Future of Natural Gas
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Hosted by:
FEMP
Federal Energy Management Program
FPL
Agenda

• Gas Facts
• Supply vs. Capacity
• Sources
• Consumption
• Pipeline system
• Gas Interruptions – Operational Flow Orders
• Pricing
Sources of Natural Gas

- Mine
- Import
- Remove from storage
Natural Gas Proven Reserves

- CAN – 68 TCF, 2013
- Central & South America – 269, Venezuela 195
- Asia & Oceania – 521, China 141
- Africa – 515, Algeria 159
- Eurasia – 2,178, Russia 1,688
  - gas and liquid fuels represent 50% of federal revenues
- Middle East – 2,823, Iran and Qatar 2,087
- Worldwide – 6,846 TCF
- US annual consumption, 26 TCF, 483,000 wells
Geology of Gas Resource

Conventional non-associated gas

Coalbed methane

Conventional associated gas

Seal

Sandstone

Tight sand gas

Gas-rich shale

Land surface

Oil

US Shale Plays

Source: Energy Information Administration based on data from various published studies
Updated: May 28, 2009
Hydraulic fracturing, or "fracking," involves the injection of more than a million gallons of water, sand and chemicals at high pressure down and across into horizontally drilled wells as far as 10,000 feet below the surface. The pressurized mixture causes the rock layer, in this case the Marcellus Shale, to crack. These fissures are held open by the sand particles so that natural gas from the shale can flow up the well.
Shale Gas Wellheads
US Gas Production

U.S. dry natural gas production
trillion cubic feet

Source: U.S. Energy Information Administration, Annual Energy Outlook 2013 Early Release
US Import/Export Facilities

- Pipelines and shipping terminals
- 24 import only
- 18 export only
- 13 are both
- 8 are LNG import (today!!)

Net Imports of LNG

- 1995 – -0.047 TCF (Japan and 6 others)
- 2000 – 0.16 (Trinidad and 8 others)
- 2007 – 0.72 (peak year)
- 2012 – 0.15
Natural Gas Storage

• Underground
• Depleted reservoirs, Aquifers, other Caverns
  – 397 sites
  – 8.5 TCF total, 4.2 TCF practical
  – 0.095 TCF per day, max delivery
• Spring 2014 storage was at 822 Bcf, lowest since 2003
• October 24th, 3,480 Bcf, 8% below the 5-year average
• Levels price, provides more delivery points
Underground Storage Facilities

The EIA has determined that the informational map displays here do not raise security concerns, based on the application of the Federal Geographic Data Committee's Guidelines for Providing Appropriate Access to Geospatial Data in Response to Security Concerns.

Federal Utility Partnership Working Group
November 5-6, 2014   Cape Canaveral, FL

U.S. Underground Natural Gas Storage Facilities, Close of 2007

Supply vs. Capacity

• 1992 FERC Order 636, unbundled the pipeline
  – Transportation companies
• Capacity – the delivery system, pipeline
• Supply – natural gas
• Must have both
• In a constrained marketplace a lack of either will reduce or stop delivery, and/or cause the price to spike
Consumption by Sector (TCF)

- **2002**
  - Industrial: 8.63
  - Residential: 4.88
  - Electric Power: 5.68
  - Transportation: 0.69

- **2012**
  - Industrial: 8.56
  - Residential: 4.17
  - Electric Power: 9.25
  - Transportation: 0.76

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Fuel Cost Differential

Coal and Gas Generation Power Cost

- Generation Cost $/MWH
- Combined Cycle - $/MWH
- Coal-fired - $/MWH
- Combined Cycle - ca. 2004
- Coal-fired ca. 2004

Jan 2009 to Oct 2012

Federal Utility Partnership Working Group
November 5-6, 2014  Cape Canaveral, FL
US Electric Generation by Fuel

Figure 12. Electricity generation by fuel, 1990-2040 (trillion kilowatthours per year)

- **1993 History**
  - Natural gas: 13%
  - Renewables: 11%
  - Nuclear: 19%
  - Coal: 53%
  - Oil and other liquids: 4%

- **2011**
  - Natural gas: 25%
  - Renewables: 13%
  - Nuclear: 19%
  - Coal: 42%
  - Oil and other liquids: 1%

- **Projections**
  - Natural gas: 30%
  - Renewables: 16%
  - Nuclear: 17%
  - Coal: 35%
  - Oil and other liquids: 1%

Data from EIA.
Market Outlook

• Hydraulic fracturing drilling technology is improving
  – Producers are drilling in liquids rich gas and crude oil shale plays due to lower returns on dry gas production
  – Improved well completion time enables shale supply to balance incremental demand faster than historical production

• MATS regulation will continue to drive more electric generation to natural gas

• LNG exports replaces LNG imports, price increases

• Incremental pipeline infrastructure needed
Gas Delivery System: Pipeline

• Interstate and Intrastate transmission (higher pressures), and distribution (LDC) systems
• Transco and Southern Natural (Sonat)
• Florida Gas, Gulf Stream Natural, Gulf South and Sonat
• Transmission and distribution combined, 2.4 million miles of pipe
• FL – 27,000 miles
• FL, GA, SC & NC – 120,000 miles
Major US Transportation Corridors

Legend

- Interstate Pipelines
- Intrastate Pipelines

Source: Energy Information Administration, Office of Oil and Gas, Natural Gas Division, GasTran Gas Transportation Information System.

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States in grey are at least 85% dependent on the interstate pipeline network for their natural gas supply.
Gas LDCs

• Florida Public Utilities, TECO Peoples Gas, Florida City Gas and municipal systems

• GA – only deregulated SE state
  – Primary LDC is Atlanta Gas Light
  – 12 marketers and 84 muni systems

• SC – 1 intrastate pipeline company, 2 primary LDCs and munis

• NC – 4 LDCs and 8 munis
Purchasing Gas

• Firm Transportation – FT
  – Reserved pipeline capacity
  – Monthly demand charge
  – Nominal usage fee

• Interruptible
  – Serve when available
  – Lower price than FT
Winter 2013-14

- Polar Vortex - a new kind of winter storm
- Dramatic fluctuations of extreme temps
- Heavy utilization of interstate storages & on-system LNG
- Transco Zone 5 daily delivered prices hit new highs
- Record natural gas throughput all along the Eastern Seaboard
- Curtailments!!
Curtailment & Gas Categories

- Categories 1 – 10
- 1 – residential and small commercial, firm
- 2 – 3B – commercial and industrial firm loads
- 3C to 9 – interruptible categories
  - 3C – colleges, hospitals and military bases
  - 3D to F – direct flame applications
  - Cat 6 to 9 – boilers, based on size
Winter 2013 - 14
Operational Flow Orders - OFO’s

• Issued to protect the operational integrity of the system

• Transco issued 27 OFOs
  – 18% of winter season

• Sonat issued 44 OFOs
  – 29% of winter season

• Customer penalty can be $50 Dt
Curtailments – Winter 2013-14

- Cat 3C 13 days, 318 hours, 3 continuous
- Cat 3F 22 days, 530 hours, 5 continuous
- Cat 6 28 days, 686 hours, 6 continuous
- Cat 9 32 days, 775 hours, 11 continuous days
- If capacity is fixed and demand increases, curtailments increase
Available Capacity

• Capacity Constrained Environment, issues that impact pipeline operations
  – Line pack and BTU content
  – Receipt and delivery combinations
  – Inlet pressures and volumes
  – Uniform hourly flow rates
  – Non uniform hourly flow rates
  – Overall system pressures

• Impact the ability to schedule IT
Historic BTU Content

Weighted Average BTU

12 Month (May to April) weighted averages:

- 2012 - 2013: 1.0162
- 2011 - 2012: 1.0206
- 2010 - 2011: 1.0234
- 2009 - 2010: 1.0304
- 2008 - 2009: 1.0364
- 2007 - 2008: 1.0347
Accessing Shale Supply

- Transco, Southern Natural are fully subscribed
- Transco begins projects to move natural gas bi-directionally
- New firm capacity requires additional pipeline and compression
- Cost of Construction has increased
- Long term contracts (20+ years) are required to support new infrastructure
Natural Gas Pricing Variables

- Producer behavior and production activity
- Supply – production, imports, exports and volumes in storage
- Capacity - pipeline infrastructure
- Economic recovery/growth
- EPA policies
- Nuclear generation
# Natural Gas Settlement Prices

## Yearly Average Price

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**Avg** | $8.62| $7.23| $6.86| $9.03| $3.99| $4.39| $4.04| $2.79| $3.65| $4.43
Current Market

- Natural gas prices trading around $4.00
- Current Close $4.03
- 12-month strip $3.88
- Winter $4.06
- Summer $3.77
- TransCo Zone 5 Interruptible 3C
  - Customer price = Henry Hub plus ~$1.50
- Interstate, intrastate, LDC and margin
Henry Hub Price History & Forecast

- Base Case
- High Economic Growth
- Low Economic Growth
- High Production
- Low Production

$ / MMBtu

Key Points

• Natural Gas is plentiful with strong demand
• Additional pipeline infrastructure is needed to match supply with demand
• Future expansions may be above the current system rate and will likely require longer term commitments
• Talk with your local provider early in the planning process and for pricing data
Questions