



CASUALTY ACTUARIAL SOCIETY SEMINAR
BALTIMORE, MARYLAND
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MEASURING CAT EXPOSURE IN THE ENERGY SPACE
HYDROFRACKING

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Overview of “Hydrofracking”: Scope and Magnitude

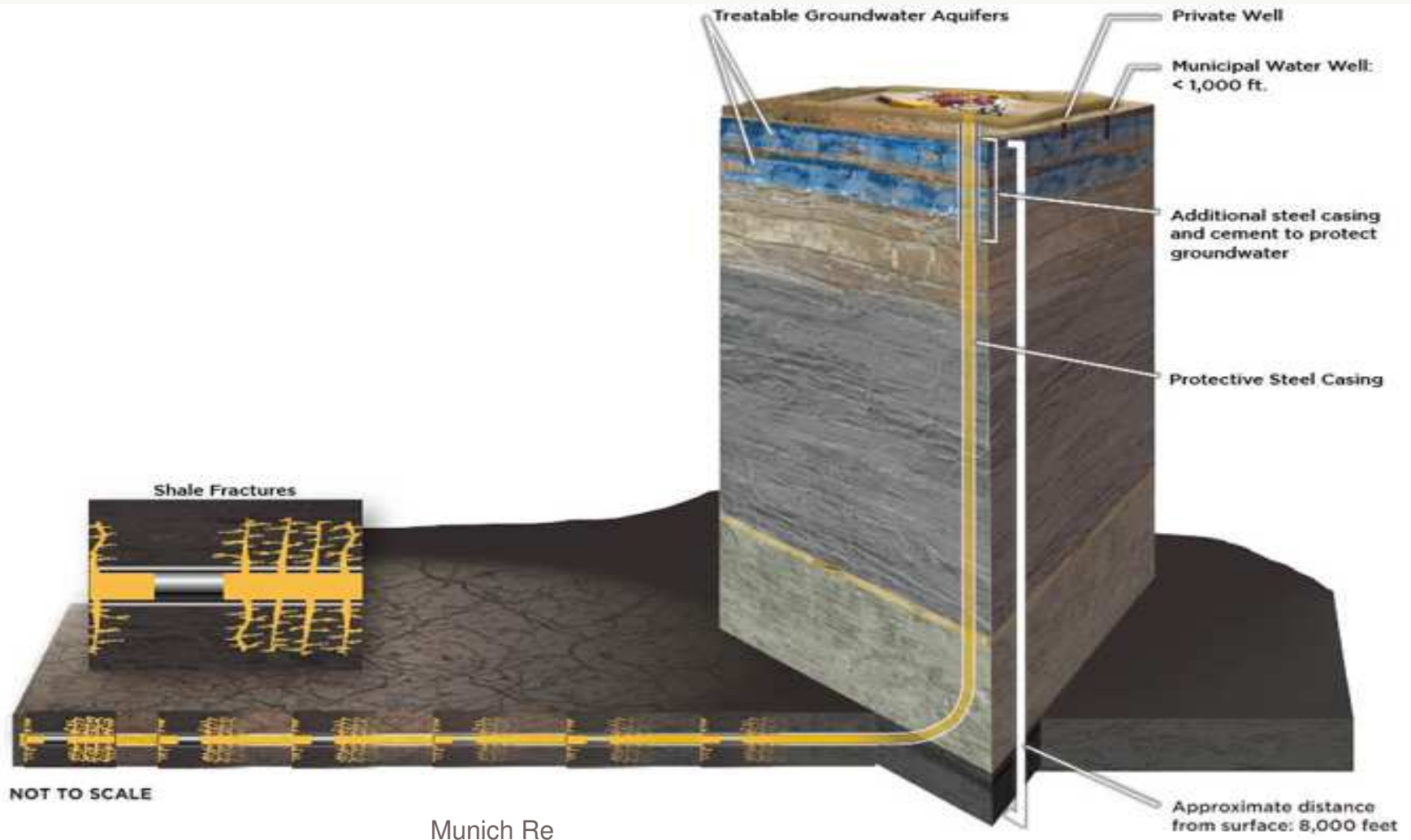
Site Accumulation - Well Risk

Latent Accumulation - Pollution

Earthquake Risk Potential

Conclusions

SCOPE AND MAGNITUDE

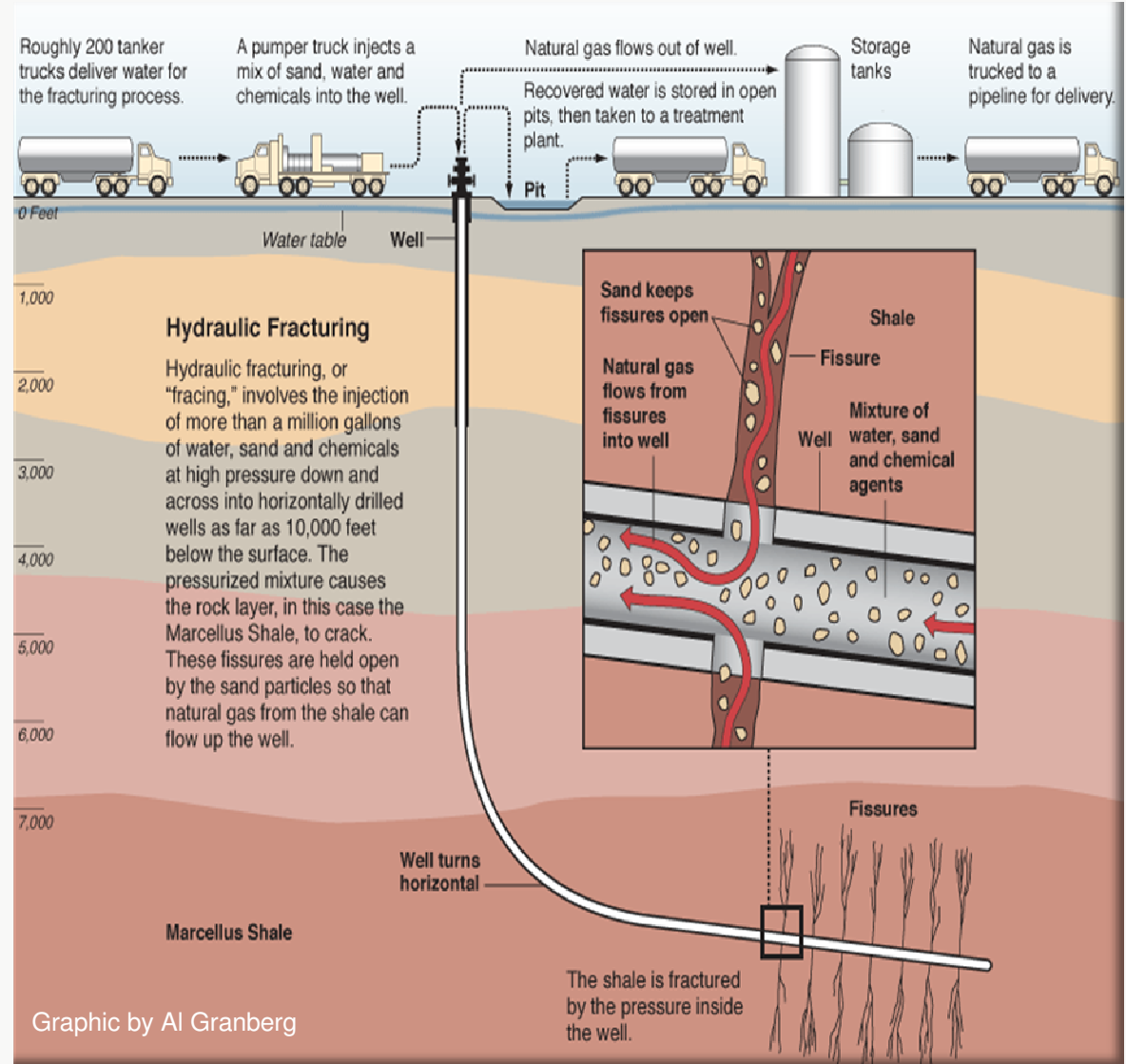


What is “Hydrofracking”?

A process used to extract gas from deposits trapped in rock formations (shale) where the rock pores are too small for the gas to be accessed with traditional drilling techniques.

Hydraulic
A gas well is treated with large amounts of extremely pressurized water (up to 5mm gallons per well) mixed with sand and chemicals (some of which are toxic)

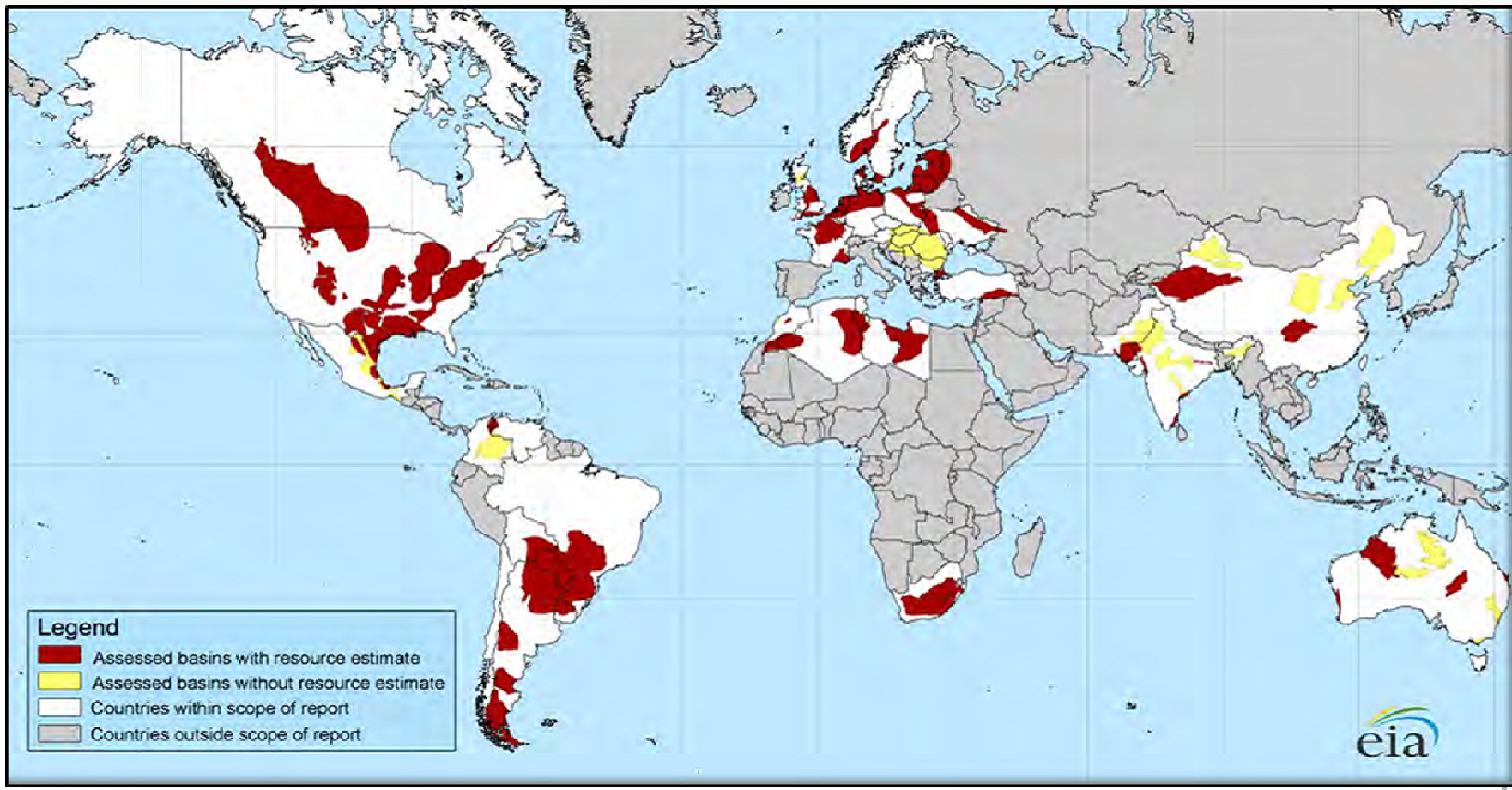
Fracturing
Water is injected at significant depths to fracture (create fissures in) the shale rock and extract natural gas
..... 20%- 80% of the water stays in the ground and the remainder need to either be disposed of or is reused



Where's the Gas.... ...and how much is there?



Global Perspective

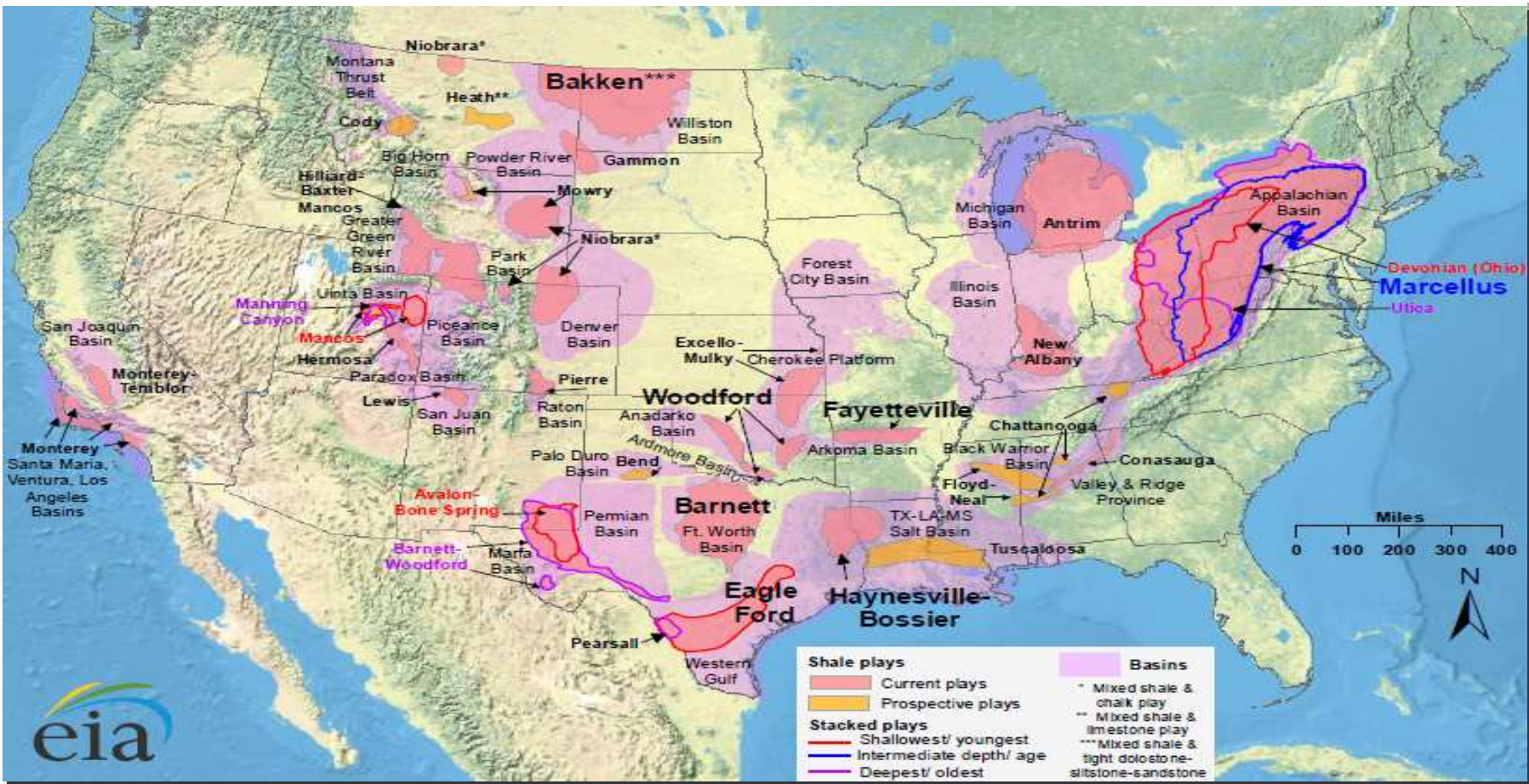


Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

Where's the Gas....
 ...and how much is there?



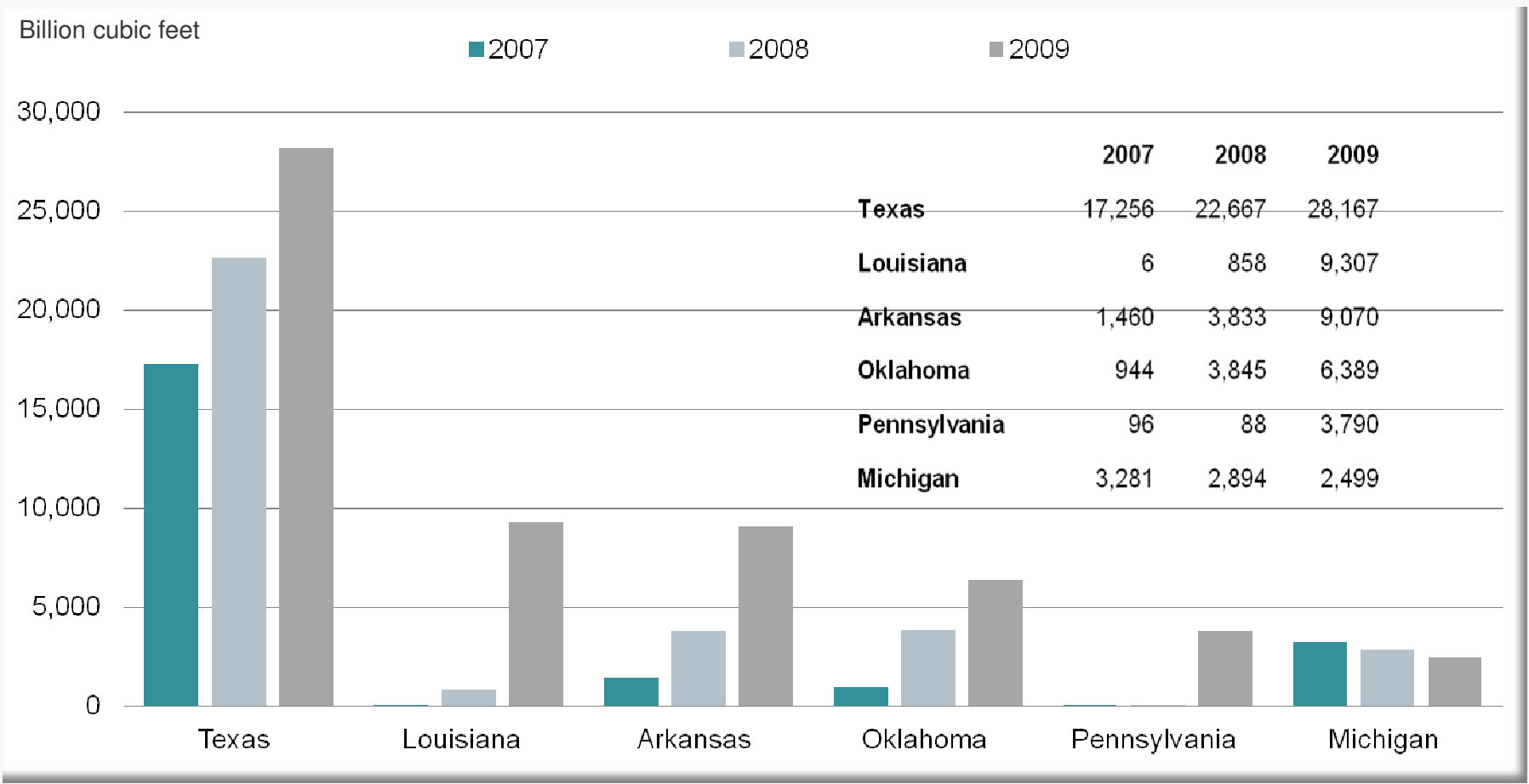
Lower 48 States Shale Plays



Source: Energy Information Administration based on data from various published studies.
 Updated: May 9, 2011

Where's the Gas.... ...and how much is there?

Shale Gas Proved Reserves By Year



Note: The volume of share gas represented only data reported by operators on Form EIA-23, as opposed to complete EIA estimates. The actual total volumes, including estimates for non-surveyed operators, may consequently be different.

Where's the Gas....
 ...and how much is there?

Shale Gas and the Future

Drilling Permits

- Marcellus Shale
 - 2005 = 11
 - 2010 = 3,043

Active Wells

- 493,000
 - Texas = 93,000
 - PA = 71,000

US Supply

- EPA: Shale will provide 20% of US Gas needs by 2020
- EIA:
 - Natural gas supply will last 100 years
 - Shale will provide up to 47% of US Gas needs by 2035 (currently at 16%)

Shale Gas is a Growing Industry.....
Will become more prominent

Perceived Benefits of Hydrofracking

Cost Effectiveness

- Makes shale rock treatment less costly
- Gas exploration made financially viable

Global / Political

- Lessens dependence on foreign oil (supply & price volatility)
- U.S. as a price-setter and exporter

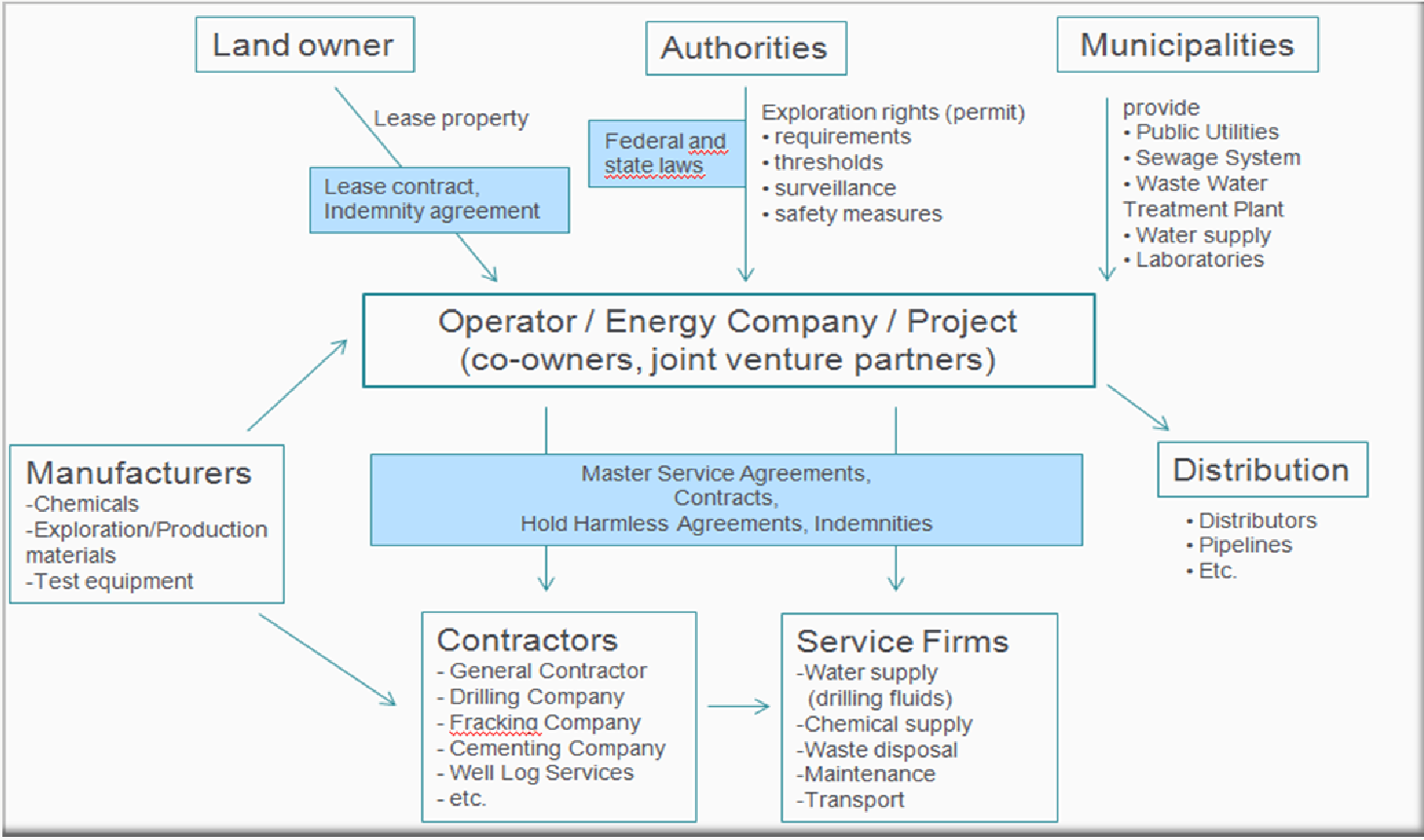
U.S Society/Economy

- Long-term source of energy supply
- Job creation
- Smaller carbon footprint (more climate change friendly – water pollution exposure needs to be managed)

SITE EXPOSURES



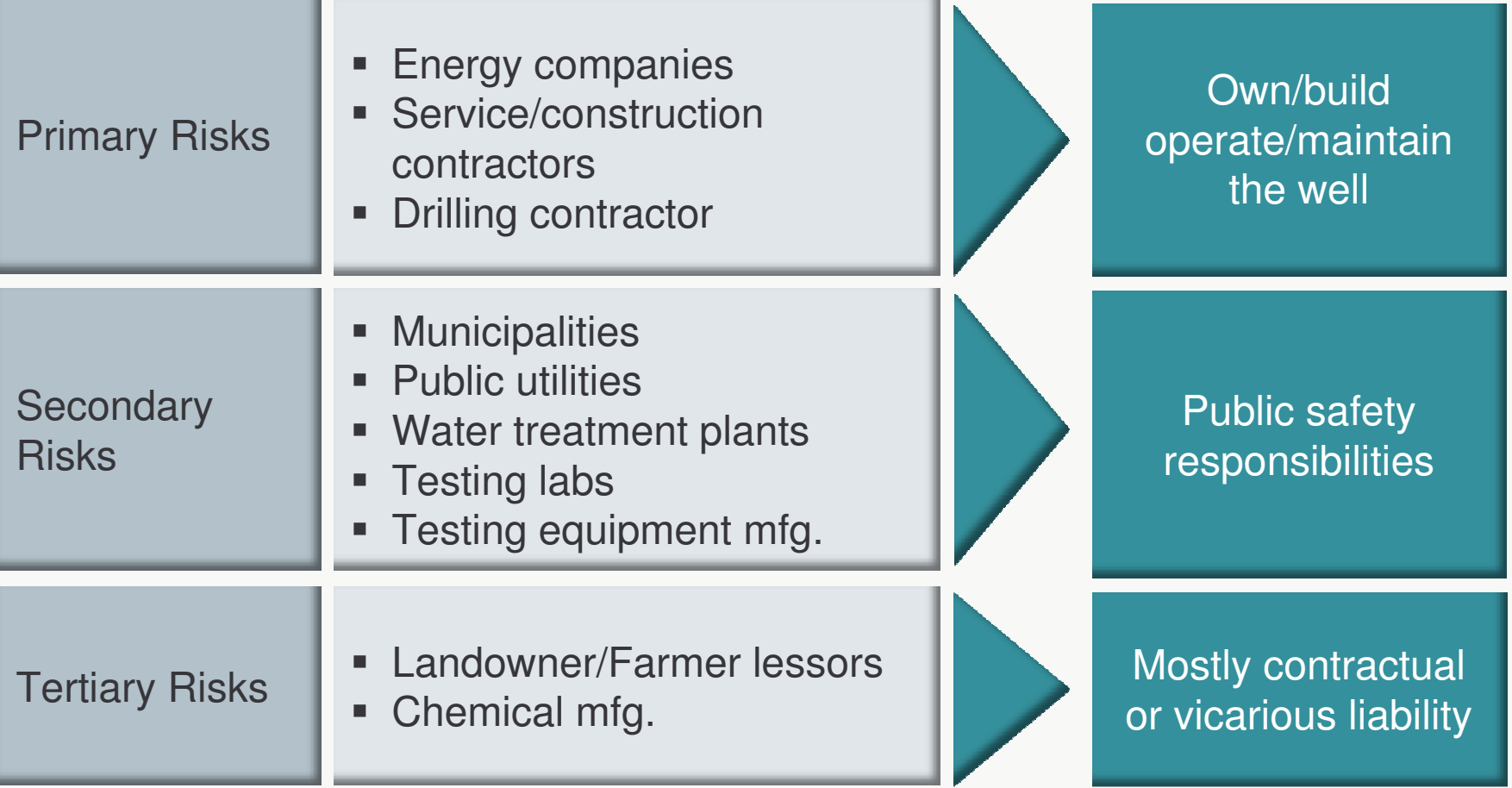
Site/ Operational AccumulationClash Loss Scenario



Operational Risk Who's Exposed



Potential Defendants



Potential Loss Scenarios

Operational Site Accidents

- Blow outs
- Spills and accidents involving vehicles and equipment used to transport people, equipment, chemicals, etc.
- Bodily Injury or Property Damage (including loss of value or enjoyment)
- Gas migration related fires, explosions...above or under ground
- Sudden release of pollutants



Picture: Saul Ewing , LLP

Marcellus Shale Example

Recent Incidents

(Future Claims?)

Numerous (recent) examples of incidents associated with Marcellus Shale Drilling include:

October, 2009 – 10,000 gallons of flowback & freshwater released from transmission line into high-quality waterway, in Hopewell Twp., Washington Co.

March, 2010 – Frac Pit Fire in Hopewell Township – Washington County

June, 2010 - Gas well blowout Clearfield County released gas and 35,000 gallons of fracking fluid for 16 hours.

October, 2010 – Tanker truck overturns and spills nearly 5,000 gallons of fracking fluid in Washington County.

April, 2011 – Blowout in Bradford County took 13 hours to have an emergency response team from Texas fully control the situation.

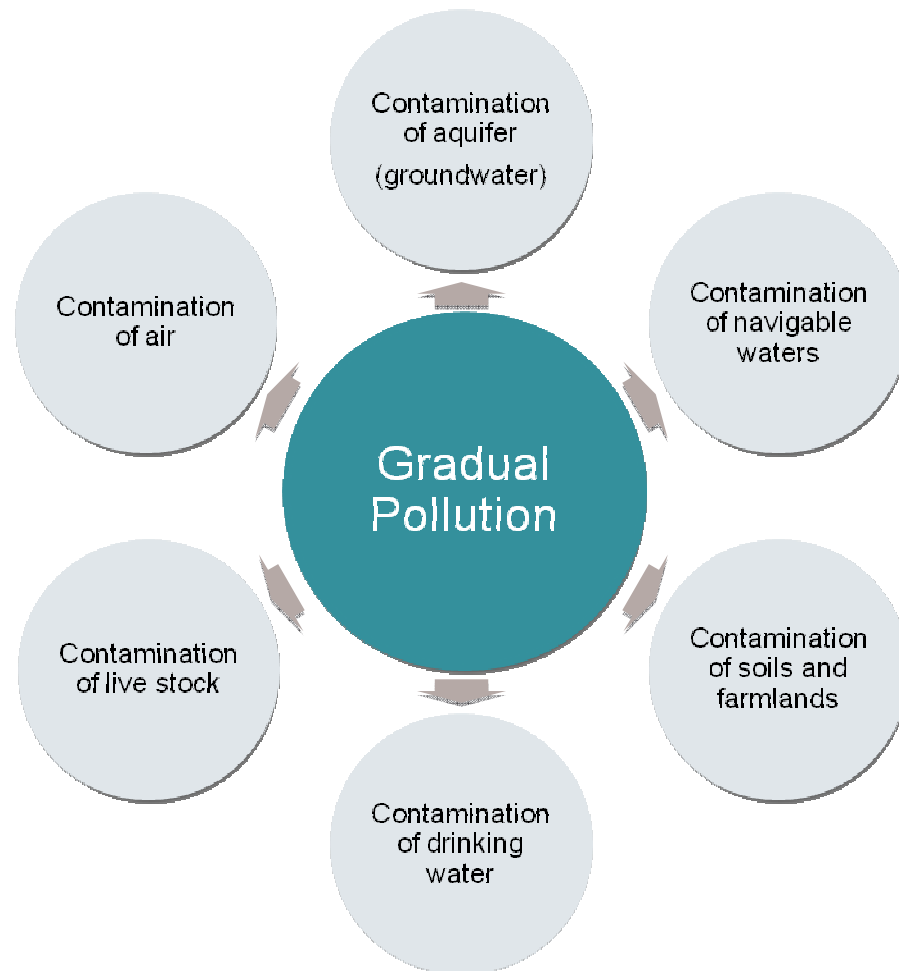
May, 2011 - DEP fines Chesapeake Energy \$1.1m for water contamination and tank fire in Bradford County.

POLLUTION EXPOSURES



Exposures Gradual Pollution

- Fracking water contains hazardous chemicals
- Up to 700 different chemicals have been used
- Water Treatment – Water treatment plants unable to fully test and clean the water before releasing
- Groundwater pollution – chemical infused wastewater can escape into the environment in several ways:
 - Failures in well casing allow water to leak into aquifers
 - Waste water can leak out of the storage pits (lining fails)



Pollution Regulatory Landscape

(1/2)



Federal

- CERCLA (Superfund) - Imposes Liability for the release of hazardous substances and provides response activities.
- Clean Air Act - Gives EPA jurisdiction over the reduction of contaminants in the air
- Clean Water Act - Gives the EPA jurisdiction over the discharge of pollutants into the water from the “point of discharge”
- Safe Drinking water Act - Requires the EPA to set standards and oversee states, localities and water suppliers.
- Energy Policy Act of 2005 - Providing tax incentives & loan guarantees for various types of energy production.....included the “Halliburton Loophole”
- FRAC Act of 2009/10/11- Aimed at repealing Halliburton Loophole

The Challenge: Balance Energy & Job needs with Environmental Concerns

Pollution Regulatory Landscape (2/2)

State
and
Local

- NY, PA, MD, VT & TX at the forefront (also AR, CO, NJ, WY)
- Initiatives vary— some include (Current or Proposed):
 - Ban or Moratorium (Active or Pending a Study) - MD; NJ; NY; VT
 - Requiring (passed or proposed) full disclosure of chemicals - (e.g., TX; AR; CO, OH; MI; PA; WVA; WY)
 - Operational Regulations —
 - Positing a bond to cover well closings (Delaware River Basin)
 - Monitoring level of fluid contamination (Ohio)
 - Presumption of Liability (PA Oil and Gas Act)
 - Taxes initiatives (WVA passed a law imposing tax penalties for repairing land damaged by Hydrofracking activities)

The Challenge: Balance Energy & Job needs with Environmental Concerns

Pollution Coverage Considerations

Occurrence
Trigger

Possibilities:

- **Exposure** - Proximity to the well
- **Injury-in-fact** - The date actual damage/injury takes place
- **Manifestation** - The date when the damage/injury becomes evident or is discovered
- **Continuous Injury Trigger** - Period from initial exposure to discovery

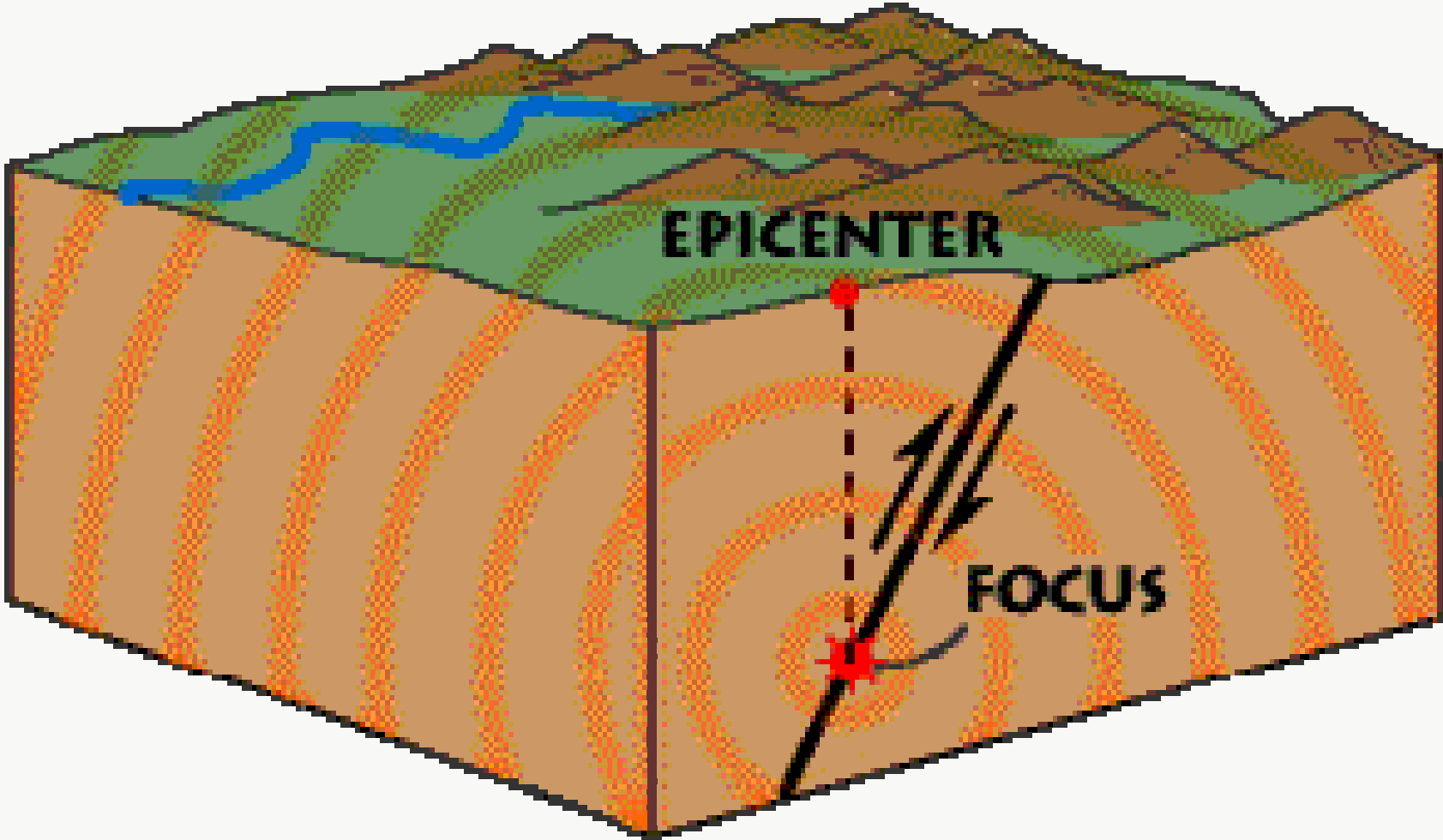
Specific EIL Coverage will likely fill the Coverage Gap

Exclusions

Most Prominent

- **Pollution**
 - Language – Total; Absolute; Named Peril / Time Element; Manuscript
 - Exceptions – S&A; Do all defendant “own, occupy or rent” the fracking location?
 - Application to Personal Injury – wrongful eviction or invasion of privacy
- **Fortuity** – Are fracking losses Expected /Intended

EARTHQUAKE EXPOSURES

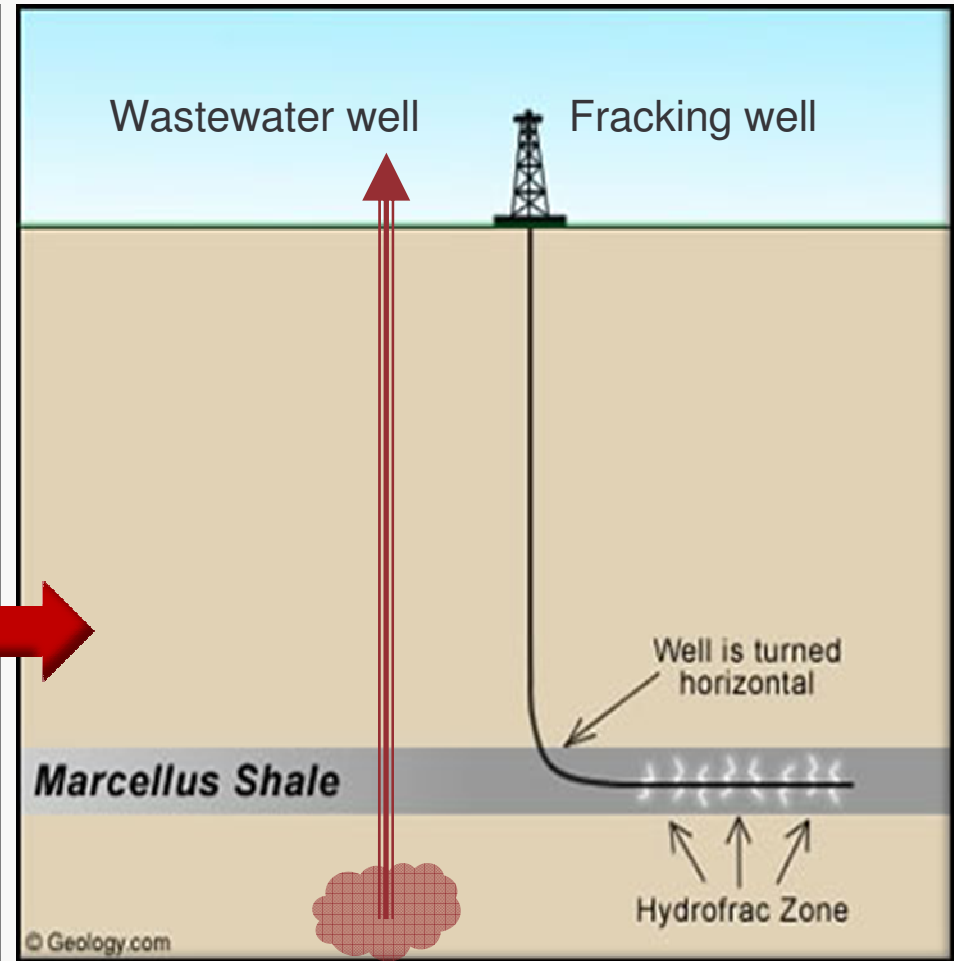


Does Hydrofracking cause Earthquakes?

**Wastewater Injection
Wells.....**

.....greater issue than
the Fracking Well itself...

.....Deeper,
Longer Duration



US Dept. of Interior/US Geological Survey Earthquake Examples (Largest recorded)

- Rangely, CO, **injection** experiments (M4.9, 1995), 1945-1995
- Rocky Mountain Arsenal (M5.3, 1967), fluid **injection**, 1962-1966
- Gazli, Uzbekistan, gas recovery (M7.2), 1976-1984
- Water Reservoirs: Lake Mead (M5), Koyna (M6.3), Oroville (6.1) Tadjikistan, Italy and many others
- Geysers Geothermal Field (M4.6), **injection**-enhanced production
- Dallas Airport (M3.3), fluid **injection**, 2008-2009
- Arkansas (M4.7), fluid **injection**, 2010-2011
- Youngstown, Ohio (M4.0), fluid **injection**, 2011

Earthquake frequency in the central U.S. increased 50% in 2000, and then over seven-fold in 2008

Earthquake Coverage Considerations

Standard Commercial & Personal Property Coverage

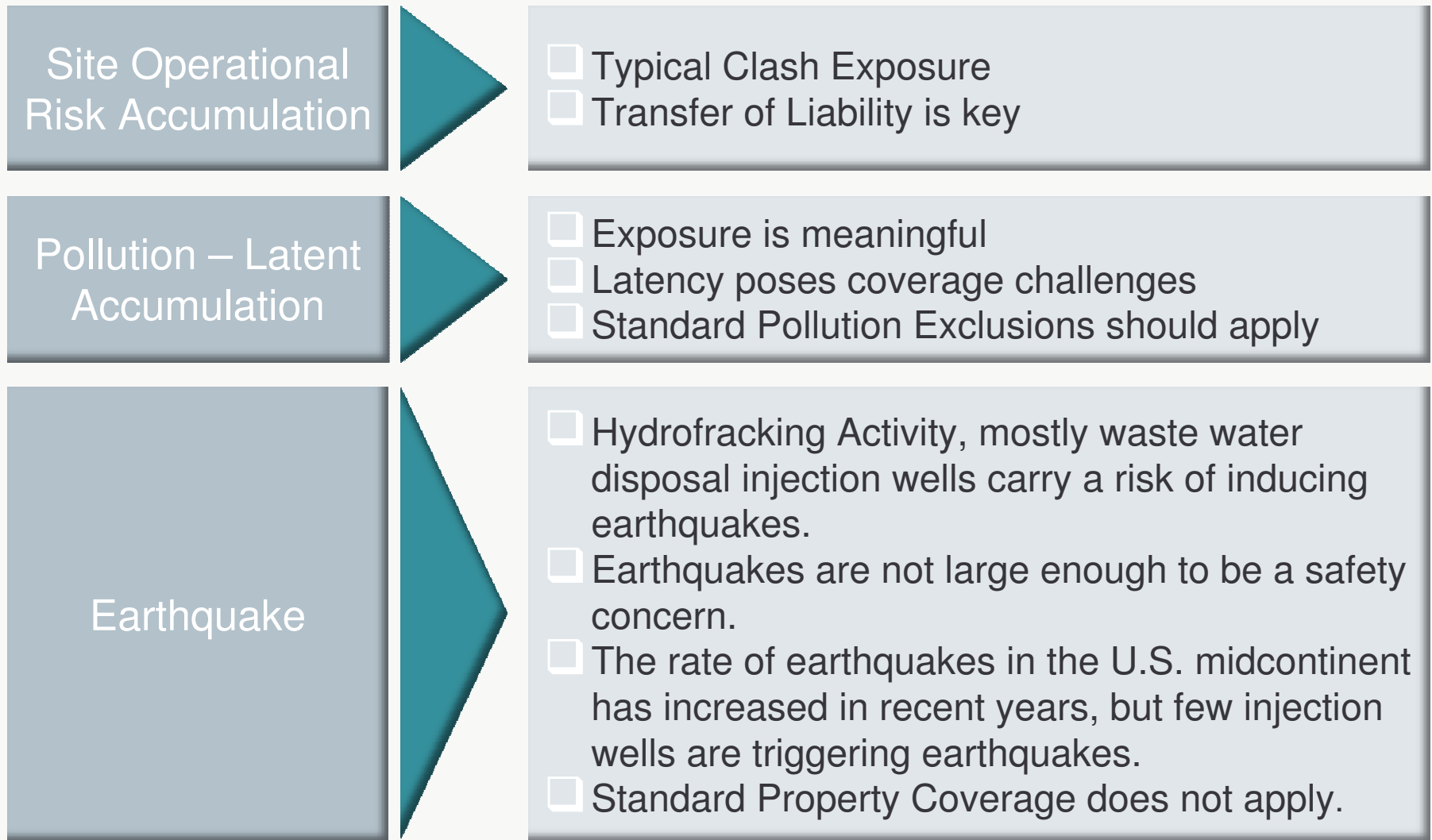
- Standard Policies do not cover Earthquake
- EQ Coverage needs to be added by endorsement for an additional Charge

Developers/ Energy Cos./ Contractors could still be liable for damage!!



Conclusions

What is the Catastrophic Potential??



- ❑ The Cat Risk associated with Hydrofracking is not significant
- ❑ It can be controlled through Coverage and Risk Management





Thank you For Your Attention

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