

CLIMATE & ENERGY



EDF scientist **Dr. Ramón Alvarez** (*left*), an authority on methane leakage from natural gas operations, tours an Arkansas shale gas drilling site with **Mark Boling**, a senior executive with Southwestern Energy.



Bringing science to the shale gas conflict

The natural gas boom could benefit the environment and the economy—if we protect communities by fighting for strong rules and responsible development. EDF is bringing together industry, scientists and activists to make progress on one of the most controversial issues.

Mark Boling, a senior executive of Southwestern Energy, and Dr. Ramón Alvarez, a longtime EDF scientist, are examining a remote natural gas drill site about 75 miles north of Little Rock, Arkansas. They are in the Fayetteville Shale, a giant shale gas deposit that cuts through the state.

The two men are seemingly on opposite sides of the rancorous shale gas debate. But as they climb a drill rig under the watchful eye of supervisor Chris Varela, they talk about how their partnership could help transform the way America taps its shale gas reserves. This is an issue that matters to a lot of people. As Varela puts it: “I want to make sure that we don’t mess up this land. My family is here. I hunt and fish here.”

In 1990, shale gas contributed 1% of U.S. natural gas; today it’s about 30% and rising. Since gas emits less carbon than coal when burned, it could be one step in the shift to a clean energy economy, and it already has created hundreds of thousands of jobs. But shale gas extraction—which commonly involves hydraulic fracturing, or fracking—also can pollute air and water and despoil landscapes.

In 2011, EDF president Fred Krupp served on U.S. Energy Secretary Steven Chu’s natural gas advisory board. He and fellow board members visited rural Pennsylvania, where a mother told them she had been forced off her farm because of air pollution from gas wells. Her young son had become ill, and she was living out of her car.

“We can’t ask people to trade away their health and quality of life in exchange for cheap

As shale gas drilling encroaches on communities (*opposite page*), pollution concerns are growing. Below, Southwestern Energy’s Mark Boling (*center*) and EDF’s Dr. Ramón Alvarez examine methane monitoring equipment in use at an Arkansas well site.



“Industry and the environmental community need to identify the real problems in shale gas development and come up with real solutions.”

Mark K. Boling, President
V+ Development Solutions Division
Southwestern Energy



energy,” Krupp said afterward. He successfully urged the board to call for tighter pollution controls, stronger enforcement, and disclosure of chemicals, water use and pollution.

EDF is fighting for these goals in 14 states that hold 85% of U.S. onshore shale gas reserves. In Pennsylvania, we’re supporting communities fighting to retain their rights to regulate drilling.

CLEANING UP THE SYSTEM

Everyone has a right to clean air and water and a healthy environment. That’s why EDF is helping to create and push for rigorous standards for shale gas operations.

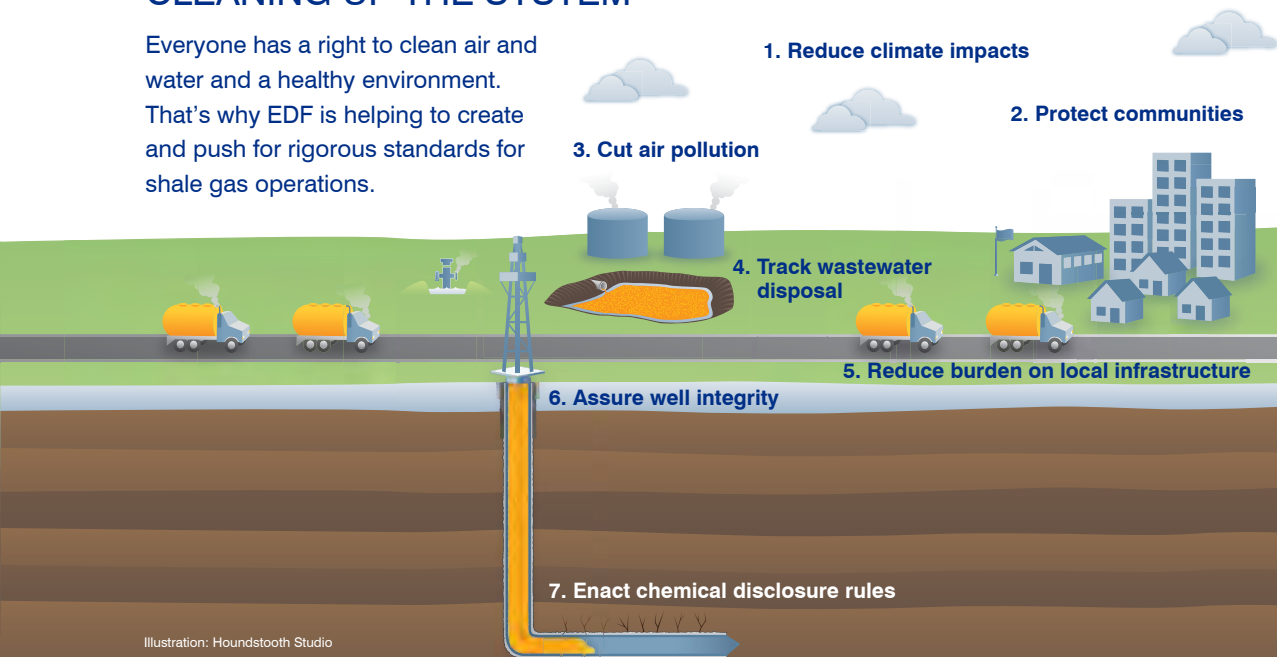


Illustration: Houndstooth Studio

In Colorado, we helped set the standard for disclosure of fracking chemicals, and in Ohio, our ideas on sound well construction are being enacted into regulation.

In addition, last year Alvarez and Dr. Steven Hamburg, EDF’s chief scientist, were among the authors of a peer-reviewed paper that found the climate benefits of natural gas—which is mostly methane, a potent greenhouse gas—could be lost for decades if too much leaks into the atmosphere. Now EDF is participating in a series of five studies with companies and research universities to map leakage along the natural gas supply chain. “There’ve been a lot of claims about leakage rates,” says Alvarez, “but we’re using rigorous scientific methods to get the data we need to find and reduce leakage.”

CLIMATE & ENERGY GOALS

Reverse the rising trend in global greenhouse gas emissions

Hasten the transition to low-carbon energy in the United States and China

Reduce greenhouse gas emissions from deforestation and agriculture

Cut emissions of methane and other short-lived but potent greenhouse gases



“Climate change is our most formidable challenge. We must convey the need for action in ways that are relevant to individuals’ lives.”

Jim Marston, VP Energy (*left*)
Steve Cochran, VP Climate



CALIFORNIA: A CLIMATE LAUNCH PAD

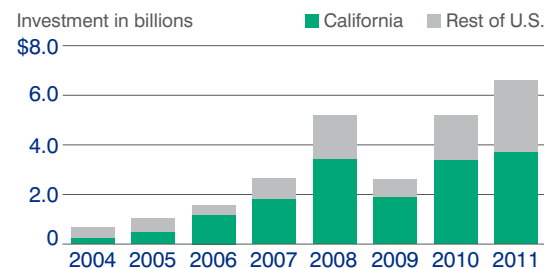
With help from EDF, California initiates the nation's first economy-wide cap on greenhouse gases. That ignites a market—and the clean energy race in America.

HELP WANTED: Iron workers for solar and wind projects. That's the message Stan Martin, a recruiter with Southern California Laborers Union #1184, delivered at a local job fair. "We're getting ready for a lot of work out here in the next ten years," he said.

In fact, job growth in California's clean-tech sector is ten times that of the state's overall economy, thanks to the landmark 2006 Global Warming Solutions Act (AB 32), which EDF co-sponsored and defended in court and at the polls. It calls for a cap-and-trade market for greenhouse gases starting in January 2013.

"California's law is proof that cost-effective climate action is still possible on a large scale in the United States even though Congress remains

INVESTING IN CLEAN TECH



Clean-tech venture capital has been surging into California since AB 32 passed in 2006.

gridlocked," says Derek Walker, EDF's director of strategic climate initiatives.

AB 32 aims to cut California's greenhouse gas emissions to 1990 levels by 2020, with one-third of electricity to come from renewable sources. The cap-and-trade market alone will slash global warming pollution by an amount equivalent to taking 3.5 million cars off the road.

The idea behind the market is simple. AB 32 caps greenhouse gases emitted by the state's largest polluters, and then lowers that cap every year, creating a market for innovations that will help companies reduce emissions at lowest cost.

The declining cap is helping to drive California's three biggest electric utilities to invest in "smart grid" projects, designed to enable greater use of renewable energy, energy efficiency and electric vehicles. EDF played a key role in guiding those plans in California (and also in New York, North Carolina and Texas).

As California's carbon market grows, the state's economy will only become more efficient, competitive and innovative. And that means more Help Wanted signs.

ENERGY DETECTIVES CUT CARBON POLLUTION

EDF Climate Corps pairs business school students—the green business leaders of tomorrow—with companies and public institutions looking to reduce energy waste. This summer, EDF trained 97 fellows to work at AT&T, Caterpillar, Facebook and elsewhere. Since the program began in 2008, our fellows have found \$1.2 billion in energy savings, enough to power 150,000 homes.



“My career goal can be described in two words: to matter.”

Michelle de Arruda
EDF Climate Corps fellow

HOME

São Paulo, Brazil

EDUCATION

MBA student, University of Virginia

LAST ACCOMPLISHMENT

Michelle de Arruda spent the summer at UNICEF in New York, where she recommended energy efficiency improvements in lighting, HVAC and computer power management that are now being implemented.

TOTAL POLLUTION REDUCTION

Up to 30% of NY office's CO₂ emissions



EDF DONOR MICHAEL BLOOMBERG

FROM THE BIG APPLE TO THE BLUE PLANET

Michael Bloomberg has never shied away from bold ideas that benefit the planet. As Mayor of New York, he got to know EDF staff as we worked together to clean the City's air and reduce its carbon footprint.

Now, in his role as a prominent philanthropist, Bloomberg has made a generous gift supporting EDF's work to help protect communities from the impacts of natural gas development by promoting stronger state and local environmental rules.

“Our approach at Bloomberg Philanthropies is not unlike a venture capital firm,” he says. “You see a team with the ideas you want to invest in, who have the best chance to succeed, and you commit.”

Bloomberg also chairs the global C40 Cities Climate Leadership Group. “Cities around the world are making more progress in combating climate change than any other level of government,” he says.

“EDF doesn't just talk about problems,” he notes. “They help design smart government policies, combine them with private sector know-how and create solutions. That's why they are effective and why we are excited to partner with them.”



CHINA: KEY TO A CLIMATE SOLUTION

The road to a global climate solution leads through China. That means capping carbon pollution—while reducing poverty among farmers.

China, the world's largest coal consumer and greenhouse gas emitter, is crucial to stabilizing the planet's climate.

EDF is engaged at every level helping China solve its environmental challenges. Our VP Dr. Daniel Dudek co-chairs the task force advising the Chinese government on how to meet the nation's ambitious environment goals.

More than 20 years ago, Beijing called on Dr. Dudek to participate in the country's first experiments with economic incentives for pollution control. Early successes prompted the government to include carbon trading projects in its latest five-year plan.

This year Beijing, assisted by EDF, designated seven cities and regions for pilot carbon trading.

“EDF emphasizes poverty alleviation, dealing with climate change, and low-carbon development, which are the highest priorities for China.”

Lin Erda, Member
Chinese People's Political
Consultative Congress

Compulsory trades start in 2013. The programs aim to reduce carbon emissions in China's main economic regions. Shanghai, for example, will focus on 200 large enterprises in the Yangtze River Delta. Eventually, China plans to establish a nationwide trading system and link with other carbon markets. “We're helping lay the groundwork to make it happen,” says Dr. Dudek.

EDF's work on carbon markets also helps with poverty reduction—China's top priority. Our partner is the State Council's Poverty Alleviation Office, which has representatives in every community. We've created a program where some 500,000 poor farmers in Xinjiang, Sichuan and Shaanxi provinces earn income by reducing carbon emissions, through improved agricultural practices and by turning waste to energy. Our goal is to enlist 20 million farm families by 2016.

Since environmental enforcement remains weak, we helped Beijing devise tougher penalties for water pollution. A similar policy is now being developed for air pollution. All these changes will be implemented by a new generation of Chinese environmental leaders, many trained through a program EDF set up with China's elite universities. So far nearly 11,000 professionals have graduated.

MANY PATHS, ONE PLANET

Global warming affects everyone, but the poor most of all. EDF is helping nations deliver a better life for their people, even as they shift to low-carbon sources of energy and learn how to manage their forests and farmlands in ways that alleviate climate change.



CREATE CARBON MARKETS

Thanks in part to EDF, countries representing one-quarter of the world's economy are putting in place market-based carbon limits to reduce pollution, conserve natural resources and help finance low-carbon economic development around the world.

CHINA
EUROPEAN UNION
SOUTH KOREA
AMAZON STATES



PRESERVE RAINFORESTS

Rainforest destruction accounts for about 15% of all global greenhouse gas emissions. We helped defend Brazil's rainforest protection law. Based in part on our proposals, the Brazilian government is now creating incentives to reduce the country's deforestation and preserve its biodiversity.

BRAZIL
MEXICO



MOVE TO LOW-CARBON ENERGY

Fossil fuel use for energy accounts for 60% of greenhouse gas emissions. Our initiatives improve energy efficiency and encourage the growth of clean energy in places like China, which burns half the world's coal. In India, we helped bring 120,000 families cleaner burning stoves, reducing unhealthy air pollution.

CHINA
EUROPEAN UNION
INDIA



FOSTER LESS-POLLUTING AGRICULTURE

Farming accounts for about 12% of global greenhouse gas emissions. EDF is helping poor farmers in Asia grow crops in ways that reduce global warming pollution while boosting yields and providing additional income through the carbon market. These projects reduce annual greenhouse gas emissions by 350,000 tons.

CHINA
INDIA
VIETNAM



CUT METHANE

EDF helped Russia's Gazprom, the world's largest natural gas company, complete a project to identify and cut leaks of methane, a potent greenhouse gas, at its facilities. And in Asia, our work with rice farmers could be a model for cutting methane emissions from that continent's 300 million acres of rice.

CHINA
INDIA
RUSSIA
VIETNAM

Gazprom