

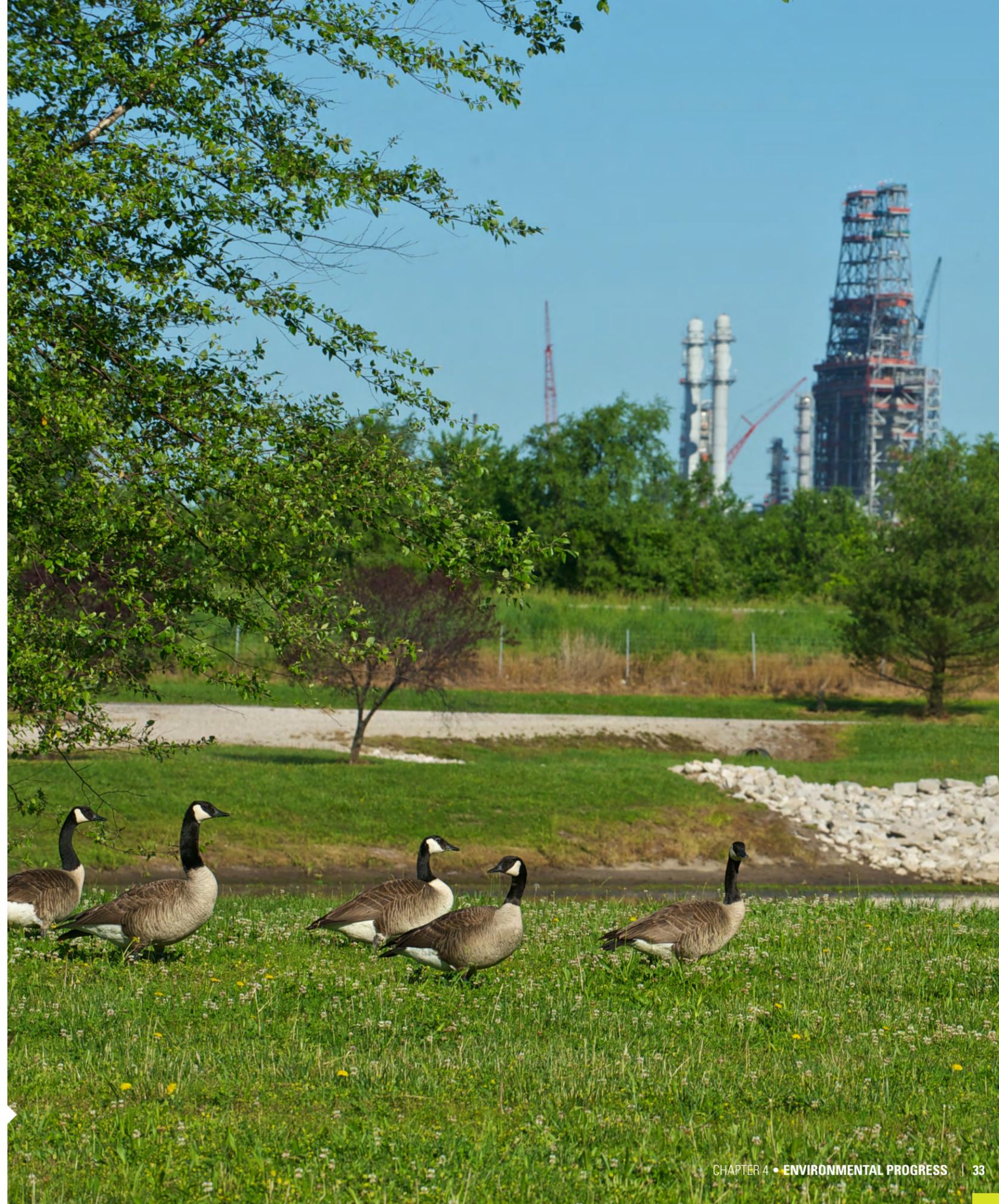
Chapter 4 – Environmental Progress

WORKING TOGETHER, WE CAN PROTECT OUR ENVIRONMENT

Phillips 66 delivers affordable energy while protecting air, water and land resources.

As we strive each day to operate with the highest safety standards, we steward energy and resources efficiently, invest in research and technology, and support habitat and conservation programs. In addition to complying with strict environmental regulations to protect air, land and water resources, in many cases, we work to go beyond the requirements.

WOOD RIVER REFINERY
Roxana, Illinois



RESPECT AND PROTECT

We protect the environment by operating safely. We make investments in companywide asset maintenance, operating standards and procedures, and business assurance programs. Our [HSE Policy and Management System \(HSE-MS\)](#) dictates our vision and goals and governs our programs and practices. Our HSE-MS is a single system that focuses on operating excellence and facilitates HSE performance and compliance. It includes an environmental component and incorporates key standards, procedures and guidelines that are consistently applied by all business units. Our core standards include reporting, metrics, crisis management, emergency response, due diligence, incident investigation, risk assessment and corporate auditing.

The operating standards and procedures we implement often exceed regulatory requirements. For example:

- Our Midstream business applies [pipeline integrity management](#), including inline inspections, enabling us to prioritize necessary maintenance and prevent problems.
- At our Refining sites, we set operating limit alarms. These alarms require action well before conditions exceed environmental limits or cause problems. As a result, the EPA has recognized our cutting-edge use of environmental operating limits.
- We are upgrading atmospheric relief vents and valves in all our refineries to achieve atmospheric venting that exceeds regulatory standards.
- Many of our Specialty and Lubricants plants have achieved internationally recognized ISO certification.

CONTINUOUS IMPROVEMENT

Our ambitious goal of zero incidents, coupled with strong HSE policies, HSE-MS and processes, produces results. We are making very good progress.

- From 2012-2016, the number of environmental events (air, waste, water permit exceedances) has decreased 26 percent.
- In that same time period, our number of tier 1 process safety events was cut in half.
- 2016 was our best safety performance year.
- Our industry's safety rate is more than 26 times better than all manufacturing.

BY THE NUMBERS

>\$6
BILLION
INVESTED IN
ENVIRONMENTAL
PROJECTS &
SUSTAINING
CAPITAL
(2012-2016)

MEASURABLE RESULTS

EMISSION REDUCTIONS
(2002-2016)

SO₂ ↓ 92%
(44,000 ton/yr)

NO_x ↓ 62%
(14,000 ton/yr)

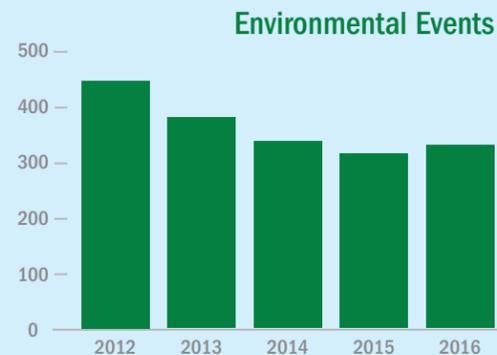
PM ↓ 62%
(3,000 ton/yr)



PASADENA TERMINAL
Pasadena, Texas

STRIVING FOR EFFICIENCY

We operate in a highly regulated industry. At our facilities, we manage numerous environmental permits that regulate operations such as air emissions, water effluent and solid waste handling. Over the past decade, we've reduced the number of environmental events that require reporting to a governing agency – even as we've expanded our business – by improving the management of our operations. Fewer events show progress and the trend shows steady improvement.



WOOD RIVER REFINERY
Roxana, Illinois

Energy use

According to the [International Energy Agency](#), global demand for oil and natural gas is expected to increase through [2040](#). We are on track to meet that demand by affordably and efficiently manufacturing and distributing our energy products to customers around the world. A critical component of this production and distribution capacity is energy efficiency.

On average, our refineries process more than two million barrels of crude into clean, affordable products every day. It takes energy to make and deliver energy on this scale. Energy expenditures can account for roughly 40 percent of a refinery's operating expenses. Focusing on efficiency is important to us. We capitalize on opportunities for things like improvements in heat exchange or recovery, furnace controls and steam optimization. Projects range from installing new boilers to improving seals, adjusting inlet and stack temperatures, and optimizing steam use. Energy and other resource savings from recent efficiency projects include:

- Saving 196 million BTUs per hour. This is equivalent to the energy used in about 45,000 U.S. homes in a year.
- Reducing global water use by 94 million gallons per year.
- Reducing our use of steam by 90,000 pounds per hour, which saves additional energy and water.

Emissions Improvements in action

A \$200 million project to install state-of-the-art power distribution facilities at our Wood River Refinery in Roxana, Illinois, has improved facility reliability and reduced flaring from unplanned events. The project replaced wooden power utility poles with metal stanchions and has improved power supply reliability and reduced the burning of excess fuel because we



now have more uptime and less unplanned downtime.

We've reduced sulfur dioxide (SO₂) emissions at the Billings Refinery in Billings, Montana, through innovations such as a gas recovery unit that removes sulfur from the emergency system and redirects the sweetened gas for use as fuel inside the refinery. Billings also began production of an ultra-low sulfur diesel fuel, utilized a gas oil hydrotreater to remove sulfur from fuels and refinery products, and worked with the nearby Jupiter Sulfur plant to convert excess sulfur into other goods, such as fertilizer. As a result, SO₂ emissions were reduced, which contributed to the improved conditions, enabling the EPA to designate Yellowstone County, Montana, as being in attainment for SO₂ levels.

More than a third of our U.S. refineries have earned



the EPA's [ENERGY STAR](#)[®] certification in recognition of our voluntary efforts to improve energy efficiency. ENERGY STAR refineries perform in

the top 25 percent nationwide for energy efficiency using the Solomon-EII™ scoring system and meet

environmental performance levels set by the EPA.

Greenhouse Gas Emissions

Phillips 66 is committed to managing greenhouse gas (GHG) emissions. We do this on a global basis by investing in public and private research to advance energy solutions and reviewing potential GHG emissions impact as part of our major project approval process.

We focus on:

- Monitoring GHG emissions from our operations and lowering emissions by increasing energy efficiency.
- Conducting research in alternative energy, processing improvements and product innovation.
- Supporting stakeholder and public education on energy issues.
- Blending renewable fuels and evaluating opportunities for co-processing or – production of renewables.

Since 2010, our GHG emissions data have been publicly available through the [EPA](#) and [European Union](#) websites.

WORKING TOGETHER: COGENERATION

Cogeneration (cogen) is the use of a single fuel source to produce electricity and heat, and it's one way Phillips 66 employs energy efficiency practices. The process helps us meet our manufacturing needs and convert heat that would otherwise be lost to the environment into thermal energy to power our process equipment.

Seven of our refineries have associated cogen units. Three refineries – Los Angeles, San Francisco and Sweeny – have Phillips 66 owned units. Four others, in the Texas Panhandle, New Jersey, Washington and the United Kingdom, purchase part of the waste heat steam from, or electricity generated at, third-party cogen units adjacent to our facilities.

Phillips 66's 440-megawatt Sweeny Cogeneration Power Plant produces steam and power to serve our refinery and [Chevron Phillips Chemical Company's](#) facility in Old Ocean, Texas, plus enough extra electricity to sell to the local utility market.

The steam power plant at our Rodeo Carbon plant in California uses cogeneration to generate steam and electricity for on-site use and sells the excess electricity to the local utility market.



SWEENEY TERMINAL
Old Ocean, Texas

OPERATION CLEAN HOUSE
Bartlesville, Oklahoma



HAZARDOUS MATERIAL DISPOSAL
Bartlesville, Oklahoma

Water and Waste

Phillips 66 uses robust water and waste management programs and practices at all our operating facilities. All facilities have wastewater systems and oil recovery units that recover reusable water and oil streams, thereby reducing fresh water use, improving discharged water quality and conserving valuable hydrocarbons.

We empower and incentivize our sites to find new and efficient ways to reduce waste and conserve resources. For example:

- Our Borger Refinery in Borger, Texas, uses a centrifuge to separate oil, water and sludge, then sends oily sludges to a thermal desorber unit (TDU) to recover hydrocarbons and water for recycling. The result is less waste in landfills.
- Our Ponca City Refinery in Ponca City, Oklahoma, partnered with a local municipality to construct water wells that can serve both the refinery and the local community, ensuring efficient use of the area's limited groundwater resources.
- Our Bartlesville, Oklahoma, Research Center holds an annual "Operation Clean House" event each Earth Day. The event is coordinated with volunteers from the city, Chevron Phillips Chemical Company and ConocoPhillips. It helps citizens dispose of hazardous household items in an environmentally responsible manner. **At the 2017 "Operation Clean House" event, 75 of our employee volunteers collected and safely disposed of 12,570 pounds of hazardous waste.**

Phillips 66 conducts research and shares best practices in all aspects of water use and water recycling to reduce operating costs and ensure sustainable water resources in the communities surrounding our facilities.

FINDING SOLUTIONS NOW ...

We are the only integrated downstream energy manufacturing and logistics company with our own research department. More than 300 scientists work at our 440-acre research campus in Bartlesville, Oklahoma, giving us the capability to scale innovative ideas from beakers to labs to pilot plants and beyond.

Research and development in advanced technology enables our refineries and Midstream facilities to run more efficiently, using less water and energy. The Technology organization focuses on three areas: advanced engineering optimization for our existing businesses, sustainability technologies for a changing regulatory environment, and future growth opportunities. Technology creates value through evaluation of advantaged crudes, models for increasing clean product yield, and research to increase safety and reliability. Research allows Phillips 66 to be well positioned to address issues like corrosion, water consumption and changing regulations, as well as reducing risk and generating novel solutions for our growing Midstream operations. We also research new energy sources, alternative fuels, air quality and water management.

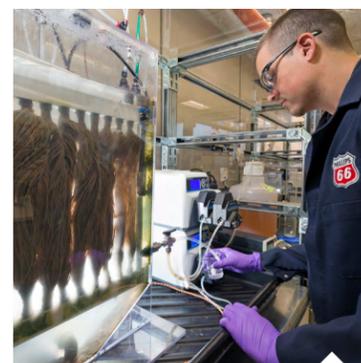
Work in these areas has led to inventions that have unlocked new business opportunities and reduced the environmental impact of our operations. At the Wood River Refinery in Illinois, Phillips 66 researchers used pilot scale experiments to validate our proprietary, predictive models for corrosion of piping and equipment from crude oils in a commercial setting. This work allows our refineries to select advantaged crude oils with

confidence in the integrity of our pipes, the safety of our operations and the efficiency of our processing units.

We also hold United States Patent 7419602 for selenium removal from water. Selenium is a necessary micronutrient, but as with most compounds, at higher concentrations in water, it can be undesirable. Phillips 66 has developed technology to reduce the concentration of selenium in water that is discharged from refineries. This technology has been used successfully at the Los Angeles Refinery in California for almost a decade, protecting nearby aquatic life.

Our United States Patent 7550634 for a process converting triglycerides to hydrocarbons came from our research to convert cooking oil, tallow or vegetable oil into high-quality diesel fuel with a low-carbon footprint. This technology can be integrated into existing refineries to simultaneously produce biofuels and conventional fossil fuels while reducing the refinery's overall greenhouse gas emissions. We have implemented this technology at two Phillips 66 refineries.

Our air research program works with government agencies, trade organizations and academic institutions to provide data that leads to improved air quality in the communities where we operate. For example, our research into volatile organic compounds (VOCs) helped identify the origin and transport of VOCs. Using that information, we reduced VOC emissions at our facilities. We also collaborate with the [Georgia Institute of Technology](#) to advance particulate matter science.



RESEARCH CENTER
Bartlesville, Oklahoma

FINDING SOLUTIONS FOR THE FUTURE ...

We blend renewable fuels and have conducted research in various fuel-related areas such as liquid gas, tallow and renewable diesel. We also research sustainable fuel cells, solar panels and water quality to help us develop new environmental solutions in advance of changing governmental regulations and future demand growth.

We believe a growing population will require increasing amounts of energy, and there's a place for all forms of energy.

Our company's advances in solid oxide fuel cells (SOFC) technology are an exciting way our research is helping solve the world's biggest energy challenges. Scientists and engineers at the Phillips 66 Research Center are developing a new generation of SOFCs that run on natural gas. They are small but powerful. Each cell is less than half a millimeter thick and produces approximately one volt. Cells can be stacked, and stacks can be bundled into modules that could provide large amounts of power.

SOFCs are less expensive and more convenient to operate than conventional hydrogen fuel cells. Conventional low-temperature fuel cells require ultra-high purity hydrogen or extensive fuel processing. We see an opportunity in using natural gas. Phillips 66 SOFCs can generate electricity at high efficiencies from an abundant, reliable and inexpensive fuel source. Broad adoption of current SOFC technology is limited by high cost and short lifetimes. Phillips 66's research is

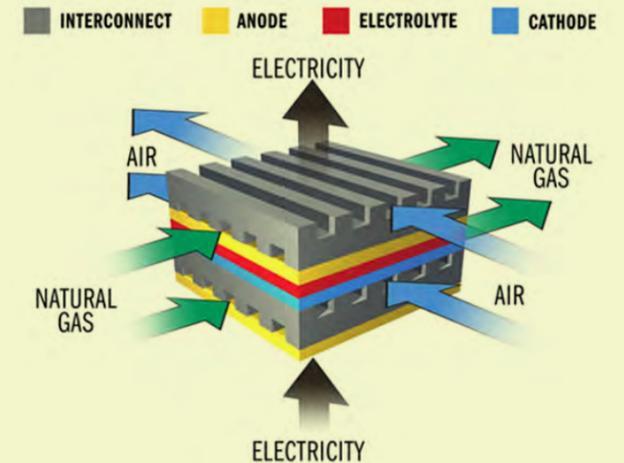
focused on developing better materials, manufacturing techniques and device designs. The technology could also complement our extensive Midstream businesses in natural gas gathering and processing.

SOFCs offer advantages for future power generation because they are approximately twice as efficient as coal or natural gas power plants, and they don't involve combustion. That means SOFCs have low emissions and are silent, unlike traditional generators. And SOFCs can be paired with solar- or wind-generated power, ensuring reliable energy during periods when the sun is not shining or the wind is not blowing. Their quiet, compact, modular design make SOFCs a convenient source for on-site power for homes and businesses, ensuring reliable energy even during traditional power grid outages.

Phillips 66 technologies are also creating the potential for cost-effective renewable energy generation. In 2016, Phillips 66 set a new world record in power conversion efficiency for polymer-based single junction organic photovoltaic (OPV) cells. This breakthrough in efficiency moves solar technology significantly closer to commercial viability by enabling the development of flexible, lightweight and transparent solar modules that can be manufactured at a low cost. In addition, the OPV solar cells are made without hazardous components, such as lead or cadmium, which are found in some other types of thin film technologies.

WHAT IS A FUEL CELL?

A fuel cell is a device that uses chemical energy, such as natural gas, hydrogen or other fuels, to produce electricity. While a fuel cell can be thought of as similar to a battery, there are key differences between the two. A fuel cell uses a continuous source of fuel and oxygen to sustain its chemical reaction; a battery's chemical energy comes from chemicals present in it. Fuel cells also can power large, industrial systems and small, personal electronics. These differences create potential application for fuel cells.



SOLID OXIDE FUEL CELL
PHILLIPS 66 RESEARCH CENTER
Bartlesville, Oklahoma

HEALTH, SAFETY AND ENVIRONMENTAL TRANSPARENCY

Phillips 66 provides key safety information through an extensive public [database of safety data sheets](#). This information helps people understand potential hazards associated with our products so they can handle and dispose of them safely. We maintain [communication](#) with our communities. We also comply with the [EPA's Toxic Substances Control Act](#) and [OSHA's Hazard Communication Standard](#). We support the goals of the [European Union's REACH regulation](#) and report GHG emissions from our operations to the [EPA GHG website](#) and other regulatory agencies.

WORKING TOGETHER TO PRESERVE CRITICAL HABITAT

Conserving and protecting our natural environment is a key component of our environmental stewardship mission. That stewardship extends beyond our fence line. We work with national partners such as [Ducks Unlimited](#) and the [National Fish & Wildlife Foundation](#) to conserve ecologically important habitats and enhance biodiversity. Our gift of [\\$400,000](#) to the Gulf Coast Initiative will support conservation efforts in the wetlands of Texas and Louisiana, which are North America's most significant waterfowl wintering grounds.

Every act of conservation matters. With Wildlife Habitat Council, we started a pilot project at our branded California 76 stations to educate our operators on landscaping options that support biodiversity for pollinators. The program provides continuing support in our efforts to enhance and conserve the environment. Additionally, our environmental giving in 2017 has helped preserve more than 21,000 acres of habitat.

Read more about how we are walking the talk on environmental conservation in our [philanthropy](#) section.

SEA CENTER TEXAS
Lake Jackson, Texas



76 STATION
Chino Hills, California



FERNDALE REFINERY
Ferndale, Washington