Natural Gas From Shales Will Permanently Change U.S. Energy Supply For The Better

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Jefferies

U.S. Energy Outlook At This Moment

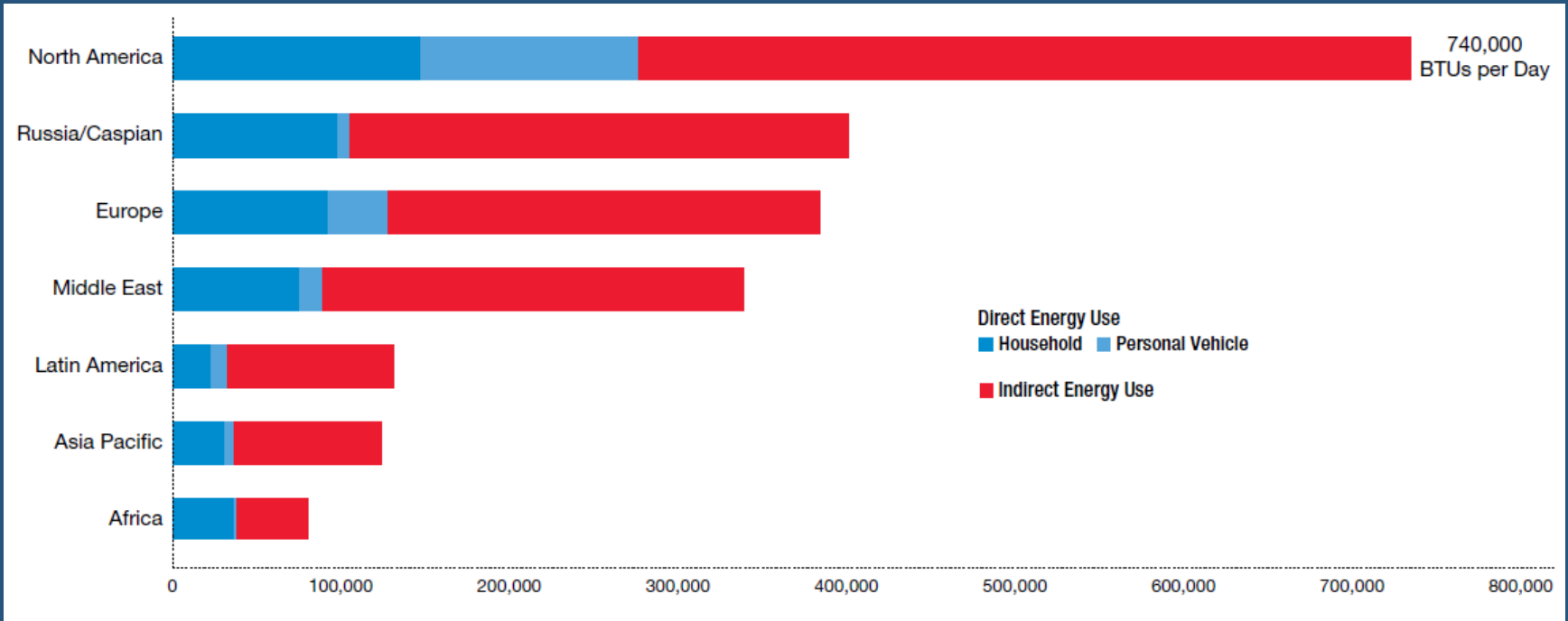
- Worldwide oil prices expected to rise with demand growth from China and India, and improving worldwide economy
- U.S. natural gas prices relatively low due to surge of new sources of gas from shales
  - A few years ago U.S. had 10 years of known natural gas reserves, we now have 100 years of supply
  - Natural gas developments are competitive with other energy sources
    - Very achievable to substitute natural gas for imported oil for transportation and coal for power
    - Gas is cheaper and cleaner than oil and coal
    - Gas can be developed in U.S. creating jobs, growing tax base, providing secure supply and fixing trade imbalance

U.S. Energy Outlook At This Moment

- All the world's largest energy companies recognize the importance of U.S. natural gas and are investing in it
- Our politicians are finally recognizing these attributes and beginning to talk positively about natural gas
  - Gas makes positive CO_2 impact
  - Gas can augment solar and wind when the sun doesn't shine and wind doesn't blow
- Gas is in the U.S. and its development creates jobs and provides a secure supply
- Converting natural gas into a well accepted new source of supply will require cooperation between industry, local and national politicians, regulators and the public

Worldwide Energy Picture

Daily Energy Use (Btus per Person)



- Population - 0.9% average growth per year, 2005 - 2030
- GDP - 2.7% average growth per year, 2005 - 2030
- Energy Demand - 1.2% average growth per year, 2005 - 2030
- Other countries aspire to North American/European standard of living
- Pay close attention to Asia Pacific

Source: ExxonMobil, "Outlook for Energy: A View to 2030"

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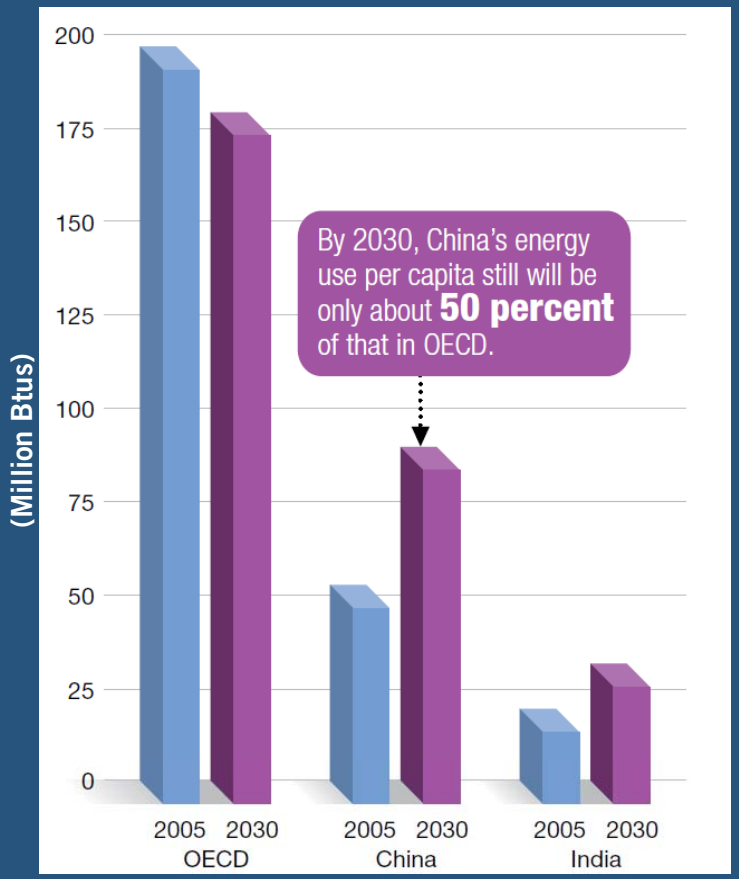
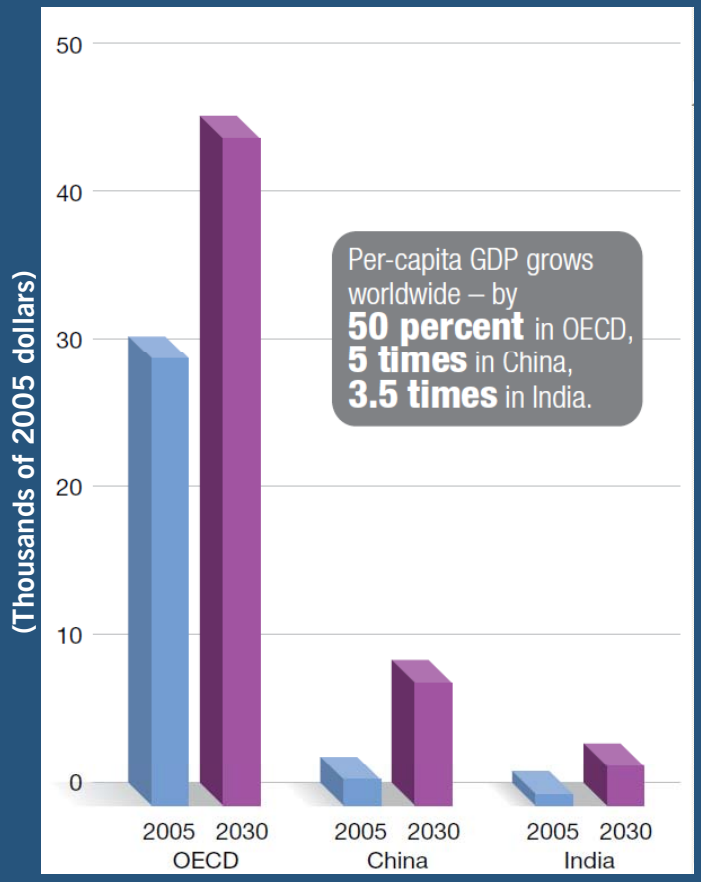
China & India Drive Energy Demand through 2030

Energy Use per Capita
OECD vs. China & India



GDP per Capita
OECD vs. China & India



- Both have relatively low energy use, but huge expected growth
- Everyone wants comfortable housing, automobiles, air conditioning/heating and the ability to buy essentials (and non-essentials)

Source: ExxonMobil, "Outlook for Energy: A View to 2030"

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U.S. Dependence on Imported Oil

Current U.S. Demand	19.0 million barrels per day
All Imports	9.1 million barrels per day
Total OPEC Share	4.5 million barrels per day
Total Non-OPEC Share	4.6 million barrels per day

Major Suppliers		Million Barrels Per Day (2010 Average)
	Canada	2.0
	Mexico	1.1
	Saudi Arabia	1.1
	Nigeria	1.0
	Venezuela	0.9
	Iraq	0.4
	Angola	0.4
	Colombia	0.3
	Algeria	0.3
	Brazil	0.3
	Russia	0.3

Current "trusted friends" of U.S. (4.8 MMBpd)

Source: EIA article, November 29, 2010

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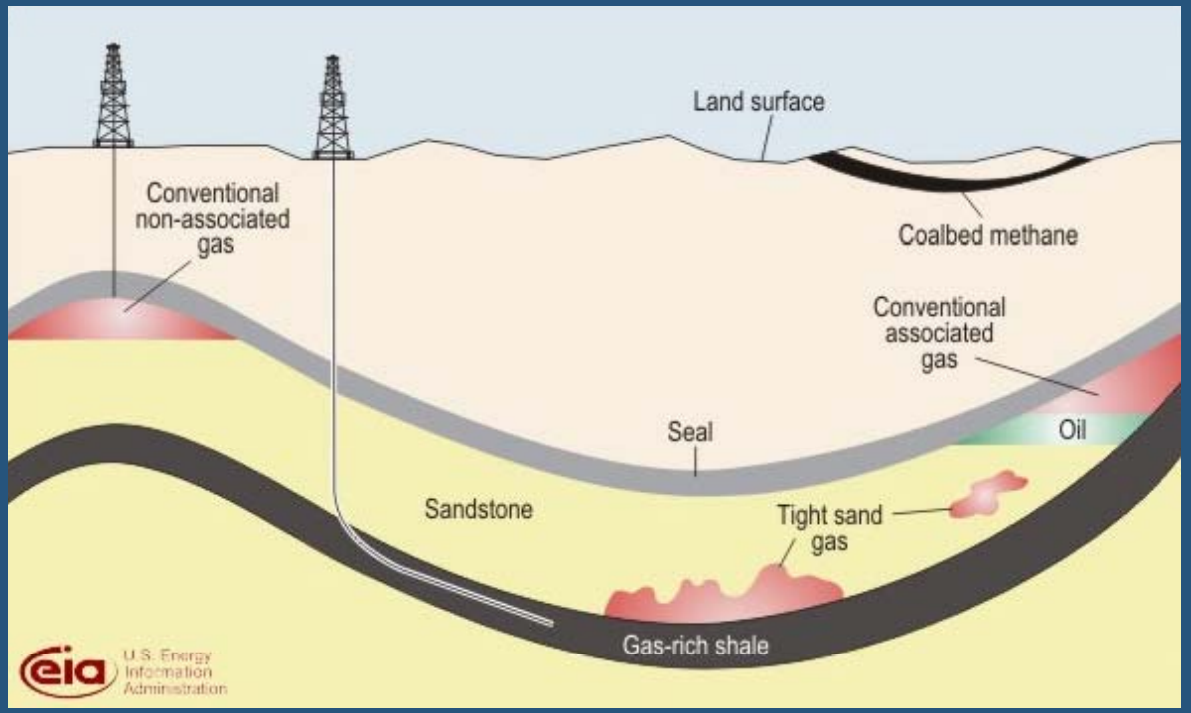
U.S. Natural Gas From Shales

What Is A Shale?

- Shale is sedimentary rock derived from clastic sources (pre-existing rocks that were transported, deposited and then hardened into new rock)
- Best shales are black shales, rich in organic matter which, through temperature and pressure over time, form hydrocarbons
- Because of the clastic nature, shales have very small pore size, 1/100th to 1/1,000th that of sandstones (typical South Louisiana producing formation)
- Interconnectivity of pore space is also an issue, therefore requiring fracture stimulation
- Attractive aspect of shale is that the rock is the source, the trap, and the reservoir rock

What Is A Shale?



- Shale used to be what all geologists tried to avoid when looking for oil and gas, it was the source rock, but was unproduceable
- Due to a combination of ……
  - Horizontal drilling technology
  - Fracing and completion technology
  - Favorable natural gas price

  …….there is a marked increase in shale attractiveness

Source: EIA

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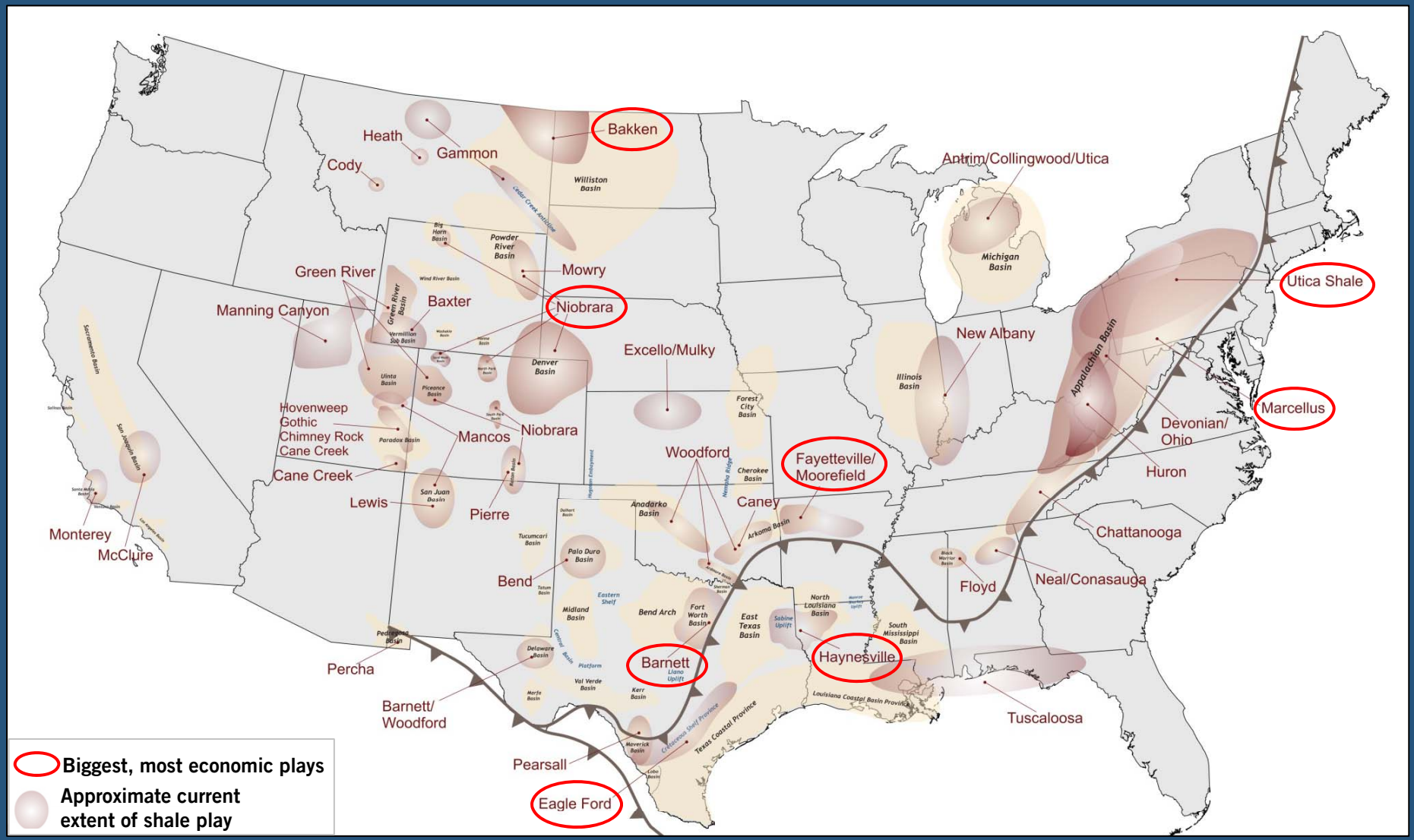
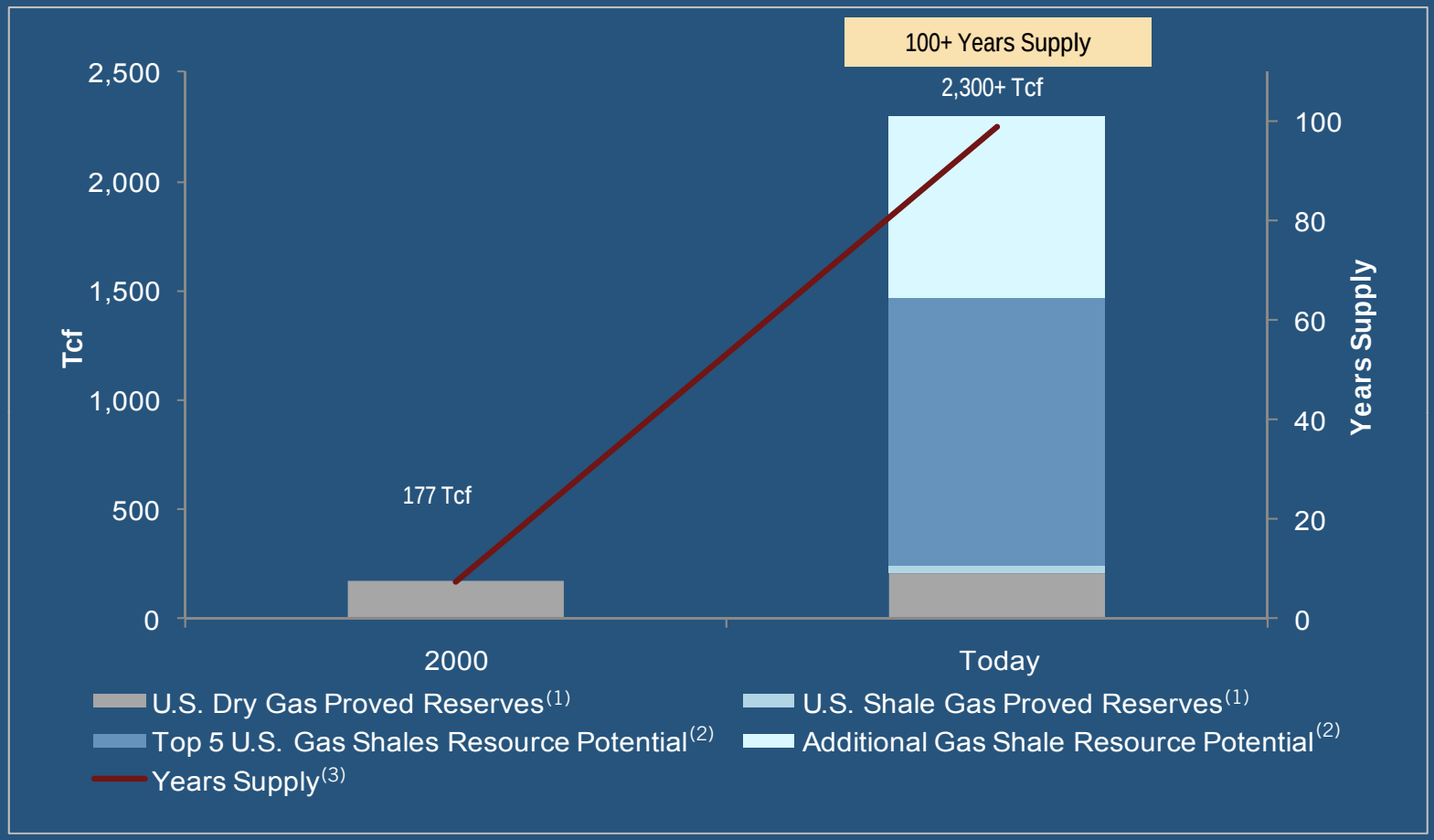
Where The U.S. Shale Plays Are



Source: Jefferies

Abundant Gas Resources - Fundamentally Altering U.S. Gas Supply



- **Since 2000, the U.S. has gone from 8 years of supply to in excess of 100 years(3) – with virtually all of the increase coming from the commercialization of shale gas**

(1) Source: EIA. Current based on 2008 data
(2) Source: Jefferies & Company estimates
(3) 23.3 Tcf annual consumption in 2000 and current estimated consumption of 23.2 Tcf based on 2008 annual consumption. Data per EIA.

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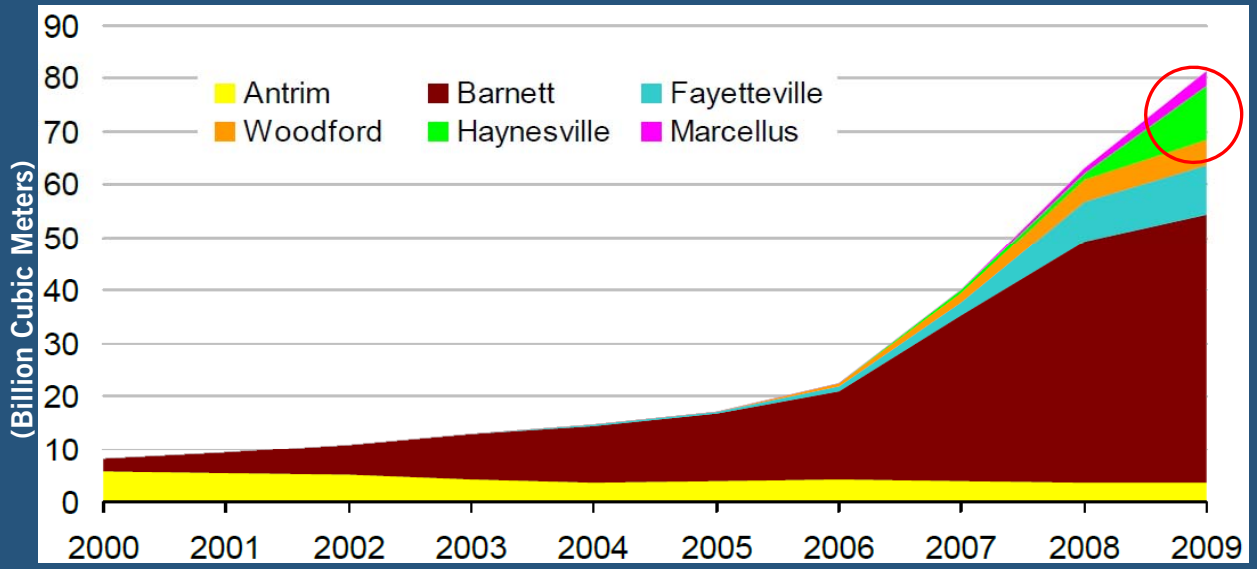
U.S. Shale Production Growth and Outlook

Tulane University

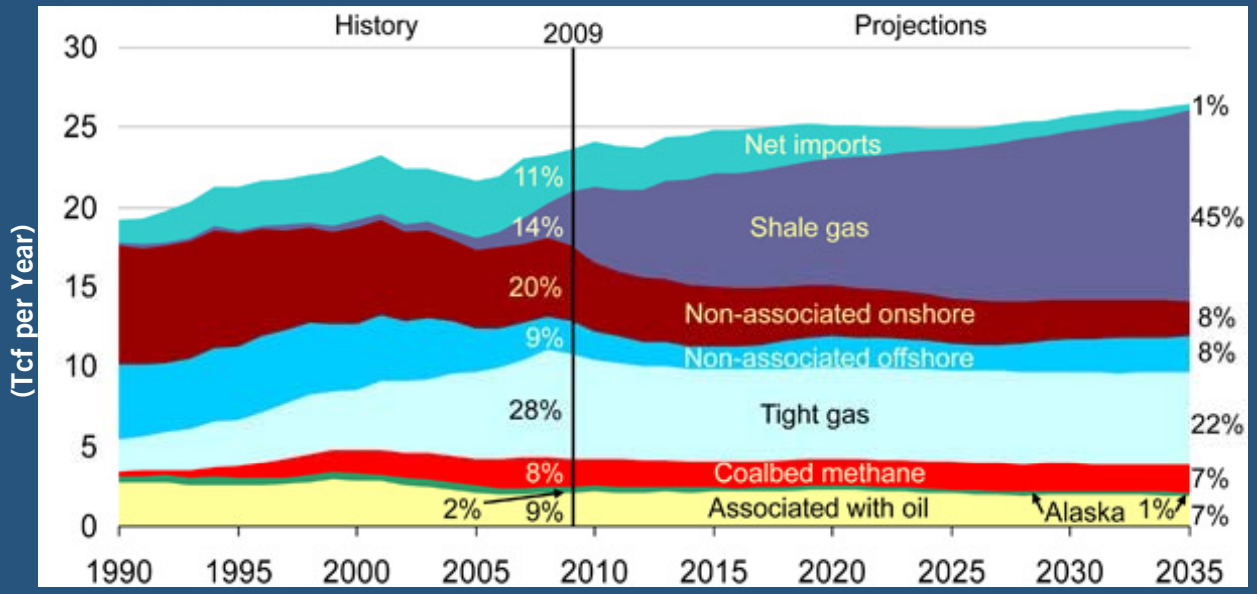
Shale Gas Production (2000-2009)

As of 2011, Louisiana's Haynesville is the largest producer at 5.5 billion cubic feet per day (almost 10% of U.S. total production)



U.S. Dry Gas Production (1990-2035)

Shale gas percentage expected to triple



Source: EIA, Lippman Consulting

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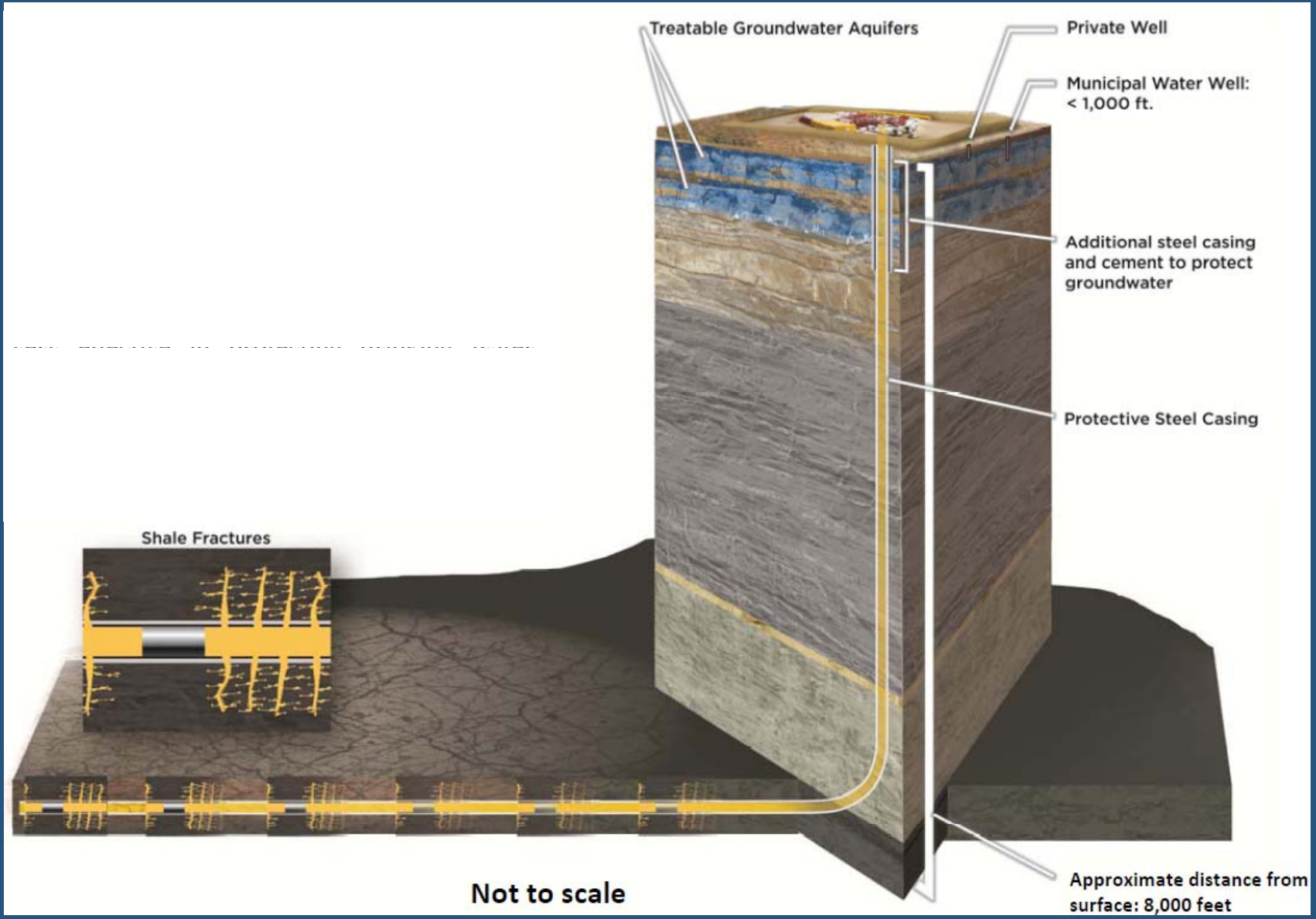
Hydraulic Fracturing



Source: Chesapeake Energy

Increasing Foreign Interest in Shale Plays

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Date	Buyer	Buyer Domicile	Seller	Resource Play	Transaction Value ($MM)
11-Feb	BHP Billiton	Australia	Chesapeake Energy	Fayetteville Shale	$4,750
11-Feb	PetroChina	China	Encana	Montney Shale	5,427
11-Jan	CNOOC	China	Chesapeake Energy	Niobrara Shale	1,267
10-Dec	Sasol	South Africa	Talisman Energy	Montney Shale	1,040
10-Oct	CNOOC	China	Chesapeake Energy	Eagle Ford Shale	2,160
10-Oct	Statoil / Talisman	Norway / Canada	Enduring	Eagle Ford Shale	1,325
10-Aug	Reliance Industries	India	Carrizo Oil & Gas	Marcellus Shale	392
10-Jun	Reliance Industries	India	Pioneer Natural Resources	Eagle Ford Shale	1,150
10-May	BG Group	United Kingdom	EXCO Resources	Marcellus Shale	950
10-Apr	Reliance Industries	India	Atlas Energy	Marcellus Shale	1,700
10-Mar	Statoil ASA	Norway	Chesapeake Energy	Marcellus Shale	253
10-Feb	Mitsui & Company	Japan	Anadarko Petroleum	Marcellus Shale	1,400
9-Dec	Total SA	France	Chesapeake Energy	Barnett Shale	2,250
9-Jun	BG Group	United Kingdom	EXCO Resources	Haynesville Shale	1,055
8-Nov	Statoil ASA	Norway	Chesapeake Energy	Marcellus Shale	3,375
8-Sep	BP	United Kingdom	Chesapeake Energy	Fayetteville Shale	1,900
				Total Since 9/08	$30,814

Jefferies Transactions

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Increasing Major Oil Interest in Shale Plays

Date	Buyer	Seller	Resource Play	Transaction Value ($MM)
9-Dec	ExxonMobil	XTO Energy	Bakken, Marcellus, Barnett, Fayetteville	41,000
10-May	Shell	East Resources	Marcellus	4,700
10-Nov	Chevron	Atlas Energy	Marcellus	4,300
			Total for Majors	50,000
			Plus International Buyers	30,800
			2-Year Shale Total	80,800

- Taken all together, lots of sophisticated buyers that can buy anywhere in the world are buying U.S. Shales
- U.S. shales have economics and ultimate resource size competitive with any other investment opportunity in the world

Jefferies Transactions

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Future Capital Expenditures By Play[1]

Play	Est. Total Area (Acres)	Wells to be Drilled	Implied Recovery Resource (Bcfe)	Total Future Capital ($B)
Bakken	3,000,000	4,688	16,900	32
Barnett - Core	1,200,000	21,818	54,545	59
Bossier	1,000,000	12,500	68,800	95
Eagle Ford	3,000,000	37,500	206,100	214
Fayetteville - Core	2,500,000	31,250	84,375	104
Haynesville	3,000,000	37,500	246,500	305
Marcellus	7,500,000	93,750	421,875	395
Utica	3,000,000	37,500	206,300	172
Woodford	1,000,000	12,500	38,800	70
Total	25,200,000	289,006	1,344,195	1,444

- Estimated midstream/downstream $300 - $500 billion investments required
- Future total capital required for these plays is almost $2 trillion
- Resource players are under-capitalized and will require significant investments to develop their shale positions
- Capital markets ability to fund this need is finite

(1) Statistics based on Jefferies and Wall Street estimates

Why Natural Gas Will Carry the Day For Near-Term U.S. Energy Supply

- 100+ year supply now in the U.S.
- Have a vast pipeline infrastructure in place, easy to expand
- The best shales (Marcellus, Haynesville and Eagle Ford) have world-class economics to develop, capital will flow here from around the world
- Natural gas is the perfect bridge between oil and renewables
  - ½ CO_2 of oil, 90% less particulates
  - Great unsubsidized economics
  - Competitive with coal, cheaper than "clean coal"
- Development of U.S. natural gas will stem $1 billion per day that the U.S. pays for foreign oil, could allow U.S. to import oil only from countries that like us
- It will create millions of jobs and increase tax base in communities where it is developed

Near-Term Challenges

- Government policies and support needed to jump start natural gas as transportation fuel
- The Obama administration has got to quit kicking the energy business as "the bad guys" as we head toward $5.00/gallon gasoline
- Industry needs to continue to educate everyone on fracing, water use and disposal and other aspects
- Industry needs to continue improving its relationships with all stakeholders and provide responsible development of these assets
  - EPA and industry need to work together, not trade barbs
  - April 6, 2011, a bi-partisan NAT GAS act was introduced by 2 Democrats and 2 Republicans. As of April 8, it had 133 cosponsors from both parties. Very encouraging.

We Actually Have A Chance To Become (More) Energy Independent

- Abundant natural gas from shales to substitute for imported oil
- Increased energy efficiency which will occur due to rising price of energy and growing interest in environmentally friendlier policies
- Increasing U.S. oil production due to shale technology developed in the U.S. - U.S. oil production has risen in the last 2 years, first time since the 1980's
- A potential even exists to export natural gas (LNG), depending on U.S. policies and worldwide supply and demand for LNG

How Tulane University Could Be Involved

- Natural gas from shales will be transformational in changing U.S. energy supply and worldwide energy flows
- A commonly used phrase is that this is a "no-brainer" for the U.S. to embrace
- $2 trillion business over the next 30 years
- Some areas Tulane could be involved, thinking about the University's expertise
  - Science and Engineering, of course
  - Environmental - great needs to ensure responsible development
  - Legal - environmental law, state vs. federal issues
  - Business - big business when $2 trillion is involved in development
  - Critical need for EPA and industry to talk - Lisa Jackson, EPA Director, is one of our distinguished alums
- Huge economic driver for Louisiana, perfect replacement for offshore oil and gas as it declines
- Finally, Tulane understands how to create and sustain economic engines. This will be one of the biggest and most important in our recent history.