



Abundant North American Unconventional Natural Gas Supplies Offer Multiple Clean Energy Options

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Unconventional Resources • Enhanced Recovery • Carbon Sequestration



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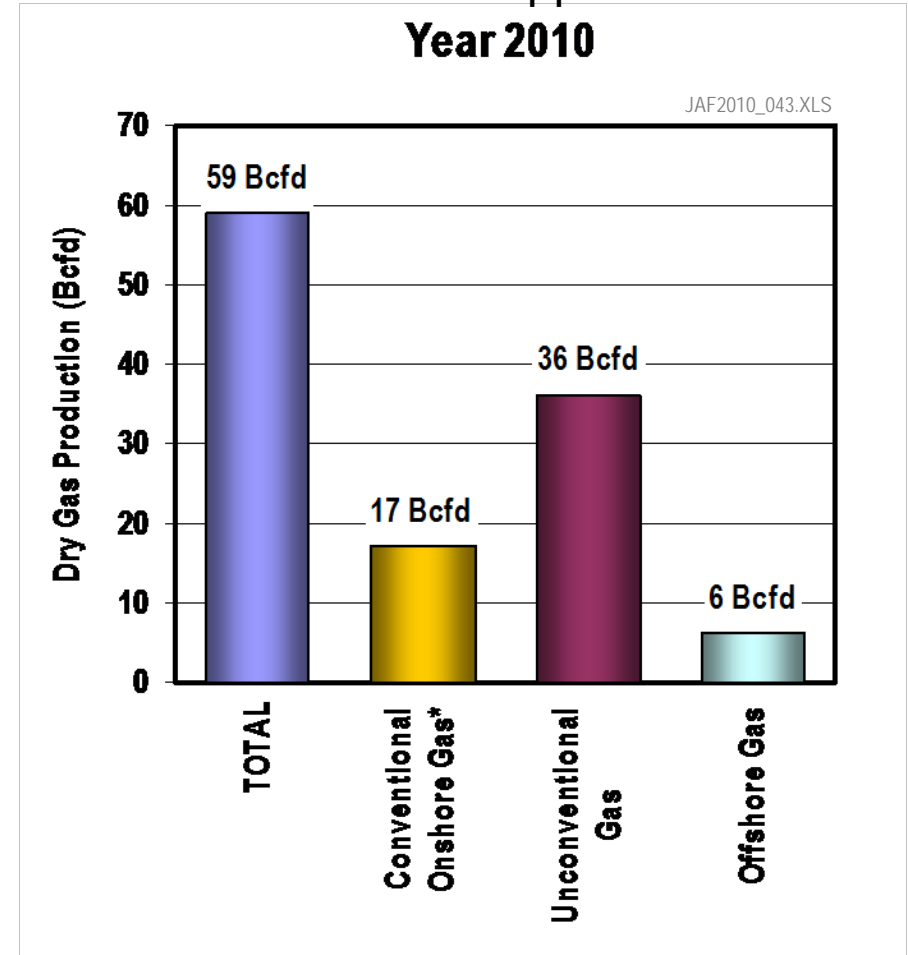
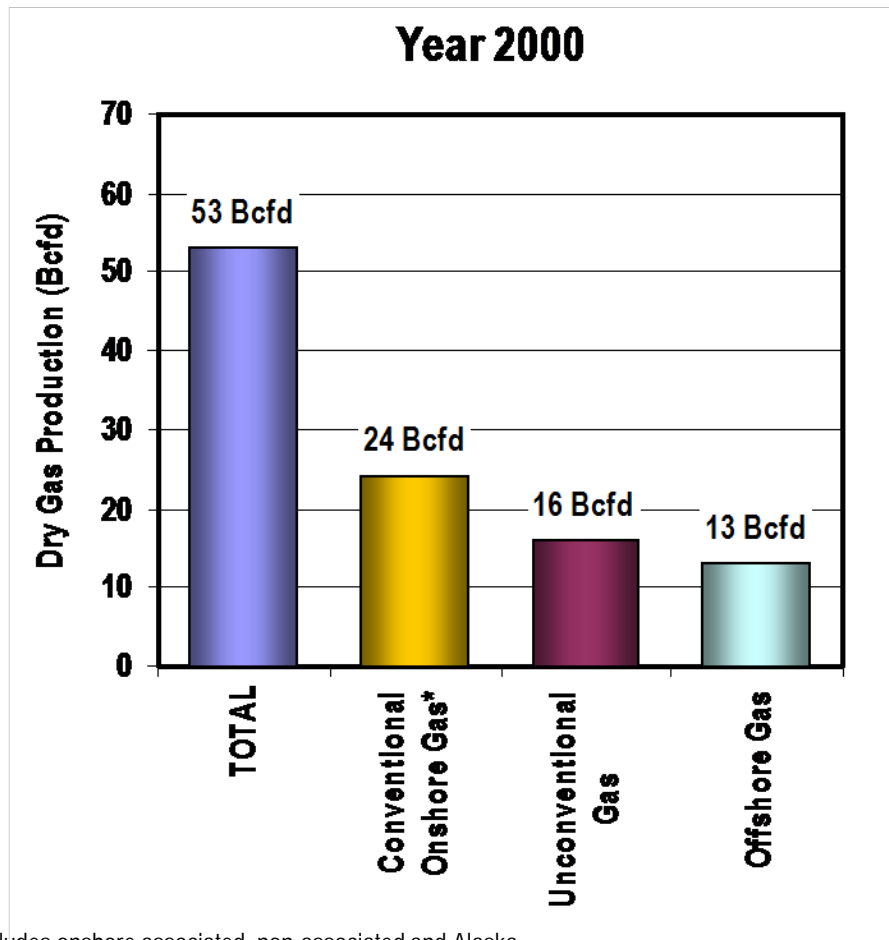
From “Fears of Shortages” to “Expectations of Plenty”

Gas shales have changed the outlook for U.S. natural gas from “*fears of impending shortages*” to “*expectations of plenty*”.

- Instead of declining, U.S. natural gas production increased, from 53 Bcfd in 2000 to 59 Bcfd this year.
- Gains in unconventional gas of 20 Bcfd more than countered declines in onshore and offshore conventional gas.
- Gas shales provide 12 Bcfd today (20% of domestic natural gas production) account for much of the 20 Bcfd of the growth.
- Today, unconventional gas provides over 60% of U.S. natural gas production.

Unconventional Gas Is Now the Dominant Source of U.S. Natural Gas Production

The 20 Bcfd growth in unconventional gas production, has more than replaced declines in U.S. conventional onshore and offshore supplies

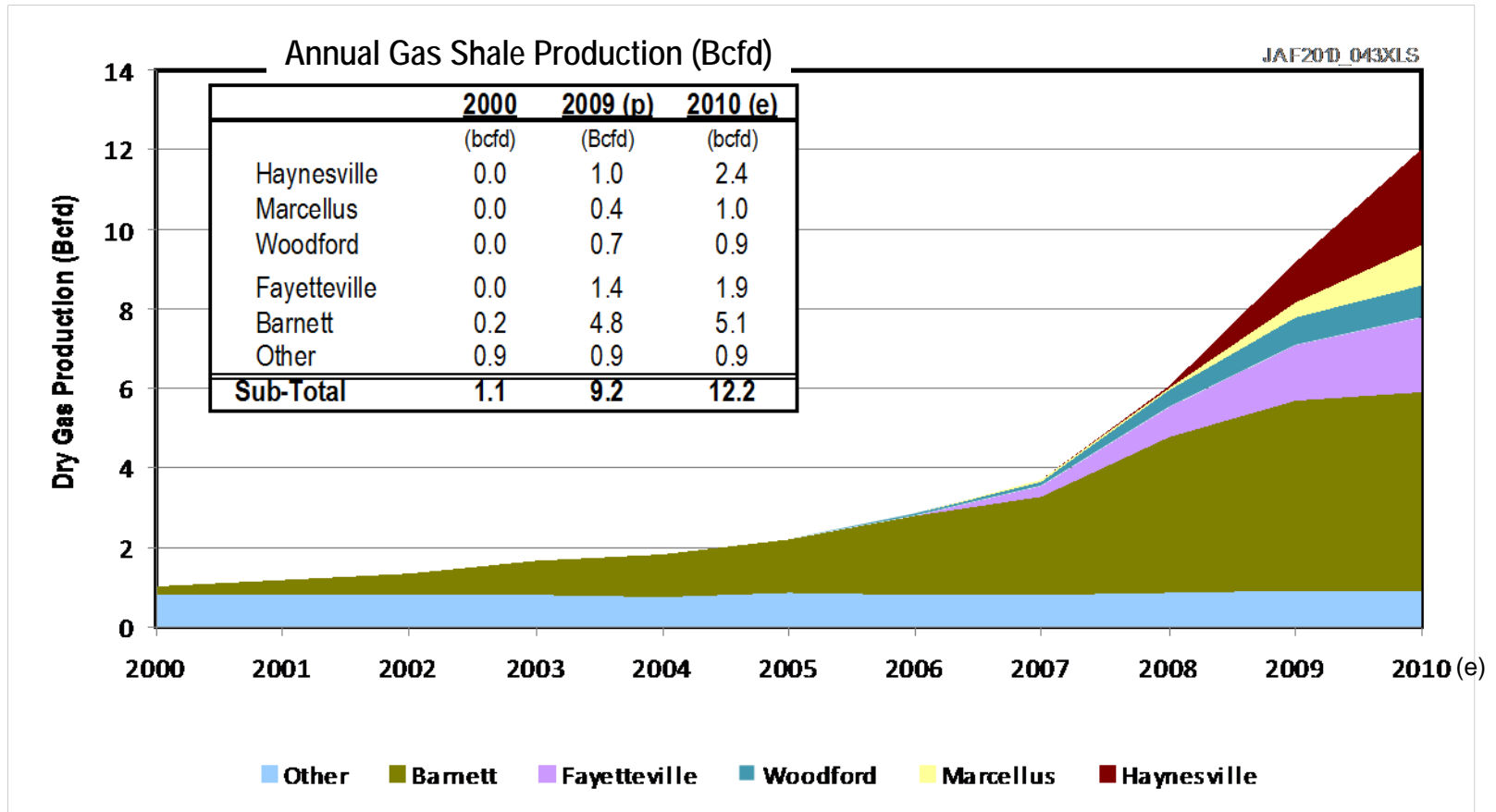


*Includes onshore associated, non-associated and Alaska.

Source: U.S. Energy Information Agency (2010); Advanced Resources Int'l (2010).

How Much Do Gas Shales Contribute Today?

Production of gas shales has grown by ten-fold and is expected to exceed 12 Bcfd, equal to 20% of U.S. natural gas production this year.



Source: Advanced Resources International (2010)



Addressing the Fundamental Questions

Projecting the impact and benefits of gas shales and unconventional gas for the U.S. requires that we first address a series of questions:

- *How large is the unconventional gas resource base?*
- *Is it large enough to enable unconventional gas to become a major climate change solution and support exports via LNG?*
- *How much of it can be converted to productive capacity at affordable prices?*
- *How much would progress in technology impact the economically affordable resource base?*
- *Can the resource be developed in an environmentally sound way?*

Understanding the impact of gas shales on the European gas markets requires addressing these same topics.

How Large is the Gas Shale and Unconventional Gas Resource?

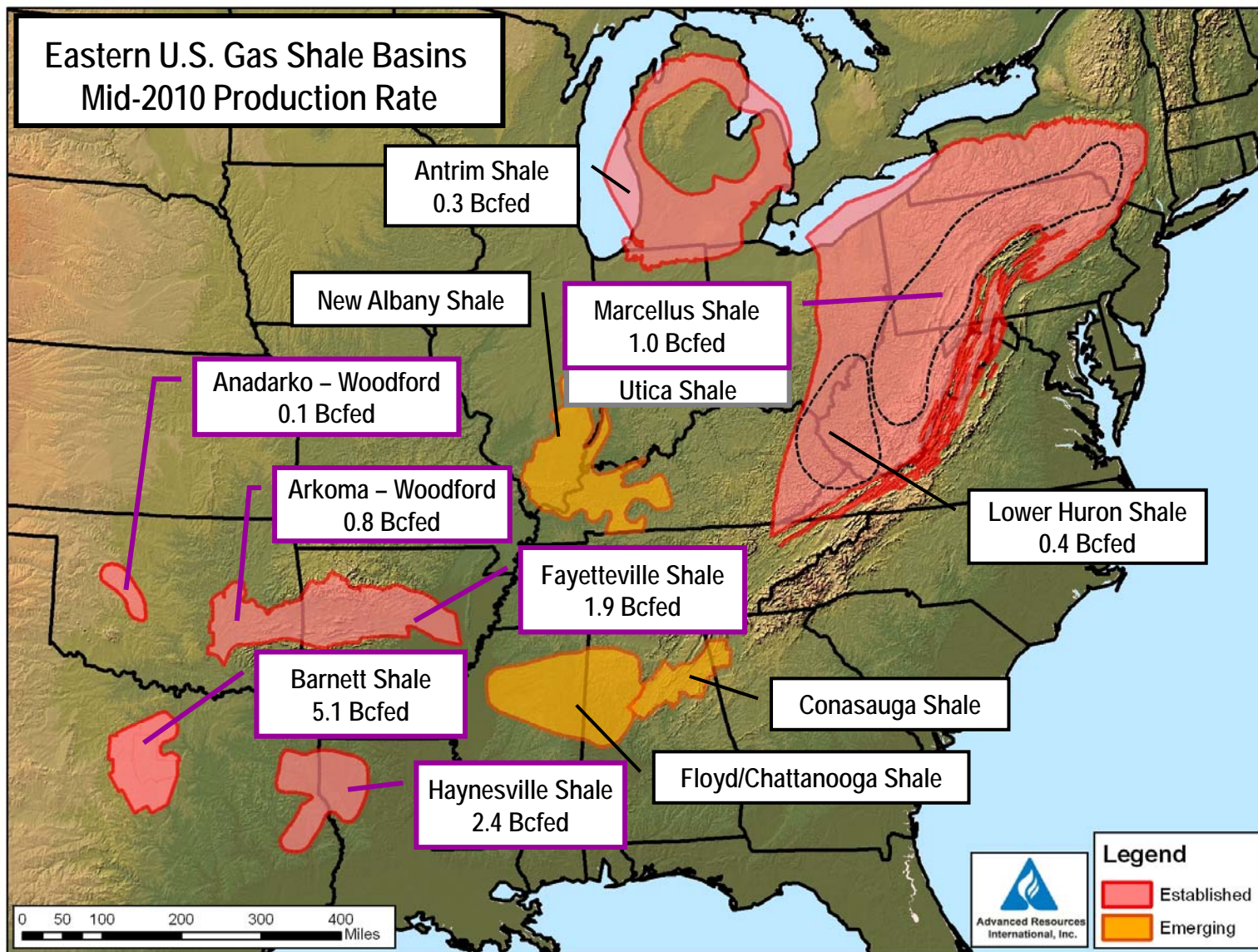
Our in-depth assessments of U.S. gas shale, tight gas sand and coalbed methane basins shows nearly 1,400 Tcf of recoverable resources.

Sources	Recoverable Resource*
	Tcf
Gas Shales	705
Tight Gas Sands	567
CBM	106

*Includes 39 Tcf of gas shales proved reserves, 96 Tcf of tight gas sands proved reserves and 21 Tcf of coalbed methane proved reserves.

In addition, the U.S. recoverable conventional gas resource base (including Alaska) is in excess of 1,200 Tcf.

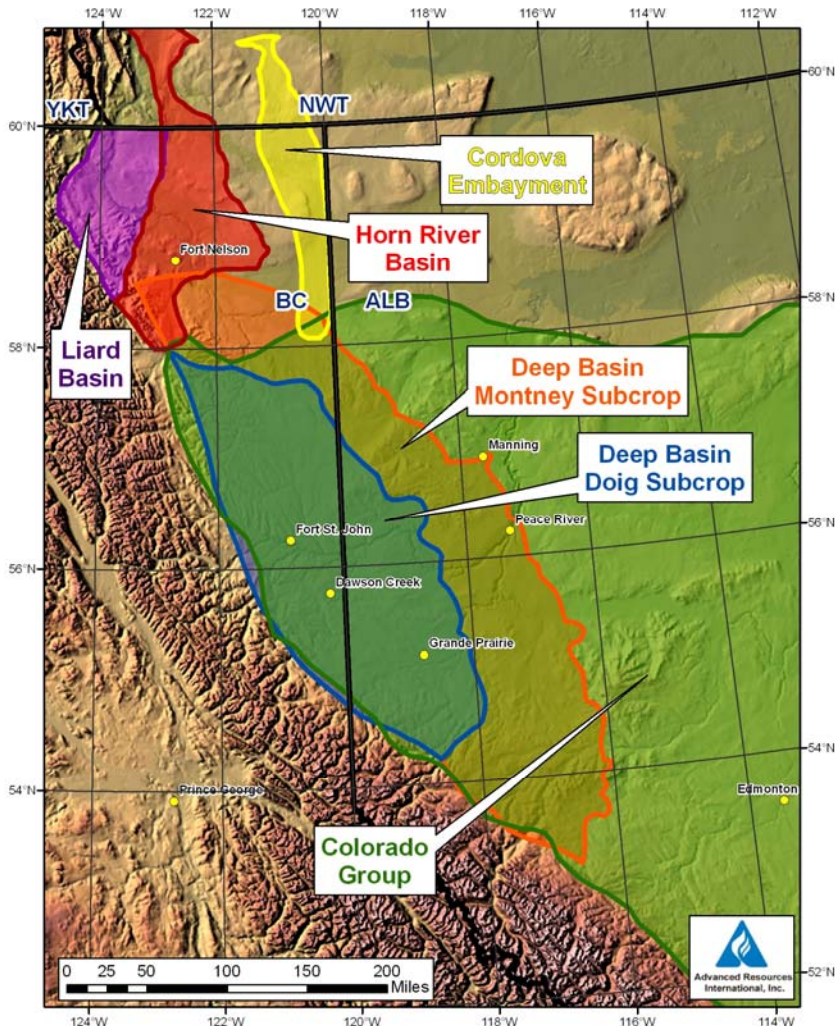
U.S. Gas Shale Basins



Source: Advanced Resources International

Canada's Emerging Gas Shale Resources

Gas Shale Basins of Western Canada



Even with recent declines, Canada is still the world's third largest producer of natural gas at nearly 16 Bcfd.

The size of Canada's proved reserves of 58 Tcf have recently stabilized.

Development of the abundant gas shale resources of Western and Eastern Canada (plus CBM and tight gas sands) can reverse the decline:

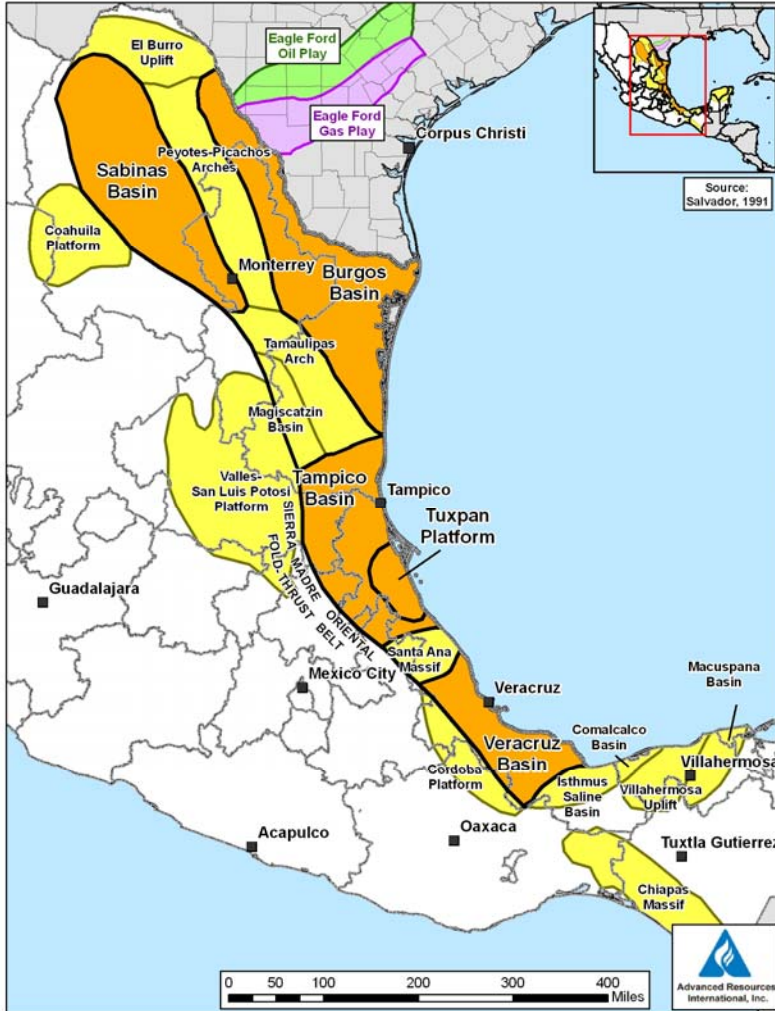
	Western Basins	Eastern Basins
	(Tcf)	(Tcf)
Gas In Place*	1,080	150
Recoverable*	290	30

*Geologically Risked

Source: Advanced Resources International

Mexico's Undeveloped Gas Shale Resources

Onshore Gas Shale Basins of Eastern Mexico's Gulf of Mexico Basin



While still an important producer, Mexico is a net importer of natural gas:

- **Production:** 4.9 Bcfd
- **Consumption:** 5.9 Bcfd

Mexico's proved natural gas reserves of 13 Tcf are modest.

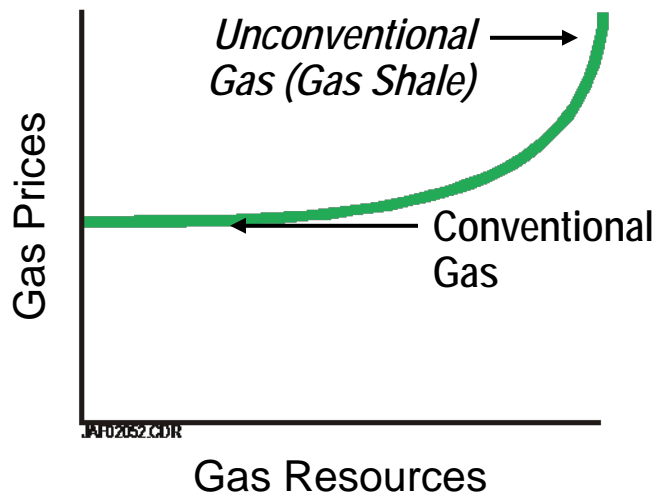
However, Mexico has major potential for new reserves from its multiple gas shale basins:

- **Geologically risked gas in-place of over 2,000 Tcf**
- **Risked recoverable reserves of over 700 Tcf (risked)**

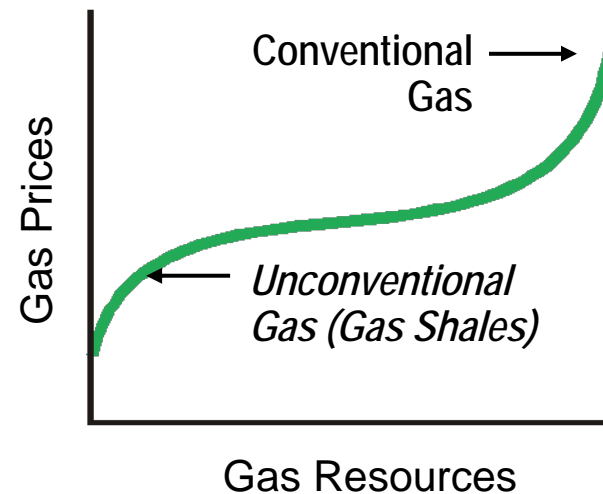
Will Gas Shale and Unconventional Gas Remain Economically Affordable?

Unconventional gas (particularly the higher quality gas shales) is today the low cost portion of the natural gas price/supply curve.

Prior Perception

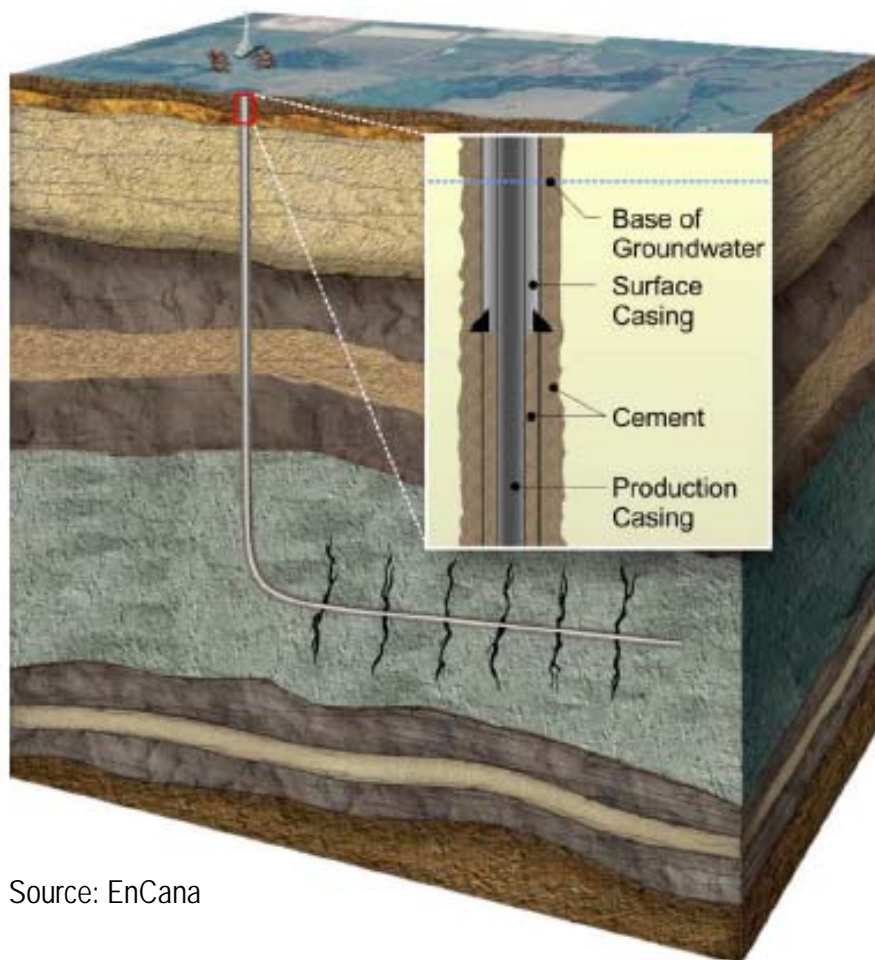


New Understanding



What Changed the Game?

Horizontal Well with Multi-Stage Fracturing



Source: EnCana

Natural gas production from shallow, fractured shale formations in the Appalachian and Michigan basins of the U.S. has been underway for decades.

What “changed the game” was the recognition that one could “create a permeable reservoir” and high rates of gas production by using intensively stimulated horizontal wells.

Role of Policies, R&D and Technology

Gas shales and unconventional gas are a R&D and policy success story:

- The DOE/NETL helped build the essential resource and science knowledge base.
- The Gas Research Institute and industry launched the early technology demos.
- Section 29 tax credits (now expired) helped attract capital and build economies of scale.

However, we are still in the early, emerging stages of having an optimum set of technologies.

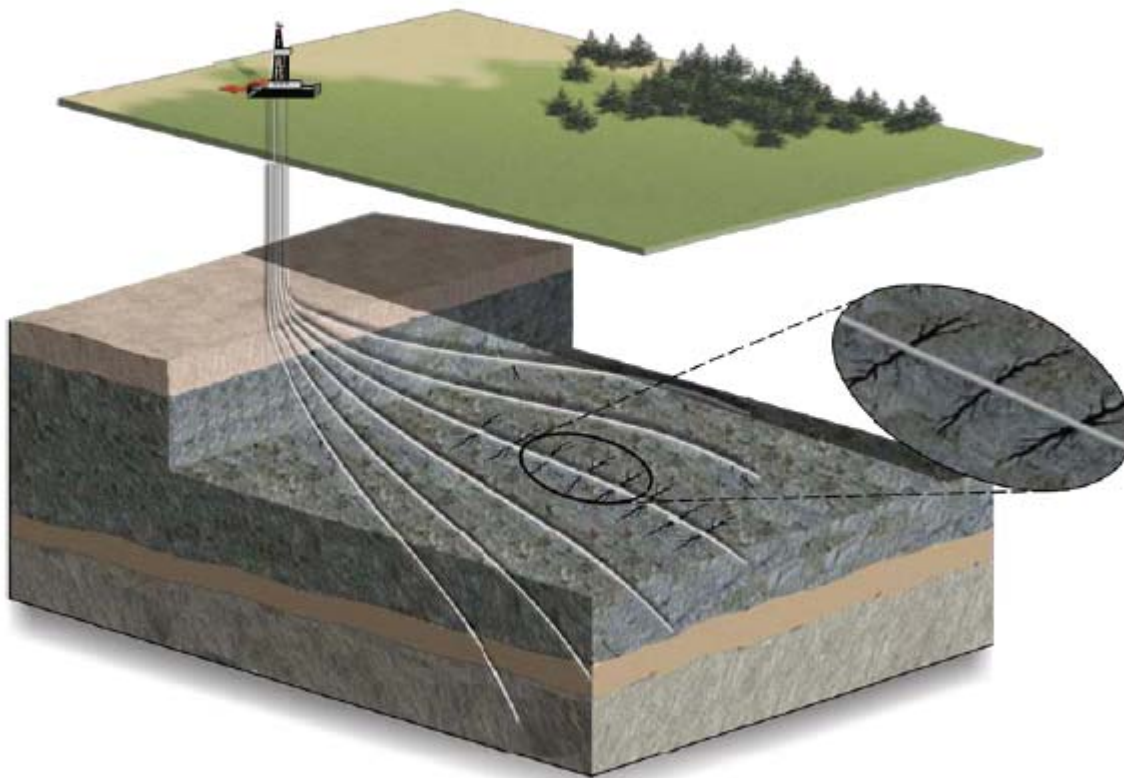
Can These New Natural Gas Resources Be Developed In An Environmentally Sound Way?

As drilling increases and production grows, a harsher spotlight will fall on natural gas. “Green natural gas development” will help put a more environmentally friendly face on this activity.

- Reducing Land Use Impacts
- Reducing Water Use and Disposal
- Capturing Methane Emissions
- Assuring Environmentally Safe Wells and Hydraulic Fractures

“Green” Unconventional Gas Development

Reducing Land Use Impacts with Multi-Well Pads and Horizontal Wells



- Multi-well pad drilling reduces land use impacts and rig mob/demob time.
- Operators can save \$100,000 to \$200,000 per well by using multi-well pad drilling.

Source: Canadian Association of Petroleum Producers, 2010

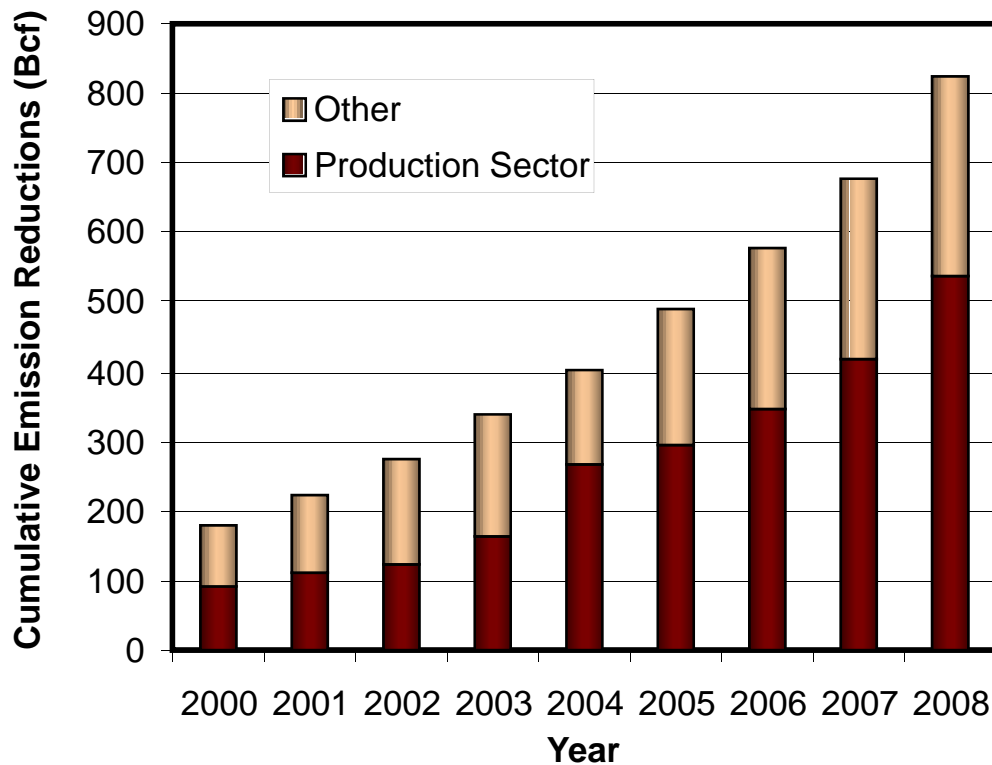
Reducing Water Use and Disposal



- The simplest and most economic option for reducing water use and disposal is recycling the produced frac water.
- Doing so can save up to \$200,000 per well and avoid 1,000 water trucks on the road.
- Recycling the produced water may involve modest treatment to remove suspended solids, iron sulfide, and scale forming materials.

Reducing Methane Emissions

Cumulative Methane Emission Reductions by EPA Natural Gas STAR Partners (2000-2008)

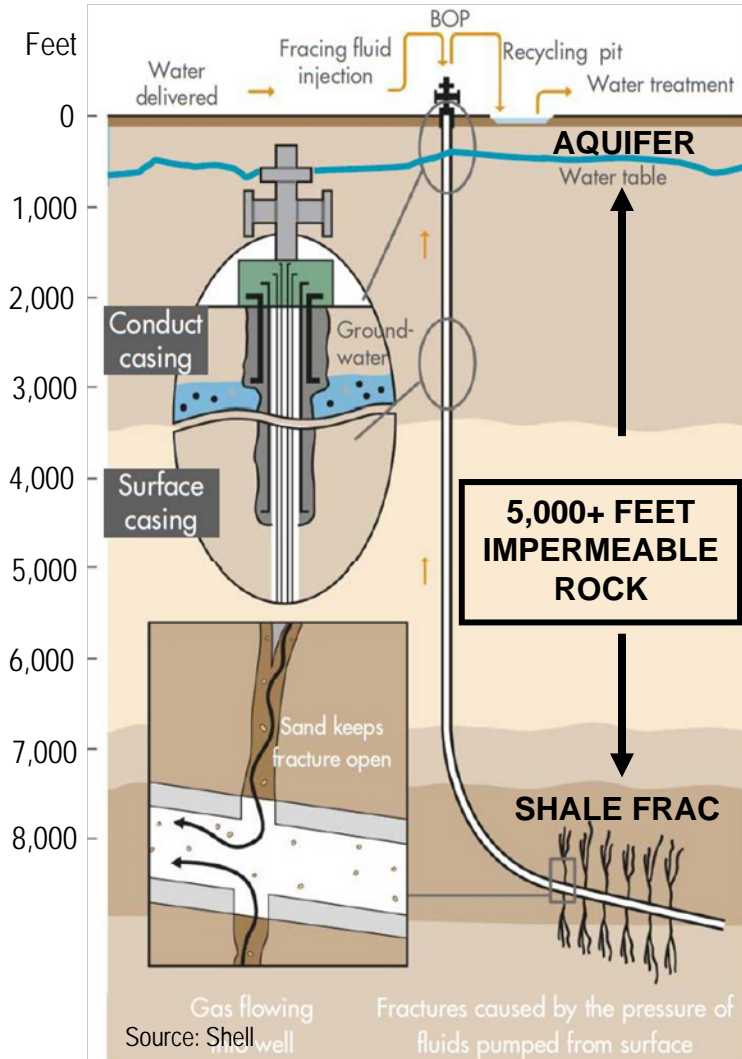


- Since 1990, Natural Gas Star partners have eliminated over 500 Bcf of methane emissions from the oil and gas production sector.
- Williams reports 24 Bcf of methane emissions captured with costs of \$17 million and revenues of \$159 million.

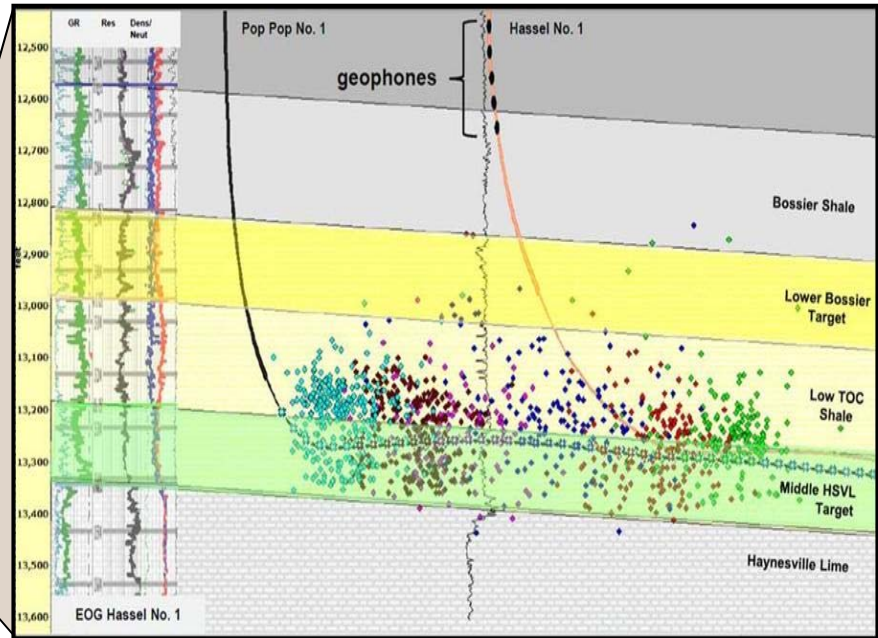
Source: U.S. Environmental Protection Agency (www.epa.gov/gasstar/accomplish.htm)



Properly Designing the Well and Monitoring the Frac



- The well is designed with steel casing and cement to protect groundwater aquifers.
- The shale interval is 5,000 to 10,000 feet below the water table, protected by unfractured strata.
- Real-time micro-seismic monitoring reveals that the fractures remain in the shales, deep underground.

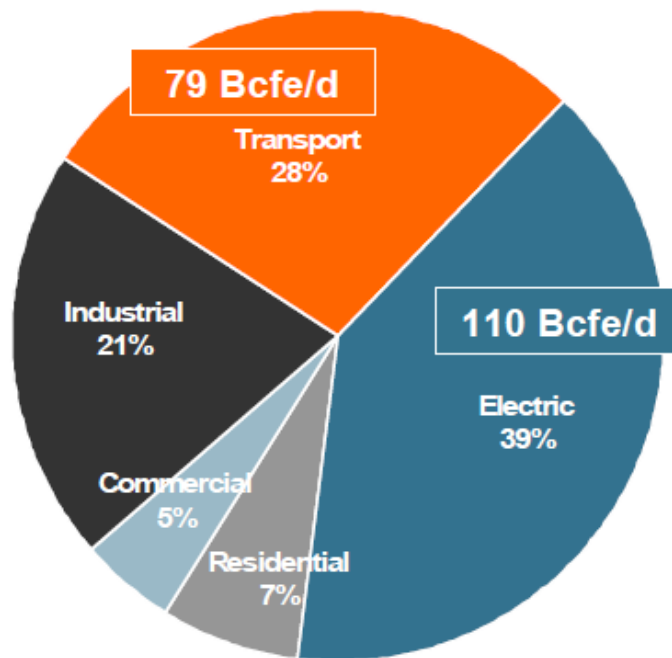


Source: EOG

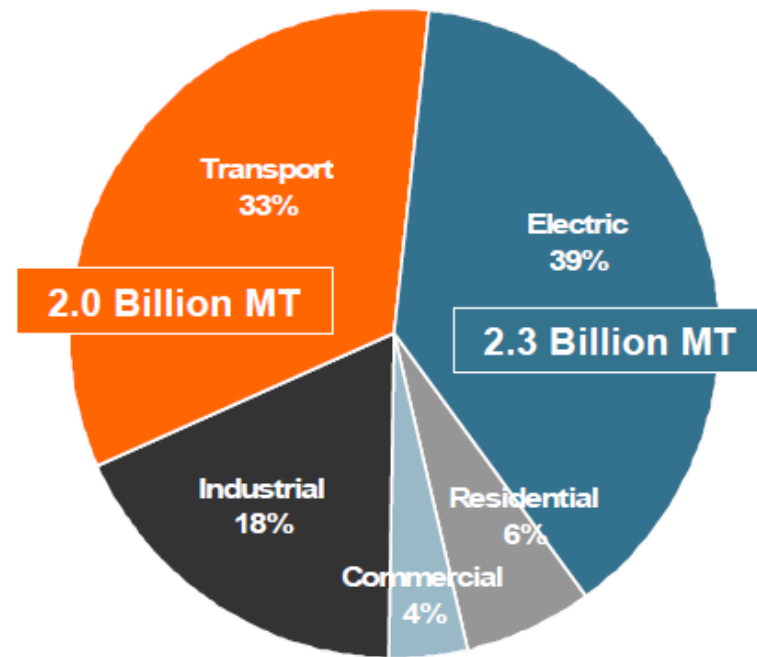
Natural Gas as the Economically Competitive Climate Change Mitigation Option

Electric Power and Transportation Sectors Account for the great majority of U.S. and Canada CO₂ Emissions

Input Energy Consumption
(281 Bcfe/d)



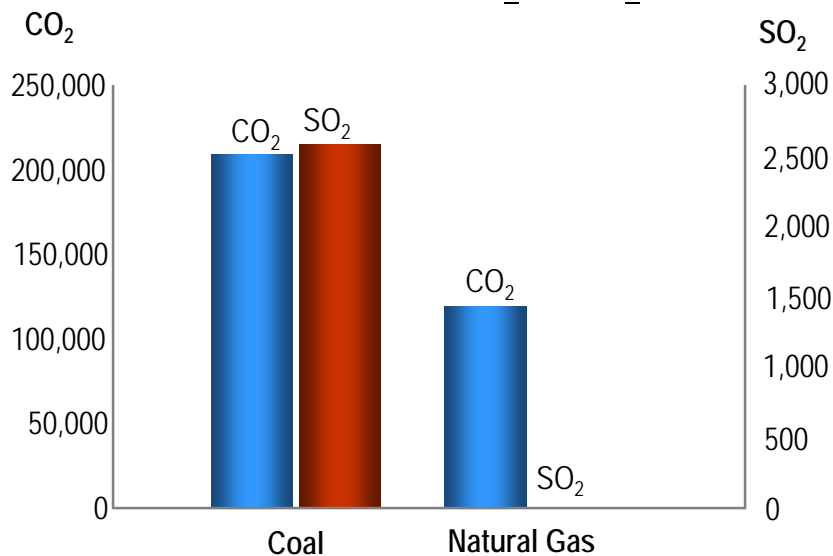
Annual CO₂ Emissions
(6.1 Billion Metric Tonnes)



Source: EIA AEO 2010 preliminary release, CANSIM, Environment Canada, EnCana

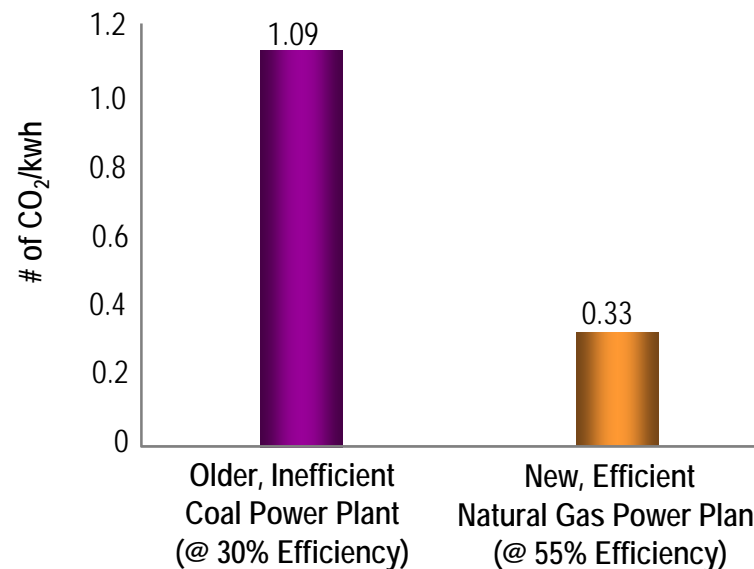
Natural Gas is a 70% Climate Change Mitigation Option for the Power Sector

CO₂/SO₂ Emissions by Fuel Type (lbs of CO₂ & SO₂/BBtu)



Source: EnCana 2009

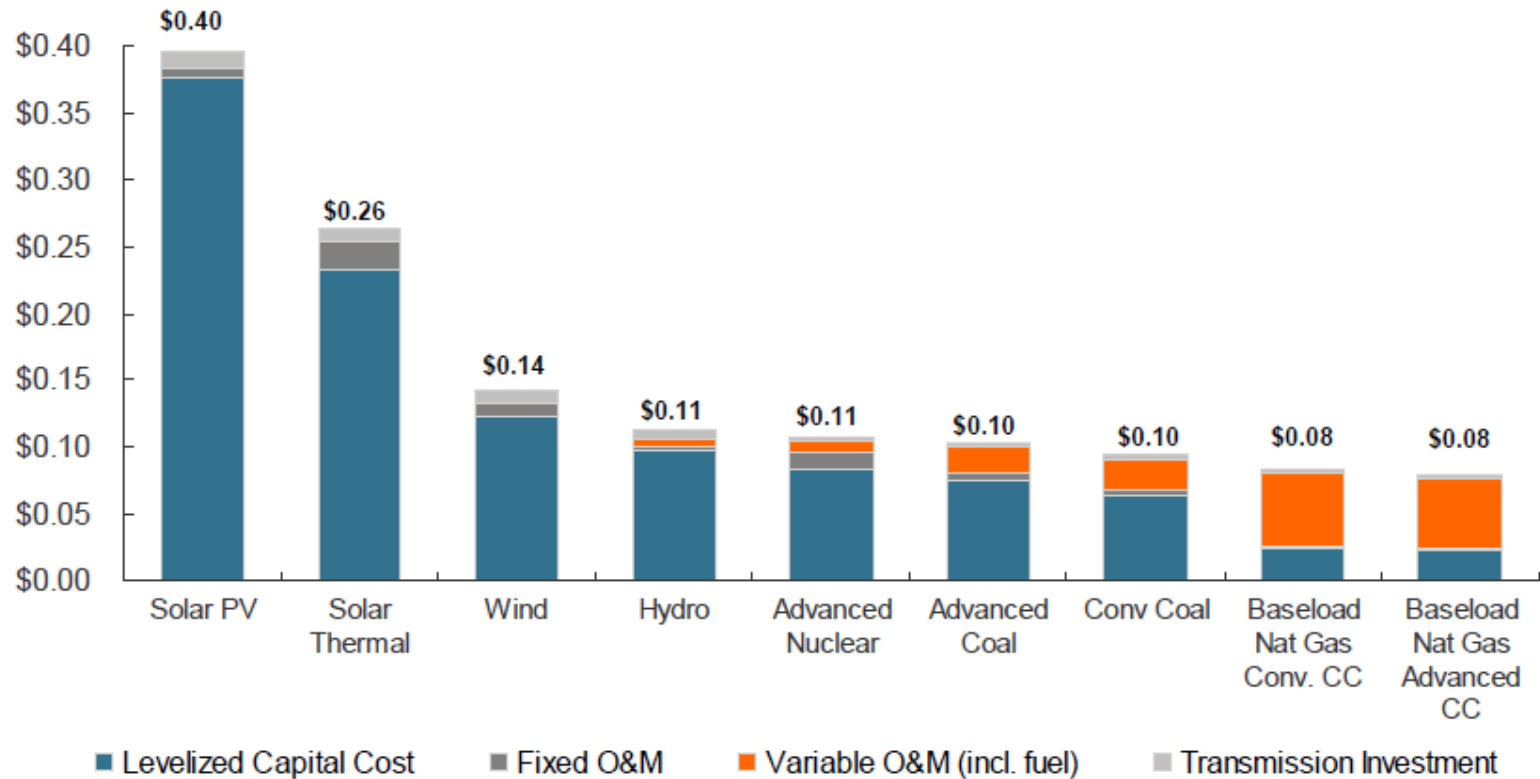
CO₂ Emissions for Electricity (lbs/kwh)



Natural Gas is the Least Cost Option for New Power Generation

Average Cost for Plants Entering Service by 2016

US\$/kWh



Source: EIA Annual Energy Outlook 2009, EnCana



Concluding Remarks

Our work to date shows that North America has large resources of gas shales and other unconventional gas. The challenge is to convert these resources into economical reserves.

With “green development practices”, these resources can be developed in an environmentally sound way.

Bountiful supplies from gas shales and unconventional sources can provide many benefits:

- Promote progress on climate change by substituting natural gas for coal in old, inefficient power plants.
- Increase energy security by replacing imported petroleum for transportation with CNG and low emission power for electric cars.
- Improve the economy from lower energy costs, more domestic jobs and an improved trade balance.



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