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US Regulations Impacting Operators in Shale Gas Drilling and Production

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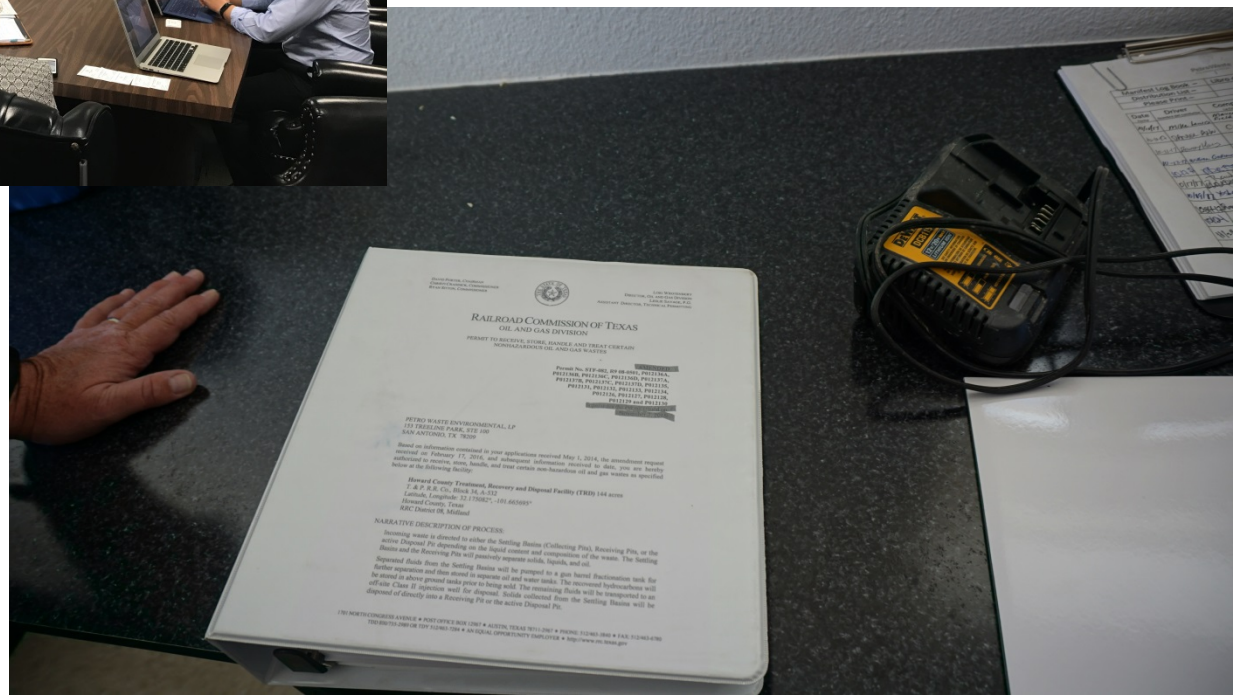
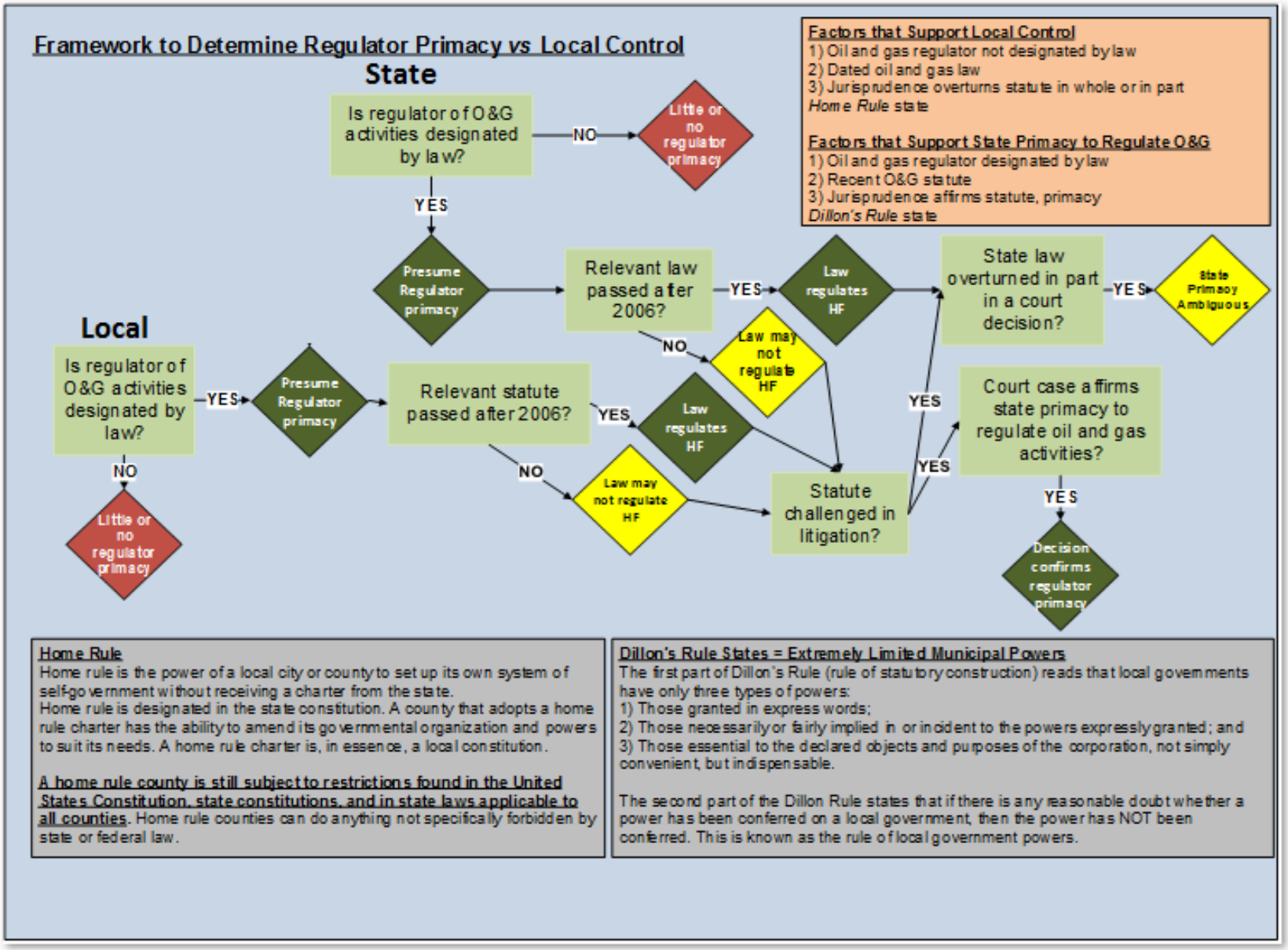

RAILROAD COMMISSION OF TEXAS
OIL AND GAS DIVISION

Outline: Onshore Regulations

- State primacy/local bans
- Permitting
- Federal Hydraulic Fracturing Regulations
- State and Local Hydraulic Fracturing Regulations
- Safety
- Best Management Practices (BMPs)/Implementations/Case Histories

State Primacy/Local Bans



Permitting

- In addition to the BLM (Bureau of Land Management) itself, operators must conform to numerous other federal laws including:
  - National Environmental Policy Act (NEPA)
  - Tribal Consultation
  - U.S. Forest Service
  - U.S. Fish and Wildlife Service

➢ https://www.daily-times.com/story/money/industries/oil-gas/2017/05/27/blm-outlines-drilling-permit-process-federal-lands/101753030/

Permitting

1.	Lease is obtained by operator (development must start within the term of the lease – typically 10 years - or the lease will expire).
2.	Operator files a Notice of Staking.
3.	BLM must schedule an on-site inspection of the NOS within ten days and post the NOS for a 30-day review. There is no time requirement for the actual inspection.
4.	Within two weeks after the on-site inspection, a NEPA interdisciplinary team meeting takes place.
5.	Operator files APD.
6.	BLM has 10 days to review the APD and determine if it is complete.
7.	If deficiencies in APD are found, operator has 45 days to address them
8.	If the APD is complete and NEPA requirements are met, BLM has 30 days to approve, deny or defer the permit.
9.	After contractors submit the NEPA documentation (which averages 30 days to compile), BLM and specialists review it within 10 days.
10.	If NEPA requirements are not met, the APD is placed into deferred status until they're met. There is no time requirement for deferred status.
11.	Once NEPA documentation has been reviewed by specialists and requirements are met, it is reviewed by BLM planning and environmental coordinator, usually within 10 days.
12.	The NEPA documentation then goes to BLM management for review.
13.	If management determines a public comment period is needed, comment period may last up to 30 days.
14.	Management may revisit the NEPA documentation in order to address substantive comments. There is no time limit for this process.
15.	If a significant impact is found, an Environmental Impact Study is initiated
16.	Once all issues have been addressed, and if the BLM team determines there is no significant impact from drilling, the operator receives the approved permit, usually within a few days, along with any applicable conditions of approval. The operator is free to begin drilling (so long as any needed Right of Way approvals for roads, etc., have been obtained).

Farmington Daily Times, BLM outlines drilling permit process on federal lands, https://www.daily-times.com/story/money/industries/oil-gas/2017/05/27/blm-outlines-drilling-permit-process-federal-lands/101753030/

Federal Regulations as Related to Air

- Greenhouse Gas Reporting Program (GHGRP) (40 CFR 98)
- National Ambient Air Quality Standards (NAAQS) (40 CFR 50)
- New Source Review (NSR) Permits (40 CFR 51-52)
- New Source Performance Standards (NSPS) (40 CFR 60)
- National Emission Standards for Hazardous Air Pollutants (NESHAPs) Regulations (40 CFR 63)

- United States Environmental Protection Agency, Reviewing National Ambient Air Quality Standards (NAAQS): Scientific and Technical Information
- United States Environmental Protection Agency, New Source Performance Standards and Permitting Requirements
- United States Environmental Protection Agency, New Source Performance Standards and Permitting Requirements
- United States EPA, https://www.epa.gov/stationary-sources-air-pollution/national-emission-standards-hazardous-air-pollutants-neshap-9
- United States Environmental Protection Agency, GHGRP Petroleum and Natural Gas Systems

Federal Regulations Related to Energy Resource Development

- BLM Oil and Gas Development Regulations (43 CFR 3100-3190)
- BLM Waste Prevention, Production Subject to Royalties, and Resource Conservation (43 CFR Parts 3100, 3160 and 3170)
- Federal Land Policy and Management Act of 1976 (FLPMA)
- Mineral Leasing Act

- Tribal Energy and Environmental Information, Federal Land Policy and Management Act
- United States Department of Interior Bureau of Land Management, Mineral Leasing Act of 1920 as Amended

Federal Regulations as Related to Hazardous Materials and Waste Management

- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund)
- Emergency Planning and Community Right-to-Know Act (EPCRA)
- Toxic Substances Control Act (TSCA)
- Resource Conservation and Recovery Act (RCRA)

- United States Environmental Protection Agency, Superfund: CERCLA Overview
- United States Environmental Protection Agency, Key Provisions of the Emergency Planning and Community Right-to-Know Act
- United States Environmental Protection Agency, Resource Conservation and Recovery Act (RCRA) Laws and Regulations

Federal Regulations as Related to Environmental Policy and Safety

- **National Environmental Policy Act:** Electronic Code of Federal Regulations, Title 40 – Council on Environmental Quality

- **Occupational Safety and Health (OSH) Act:** United States Department of Labor, OSH Act of 1970

Federal Regulations as Related to Water

- Spill Prevention Control and Countermeasure Plan (SPCCP) Regulations (40 CFR 112)
- National Pollutant Discharge Elimination System (NPDES) Regulations (40 CFR 122-136 and 401-471)
- EPA Section 404 Wetlands Protection Regulations (40 CFR 230-233)
- USACE Section 404 Wetlands Protection Regulations (33 CFR 323)
- Safe Drinking Water Act (SDWA) (40 CFR 141-149)
- UIC Program Regulations (40 CFR 144-148)

Federal Regulations as Related to Endangered Species Act

- **Endangered Species Act (ESA)**
  - United States Fish & Wildlife Services, Endangered Species

State and Local Regulations

- Defining the overall “strictness/leniency” of any given state *vis a vis* the overall regulatory environment is extremely difficult.
- Some states have a relatively straight forward and streamlined process for obtaining a permit to drill, but may also require permits from various agencies for water, air, building a camp for workers, etc.
- Making a blanket determination that any given state is more or less lenient for oil and gas production is not a clear-cut ‘black or white’ task.

State and Local Regulations

- "Domestic onshore oil and gas development is regulated by the individual state in which the activity will take place. Each state has its own regulatory agency or agencies that control things such as:
  - The distance between oil wells and property lines to protect the rights of adjacent landowners.
  - Prevention of waste.
  - Health and safety issues.
- However, local government control over oil and gas production is generally not permitted by state law, except for local zoning input that in some states allows local government control over where and when oil and gas production activities can take place (to prevent, for example, residential neighborhoods from noise pollution, industrial traffic, or perceived health hazards)."

➢ Michael P Joy and Sashe D Dimitroff. Oil and gas regulation in the United States: Overview. Thompson Reuters Practical Law. June 1, 2016.

State and Local 'Programs' for State and Local Agencies

- **The States First program** is a state led effort in which multiple state regulatory agencies are collaborating with each other in an ongoing effort to keep current with rapidly changing technology, and to share the best and innovative regulatory procedures from state to state.
- In this initiative, governors, regulators, and policy leaders from oil and gas producing states across the U.S. have aligned with the **Interstate Oil and Gas Compact Commission (IOGCC) and Ground Water Protection Council (GWPC).**
  - The IOGCC is a multi-state government organization with an objective to conserve and maximize oil and natural gas resources while protecting health, safety and the environment.
  - The GWPC is a national 501(c)6 organization whose members are comprised of state ground water regulatory agencies committed to the protection of the nation's ground water supplies.
  - This joint initiative allows a distinctive synthesis of regulatory experts, state policy and technical staff from across the country to come together and share business practices, review internal operations.
  - Additionally, the initiative fosters opportunities for extrapolating effective practices from one state to another.

➢ http://www.statesfirstinitiative.org/about

State and Local Review Process

- States identified a need to have a regulatory review process. They established a program with the financial the assistance of the U.S. Department of Energy in the early 1990's to develop STRONGER, (State Review of Oil and Natural Gas Environmental Regulations).
- STRONGER is a 501(c)3 nonprofit, multi-stakeholder, educational organization. The Board of Directors is comprised of equal representation from the oil and gas industry, state oil and gas environmental regulatory agencies, and the environmental public advocacy community.
- STRONGER's work focuses on two areas:
  - developing guidelines for state oil and gas environmental regulatory programs,
  - and publishing State Review Reports of volunteer programs against the criteria of those Guidelines.
- All STRONGER efforts are led by multi-stakeholder workgroups comprised of subject-matter experts.

➢ http://www.strongerinc.org/

Safety

- Onshore oil and gas safety is regulated by federal and state agencies.
  - OSHA's General Industry Standards (29 CFR 1910)
  - OSHA's Construction Standards (29 CFR 1926)
  - General Duty Clause of the Occupational Safety and Health (OSH) Act
- Additionally, OSHA regional offices located in areas of active onshore exploration and production deploy regional or local programs for the purpose of conducting inspections on oil and gas operations. These regions are:
  - Region III (Philadelphia)
  - Region VI (Dallas)
  - Region VII (Kansas City)
  - Region VIII (Denver)

- https://www.osha.gov/dep/leps/RegionIII/reg3_fy2018_2018-01.pdf
- https://www.osha.gov/dep/leps/RegionVI/reg6_fy2018_oilandgas_CPL-2-02-00-013.pdf
- https://www.osha.gov/dep/leps/RegionVII/reg7_fy2018_CPL-2-07-13M.pdf
- https://www.osha.gov/dep/leps/RegionVIII/reg8_fy2018_18-04_oil_gas.pdf

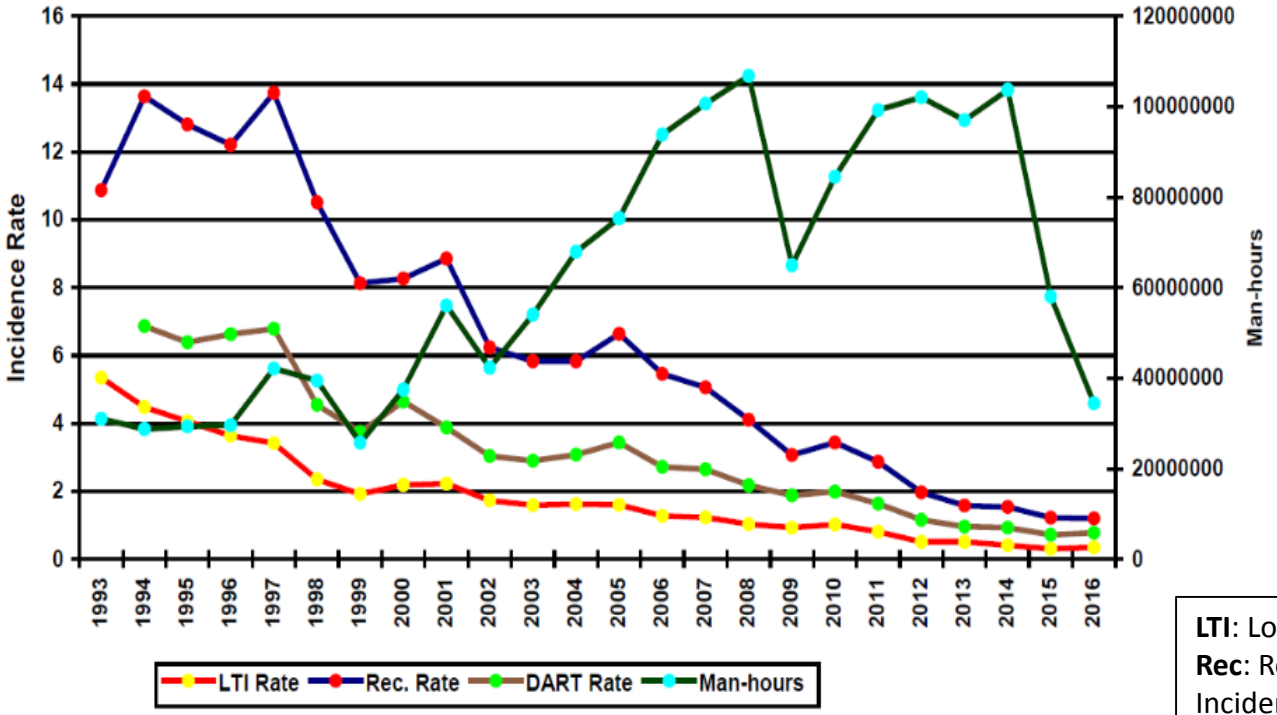
Safety

- It is important to note for this presentation that the U.S. industry's safety performance is enhanced by self-regulation
  - through various programs
  - transparent reporting of incidents
  - company required training and accreditations.
- In particular, are the programs through the American Petroleum Institute (API) and the International Association of Drilling Contractors (IADC).
  - IADC, for example, has produced HSE Case Guidelines for both offshore and onshore drilling rigs that have become increasingly popular with drilling contractors in many areas around the world.

Best Management Practices

- There are two paths that can be taken by oil and gas producers regarding the impacts that shale activities have on communities, health and the environment.
- The first path is a status quo pathway whereby industry hopes that the economic benefits of development will overwhelm concerns over environmental and community impact. This path would likely be fraught with burdensome, one-size-fits-all regulations.
- The second path would require producers to take positive steps to head off bad regulations. It would require industry to identify and implement Best Management Practices (BMPs) for sustainable shale production.

Best Management Practices



U.S. Land Total Incidence Rates vs Man-hours (Source: International Association of Drilling Contractors)

LTI: Lost Time Injury
Rec: Recordable Incident
DART: Days Away, Restricted, or Transferred

Best Management Practices

- An example of voluntary BMPs is **The Environmental Partnership**, an American Petroleum Institute (API)-led effort of 26 companies that have committed to reducing methane emissions by:
  - Implementing leak monitoring using the latest detection methods
  - Replacing or retrofitting highly emitting pneumatic controllers; and
  - Attempting to minimize emissions from manual liquids unloading for gas production sources.

➢ https://theenvironmentalpartnership.org/

Best Management Practices

- EPA's **Natural Gas Star Methane Challenge Program** is another voluntary methane emissions reduction program managed by EPA with over 40 industry participants.
- The **Sustainability Accounting Standards Board (SASB)** is an independent, private-sector standards setting organization based in San Francisco, California dedicated to enhancing the efficiency of the capital markets by fostering high-quality disclosure of material sustainability information that meets investor needs.

➢ https://www.epa.gov/natural-gas-star-program/methane-challenge-program

Best Management Practices

- Increasingly, oil and gas producers are expected to do more than just meet the criteria required by law in order to receive their permits and other license to operate. They are expected to contribute to the communities, societies and ecosystems in which they operate. This involves not just avoiding impacts, but provide offsets and net gains to communities, societies and ecosystems.
- Examples might include contributing to local schools and universities, providing needed wildlife research, building roads, and planting forests. When companies make positive contributions such as these, they create goodwill in a community which makes those communities more accepting of them and their operations. This is known as a **Social License to Operate**. Companies that achieve a social license to operate have a greater likelihood of success in gaining future permits and avoiding lawsuits.

Best Management Practices

Below lists some of the issues that have been recognized as BMPs concerning sustainable shale development:

- Reduced land disturbance.
- Reduced water use and disposal.
- Reduced atmospheric methane emissions.
- Model well completion and operating practices.
- Use of non-toxic hydraulic fracturing fluids (and educating the public there of).
- Reduced air-quality impacts.
- Treatment of naturally occurring radiation.
- Collection of pre-drilling and development baseline data.
- Efficient incident response capability.
- Robust public engagement.

Best Management Practices

Industry has various BMPs that it can point to and utilize in the shale plays. They include:

- Pad drilling, which reduces land impacts, also saves money by improving rig efficiency and reducing pit construction costs.
- Treating and recycling water used in fracturing which can reduce truck traffic and cuts costs.
- Investments to capture methane emissions during well testing and production that generate additional revenues that far exceed their costs.

Forest Fragmentation

Best Management Practices

Air and climate protection and surface and groundwater protection performance standards include:

Air and Climate Protection

- Limitations on Flaring
- Use of Green Completions
- **Reduced Emissions (Natural Gas STAR Program)**
- Reduced Engine Emissions (e.g. decrease vehicles to from sites)
- Emissions Controls on Storage Tanks

Surface and Groundwater Protection

- Voluntarily Maximizing Water Recycling (As close to 100%)
- Development of Groundwater Protection Plans
- Closed Loop Drilling
- Well Casing Design (Education there of)
- Groundwater Monitoring
- Wastewater Disposal
- Impoundment Integrity
- Chemical Disclosure (Education there of)

Looking at Methane Emissions

- From Natural Gas STAR Website:

Best Management Practice Commitment Option

- Focus their commitment on one or more sources
- Select from BMP mitigation options affiliated with each source
- Set the target year for company-wide implementation of best practices (within five years of start date), and establish the timeframe for implementation and relevant milestones

ONE Future Emissions Intensity Commitment Option

- The Commitment supports members of the Our Nation's Energy Future Coalition (ONE Future) partnership, who have agreed to segment-specific emissions intensity targets that inform a collective goal of reducing methane emissions associated with the production, processing, transmission and distribution of the U.S. onshore natural gas value chain to 1% or less by 2025.

➢ https://www.epa.gov/natural-gas-star-program/methane-challenge-commitment-options

Can visit the site below to see all the partnership commitments.

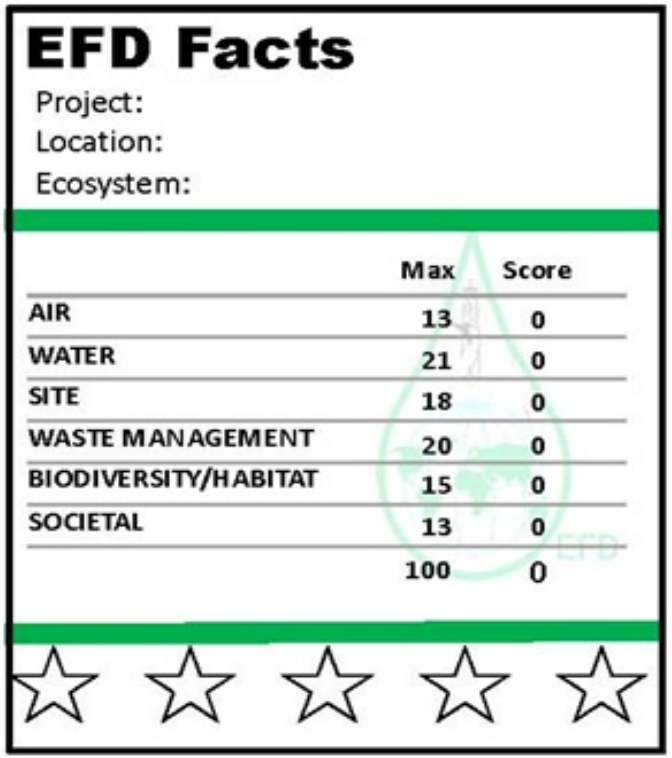
- **To date over 100 companies are participating.**
- **Companies are ranging (dependent on their functions) 0.31-95% cut in methane emissions**

➢ https://www.epa.gov/natural-gas-star-program/methane-challenge-partner-commitments

Best Management Practices

- Another best practice example is the Environmentally Friendly Drilling (EFD) Scorecard was created as a voluntary, consensus-based tool that measures how industry addresses certain issues.
- It can be used to objectively assess operators' environmental performance.

➢ Haut, R.C., Burnett, D., Williams, T. and Theodori. 2010. Balancing Environmental Tradeoffs Associated with Low Impact Drilling Systems to Produce Unconventional Natural Gas Resources. Presented at the Canadian Unconventional Resources & International Petroleum Conference, Calgary, Alberta, Canada, 19-21 October. CSUG/SPE-137430-PP



Best Management Practices

- **Best Management Practices in Disclosing Chemicals used in Hydraulic Fracturing**
- An example of the application of BMPs in a way that avoids regulation and provides transparency is FracFocus
- FracFocus is managed by the Ground Water Protection Council (GWPC) and Interstate Oil and Gas Compact Commission (IOGCC), two organizations committed to conservation and environmental protection. FracFocus and its corresponding website was created to provide the public access to reported chemicals used for hydraulic fracturing within their area.
- The site also provides objective education on hydraulic fracturing, the chemicals often used, the purposes they serve, and various means by which groundwater is protected.

States' Analysis

- State comparison
- Case Studies

State	Range of Break Even Costs	Relevant Agencies/Jurisdictions (primary in bold)	Average time to Permit to Drill
North Dakota	Bakken Antelope $24.99 - $87.50 (Bakken Billings) [Oil]	**The Department of Mineral Resources, Oil and Gas Division** North Dakota Industrial Commission US EPA North Dakota Environmental Health Department of Health, BLM (tribal land)	25 – 30 days
Ohio **Case Study: Operator Risk Management**	Appalachian Index – Dominion Transmission $2.427-$0.79 Appalachian Index – TCO $2.370-$0.97	**Ohio Department of Natural Resources (ODNR), Division of Oil and Gas** ODNR - Division of Water Resources Ohio EPA United States Army Corps of Engineers (USACE)	10-21 days
Oklahoma **Case Study: Oklahoma Water for 2060**	Anadarko Basin: $32.79 (Stack) - $62.84 (Ardmore) [Oil]	**Oklahoma Corporation Commission (OCC)** Oklahoma Water Resources Board Oklahoma DEQ US EPA	1 -3 days
Pennsylvania	Marcellus - $2.60 (Appalachian PA West) - $3.60 (Appalachian PA South) [Natural Gas]	**Pennsylvania Department of Environmental Protection (DEP), Office of Oil and Gas Management** Susquehanna and Delaware River Basin Commissions PA Public Utility Commission PA Department of Conservation and Natural Resources US EPA Bureau of Air Quality	
Texas **Case Study: Denton Fracking Ban (HB 40)**	Permian Bone Spring Basin $23.84 - $64.74 Eagle Ford $26.67 (Dewitt) - $59.62 (Giddings) [Oil)]	**Railroad Commission of Texas (RRC)** Texas Commission on Environmental Quality (TCEQ) Texas General Land Office University Lands The Office of the Comptroller of Public Accounts Texas Department of State Health Services (DSHS)	1 day
California	Information not published or available for Monterrey Shale	**Division of Oil, Gas, and Geothermal Resources (DOGGR)** U.S. EPA State and Regional Water Quality Control Boards California Air Resources Board Additional Agencies with Regulatory Oversight over Petroleum Production in California: Department of Conservation Department of Toxic Substances Control Office Environmental Health Hazard Assessment California State Lands Commission Regional Air Districts Local City and County Governments State Fire Marshall California Fish and Wildlife U.S. Fish and Wildlife California Office of Spill Prevention and Response California Coastal Commission California Department of Water Resources California Energy Commission California Department of Public Health California Department of Industrial Relations	Within a week
Colorado **Case Study: Firestone**	DJ Basin $37.63-$68.22 (Oil)	**Colorado Oil & Gas Conservation Commission (COGCC)** DPHE Water Quality Control Division Hazardous Materials and Waste Management Division US EPA	Depends on region, average: 90-100 days, accommodates priority requests
New Mexico	Permian Bone Spring Basin $23.84 - $64.74 (Oil)	**New Mexico Oil Conservation Division**	App must be submitted 30 days before hearing, hearings are held once a month, and then it will take 3- 6 weeks after the hearing for the permit to be issued.

[1] Western States Petroleum Association
[2] North American Shale: Break-Even Prices, 1st Edition
[3] Colorado Department of Public Health and Environment, https://www.colorado.gov/pacific/cdphe/categories/services-and-information/environment/oil-and-gas/oil-and-gas-environmental-requirements
[4] OIL and GAS MANUAL
[5] http://ergon.com/prices
[6] Ohio's Regulations: A Guide for Operators Drilling Shale Oil and Gas Wells
[7] Fracking and Oil & Gas Water Permitting in Oklahoma
[8] MARCELLUS SHALE DEVELOPMENT
[9] https://www.pioga.org/education/hydraulic-fracturing-process/oil-and-gas-regulations/
[10] https://www.txoga.org/category/who-regulates-oil-and-gas/
[11] An Overview of Oil and gas Regulation in Texas

Case History: Induced Seismicity

- The dramatic increase in earthquake activity in the Mid-Continent since 2009 has focused attention on the potential hazard posed by earthquakes induced by injection.
- 2013 saw a more rapid increase in seismicity events primarily in the Mid-Continent U.S., with the majority in Oklahoma. These events coincided with increased activity in oil and gas activity. Other states had similar events around this same time.
- The premise was they were caused by either produced water injection, the drought or hydraulic fracturing.
- But be aware: Correlation is not Causation!

Induced Seismicity

- A Research Partnership to Secure Energy for America (RPSEA) study included two primary goals:
  - (1) to determine the relationships between fluid injection practices, regional geology and stress regime, and the occurrence of earthquakes and
  - (2) to identify waste disposal strategies for injection that reduce and minimize the triggering of seismic activity, or that ensure that seismic activity is confined to low-magnitude, harmless events.
- Two-year surveys of earthquake activity were conducted in the Fort Worth Basin of Texas, the Eagle Ford play of Texas, the Bakken-Williston Basin of North Dakota and Montana, and the Haynesville play of Texas and Louisiana.

➢ "*Relationships between Induced Seismicity and Fluid Injection: Development of Strategies to Manage Fluid Disposal in Shale Hydrocarbon Plays*" (RPSEA project 11122-27)

Induced Seismicity: Result Summary

- **The project results indicate that the relationship between seismicity and injection is not consistent among the four geographic regions studied.**
- Fort Worth Basin: Injection disposal triggered nearby earthquakes
- Eagle Ford: fluid extraction triggered earthquakes
- Bakken: earthquakes were virtually non-existent
- Haynesville: and two earthquake sequences occurred including a magnitude 4.8 triggered event, but otherwise there was little apparent triggered activity.
- **The observation that the injection/seismicity relationship may be significantly different in different geographic regions is important and has implications for managing injection waste disposal operations.**
- **It implies that surveys should be undertaken to assess the relationship between injection and seismicity within a particular locale before crafting regulations or implementing hazard-reduction actions. The project also highlighted the continued need for investments in monitoring seismicity in areas of active oil and gas activities.**

Implementation: Induced Seismicity

- States have primary regulatory responsibility, although Underground Injection Control (UIC) of injection wells has EPA jurisdiction and primacy to most states. As the seismicity events increased in some states, regulators got together to share information through the "**States First**" organization created through the Ground Water Protection Council (GWPC) and the Interstate Oil and Gas Compact Commission (IOGCC).
- States were afraid if they did not get in front of the issue, the government and/or the EPA would attempt (through the UIC program) to potentially shut down produced water injection wells and possibly hydraulic fracturing.
- The States First effort was led by the Induced Seismicity by Injection Work Group (ISWG), composed of representatives of state oil and gas regulatory agencies and geological surveys with support from subject matter experts from academia, industry, federal agencies, and environmental organizations.

Event	ST	Regulatory Changes/Impacts	Operator Changes/Impacts
		Disaster/Major Incident	
Macondo (Deep Water Horizon explosion) **Midstream**	TX LA	Offshore O&G Production Regulations: (2010) Secretarial Order No. 3299 eliminated Minerals Management Service, replaced with three new bodies: Bureau of Safety and Environment Enforcement (BSEE); Bureau of Ocean Energy Management (BOEM); and Office of Natural Resources Revenue (ONRR). Permit Applications: Applications must meet new standards for well design, casing & cementing, and must be independently certified by a professional engineer. Plans must also include a compliance statement and a review of subsea blowout containment resources (deepwater drilling). April, 2018: U.S. Dept. of Interior proposed BOP and well control rules. Post Macondo, any employee and/or contractor can order work to be suspended if he/she believes anything is unsafe. RESTORE Act; Signed into law in 2012, calls for a regional approach to restoring long term health of Gulf Coast region (ecosystem and economy). Subtitle F of Public Law 112-141 resulting from Clean Water Act penalties to operators - $6.659B	There are now well-established well containment equipment, companies and consortium formed with stand-by personnel and facilities in the GOM region. Other facilities have been established in offshore regionals across the world as a result of the Macondo incident, where companies are investing in risk mitigation. These well containment companies conduct drills to assure they can react to future well control events. The oil and gas industry, through the American Petroleum Institute (API) and the International Association of Drilling Contractors (IADC) facilitated offshore operators, drilling contractors, service companies and associations to establish the Center for Offshore Safety (COS) to promote offshore safety through leadership and effective management systems addressing communication, teamwork and independent third party auditing and certification. COS membership includes the majority of operators and service providers in the GOM. COS is an example of how culture of an industry can make positive changes when they work together.

[1] https://digital.ogj.com/ogjournal/20180507/MobilePagedArticle.action?articleId=1392196&sub_id=emQ0Qco5lQct#articleId1392196

[2] https://www.restorethegulf.gov/about-us

[3] https://www.treasury.gov/services/restore-act/Documents/Final-Restore-Act.pdf

Firestone (Pipeline explosion) **Midstream**	**CO**	Colorado proposed comprehensive regulatory changes to safety rules and practices governing gas wells and pipelines. Beginning May 1, 2018, companies are required to: 1. Perform routine tests on smaller flowlines (previously unrequired). 2. File a new Form 44 with information about locations of flowlines. 3. File more specific geodatabase information with flowline locations with the COGCC.	Operators disputed the publication of specific mapping of flowlines stating that sharing such information may cause public safety issues. After negotiations with regulators, the decision was made to only allow local governments access.
Aliso Canyon (Gas storage leak) **Midstream**	CA	Southern California Gas Company (SoCalGas), owned/operated the well that leaked approximately 100,000 metric tons of methane over four months in October, 2015 to February, 2016. The final investigation into the root cause has not been published, however poor operator practices and a breakdown in regulatory oversight have been identified. Congress passed the Protecting our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act in June, 2016. This act created an interagency task force led by the U.S. Secretary of Energy. In the California legislature, Senate Bill 380 placed a moratorium on new gas injections and Senate Bill 887 established new safety standards for and rigorous inspections/monitoring of natural gas storage wells across California.	SoCalGas was ordered to close this well permanently and enact processes to prevent further leaks. They were also required to temporarily cease injection of gas at the Aliso Canyon reservoir, monitor field for further leaks, develop a community alert system and fund a public health study. Estimated costs as of Feb, 2018 are ~$1 Billion. California is now promulgating new regulations and has hired and trained new inspectors for all oil and gas activities. The other states under the umbrella of the State's First Initiative assembled a group of state regulators and subject matter experts to develop a guide book on underground gas storage. This 'Primer' was a direct result of the Aliso Canyon event. It included studies of prior gas storage events. State regulators have since utilized this information to strengthen their regulations and practices. The body of work also provides the public with a good understanding of gas storage safety as well as associated risks. These recommendations go beyond API recommended practices on gas storage (API RP 1170 and 1171). This report and subsequent state actions are also reactive to Federal Legislation passed in 2015 on pipeline safety which is administered by the Pipeline Hazardous and Materials Safety Administration (PHMSA).

[1] https://www.colorado.gov/governor/news/cogcc-approves-comprehensive-new-flowline-regulations
[2] http://www.statesfirstinitiative.org/
[3] https://www.phmsa.dot.gov/

Lake Peigneur (Salt Dome) **Gas storage in Salt Dome**	**LA**	1980: Drilling miscalculations resulted in the drilling into the Diamond Crystal Salt Mine beneath Lake Peigneur in Louisiana. 2013: Louisiana Department of Natural Resources (DNR) issued Jefferson Island Storage & Hub a Coastal Use Permit to construct 2 new NG caverns under Lake Peigneur. The 16th Judicial District Court reversed NDR decision in 2014.	Texaco, contractor of the operations for this event, paid a total of $44.8 million in settlements to compensate for the resulting damage. The mine was closed in 1986. 1994: AGL Resources utilizes the salt dome as a storage and hub facility for pressurized natural gas.
Environmental Concerns			
Seismicity	OK	An increase in both quantity and intensity of earthquakes in Oklahoma caused the states to conduct a study to the causes. A few other states with a high level of oil and gas activity and associated rise in underground water disposal also reported increased seismicity events. Oklahoma recently updated regulations in. 2018 (Feb.) related to well completion protocols to address underground disposal (injection) of O&G wastewater and hydraulic fracturing.	As a result of new regulations and monitoring in OK, the number and size of seismicity events have decreased. Other states have incorporated increased monitoring and have passed new regulations. The State's First Initiative in December, 2017, released a second addition of the Induced Seismicity Primer titled, "A Primer on Technical and Regulatory Considerations Informing Risk Management and Mitigation." Operators collaborated with regulators, formed the Produced Water Working Group to address increased seismic events.

[1] http://www.statesfirstinitiative.org

Fresh Water Conservation		Various examples: New Mexico (2015): Oil Conservation Commission revised Rule 34 in order to promote water conservation by encouraging reuse and recycling of produced water through the regulation of facilities that store, treat and recycle water used in drilling, completions, productions and/or plugging of wells.	2014: Energy Water Initiative : https://wateractionhub.org/projects/528/d/energy-water-initiative/
Methane Emissions		The U.S. EPA issued three final rules that, together, were intended to curb emissions of methane, smog-forming volatile organic compounds (VOCs) and toxic air pollutants such as benzene from new, reconstructed and modified oil and gas sources, while providing greater certainty about the Clean Air Act. These rules were based on limited data from the EPA and environmental/NGO studies. The rules known as NSPS OOOO and OOOOa (also referred to as 'Quad Oa') amended 40 CFR 60 Subpart OOOO in August, 2016 and were challenged by the oil and gas industry as unnecessary and over-reaching. Legal challenges are still pending. The EPA has posted that they intend to reconsider certain aspects of fugitive emissions requirements in the 2016 New Source Performance Standards for the oil and natural gas industry.	In April, 2016, a publication prepared for the Natural Gas Council (NGC Final Report) examined studies related to methane emissions. The appendix summarizes 75 studies from myriad organizations within and outside of industry. The report finds that, overall, industry has and continues to reduce methane emissions through voluntary actions as well as existing regulations.

[1] https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=199d7c6253c1a15c59676f9299e9767d&mc=true&r=SUBPART&n=sp40.8.60.oooo_0a
[2] http://www.ngsa.org/download/analysis_studies/NGC-Final-Report-4-25.pdf

Wildlife Endangered/Threatened			
Wildlife Protection		Endangered Species Act (ESA, 1973) is designed to protect animal and plants species at risk of extinction due to habitat changes or loss. In February of 2016, the US Fish & Wildlife Service finalized changes to the administration of the ESA (e.g. new authority to designate new areas as critical habitat).	The Independent Petroleum Association of America (IPAA), a national trade association, represents thousands of independent oil and gas producers and service companies across the U.S. Independent producers develop ~95% of U.S. oil and gas wells, produce ~54% of U.S. oil and ~85% of U.S. natural gas. Member companies include: Cimarex, Whiting Petroleum, Encana, Oxy, and PDC Energy. IPAA launched 'Endangered Species Watch' to provide IPAA member companies facts about the ESA and potential alterations.
Wildlife and Habitat Conservation **Permian Basin**	NM, TX	Endangered Species Act, etc.	November, 2017: Anadarko, Chevron, Noble Energy, Occidental Petroleum, Shell Oil, and XTO Energy partnered with the National Fish & Wildlife Foundation to conserve Pecos watershed in Texas and New Mexico. The Pecos Watershed Conservation Initiative is the first-of-its-kind partnership. The O&G companies committed more than $3.5 million over 3 years in initial funding for conservation projects, with the overall objective of investing in projects that will advance science-based, cost effective strategies to conserve wildlife and habitat in the Permian Basin.

[1] http://esawatch.org/
[2] http://www.nfwf.org/swrivers/pecos/Documents/nfwf-partners-with-permian-basin-oil-natural-gas-companies-to-conserve-pecos-watershed-in-texas-new-mexico-2017-1109.pdf

Community Impacts			
Night Skies (Light Pollution)	TX	Ordinances in place regarding private residents and business light usage. February, 2016: Texas Railroad Commission issued a notice to operators encouraging minimizing lighting impacts from O&G activities.	Operators collaborated with the University of Texas McDonald Observatory to mitigate light pollution through LED lighting, shields, and other safety practices. This collaboration was in place before RRC issued notice. Other organizations have encouraged voluntary action by operators to reduce light impacts. The Permian Basin Petroleum Association (PBPA) issued a letter to over 500 operators in the region, further increasing participation.
Traffic and Infrastructure Impacts	TX	Up to 6,000 truck loads are utilized to construct, drill and complete a typical shale well in most of the U.S. plays. Traffic has been identified in numerous studies as the largest safety and public nuisance from oil and gas activities. 2011-2016: The Eagle Ford Task Force, created by Texas Railroad Commission, was a 24 member group with a mission to open lines of communication between all parties, establish best practices for developing the Eagle Ford Shale, and promote economic benefits locally and statewide.	Task Force (including members from O&G industry) proposed that a proportional share of oil and gas severance taxes be returned to the counties where the tax was derived and provide timely funds for road repairs at the county level. Best Practice: Operators established road usage agreements and guidelines for employees/contractors and local authorities which included commitments by operators to avoid driving during peak traffic hours, school bus hours and community events; establish overnight 'quiet' periods; and ensure adequate off-road parking and delivery areas at all sites to avoid blocking lanes and roads.
Community Concerns	CO	2008: Colorado revised regulations to allow for increased public input in permitting and environmental assessments of oil field sites due to increased pressure from community members.	Operators (Anadarko, ConocoPhillips, etc.) have designated community relations personnel to keep community stakeholders informed and engaged. Anadarko shares an Onshore Ambassador Toolkit to assist with engagement. STEER, referenced in the opening paragraph to this section, is another example of how companies have collaborated in order to improve communication and work with communities.
Community Stewardship – Small Producer	TX	Various permit requirements call for performance of environmental site assessments, well casing/logging reports, etc., however no 'specific' regulation on community engagement and/or operating with a focus on stewardship.	Small producer in Midland, Texas shares best practices and community engagement.

[1] http://www.rrc.texas.gov/media/32400/notice-to-operators-lighting-final_2-16-2016.pdf
[2] https://mcdonaldobservatory.org/sites/default/files/pdfs/oilfield_lighting_can_coexist.pdf
[3] https://s3.amazonaws.com/static.texastribune.org/media/documents/Dark_Skies_Letter04.01.15_1.pdf?preview
[4] The Academy of Medicine, Engineering and Science of Texas. 2017. Environmental and Community Impacts of Shale Development in Texas. Austin, TX: The Academy of Medicine, Engineering and Science of Texas. doi: 10.25238/TAMESTstf.6.2017.
[5] https://www.documentcloud.org/documents/1390087-eagle-ford-task-force-report.html
[6] https://www.tapl.org/media/files/Article/dbd3b7fe/APCAmbassadorToolKitUSOnshore.pdf

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- To you-the audience