ONTARIO'S ECONOMIC RENAISSANCE FUELLED BY NATURAL GAS





02	EXECUTIVE SUMMARY		
05	IT'S TIME TO JUMPSTART ONTARIO'S ECONOMY		
	06	REPATRIATION OF MANUFACTURING JOBS	
	10	ONTARIO IS POSITIONED TO EXPLOIT NATURAL GAS FOR ITS OWN MANUFACTURING RENAISSANCE	
	12	UNLOCKING ONTARIO NATURAL GAS ADVANTAGE INVOLVES FIVE BOLD PLAYS	
15	FIRST	BOLD PLAY:	

- SECOND BOLD PLAY: MAKING THE TRANSPORTATION OF GOODS AND PEOPLE CLEANER AND MORE AFFORDABLE
- THIRD BOLD PLAY: 31 CONNECTING RURAL ONTARIO FAMILIES AND BUSINESSES
- FOURTH BOLD PLAY: 37 EXPANDING SUSTAINABILITY THROUGH COMBINED HEAT AND POWER
- 45 FIFTH BOLD PLAY: FUELING THE RING OF FIRE USING NATURAL GAS
- CONCLUSION: 51

BOLD ACTION IS REQUIRED TO UNLOCK ONTARIO'S GROWTH POTENTIAL

EXECUTIVE SUMMARY

Ontario's easy proximity to North America's largest reserves of clean, affordable Natural Gas represents one of this Province's single biggest opportunities for jumpstarting economic development and job creation. Competitor states such as Ohio, Michigan, New York and Pennsylvania are already utilizing low cost natural gas to revitalize their manufacturing sectors.

Unlike Alberta, Ontario is not blessed with abundant fuel resources of its own. But Ontario's geographic location combined with the strategic advantage provided by the Dawn natural gas storage hub, Canada's largest integrated underground storage complex, means that Ontario can compete with and beat the competition for jobs and manufacturing investment - if it effectively leverages these attributes. Ontario is at a fiscal and economic crossroads. The fragile recovery from the 2008/9 recession has been slow and has been constrained by high energy costs. The Ontario government must make the critical decisions necessary to ensure that the provincial recovery does not falter. A crucial means of ensuring the economic success of the province will involve attracting private investment - most notably in the manufacturing sector.

As evidenced in the American "rust belt" states. growth in manufacturing has been central in reducing the unemployment rate and increasing GDP.

As the power play of the 21st century, natural gas is a secure, abundant, affordable and flexible energy source that can be used to reduce input costs, attract new manufacturing industries, and create jobs to jumpstart economic growth. Innovations in shale gas technology have fundamentally changed the natural gas industry and provided Ontario with access to

more competitive and diverse sources of supply in close proximity to the province. As a key feedstock for many manufacturing processes, as well as a means of electricity and heat production, natural gas holds many opportunities for stable, sustainable economic growth.

Natural gas has become a major strategic advantage for North America. North American natural gas prices are the lowest in the world, and huge reserves will ensure that this remains the case for years to come. These affordable prices are bringing energy intensive industries back to North America.

Ontario has the robust storage and pipeline infrastructure necessary to deliver the clean, affordable and reliable energy solution that Ontario families, businesses and industrial job creators need. This can be a competitive advantage for the province.

Ontario needs a specific long term natural gas strategy to complement its Long Term Energy Plan. This strategy needs to be developed and implemented by a crossgovernment working group to ensure coordination.

No one ministry alone can take the actions needed to seize this major opportunity to build our province's economy.

The right public policy framework and strong government leadership will incent private sector investment to exploit the opportunities presented by natural gas. Union Gas believes that Ontario can unlock the economic development potential of its position at the nexus of the North American natural gas network through Five Bold Plays:



UTILIZING NATURAL GAS AS A STRATEGIC ASSET TO ATTRACT INDUSTRY

As an abundant, affordable fuel, natural gas can help existing energy-intensive industries in Ontario become more competitive and can lure new energy-intensive industries to Ontario.



CONNECTING RURAL ONTARIO FAMILIES AND BUSINESSES

Thousands of rural families and businesses currently do not have access to natural gas due to a lack of infrastructure. Supporting the expansion of Ontario's natural gas infrastructure to these communities would support economic development, job creation, and a more affordable cost of living for rural Ontario.



FUELING THE RING OF FIRE

The delivery of reliable, affordable natural gas in large volumes to this previously inaccessible region can act as a major catalyst for the economic development of this large-scale economic transformation of this remote region of Ontario.

MAKING THE TRANSPORTATION OF GOODS AND PEOPLE CLEANER AND MORE AFFORDABLE

Natural gas holds promise for reducing the cost and environmental impact of Ontario's transportation fleets by powering heavy duty and large-scale transportation fleets. Incenting the use of natural gas for transportation can reduce emissions and cut the cost of transportation for businesses, making Ontario business more competitive.



EXPANDING SUSTAINABILITY THROUGH COMBINED HEAT AND POWER

Low natural gas prices, combined with rising electricity prices, have improved the attractiveness of CHP to enable businesses to better manage energy costs. CHP can play an important role in meeting Ontario's energy needs, and positively impacting local economies and supporting Ontario's policy goals.

IT'S TIME TO JUMPSTART ONTARIO'S ECONOMY

The first decade of the millennium was not kind to Ontario's economy. The 2008 financial crisis hit Ontario hard, increasing unemployment substantially and forcing governments to assume massive debt in order to prevent the economy from entering into freefall. These factors, along with the high Canadian dollar, resulted in a loss of competitiveness and a lack of investment by the private sector throughout the province. From 1997 to 2010, Ontario's GDP grew at an average rate of 2.5% relative to the U.S.'s 4%¹, and Ontario's productivity grew at an average rate of 1.2% compared to the U.S.'s 2.65%².

While the recession has ended and both employment and output are beginning to recover, the province still needs to address the long-term performance of the economy – in particular, the performance of its manufacturing industries. Even without the impact of the recession, data indicates that Ontario has been performing poorly over the last decade when compared to many other provinces and competitor states. Productivity and income growth have lagged. Manufacturing jobs have been lost in unprecedented numbers.

The Ontario economy needs a jumpstart. While the province's tax environment and skilled labour force are internationally competitive, Ontario risks losing out on economic opportunities due to its high cost of electricity. Competitor U.S. states are exploiting new sources of natural gas to help fuel a manufacturing resurgence. Ontario's easy proximity to North America's largest reserves of clean, affordable natural gas represents one of this province's single biggest opportunities for jumpstarting economic development and job creation.

Natural gas is the power play of the 21st century. By tapping into the advantages offered by natural gas, Ontario can strengthen its economic competitiveness to become an economic triple threat – low taxes, skilled labour, and affordable energy. This White Paper sets out a path for Ontario to pursue in fueling an economic renaissance, particularly in growing its manufacturing base, through North American natural gas.

REPATRIATION OF MANUFACTURING JOBS

The 2000's witnessed acceleration in the loss of manufacturing jobs in North America. For U.S. manufacturing, the first decade of the new millennium was the worst since the Great Depression with 5.7 million jobs lost and manufacturing jobs declining to just one-third of total American employment³.

This significant decline was due in large part to China and other export powerhouses gaining a competitive edge as low-cost manufacturing bases.

The story in Canada, particularly in the manufacturing heartland of Ontario, has been no less challenging. From 2004 to 2011. Canada lost more than 300.000 manufacturing jobs, with Ontario accounting for twothirds of these losses⁴. In less than a decade, Ontario lost one-guarter of its manufacturing job base⁵. And, while there is some evidence that, after a decade of loss, manufacturing is stabilizing on a national basis⁶, Ontario is likely to continue struggling with continued expected losses in auto industry jobs over the coming decade⁷.

While the outlook in Ontario remains mixed, there is increasing optimism about U.S. manufacturing regaining its competitive edge, particularly in the "rust belt" states that compete with Ontario. The country's exports have been growing more than seven times faster than GDP since 20058. This revival of U.S. manufacturing could create 2.5 to 5 million jobs by 2020, reducing the unemployment rate by as much as 2 to 3 percentage points⁹.

According to a recent report issued by the Boston Consulting Group, the U.S. now has distinct productioncost advantages over other developed economies in labour, natural gas, and electricity - advantages that are attracting manufacturers back to the U.S.¹⁰. The most disruptive of these cost advantages to global manufacturing lies in access to natural gas. Innovations in shale gas drilling technology (ie. Horizontal Directional Drilling) have fundamentally changed the industry by making previously inaccessible formations accessible. As a result, the supply of natural gas in North America is extremely robust. The price of natural gas has fallen

and is expected to increase only modestly over at least the next twenty years¹¹.

Hydraulic fracturing has now been employed over one million times without a single documented incidence of drinking water contamination. Studies conducted by respected authorities have all concluded that hydraulic fracturing is safe. The U.S. Environmental Protection Agency (EPA), Ground Water Protection Council (GWPC) and the Interstate Oil and Gas Compact Commission (IOGCC) have all found hydraulic fracturing non-threatening to the environment, our ecosystems, or public health. Jurisdictions where shale gas is found continue to put in place tough regulatory standards and continue to enact new regulations to ensure that public health and the environment are protected. With proper regulation and the utmost care, hydraulic fracturing can be done safely and reliably. It's too big of an opportunity not to get it right.

Natural gas is now being produced in quantity from basins like Marcellus and Utica, which were thought to be inaccessible just a few years ago. New supply is set to be produced from other non-traditional areas such as Oklahoma and Appalachia.

The significant increase in natural gas production has helped to push down the U.S. wholesale price of natural gas by 51% since 2005¹², and has caused the U.S. to surpass Russia as the world's leading producer of natural gas¹³.

By 2020, recovery costs from shale are expected to be half of what they were in 2005¹⁴, ensuring a long-term and affordable domestic source of natural gas that results in a competitive advantage for the United States. Natural gas prices in North America are now the lowest in the world. The huge reserves mean that they are expected to stay that way for years to come. This has important implications for the U.S.'s manufacturing industries, as natural gas can be used as a key feedstock for chemicals and plastics manufacturing, and can be used in gas-fired power plants to generate reliable, affordable energy. With these technological advances increasing supply and

decreasing price, U.S. natural gas has become the energy power play of the century, helping to fuel the country's economic recovery.

U.S. federal and state governments are exploiting this strategic energy advantage in their collective focus on rebuilding U.S. manufacturing and jobs. President Obama's 2012 election platform committed to doubling U.S. exports by 2015 through the National Export Initiative and creating one million new manufacturing jobs¹⁵.

U.S. federal government initiatives are being matched by state government efforts to increase manufacturing investment and employment – an integrated approach that is succeeding. The abundance of natural gas energy both as feedstock to industrial processes and for the generation of affordable and cleaner electricity

TOP 20 STATES FOR MANUFACTURING JOB CREATION¹⁶

December 2009 to March 2013 (in thousands of workers)



is playing an important role in the revitalization of the rust belt. Since 2010, rust belt states such as Michigan, Ohio, Wisconsin, Indiana, and Illinois have been leading manufacturing job growth (see Figure¹⁶).

According to a Wall Street Journal report, "plunging prices have turned the U.S. into one of the most profitable places in the world to make chemicals and fertilizer, industries that use gas as both a feedstock and an energy source. And they have slashed costs for makers of energy-intensive products such as aluminum, steel and glass."¹⁷ In fact, the U.S. boom in natural gas and oil production is projected to create 3.6 million new jobs by 2020 and increase U.S. GDP growth by two to three percent annually¹⁸, with the rust belt states expected to be major participants in economic and job growth.¹⁹



RISING TIDE

A NATURAL-GAS BOOM IS RESHAPING THE U.S. INDUSTRIAL SECTOR.²⁰

U.S. PRODUCTION OF NATURAL GAS HAS CLIMBED...

Production, in billions of cubic feet per day.



AND NATURAL GAS NOW RIVALS COAL AS A SOURCE OF ELECTRIC POWER...

Consumption by end-use, average for the first nine months of 2012, share of total electric power generation.



WITH A BIG SLICE OF THE DEMAND FOR GAS COMING FROM INDUSTRY... Consumption by end-use, average for the first nine months of 2012, in billions of cubic feet a day.



WHICH GIVES U.S. COMPANIES AN EDGE OVER GLOBAL COMPETITORS Natural-gas prices in other major manufacturing economies as multiples of U.S. prices; 2001 averages



ONTARIO'S ELECTRICITY RATES VS. SURROUNDING PROVINCES/STATES

(BASED ON AVERAGE RESIDENTIAL AND INDUSTRIAL CONSUMPTION HOEP + GLOBAL ADJUSTMENT)²²

In contrast, industrial energy prices in Ontario, particularly in the GTA, are significantly higher than those in competing jurisdictions²¹. This puts the province at a disadvantage relative to its rust belt competitors, who are aggressively leveraging affordable natural gas to restore manufacturing jobs and growth. Ontario must formulate an integrated economic and energy policy response to compete and foster a manufacturing renaissance of its own.



The ability to transport natural gas to all regions of Ontario is critical to realizing the benefits that the natural gas boom offers. With the completion of currently proposed expansions and reinforcements discussed further in this paper, Ontario will have the robust storage and pipeline infrastructure necessary to deliver the clean, affordable and reliable energy solution that Ontario families, businesses and industrial job creators need. The right public policy



framework and strong government leadership will incent private sector investment to exploit the opportunities presented by natural gas.

Natural gas supplies and the low prices they have brought are a major strategic competitive advantage for North America. Many U.S. states are seizing this advantage. Ontario cannot afford to be left behind.

ONTARIO IS POSITIONED TO EXPLOIT NATURAL GAS FOR ITS OWN MANUFACTURING RENAISSANCE

For Ontario, as for its most immediate competitors, natural gas is a secure, abundant, affordable and flexible energy source that can be used to reduce input costs, attract new manufacturing industries and create jobs to jumpstart economic growth. Natural gas also trades on an open, North American market, further reinforcing security of supply and long-term pricing.

Ontario can compete with the U.S. for new manufacturing industries and jobs because of its strategic position within the North American natural gas network. Ontario's proximity to North America's most abundant and most affordable supplies of natural gas gives this Province an energy platform on which to build a manufacturing resurgence. A key strategic aspect in this respect is the Dawn hub outside of Sarnia, which puts Ontario at the centre of natural gas distribution in North America.

The Dawn storage hub is one of the top three physical trading hubs in North America and its strategic location provides direct access to North America's major supply basins, as well as to emerging natural gas supplies in Utica and Marcellus (both located just south of the Great Lakes). Dawn is the largest integrated natural gas storage facility in Canada, with 23 underground storage pools, strong 365 day markets in Ontario, Quebec and the northeastern U.S., and the ability to interconnect with 10 major pipelines²³. This pipeline infrastructure will be expanded further over the coming years, providing even more access to the most important supplies of affordable natural gas²⁴. This is important for Ontario because it gives the province the ability to provide existing and prospective manufacturers secure access to abundant, affordable and flexible energy.





UNLOCKING ONTARIO NATURAL GAS ADVANTAGE INVOLVES FIVE BOLD PLAYS

When Ontario released its first Long-Term Energy Plan (LTEP) in 2010, it predicted that natural gas would only be used for specific purposes²⁵. The provincial government's current review of its energy policy provides an opportunity to re-position natural gas as a strategic competitive advantage for the economic development of the province.

The key to unlocking the power of natural gas will be to recast Ontario's energy policy from one focused solely on electricity production to one

focused on providing energy diversity that can serve the wide variety of industrial inputs that are impacted by the cost of energy. A diversity of energy sources is vital to ensuring long-term affordable electricity across the province and, more broadly, to ensuring that the right kinds of energy are available for other uses, such as transportation, where it is a key input. Union Gas believes Ontario can unlock the economic development potential of its position at the nexus of the North American natural gas network through Five Bold Plays:

Natural gas production will contribute another \$576 billion to Canada's economy over the next two decades, supporting roughly 129,000 jobs²⁶. Affordable North American natural gas offers a significant competitive advantage to users and is attracting energy intensive industries back to North America. North America has the world's lowest natural gas prices. This strategic advantage is expected to continue for many years to come. Ontario needs to be bold and seize this opportunity if it is to compete and win. The Five Bold Plays in

FIVE BOLD PLAYS

Utilizing Natural Gas as a Strategic Asset to Attract Industry As an abundant, affordable fuel, natural gas can help existing energyintensive industries in Ontario become more competitive and can lure new energy-intensive industries to Ontario.

Making the Transportation of Goods and People Cleaner and More Affordable

Natural gas holds promise for reducing the cost and environmental impact of Ontario's transportation fleets by powering heavy/medium duty and large-scale transportation fleets. With the decoupling of natural gas prices from oil and gasoline prices, natural gas has a significant competitive advantage. Incenting the use of natural gas for transportation will reduce emissions and cut the cost of transportation for businesses, making Ontario business more competitive.

Connecting Rural Ontario Families and Businesses

Natural gas is taken for granted in urban Ontario, with nearly every urban Ontario resident having access to this fuel source in their home. Unfortunately, many rural families and businesses currently do not have access to natural gas due to a lack of infrastructure. Supporting the expansion of Ontario's natural gas infrastructure to these communities would support economic development, job creation, and a more affordable cost of living for rural Ontario.

Fueling the Ring of Fire

The 'Ring of Fire' is one of the most significant mineral regions in the province and includes the largest deposit of chromite ever discovered in North America. Affordable, flexible, and efficient energy can help unlock this opportunity. The delivery of reliable, affordable natural gas in large volumes to this previously inaccessible region can act as a major catalyst for this large-scale economic transformation of this remote region of Ontario.

this White Paper will help put Ontario back on the world's manufacturing map.

In order to guickly and fully embrace this opportunity Ontario's government should develop a natural gas strategy implemented by a special task force that is capable of driving change and decision -making across the entire government. This 'whole of government' approach will provide the critically needed leadership necessary to leverage this unique opportunity to jumpstart economic renewal and job creation.

Expanding Sustainability through Combined Heat and Power Combined Heat and Power (CHP) is the simultaneous production of electricity and heat from a single fuel source – in this case natural gas. Low natural gas prices, combined with rising electricity prices, have improved the attractiveness of CHP to enable businesses to better manage energy costs, giving institutions and businesses an incentive to install CHP systems to save on costs. CHP can play an important role in meeting Ontario's energy needs, positively impacting local economies and supporting Ontario's policy goals.



THE OPPORTUNITY

Ontario's manufacturing industry operates in a highly competitive global market, where affordably priced energy is a key determinant in locating facilities. With ten times the energy needs of other sectors²⁷, manufacturing industries regard energy as a key input cost in operations. As Ontario's manufacturing sector continues to struggle to defend its eroding competitive position, finding new ways of attracting industry will be central to job creation and economic growth for many local economies. Energy is also an important input cost in other industries where Ontario competes for jobs and investment, meaning that our access to reliable, affordable natural gas can be a competitive advantage.

FIRST BOLD PLAY: UTILIZING NATURAL GAS AS A STRATEGIC ASSET TO ATTRACT INDUSTRY

WHY IT MATTERS TO ONTARIO

Natural gas is an abundant, affordable fuel that can help existing energy-intensive industries in Ontario increase their output and can lure new energy-intensive industries to Ontario. Reliable, affordable natural gas must be a part of the provincial government's pitch to manufacturers considering investments in Ontario. Establishing a diversity of energy sources is key to ensuring long-term energy security and, more widely, ensuring that energy is available for other uses, such as manufacturing.

Some of Canada's most energy-intensive industries are mining, iron and steel, glass, primary metals smelting, industrial chemicals, cement, and pulp and paper²⁸. Their processing plants are often very large and, often, are the mainstay of local or regional economies²⁹. Enabling Ontario to attract more of these industries by leveraging its natural gas advantage, industry-specific jobs, as well as jobs associated with energy production, will present new and exciting opportunities for Ontario workers.

Ontario's access to natural gas can be a strategic selling point in attracting and retaining manufacturers³⁰. Shell Canada's LNG facility in Sarnia Lambton is an example where access to highly reliable, competitively priced natural gas services was a critical factor underpinning the company's decision to invest in Ontario³¹. Capitalizing on the province's robust network of natural gas infrastructure, the government can collaborate with the natural gas industry to champion the increased use of natural gas as an affordable alternative for energy-intensive industries.

Foreign energy-intensive companies should be made aware of the cost-efficiencies inherent in relocating to Ontario as well; for instance, Union Gas recently worked with the Ministry of Economic Development and municipal economic development organizations to encourage large fertilizer plants to locate in southwestern Ontario³².

While Ontario has significant natural gas infrastructure already, there is a need to expand this infrastructure to ensure that Ontario natural gas users continue to have secure and reliable access to new and cost effective supplies. New pipeline infrastructure in and around the Greater Toronto Area is necessary for longer-term access to low-cost, stable supply. TransCanada's proposal to partially convert the natural gas mainline to oil could put cost and supply pressures on the Ontario market if not properly designed.³³.

With low fuel costs and lower capital investment costs, natural gas can also help exert downward pressure on electricity prices. Natural gas can provide greater flexibility as well as long-term supply and cost certainty. Reliable and affordable electricity is a critical requirement for business and a major input cost. Increasing electricity prices make Ontario less and less competitive with our neighbours. Making greater use of Ontario's existing natural gas power plants could help reduce expected electricity price increases. With natural gas expected to remain so affordable, the use of natural gas for base load power should be seriously considered. This will reduce the burden on Ontario consumers and contribute to making Ontario's energy-intensive industries more competitive.



ONTARIO MUST MOVE QUICKLY TO COMPETE

The U.S. economy is facing significant challenges, similar to those faced by Ontario: sluggish job growth, mounting debt and economic uncertainty. The U.S.'s five most energy-intensive industries chemicals, pulp and paper, iron and steel, refining, and non-metallic minerals – consume approximately one half of the energy used in the industrial sector³⁴. President Obama's 2012 election platform committed to making the U.S. a magnet for manufacturing jobs. Obama's platform stated a goal of doubling U.S. exports by 2015 through the National Export Initiative and creating one million new manufacturing jobs domestically³⁵. This strategy, paired with the goal of reducing energy prices, is designed to ensure that the U.S. remains attractive to potential investors and job creators.

To date, this strategy has been relatively effective. Advances in environmentally sustainable shale gas extraction technology are supporting millions of jobs, boosting trade and contributing to a rebuilding of America's competitiveness around the world. Several American firms, including Caterpillar, GE and Dow, have announced that they are shifting manufacturing operations back to the U.S. due to increasing production and energy costs overseas³⁶. Many industrial companies in Europe are now planning to build new factories in the U.S. due to its low energy prices. Natural gas is playing a leading role in the repatriation of U.S. manufacturing jobs. North America's natural gas price advantage is proving itself to be a strategic advantage that Ontario needs to seize. Ontario's proximity to these same reservoirs of affordable, abundant natural gas, along with its strategic infrastructure assets, means that this province can also enjoy a resurgence of manufacturing jobs.



IN ORDER TO ATTRACT AND **RETAIN MANUFACTURING JOBS USING ONTARIO'S NATURAL GAS** ADVANTAGE, ONTARIO SHOULD:

Approve critical projects to ensure security of supply

To ensure continued security of supply, the Government of Ontario should provide policy and regulatory support for essential (privately funded and built) infrastructure projects.

First, there are a number of projects in planning or being built in the Western GTA by Enbridge, Union Gas, and TransCanada. When complete, these projects will ensure that there is adequate capacity to transport natural gas between Dawn and the GTA. This will:

- Relieve a growing bottleneck that threatens the ability to diversity and secure affordable natural gas supplies for Ontario.
- Assist in serving a growing demand for natural gas in central, eastern and northern Ontario, as well as Quebec and the U.S. northeast.
- Help to increase the diversity of natural gas supply (reducing dependence on declining supplies of western gas available to move east to Ontario)while supporting the development of new natural gas infrastructure in Ontario.

Second, it is essential to ensure that Ontario consumers and businesses have improved access to the Marcellus and Utica basins - reliable supplies of affordable natural gas. Improved pipeline transportation infrastructure is needed to support growing demand for cleanburning natural gas and to help offset the decline in traditional western Canadian supplies. Projects to connect the Dawn Hub to these growing sources of affordable, abundant natural gas are currently in the evaluation phase.

These and other important projects will require a number of regulatory approvals including OEB approval,

environmental assessments, and permitting from the Ministry of Natural Resources, the Ministry of Environment, the Ministry of Tourism, Culture and Sport and the Ministry of Transportation. The Ontario government should deal expeditiously with the regulatory applications for these time sensitive, critical projects. The government should focus on the critical supply changes taking place in North America and what Ontario needs to do and support to ensure diverse, secure and affordable natural gas supply access going forward. Municipal governments can also do their part to contribute to economic growth by ensuring that permitting processes proceed expeditiously on these time sensitive projects.

Actively pursue companies in energy intensive industries and those that use natural gas as a feedstock

In collaboration with the natural gas industry, the Ontario government should identify and pursue significant strategic investments that private sector players may consider making in Ontario as a result of the province's geographic location and access to affordable and reliable energy. Working together, industry and the government would identify companies who are attracted to Ontario due to its many advantages and are reliant on affordable natural gas as an energy source. Once a potential investment opportunity has been identified, it would be evaluated for its potential viability and impact on the economy. If a decision is reached to pursue the opportunity the province would activate a "one window team" mandated to pursue the opportunity. This team, led by a senior public servant, would be tasked with aggressively pursuing the opportunity utilizing existing government tools. It would be designed to co-ordinate and leverage the cross-functional strengths of Finance, Economic Development, Energy, and other departments. The one-window team would also assist the company in navigating the various licensing, regulatory and other approvals processes as well as provide advice on issues related to municipal, aboriginal and other issues generally associated with establishing or expanding large industrial footprints in Ontario.

SECOND BOLD PLAY: MAKING THE TRANSPORTATION OF GOODS AND PEOPLE CLEANER AND MORE AFFORDABLE

THE OPPORTUNITY

Natural gas presents an exciting opportunity to reduce the cost and environmental impact of Ontario's transportation fleets. With the decoupling of natural gas prices from oil and gasoline prices, natural gas now holds significant competitive advantages for powering heavy duty and large scale transportation vehicles. This has created new and emerging opportunities for liquefied natural gas (LNG) and compressed natural gas (CNG) to fuel heavy duty long-haul transport and return-to-base fleets.

Natural gas fuelled vehicles are quiet and clean compared to the fuels they replace; they use newly abundant supplies of natural gas, which is more affordable than conventional diesel fuel. Furthermore, the environmental and related health benefits associated with reducing emissions provide clear incentives for considering LNG and CNG transportation fleets⁴². Incenting the switch from diesel to natural gas for transportation will reduce GHG emissions and cut transportation costs for businesses and industry, making Ontario a more competitive and environmentally responsible marketplace.

Canada was an early leader in developing codes and standards for CNG vehicles, stations, and components⁴³. Canada has well-established CNG vehicle and station codes and the Canadian Standards Association (CSA) recently re-established the Committees that oversee these codes. Work is underway to review both codes, with updates expected later this year. Liquefied natural gas (LNG) vehicles and stations are new to the Canadian market. Industry and government are working to develop all necessary regulation. It is expected that Canada will soon have an LNG refueling station code, which will be added as an amendment to Canada's existing industrial LNG code, *CSA Z276 – Liquefied Natural Gas Production, Handling & Storage.*

The development of an LNG vehicle code is currently under review by the CSA B109 Committee⁴⁴.

CNG VS. LNG³⁷



Compressed Natural Gas

CNG is stored on the vehicle in high-pressure tanks - 3,000 to 3,600 psi³⁸. A distinctive odour is normally added to natural gas to facilitate leak detection. Natural gas will typically dissipate in the case of a leak, providing a significant safety advantage compared to gasoline³⁹.

Liquefied Natural Gas

LNG is natural gas stored as a cryogenic liquid. Natural gas becomes a liquid at -160oC (-256 oF) LNG offers an "energy density comparable to petrol and diesel fuels, extending range and reducing refueling frequency"⁴⁰. There exists, however, a high cost of cryogenic storage on vehicles as well as the major infrastructure requirements of LNG dispensing stations, production plants and transportation facilities⁴¹.



WHY IT MATTERS TO ONTARIO

LNG is already fueling hundreds of long-haul fleet vehicles in the U.S., and with the right strategy and collaboration between the private sector and government, Ontario could enjoy similar adoption and benefits. LNG is ideally suited to heavy duty long-haul vehicle fleets where significant, sustained horse-power is required to power the vehicle over long distances, something electric power, for example, cannot accomplish. The highway 401 corridor is the busiest highway in North America⁴⁵. Approximately 60% of Canada's road travelled trade with the U.S. occurs on this corridor.

There is also great opportunity to fuel marine shipping through LNG, as well as potentially rail locomotive applications. By contrast CNG is an ideal solution for on site and short-haul situations where vehicles return to base on a daily basis, for example garbage trucks, city buses and construction vehicles.

The conversion to natural gas vehicles is a proven, commercially available option for reducing carbon emissions using lower cost fuel. Notably, this provides benefits to both businesses and the environment, particularly as the price of oil and diesel rises; as such, it provides a 'win-win' scenario for government and policy-makers. The advantages to businesses with natural gas fleets are substantial: natural gas is up to 44% less expensive than gasoline and up to 45% less so than diesel. These decreased transportation costs for businesses would contribute to Ontario's economic competitiveness. There are approximately 100,000 Class 8 trucks in Ontario, with an annual turnover of 10% or 10,000 new vehicles each year. If even one in ten of those new vehicles were powered by natural gas, the fleet would grow rapidly.

Furthermore, a shift towards natural gas fueled transportation holds the promise of jobs and economic development. Demand for new engines is already creating opportunities in the manufacturing sector in the U.S. and Canada. Developing the fuelling infrastructure for natural gas vehicles would require a significant engineering and construction workforce, thereby also contributing to job creation in the province.

The conversion to natural gas vehicles could substantially reduce GHG emissions, positively impacting Ontario's environment. According to the Natural Gas Vehicle Alliance, the transportation sector is the second largest energy user in Canada, and accounts for 29% of Canadian energy demand and was responsible for 27% of Canada's greenhouse gas emissions in 2008⁴⁶. Furthermore, natural gas provides a significant carbon advantage, with a 20-25% lower lifecycle of greenhouse gas emissions when compared to traditional transportation fuels⁴⁷. The entire natural gas fuelling system is sealed, meaning that emissions will not evaporate while refueling, or contaminate soil or groundwater at station sites⁴⁸.



NATURAL GAS EMISSION REDUCTIONS AS A % OF GASOLINE⁴⁹ (Source: EIA)



Displacing 1 Gasoline Gallon Equivalent (GGE) of vehicle fuel with Natural Gas



THERE ARE A NUMBER OF BARRIERS TO THE IMMEDIATE ADOPTION OF NATURAL GAS VEHICLES. THESE INCLUDE:



A lack of LNG and CNG infrastructure

The Canadian Natural Gas Vehicle Alliance describes the lack of commercially -available LNG in Canada, coupled with very extensive underground natural gas distribution system as having limited "the development of LNG refueling station infrastructure in Canada"⁵⁰. There are currently only a handful of CNG fuelling stations in Canada, most not open to the public.

Ontario has just one LNG plant (out of four that currently exist in Canada). Located in Hagar Ontario, it is currently only producing LNG as part of the integrated natural gas LDC operations. Owned by Union Gas, an application is soon to be submitted to transform this plant and enable LNG to be provided for broader transportation fuel applications.

CNG refueling stations can be installed wherever there is a natural gas pipe in the ground, and refuelling facilities can be publicly accessible at retail sites or installed at private sites⁵¹. Canada has a network of approximately 80 public refueling stations located in five provinces, and there are currently seven public access CNG stations in Ontario.







Key corridor infrastructure Cost and a lack of CNG infrast CNG service stations. LNG dis

barrier to wide

Inconsistencies between provincial and territorial regulatory regimes for CNG vehicles have resulted in a weak overall system for the implementation of natural-gas powered transportation vehicles in Canada. Ontario has the strictest regulations for CNG vehicles and refueling stations relative to other provinces and territories⁵³; it indirectly references CSA B51-03 (Boiler, Pressure Vessel, and Pressure Piping code) in its provincial adoption of the National Fire Code and in its Technical Standards and Safety Act. Ontario also has additional regulatory requirements for compressed gas and certification requirements for conversion shop personnel⁵⁴.

With respect to refueling infrastructure, the provinces and territories are fairly consistent in terms of the relative strength of their regulations; nonetheless, Ontario has the most stringent regulatory requirements, referencing the Boiler Pressure Vessel and Pressure Piping Code in its Fire Gas and Propane Installation Code and the Propane Storage and Handling Code in its Technical Standards and Safety Act⁵⁵.

Vehicle cost premium needs to be addressed

The cost premium for a vehicle to run on CNG or LNG instead of diesel can be as high as \$80,000 per vehicle for an LNG system in a heavy-duty truck⁵². This high price of entry has been a momentous barrier in the wider adoption of natural gas as a transportation fuel. Vehicle purchasers face another disincentive in the form of weight restrictions. CNG and LNG systems add weight to a vehicle, reducing the amount of cargo that a truck can carry while still meeting the total Gross Vehicle Weight (GVW) allowance on provincial highways. The government should seriously consider increasing the GVW for natural gas vehicles to remove this disincentive.

Cost and a lack of CNG infrastructure are hampering the development of CNG service stations. LNG distribution infrastructure, on the other hand, is widely developed. The lack of refuelling infrastructure, however, is a key barrier to wider adoption of both technologies.

Inconsistent CNG Regulatory Requirements

ONTARIO'S COMPETITORS ARE AGGRESSIVELY PURSUING NATURAL GAS FOR TRANSPORTATION

Leading vehicle manufacturers are pursuing natural gas vehicles in a variety of markets to reduce carbon emissions and environmental impacts while providing a cost-effective alternative to foreign crude oil. Natural gas is becoming increasingly attractive for transportation purposes, as the technology has greatly improved with respect to efficiency, affordability, and safety. Various U.S. states, including all of Ontario's direct competitor states, have put in place policy frameworks and supporting investment incentives to encourage the conversion of transportation fleets. The following illustration summarizes the initiatives in key competitor states⁵⁶.



THE INITIATIVES IN KEY COMPETITOR STATES





New York

Pennsylvania

Ohio





- sell alternative fuels; and

Initiatives by the Pennsylvania state government include:

- Purchase and conversion incentives;
- Participation in multistate initiative to encourage natural-gas vehicle procurement.

- Purchase and conversion incentives;

Initiatives by the Michigan state government include:

- Tax exemption for properties used for high technology activities including those related to alternative vehicles;
- Permitting exemptions for natural gas storage and handling facilities; and • Exemptions from emissions inspections for CNG, propane and electric vehicles.

Initiatives by the Illinois state government include:

- Purchase and conversions incentives;
- Marketing opportunities for fleets using alternative fuels;
- · School bus retrofit reimbursements;
- Alternative "Public Utility" definition for natural gas and electricity
- providers providing fuel for transportation; and
- Government fuel-effcient vehicle acquisition goals

Initiatives by the New York state government include:

- Vouchers for CNG vehicles and grants for fuel stations;
- Exemptions from state sales and use taxes for CNG;
- Elimination of exclusivity agreements allowing franchisees to
- State acquisition requirements for alternative vehicles.
- Grants for LNG and CNG stations; and

Initiatives by the Ohio state government include:

- Emissions reduction programs for heavy duty vehicles;
- · Exceptions to gross vehicle weight provisions; and
- Requirements for state vehicles to use alternative fuels.

In Canada, a number of provinces have recognized that the use of natural gas to fuel transportation fleets is safe and cost-effective for business. Quebec has adopted tax measures which provide accelerated capital cost allowances on new trucks. The province's Assistance Program for Improving Energy Efficiency in Road, Rail and Marine Transportation (PEET) funded up to \$15,000 per truck for alternative fuel conversion until March 2013⁵⁷. The Quebec government recently announced they will subsidize 30% of the incremental cost for natural gas vehicles up to a maximum of \$75,000 and also invested in infrastructure for the "Blue Corridor", which will establish Canada's first liquefied natural gas-fuelled freight transportation corridor along the 20/401 highway between Quebec City and the Greater Toronto Area⁵⁸. In Alberta, the government updated infrastructure regulations to provide for increased weight allowances for LNG HD trucks on the road⁵⁹. The natural gas distribution company ATCO Gas has also allowed public access to its private fueling station in Lethbridge, inducing more consumers to use natural gas vehicles despite the limited availability of public natural gas infrastructure⁶⁰.

British Columbia has perhaps been the most active on the policy front in terms of embracing natural gas and its potential. In 2012, the BC government released

its Natural Gas Strategy which recognized that investments in natural gas vehicles will lead to economic growth and new jobs. To support the implementation of the natural gas strategy, the BC government enabled regulated utility companies to:

1. Offer incentives to transportation fleets that would use natural gas for vehicles such as buses, trucks or ferries;

2. Build, own and operate CNG fueling stations or LNG fueling stations; and

3. Provide training and upgrades to maintenance facilities to safely maintain natural-gas-powered vehicles⁶¹.

FortisBC established the FortisBC Natural Gas for Transportation Program based on the government's 2012 Natural Gas Strategy. FortisBC provides incentive funding of up to 80% of the difference in cost for eligible medium and heavy natural gas vehicles⁶². Similarly, the Clean Energy Vehicles for BC program offers \$5,000 in incentive funding for factory-built dedicated light CNG vehicles63.

A made-in-Ontario natural gas strategy can help Ontario catch up to its competitors.



ONTARIO CAN CREATE THE POLICY ENVIRONMENT NEEDED TO UNLOCK PRIVATE SECTOR INVESTMENT

There are a number of actions the Ontario government can take to unlock private sector investment and promote the use of natural gas as a cost-effective and environmentally friendly fuel to power heavy duty and large-scale transportation fleets. In order to do this, the government should:

Promote natural gas as a policy direction for Ontario

The government should revise its energy policies to promote natural gas use, particularly in the transportation sector. Such revisions would give the province an opportunity to consider whether the role of natural gas should change in the coming years, and could promote utility companies delivering natural gas transportation programs for Ontarians.

The integration of natural gas initiatives into the provincial policy has occurred in British Columbia, with success. By formally recognizing the utility of natural gas vehicles in its provincial strategy, as well as developing private sector incentive programs, British Columbia has prompted several major trucking companies to begin seriously considering converting to natural gas.

The Ontario government should support policy that drives industry investment. Implementing policy that clearly indicates that the government is committed to increased use of natural gas will help to ensure buyin from industry and the public, and signals to the private sector that their investments are aligned with the government's overall policy direction. This could include time-limited incentives, in the form of accelerated depreciation, to support the purchase of new CNG or LNG vehicles and the conversion of existing vehicles to use these fuels. This will promote investment and create jobs while providing the private sector with incentives to invest in this new fuel source.

Incentivize private sector investment in LNG liquefaction plants and LNG refueling stations

The government should also incentivize private sector investment in LNG liquefaction plants and LNG refueling stations. For instance, Ontario could join with the Province of Quebec and seek to mirror existing provincial legislation that provides incentives for the establishment of a "blue road" between Quebec City and Windsor, supporting the rollout of technologies designed to unlock emerging economic opportunities for fleet operators, while delivering a clear environmental win for the province in the process. Alternatively, the government could allow accelerated depreciation of fuelling equipment to spur development.

Harmonize regulatory approaches to natural gas vehicles and refueling infrastructure

Finally, the Government of Ontario could aid in the development of regulatory standards across the transportation industry which would remove barriers to adoption. A possible means of accomplishing this would be to adopt a common transportation code for the provinces, territories, and the federal government, which covers all of the areas specified in CNG and LNG. Such a common code would require a common set of mandatory certification requirements⁶⁴. Ontario could take a leadership role in national harmonization.

Another approach would be to agree on increased adoption of international standards for CNG vehicles, such as those developed by the International Organization for Standardization (ISO). The regulatory regime for CNG refueling infrastructure is less fragmented than it is for CNG vehicles, but there are differences with respect to the stringency of each jurisdiction's respective regulations. The adoption of a comprehensive code would be one possible way to ensure a more consistent, unified system of regulations for CNG refueling infrastructure.

THIRD BOLD PLAY: CONNECTING RURAL ONTARIO FAMILIES AND BUSINESSES THE OPPORTUNITY Although natural gas is taken for granted in urban Ontario, the majority of rural families and businesses are currently without access to this important energy source. Due to a lack of infrastructure, less than 20 percent of Ontario's rural residents have access to natural gas; instead, they must rely on oil, propane, or electric heat for homes and businesses, which comes at a significantly higher cost⁶⁵. This absence of natural gas services in rural Ontario is a significant barrier to economic development for these communities. The inability to access this affordable energy source impedes a community's ability to attract business and benefit from economic growth; meanwhile, the extra costs borne by residents for energy in their homes limits their ability to contribute to the local economy and makes it tougher to make ends meet. Given the low cost of natural gas relative to other fuel sources, un-serviced towns and villages throughout Ontario are expressing serious interest in finding ways to connect to natural gas. Union Gas has identified over 40 communities with populations of 500 or more which could benefit from improved access to natural gas. ⁶⁶Kincardine, Milverton, Bancroft and Marathon, among others, recognize the disadvantage of their current situation and acknowledge that natural gas would give them a competitive advantage in attracting and retaining businesses. In surveys, large numbers of people say they would convert to natural gas⁶⁷. Supporting the expansion of Ontario's natural gas infrastructure to these communities would result in economic development, job creation, and a more affordable cost of living for rural Ontario, by giving consumers and businesses access to significantly lower energy costs. In most cases, these communities would be connected to the natural gas pipeline grid. In some cases, however, it may be more economically viable to deliver CNG/LNG to a community by truck with local pipeline distribution. Both options should be studied.

WHY IT MATTERS TO ONTARIO

Rural communities are significant contributors to the Ontario economy. Rural Ontarians, however, are struggling due to a lack of employment opportunities and a relative decline in population, as more families move to urban and suburban centres.

Natural gas is North America's most affordable and versatile energy source. Expanding Ontario's natural gas infrastructure would encourage economic development in rural communities, and provide economic stimulus opportunities by significantly reducing energy expenses for business and families, reducing heating costs in agricultural and commercial sectors and boosting the competitiveness of these communities.

Expanded access to affordable natural gas in rural communities can deliver annual savings of more than \$40 million in energy costs to families and businesses. Compared to current energy costs, residential consumers in rural communities could save an average of 70-80% (\$1,500 to \$2,500) in costs per year by using natural gas for heat and hot water, depending on their current energy source. Savings for businesses are magnified, with some medium sized commercial businesses able to save up to \$15,000 per year.

As Ontario's rural communities are significantly removed from the existing natural gas system, they are not viable to serve under the current Ontario Energy Board (OEB) economic test⁶⁸. The OEB does not currently allow for medium or long term subsidization of new infrastructure by existing gas consumers, nor does it allow new assets to be treated as network assets⁶⁹. As a result, small communities are unable to access natural gas commercially, because they cannot pay the full freight for connecting to the existing natural gas system. Due to the great distances of these communities to existing natural gas infrastructure, they will not gain access to natural gas without significant economic support and/or the removal of the regulatory constraint that currently prevents the cross-subsidization involved in expanding the network from existing utility gas customers to new customers in rural regions⁷⁰.

If all of Ontario is to benefit from the economic potential of natural gas, then rural Ontario needs to be connected.

OTHER JURISDICTIONS RECOGNIZE THE IMPORTANCE OF CONNECTING SMALL AND RURAL COMMUNITIES

Throughout the U.S., governments are realizing that switching to natural gas has the potential to save energy consumers substantial sums of money and contribute to a more robust economy and a cleaner environment. The low price of natural gas has sparked interest in growing the use of this energy source in the U.S., and "current and expected natural gas

SELECTED U.S. MEASURES TO CONNECT RURAL COMMUNITIES



prices make it economically sensible for more energy consumers to switch from oil or propane to natural gas⁷¹. "According to Dr. Ken Costello of the National Regulatory Research Institute, "from an operational standpoint, the integration of new lines into a utility's existing distribution network can lead to internal efficiencies ⁷²." These benefits can lower the average cost of a utility service. A summary of just a few U.S. initiatives to connect more Americans to natural gas are presented in the illustration below.

Minnesota73

Throughout Minnesota, gas utilities have developed a New Area Surcharge (NAS) for new customers in previously un-serviced locations. This program was developed based on policy concerns that individual contributions could be so high that prospective customers may decide not to switch to natural gas, despite the fuel being the most cost-beneficial from a lifecycle perspective. To calculate the yearly surcharge, gas utilities take the present value of the annual difference between the expected and required revenue for a line extension and then divided it and charge it across the rate base. This provides for a gradual and affordable repayment of the capital and additional operating costs incurred to develop a new line⁷⁴.

Nebraska

Nebraska has passed legislation facilitating the expansion of gas lines into new areas, an initiative that was promoted as being about economic development. The legislation streamlines the regulatory review process and allows utilities to spread the costs of line extensions to all of their ratepayers. It requires the creation of line extension plans examining the economic effect on the area, economic feasibility, and other options that would better advance the public interest.

The legislation allows for several mechanisms to pay the cost of the line extension, including cost recovery from all of the utility's customers if the plan promotes economic development in an un-served or underserved area. The legislation also allows remote municipalities fund line extensions for the purpose of economic development.

North Carolina

North Carolina legislation authorizes the issuance of bonds for natural gas extensions that are not economically feasible. It also allows for the creation of expansion funds for the extension of gas service to un-served areas. Gas utilities can apply the funds only to economically infeasible expansions.

This legislation facilitates the development of natural gas infrastructure in remote areas of the state where the economics would otherwise preclude development. Funds can come from a surcharge imposed on existing ratepayers, supplier refunds, or other sources approved by the regulator.

Connecticut

On June 14, 2013, Connecticut's three gas distribution companies filed a plan to expand service to about 280,000 new customers over the next 10 years. The Plan is part of an effort to meet the gas expansion plans proposed in Governor Dan Malloy's Comprehensive Energy Strategy (CES). Recognizing that "conversion to natural gas promises a cheaper, cleaner, and more reliable fuel for heating, power generation, and perhaps transportation," the CES calls for an expansion of Connecticut's natural gas distribution infrastructure to increase access to natural gas to potential new residential and commercial customers across the state over the expansion period.

To allow for this expansion, the CES includes consideration of societal benefits in economic modelling and a unique system expansion rate to recover a portion of the expansion driven revenue requirements from existing customers. New customers as of January 1, 2014 will be placed on a different rate schedule that, in effect, will have all its distribution rates increased by a pre-determined percentage amount. The percentage will be set in order to allow each class of customers to retain the majority of the differential between oil and gas prices. In this manner, the proposal allows new customers to recoup their initial investment over time, while still contributing a significant amount towards the cost of the necessary expansion of the gas system.

ONTARIO CAN ENSURE THE CONNECTION OF THOUSANDS OF ONTARIANS WITH THE STROKE OF A PEN

The Ontario government should examine options and implement time limited solutions (for a period of five years) appropriate to specific circumstances to allow rural communities to be supplied with natural gas. This rural community economic development will benefit the entire economy as communities become more self-sustaining. A barrier to local economic development would be removed, and annual energy savings of up to \$40 million would be injected into the local economies. It is also a province-building strategy, providing energy choice for all Ontarians. Options include a combination of the following measures:

Direct Government Capital Contribution

The province could provide a direct financial contribution to the projects recognizing the economic development potential that the pipeline would bring to the community. For example, a commitment of \$200 million over 5 years would enable expansion to as many as 40,000 homes and businesses in over 40 towns and villages.

Provide direction to the OEB

The Ontario government could direct the Ontario Energy Board to treat new natural gas connections as network assets to allow for some greater level of cross-subsidization of expanding the network from existing utility gas customers to new customers in rural regions. This would be consistent with practices observed in jurisdictions such as Minnesota and Nebraska, where expansions can be bundled and funded through the full rate base. Any crosssubsidization model should keep impacts on existing customers minimal (approximately 1% or \$3.50/year for residential customers).

A tax based approach

The province could make a change in tax regulations that would allow municipalities to voluntarily forego pipeline related property taxes until such time as total economic contributions required for a project have been collected.

Extension of Local Improvement Charges

The province could support and promote the use of Local Improvement Charges in order to help municipalities finance their contribution to the expansion project even though the community and the customers would not own the pipeline asset. This mechanism could be used to fund both a municipal and a customer contribution to the projects.



Fueling Ontario's Economic 35 Renaissance through Natural Gas

FOURTH BOLD PLAY: EXPANDING SUSTAINABILITY THROUGH COMBINED HEAT AND POWER

THE OPPORTUNITY

Combined Heat and Power (CHP) is the simultaneous production of electricity and heat from a single fuel source⁷⁵. As an integrated energy system that can be modified depending on the needs of the energy user, CHP ensures superior power quality and reliability while avoiding unnecessary electricity transmission and distribution infrastructure builds. CHP plants are an energy efficient way to produce electric and thermal energy – excess outputs of heat can be used in adjacent buildings, while excess electricity can be sold⁷⁶.

The wider utilization of natural gas CHP systems would strengthen and secure Ontario's electricity system, better serving industry through increased energy security and relieving pressure on the grid. When considered alongside the rising price of electricity, installing natural-gas CHP systems are a cost-efficient means by which businesses can manage energy costs. The use of low-priced natural gas, rather than other energy sources, reduces input costs significantly, while the ability to use excess outputs enables producers to recuperate more of the costs of energy production and significantly increase efficiency. Should the government pursue CHP projects, it would relieve critical pressures on the grid while creating more impetus for businesses to locate in Ontario. Doing so will also help improve the competitiveness of energy-intensive businesses such as greenhouses.

WHY IT MATTERS TO ONTARIO

CHP can play an important role in meeting Ontario's energy needs, positively impacting local economies and supporting Ontario's policy goals. CHP systems can be used in a variety of ways, ranging from the residential scale to large-scale industrial systems⁷⁷. Common applications include:

- Industrial: chemical, pulp and paper, metallurgy, heavy processing, oil refining;
- Critical infrastructure: emergency services facilities, hospitals, water and wastewater treatment plants;
- Institutional: retirement homes, research institutions, government buildings;
- · Commercial: hotels, airports, office buildings; and
- District energy: colleges and university campuses, urban centers, military bases⁷⁸.

A number of CHP projects developed in Ontario were driven by the need to increase power reliability and local energy generation. Recent CHP installations include the Windsor Casino (12 MW); the West End Community Centre in Guelph (0.2MW); London Health Sciences (11MW) and the Ferrero Canada in Brantford (5MW; currently under construction)⁷⁹.

BENEFITS OF CHP



Reduced costs and increased competitiveness for businesses. CHP systems help to reduce overall costs and increase business competitiveness for industry and institutions by enabling them to purchase electricity and heating jointly, rather than separately. In this way, CHP systems increase energy efficiency and improve cost management⁸⁰.

Not only do CHP systems offset the capital costs typically associated with the installation of boilers or chillers in new industrial construction, they also recapture the thermal energy emitted during electricity generation that would otherwise be wasted as byproduct⁸¹. In this, CHP systems provide significant savings to industrial users, eliminating the 4-9% of energy lost during conventional electricity generation and transmission.

Energy System Security

CHP systems would enhance energy security by reducing Ontario's energy requirements, and helping businesses be more durable in the face of energy price volatility and potential supply disruptions⁸². By allowing businesses and critical infrastructure to remain online in the event of outages, CHP systems deliver energy security not offered by the grid; furthermore, they increase the resiliency of energy infrastructure by limiting congestion and offsetting transmission losses⁸³.

Increased Energy and Environmental Efficiencies

As CHP systems produce fewer CO2 emissions and other pollutants approximately 30% fewer CO2 emissions than a combined-cycle natural gas plant⁸⁴ – using CHP systems would help to advance the government's climate change and environmental initiatives in Ontario. Moreover, the integrated nature of CHP systems improves energy efficiency by recovering thermal energy that is normally expended in generation.

CHP systems also reduce the need for distribution infrastructure, as they localizes electricity and heat into one system. This helps to reduce general infrastructure investment from the province, and provides locally generated electricity which can be used to address urban supply constraints.

While CHP holds strong economic and environmental promise, the Ontario Power Authority (OPA) seems to have frozen its Standard Offer Program (CHPSOP). The Ontario Power Authority (OPA) seems to have frozen its CHP Standard Offer Program (CHPSOP). In 2010, the OPA received a directive from the Minister of Energy authorizing the procurement of individually negotiated Combined Heat and Power (CHP) projects greater than 20 megawatts (MW) in capacity. Since then, CHPSOP has only made two awards and there are currently 42 applicants on hold⁸⁵. The new directive related to CHP for greenhouses is a positive development, but there are further opportunities in CHP that are not being realized. CHP development is also complicated by the lack of a

standardized, transparent process at the LDC level for the Connection Impact Assessment required for any potential CHP project. This assessment establishes the safety and operational impacts of a customer's cogeneration plans on the LDC distribution system. Without a transparent process, potential CHP projects are subject to issues around response times, prioritization of requests, and fairness⁸⁶.

Lastly, CHP development is hampered by the lack of a stand-by rate which establishes a fair system charge to those not connected to the grid⁸⁷. While a stand-by rate is in the process of being developed by the OEB, until it is an appropriate rate is implemented, it will remain a policy barrier to CHP projects in Ontario.



OTHER JURISDICTIONS RECOGNIZE THE VALUE OF CHP PROJECTS

A number of jurisdictions are realizing the value of CHP projects and their ability to provide significant energy, energy system and environmental benefits. In the U.S., achieving greater use of CHP is consistent with President Obama's Executive Order 13626 – Accelerating Investment in Industrial Energy Efficiency, which calls for 40 new gigawatts of cost-effective CHP by 2020. Currently, the chemical industry in the U.S. has the largest share of CHP capacity at 29%, followed by the petroleum industry at 18%, and the pulp and paper industry at 14%⁸⁸.

The United States Environmental Protection Agency (EPA) has developed a CHP Partnership, which seeks to reduce the environmental impact of power generation by promoting the use of CHP⁸⁹. The Partnership works closely with energy users, the CHP industry, state and local governments, and other clean energy stakeholders to facilitate the development of new projects and to promote the environmental, economic and benefits of CHP. This partnership includes partner facilities in the industrial, commercial, district energy and institutional sectors, as well as project developers and equipment suppliers. Other relevant stakeholders include end users of CHP technology, financiers, utilities and other organizations that promote distribute degeneration⁹⁰. In 2012, the EPA CHP Partnership has more than 440 Partners dedicated to promoting and installing CHP, assisting 770 CHP projects and representing 5,700 megawatts (MW) of new CHP capacity⁹¹.

Here in Canada, two workshops have been held to discuss CHP. Early last year Alberta held a workshop hosted by the Canadian Gas Association and facilitated by Alberta-based C3. The workshop engaged representatives from provincial and municipal governments, utilities, technology providers and developers on the potential of CHP for Alberta. The participants were tasked with identifying barriers, recommending solutions, and offering an action plan that would allow CHP to advance in 'MUSH' (municipal, university, schools and hospitals) organizations and the small industrial sectors⁹².

The CHP workshop concluded with a commitment from participants to work on action items to help make CHP a popular and viable option for meeting energy needs. The results of the workshop then formed the foundation for a second CHP Workshop to be held in Toronto in the fall of 2013⁹³. At the workshop, participants reviewed a step-by-step approach to develop a successful community energy plan and deploy district energy.



POLICY CLARITY CAN UNLOCK THE POTENTIAL OF CHP SOLUTIONS

Ontario can increase the efficiency and sustainability of the electricity system by facilitating the utilization of CHP technologies. In order to do so, the government should:

Provide direction to the Ontario Power Authority (OPA) regarding Combined Heat and Power Standard Offer Program applications

The government should encourage the OPA to release the hold on the CHPSOP applications submitted in 2011 and begin awarding contracts for CHPSOP projects capable of connecting to the grid⁹⁴.

Standardize Local Distribution Companies' Connection Impact Assessments

The Ministry of Energy should develop a standardized process for the Connection Impact Assessment that is completed by LDCs to ensure a timely, fair and transparent process for approving CHP projects⁹⁵.



Work with the OEB to establish a fair and equitable stand-by rate

The OEB should establish a stand-by rate that is fair and equitable to ensure that CHP projects are not penalized for being off the grid. A key condition for the economic viability of CHP is that the avoided costs of purchasing electricity from the grid be greater than the capital and operating costs involved in building the facility. Although a customer may generate all or most of its electricity requirements with CHP facilities located on its own premises, it must have access to affordable standby services from the local utility grid. Excessive standby rates and other charges can upset this balance by adding to operating costs, negatively impacting the economics of CHP systems. The stand-by rates established by the OEB should be based on the following principles:

1. Contract demand or reservation charges should be small in relation to the variable charges for peak demand and energy;

2. Contract demand or reservation charges should be designed to reward customers for maintaining and operating onsite generation by giving them a strong incentive to use electric service most efficiently, to minimize the costs they impose on the system, and to avoid charges when service is not taken;

Increase government-industry coordination of CHP initiatives

The Ontario government should undertake efforts to increase coordination and knowledge of CHP initiatives, such as providing assistance for candidate sites by connecting entities looking to convert to CHP to industry partners, such as project developers and equipment suppliers. The U.S. EPA CHP Partnership performs this coordinating service in the United States; similarly, the Ontario government could help promote the use of private sector partnerships for CHP project assistance.





FIFTH BOLD PLAY: FUELING THE RING OF FIRE USING NATURAL GAS

THE OPPORTUNITY

The Ring of Fire is one of the most significant mineral regions in the province, and includes the largest deposit of chromite ever discovered in North America. Five hundred and forty kilometres northeast of Thunder Bay, the region is estimated to contain between \$30B and \$50B worth of minerals⁹⁶, providing jobs for decades to come.

Unfortunately, declines in commodity prices and the high costs of extracting the resources from the region are challenging the economics of developing the finds. Processing chromite and other minerals is extremely energy intensive. Rising fuel costs and difficulties in securing reliable and affordable electricity in an extremely remote region of the province are contributing to these high production costs.

Affordable, flexible and efficient energy can be part of the solution, helping to unlock the Ring of Fire by making production and processing affordable. The delivery of reliable, affordable natural gas in large volumes to this previously inaccessible region could act as a major catalyst for the large-scale transformation of a region with great economic potential for Ontario⁹⁷. It would also be more sustainable than the currently contemplated alternative – subsidized electricity.

WHY IT MATTERS TO ONTARIO

The Ring of Fire represents the greatest economic development opportunity for northern Ontario in several generations.

Currently, approximately 27,000 Ontarians are directly employed in metal mining, and 50,000 Ontarians are employed in jobs associated with mining processing⁹⁸. The mining sector is also the largest private sector employer of Aboriginals in Canada. Tapping into this opportunity would create jobs and economic prosperity in Ontario for decades⁹⁹.

Furthermore, the Ring of Fire is a tremendous investment that will bring tangible benefits for Thunder Bay and other communities in the Northwest, including First Nations communities in the Ring of Fire itself.

Electricity needs will grow as mining within the Ring of Fire develops, and natural gas can meet these demands as an affordable and abundant fuel. Natural gas electricity generation or cogeneration can be built quickly, at the scale required and where needed, avoiding the need for new electricity transmission capacity. Ontario's advantage not only lies in having access to plentiful and affordable natural gas throughout the province, but also in having a modern and robust storage and transportation network, which creates a unique regional competitive advantage in the north.

THE RING OF FIRE CANNOT BE AN OPPORTUNITY LOST

Slumping commodity prices, environmental quest and delays threaten the Ring of Fire. A primary reason for the delays surrounding the Ring of Fir and other northern development projects is the unpredictability of future electricity costs, as well as a lack of infrastructure.

New energy infrastructure for the Ring of Fire is desperately needed to help ensure predictable energy costs. Mining extraction energy use has grown149% since 1990, making this sub-sector largest industrial user of energy in Canada¹⁰⁰. Th mining sector is extremely energy intensive, an faces major energy obstacles prompted by risin costs, challenges in securing reliable and affordation electricity, and carbon policy developments. The challenges have already taken their toll on the O economy: in 2010, Ontario's high electricity rate caused mining giant Xstrata to move processing operations from Timmins to Quebec, taking 670 along with it¹⁰¹. Without an established, effective energy infrastructure in northern Ontario, the Ri of Fire will be nothing more than a desirable, bu unattainable investment.

The recent Cliffs proposal to develop the Ring of Fire relied heavily on subsidized Ontario electricity rates to offset the cost of energy-intensive chromite refining¹⁰². Although this may be a short-term solution, subsidization is unsustainable for long-term northern investment, and creates a significant burden on Ontario ratepayers and taxpayers. Furthermore subsidizing electricity adds to the unpredictability of energy in the province, and leads to uncompetitive electricity rates. Using natural gas as an affordable means of reducing fuel costs and increasing energy sustainability in the north will help to ensure that the Ring of Fire is a successful part of the Ontario economy.

•	the value that affordable natural gas brings to the
	development of mining sectors. In 2010, a report
	published by the Yukon Government's Department
stions	of Energy Mines and Resources identified that the
. \	Yukon's energy requirements might soon surpass its
ire	existing renewable energy particularly if new mines
	become operational ¹⁰³ Citing the uppredictability
ell	of future discal fuel prices, the report expeluded
	that natural and acuid react the Vulcer's projected
	that hatural gas could meet the rukon's projected
5	energy requirements for decades, and would be a
future	low-capital, environmentally responsible alternative
5	to other fuel sources ¹⁰⁴ . Since the publication of this
r the	report, the Yukon government has made changes to
ne	the Yukon Oil and Gas Act to allow for the handling,
d	storage and vaporization of natural gas, and is
ig fuel	planning to replace a number of diesel power
able	generators with LNG ¹⁰⁵ .
ese	
Ontario	In addition to being used as an alternative to diesel
S	for Yukon's energy grid, this natural gas resource will
q	be used off-grid by mining companies that are too big
) iobs	or too far away to access Yukon's energy power ¹⁰⁶ .
e	
ina	After almost a decade of paying the highest energy
ut	costs in South America, copper miners in Chile are
	analyzing the use and consumption of shale gas in
	their processes. Chile is particularly short of power
of Fire	in its northern regions, where much of the mining
ates	sector is located. The International Energy Agency $\!$
	(IEA) recently published a report stating that Chile has
lution	the third largest reserves of the unconventional fuel
thern	in South America ¹⁰⁷ . Chile has recognized the value
	of securing domestic sources of natural gas, and the
	Ministry of Energy is currently in discussions with a
tv	number of companies regarding the establishment of
cy Atitiva	special petroleum operation contracts. Chile has also
	requested to purchase Canadian LNG to help grow its
DIE	mining industry through affordable natural gas.
eryy	- · · · ·

A number of other juriedictions have recognized

ONTARIO CAN SHIFT THE ENERGY PARADIGM TO UNLOCK THE RING OF FIRE

In order to unlock the opportunities in the Ring of Fire, the provincial government must forge partnerships with industry. Securing the natural gas energy infrastructure necessary to fuel new economic activity is a more sustainable solution than building electricity transmission capacity and subsidizing electricity prices. It will, however, require action from the government on two key opportunities:

Establish policy promoting the use of natural gas

Provincial policy should favour natural gas as an energy source for the mining sector's high demands in the Ring of Fire. Ontario should undertake a broader view and policy discussion surrounding LNG and CNG applications for mining development, expansion and operation in northern Ontario. New pipelines or LNG/CNG hubs (as LNG can be trucked to the mine sites) could provide flexibility and prosperity to the region without the need for added and expensive electricity generation or transmission lines, and could offer widespread access and opportunity to a whole variety of northern communities and economic players.

Study the use of CNG/LNG fuelled cogeneration as an alternative to subsidized electricity to meet the energy needs of the Ring of Fire

Subsidizing electricity prices may help attract one company to Ontario, but it is not a sustainable solution, particularly if we want to exploit the vast potential of the Ring of Fire. CNG/LNG could offer an alternative solution to meet the significant energy demands of processing chromite and other minerals. This solution would avoid the need for large investments in transmission infrastructure.

It would also allow for greater flexibility, as cogeneration capacity can be developed quickly, as and where needed. Before making decisions that will subject Ontario ratepayers (including other industries struggling to compete with rivals in jurisdictions with low energy prices) to years subsidizing electricity, the government should consider the compelling natural gas alternative.





CONCLUSION: BOLD ACTION IS REQUIRED TO UNLOCK ONTARIO'S GROWTH POTENTIAL

Affordable North American natural gas is a significant competitive advantage that is already beginning to attract energy intensive industries back to North America. Ontario stands to benefit from this opportunity.

Energy is a key input for Ontario's prosperity. Energy intensive industries like petro-chemicals, steel, mining, and fertilizer production are scouring North America in search of attractive jurisdictions to expand existing production or site new operations, all because of access to affordable natural gas. The province's economic vitality - specifically, the ability to retain existing industry and business and attract new ones – depends in part on cost-competitive energy supplies, especially in relation to competitive regions in North America and internationally. Ontario's advantage lies not only in having access to plentiful and affordable natural gas, but also in having a modern and robust storage and pipeline network that creates a unique regional competitive advantage.

The natural gas price reduction is a North American phenomenon, which implies that there are major benefits to U.S. consumers and the U.S. economy. This means that the size of the U.S. economy will be increased and that U.S. price levels for almost all commodities and services will be reduced. Ontario stands to benefit from this phenomenon as well; however, Ontario requires bold action in which energy policy recognizes the role that natural gas can play to stimulate economic growth and jobs. Union Gas and others in the gas industry are doing their part to fuel Ontario's economy and seize these opportunities. Ontario must recognize and support the opportunity associated with natural gas in Ontario.

UNION GAS HAS DEVELOPED FIVE BOLD PLAYS WHERE THE UTILIZATION OF AFFORDABLE AND STABLE NATURAL GAS CAN STIMULATE GROWTH IN ONTARIO:

- Utilizing Natural Gas as a Strategic Asset to Attract Industry Making the transportation of goods and people more affordable Connecting rural families and businesses • Expanding sustainability through combined heat and power

- Fueling the Ring of Fire

Through these opportunities, the increased use of natural gas will drive job creation and retention, economic growth, prosperity and greater competitiveness. With the economic, environmental and societal benefits that will come with the increased use of natural gas, Ontario can build a better future for its residents. All it takes is leadership and a sound strategy.

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ONTARIO'S ECONOMIC RENAISSANCE FUELLED BY NATURAL GAS