



The State of State Shale Gas Regulation: State-by-State Tables

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


Experts in RFF's Center for Energy Economics and Policy are analyzing regulations and surveying regulators in the 31 states in the continental United States that have significant shale gas reserves or where industry has shown interest in shale gas development. The following tables show the preliminary results of these efforts for approximately 20 important regulatory elements in each state.

A final report that includes all updated maps, tables, and additional analysis is available at www.rff.org/shalemaps. In the meantime, suggestions and comments are welcome and can be sent to richardson@rff.org.

Last updated 6/21/2013. Regulatory data current as of 3/1/2013.





















Alabama

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Registration & reporting required (if >100k gal/day)
Setback Restrictions from Buildings		200 ft.
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		Yes, varies based on drilling depth
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Isolate all hydrocarbon zones
Production Casing Cement Circulation Regulations		500 ft. above shoe/uppermost hydrocarbon zone
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		Conditional
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		6 months permitted
Temporary Abandonment		12 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		Immediate
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	8% (about 19.68¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2





















Arkansas

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		Has setback restrictions
Setback Restrictions from Water Sources		Has setback restrictions
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		100 ft. below water table/50 ft. into consol. rock
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		Cementing to surface required
Venting Regulations		No evidence of regulation found
Flaring Regulations		No evidence of regulation found
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		20 mils
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required (3 years)
Underground Fluid Injection		Some local bans/moratoria
Well Plugging & Abandonment		
Well Idle Time		24 months permitted
Temporary Abandonment		36 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		24 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	7% (about 12.3¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	3+





















California

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		Other setback restrictions
Setback Restrictions from Water Sources		Other setback restrictions
Well Drilling and Production		
Cement Type Regulations		Addressed in permit
Casing and Cementing Depth Requirements		Addressed in permit
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		500 ft. above uppermost hydrocarbon zone
Production Casing Cement Circulation Regulations		500 ft. above uppermost hydrocarbon zone
Venting Regulations		No evidence of regulation found
Flaring Regulations		No evidence of regulation found
Fracking Fluid Disclosure Regulations		Proposed: disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		No evidence of regulation found
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		300 months permitted
Temporary Abandonment		No temporary abandonment status in state regs
Well Inspection & Enforcement		
Accident Reporting Requirements		No evidence of regulation found
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	1.4¢/MCF (about .5% at \$2.46/MCF price)
Number of Regulating Agencies	N/A	3+





















Colorado

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		0.5 miles
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		500 ft.
Setback Restrictions from Water Sources		Designated water sources only, varies
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		50 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		200 ft. above uppermost hydrocarbon zone
Production Casing Cement Circulation Regulations		200 ft. above uppermost hydrocarbon zone
Venting Regulations		Notice and approval required
Flaring Regulations		Notice and approval required
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		24 mils
Flowback/Wastewater Transportation Tracking		Recordkeeping required (5 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		6 months permitted
Temporary Abandonment		6 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		24 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	Local bans/moratoria
Severance Tax	N/A	5% (about 12.3¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2

Georgia*





















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KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:






* Very little shale gas development—no natural gas wells as of 2010.



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required (if >100k gal/day)
Setback Restrictions from Buildings		330 ft.
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		Addressed in permit
Casing and Cementing Depth Requirements		Performance standard
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		500 ft. above uppermost hydrocarbon zone
Venting Regulations		No evidence of regulation found
Flaring Regulations		No evidence of regulation found
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		Addressed in permit
Pit Liner Requirements		Addressed in permit
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		6 months permitted
Temporary Abandonment		No temporary abandonment status in state regs
Well Inspection & Enforcement		
Accident Reporting Requirements		Immediate
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	None
Number of Regulating Agencies	N/A	1





















Illinois

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		Within 0.25 miles of well
Water Withdrawal Restrictions		Permit required, register & report if >100k gal/day
Setback Restrictions from Buildings		200 ft.
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		50 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		250 ft. above uppermost hydrocarbon zone
Venting Regulations		No evidence of regulation found
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Proposed: disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		20 mils.
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required (3 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		24 months permitted
Temporary Abandonment		24 months
Well Inspection & Enforcement		
Accident Reporting Requirements		Immediate
Other		
State/Local Bans & Moratoria	N/A	Local bans/moratoria
Severance Tax	N/A	0.1% (about 0.246¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2





















Indiana

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KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit, register & report if >100k gal/day
Setback Restrictions from Buildings		200 ft.
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		Addressed in permit
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Cementing to surface required
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		No evidence of regulation found
Flaring Regulations		No evidence of regulation found
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		Addressed in permit
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		60 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		2-48 hours after discovery, depending on severity
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	3¢/MCF (about 1% at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2





















Kansas

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KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		660 ft.
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		Determined by county
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Addressed in permit
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Permit required for all pits and tanks
Freeboard Requirements		1-2.5 ft., depending on pit type
Pit Liner Requirements		Yes, liner required
Flowback/Wastewater Transportation Tracking		Recordkeeping required (3 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		3 months permitted
Temporary Abandonment		12 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		24 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	8% (about 19.68¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2





















Kentucky

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Oil and gas industry exempt
Setback Restrictions from Buildings		150 ft.
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		30 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Cementing to surface required
Production Casing Cement Circulation Regulations		No evidence of regulation found
Venting Regulations		Discretionary standard
Flaring Regulations		Discretionary standard
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		1 ft.
Pit Liner Requirements		20 mils
Flowback/Wastewater Transportation Tracking		Permit or approval required
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		Idle time regulated, time limit not specified
Temporary Abandonment		24 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		2 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	4.5% (about 11.07¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	3+





















Louisiana

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Registration and reporting required
Setback Restrictions from Buildings		500 ft.
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		Yes, varies based on drilling depth
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Addressed in permit
Production Casing Cement Circulation Regulations		500 ft. above shoe
Venting Regulations		Banned
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		Yes, liner required
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required (3 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		6 months permitted
Temporary Abandonment		3 months permitted, if the well has no future utility
Well Inspection & Enforcement		
Accident Reporting Requirements		1-24 hours after discovery, depending on severity
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	16.4¢/MCF (about 6.7% at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2

Maryland

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required (if >10k gal/day)
Setback Restrictions from Buildings		1,000 ft.
Setback Restrictions from Water Sources		1,000 ft.
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		100 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Addressed in permit
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		No evidence of regulation found
Flaring Regulations		No evidence of regulation found
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		Pit liners required
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		No temporary abandonment status in state regulations
Well Inspection & Enforcement		
Accident Reporting Requirements		2 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	18 month statewide moratorium
Severance Tax	N/A	7% (about 17.22¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	1





















Michigan

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		Yes
Water Withdrawal Restrictions		Permit required (if >100k gal/day)
Setback Restrictions from Buildings		300 ft.
Setback Restrictions from Water Sources		300 ft.
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		100 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Addressed in permit
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		20 mils
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required (2 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		12 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		8 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	Local bans/moratoria
Severance Tax	N/A	5% (about 12.3¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	1





















Mississippi

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

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	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required (if >20k gal/day)
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		Yes, varies based on drilling depth
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		500 ft. above shoe
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		1 ft.
Pit Liner Requirements		Yes, liner required
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		6 months permitted
Temporary Abandonment		6 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		Immediate
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	6% (about 14.76¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2





















Montana

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required (if >50.4k gal/day)
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		Addressed in permit
Casing and Cementing Depth Requirements		Performance standard
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		No evidence of regulation found
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		3 ft.
Pit Liner Requirements		Addressed in permit
Flowback/Wastewater Transportation Tracking		No temporary abandonment status in state regs
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		No temporary abandonment status in state regs
Well Inspection & Enforcement		
Accident Reporting Requirements		Immediate
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	9% (about 22.14¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2





















Nebraska

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		Within 1 mile of well
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		Addressed in permit
Casing and Cementing Depth Requirements		Performance standard
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Addressed in permit
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		Banned
Flaring Regulations		Allowed
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Permit required for all pits and tanks
Freeboard Requirements		2 ft.
Pit Liner Requirements		Yes, liner required
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required (5 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		2 months permitted
Temporary Abandonment		12 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		48 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	3% (about 7.38¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2

New Jersey*

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:






*Very little shale gas development—no natural gas wells as of 2010.



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required (if >100k gal/day)
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		Performance standard
Surface Casing Cement Circulation Regulations		No evidence of regulation found
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		No evidence of regulation found
Venting Regulations		No evidence of regulation found
Flaring Regulations		No evidence of regulation found
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		No evidence of regulation found
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		No evidence of regulation found
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		No evidence of regulation found
Temporary Abandonment		No evidence of regulation found
Well Inspection & Enforcement		
Accident Reporting Requirements		2-24 hours after accident, depending on severity
Other		
State/Local Bans & Moratoria	N/A	Recently ended statewide moratorium
Severance Tax	N/A	None
Number of Regulating Agencies	N/A	0





















New Mexico

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		Other setback restrictions
Setback Restrictions from Water Sources		Other setback restrictions
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		Addressed in permit
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Addressed in permit
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		2-3 ft., depending on pit type
Pit Liner Requirements		20 mils
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required (5 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		60 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		24 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	Local bans/moratoria
Severance Tax	N/A	3.75% (about 9.28¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2

New York*

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

***Most regulations part of comprehensive proposal released in 2011, and have not been finalized or implemented.**

Regulatory Tools Used:

	19		1
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Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		Within 0.19 miles
Water Withdrawal Restrictions		Permit required (if >100k gal/day)
Setback Restrictions from Buildings		100 ft.
Setback Restrictions from Water Sources		150-2,000 ft., depending on water body
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		75 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Cementing to surface required
Production Casing Cement Circulation Regulations		Cementing to surface required
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		30 mils
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		3 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		2 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	Indefinite statewide moratorium
Severance Tax	N/A	None
Number of Regulating Agencies	N/A	1

North Carolina*

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:






* Very little shale gas development—no natural gas wells as of 2010.



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Registration and reporting required (if >100k gal/day)
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		50 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		500 ft. above shoe
Venting Regulations		No evidence of regulation found
Flaring Regulations		No evidence of regulation found
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		No evidence of regulation found
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Statewide ban
Well Plugging & Abandonment		
Well Idle Time		1 month permitted
Temporary Abandonment		No temporary abandonment status in state regs
Well Inspection & Enforcement		
Accident Reporting Requirements		No evidence of regulation found
Other		
State/Local Bans & Moratoria	N/A	De-facto statewide ban, pending writing of regulations
Severance Tax	N/A	0.05¢/MCF (about 0.02% at \$2.46/MCF price)
Number of Regulating Agencies	N/A	1





















North Dakota

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		500 ft.
Setback Restrictions from Water Sources		Performance-based setback restrictions
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		50 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		Banned
Flaring Regulations		Allowed
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		Yes, liner required
Flowback/Wastewater Transportation Tracking		Permit or approval required
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		12 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		24 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	9.4¢/MCF (about 3.8% at \$2.46/MCF price)
Number of Regulating Agencies	N/A	1





















Ohio

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		Within 0.28 miles of well
Water Withdrawal Restrictions		Permit req. if >2m gal/day, reg./report if >100k gal/day
Setback Restrictions from Buildings		100-200 ft.
Setback Restrictions from Water Sources		50 ft.
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		50 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		500 ft. above shoe
Production Casing Cement Circulation Regulations		1000 ft. above shoe
Venting Regulations		Banned
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Permit required for all pits and tanks
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		No evidence of regulation found
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required
Underground Fluid Injection		Some local bans/moratoria
Well Plugging & Abandonment		
Well Idle Time		12-24 months permitted
Temporary Abandonment		12 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		No evidence of regulation
Other		
State/Local Bans & Moratoria	N/A	Local bans/moratoria
Severance Tax	N/A	2.5¢/MCF (about 1% at \$2.46/MCF price)
Number of Regulating Agencies	N/A	3+





















Oklahoma

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		50 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		200 ft. above uppermost hydrocarbon zone
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Tanks required for some fluids
Freeboard Requirements		1.5-3 ft., depending on pit type
Pit Liner Requirements		30 mils.
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required (3 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		60 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		24 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	7% (about 17.22¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2





















Pennsylvania

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



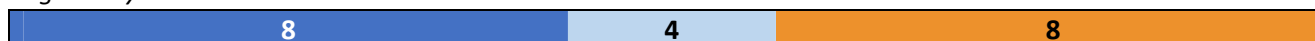
Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		Not required; relevant liability rule
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		500 ft.
Setback Restrictions from Water Sources		300-1,000 ft., depending on type of water body
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		50 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Cementing to surface required
Production Casing Cement Circulation Regulations		500 ft. above true vertical depth
Venting Regulations		Discretionary standard
Flaring Regulations		Discretionary standard
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		Yes, liner required
Flowback/Wastewater Transportation Tracking		Recordkeeping required (5 years)
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		60 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		2 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	Local bans/moratoria
Severance Tax	N/A	None
Number of Regulating Agencies	N/A	2





















South Dakota

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required (if >25.9k gal/day)
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		Addressed in permit
Casing and Cementing Depth Requirements		Yes
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Addressed in permit
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		Banned
Flaring Regulations		Allowed
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		12 mils.
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		No evidence of regulation found
Temporary Abandonment		6 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		Immediate
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	4.5% (about 11.07¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	1





















Tennessee

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Registration and reporting required (if >10k gal/day)
Setback Restrictions from Buildings		200 ft.
Setback Restrictions from Water Sources		100 ft.
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		50 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		No evidence of regulation found
Venting Regulations		Discretionary standard
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		Yes, liner required
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		60 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		No evidence of regulation found
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	3% (about 7.38¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2

Texas

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		200 ft.
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		Performance standard
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		600 ft. above shoe
Production Casing Cement Circulation Regulations		600 ft. above shoe
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		Addressed in permit
Flowback/Wastewater Transportation Tracking		Permit/approval and recordkeeping required
Underground Fluid Injection		Some local bans/moratoria
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		No temporary abandonment status in state regs
Well Inspection & Enforcement		
Accident Reporting Requirements		Immediate
Other		
State/Local Bans & Moratoria	N/A	Local bans/moratoria
Severance Tax	N/A	7.5% (about 18.45¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2





















Utah

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		Addressed in permit
Casing and Cementing Depth Requirements		Yes
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		No evidence of regulation found
Venting Regulations		Banned
Flaring Regulations		Discretionary standard
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		40 mils
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		60 months permitted
Temporary Abandonment		12 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		24 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	5% (about 12.3¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	2

Vermont*





















Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:

*Very little shale gas development—no natural gas wells as of 2010.



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit req. if >57.6k gal/day, reg./report if >20k gal/day
Setback Restrictions from Buildings		No evidence of regulation found
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		No evidence of regulation found
Surface Casing Cement Circulation Regulations		No evidence of regulation found
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		No evidence of regulation found
Venting Regulations		No evidence of regulation found
Flaring Regulations		No evidence of regulation found
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		No evidence of regulation found
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		No evidence of regulation found
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		24 months permitted
Temporary Abandonment		Temporary abandonment allowed, no timeline specified
Well Inspection & Enforcement		
Accident Reporting Requirements		No evidence of regulation found
Other		
State/Local Bans & Moratoria	N/A	Statewide ban
Severance Tax	N/A	None
Number of Regulating Agencies	N/A	1

Virginia

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found






Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		Within 0.09 miles of well
Water Withdrawal Restrictions		Permit required (if >300k gal/day)
Setback Restrictions from Buildings		200 ft.
Setback Restrictions from Water Sources		No evidence of regulation found
Well Drilling and Production		
Cement Type Regulations		No evidence of regulation found
Casing and Cementing Depth Requirements		No evidence of regulation found
Surface Casing Cement Circulation Regulations		No evidence of regulation found
Intermediate Casing Cement Circulation Regulations		No evidence of regulation found
Production Casing Cement Circulation Regulations		No evidence of regulation found
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		No evidence of regulation found
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		2 ft.
Pit Liner Requirements		10 mils
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		No evidence of regulation found
Temporary Abandonment		No evidence of regulation found
Well Inspection & Enforcement		
Accident Reporting Requirements		0-24 hours after discovery, depending on severity
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	1% (about 2.46¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	3+





















West Virginia

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		Within 0.19 miles of well
Water Withdrawal Restrictions		Permit, register and report if >7k gal/day
Setback Restrictions from Buildings		625 ft.
Setback Restrictions from Water Sources		100-1,000 ft., depending on type of water body
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		30 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		Addressed in permit
Production Casing Cement Circulation Regulations		Addressed in permit
Venting Regulations		Discretionary standard
Flaring Regulations		Discretionary standard
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Only pits regulated
Freeboard Requirements		2 ft.
Pit Liner Requirements		Yes, liner required
Flowback/Wastewater Transportation Tracking		Recordkeeping required
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		No temporary abandonment status in state regs
Well Inspection & Enforcement		
Accident Reporting Requirements		Accident reporting required, but no timeline specified
Other		
State/Local Bans & Moratoria	N/A	Local bans/moratoria
Severance Tax	N/A	5% (about 12.3¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	1

Wyoming

Below is an analysis of various regulatory elements related to shale gas development activities. The type of regulatory tool used for each activity is color-coded according to the key (right), and the quantities of each type are displayed in a bar graph. Details for each activity and tool used are provided in the table below.

KEY	
	Command/control
	Permit
	Performance standard
	Other
	No evidence of regulation found

Regulatory Tools Used:



Activity/Regulatory Element	Tool	Details
Site Development and Preparation		
Pre-Drilling Water Well Testing		No evidence of regulation found
Water Withdrawal Restrictions		Permit required
Setback Restrictions from Buildings		350 ft.
Setback Restrictions from Water Sources		350 ft.
Well Drilling and Production		
Cement Type Regulations		Yes
Casing and Cementing Depth Requirements		120 ft. below water table
Surface Casing Cement Circulation Regulations		Cementing to surface required
Intermediate Casing Cement Circulation Regulations		200 ft. above trona interval
Production Casing Cement Circulation Regulations		200 ft. above trona interval
Venting Regulations		Restricted
Flaring Regulations		Restricted
Fracking Fluid Disclosure Regulations		Disclosure required
Flowback/Wastewater Storage and Disposal		
Fluid Storage Options		Pits allowed and regulated for all fluids
Freeboard Requirements		No evidence of regulation found
Pit Liner Requirements		Discretionary standard
Flowback/Wastewater Transportation Tracking		No evidence of regulation found
Underground Fluid Injection		Underground injection allowed
Well Plugging & Abandonment		
Well Idle Time		12 months permitted
Temporary Abandonment		24 months permitted
Well Inspection & Enforcement		
Accident Reporting Requirements		24 hours after discovery
Other		
State/Local Bans & Moratoria	N/A	None
Severance Tax	N/A	6% (about 14.76¢/MCF at \$2.46/MCF price)
Number of Regulating Agencies	N/A	3+