Formosa Chemical and Fibre Corporation, and Formosa Petrochemicals Corporation.
- The oil refining, petrochemicals and plastic raw materials division owns and operates Taiwan's only private owned oil refinery and naphtha cracking plant through Formosa Petrochemicals Corporation. It is engaged in the production of gasoline and diesel and sells these to gas stations across Taiwan. It has a naphtha cracking plant with annual capacity of 1.35 million metric tons.
- The fibers, textiles and carpets division serves textiles and finishing and dyeing producers in Taiwan. The division mainly produces six types of fibers namely, polyester, acrylic, nylon, rayon, carbon and spandex. The electronic materials division has a vertically integrated production system.
- Virtually, all the manufacturing operations are located in Taiwan, China and USA and most of the products are supplied to customers in Asia and US.

### FORMOSA PLASTICS CORPORATION

- It was established in 1954 and its principal business includes producing intermediate raw materials for plastics. Its products include PVC resins, VCM, caustic soda, hydrochloric acid, MBS, HDPE, EVA/LDPE and LLDPE, and specialty chemicals such as acrylic acid, MTBE etc..
- It is one of the largest manufacturer of PVC resins in the world with total capacity of 3.17 million metric tons per year with production facilities in Taiwan and USA. Further, it is the largest manufacturer of some of its products in Taiwan such as HDPE, acrylic fibers, etc.

### FORMOSA PETROCHEMICALS CORPORATION

- It is engaged in the business of refining crude oil, selling refined petroleum products and producing and selling olefins from naphtha cracking operations. It also sells electricity, steam and related products generated from its co-generation power plants.
- It has its primary operations in Taiwan. The company sells its refined products in domestic and international markets. It also produces and sells olefins including ethylene, propylene, BTX and butadiene within the Formosa group companies for further downstream processing. It produces 2.9 million metric tons of ethylene and 2.2. million metric tons of propylene.

### FORMOSA CHEMICALS AND FIBRE CORPORATION

- It is principally engaged in the manufacture and sale of chemical products, plastics materials, textile products and fiber products. The chemical products include benzene, toluene, paraxylene, phenyl ethylene and acetone , among others.
- The company distributes its products in the domestic market as well as to oversees markets including Mainland China, Hong Kong, Macau, Americas etc.

### NAN YA PLASTICS CORPORATION

- It is principally engaged in the manufacture and sale of plastic products, electronic materials and petrochemicals products. The petrochemical products include glycol, butylene glycol, bisphenol A and others.
- It distributes its products in Taiwan, China, Americas and Southeast Asia.

Formosa is focused to pursue a low cost strategy by setting up integrated plants closer to customer base such as in China and Vietnam and leveraging on its diverse product portfolio.

### Strategic Thrust

- Plans to invest \$13.25 billion in overseas expansion in China, Vietnam, and U.S.
- New propylene plant in Point Comfort, TX with production capacity of 545KMT/yr
- \$2 billion expansion including 625KMT/yr LDPE plant and PDH units in Point Comfort, Texas
- New investments in China and Vietnam
  - Set up of a steel plant in Vietnam with approximate cost of \$2 billion
  - \$500 million in Vietnam's Dong Nai to expand its textile and plastics production capacity and \$100 million to build a 200KMT/yr PS unit in Hong Fu-yuan
  - Expansion projects in existing facilities in Ningbo, China
- Intends to build complete industrial park bringing together upstream, intermediate and downstream products
  - Expansion of petrochemical complex in Mailiao, Vietnam with capital budget of \$4 billion
  - Number 6 Naphtha cracker in Taiwan is fully integrated petrochemical refining complex in the region
- Leverage competitive edge due to product diversity to further penetrate market with new products
  - Cooperation agreement with SK Energy of South Korea to develop energy storage batteries for automotive applications
  - Collaboration with China Guodin Corporation to manufacture gearboxes for wind turbines and carbon fibers blades
- Pursue agreements and collaborations to increase revenue growth
  - Agreement with CPC to supply ethylene and propylene - expected to lift utilization of olefins plant by 3 to 4 percent



Formosa is a regional player with virtually all its operations and end market in Asia. It has some petrochemical investments in the USA to cater to customers in USA, but the long term focus is mostly in Asia, specially, China. The company is short on ethylene and propylene feedstock for its downstream products and there may be an opportunity to secure the feedstock supply by making investments in North Dakota if it is cost effective.

### Market Position

- Limited geographic presence
  - Focus on domestic market and China
  - Limited operations in USA
  - No operations in Europe, Middle East, South America, Africa
- One of the largest petrochemical company in the Asia with leading market positions in PVC, caustic soda, HDPE, polypropylene, etc
- Product diversity – ranges from plastics, polymers, electronics, fibers etc
- Significant exports to China

### Manufacturing Position

- Virtually all operations in Taiwan and USA
  - Owns several large petrochemical plants and gas wells in USA (polyester plant in South Carolina, ethylene plant in Texas)
  - Recent expansions in China and Vietnam
- Focus on less labor intensive and higher return products such as specialty chemicals in Taiwan
- Integrated production facilities and hence cost efficient facilities
- Safety risks – recent safety violations led to temporary suspension of 13 plants of FCFC, 16 plants of FPC and 19 plants of Nan Ya Plastics

### Business Strategy

- Make sustainable investments in Asia to secure competitiveness
- Build integrated operations in China
- Leverage product diversity and innovations to generate new sources of growth

### Technology

- Dependence on technology from others

### Opportunities in Value Chain

- Short position in olefins – does not produce all ethylene and propylene it needs to satisfy its own downstream requirements
- Opportunity to secure feedstock supply at relatively lower cost
  - With most of the operations and customers in Asia, there may be a remote chance of investing in North Dakota for securing feedstock supply if it is cost effective

### Financials

- Good financial position

SWOT Analysis – Formosa is a diversified company with operations principally in Asia and USA. It has a limited geographical presence which adds more competitive pressure on Formosa as all the other chemical companies are increasingly focused on the Asian market.

### Strengths

- Diversified business and wide customer base in the growth region
- Strong market positions in Asia and in certain products at global level
- Vertical integration advantages

### Opportunities

- Feedstock security – short olefins position
- Expansion activities in China and Vietnam
- Proximity to the growing Asian market

### Weaknesses

- Safety risks – recent violations and temporary suspension of facilities in Taiwan
- Poor global sales network – over dependence on Chinese market

### Threats

- Competitive pressure
- Stringent environment regulations
- Fluctuations in raw material prices may impact the profitability

Formosa is a regional player in Asia Pacific with most of its operations and customers in that region. The company is short on olefins as it does not produce all ethylene and propylene it needs to satisfy its own downstream requirements. Therefore, the company has an opportunity to secure its feedstock supply on a long term basis.

	Investor Screening Matrix												
	Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
	10%		25%		10%		20%		15%		20%		
Formosa	8.0	0.8	8.0	2.0	9.0	0.9	8.0	1.6	8.0	1.2	8.0	1.6	8.1

- Formosa is a regional player with most of its operations and customers in Asia Pacific such as Taiwan, China and Vietnam. The operations in North America are much smaller in scale than operations in Asia Pacific. The company has diverse products ranging from plastics, polymers, electronics to fibers, etc.
- Being a regional player in Asia Pacific, the strategy of the company is to make sustainable investments in Asia to secure competitive advantage and leverage its product diversity to generate new sources of growth.
- The company is dependent on others for technology but has good financial position to make investments in long term.
- The company has short position in olefins as it does not produce all ethylene and propylene it needs to satisfy its own downstream requirements. Therefore, there is an opportunity for the company to secure its feedstock supply at relatively lower cost on a long term basis.
- North Dakota and Middle East are the two regions with abundant supply of raw materials and relatively lowest cost of production of relevant feedstocks. With most of its operations and customers in Asia, there may be more likely inclination to invest in Middle East for securing feedstock supply in longer term. However, there may be a reasonable chance of investing in North Dakota too for securing feedstock supply considering availability of large amount of gas reserves, opportunity to expand its market beyond Asia in high value downstream products in long term, and effective fiscal policies and incentives of the country.

## Potential C<sub>2</sub> Value Chain Investor Profiles

### Potential Investor Profiles

Chevron Phillips

DOW

ExxonMobil Corp.

Formosa Group

Lyondell Basell

SABIC

Royal Dutch Shell

Total PC

LyondellBasell, headquartered in Netherlands, was formed by merger of Basell and Lyondell in 2007. The company is one of the world's largest polymers, petrochemicals and fuels companies. The business structure of the company comprises five business segments. These operations comprise substantially the same businesses owned and operated by LyondellBasell AF prior to the Company's emergence from bankruptcy.

## Corporate Overview

- LyondellBasell Industries N.V., a successor to LyondellBasell Industries AF S.C.A. is one of the leading companies in the fields of chemicals, fuels and refining, and polymers. It is engaged principally in the manufacture and sale of polypropylene and polypropylene compounds, propylene oxide, polyethylene, ethylene and propylene, polyolefins and biofuels. The company is also engaged in the business of refining crude oils into petrochemical products and production of gasoline blending components. The company's products are extensively used in areas such as packaging, electronics, automotive components, home furnishings, construction materials and biofuels. In addition, the company is a developer and licensor of technologies for the production of polymers.
- The Company operates in five reportable business segments namely, Olefins and Polyolefins-Americas segment, Olefins and Polyolefins-Europe, Asia & International segment; Intermediates & Derivatives segment Refining and Oxyfuels segment and Technology segment.
- The company operates through 59 manufacturing facilities across 18 countries worldwide. The company and its subsidiaries distribute its products in more than 100 countries across the world. During the fiscal year ended 2010, the company earned 52 percent of its revenue from North America region followed by Europe (36 percent) and All Others (12 percent).

### OLEFINS & POLYOLEFINS - AMERICAS

- This segment along with EAI is engaged in the production of polypropylene, polypropylene compounds, polyethylene, ethylene and propylene. The products offered by this segment are used in food packaging, textiles, automotive, appliances, films and flexible piping.
- This segment has the annual capacity to produce 4.4 million metric tons of ethylene, 2 million metric tons of propylene and 2 million metric tons of polypropylene. It represents about 20 percent of global revenues of the company.

### OLEFINS & POLYOLEFINS – Europe, Asia and International (EAI)

- This segment produces and markets olefins, including ethylene and ethylene co-products and polyolefins in Europe, Asia and International markets.
- This segment has the capacity to produce 2.9 million metric tons of ethylene, 2.4 million metric tons of propylene and 5.8 million metric tons of polypropylene. It represents about 30 percent of global revenues of the company.

### INTERMEDIARIES AND DERIVATIVES

- This segment produces and markets propylene oxide (PO) and its co-products and derivatives, acetyles, ethylene oxide and its derivatives. These products find applications in insulation, home furnishings, adhesives, consumer products and coatings.
- It represents about 13 percent of global revenues of the company.

### REFINING & OXYFUELS

- This segment refines heavy, high sulfur crude oil in the US Gulf Coast, refines light and medium weight crude oil in southern France and produces oxyfuels at several of olefin and PO units. The refineries owned include the Houston refinery in the US and Berre refinery in the Europe.
- It represents about 36 percent of global revenues of the company.

### TECHNOLOGY

- This segment develops and licenses polyolefin process technologies and provides associated engineering and other services. This segment also develops, manufactures, and sells polyolefin catalysts under the Avant brand.
- It represents about 1 percent of global revenues of the company.

LyondellBasell is focused on growing through adoption of various measures such as cost reduction initiatives, investing in high growth projects, managing portfolio of assets and products for higher growth etc.

### Strategic Thrust

- \$1.3 billion ethylene expansion program at its plants in Channelview, La Porte, and Corpus Christi, Texas
- Announced an agreement to conduct a joint feasibility study to construct a world scale PO/TBA plant in Ningbo, China with Sinopec
- Announced its plans to expand Tri-ethylene Glycol production capacity at the company's existing ethylene oxide and ethylene glycol plant in Pasadena, TX.
- Investments in high return and low cost growth projects (projected spending of \$1,300 to \$1,500 million):
  - China PO/TBA Plant: Plan to build a world scale PO/TBA plant in Ningbo, China along with Sinopec.
  - Methanol Plant Restart: Restart the 780 KT per year methanol plant at Channelview, Texas to take advantage of low cost natural gas supplies
  - Ethane feedstock flexibility: Increase the capacity of Channelview, Texas plant to process low cost ethane feedstocks by an additional 500 million pounds per year
  - Co-product facility expansion: Plan to build a new metathesis unit at Channelview, Texas to increase propylene production by 500 million pounds per year of equivalent ethylene
  - Butadiene expansion at Wesseling, Germany by 40 percent through a debottlenecking project.
  - Acquisition of Houston area olefins pipeline
- Effective portfolio management:
  - Exit lagging business – sale of flavors and fragrances business, planned sale of refinery at Berre, France
  - Reduction of US polymer exports to Asia
  - Rebalance Europe/Middle East polymers
- Strict cost management – cost reduction programs planned in Europe

LyondellBasell is the global leader in olefins and polyolefins business with strong market positions in North America and Europe. It has diversified and integrated operations with strong product portfolio mix. North America represents more than 50 percent of global revenues and hence is the most important market for the company.

### Market Position

- Wide geographical coverage
  - sale of products in more than 100 countries across the world.
  - Dominated by North America which represents about 52 percent of global revenues followed by Europe with 36 percent of revenues
- Leading global market positions
  - Chemicals - Ranked #2 in propylene oxide, #4 in propylene, #5 in ethylene
  - Polymers – Ranked #1 in polyolefins (PE+EP), polypropylene, polypropylene compounds, #4 in polyethylene
  - Refining & Oxyfuels – Ranked #1 in oxyfuels
  - Technology & R&D – Ranked #1 in polypropylene catalysts, #3 in polyolefins licensing
- Diverse end markets for olefins and polyolefins business:
  - uniquely positioned with scale, technology and global footprint
  - larger exposure to non durable products (packaging and refining)
- Leading global olefins, polyolefins and co-product position
- Robust and diversified portfolio for intermediaries and derivatives
- Asia is the highest growth market for propylene oxide
- Demand growth of oxyfuels from emerging markets

### Manufacturing Position

- Wide geographic presence in manufacturing operations - about 59 manufacturing locations in 18 countries
- US ethylene plants second to Middle East in production costs
- US ethane advantage
- Technology/ feedstock advantage
- Feedstock and co-product flexibility
- Operational excellence
- Joint venture operations in Saudi Arabia, Asia and Europe for ethylene, propylene, PP compounds etc
- Integrated large scale refining business with chemical business

Since emerging from bankruptcy, the company is focused on achieving robust growth through multiple means such as targeted investments with quicker payback period, cost reduction, taking advantage of its feedstock position, sale of non strategic assets. Since most of the operations are based in North America, there could be opportunities for securing long term access of natural gas, ethane feedstock and heavy crude supplies.

### Business Strategy

- Differentiated products in diverse end markets to reduce the impact of economic swings
- Cost reduction programs to maintain fixed costs
- Invest in growth and efficiency projects
- Continue to leverage on US feedstock/heavy crude advantage
- More streamlined and efficient portfolio management
- Operational excellence and efficiency

### Technology

- Co-product technologies
- Strong technology business
- Access to technology through joint ventures
- Global leader in polyolefin catalyst and process technology

### Opportunities in Value Chain

- Access to low cost natural gas in North America
- Opportunities for ethane feedstock in North America to maintain sustainable earnings
- Opportunity for Refining business - new heavy crude supplies in North Dakota

### Financials

- Modest financial leverage relative to EBITDA generation
- Access to capital markets
- Non investment grade rating – but moving to investment grade quality balance sheet



SWOT Analysis – LyondellBasell has benefits of advantageous feedstock position and strong market position in olefins and polyolefins. It relies on non US companies and other domestic suppliers for feedstock for Houston refinery operations.

### Strengths

- Diversified integrated portfolio of products & focus on growing and diverse end use markets
- Technology driven
- Feedstock security
- Strong global presence

### Opportunities

- Securing the feedstock for which it has a shortfall
- Commodity differentiation
- Development of specialty polymers
- Opportunities to grow in Asia and Middle East markets

### Weaknesses

- Reliance on non US affiliates for feedstock for Houston refinery operations

### Threats

- Tax policies
- Impact of strict environmental regulations – REACH in Europe, Toxic Substances Control Act in USA, Restriction of Hazardous Substances in China.
- Competitive landscape

Besides investing in Asia Pacific and emerging markets to grow its market position, the company is also investing in North America in efficiency and growth projects for achieving sustainable earnings on a long term basis. There are opportunities to secure access to natural gas, long term supply of ethane feedstock and heavy crude supply in North America.

Lyondell Basell	Investor Screening Matrix												
	Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
	10%		25%		10%		20%		15%		20%		
	10.0	1.0	9.0	2.3	10.0	1.0	10.0	2.0	10.0	1.5	8.0	1.6	9.4

- North America is the biggest market for LyondellBasell accounting for more than half of its global revenues. It has leading global position in number of products and robust and diversified portfolio for intermediaries and derivatives. It has about 59 manufacturing locations in 18 operations with most concentration in North America. It has large scale integrated operations from refining to chemical business. Production cost in its US ethylene plants are second only to Middle East production cost.
- The company has strong technology business and also has access to latest technology through various partnerships/licensing agreements. Since emergence from bankruptcy, the Company has experienced steady and healthy growth which has resulted in healthy grown its cash flows from operations.
- Like other peer chemical companies, the company is also focused to grow its market in Asia Pacific and emerging markets.
- Since most of its operations and customers are primarily in North America, the Company is also focused to strengthen its market position in North America by investing in efficiency and growth projects such as ethylene capacity expansion in La Porte, Texas; restart of methanol plant in Channelview etc, and acquisition of olefins pipelines for Houston refinery. There are opportunities to secure access to natural gas, ethane feedstock and heavy crude supplies in North America for achieving sustainable earnings in the long term.

## Potential C<sub>2</sub> Value Chain Investor Profiles

### Potential Investor Profiles

Chevron Phillips

DOW

ExxonMobil Corp.

Formosa Group

Lyondell Basell

**SABIC**

Royal Dutch Shell

Total PC

SABIC is one of the world's leading petrochemical companies which is 70 percent owned by the Saudi government and 30 percent by GCC-based (Gulf Cooperation Council) shareholders. It operates through four reportable segments, namely Chemicals, Fertilizers, Metals and Corporate. Chemical business is the largest business with about 80 percent of the company's revenue.

## Corporate Overview

- Saudi Basic Industries Corporation (SABIC) is one of the world's leading chemical companies and one of the six largest petrochemicals manufacturers in the world. It is engaged in the manufacture and marketing of petrochemicals, metals, and fertilizers. It offers its products through four segments, namely, Chemicals, Fertilizers, Metals and Corporate and operates through a global network of manufacturing and compounding complexes (11 in Asia, 12 in Europe, 24 in the Middle East, and 17 in the Americas), 10 application centers, 46 distribution, storage facilities and logistics hubs, 6 technology centers, and 86 international subsidiaries and sales offices. A substantial portion of the company's operating assets are located in Saudi Arabia.
- The company has adopted an inorganic strategy through which it acquired several operating units to build capabilities and geographical presence to emerge as a global leader. It intends to build high-technology manufacturing companies close to the source of the gas and oil, to offer high-quality petrochemical products. Overseas expansion has been a key part of its growth strategy since its inception. It continues to look for opportunities to expand in the Americas, Asia, Europe, and in the Middle East and Africa and to broaden its product portfolio.
- It is 70 percent owned by the Saudi government and 30 percent by GCC-based (Gulf Cooperation Council) shareholders. The company has raised funds through various means such as term loans, commercial loans, bonds and notes to finance its ongoing projects. The company has a debt to capital ratio of about 40 percent. It reported revenues of \$40 billion in 2010 with an operating margin and net margin of about 25 percent 15 percent. Net income of chemical business represents about 46 percent of the company's net income.

## SABIC

### CHEMICALS

- The Chemicals business offers basic chemicals, intermediaries, polymers and specialty chemicals. It is further classified into four groups, namely, olefins and gases, aromatics and chlor alkali, oxygenates, and glycols.
- It also includes SABIC Innovation Plastics which was formed in 2007 following the acquisition of GE Plastics.
- The chemicals business accounted for approximately 80 percent of company's revenue in 2010 with gross margin of 23 percent.
- The principal market for the chemicals business are Europe, USA, the Middle East and the Asia Pacific.

### FERTILIZERS

- This segment offers fertilizer products such as ammonia, urea sulfuric acid, and various forms of phosphate fertilizers. The fertilizers are produced at its three manufacturing affiliates - Saudi Arabian Fertilizers Company, Al-Jubail Fertilizer Company, and National Chemical Fertilizer Company. Recently, SABIC formed a new joint venture with Ma'aden Phosphate Company to initiate the construction of its phosphate project.
- This segment accounts for just 3 percent of company's revenue with gross margin of 62 percent.

### METALS

- This segment is engaged in investments in aluminum and steel production facilities and products.
- The segment's operations are carried out through its wholly-owned subsidiary, Saudi Iron Steel Company (HADEED) and also through the Aluminum Bahrain joint venture and the Gulf Aluminum Rolling Mill Company.
- This segment of the company accounted for approximately 7 percent of the company's revenue in 2010.

### CORPORATE

- The Corporate segment comprises its corporate operations, research and technology centers and investment activities through SABIC Industrial Investments Company (SIIC). The company conducts corporate activities in the Kingdom of Saudi Arabia.

SABIC is focused to invest in the Asian market to meet the growing demand in the region.

### Strategic Thrust

#### **Recent Global Expansion / Acquisitions and Upcoming Projects–**

- Plans to build \$1 billion advanced polycarbonate technology plant with capacity of 260,000 tons in China to boost its growth in the market for high performance engineering thermoplastics and meet the growing demand for advanced polycarbonates in the country.
- Plans to build 14 new projects between 2012 to 2015
- Looking for opportunity to expand its operations in India by investing in refineries attached to petrochemical plants
- Introduction of new innovative products:
  - New set of PP resins for variety of sound bond applications ranging from hygiene products, roofing, building and construction, as well as automotive applications.
  - Introduction of new impact copolymer grade polypropylenes for thin wall injection molding applications
- Expanding technology and innovation and operations with new investments of two technology and innovation centers in China and India
- Looking at new opportunities in Methane, Ethylene, Propylene, C4s and/or Aromatics in the Americas

## SABIC is pursuing sustainable growth opportunities in monomers in the Americas based on superior technology, cost position and/or opportunistic acquisitions

### Market Position

- Chemicals business generates about 80 percent of global sales
- Global leader in Ethylene, large investments in PP, but PE/MEG focus (cheap ethane backbone)
- More revenues from regions outside of North America with significant customer base in Asia
- North American operations acquired from GE Plastics - focus primarily on specialty chemicals and other fabricated products
- Narrow product portfolio but plans to invest to broaden the portfolio
- Less extensive marketing coverage as compared to competitors

### Manufacturing Position

- Facilities in broad geographic coverage extending from Saudi Arabia , Europe, Asia, to the Americas - 2 sites in North Dakota and 15 sites in USA
- Advantaged feedstock cost & integration in existing markets
- Newer world scale facilities substantially located in Saudi Arabia
- Plants and infrastructure in NAM and Europe vary by age and efficiency – not quite extensive and streamlined as facilities in Middle East
- Experience in handling large scale projects across continents
- Light olefins cost structure & balanced propylene position

### Business Strategy

- 'To be the preferred world leader in chemicals'
- Looking to provide substantial enterprise value by gaining competitive sustainable advantage in the Americas in monomers
- Establishment of sales office & projects in target markets to be close to customer base
- Use SABIC IP/DSM marketing infra-structure & logistics for PE & PP sales
- Increasing diversification through joint ventures and product innovations
- Plans to build 14 new projects between 2012 to 2015 – Push to increase direct sales in Asia; looking for investments in China & India

### Technology

- Access to latest technology through extensive partnerships and joint ventures
- Significant investments in R&D

### Opportunities in Value Chain

- Looking at new opportunities in Methane, Ethylene, Propylene, C4s and/or Aromatics in the Americas
- Move toward on-purpose propylene production (methasis/dehydro) to complement steam-cracker supplies & fill gap left by shut-down of naphtha crackers
- Likely opportunity in North America for certain feedstocks such as ethane, benzene which are either provided by JV partners or/and purchased from third parties

### Financials

- Support of Saudi Arabia government
- Financial resources for large investments
- Ability to raise finances through term loans, bonds, notes etc for project financing

SWOT Analysis – The Company has strong manufacturing position due to low cost structure and feedstock advantages but has relatively less pronounced marketing network due to its less extensive geographic focus. It has a tremendous opportunity to expand its marketing network and broaden its product portfolio.

### Strengths

- Advantaged feedstock cost & integration in existing markets
- Newer, world-scale facilities with relatively lower operating costs
- Government support and financial resources for large investments
- Strategic partnerships with other large companies for access to technology and operational excellence
- Expanding operating margins indicating efficient cost management and focus on improving profitability

### Opportunities

- Growing international market
- Strategic location of KSA to serve East and West market
- Strengthening of existing business through expansion of product portfolio in the areas of packaging, automotive materials and compounding, and growth of downstream business
- Attractive government policies in Middle East and Africa for investments in the region

### Weaknesses

- Lack of large domestic market
- Weak marketing mentality driven by strong manufacturing mentality
- Narrow product portfolio
- Ethylene driven strategy

### Threats

- Protectionism
- Dependence on/no direct control of KSA gas resources
- Increasing regional competition
- Potential rising costs for feedstocks
- Environmental lobby /customer rejection of plastics
- Environment pollution threats – possible carbon emission limitations posed by developed world

SABIC's current strategy revolves around growth in Asia. However, it may have an interest to invest in North Dakota as it looks for growth beyond Asia in North America in the long term.

Investor Screening Matrix												
Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
10%		25%		10%		20%		15%		20%		
5.0	0.5	8.0	2.0	7.0	0.7	6.0	1.2	7.0	1.1	10.0	2.0	

- SABIC has strong chemicals business with strong market position outside North America. It has significant customer base in Asia. Further, it also has relatively narrow product portfolio as compared to its global competitors but looking to expand its product portfolio and sales network.
- SABIC is looking to add substantial competitive advantage in Americas by expanding its presence in monomers and using SABIC IP marketing infrastructure to increase its PE/PP sales.
- In North America, SABIC is looking for opportunities in methane, ethylene, propylene, C4s and/or aromatics to strengthen its market position and also to take advantage of relatively cheaper natural gas. Currently, it purchases certain feedstocks such as ethane, benzene in North America from either third parties or joint venture partners. Therefore, there may be an opportunity for SABIC to invest in North America to secure feedstock supply, specially, when it is looking for opportunities in methane, ethylene and other aromatics.
- SABIC has strong manufacturing position in Middle East and most of its world class facilities are based in Saudi Arabia as compared to North America. The existing facilities in North America vary by age and efficiency and are not quite extensive and streamlined as facilities in Middle East.
- SABIC has entered into many agreements/joint ventures with various companies for gaining access to technology. It is committed to make investments in research and development activities. However, it is dependent on leading chemical players for access to technology.
- Overall, SABIC's strategy revolves around growing market in Asia where it has significant customer base and world class facilities in Saudi Arabia. However, the company is looking to gradually expand its operations in North America by expanding its presence in monomers and securing feedstock supply. It may have an interest in investing in North Dakota during medium to long term to secure its feedstock supply for its operations in North America and also expand its product portfolio to compete with other players in the market.



## Potential C<sub>2</sub> Value Chain Investor Profiles

### Potential Investor Profiles

Chevron Phillips
DOW
ExxonMobil Corp.
Formosa Group
Lyondell Basell
SABIC
<b>ROYAL DUTCH/SHELL</b>
Total PC

Shell is a global group of energy and petrochemical companies headquartered in Netherlands. It has operations in more than 90 countries. It manages its business through three business segments, Upstream, Downstream and Corporate. The chemical business is included in Downstream business segment.

## Corporate Overview

- Royal Dutch Shell plc (Shell) is one of the world's largest independent oil and gas company. The Company owns, directly or indirectly, investments in the numerous companies constituting Shell. Shell is engaged worldwide in the principal aspects of the oil and gas industry and also has interests in chemicals and other energy-related businesses.
- The Company operates its business through three business segments namely, Upstream, Downstream, and Corporate. The key activities of the company comprises exploration and production, transportation and trading, refining and marketing, power generation, other energy efficiency solutions, and production and sales of petrochemical building blocks to industrial customers. The company operates in more than 90 countries and territories worldwide with about 30 refines and chemical plants.
- The chemical business is included in the 'Downstream' business segment. The company produces and sells petrochemicals to some 1,100 major industrial customers worldwide, with the top 20 customers accounting for about 44 percent of sales. The range of petrochemicals include base chemicals such as ethylene, propylene and aromatics; first line derivatives such as styrene monomer, propylene oxide, solvents, detergent alcohols and ethylene oxide; and polymers such as polytrimethylene terephthalate, polypropylene and polyethylene. The company sold more than 20 million tons of bulk petrochemicals in 2010; base chemicals comprising about 54 percent and first line derivatives comprising remaining sales volume.
- Europe is the largest market for petrochemical products representing about 35 percent of the total sales followed by USA with 33 percent and Asia, Oceania and Africa with 30 percent sales volume.

### UPSTREAM

- Upstream business engages in exploration for and extraction of crude oil and natural gas, through joint ventures with international and national oil companies. It also engages in the liquefaction of natural gas and the conversion of natural gas to liquids. This segment is further divided into Upstream Americas and Upstream International. Upstream International covers the company's interest in Asia/Middle East/Russia, Europe, Australia/Oceania and Africa.
- The company started production from expanded mining facilities at its oil sands operations in North Dakota.

### DOWNSTREAM

- Downstream segment encompasses a number of businesses including manufacturing, chemicals and trading. The segment engages in the refining of crude oil to a number of products, including fuels, lubricants and bitumen. These refined products are marketed for domestic, industrial and transport use. Furthermore, it engages in the production and sale of petrochemicals for industrial use across the world.
- It has the capacity to produce 6 million tons of ethylene per year with about 37 percent capacity in USA followed by Asia and Middle East (32 percent) and Europe (31 percent). This segment accounts for about 83 percent of total revenue of the company.

### CORPORATE

- This segment carries out the non operating activities of the Company such as treasury operations, human resources, corporate affairs etc.

Shell's strategy for chemical business is to invest in selective growth projects, focus on improvements in efficiency and integration and strengthen the feedstock sources.

### Strategic Thrust

- Acquired BG Group for 70 billion in April 2015
- Continue to focus on the synergies amongst the chemical plants, refineries and Upstream businesses to increase the supply of the best available feedstock for the crackers
  - Modification of ethylene plants at Deer Park and Norco on the US Gulf Coast (USGC) to increase the amount of gas based feedstock that they can process.
  - New pipeline to bring additional gas feedstock to Deer Park
- Focus on cost reduction initiatives - Greater focus on asset up time and reducing costs
- Selective growth at existing sites through increase in capacity, improvements in efficiency & integration and strengthening of feedstock sources
  - Starting of Shell Eastern Petrochemicals Complex (SEPC) in Singapore in May 2010 – largest chemical investment to date to improve the integration of refining and chemical facilities in Singapore and help meet the long term demand growth in Asia.
  - Agreement in Dec 2011 with Qatar Petroleum to develop a world scale petrochemical complex in Ras Laffan Industrial City – MEG production capacity of up to 1.5 million tons per year using Shell's proprietary OMEGA technology
  - Strategic global cooperation with Gazprom for development of cooperation on hydrocarbons processing and distribution in Russia and Europe
  - Expansion of refinery at Port Arthur
- Develop technologies to convert gas into chemicals
- Integrated growth project with partners
- Improvement in marketing portfolio

Shell is one of the global leaders in alpha olefins and other intermediaries chemicals and derivatives with wide spread geographical market. The chemical operations of the company are geographically diversified with operations in USA, Canada, Singapore, China, Saudi Arabia and Europe. SEPC in Singapore is the largest chemical investment of Shell to date.

### Market Position

- Wide geographical coverage
  - 1,100 major industrial customers
  - Europe is the leading region for sales of chemical business with 35 percent share of sales volume followed by USA (33 percent) and Asia, Oceania and Africa (30 percent)
- Leading global market positions in alpha olefins, detergent range linear alcohols, hydrocarbon solvents, etc.
- Leading position in the growing petrochemical market in Asia
- Robust and diversified portfolio for intermediaries and derivatives
- Focus on emerging markets

### Manufacturing Position

- Wide geographic presence in manufacturing operations – more than 30 refineries and chemicals plant in 19 countries
- Integrated refineries with chemical operations
- Technology/ feedstock advantage
- Operational excellence
- Largest MEG plant in Asia (Singapore) to cater to growing demand of Asia
- About 6 million tons of ethylene capacity
  - 37 percent capacity in USA
  - 32 percent capacity in Asia with 18 percent capacity in Singapore, 8 percent in China and 6 percent in Middle East
  - 31 percent capacity in Europe with operations spread across Germany, Netherlands and UK
- About 2.6 million tons of capacity of styrene monomer
  - 54 percent capacity in Asia (Singapore, Saudi Arabia and China)
  - 30 percent in Netherlands, Europe
- About 2 million tons of capacity of ethylene glycols
  - 50 percent capacity in Asia (mostly in Singapore)
- About 1.3 million tons of capacity of higher olefins mostly in USA

Shell Chemicals is following different strategies for Asia and North America respectively. It is looking to maintain its leading position in growing petrochemical market in Asia by continuing to focus on investments and integration in Singapore and Middle East. In North America, it is focused on reducing its exposure to oil derived liquids feedstock by taking various measures.

### Business Strategy

- Maintain a leading position in the growing petrochemical market in Asia
- Pursue feedstock strategy to reduce exposure to oil derived liquids
- Invest in growth and efficiency projects
- Greater focus on asset up time and reduction of cost
- Product innovation
- Strengthen processing capability by investing in units which gives flexible feedstock options on the US Gulf Coast
- Heavy investments in natural gas

### Technology

- Strong technology position
- Advanced OMEGA technology
- Development of processes and catalysts to steadily improve the production of ethylene oxide and lower CO2 emissions
- Leader in Gas-to-Liquids technology

### Opportunities in Value Chain

- Feedstock strategy to reduce exposure to oil derived liquids and increase the amount of gas based feedstock. New investments in oil sands project in North Dakota provides an opportunity for securing gas based feedstocks for North American operations in North Dakota and USA.

### Financials

- Strong financial performance

SWOT Analysis – Shell has strong global chemical business with feedstock security from its upstream business. Gas growth is at the heart of its strategy and integration of chemical operations with investments in gas and refining business may provide it with long term feedstock advantage. However, it has relatively narrower focus on specialty derivatives for niche applications as compared to other global producers like BASF, Dow etc.

### Strengths

- Global integrated operations – large world scale refinery complexes with chemical plants
- Technology driven
- Feedstock security
- Strong global presence
- Sturdy research and development activities

### Opportunities

- Opportunities in unconventional energy sources
- Feedstock security – more exposure to gas based feedstock
- Opportunities to grow in Asia and Middle East markets

### Weaknesses

- Relatively narrow focus on specialty derivative products which may provide higher margin and niche market

### Threats

- Tax policies
- Stringent environment regulations

The key business strategy of the company is to maintain its leading position in the petrochemical market in Asia and reduce its exposure to oil derived liquids feedstock and increase the amount of gas based feedstock in North America.

Shell	Investor Screening Matrix												
	Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
	10%		25%		10%		20%		15%		20%		
	10.0	1.0	10.0	2.5	7.0	0.7	10.0	2.0	10.0	1.5	10.0	2.0	9.7

- Shell produces 2.6MMT/yr of ethylene and 360KMT/yr of MEG in the U.S.
- Shell agreed to sell Pinedale and Haynesville onshore gas assets for \$2.1 billion in the Marcellus and Utica shale regions. This action could strongly signal that Shell is not planning to invest in shale assets in the near future.
- Shell has strong global market position with significant presence in Europe followed by North America and Asia. It has leading global market positions in alpha olefins, detergent range linear alcohols, hydrocarbon solvents, etc. It has wide geographic presence in manufacturing operations with more than 30 refineries and chemicals plant in 19 countries. Most of its chemical plants are integrated with refineries. Further, the company has strong technology and availability of finances for investing in new projects.
- The key business strategy of the company is to maintain its leading position in the petrochemical market in Asia and reduce its exposure to oil derived liquids feedstock and increase the amount of gas based feedstock in North America.

## Potential C<sub>2</sub> Value Chain Investor Profiles

### Potential Investor Profiles

Chevron Phillips

DOW

ExxonMobil Corp.

Formosa Group

Lyondell Basell

SABIC

ROYAL DUTCH/SHELL

TOTAL PC



Total operates as an integrated oil and gas company worldwide with its subsidiaries and affiliates. It engages in all aspects of the petroleum industry, including oil and gas exploration, development and production, LNG, refining, marketing & trading and shipping of crude oil & petroleum products and base & specialty chemicals. The company also holds major interest in the coal mining and power generation sector and next generation energy activities (solar, biomass, nuclear).

## Corporate Overview

- TOTAL SA is a France-based integrated international oil and gas company. With operations in more than 130 countries, TOTAL engages in all aspects of the petroleum industry, including Upstream operations (oil and gas exploration, development and production, liquefied natural gas (LNG)) and Downstream operations (refining, marketing and the trading and shipping of crude oil and petroleum products). It also produces base chemicals (petrochemicals and fertilizers) and specialty chemicals for the industrial and consumer markets.
- The company used to operate its business through three primary business segments, Upstream, Downstream and Chemicals. The chemicals segment includes the base chemicals and specialty chemicals division. Recently, the company reorganized its downstream and chemicals businesses to two divisions – Refining and Chemicals, and Marketing. Refining and Chemicals business combines the erstwhile refining manufacturing operations (included in Downstream business) and chemicals manufacturing operations while the Marketing business consists of marketing and trading activities. Total's chemical operations are some of the largest in the world and recently have been consistently creating value and generating decent returns on capital.
- Chemicals business constitute about 12 percent of the Total's business and generates about 5 percent return. The primary operations is in West Europe. The chemical business focuses on Asia and the Middle East as growth areas, while enhancing the competitiveness of the facilities operating in the more mature markets of West Europe and North America.

### UPSTREAM

- The company, through its Upstream segment, engages in the exploration, development and production of oil and gas reserves. The Upstream segment also involves in coal, gas and power sector operations. In addition, the Upstream segment is engaged in power generation from gas-fired combined-cycle plants and renewable energies, the trading and marketing of electricity and the production and marketing of coal.

### REFINING AND CHEMICALS

- Refining and chemicals division is a major production hub combining all of refining and petrochemical operations including specialty chemicals and fertilizers.
- Division is headquartered in Brussels and Paris with senior management based in Brussels.

### MARKETING

- Dedicated to the global supply and marketing of petroleum products.

Total SA, as a company, is more focused on achieving growth in the energy sector (upstream and refining) than petrochemicals sector. In the petrochemicals sector, the company is focused on expanding its market presence in growth markets such as Asia, Africa and Middle East while reducing/restructuring its competitiveness and efficiency in mature markets like Europe.

### Strategic Thrust

- Emphasize growth in the energy sector and in the fast growing emerging markets. The upstream business is projected to receive 70 to 80 percent of the company's investments reflecting its dominance in generating profits and enhancing the overall value of Total.
- Restructuring of downstream and chemicals business to create two new divisions - 'Refining & Chemicals' and 'Marketing' divisions.
- Refining & Chemicals business – focused on a few highly competitive integrated platforms and more active in emerging markets such as Middle East, Asia and Africa.
- Asset rationalizations and active portfolio management
  - Reducing downstream chemicals exposure in mature markets such as downsizing European footprint
- Selective investments to capture growth:
  - Port Arthur deep conversion
  - Expanding petrochemicals in Qatar and South Korea
  - Capitalizing on marketing presence in growth regions such as Asia and Africa
  - Investments in USA in shale gas – Barnett Shale and Utica Shale
  - Expansion and modernization of industrial development project of joint venture 'Samsung Total Petrochemicals' to be equipped with a second aromatic unit and Ethylene-vinyl acetate copolymer unit.
  - Acquisition of 35 percent share in ExxonMobil's Fina Antwerp Olefins
- Acquired 68% interest in Germany's Polyblend which produces blends of polymers (PE and PP)

Chemicals business represents about 12 percent of the global revenues of the company generating the return of about 5 percent. Majority of the base chemicals production is consumed internally. It is one of the top producers in specialty chemicals in which it operates, for e.g., resins. Majority of the company's chemicals operations are based in West Europe which has recently seen stagnation due to sovereign debt crisis.

### Market Position

- Operations in about 130 countries with more focus on West Europe and emerging markets
- Chemicals business represent about 12 to 13 percent of global revenues with operating margin of about 5 percent. About two-third of sales are from base chemicals and one-third from specialty chemicals.
- One of the top global producer for base chemicals such as polystyrene, ethylbenzene and polypropylene
- On an average, consumes about 70 percent of its base chemicals production for internal consumption
- Leader in the specialties business in which it operates
  - Markets in more than forty five countries globally
- Most of the derivative (polymer) production is sold in the merchant market and only small quantities is used for production of intermediaries and specialty products

### Manufacturing Position

- 7 world class refining-petrochemicals platforms
  - Integrated and most competitive platforms in Europe
  - US – Port Arthur refining and petrochemical plants
  - Continued expansion of Qatar and South Korea petrochemicals units are to capitalize on growth in regional markets
- Majority of chemicals operations located in West Europe, specially in France
- Increasing presence in Middle East and Asia with projects in Qatar and China
- Declining capacity in West Europe and North America with rationalization of business and more focus on emerging markets
- Integrated chemical operations with refineries – high level of integration of base chemicals and polymer production
- Specialty business not fully integrated with bulk chemicals operations

Like other chemical companies, Total is also focused to achieve growth by expanding its chemical operations in growth markets of Asia and Africa while rationalizing the operations in West Europe/North America.

### Business Strategy

- Increase 2015 profitability of refining – chemicals business by 5 percent vs 2010
- Grow refining and petrochemicals in Asia and Middle East
- Increase competitiveness of European downstream business
- Expand in growth areas of Asia and Africa
- Growing importance of alternative feedstock and new energies such as Solar energy and production of bio-molecules on an industrial state

### Technology

- Investing in cleaner technologies and new product functionalities in chemicals business
- Ongoing R&D on oil sands – research centers in Calgary and France
- Partnerships to secure best technologies for oil sands project
- 22 R&D sites on a global basis
- Collaboration with various leading companies and academic institutes

### Opportunities in Value Chain

- The liquid oil produced in North Dakota may be transported to its refining and chemicals operations in USA as well as sold in Asian markets.

### Financials

- Strong balance sheet
- Favorable access to capital markets
- Decent returns on capital in chemicals business
- 'Stable' investment grade credit rating

**SWOT Analysis – The company's integrated refining and chemicals operations give it a competitive advantage and feedstock advantages. Besides, the company's investments in unconventional energy sources provide it with a solid position in an attractive long-term resource base. However, the company faces risks from the fluctuating oil and gas market, the political and economic instability in a few regions for its upstream business.**

### **Strengths**

- Integrated operations – strong upstream and refining business
- Feedstock advantages due to upstream integration
- Leader in specialties chemicals
- Global presence
- Strong operational excellence
- Product innovations
- High quality and growing LNG business

### **Opportunities**

- Projects in Middle East and Asia provide an opportunity to expand its market presence in these regions
- Shale gas opportunity in US and oil sand project in North Dakota provide an opportunity for feedstock competitiveness

### **Weaknesses**

- Heavy exposure to Europe in its downstream and chemicals segments given the economic gloom that hangs over the region

### **Threats**

- Stringent environment regulations
- Upstream activities in certain countries that are subject to USA and EU sanctions

Total's chemical business is more concentrated in Europe than in North America. The company is now focused to expand its chemical business in growth markets such as Asia, Africa and Middle East while rationalizing the operations in Europe/North America.

Investor Screening Matrix												
Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
10%		25%		10%		20%		15%		20%		
7.0	0.7	8.0	2.0	8.0	0.8	8.0	1.6	8.0	1.2	8.0	1.6	7.9

- BASF Total JV is exploring construction of a \$1.7 billion 1MMT/yr ethylene plant in Port Arthur, TX of which Total is the chief sponsor of the project.
- Chemical business has markets in 130 countries but is more focused on Europe and emerging markets like Middle East, Asia and Africa. Majority of the revenues are derived from Europe.
- Total is focused to achieve growth by expanding its chemical operations in growth markets of Asia and Africa while rationalizing the operations in West Europe/North America. The company is also committed to seek alternative cheaper feedstock such as shale gas, and liquid oil from oil sands. The company is committed to invest \$15 billion in oil sands project in Alberta, North Dakota over the period of next 10 years. Additionally, it has also invested in shale gas in USA - Barnett Shale and Utica Shale.
- Majority of the company's chemicals operations are based in West Europe, specially in France. There are about 30 locations in North America including a world class refinery in Port Arthur, Texas. The company is looking to expand petrochemical units in Qatar and South Korea to capitalize on growth in regional growing markets while downsizing in Europe. Most of the company's operations are integrated with refineries.
- Total has strong R&D capabilities and investing in cleaner technologies and new product functionalities in chemicals business.
- The company has sound financial position and earns a 'decent' return of about 5 percent in chemical business. The company's goal is to increase the profitability of chemicals business by 5 percent by 2015.
- Considering that the current focus of the company is to expand its operations in Middle East and Asia and rationalize operations in Europe and North America, there are very limited opportunities for new petrochemical investments in North Dakota except for any future project that may be associated with the current oil sands project in Alberta, North Dakota. The company has committed about \$15 billion in next 10 years for the project. As per the current projections, the liquid oil produced in North Dakota may be transported to its refining and chemicals operations in USA through pipelines as well as sold in Asian markets.

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## Potential C1 Value Added Investor - Grupa Azoty

## Grupa Azoty is a big player in fertilizer chemicals worldwide especially in Central Europe.

### Corporate Overview

- Grupa Azoty is the largest chemical producer in Poland and the largest fertilizer producer in Central Europe. The company has a history of more than 85 years. The company's core activity revolves around production, services, and trade in the field of construction plastics, as well as the raw materials for their manufacturing and mineral fertilizers. Grupa Azoty S.A. manufactures nitrogen fertilizers and compounds, engineering plastics, organic inorganic chemicals, and other chemical products. The company also generates revenue from selling electricity and laboratory, logistics and other services. Below are all subsidiaries of Grupa Azoty and their functions.

#### Grupa Azoty S.A.

- Grupa Azoty S.A. is an integrated manufacturer of PA6 trading under the name Tarnamid® which is produced through the polymerization of manufactured caprolactam. The company is the country's sole producer of polyacetal resin sold as Tarnoform®. It also manufactures fertilizer in two granulation types differentiated as macro and standard. Products include Saletrosan, Nitro-chalk, Ammonium saltpeter, and Ammonium sulfate.

#### Grupa Azoty Pulawy

- ZA Pulawy focuses on two business segments: chemicals for various industries and fertilizers for agricultural producers. Their agricultural products include Pulan®, Pulrea®, Pulsar®, RSM®, PULASKA®, RSMS®, Pulgran®, and Pulgran®s. Their chemical products include meamine, CPL, hydrogen peroxide, carbon dioxide, compressed hydrogen, nitric acid, anhydrous ammonia, coolant, ammonia water, and urea solution.

#### Grupa Azoty ZAK S.A.

- Grupa Azoty ZAK S.A.'s core operations focus on manufacturing nitrogen fertilizers and compounds, organic and inorganic chemicals and other chemical products. The company manufactures plasticizers for plastics (chiefly PVC) and raw materials for their production, oxo alcohols and phthalic anhydride.

#### Grupa Azoty Police

- Grupa Azoty Police manufactures compound mineral fertilizers (its standard fertilizers are marketed under the POLIFOSKA® brand) and urea. The fertilizers manufactured at Police are POLIWAP®, POLIDAP®, POLIFOSKA®, POLIMAG®, and Mocznik.pl®

#### Grupa Azoty ATT Polymers GmbH

- Grupa Azoty ATT Polymers GmbH manufactures and markets plastics (polymers) and their intermediates and the by-products of the manufacturing process. The company's operations cover processing of supplied caprolactam into granulated natural and modified PA6 which is marketed as Alphon™

#### Grupa Azoty Siarkopol

- Grupa Azoty SIARKOPOL produces pure elemental sulfur which is used to manufacture sulfuric acid, phosphate fertilizers, plant protection products, tires and rubbers. SIARKOPOL uses sulfur to produce carbon disulfide. The company is the only active sulfur mining company in the world and its exports amounts 80% of its annual sales.

#### Grupa Azoty Koltar sp. z.o.o.

- The company's core operations include provisions of services to Grupa Azoty in particular freight forwarding, loading and unloading services, commercial operations, and railway track maintenance for Grupa Azoty's on-site railway station. Grupa Azoty PKCh sp. z.o.o. covers chemical industry investment coordination from studies through process development, construction, and implementation.

#### Other Grupa Azoty subsidiaries

- Grupa Azoty PKCh sp. z.o.o. cover chemical industry investment coordination from studies through process development, construction, and investment. Grupa Azoty JRCh sp. z.o.o. provides special rescue services in hazardous operation. Grupa Azoty Automatyka sp. z.o.o. covers industrial automation, control and measurement systems, electrical engineering, safety systems, and IT. Grupa Azoty Prorem sp. z.o.o. covers the provision of high quality maintenance and repair services for the chemical, energy, and petrochemical industries.



Expanding its fertilizer business along with PA and other chemicals. Upcoming PDH unit would make Grupa a large C<sub>3</sub> Player in Europe.

#### Strategic Thrust

- By 2019 Grupa Azoty plans to build Europe's largest and most advanced PDH unit for propylene production sited in Police. In addition to the PDH unit, the project involves the construction of a power generating unit and expansion of the chemicals terminal in the port facilities owed by the Group.
- In 2013, the company purchased 85% stake in Kopalnie I Zakłady Chemiczne Siarki Siarkopol S.A.
- In 2013, the company purchased 55% equity interest in AIG, a company with licenses to phosphorite and limenite deposits in Senegal
- In 2013, Grupa Azoty acquired a controlling stake in ZA Pulawy
- In 2012, the company acquired 10.3% of the shares in ZA Pulawy S.A.
- In 2011, Grupa Azoty ZAK S.A. replaced its old 450 KMT/yr nitric acid plant at Kedzierzyn-Kozle, Poland, with a new one with 325 KMT/yr of capacity
- In 2011, the company acquired 66% shares in Zakłady Chemiczne Police S.A. and 40.86% of ZAK SA.
- In 2010, Grupa Azoty acquired a controlling stake in ZAK
- In 2010, the company acquired 100% shares of a polyamide manufacturer – Unylon Guben Polymers GmbH in Germany.

Strong player in the fertilizer business and only sulfur mining company in the world. Aims to increase its capabilities through acquisitions and capacity expansions.

### Market Position

- Grupa Azoty has 1.9% of global nitric acid market share
- Poland's largest chemical maker
- Only sulfur mining company in the world
- One of the largest fertilizer producer in the world and the largest in Central Europe

### Manufacturing Position

- Grupa Azoty is the top producer of nitric acid in Central Europe accounting for about 20% of estimated Central Europe capacity.
  - 1) Grupa Azoty Pulawy S.A. produces 900KMT of nitric acid in Pulawy, Poland
  - 2) Grupa Azoty S.A. produces 290KMT/yr of nitric acid in Tarnow, Poland
  - 3) Grupa Azoty ZAK S.A. produces 325KMT/yr of nitric acid in Kedzierzyn-Kozle
- Grupa Azoty is the top producer of sulfuric acid in Central Europe accounting for 31% of the total market in the region.
  - Grupa Azoty S.A. produces about 130KMT/yr of sulfuric acid in Tarnow, Poland
  - Grupa Azoty Police in Police, Poland produces about 1,300 KMT/yr of sulfuric acid
  - Grupa Azoty Zaklady produces 225KMT/yr of sulfuric acid in Pulawy, Poland
- Grupa Azoty is the top producer of sulfur in Central Europe accounting for 44.3% of estimated regional capacity
  - Grupa Azoty produces 1,200KMT/yr of sulfur in Osiek, Poland
  - Grupa Lotus S.A. produces 130KMT/yr of sulfur from a refinery in Gdansk, Poland
- ZA Pulawy produces 70KMT/yr of CPL, 1.2MMT/yr of Urea, 1.1MMT of Ammonium nitrate, 168KMT/yr of Ammonium sulfate, and 1.2MMT/yr of UAN®, 50KMT/yr of TiO<sub>2</sub>, 450KMT/yr of wet phosphoric acid, 125KMT/yr of triple superphosphate

## Strong foothold in mineral fertilizer chemical business

### Business Strategy

- Between 2013-2020, the core activity of Grupa Azoty will be production and trade in the following sectors:
  - 1) Agricultural products sector especially mineral fertilizers
  - 2) State-of-the-art materials sector especially construction plastics
  - 3) Organic chemicals sector especially caprolactam, melamine, oxo alcohols, plasticizers, and specialty chemicals
  - 4) Inorganic chemical sector especially ammonia and titan white
- Mineral fertilizers will be the largest area of activity during the strategic period with key importance to the Group's operations. The Group continues expanding its fertilizer range to include liquid and special fertilizers as well as other products and services for agriculture
- Polyamides, polyoxymethylene and modified plastics will continue to form the key elements of the Group's construction plastics and further product diversification in this sector is planned for 2013-2020
- Activities leading to balancing caprolactam and polyamide 6 production capacity will also be conducted

### Technology

- Presumed to have fertilizer chemical technologies
- Collaborate with a number of universities for R&D

### Opportunities in Value Chain

- Continue to supply fertilizer chemicals to rising agricultural products demand

### Financials

- Strong financial performance in 2015 Q1
- Has secured \$400 million credit line from a consortium of banks to finance its strategic investments

## Grupa Azoty SWOT Analysis

### Strengths

- Strong government support
- ZA Pulaway is well integrated from raw materials to chemicals and then to trade name products
- Only producer that mines sulfur
- One of the largest producer of fertilizer chemicals

### Opportunities

- Can take the geographical advantage of North Dakota where demand for agricultural products specifically fertilizers is high

### Weaknesses

- A typical ammonia and urea plants require a large amount of water supply

### Threats

- Stringent environment regulations
- Other fertilizer producers may be interested in entering the market in North Dakota which would result some competition

As a strong player in fertilizer chemicals, Grupa Azoty could be well-positioned for development in Minot, ND

Investor Screening Matrix												
Market Positioning		Business Strategy		Opportunities in Value Chain		Manufacturing Position		Technology		Financial Strength		Weighted
Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Ranking*	Total	Total Ranking
10%		25%		10%		20%		15%		20%		
8.0	0.8	8.0	2.0	8.0	0.8	8.0	1.6	6.0	0.9	8.0	1.6	7.7

- Grupa Azoty has a strong foot in fertilizer chemicals and the only sulfur mining company in the world.
- The value chains within Grupa Azoty is well-integrated from raw materials (natural gas, hydrogen, benzene, sulfur, coal) to semi-finished products (sulfuric acid, caprolactam, ammonia, urea, ammonium nitrate/sulfate) and then to marketable products.
- Grupa Azoty produces 1.5MMT/yr of nitric acid (1.9% of world capacity and 20% of Central Europe capacity), 1.9MMT/yr of sulfuric acid (21% of estimated Central Europe capacity), 1.2MMT/yr of sulfur (44% of estimated regional capacity), and 300KMT/yr of nitrogen solutions (19.4% of regional capacity).
- In late 2010, Grupa Azoty completed investments at its plants in Poland resulting in increases of 5 thousand metric tons at Pulawy and more than 10 thousand metric tons through backward integration to cyclohexanone at Tarnow. As part of a major restructuring plan set for 2013-2020, the company announced plans to balance its caprolactam and nylon 6 chain by increasing nylon 6 polymer and ammonium nitrate capacity at Tarnow by 2016. Additional plans include a caprolactam plant consolidation.
- Grupa Pulawy is the top producer of triple superphosphate (phosphate fertilizer) in Central Europe accounting for 46.3% of estimated capacity. They also produce about 450KMT/yr of wet phosphoric acid.
- Following successful consolidation of the Polish chemical industry, in which Poland's four largest chemical companies were combined into a single entity, the Grupa Azoty Group has been able to grow its top-line by the year, while expanding its own feedstock supply and production base. From 2010 to the end of the consolidation process, the Group's revenue climbed from PLN 1.9bn (\$626 Million) to PLN 9.8bn (\$3.23 billion).

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## Potential C1 Value Added Investor - CHS

CHS Inc. is the largest farm cooperative in the U.S. that distributes and produce agricultural and energy products to customers worldwide

### Corporate Overview

- CHS Inc. is a leading global agribusiness owned by farmers, ranchers and cooperatives across the United States. Diversified in energy, grains and foods, CHS is committed to helping its customers, farmer-owners and other stakeholders grow their businesses through its domestic and global operations. CHS, a Fortune 100 company, supplies energy, crop nutrients, grain marketing services, livestock feed, food and food ingredients, along with business solutions including insurance, financial and risk management services. The company operates petroleum refineries/pipelines and manufactures, markets and distributes Cenex® brand refined fuels, lubricants, propane and renewable energy products.

#### Energy

Energy segment derives its revenues through refining, wholesaling and retailing of petroleum products. It is primarily driven by the National Cooperative Refinery Association that operates oil refineries, and sells wholesale propane and other petroleum products as well as transporting them.

#### Agriculture

Ag segment derives its revenues through the origination and marketing of grain, including service activities conducted at export terminals, through the wholesale sales of crop nutrients, from the sales of soybean meal, soybean refined oil and soyflour products, and through the retail sales of petroleum and agronomy products, processed sunflowers, feed and farm supplies, and records equity income from investments in our grain export joint venture and other investments.

#### Other

These businesses primarily include our financing, insurance, hedging and other service activities related to crop production. In addition, our wheat milling and packaged food operations are included in Corporate and Other, as those businesses are conducted through non-consolidated joint ventures

CHS's country operations, one of the largest elevator operators in North America by sales, have increased, thanks to strengthening crop nutrients and grain margins

#### Strategic Thrust

- In 2014, CHS announced \$3 billion nitrogen fertilizer plant project at Spiritwood, North Dakota; CHS acquired Rochelle, Ill. ethanol plant; CHS joined Cargill and ConAgra Foods to create Ardent Mills, a flour milling company
- In 2013, CHS and Ruralco formed a JV with Australian grain company Agfarm; CHS and Adecoagro formed sunflower JV in Argentina; CHS introduced PlastiSoy™ epoxidized soybean oil; CHS acquired Kentucky river terminal and expanded its South American fertilizer capabilities
- In 2012, CHS entered Canada with Alberta agronomy acquisition and acquired Atman to support commodity business expansion; CHS invests in Summit Texas Clean Energy and secures exclusive 700KMT urea off-take agreement; CHS completes soy protein firm acquisition in Israel, China, and Nebraska; CHS acquired Tomen Grain facility at Pekin, IL; CHS completes soy protein firm Solbar acquisition
- In 2011, CHS acquired Creston Bean Processing, LLC, in Creston, Iowa; CHS acquired grain company Agri Point Limited in the western Black Sea region, with facilities in Bulgaria, Hungary, Romania, and Serbia
- In 2009, CHS expanded its global presence with grain export venues in Australia, Ukraine, and Russia and a grain marketing office in Argentina



CHS Inc. is one of the nation's leading integrated agricultural companies, providing grain, foods and energy resources to businesses and consumers on a global basis

### Market Position

- The cooperative marketers serves more than 77,000 producer-owners across 15 states through nearly six dozen service centers that are either company owned or locally governed. Globally, CHS has operations in Israel, China, and the US (Kansas, Nebraska, and Minnesota)
- CHS makes some 81% of its refined fuel sales to members. The cooperative sold about 1.3 billion gallons of gasoline and about 1.8 billion gallons of diesel fuel in 2014. Sales are made wholesale to member cooperatives and through independent retailers operating Cenex-branded Zip Trip convenience stores.
- Largest cooperative energy company based on revenues and identifiable assets, with operations that include petroleum refining and pipelines; the supply, marketing (including ethanol and biodiesel) and distribution of refined fuels (gasoline, diesel fuel and other energy products); the blending, sale and distribution of lubricants; and the wholesale supply of propane.

### Manufacturing Position

- The company is building a nitrogen fertilizer plant in North Dakota for an estimated \$3 billion. The facility is expected to be operational by 2018 and will produce more than 2,400 tons of ammonia daily. The ammonia will be further converted to urea, urea ammonia nitrate, and diesel exhaust fuel
- CHS has purchased the ethanol plant in Annawan, IL which is partly owned by REX American Resources Corp. CHS is to acquire full ownership of Patriot Holdings LLC in a deal valued at \$196 million. CHS already owns an ethanol plant in Rochelle, IL.
- Energy segment processes crude oil into refined petroleum products at refineries in Laurel, Montana (wholly-owned) and McPherson, Kansas (an entity in which we have an approximate 88.9% ownership interest as of September 1, 2014) and sells those products under the Cenex® brand to member cooperatives and others through a network of approximately 1,400 independent retail sites, of which 76% are convenience stores marketing Cenex® branded fuels.
- Laurel facility processes approximately 55,000 barrels of crude oil per day to produce refined products that consist of approximately 43% gasoline, 37% diesel fuel and other distillates, 6% petroleum coke, and 12% asphalt and other products. McPherson refinery processes approximately 85,000 barrels of crude oil per day to produce refined products that consist of approximately 50% gasoline, 45% diesel fuel and other distillates, and 2% propane and other products.
- Soybean processing operations are conducted at facilities in Mankato, Minnesota; Fairmont, Minnesota; Creston, Iowa; and Ashdod, Israel that can crush approximately 107 million bushels of soybeans on an annual basis, producing approximately 2.5 million short tons of soybean meal/soyflour and 1.2 billion pounds of crude soybean oil

The company is a leading publicly traded cooperative marketer of grain, oilseed, and energy resources in the US.

### Business Strategy

- Broad product portfolio helps mitigate price volatility. Grain marketing JV reduces its exposure. CHS holds JV with Cargill and with United Grain Corp. The partnerships operate grain terminals and export grain for the Pacific Northwest market as well as western U.S.
- In 2014 the company acquired a 50% stake in Australian agricultural supply chain management firm Broadbent Grain, allowing it expanded access to the growing Asia/Pacific region
- CHS formed a flouring-milling partnership with Cargill and ConAgra which is North America's largest flour miller with annual sales of more than \$4 billion. CHS holds 12% of Ardent Mills while ConAgra and Cargill each own 44%
- CHS energy operates oil refineries, and sells wholesale propane and other petroleum products and transports them
- Primary focus in the foods area is Ventura Foods, LLC (Ventura Foods) which produces and distributes vegetable oil-based products such as margarine, salad dressing and other food products

### Technology

- The following year, CHS partnered with Illinois-based agronomy retailer United Prairie. Through the partnership, CHS will bring additional services and new technologies to United Prairie's customers.

### Opportunities in Value Chain

- Continue to grow as an agro product seller/distributor

### Financials

- In 2014 (ended August) CHS's revenues slipped 4% to \$42.7 billion (compared to \$44.5 billion in fiscal 2013). The dip was primarily due to a 9% decline in revenue from the Ag segment, which saw market prices of soybeans, corn, and spring wheat go down. Gains on investments and declines in interest and income tax expenses led to a 9% rise in net income in 2014 -- to \$1.1 billion versus \$992.4 million in 2013.
- Cash flow from operations declined in fiscal 2014 to \$1.4 billion, compared to \$2.5 billion in fiscal 2013. Cash spent on derivative assets, accounts payable, and expenses contributed to that decline.
- Nonetheless, CHS is in a strong financial position

## CHS Inc. SWOT Analysis

### Strengths

- North American wholesale crop nutrients business is one of the largest wholesale fertilizer businesses in the U.S. based on tons sold, and accounts for approximately 11% of the U.S. market
- One of the largest country elevator operators in North America based on revenues
- Nation's largest cooperative marketer of grain and oilseed based on grain storage capacity and grain sales, handling over 2.0 billion bushels annually

### Opportunities

- Take advantage of growth in demand for agricultural and energy products

### Weaknesses

- Exposed to risk of loss in the market value of positions held, consisting of inventory and purchase contracts at a fixed or partially fixed price, in the event market prices decrease.
- Exposed to risk of loss on our fixed or partially fixed price sales contracts in the event market prices increase.

### Threats

- Cyclical nature of petrochemical business
- Refining and wholesale fuels business can be very competitive
- There is significant seasonality in the sale of agronomy products and services, with peak activity coinciding with the planting seasons. There is also significant volatility in the prices for the crop nutrient products we purchase and sell.
- Fluctuations in prices are mainly driven by weather conditions, crop yield, existing commodity supplies, government regulation, and the global economy.

Despite their recent expansion in North Dakota, CHS Inc. could be a potential investor in Minot, N.D.

Investor Screening Matrix												
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10%		25%		10%		20%		15%		20%		
9.0	0.9	8.0	2.0	8.0	0.8	8.0	1.6	7.0	1.05	9.0	1.8	8.2

- The cooperative marketer serves more than 77,000 producer-owners across 15 states through nearly six dozen service centers that are either company owned or locally governed.
- Globally, CHS has operations in Israel, China, and the US (in Kansas, Nebraska, and Minnesota).
- CHS's broad product portfolio helps to mitigate price volatility: In its Ag Business, demand for crop nutrient products have improved. Grain marketing joint ventures reduce its exposure.
- CHS holds joint ventures with Cargill (TEMPCO) and with United Grain Corporation (United Harvest), as subsidiary of Tokyo general trading firm Mitsui & Co. The partnerships operate grain terminals and export grain for the Pacific Northwest market, as well as customers in the western US.
- In 2014 the company acquired a 50% stake in Australian agricultural supply chain management firm Broadbent Grain, allowing it expanded access to the growing Asia/Pacific region.
- In 2013 CHS formed a flouring-milling partnership with agri-giants Cargill and ConAgra called Ardent Mills. The newly-formed partnership is North America's largest flour miller with annual sales of more than \$4 billion. CHS holds 12% of Ardent Mills, while ConAgra and Cargill each own 44%.
- The company is building a nitrogen fertilizer plant in North Dakota for an estimated \$3 billion. The facility is expected to be operational by 2018 and will produce more than 2,400 tons of ammonia daily; the ammonia will be further converted to urea, urea ammonia nitrate, and diesel exhaust fuel.