
2009 Pennsylvania Natural Gas Summit

Gas Storage 101

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Agenda

1. Background

- Types of storage
- Major components of storage
- Where is storage located in the US
- NiSource Gas Transmission & Storage's assets

2. Benefits of storage facilities

3. How storage facilities operate

4. Rules of engagement- How is storage developed

5. Potential impact of Marcellus development

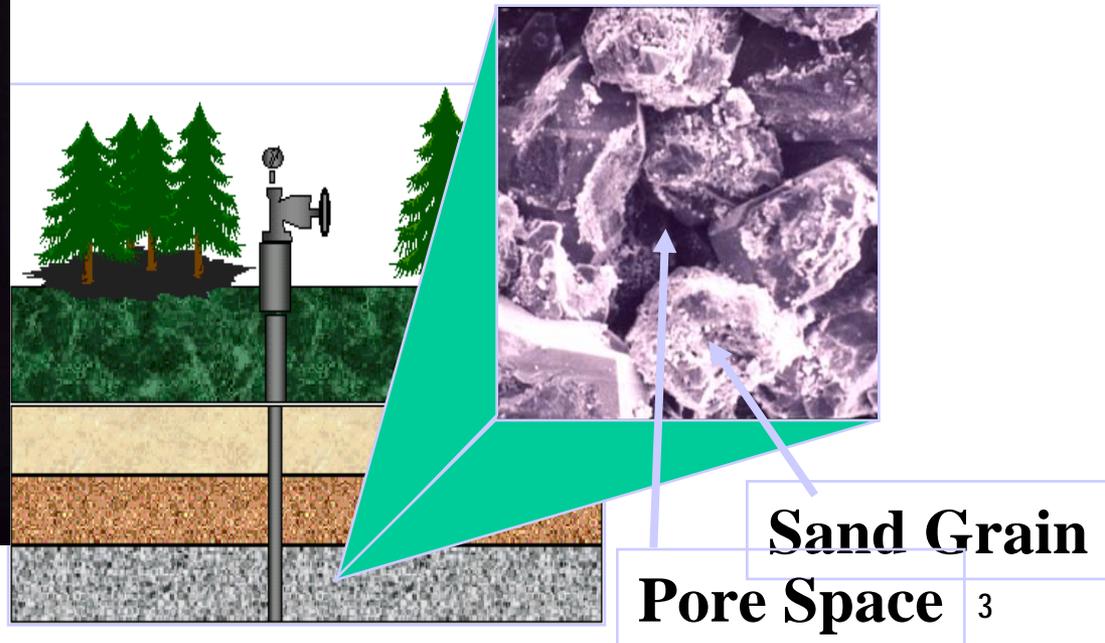
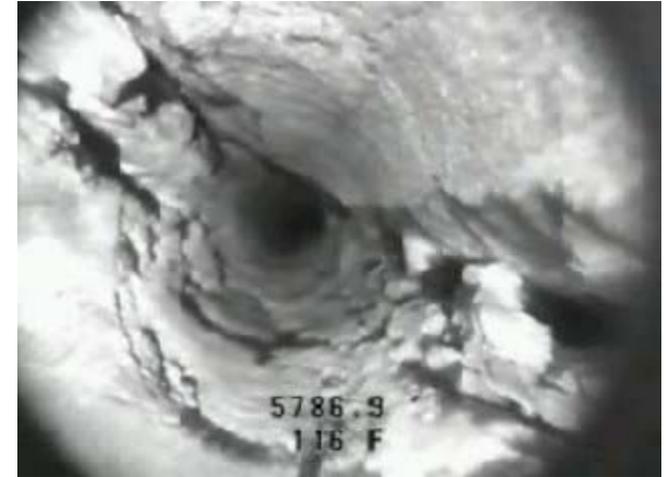
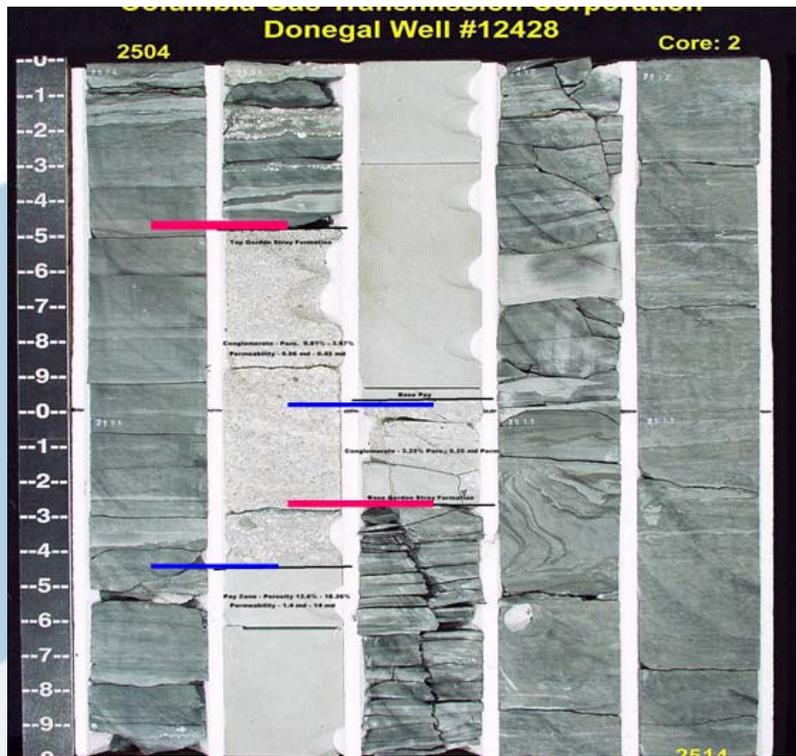
Background

- **Types of storage**
 - Gas (& oil) production fields, aquifer and salt caverns

Background

- Types of storage
- Major components of storage

– Reservoir



Background

- Types of storage
- Major components of storage
 - Reservoir, wells, pipelines



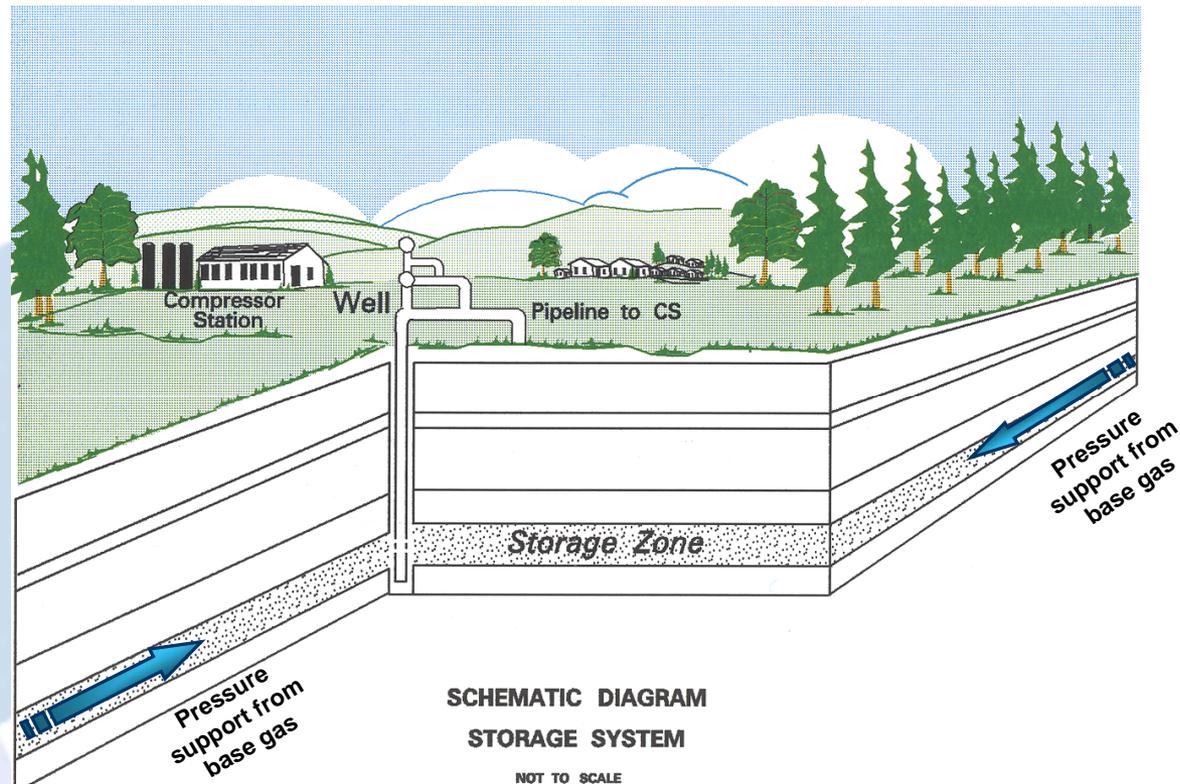
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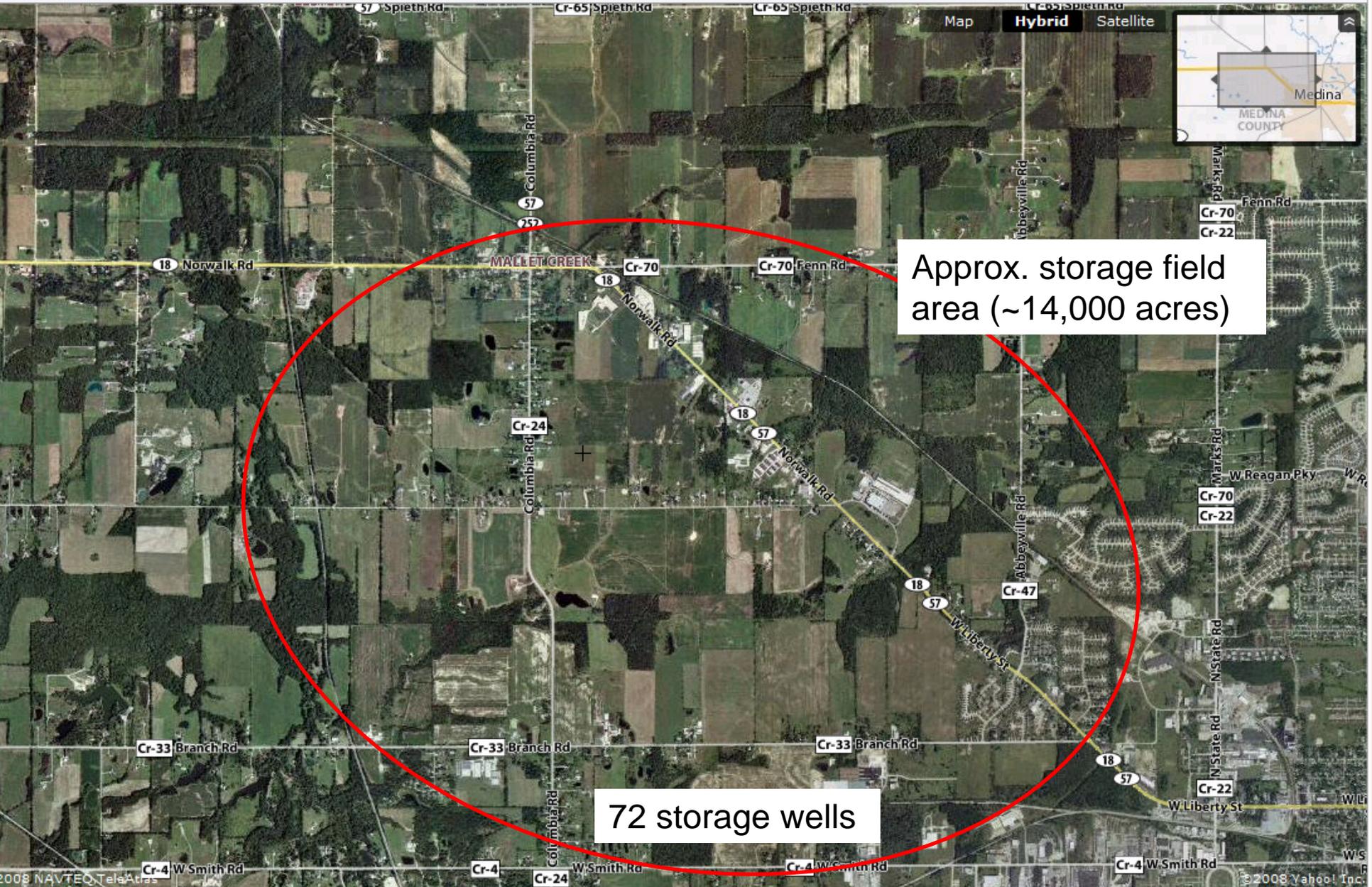
- Types of storage
- Major components of storage
 - Reservoir, wells, pipelines, **compressor station**



Background

- Types of storage
- Major components of storage
 - Reservoir, wells, pipelines, compressor station, **base gas and leases**





Background

- Types of storage
- Major components of storage
 - Geology, wells, pipelines, compressor station, base gas and leases
 - **Performance: working gas and deliverability**
 - About 3,750 BCF of working gas in US
 - About 60-70 BCF/day of maximum deliverability

Background

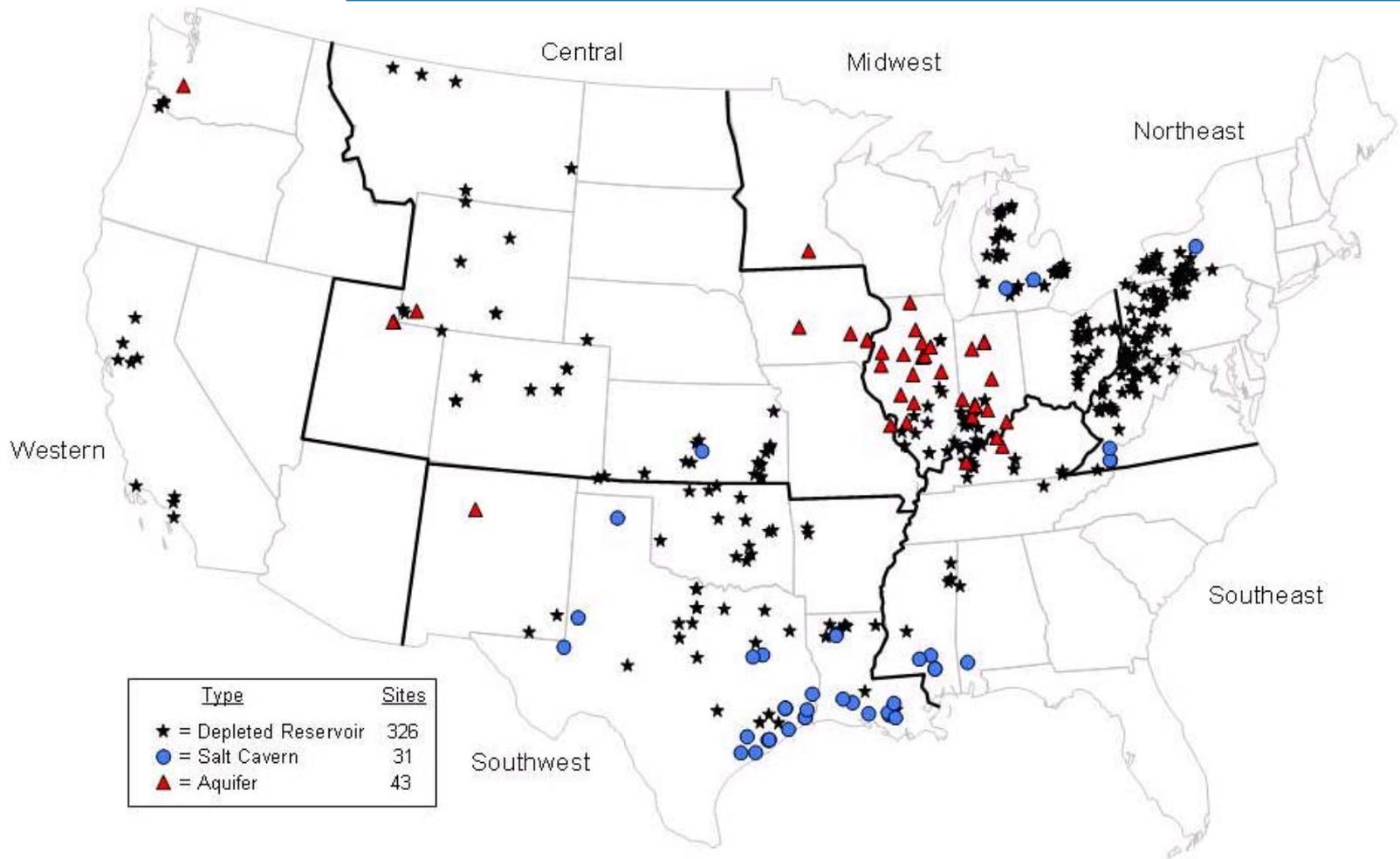
- Types of storage
- Major components of storage
- **Where is storage located in the US**

	US Ranking	October 2009 Total Capacity	% of US	# of Fields
US Total (30 states)		7,634 BCF		~400
Michigan	#1	1,020 BCF	13%	48
Illinois	#2	942 BCF	12%	29
Pennsylvania	#3	718 BCF	9%	52
Ohio	#5	539 BCF	7%	22
West Virginia	#8	480 BCF	6%	27
New York	#13	212 BCF	3%	22
Maryland	#20	62 BCF	<1%	1

Note: total capacity = base gas + working gas

Sources: EIA @ www.eia.doe.gov
and American Gas Association

Location of US Storage – End of 2008



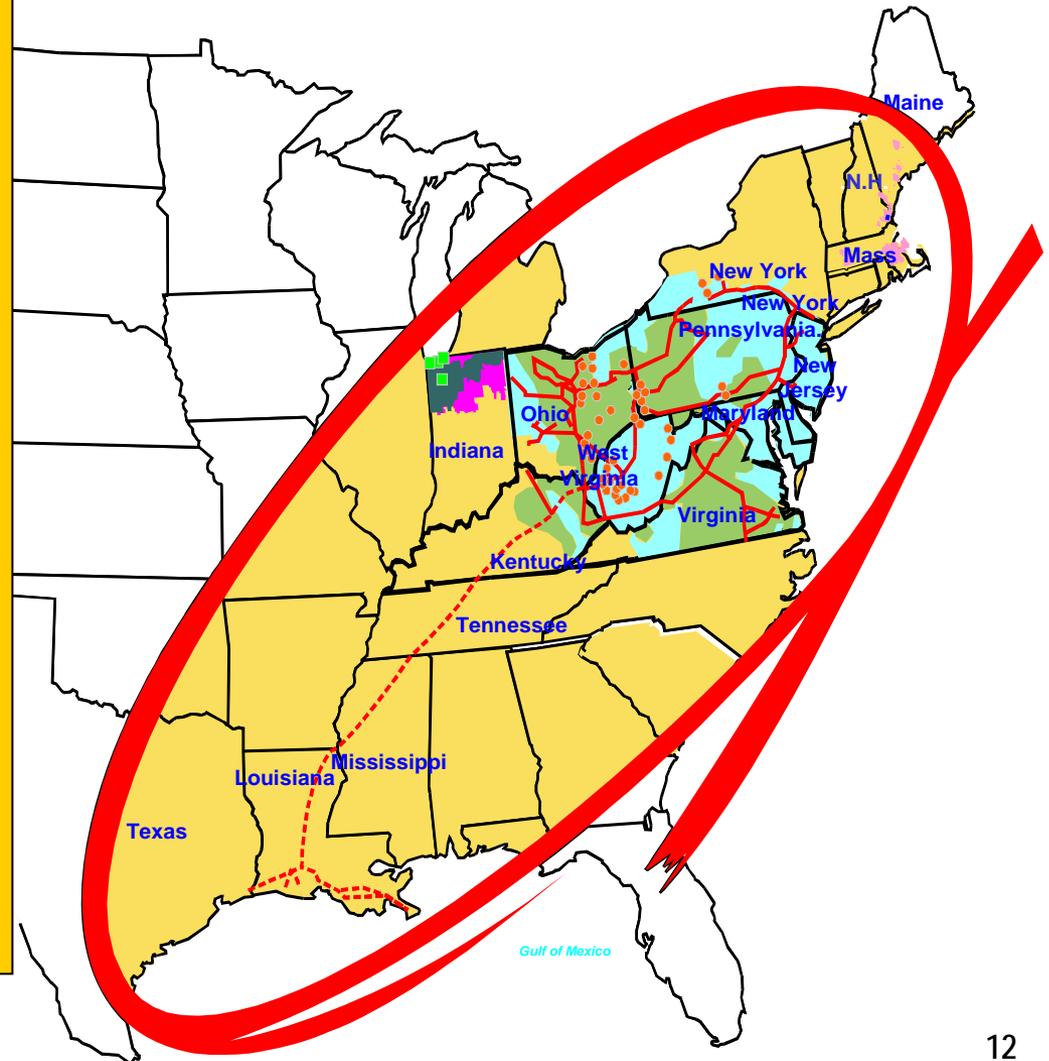
Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division Gas, Gas Transportation Information System, December 2008.

Background

- Types of storage
- Major components of storage
- Where is storage located in the US
- **NiSource Gas Transmission & Storage assets**

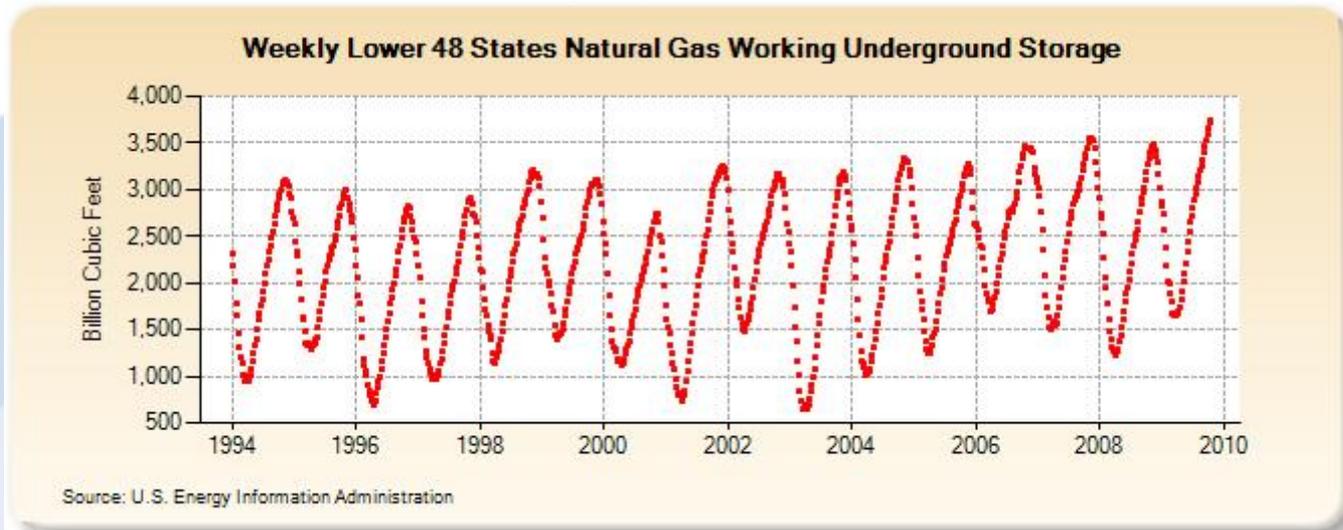
NiSource Gas Transmission & Storage

- NGT&S is the fourth largest gas pipeline system in the U.S.
 - Over 16,000 miles interstate pipelines
- NiSource's **Columbia Gas Transmission** operates one of the largest storage networks
 - Over 670 Bcf capacity
 - 261 BCF working gas
 - 4.75 BCF/day deliverability (about 60% of total peak day deliveries)
 - 37 storage fields
 - 1st field in 1919, latest field in 2007
 - 3,551 storage wells
 - 860,000 acres leased
 - Depths generally ½ to 1 mile deep



Benefits of Storage Facilities

- **Historical (1916-1980's)**
 - Balances seasonal demand fluctuations
 - Absorb daily/hourly swings
 - Reduces long distance pipeline development costs
 - Emergency supply (colder than normal, pipeline facility outage, etc.)
 - Allows for constant rate of gas production



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- **Today**
 - All of the above ... **plus...**
 - Summer power plant demand
 - Cash and futures markets – arbitrage opportunities

How Storage Facilities Operate

- **Company level**
 - Customers schedule gas deliveries & receipts per their contracts on the pipeline system including storage injection and/or withdrawals
 - Gas Control (24/7 dispatchers) coordinates and directs operations
 - Considerable automation of compressor stations
- **Field level**
 - Well tenders turn wells on/off, maintain facilities, comply with DOT's Part 192 inspections & maintenance requirements, collect data
- **Storage Technical staff**
 - Engineers – monitor field performance, conduct well work overs, schedule field tests, collect & analyze data
 - Geologists – understand the reservoir, support Storage Engineers

Rules of Engagement- How Storage Is Developed

- **Technical**

- Production field with the right features is identified
- Potential performance ranges developed for the working gas and peak day deliverability
- Capex and O&M estimates are developed
- Cost of service calculated

- **Commercial**

- Customer interest is solicited in a non-discriminatory Open Season process
 - Usually modify field's design and performance based on customer feedback
- Contracts negotiated and signed

Rules of Engagement- How Storage Is Developed

- **Regulatory**
 - Environmental review of proposed facility locations
 - Service only provided via FERC approved tariffs (character of service)
 - Stand alone performance and cost of service
 - Preparation of an Application to the FERC
 - Also required to obtain permits from other state and federal agencies, e.g. DNR, SHPO, etc.
 - Filing and review by FERC
 - Issuance of a certificate of public need and convenience if the project is found to be in the public's interest

Note: NGT&S only operate Federal Energy Regulatory Commission (FERC) regulated facilities and state regulated storage may have a different certification process

Potential Impact of Marcellus Development

- **Increase demand for storage**
 - Pipeline development
 - Could lead to more local price volatility
 - More liquid trading points
- **Some challenges**
 - The right geology doesn't always sit under the pipeline grid
 - A lot of storage already exists over the Marcellus
 - Many "right stuff" fields already storage fields, others expensive
 - Need market growth for more than minor storage expansions

Result – some incremental storage developed but a massive expansion is unlikely

Gas Storage 101

Questions?