

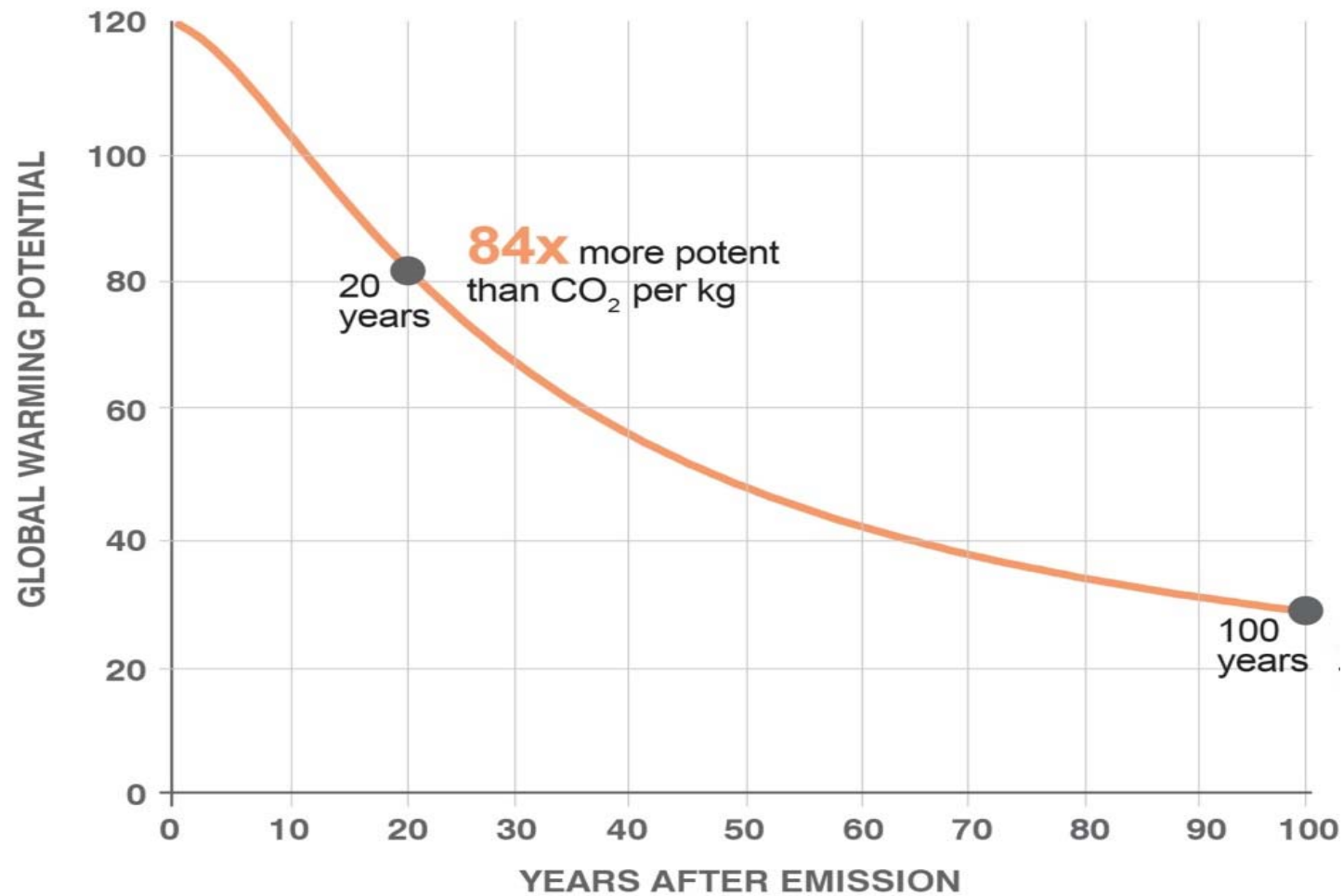
# Narrowing the Gaps

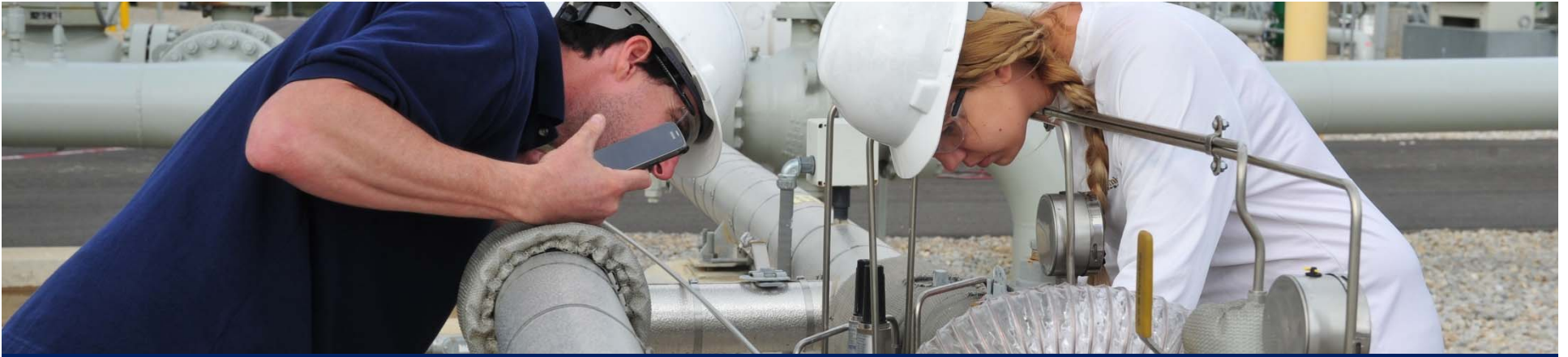
*Better Science for Smarter Policies*

Nichole Saunders  
Environmental Defense Fund  
nsaunders@edf.org

# Methane

A pound of methane has *84 times* the climate impact of a pound of carbon dioxide over the first 20 years.





## EDF Methane Research



### Science

16 peer-reviewed studies analyze data collected through multiple methods to measure oil and gas supply chain emissions



### Collaboration

More than 100 academic and industry partners



### Results

Multiple studies find emissions are higher than official estimates

# Texas Methane Research

### Coordinated Research

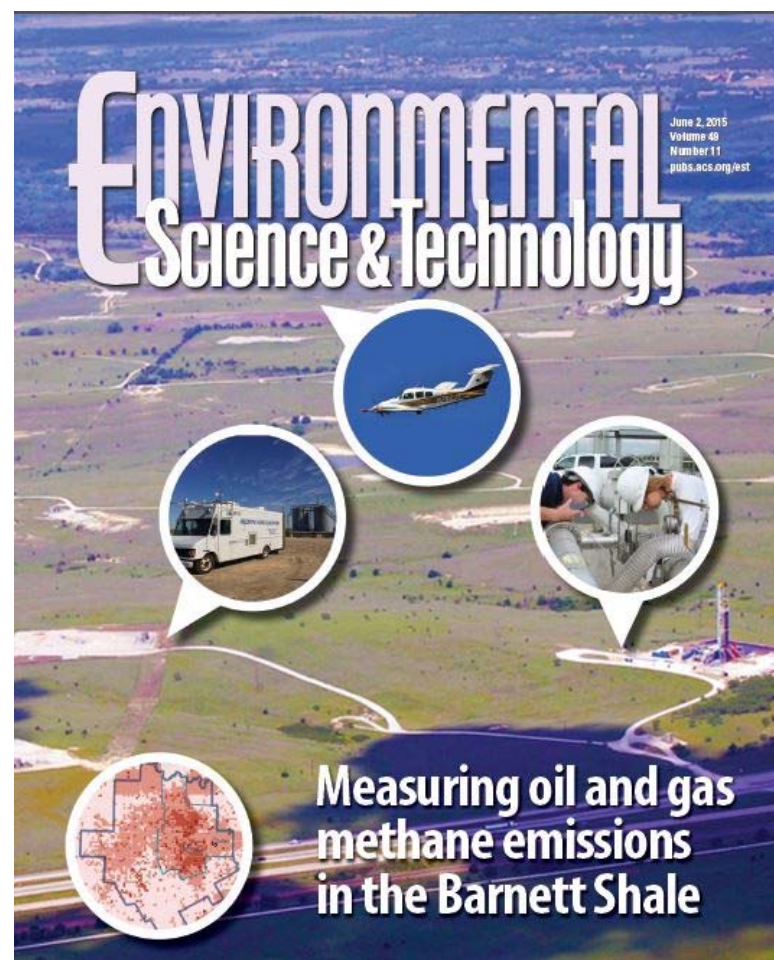
10 diverse research teams studying emissions in the Barnett Shale

### Multiple Methods

The campaign used a variety of aircraft, vehicle and ground-based measurements to quantify methane emitted across the natural gas supply chain.

### Higher Emissions Found

Due largely to super emitters and comprehensive activity data, researchers estimated emissions were **90% higher** than estimates based on the previous EPA inventory







## Lessons Learned



### Higher Emissions

As a whole, oil & gas methane emissions are higher than estimates based on older measurements.



### Super Emitters

Unpredictable, widespread problem that needs to be addressed



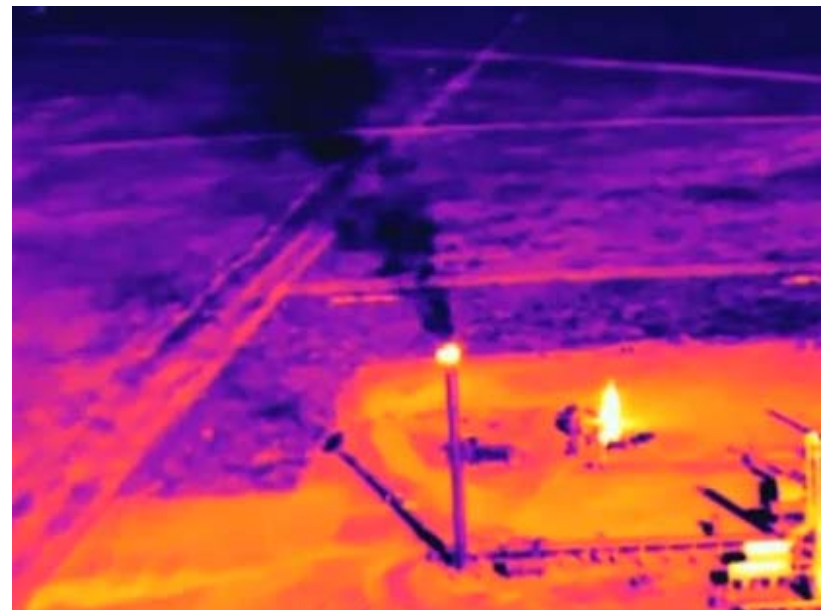
### Regulations Work

Reducing emissions through regulations narrows ranges of company performance

# More Than Methane

## *Volatile Organic Compounds (VOCs)*

- When methane is emitted, smog-forming VOCs and other harmful air pollutants are also released
- Cutting methane has the added benefit of reducing air pollution



## OIL & GAS METHANE POLLUTION

*How much is leaking?*



**9.8 MILLION  
METRIC TONS**  
of methane leaked each year  
by America's oil & gas industry

Methane leaks all  
across the natural  
gas supply chain,  
from the well head to  
the end user.



Enough gas to meet  
the annual heating and  
cooking needs of  
7 million homes



Methane leaks  
represent nearly  
\$2 billion worth of  
wasted gas



Same 20-year climate  
impact as 240 coal-fired  
power plants



Same 20-year climate  
impact of more  
than 175 million cars



**Production**



**Gathering**



**Processing**



**Transmission  
& Storage**



**Local Distribution**



# U.S. Oil & Gas Methane Pollution

## *Progress in the states*

### **CALIFORNIA**

Proposed methane rules throughout the value chain that will reduce total oil & gas leakage by 40-45% by 2030, including from 56% from production systems

### **NORTH DAKOTA**

Set regulations to reduce natural gas flaring

### **WYOMING**

Secured methane reductions of 45% in the Upper Green River Basin through improved air quality requirements on new & existing wells

### **COLORADO**

Successfully passed the nation's first statewide methane reduction rules leading to methane reductions of more than 35%.

### **PENNSYLVANIA**

Announced plans to develop nation-leading regulations on new & existing sources that would result in a 44% reduction in methane emissions.

### **OHIO**

Secured adoption of general permit LDAR requirements that are reducing methane emissions by 70%; currently working to secure adoption of requirements for compressor stations that will lead to further reductions.



# Alternative Produced Water Management

## Recycling

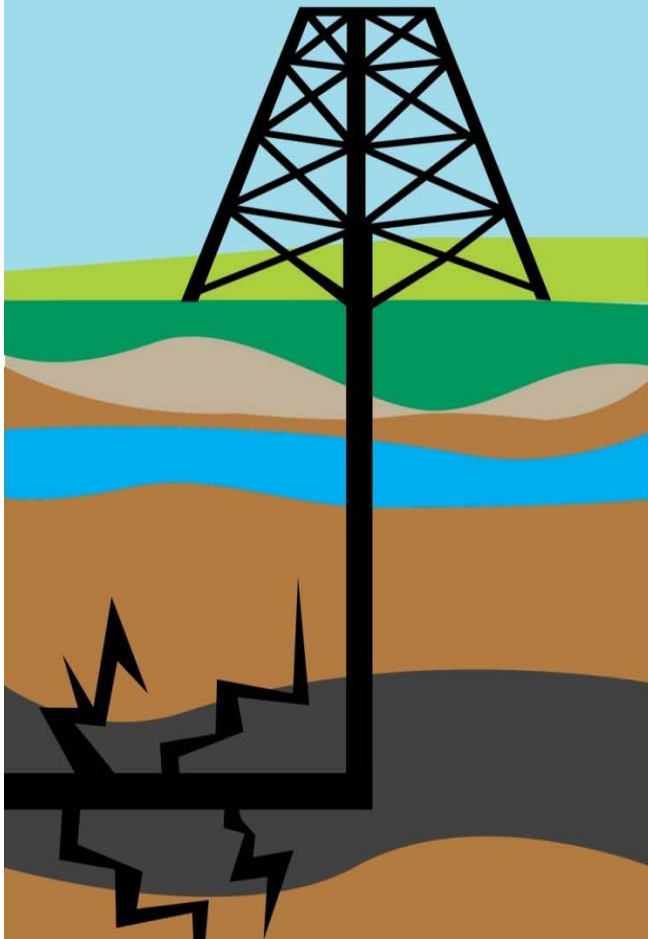
- Treated or blended for reuse in fracturing operations
  - Issues of concern:
    - Storage
    - Transportation
    - Treatment
    - Residuals management

## Reuse & Discharge

- Leaves the oilfield and enters water cycle or environment
  - Scenarios include:
    - Agriculture/Livestock
    - Industrial cooling water
    - NPDES discharge
    - Road/Land spreading
    - De-icing

## RISKS OF POORLY MANAGED OIL & GAS WASTEWATER

Water mixed with chemicals and sand is pumped under ground.



If not properly managed, this waste can end up polluting...



soil and crops



drinking water

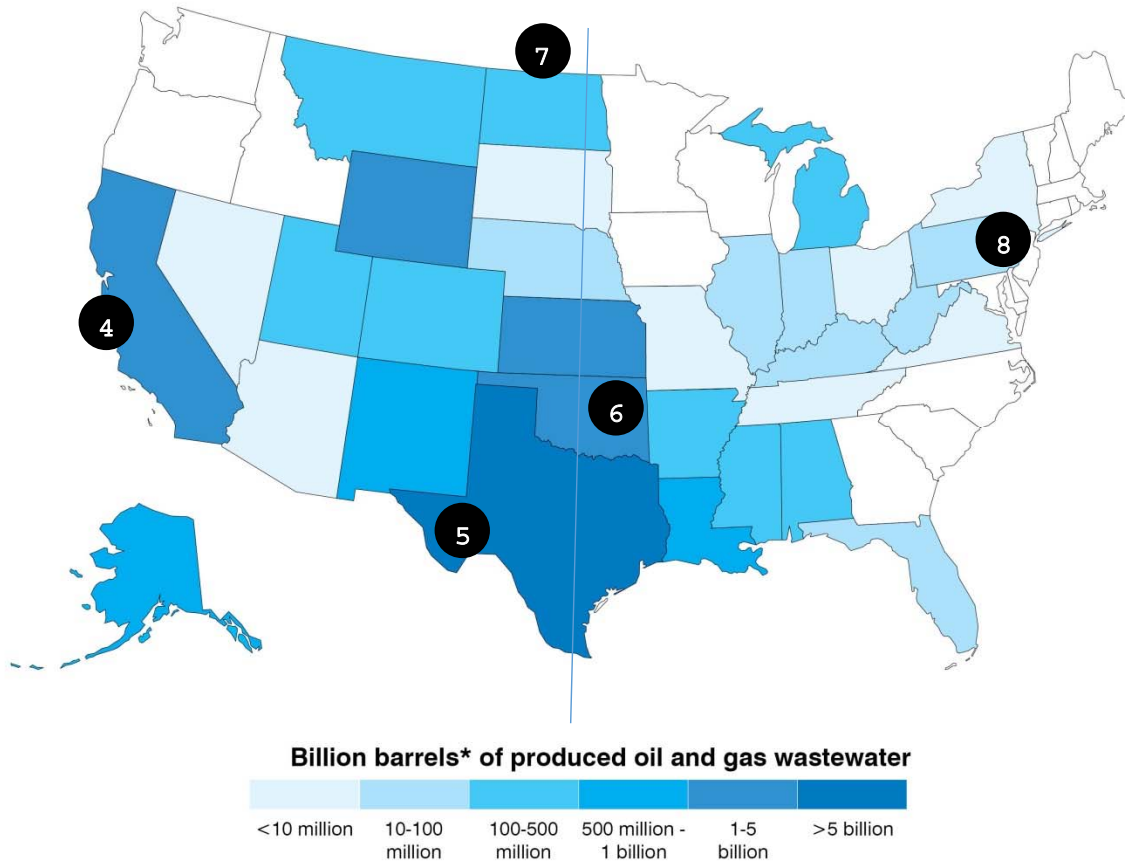


US oil and gas companies produce 800 billion gallons of **salty, toxic wastewater** each year.



## Managing oil and gas wastewater

*Alternative methods to underground disposal – a National Snapshot*



**Total produced: 800 billion gallons annually**

\*1 barrel = 42 gallons

- 4 Central Valley, California:**  
30 year program – currently over 90K acres approved to use oilfield wastewater for food crop irrigation
- 5 Pecos, Texas:**  
2015 pilot to irrigate cotton with produced water (no runoff allowed)
- 6 Oklahoma:**  
Governor task force to examine alternatives to oil and gas wastewater disposal wells
- 7 West of 98<sup>th</sup> Meridian:**  
EPA rules allow discharges if “good enough quality” for ag and livestock
- 8 Pennsylvania:**  
Discharges to surface waters via centralized treatment facilities (PA rules, in effect, require thermal distillation)

## DETECTION

We struggle with identifying the chemicals that may be present in oil & gas wastewater...

## AWARENESS

...which means we don't know exactly which chemicals or what amounts may be present because we can't find what we aren't looking for...

## EXPOSURE

...which means we aren't researching who/what may come in contact with those chemicals...

## HAZARDS

...so we can't determine the risk they pose if released...

## PROTECTION

...which means we don't have the information needed to treat or regulate unsafe chemicals and advance detection efforts....



...and the cycle repeats

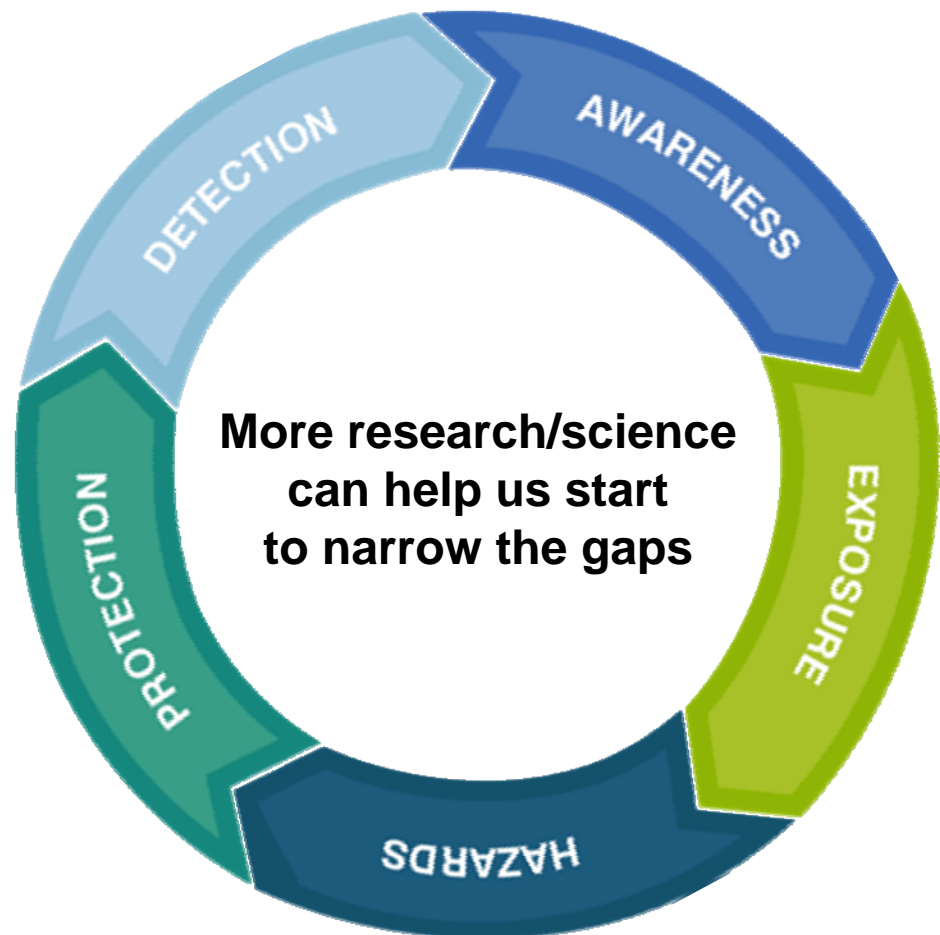




## Finding answers to narrow the gaps

### DETECTION

Conduct and catalyze important science and research needs to help narrow important gaps and build forward momentum



## EDF's Wastewater Science

### PRODUCED WATER CHARACTERIZATION

Improve analytical methods so we can know what's in the wastewater

### TREATMENT TECHNOLOGIES

Understand how we can efficiently and economically remove toxic constituents before novel uses or discharge

### TOXICITY

Understand potential toxic impacts of beneficial reuse options on land, crops, animals, and humans



## Asking the Right Questions

- How clean is “clean” for alternative proposed uses?
- What’s in the wastewater?
- What are the most effective treatment technologies?
- What are the potential impacts of intentional releases of wastewater?
  - Consider impacts to water resources, land, crops, animals, and humans
- How can we prevent or minimize unintentional releases like spills and leaks?



***You can't manage risks that you  
don't understand.***

## Well Integrity

- Model Regulatory Framework
  - Leading practices for regulators on well integrity
  - Developed by EDF and Southwestern Energy
- The RRC's 2013 Adoption of dozens of MRF provisions led to 40% drop in blowouts and 50% drop in injuries from blowouts the next year
- Next for Texas?
  - Formation integrity testing
  - Area of Review requirements for production wells
  - Refreshing Underground Injection Control rules

