Chevron

Human Energy®

Chevron in Appalachia:

Managing Performance, Measuring Results

Table of Contents

Energy Is a Cornerstone of Economic Prosperity

The United States is in the midst of an energy renaissance that is giving our nation more control over our energy future, more jobs and greater energy affordability.

Here in the Appalachian Region, we live above shale deposits that are among the greatest natural gas resources in the world. Chevron is committed to responsibly developing the energy potential of the Marcellus Shale by protecting communities and our water, land and air. We have designed operating practices that reduce the impact on our communities and the environment. Our commitment to safe and responsible development shapes our business and operational decisions.

We strive to be admired not only for what we achieve, but also for how we achieve those results. For that reason, we collaborated with environmental organizations, philanthropic foundations and other energy companies to form the Center for Sustainable Shale Development (CSSD), which encourages responsible development of shale gas resources in the Appalachian Region. In 2014, Chevron was the first operator to receive CSSD certification by a third-party auditing process, which recognizes our environmentally sound practices.

The people of Chevron work to deliver on the promise of natural gas from shale safely, efficiently and responsibly — today and for decades to come.

I invite you to learn more about Chevron's operations in Appalachia in the following pages of this report, and I welcome your feedback on our progress, which can be sent to chevroninappalachia@chevron.com.

Nigel Hearne
Vice President, Appalachian/Michigan Business Unit
Chevron U.S.A. Inc.

Operational Overview 2014

Chevron manages significant natural gas assets in the Appalachian Region, which is home to one of North America's largest and richest sources of natural gas from shale. The Marcellus Shale runs beneath large swaths of New York, Pennsylvania, West Virginia, and eastern Ohio and dips into neighboring states.

Developing this resource is critical to providing affordable and reliable energy to Americans. Production in this region is bolstering America's energy security and creates much-needed jobs.

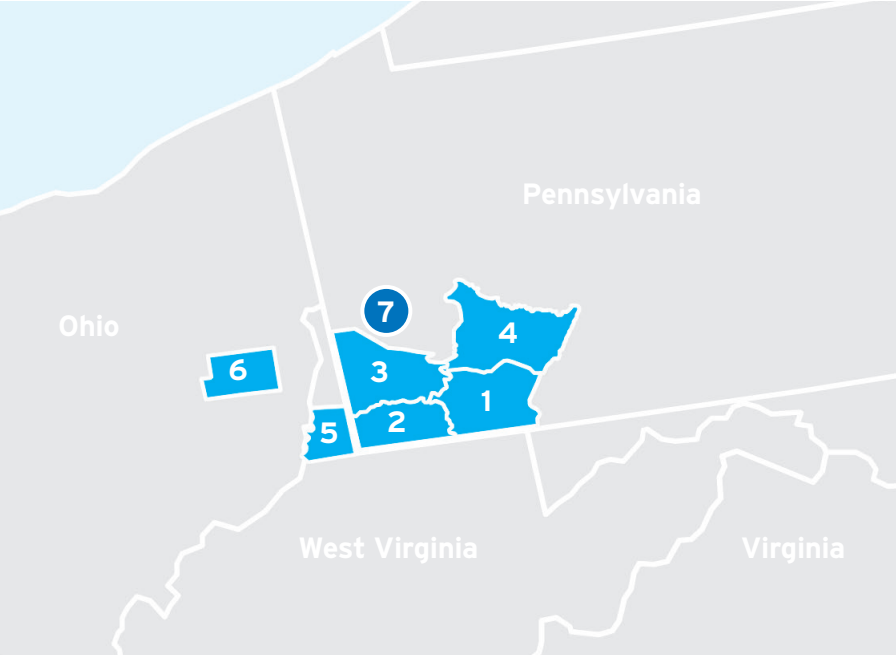
Chevron has approximately

1 million

acres of leases in the Appalachian Region

Chevron is a significant leaseholder, with approximately one million acres of leases in the Appalachian Region. As of the end of 2014, we have significant operations in:

1. Fayette County, PA
2. Greene County, PA
3. Washington County, PA
4. Westmoreland County, PA
5. Marshall County, WV
6. Harrison County, OH
7. Allegheny County, PA (Regional Headquarters)



Chevron has more than

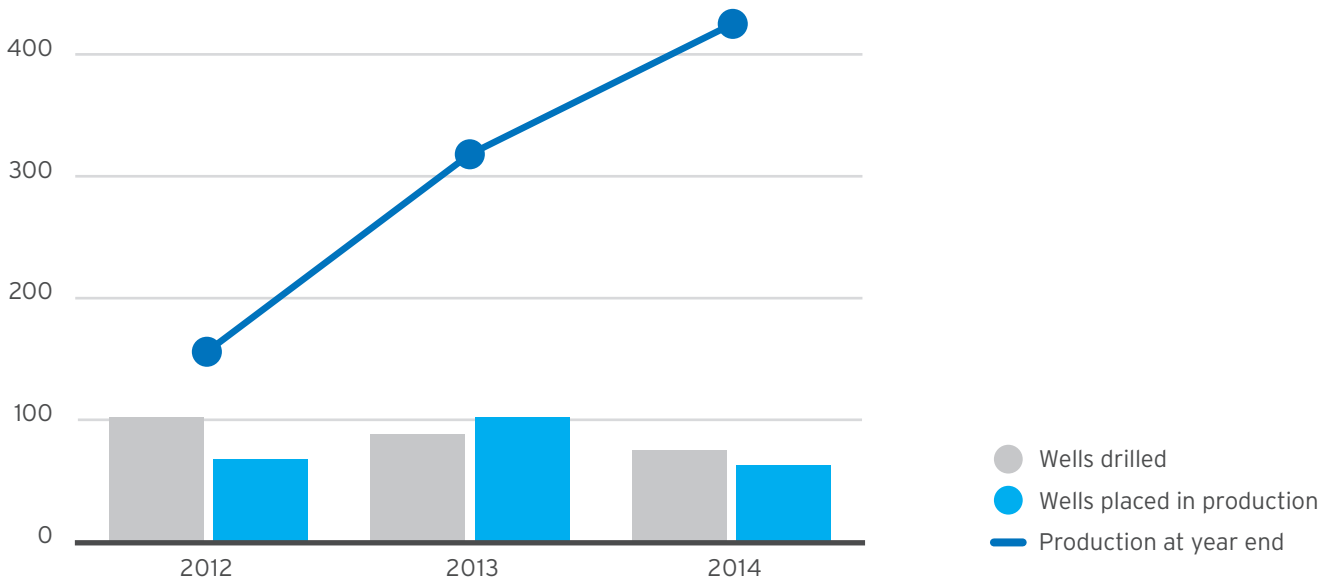
500

employees in the Appalachian Region

Scale of Business

Our natural gas production is increasing and becoming more efficient.

Number of Wells (Bars) and Millions of Standard Cubic Feet Per Day (Line)



In 2014 the Company Delivered:

An average daily production (gross) of:

370 million standard cubic feet of natural gas **and** **640** barrels of condensate and oil

75 wells drilled and completed **on** **22** well pads

11 new well pads constructed **and** **63** wells began producing natural gas

Center for Sustainable Shale Development

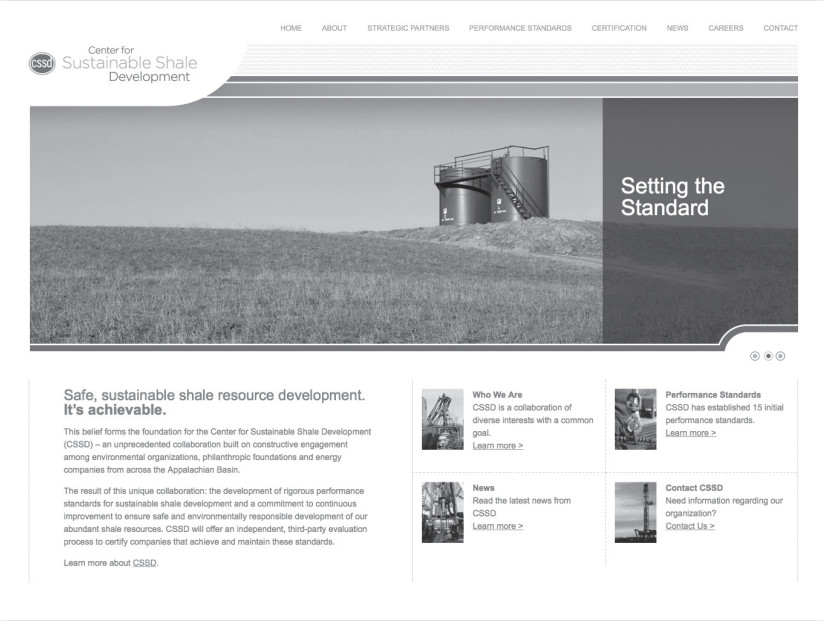
Chevron is committed to advancing the industry's operational performance through technological innovation and the sharing of best practices. We have participated in several efforts to establish recommended practices and standards for the Appalachian Region, including being a founding member of the Center for Sustainable Shale Development (CSSD).

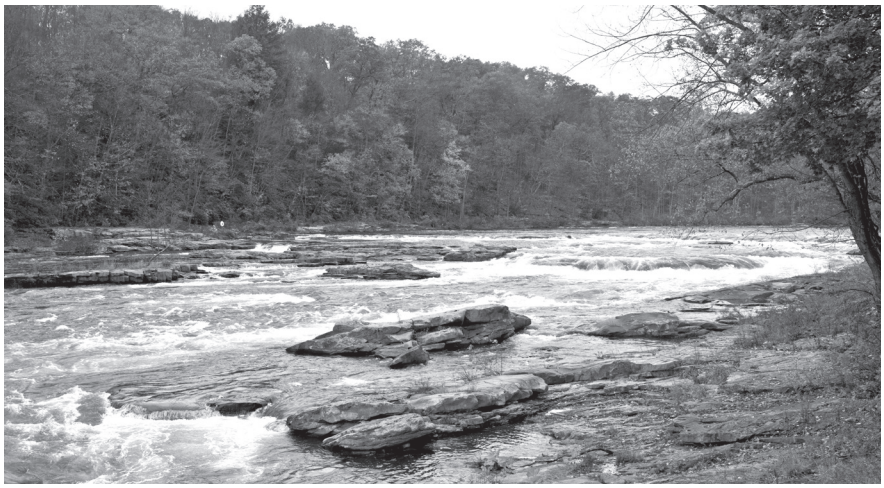
The CSSD is an unprecedented collaboration built on constructive engagement among environmental organizations, philanthropic foundations and energy companies from across the Appalachian Basin who share the objective of developing a center of excellence for natural gas from shale development. The CSSD developed and published a series of 15 science-based performance standards covering air, climate and water protection and offers voluntary third-party operator certification using these standards.

Center of Excellence

Chevron is a founding member of the CSSD, an unprecedented collaboration for the development of natural gas from shale

Additional information about CSSD can be found at: sustainableshale.org





These CSSD standards meet or exceed government regulations and the Center continues work to ensure that companies that qualify for certification maintain these standards. CSSD's 15 standards focus specifically on the areas of:

Water Performance:

- Eliminating waste water discharge
- Recycling water
- Eliminating pits and moving toward closed-loop drilling
- Conducting geologic risk assessments
- Monitoring groundwater
- Protecting groundwater

Air Performance:

- Using reduced emission completions
- Reducing engine emissions
- Limiting emissions from storage tanks and other production equipment

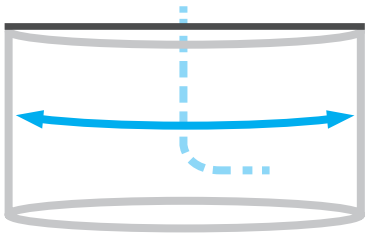
First to Certification

Chevron was the first company to be certified by the CSSD through their independent certification process

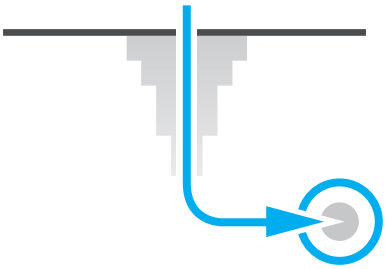
Protecting Groundwater

Our Marcellus wells are designed and drilled with control systems to protect groundwater throughout the life of the well.

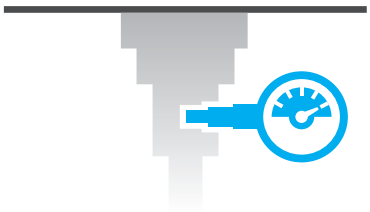
1 Assess the subsurface geology within a 1,000+ foot radius



2 Drill thousands of feet vertically and horizontally



3 Test integrity of wellbore and casing



1 Site Review Before Drilling

Before drilling occurs at any of our well sites, we assess the subsurface geology within a minimum radius of 1,000 feet. This process includes a review to identify and mitigate risks associated with groundwater aquifers, faults and geological pathways, historical wells in the area, active and inactive coal mining areas and shallow gas reservoirs. This information guides our plan and design of our wells.

2 Drilling

We drill vertically down thousands of feet and then steer the drill bit horizontally to drill thousands of feet into the targeted production zone.

3 Testing Before Hydraulic Fracturing

After the well is drilled we verify the integrity of a well's multiple layers of casing. The company conducts a combination of tests including strength tests on cement used and wellbore pressure tests prior to hydraulic fracturing activities.

In 2014 Chevron completed 285 water sampling tests in the Appalachian Region. To monitor water quality we test freshwater sources within 2,500 feet of all of our wells four times: before drilling, after drilling, after the last well on the pad is hydraulically fractured and one year after production begins. We share the test results with the state and all respective landowners. We compare each set of test results to the original, pre-drill samples. Through 2014, the samples showed that the water sources tested near our wells have not changed significantly after we began operations.

285

Water sampling tests completed by Chevron in 2014

We test freshwater sources within

2,500 ft.

of all of our wells to monitor water quality

Hydraulic Fracturing Fluid Composition

To develop natural gas from the Marcellus Shale we use hydraulic fracturing. This is a technology that involves pumping water, sand and chemical additives into a targeted section of rock to fracture the rock so natural gas can flow to the wellbore.

The chemicals we use, and their concentrations, vary from well to well in order to address the unique geology at each site. Some of these chemicals are potentially harmful to people, and some are not. To prevent health or environmental impact, we design, maintain and inspect our wells and equipment to keep all fluids contained. These chemicals are on the drill site for a short period of time. Residual amounts of the chemicals, which may remain in the well, flow back from underground when production starts, and are managed with any produced water via treatment and proper disposal.

Typical Hydraulic Fracturing Fluid

90.3% Water

9.5% Sand

0.2% Chemicals

This table outlines the chemicals used in our operations in the region. Since many have multiple names, we included each compound's corresponding Chemical Abstracts Service (CAS) number.

These numbers are unique identifiers for chemical substances, making it easier to search for and get more information about them.

The name, concentration and volume of chemicals used in each well are posted on a third-party website, www.FracFocus.org.

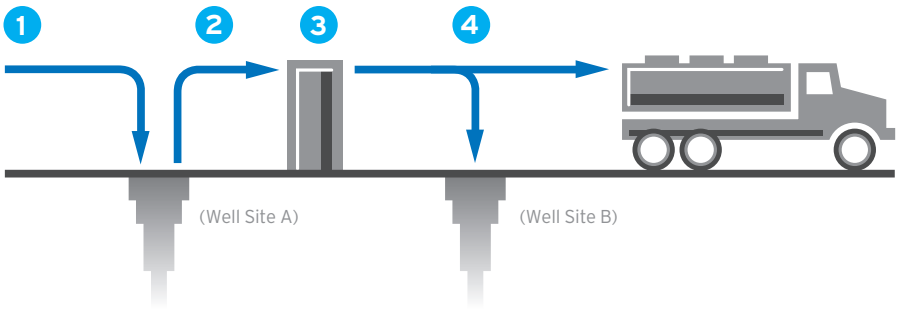
Fluid Component	CAS Number	Purpose in Well Completion[1]	Purpose Explained
Water	7732-18-5	Carrier/Base Fluid	Pumped into the well to fracture a targeted section of rock, freeing produced gas to flow up through the well to the surface
Sand	14808-60-7	Proppant	Holds the cracks in the rock open so natural gas can be produced
Polypropylene Glycol	25322-69-4	Antifoam Agent	Prevents formation of air bubbles in the well completion fluid when sand is mixed in. This enables pumping the fluid into the well
Hydrochloric Acid	7647-01-0	Perforation Cleanup	Helps dissolve minerals and initiate cracks in the rock
Polyethylene Glycol	25322-68-3	Biocide	Biocide prevents the formation of bacteria growth on well pipe walls or in the gas reservoir. Minimizes corrosive impact to maintain the integrity of the well and ensures open spaces in the gas reservoir
2,2-Dibromo-3-Nitrilopropionamide	10222-01-2		
Glutaral	111-30-8		
Dibromoacetonitrile	3252-43-5		
Ammonium Sulfate	7783-20-2	Friction Reducer	Friction reducer reduces the energy needed to pump fluid into the well to fracture subsurface formation
Petroleum Distillates, Hydrotreated Light	64742-47-8		
Urea	57-13-6		
Ammonium Acetate	631-61-8		
Alcohol Ethoxylates	*		
Carbohydrate Polymer	*	Gelling Agent	Forms a gel to ensure the sand is carried into the cracks in the rock to hold them open
Fatty Acid Amidoalkyl Betaine	*	Surfactant Gelling Agent	
Propan-2-ol	67-63-0	Surfactant Gelling Agent, RM[2]	
Hemicellulase Enzyme	9012-54-8	Gel Breaker	Causes gel to decompose after it has carried the sand into cracks in the rock
Sulfonated Polystyrene	*	Encapsulated Breaker	
Methanol	67-56-1	Corrosion Inhibitor, Iron Control	Minimizes corrosive impact to maintain the integrity of the well
Aliphatic Alcohols, Ethoxylayed #1	*		
Aliphatic Acids	*		
Prop-2-yn-1-ol	107-19-7		
Tetrasodium Etylenediaminetetraacetate	64-02-8	Iron Chelating Agent	
Trisodium Nitrilotriacetate (Impurity)	5064-31-3		
Sodium Hydroxide	1310-73-2		
Sodium Erythorbate	6381-77-7	Iron Stabilizer	
Ethylene Glycol	107-21-1	Iron Control, Scale Inhibitor	
Trisodium Ortho Phosphate	7601-54-9	Scale Inhibitor	

* This table lists the chemical category that the supplier has provided noting that the specific compound name and CAS number are proprietary

1. Defined by FracFocus
2. RM is Rheology Modifier

Between 15-20 compounds were used in each well completion in 2014

Managing Water Resources and Waste



Portion of recycled water in our hydraulic fracturing fluid

Portion of brine Chevron recycled or reused in 2014

1 Water Is Pumped In
The water that is used in our hydraulic fracturing fluid is approximately three-quarters freshwater and one-quarter recycled water. This fluid is pumped into the well during hydraulic fracturing.

2 Water Flows Back to Surface
When the well begins producing natural gas, a portion of the water pumped into the well flows back to the surface through the pipe as brine.

3 Water Is Treated
The brine is treated so it can be reused. We recycled or reused 97 percent of our brine in 2014.

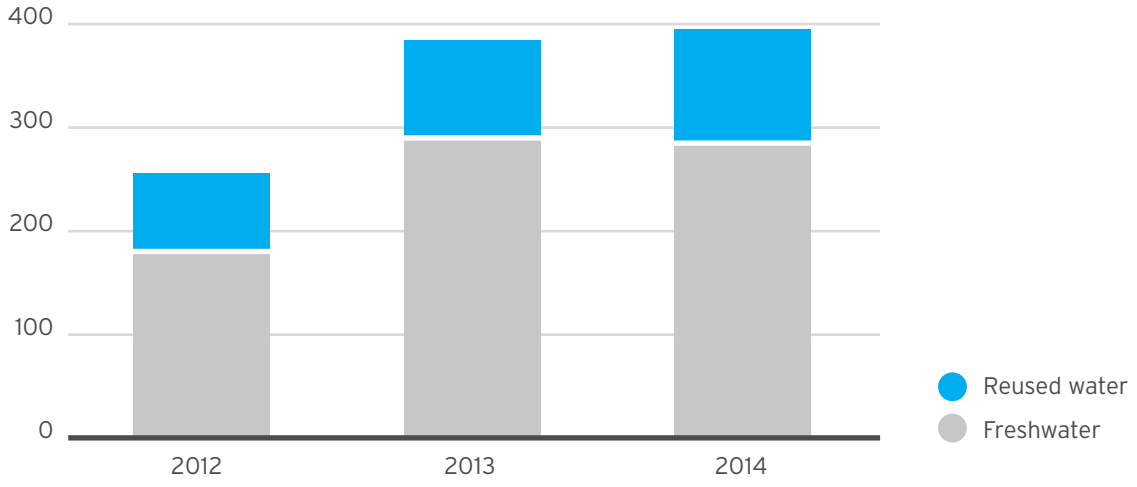
4 Water Is Reused
After treatment we transport recycled brine to another well site for use in future fracture jobs. The remaining three percent is safely taken by third-party disposal companies to permitted injection wells.

Chevron strives to maximize the reuse of its Appalachian brine; in 2014 we recycled or reused 97 percent of our brine. This is part of an overall strategy to reduce both our freshwater consumption and the need for water transportation, transfer and disposal.

Hydraulic Fracturing Water Sources

We are increasing the use of recycled brine in our well completions, displacing the need for freshwater.

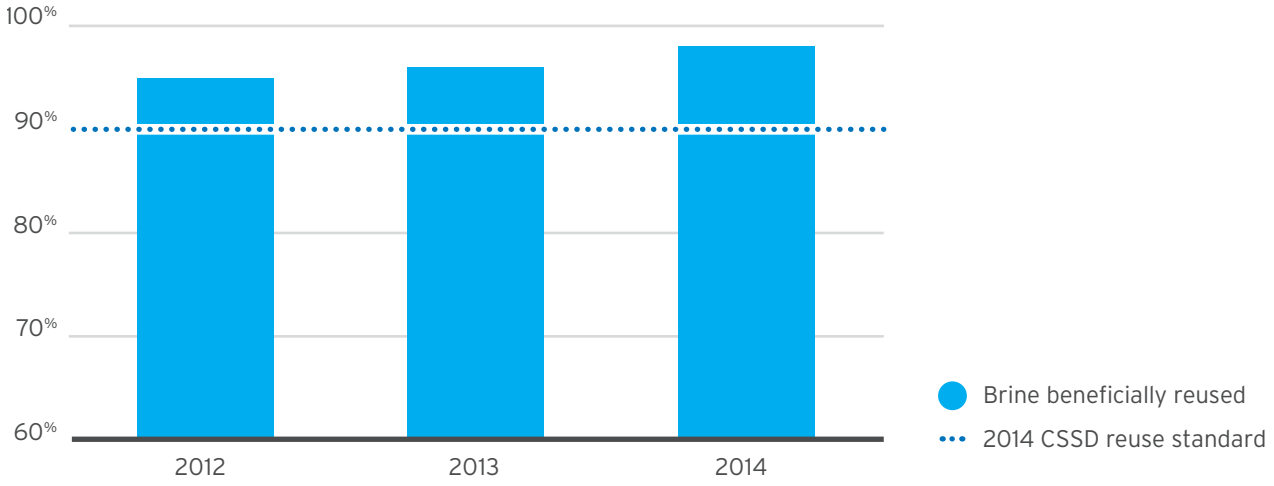
Millions of Gallons Supplied to Well Completions



Brine Recycle Rate

Our brine recycle rate is above the CSSD standard and is improving each year.

Percent of Brine Recycled



Using Water Pipelines to Transport Water

20%

of water transported by pipeline in 2014

20,000

truckloads eliminated from the surrounding roadways in 2014

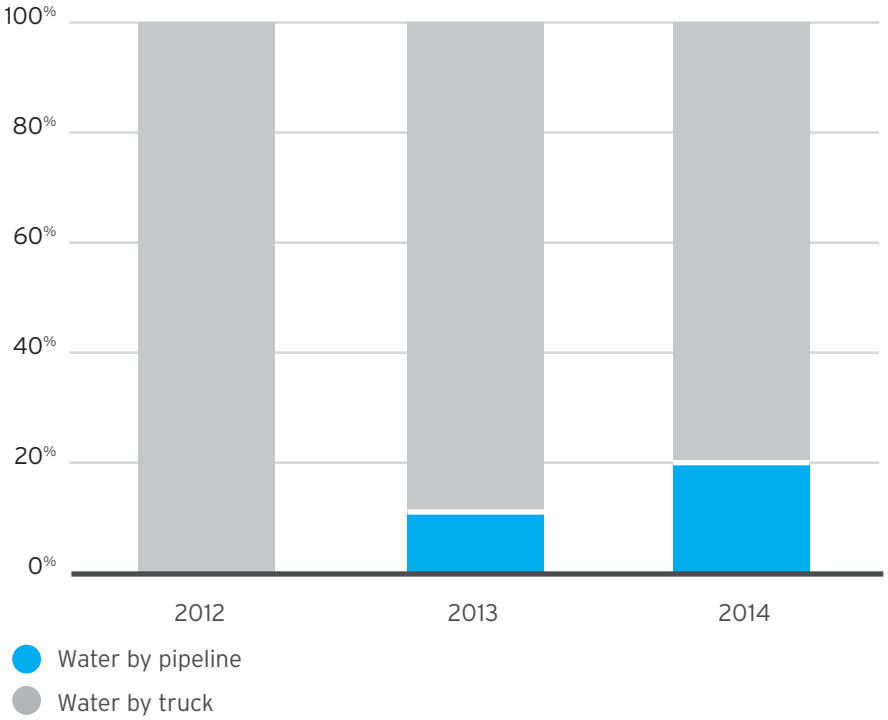
In 2014 Chevron transported 20 percent of its total water volume by pipeline in the Appalachian region, which eliminated about 20,000 truckloads from the surrounding roadways. This is part of a trend in which we are working to transport a larger portion of water to our well pads via pipeline, reducing the number of water delivery trips our trucks make on public roads, reducing traffic and air emissions from trucking.

We used pipelines to deliver most of the water needed for well completions to several well pads in Marshall County, West Virginia and Fayette County, Pennsylvania. This avoided 4,000 to 5,000 truckloads of water in 2014.

Transporting Water to Well Completion

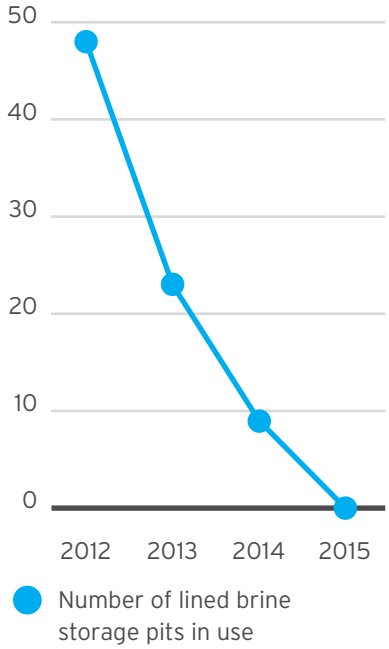
We are increasing our delivery of water by pipeline.

Percent Water Delivery



Implementing Closed-Loop Drilling

Phasing Out Lined Brine Storage Pits



Chevron has implemented pitless operations in the Appalachian Region, utilizing closed-loop drilling in all of the wells we drilled in 2014. This means we eliminated the use of in-ground, lined storage pits in favor of storage tanks that store liquids and associated settled solids.

We collaborated with a local supplier to develop designs for reusable water storage tanks. These are helping us to phase out the use of lined brine storage pits, which we are replacing with the new tanks. Over the course of 2013 and 2014 we closed and remediated 39 pits in the region. We will close the remaining nine pits in 2015.

This has helped reduce the size of the surface footprint for our temporary drilling and completions sites. Additionally, the tanks also reduce the amount of time land is under construction, as tank assembly can range from a few days to a few weeks compared with three months to dig and line storage pits.

100%

of pits closed or remediated 2012-2015

Preventing Spills

We take multiple steps to prevent any fluids from contacting the land or surface water.

100-foot

buffer zone between wells and rivers, streams and lakes

Establishing Buffer Zones

We maintain at least a 100-foot buffer zone between wells and rivers, streams and lakes.

Lining Work Areas

All well pads are constructed with a synthetic liner placed under drilling and hydraulic fracturing operations, which includes the drilling rigs, hydraulic fracturing equipment and chemical storage units. Any spills or leaks on the liner are removed with vacuum trucks and either reused or sent to a Chevron-approved recycle or disposal facility.

Inspecting and Confirming

We complete visual inspections to identify and mitigate potential leakage from on-site equipment or activities. This includes daily well site inspections during drilling and completion activity as well as inspections of operating well pads during routine operator visits.

Ongoing visual inspections

Reducing Land Impact

Planning
Before building a well site, we plan pads, access roads and facilities to reduce interference with wildlife and agriculture.

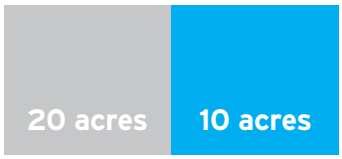
Avoiding Sensitive Areas
We work with landowners to maintain their farming and ranching activities. We avoid sensitive areas, such as archaeological sites or habitats of endangered species.

Reducing the Number/Size of Well Sites
We reduce the number and size of our well sites and environmental footprint by drilling multiple wells per pad. Our typical well pad design is for eight or more wells per pad. Additionally, we have reduced the average temporary drilling and completion site from approximately 20 acres to 10 acres.

Controlling Erosion and Sedimentation
We also implement erosion and sedimentation plans that include detailed engineering designs to control storm water releases to prevent erosion and limit sediment traveling into streams.

50%

reduction in temporary drilling and completion site surface area



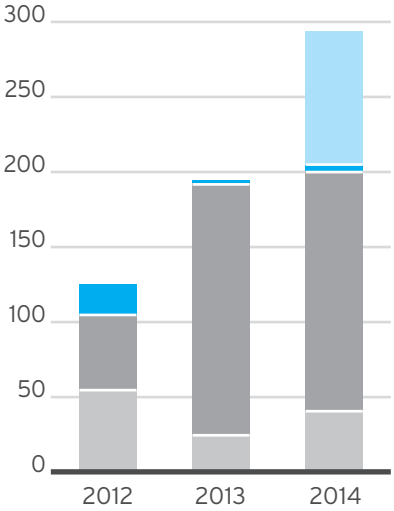
We use multi-well pads and horizontal drilling to gather gas from a large reservoir area with minimal surface disturbance. In 2014, our average length of horizontal drilling was about one mile.

Reclaiming and Restoring
We work with landowners to reclaim the land and restore its topography as close as possible to its original condition. We use hydro-seeding to accelerate regrowth of indigenous grass.

Managing Air Emissions

Greenhouse Gas Emissions
We track and report our greenhouse gas emissions.

Thousand Metric Tonnes CO_2eq



- Venting and flaring from the 2014 Pennsylvania well control incident
- Venting and flaring from well development activity
- Well drilling and completion equipment, heating for gas processing
- Other equipment

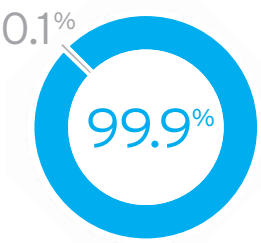
We design, construct and operate our wells to minimize air emissions and we monitor all of our well pads to maintain their integrity.

In Our Operations:

- We use production pipe that has premium connections and seals so that all fluids and gas will be contained at the wellbore at all times.
- We verify the integrity of our wells and production equipment, with regular inspections and tests on all safety control equipment, to confirm our controls are working.
- Our leak detection and repair program inspections occur weekly by operators and annually with infrared technology.

Chevron has a formal program in which we inspect all of our well pads for leaks – when we detect that any components are leaking we repair them. Over the course of 2014, less than 0.1 percent of the equipment on our well pads was identified as leaking during inspections. These leaks were identified across nearly 100 well pads that contain approximately 75,000 components. In each instance after the leaking equipment was identified, the company made the necessary repairs.

Our drilling rig fleet in the Appalachian region enables us to create a smaller physical and carbon footprint. We had six rigs operating during 2014, two of which were capable of running on natural gas. For lower air emissions, we used natural gas to power both rigs. Our entire fleet has the capability of drilling longer laterals; by using these rigs we are able to reach resources without needing to construct additional well pads.



Facilities Monitored in 2014
All of our facilities are monitored for leaking equipment and all leaks are repaired.

- Equipment without leaks
- Equipment with leaks identified and repaired

Reduced Emission Completions

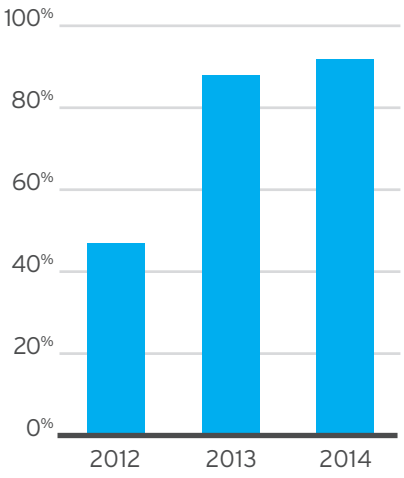
To limit emissions after hydraulic fracturing, Chevron uses a process known as reduced emission completions, which is the process of capturing any flow of natural gas at the well head immediately after well completion and directing the gas to the pipeline for sale, rather than allowing it to escape into the atmosphere.

The EPA requires implementation of reduced emission completions for non-exploratory wells in 2015. We implemented the process in 2013, and in 2014 all of our non-exploratory wells turned onto production utilized reduced emission completions.

Reduced Emission Completions

We implemented reduced emission completions over a year before the EPA requirement, reducing flaring. In 2013 and 2014 flaring only occurred at exploratory wells.

Percent of All Well Completions Without Flaring



Pennsylvania Well Control Incident

Although we have rigorous safety procedures and strive to prevent any incidents, on Tuesday, February 11, 2014, a large and unexpected release of gas escaped from a Chevron natural gas well at the Lanco A well pad in Dunkard Township, Greene County, Pennsylvania. The release of natural gas resulted in a fire, which tragically caused the death of a field service technician.

After the incident was resolved, we identified the cause of the event and developed technical recommendations on how to prevent future incidents from occurring. These recommendations were communicated to other operators and the regulatory community in an industry safety alert. The Pennsylvania Department of Environmental Protection acknowledged these recommendations. On June 1, 2015 the Pennsylvania Department of Environmental Protection fined Chevron $939,552 for violations related to this incident.

Minimizing Trucking Impacts

6 million miles driven in 2014

equivalent to more than 240 trips around the globe – without a vehicle crash that resulted in days-away-from-work injuries

Monitoring equipment

on trucks gathers data on speed and safe stops

Safer Road Trips

We look to do our part in making the roads in the region a safer place by reducing our traffic and ensuring our drivers follow safe driving practices.

In 2014 our contractors drove 6 million miles with zero motor vehicle crashes that resulted in days-away-from-work injuries.

Some of the Efforts Include:

- Reducing the number of truck trips by 20,000 in 2014 by delivering more water by pipeline.
- Working with local officials to determine best routes to avoid high-traffic or sensitive areas. We obtain permits to drive only those routes, and we use GPS tracking to confirm these routes are being followed
- Seeking alternative solutions, where possible, to reduce the volume of truck traffic, such as the use of centralized water facilities from which water is piped to multiple well pad locations
- Ensuring Chevron-contracted drivers are trained in Smith System® defensive driving
- Equipping trucks with monitoring equipment to gather data on drivers' speed and safe stops. The data is reviewed to provide feedback to the drivers
- Enforcing strict rules against distracted driving
- Enforcing a drug and alcohol testing program for our drivers, including contractors
- Proactively watering our roads to reduce dust from truck traffic
- Upgrading roads and bridges on our routes to provide safer driving conditions for the community

Improving Contractor Safety

Contractor Safety

Chevron uses a contractor management program that defines expectations regarding performance, the qualification of contractors, and the monitoring of contractor performance against expectations. This program is designed to ensure that our contractors perform to safety, health, environment and reliability requirements consistent with those required of our employees.

Over the course of 2014 we performed over 5 million hours of work in the Appalachian Region with only two days-away-from-work injuries.

During 2014 Chevron's Appalachian Business Completed the Following Actions Under Its Contractor Engagement Program:

63 audits, exceeding the 40 planned

145 reviews to discuss safety performance and compliance with all regulations and requirements

62 General Orientation sessions held with more than 2,000 workforce members to review expectations for working safely

96% of safety-sensitive contractors were verified as having management systems which met Health, Environment and Safety performance expectations. Mitigation plans were in place for the remaining contractors

5 million hours

of work in 2014 with only two days-away-from-work injuries

Creating Lasting Regional Benefits

135 billion

cubic feet of natural gas produced in 2014, enough to light 3.6 million homes

Through our work in 2014 we produced approximately 135 billion cubic feet of natural gas, the equivalent megawatt hours to light 3.6 million U.S. households for one year. This energy keeps U.S. industries competitive, bolsters consumer confidence and promotes rising living standards.

We work hard to produce affordable, reliable energy for the U.S. while also building partnerships in the Appalachia Region that create prosperity here, in the communities we work with and operate in. This comes in the form of job creation, working with local suppliers and supporting our neighbors through social investments.

In 2013 Chevron worked with IHS, an energy market consultant, to conduct an assessment to determine the economic impact of our operations on the Pennsylvania, West Virginia and Ohio economies. Highlights of these impacts include:

10 + 95

For every 10 Chevron jobs, 95 additional jobs are supported

Job Creation

For every 10 Chevron jobs in the Appalachian states we operate in, 95 additional jobs are supported. On average, 77 of those jobs will be in Pennsylvania, 15 will be in West Virginia and 3 will be in Ohio.

Higher Income

The local supply chain jobs stimulated by Chevron generally earn wages well above the state averages. In 2013, typical supply chain wages were higher, relative to their respective state averages.

$1.7 billion

contributed to U.S. Gross Domestic Product in 2013

Taxes

Our business contributed to over $450 million in federal, state and local taxes during 2013.

GDP

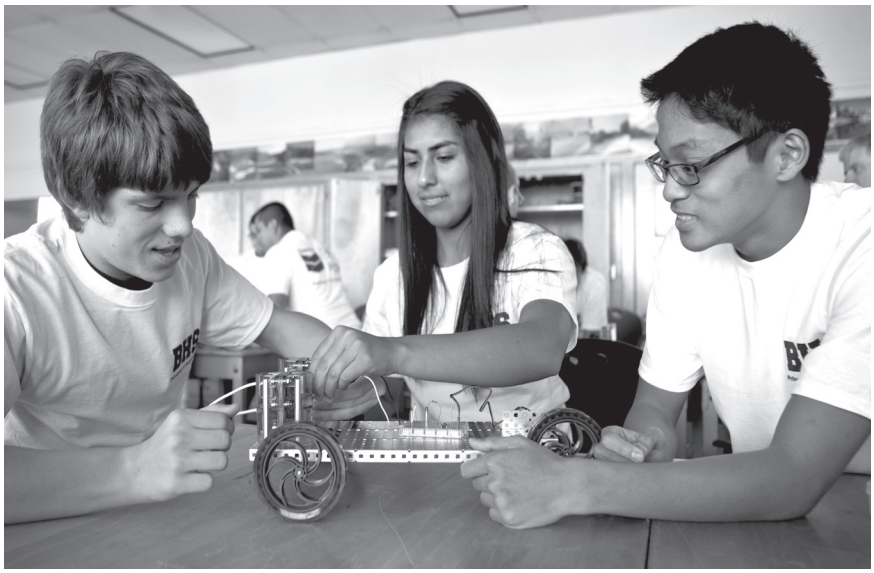
In 2013, our Appalachian business contributed $1.7 billion to U.S. Gross Domestic Product, of which $508 million was generated in our Appalachian states.

Impact Fees
In 2014 we paid $13.4 million in impact fees in Pennsylvania.

Roadways
We bonded 446 miles of roadways in Pennsylvania, Ohio and West Virginia.

Investing in Communities
Everywhere Chevron operates, we strive to build lasting partnerships that help create prosperity in the communities where we operate.

In 2014 we contributed $1 million toward education, $600,000 toward civic and community donations and $400,000 toward economic development.



Additionally, Chevron committed $20 million to launch the Appalachia Partnership Initiative. This initiative supports enhanced Science, Technology, Engineering and Mathematics (STEM) education and workforce development programs across southwestern Pennsylvania, northern West Virginia and eastern Ohio.

446 miles

of bonded roads in OH, PA and WV

$1 million

contributed for education

$20 million

Social investments for the Appalachia Partnership Initiative

Chevron North America
Exploration and Production Company
700 Cherrington Parkway
Coraopolis, PA 15108, USA
www.chevron.com

For more information:
www.chevron.com/shale
Or call Marcellus Hotline
1-877-847-8408

(8-15) 2M

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