

# Two Stepping between Science and Policy

Elena Craft, PhD  
Health Scientist





- Founded in 1967 by scientists concerned about pesticide DDT
- 700,000 members nationally
- Over \$120 million annual budget
- Over a dozen regional offices
- 300 scientists, economists, and other professional staff who emphasize
  - Sound science
  - Power of partnerships
  - Power of incentives

#### 4 Principle Goals



**Stabilize the Earth's climate by reducing greenhouse gas emissions.**



**Safeguard human health from exposure to toxic chemicals and pollution.**



**Protect the world's oceans from pollution and overfishing.**

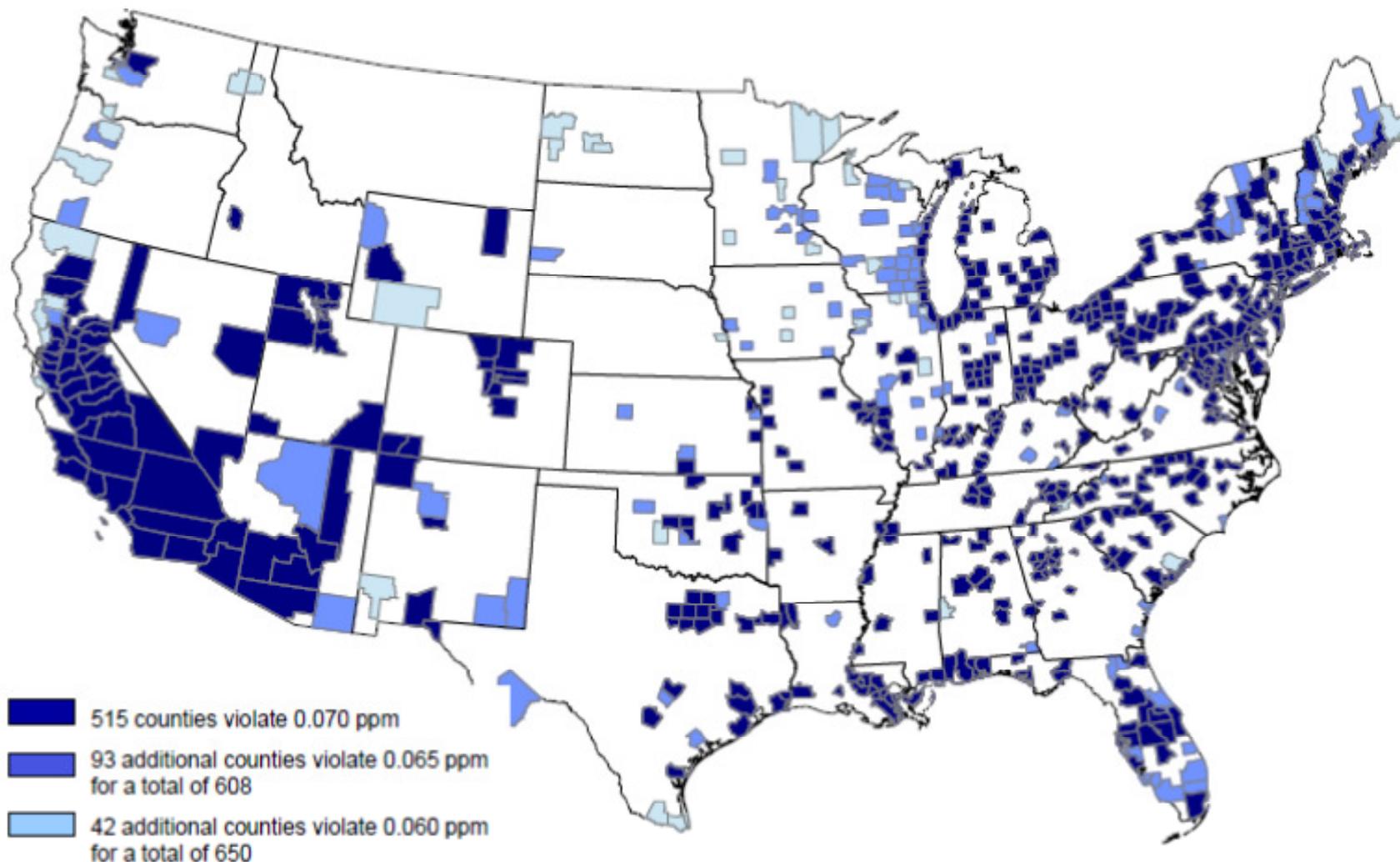


**Preserve and restore biodiversity.**

# Counties With Monitors Violating Primary 8-hour Ground-level Ozone Standards 0.060 - 0.070 parts per million

(Based on 2006 – 2008 Air Quality Data)

EPA will not designate areas as nonattainment on these data, but likely on 2008 – 2010 data which are expected to show improved air quality.



## Notes:

1. No monitored counties outside the continental U.S. violate.
2. EPA is proposing to determine compliance with a revised primary ozone standard by rounding the 3-year average to three decimal places.



# AUGUST 2009 THE PORT REPORT

Port of Houston Authority



## EPA Announces \$9 Million SmartWay™ Funding

PHA, EDF, H-GAC partnered to help fund truck engine retrofits, upgrades

In a major move to help improve regional air quality, Environmental Protection Agency Assistant Administrator Gina McCarthy on Aug. 26 announced a \$9 million American Recovery and Reinvestment Act SmartWay™ Diesel Emissions Reduction Act (DERA) award to the Houston-Galveston Area Council (H-GAC).

Environmental Defense Fund (EDF), with the Port of Houston Authority (PHA) and H-GAC, partnered on the grant application for SmartWay™ program funds to tackle one of the largest and most difficult-to-address sources of pollution at any port: drayage trucks.

"The Port of Houston Authority is pleased to continue its support of programs that help in the reduction of air emissions," said PHA Chairman James T. Edmonds. "The Clean Truck program is just one part of an important series of strategies in PHA's Clean Air Strategy Plan, an environmental stewardship program designed to help improve air quality in our region."

Drayage trucks are diesel-fueled, heavy-duty trucks that transport shipping containers. The DERA award will fund a bridge loan program that provides resources for retrofits or for newer, less-polluting trucks. The program targets owners of the more than 3,000 trucks operating at the Port of Houston.

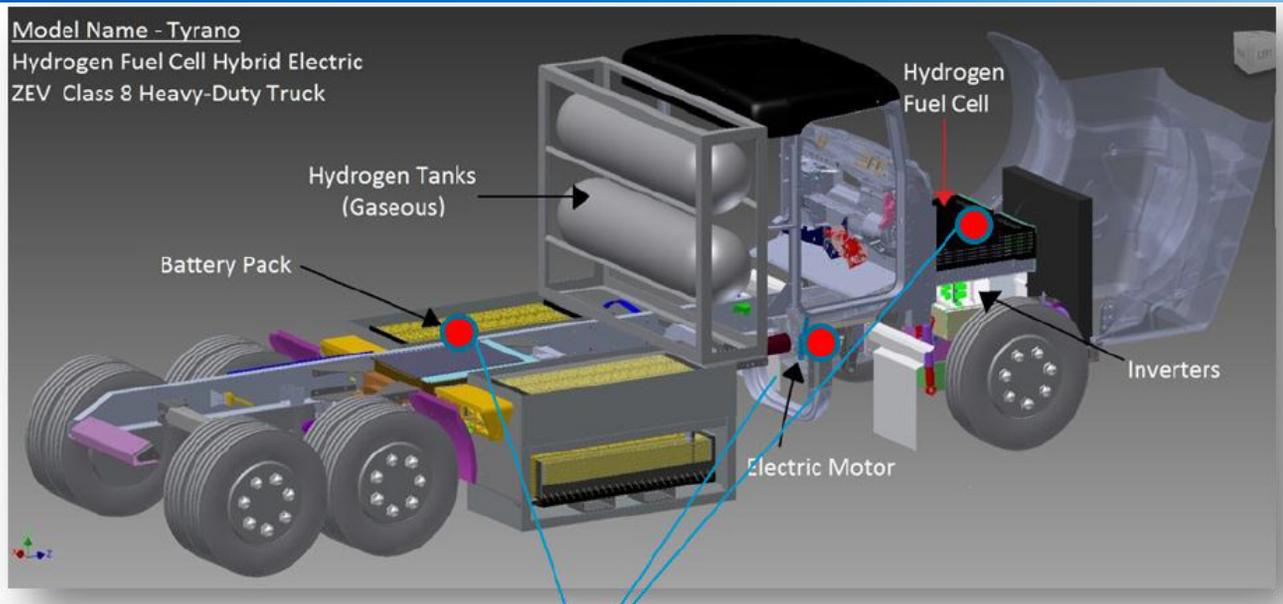
Harris County Attorney Vince Ryan; EPA Assistant Administrator Gina McCarthy; PHA Chairman James T. Edmonds; Dr. Elena Craft, air quality specialist, EDF; Karl Pepple, director, environmental programming, city of Houston; Rick Maddox, president, Canal Cartage Co., and representing Texas Motor Transportation Association; and Alan Clark, director of transportation planning, H-GAC.

Over the life of the program, the following emission reductions are anticipated: 1,428 tons of nitrous oxide; 26.7 tons of particulate



### Model Name - Tyrano

Hydrogen Fuel Cell Hybrid Electric  
ZEV Class 8 Heavy-Duty Truck



# Natural Gas Boom



# Science

## Greater focus needed on methane leakage from natural gas infrastructure

Ramón A. Alvarez<sup>1</sup>, Stephen W. Pacala<sup>1\*</sup>, James J. Winebraker, William L. Chameides<sup>2</sup>, and Steven P. Hamburg<sup>3</sup>

<sup>1</sup>Environmental Defense Fund, 301 Congress Ave Suite 1300, Austin, TX 78701; <sup>2</sup>Department of Ecology and Evolutionary Biology, 106A Guyot Hall, Princeton University, Princeton, NJ 08544; <sup>3</sup>College of Liberal Arts, Rochester Institute of Technology, Rochester, NY 14623; <sup>4</sup>School of the Environment, Duke University, Durham, NC 27708; and <sup>5</sup>Environmental Defense Fund, 18 Tremont Street, Boston, MA 02108

Contributed by Stephen W. Pacala, February 13, 2012 (sent for review December 21, 2011)

Natural gas is seen by many as the future of American energy: a fuel that can provide energy independence and reduce greenhouse gas emissions in the process. However, there has also been confusion about the climate implications of increased use of natural gas for electric power and transportation. We propose and illustrate the use of technology warming potentials as a robust and transparent way to compare the cumulative radiative forcing created by alternative technologies fueled by natural gas and oil or coal by using the best available estimates of greenhouse gas emissions from each fuel cycle (i.e., production, transportation and use). We find that a shift to compressed natural gas vehicles from gasoline or diesel vehicles leads to greater radiative forcing of the climate for 80 or 280 yr, respectively, before beginning to produce benefits. Compressed natural gas vehicles could produce climate benefits on all time frames if the well-to-wheels CH<sub>4</sub> leakage were capped at a level 45–70% below current estimates. By contrast, using natural gas instead of coal for electric power plants can reduce radiative forcing immediately, and reducing CH<sub>4</sub> losses from the production and transportation of natural gas would produce even greater benefits. There is a need for the natural gas industry and science community to help obtain better emissions data and for increased efforts to reduce methane leakage in order to minimize the climate footprint of natural gas.

With growing pressure to produce more domestic energy and to reduce greenhouse gas (GHG) emissions, natural gas is increasingly seen as the fossil fuel of choice for the United States as it transitions to renewable sources. Recent reports in the scientific literature and popular press have produced confusion about the climate implications of natural gas (1–5). On the one hand, a shift to natural gas is promoted as climate mitigation because it has lower carbon per unit energy than coal or oil (6). On the other hand, methane (CH<sub>4</sub>), the prime constituent of natural gas, is itself a more potent GHG than carbon dioxide (CO<sub>2</sub>); CH<sub>4</sub> leakage from the production, transportation and use of natural gas can offset benefits from fuel-switching.

The climatic effect of replacing other fossil fuels with natural gas depends on the context (i.e., electricity generation, transportation,

A shift to natural gas and away from other fossil fuels is increasingly plausible because advances in horizontal drilling and hydraulic fracturing technologies have greatly expanded the country's extractable natural gas resources particularly by accessing gas stored in shale deep underground (7). Contrary to previous estimates of CH<sub>4</sub> losses from the "upstream" portions of the natural gas fuel cycle (8, 9), a recent paper by Howarth et al. calculated upstream leakage rates for shale gas to be so large as to imply higher lifecycle GHG emissions from natural gas than from coal (1). (*SI Text*, discusses differences between our paper and Howarth et al.) Howarth et al. estimated CH<sub>4</sub> emissions as a percentage of CH<sub>4</sub> produced over the lifecycle of a well to be 3.6–7.9% for shale gas and 1.7–6.0% for conventional gas. The EPA's latest estimate of the amount of CH<sub>4</sub> released because of leaks and venting in the natural gas network between production wells and the local distribution network is about 570 billion cubic feet for 2009, which corresponds to 2.4% of gross U.S. natural gas production (1.9–3.1% at a 95% confidence level) (6). EPA's reported uncertainty appears small considering that its current value is double the prior estimate, which was itself twice as high as the previously accepted amount (9).

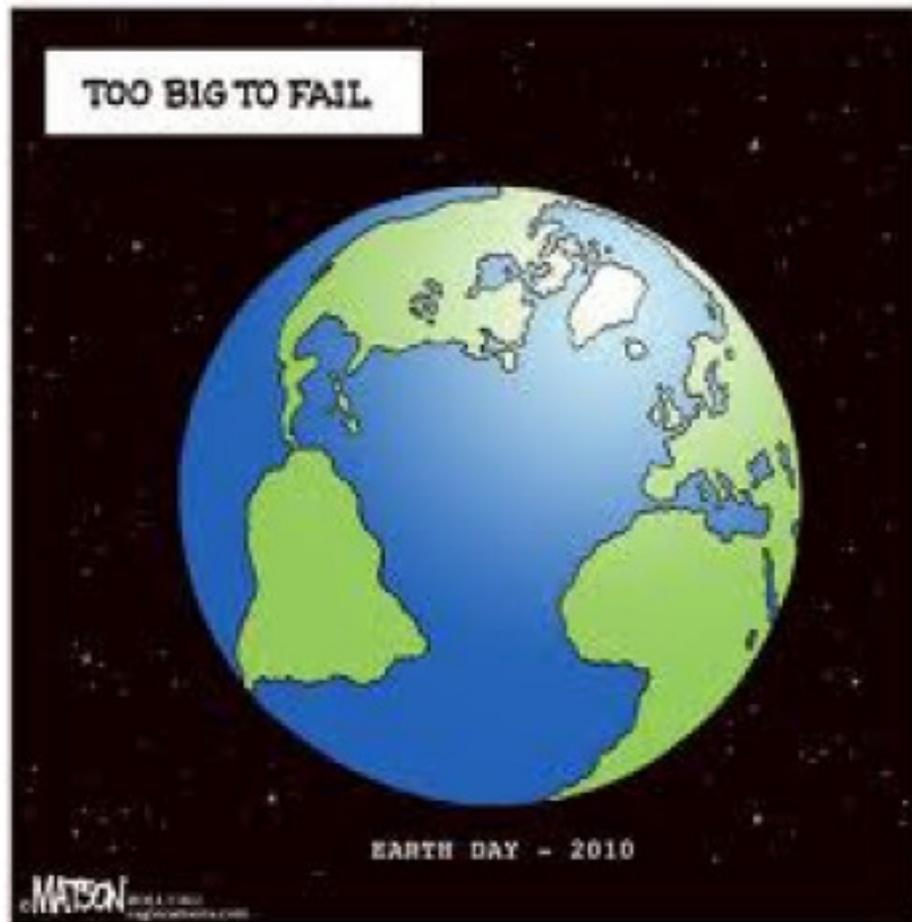
Comparing the climate implications of CH<sub>4</sub> and CO<sub>2</sub> emissions is complicated because of the much shorter atmospheric lifetime of CH<sub>4</sub> relative to CO<sub>2</sub>. On a molar basis, CH<sub>4</sub> produces 37 times more radiative forcing than CO<sub>2</sub>.<sup>1</sup> However, because CH<sub>4</sub> is oxidized to CO<sub>2</sub> with an effective lifetime of 12 yr, the integrated, or cumulative, radiative forcings from equal-molar releases of CO<sub>2</sub> and CH<sub>4</sub> eventually converge toward the same value. Determining whether a unit emission of CH<sub>4</sub> is worse for the climate than a unit of CO<sub>2</sub> depends on the time frame considered. Because accelerated rates of warming mean ecosystems and humans have less time to adapt, increased CH<sub>4</sub> emissions due to substitution of natural gas for coal and oil may produce undesirable climate outcomes in the near-term.

The concept of global warming potential (GWP) is commonly used to compare the radiative forcing of different gases relative

ENVIRONMENTAL  
SCIENCE

SUSTAINABILITY  
SCIENCE





**Elena Craft, PhD**  
ecraft@edf.org  
512-691-3452

