Natural Gas

Smarter Power Today.

Readying Michigan to Make Good Energy Decisions

Public Forum Presentation

March 4, 2013

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America's Natural Gas Alliance

About ANGA

ANGA is dedicated to increasing the understanding of the environmental, economic and national security benefits of clean, abundant, reliable and affordable North American natural gas.

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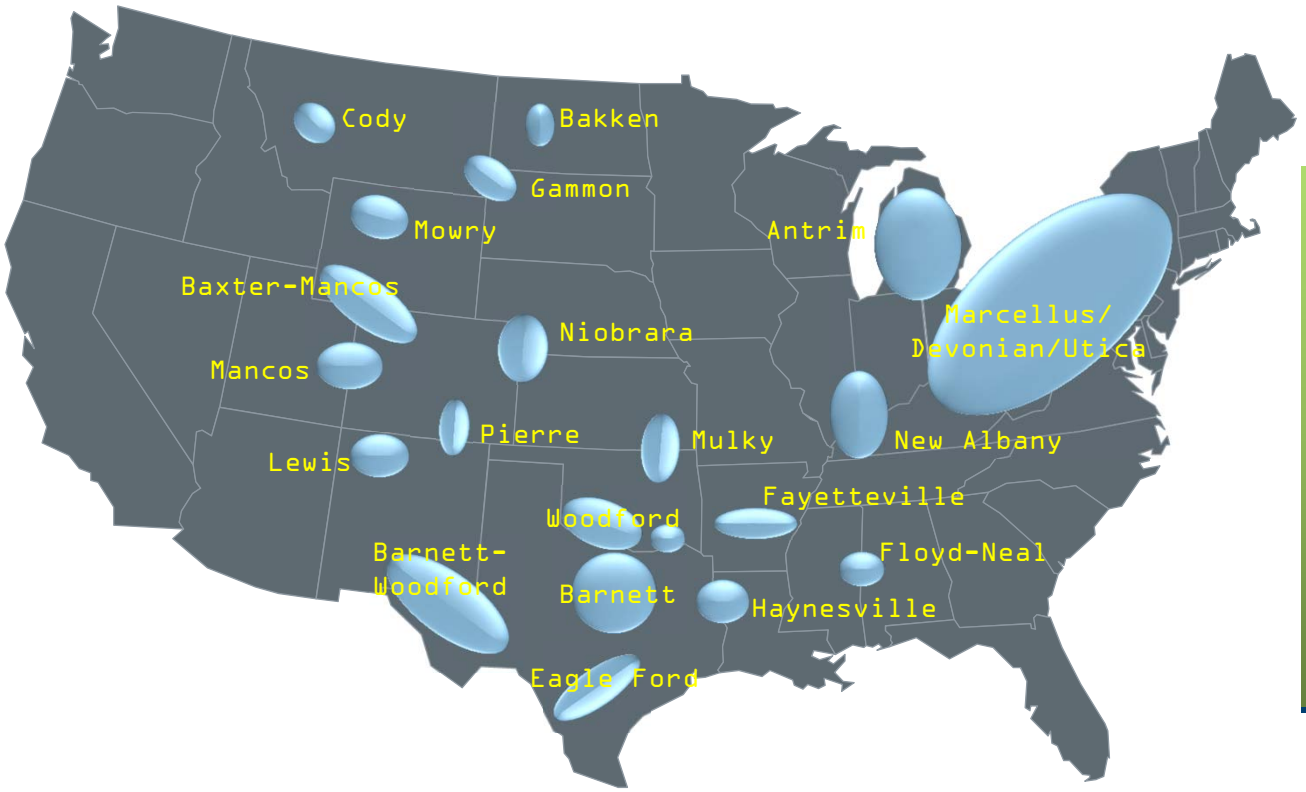
ANGA Members

Our Story

- We have an extraordinary story to tell:
  - Natural gas supports 2.8 million American jobs;
  - Our innovation is unleashing vast domestic supplies;
  - We are enhancing national security by delivering vast and sustainable domestic energy; and
  - We are poised to play a pivotal role in our nation's clean energy future.

The Shale Gas Revolution



EIA: 2012

542 TCF shale

2,203TCF total

38% INCREASE
in just four years

Source: EIA Annual Energy Outlook, 2008 to 2012

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The Shale Gas Revolution In Michigan

Access to vast supplies of shale gas is a huge development, the economics of which lead to greater U.S. investment and industry growth.

Michigan alone provides:

- $12 billion in revenue;
- Over 28,000 Michigan jobs;
- Access to natural gas pipeline from Marcellus Shale to Sarnia, Ontario;
- Access to the Great Lakes;
- Located within 500 miles of U.S industrial base;
- Excellent universities; and
- Major rail systems.

Source: American Chemistry Council, 'Shale Gas and New Petrochemicals Investment: Benefits for the Economy, Jobs, and US Manufacturing', March 2011; http://www.americanchemistry.com/Policy/Energy/Shale-Gas/ACC-State-Shale-Fact-Sheet-Michigan.pdf

Source: IHS Global Insight; 'The Economic and Employment Contributions of Shale Gas in the United States', December 2011; http://www.anga.us/media/235626/shale-gas-economic-impact-dec-2011.pdf

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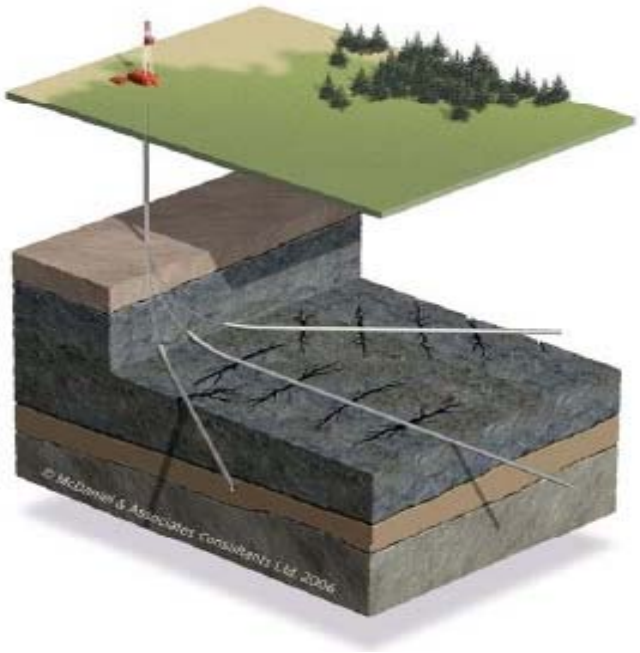
Horizontal Drilling

Traditional Wells



Horizontal Drilling

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Hydraulic Fracturing

Multiple protective layers extend from surface to below aquifers.

Groundwater aquifers

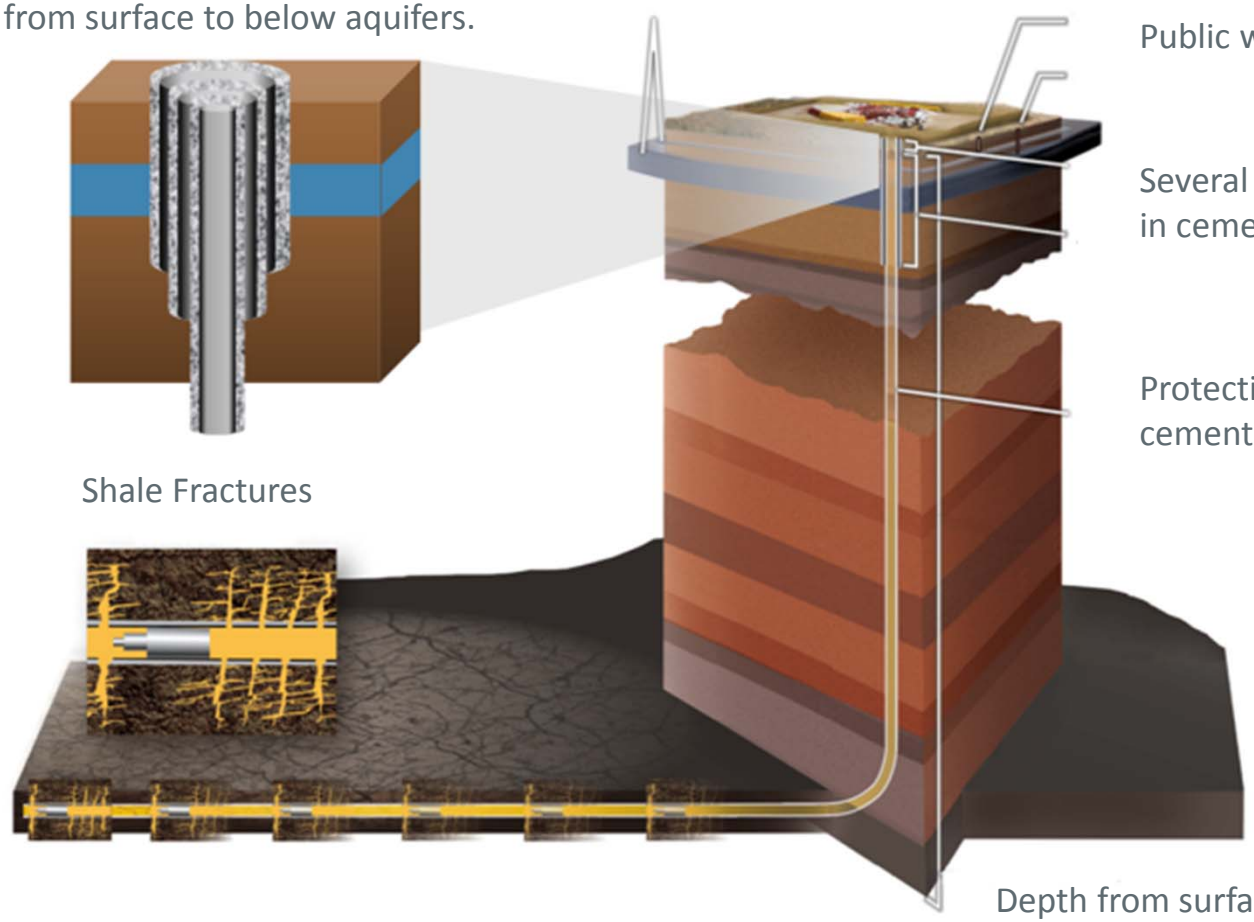
Private well, about 500 feet deep

Public well, about 1,000 feet deep

Several layers of steel tubes encased in cement protect groundwater supplies

Protective steel casing encased in cement extends to shale depth

Shale Fractures



Depth from surface is typically more than a mile

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Innovations In Production

Water Innovations

- Onsite Water Recycling
- Wastewater Treatment Facilities
- Hybrid Stimulation
- Abandoned Coal Mine Water
- Reuse of Municipal Wastewater
- Development of Electrocoagulation
- Greener Fluids
- Increased Efficiencies
- Water Pipelines Reducing Truck Traffic
- Involving Small Businesses in Water Reuse & Recycling
- “The Marcellus Effect” and Water Purification Developments

Non-Water Innovations

- Emissions Reductions
- Natural Gas STAR
- Horizontal Drilling
- Development of Natural Gas Turbines
- Improving Estimates for Technically Recoverable Gas

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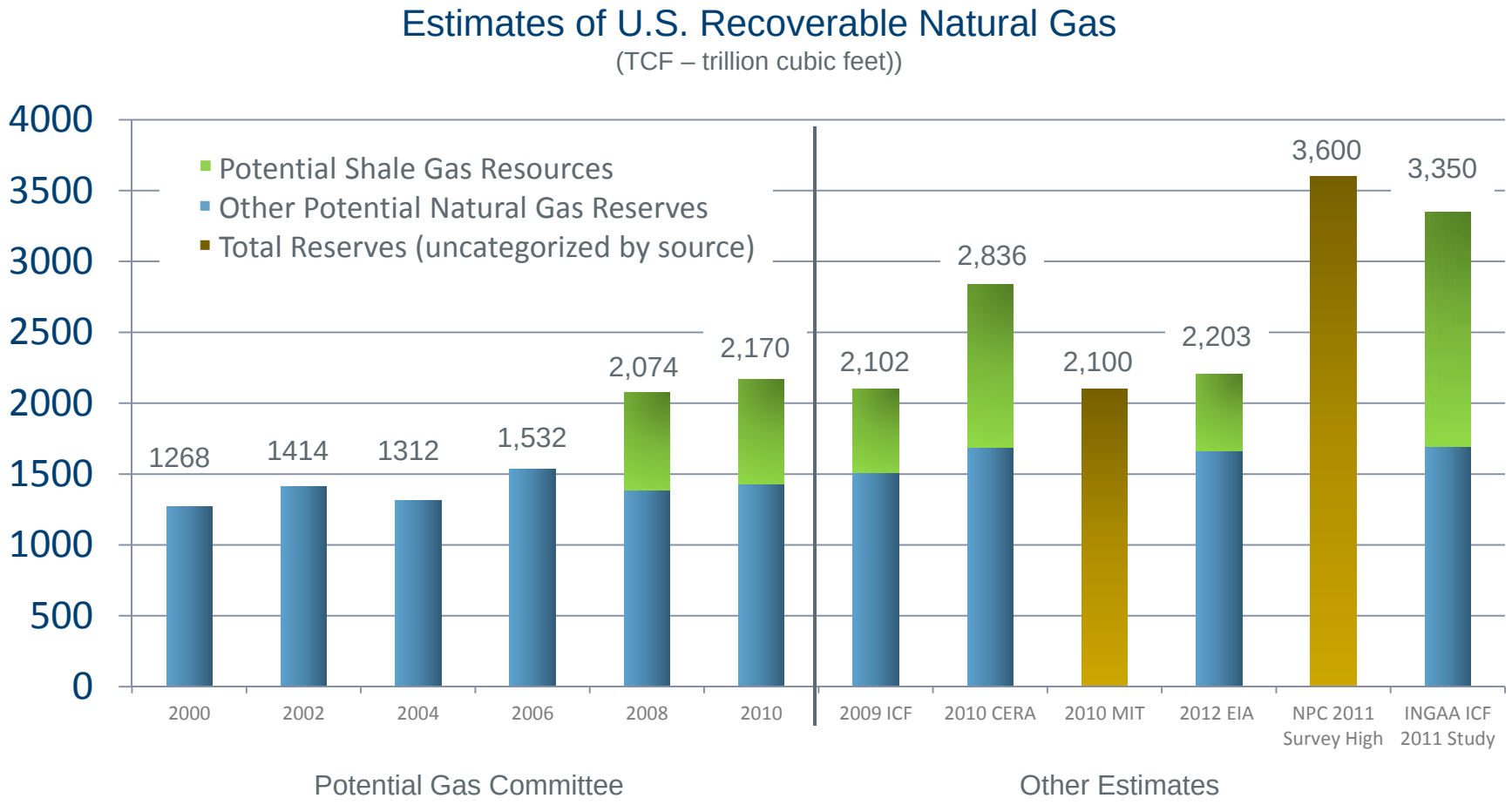
Abundant By Any Estimate



Sources:
ICF: As reported in MIT Energy Initiative, 2010, The Future of Natural Gas, interim report ; Table 2.1
EIA: 2012 AEO, June 2012
PGC: Potential Gas Committee's Advance Summary and press release of its biennial assessment; see www.potentialgas.org
CERA: IHS CERA, 2010, Fueling North America's Energy Future: The Unconventional Natural Gas Revolution and the Carbon Agenda
MIT: MIT Energy Initiative, 2010, The Future of Natural Gas, interim report

NPC: Realizing the Potential of North America's Abundant Natural Gas and Oil Resources Johns Hopkins University ; Prudent Development Study 2011

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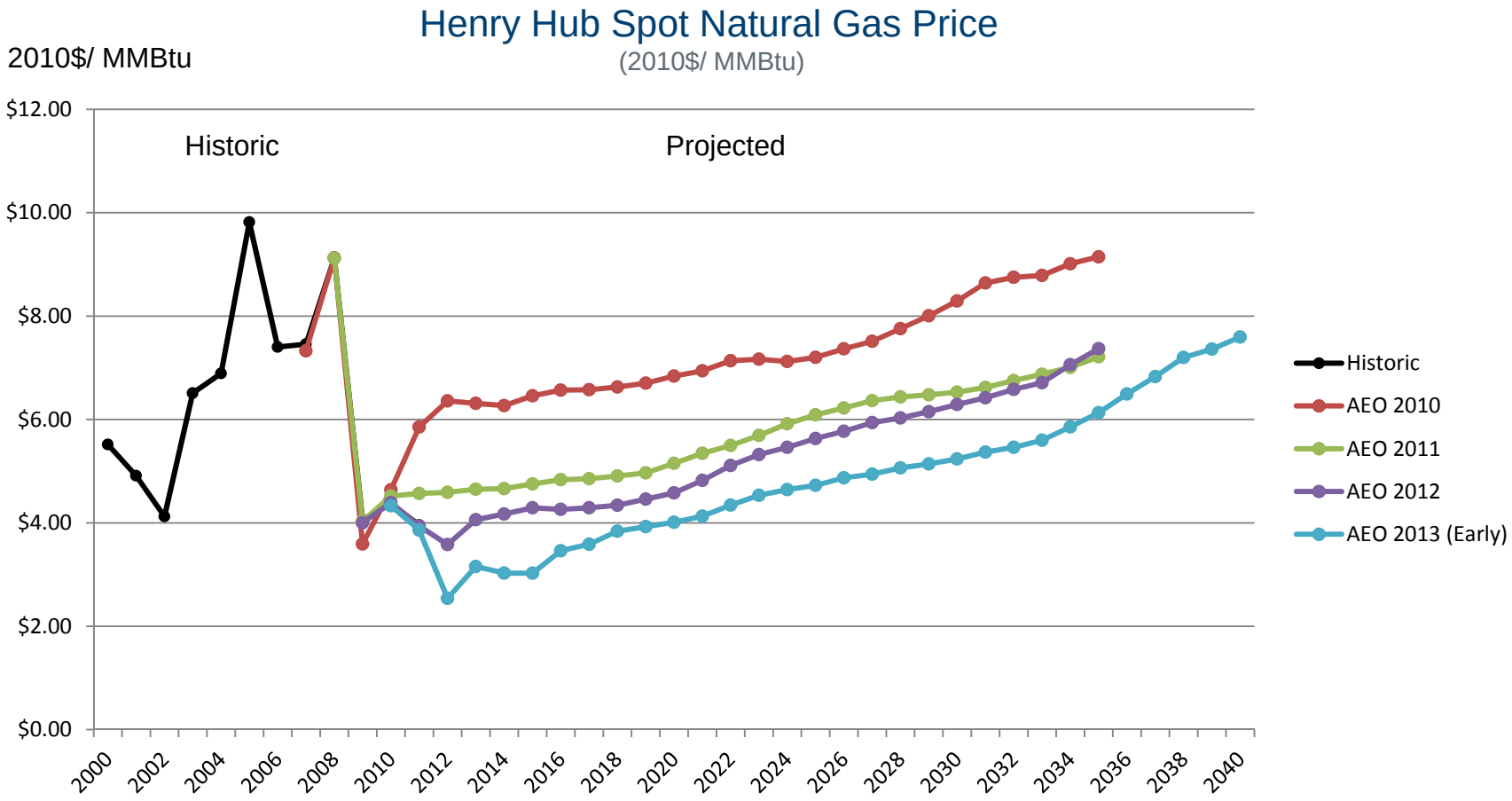
Long-Term Price Stability



Source: EIA Annual Energy Outlook: 2013 (Early Release), 2012, 2011, 2010, and 2009
Henry Hub Spot prices (EIA reported actual prices included 2000 to 2010)

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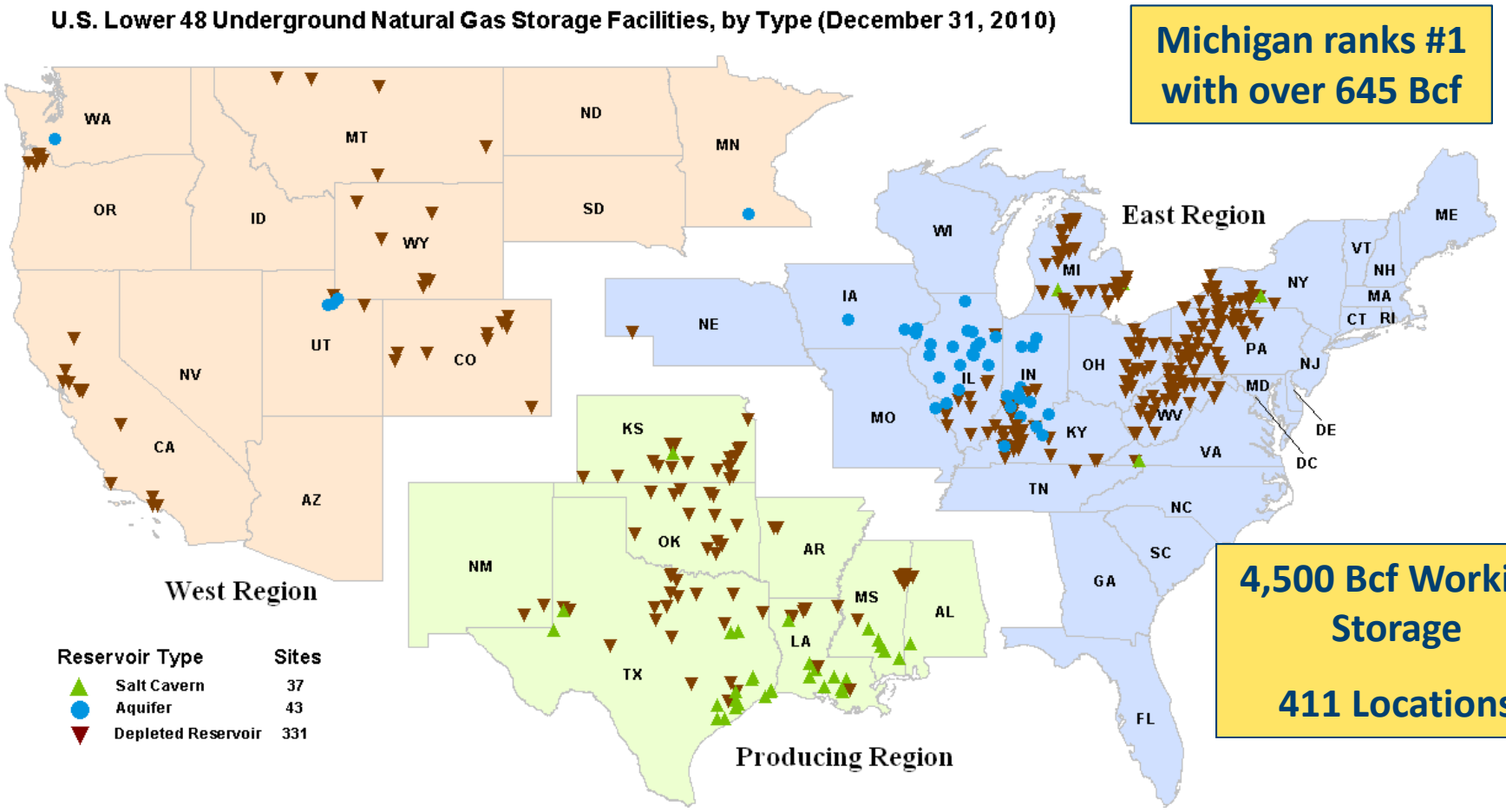
U.S. Storage Capacity



Michigan ranks #1 with over 645 Bcf

4,500 Bcf Working Storage

411 Locations

Source: EIA Data Year-End 2010

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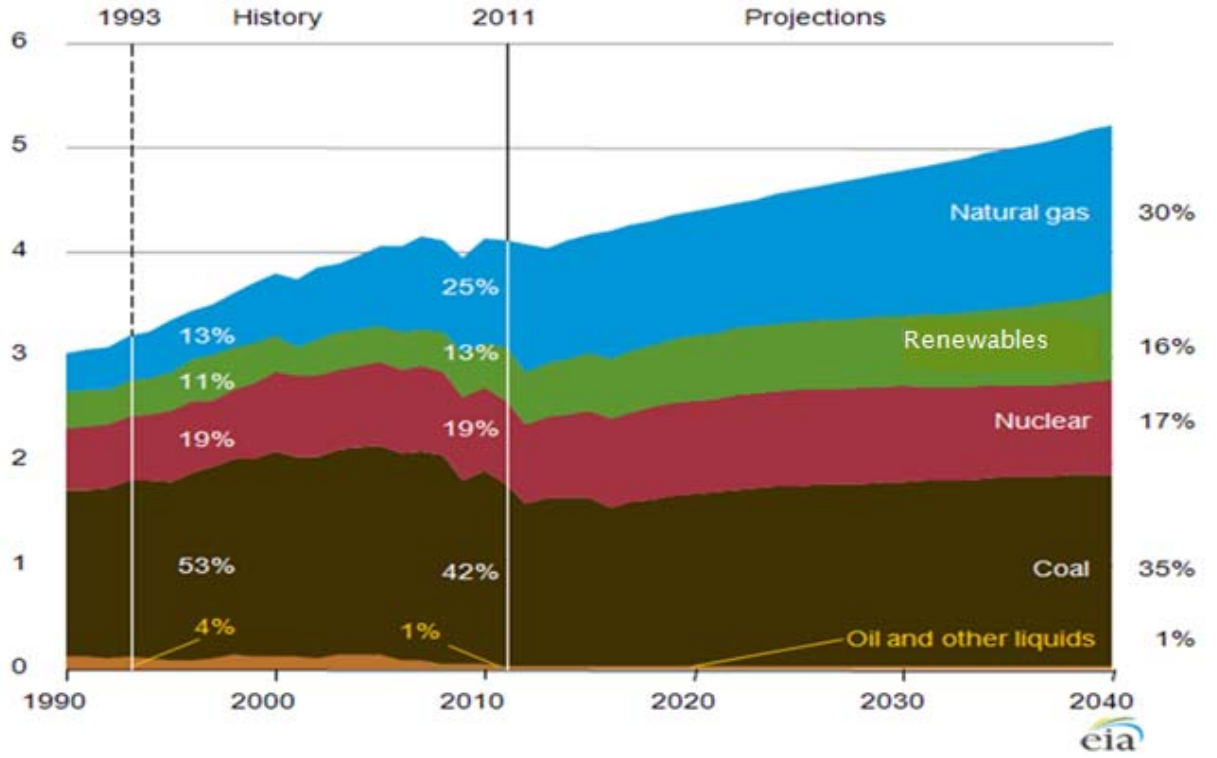
A Cleaner Energy Future on the Way

For electricity generation, natural gas and renewable energy are the only fuel sources projected to grow over the next 25 years.



Source: U.S. Energy Information Administration, Annual Energy Outlook Early Release 2013

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2017 Expected Costs

Levelized Cost of New Generating Technologies – Entering Service in 2017

Plant Type	Capacity Factor (%)	Total System Levelized Cost (¢ per KWH)
Natural Gas – Combined Cycle	87	6.55
Natural Gas – Conventional	87	6.86
Natural Gas – Combined Cycle with CCS	87	9.28
Coal – Conventional	85	9.96
Coal – Advanced	85	11.22
Coal – Advanced with CCS	85	14.07
Wind – Onshore	34	9.68
Wind – Offshore	27	33.06
Solar – PV	25	15.69
Solar – Thermal	20	25.10
Biomass	83	12.02
Nuclear	90	11.27

Source: Institute for Energy Research, using data from EIA Annual Energy Outlook 2012.
All ¢/KWH in 2010 dollars.

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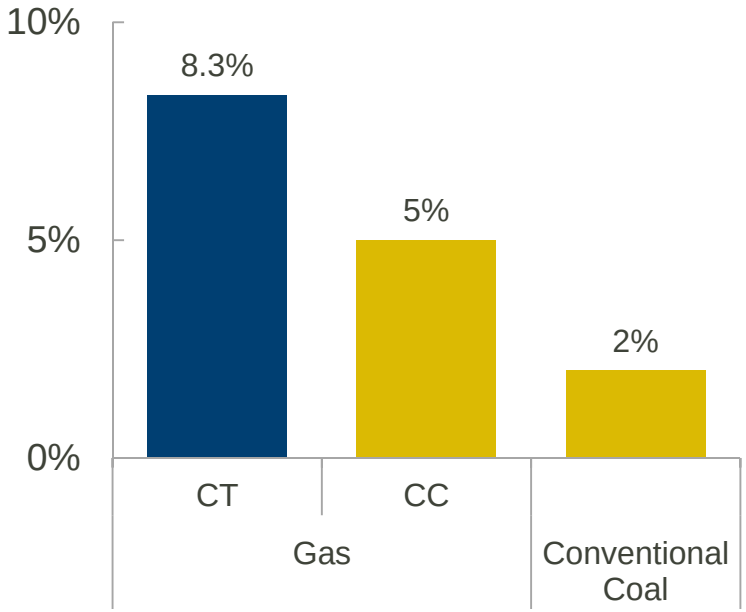
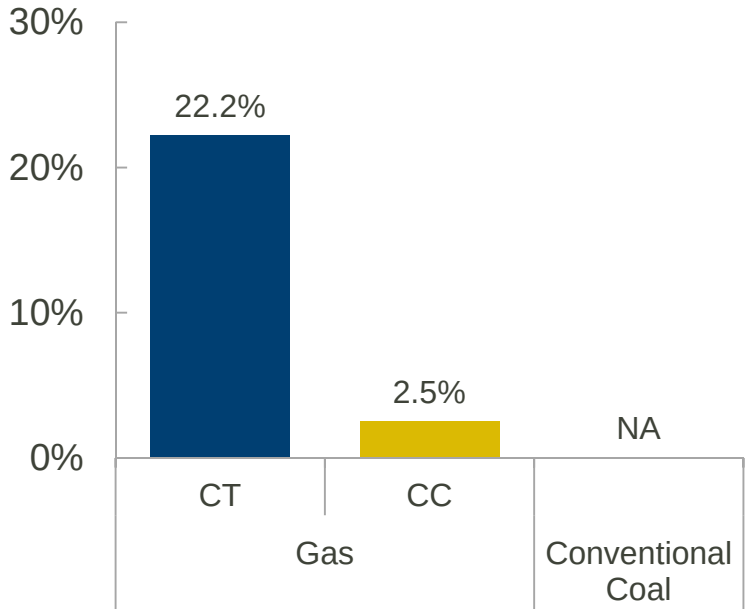
Reliability: Natural Gas Turbines Can Ramp Up Quicker Than Other Resources

Spin[1] Ramp Rate
(% of capacity per minute)



Quick Start[2] Ramp Rate
(% of capacity per minute)



CT: Simple Cycle Combustion Turbine CC: Combined Cycle

[1]Spinning ramp rates reflect the rate at which a unit can ramp up capacity when its turbine is already spinning and synchronized with the grid.
[2]Quick start ramp rates reflect the rate a which a unit can ramp up when its turbine is not synchronized with the grid.

Source: Black & Veatch

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Shale Gas And Our Economy

	2010 Jobs	2010 Labor Income	2010 Value-Added Economic Output
National	601,348	$42 billion	$76.9 billion
Michigan	28,063	$1.8 billion	$2.96 billion

	2035 Jobs	2035 Labor Income	2035 Value-Added Economic Output
National	1,660,090	$121 billion	$231 billion
Michigan	63,380	$4.1 billion	$6.09 billion

The IHS Global Insight study looks at unconventional gas' contributions to the United States' economy. The numbers above include direct, indirect and induced jobs, income and economic output caused by the shale gas revolution.

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Source: IHS Global Insight; 'The Economic and Employment Contributions of Shale Gas in the United States', December 2011; http://www.anga.us/media/235626/shale-gas-economic-impact-dec-2011.pdf

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