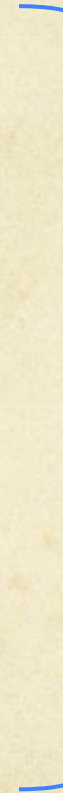
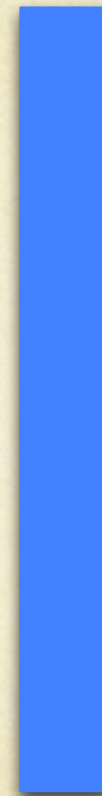
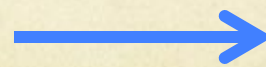


The media is misleading the American public about the role of methane (natural gas) in climate change.

- ◆ Four slides of history,
- ◆ 13 slides showing sources of error,
- ◆ three slides of implications.

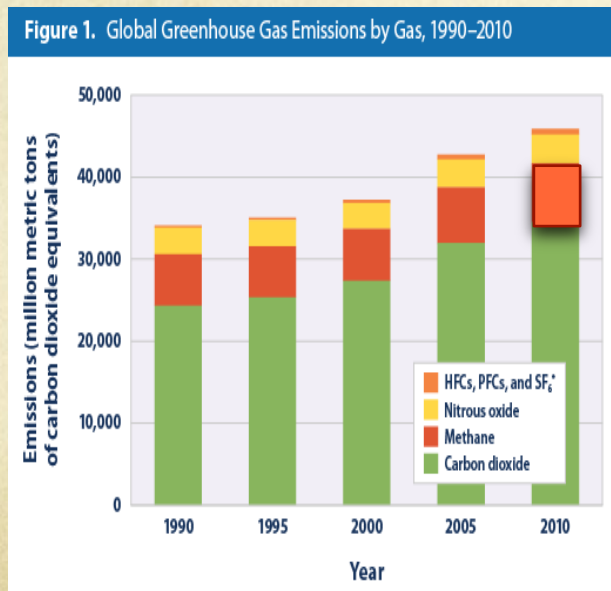
Obsolete (but still being used)



Accurate

The cumulative errors result in 1,376% under reporting

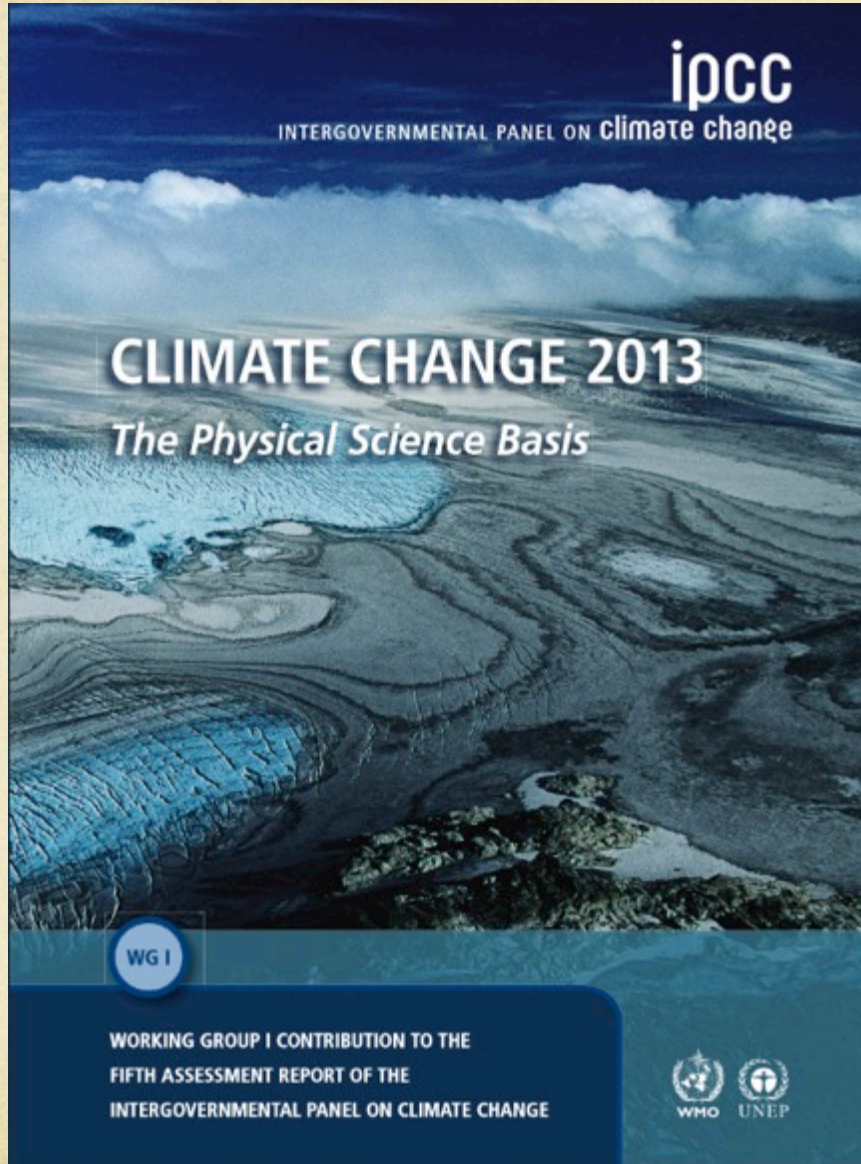
This is what the media is reporting based on obsolete sources



This is accurate

Important points

- When methane is burned, it produces about half the amount of CO₂ as coal or oil – this can be a good thing.
- When it leaks into the atmosphere before being burned, it does a great deal more damage – this is a bad thing.



International Panel on Climate Change (IPCC) reports were issued in 1990, 1992, 1995, 2001, 2007, and 2013.

The 2013 report had 9,200 peer reviewed studies

////

Over 50,000 scientists from 120 countries contributed, reviewed and approved the findings

These reports cover many “greenhouse gasses” including their impact over different time frames and life in years.



Gas Name	Formula	Life (years)	20 year impact	100 year impact
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As science advances, these values are updated.

Many reporters do not fully understand some of the scientific definitions behind the numbers they cite, and are also using obsolete data.

Methane is the key ingredient in natural gas – a major contributor to climate change.

Recent typical errors made in reporting

- Methane has a warming effect on the planet more than 20 times greater than carbon dioxide, according to the EPA.” (*Wall Street Journal*, August 17, 2015)
- “Methane, which leaks from oil and gas wells, accounts for just 9 percent of the nation’s greenhouse gas pollution – but it is over 20 times more potent than carbon dioxide, so even small amounts of it can have a big impact on global warming.” (*New York Times*, August 17, 2015).
- “Methane – a potent greenhouse gas 25 times more powerful than carbon dioxide at trapping atmospheric heat – is a contributor to global warming.” *USAToday* August 18th, 2015

Methane leakage in New York City

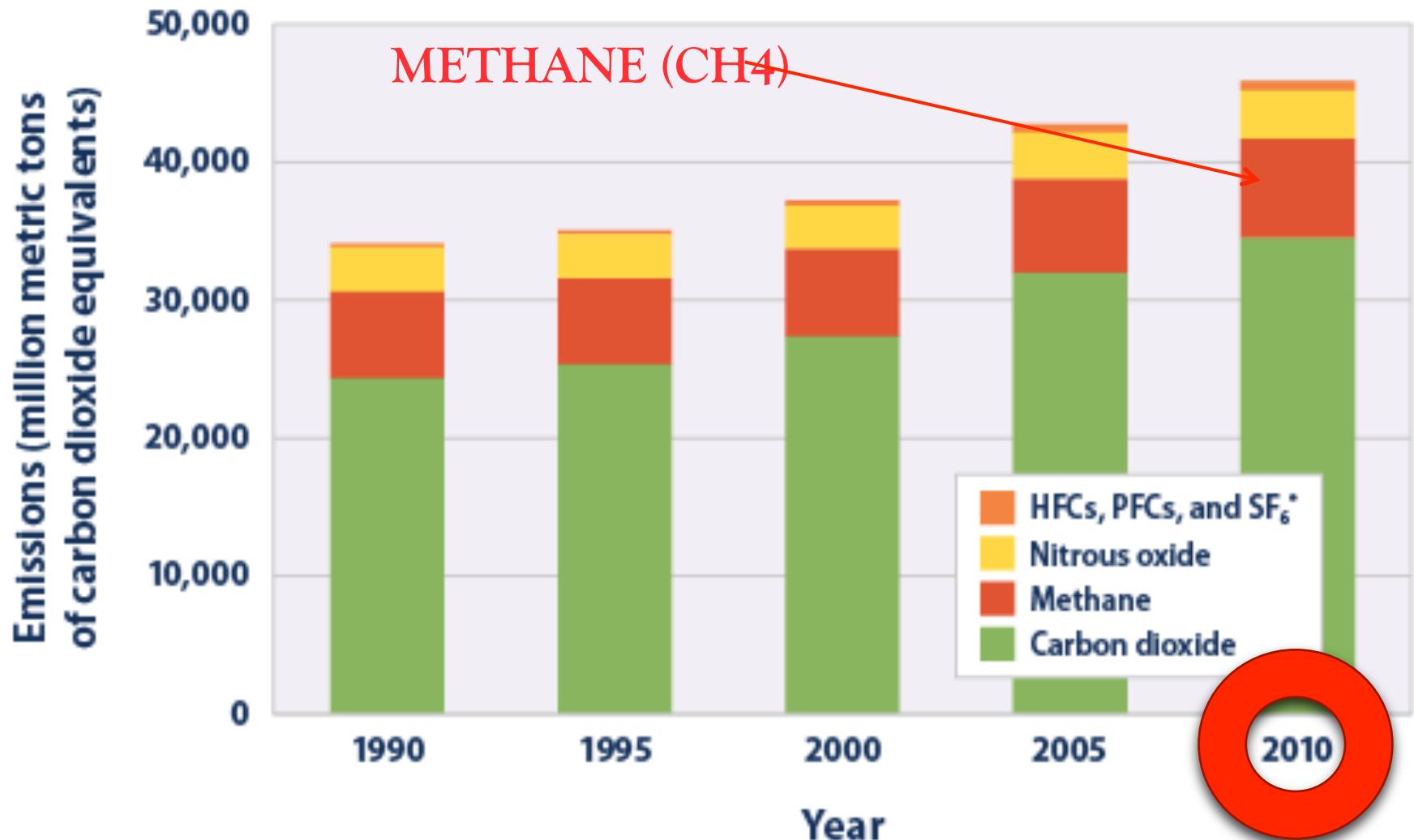


<http://www.damascuscitizensforsustainability.org/2013/03/manhattan-natural-gas-pipeline-emissions-final-report/>
Environ. Sci. Technol. Lett., September 9, 2015



2011 EPA graph is based on IPCC 2007 report (100 year time frame)

Figure 1. Global Greenhouse Gas Emissions by Gas, 1990–2010



<http://www3.epa.gov/climatechange/science/indicators/ghg/global-ghg-emissions.html>

Problem #1: The statement “25 times more potent” is 2007 data. In 2013 the International Panel on Climate Change (IPCC) revised the potency to be 34 TIMES worse than CO₂ at 100 YEARS (a 36% increase), and 86 times worse at 20 YEARS (a 19% increase).

Gas Name	Formula	Life (years)	20 year impact	100 year impact
Carbon Dioxide	CO ₂		1	1
Methane (IPCC 2007)⁽¹⁾	CH₄	Data used	72	25
Methane (IPCC 2013)⁽²⁾	CH₄	Correct data	86	34⁽³⁾

(1) IPCC Fourth Assessment Report, AR4, 2007, Table 2.14, Chapter 2, P. 212

(2) GWP values and lifetimes from 2013 IPCC AR5 p714 (https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf)

(3) EPA uses 28-36 (<http://www3.epa.gov/climatechange/ghgemissions/gases/ch4.html>)

Problem #2: There is no mention of timeframe of reference.

Gas Name	Formula	Life (years)	20 Year Impact	100 Year Impact
Carbon Dioxide	CO ₂		1	1
Methane (IPCC 2007) ⁽¹⁾	CH ₄		72	25
Methane (IPCC 2013) ⁽²⁾	CH ₄		86	34

The IPCC says: “.....there is no scientific argument for selecting 100 years [as the time horizon for GWP] compared with other choices.”⁽³⁾

(1) IPCC Fourth Assessment Report, 2005, Table 2.14, Chapter 2, P. 212

(2) GWP values and lifetimes from 2013 IPCC AR5 p714

(3) IPCC, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE at 711 (2013).



Problem #3: There is no mention of lifetime

Gas Name	Formula	Life (years)	20 Year Impact	100 Year Impact
Carbon Dioxide	CO ₂		1	1
Methane (IPCC 2007) ⁽¹⁾	CH ₄		72	25
Methane (IPCC 2013) ⁽²⁾	CH ₄	12.4	86	34

“.....there is no scientific argument for selecting 100 years [as the time horizon for GWP] compared with other choices.”⁽³⁾

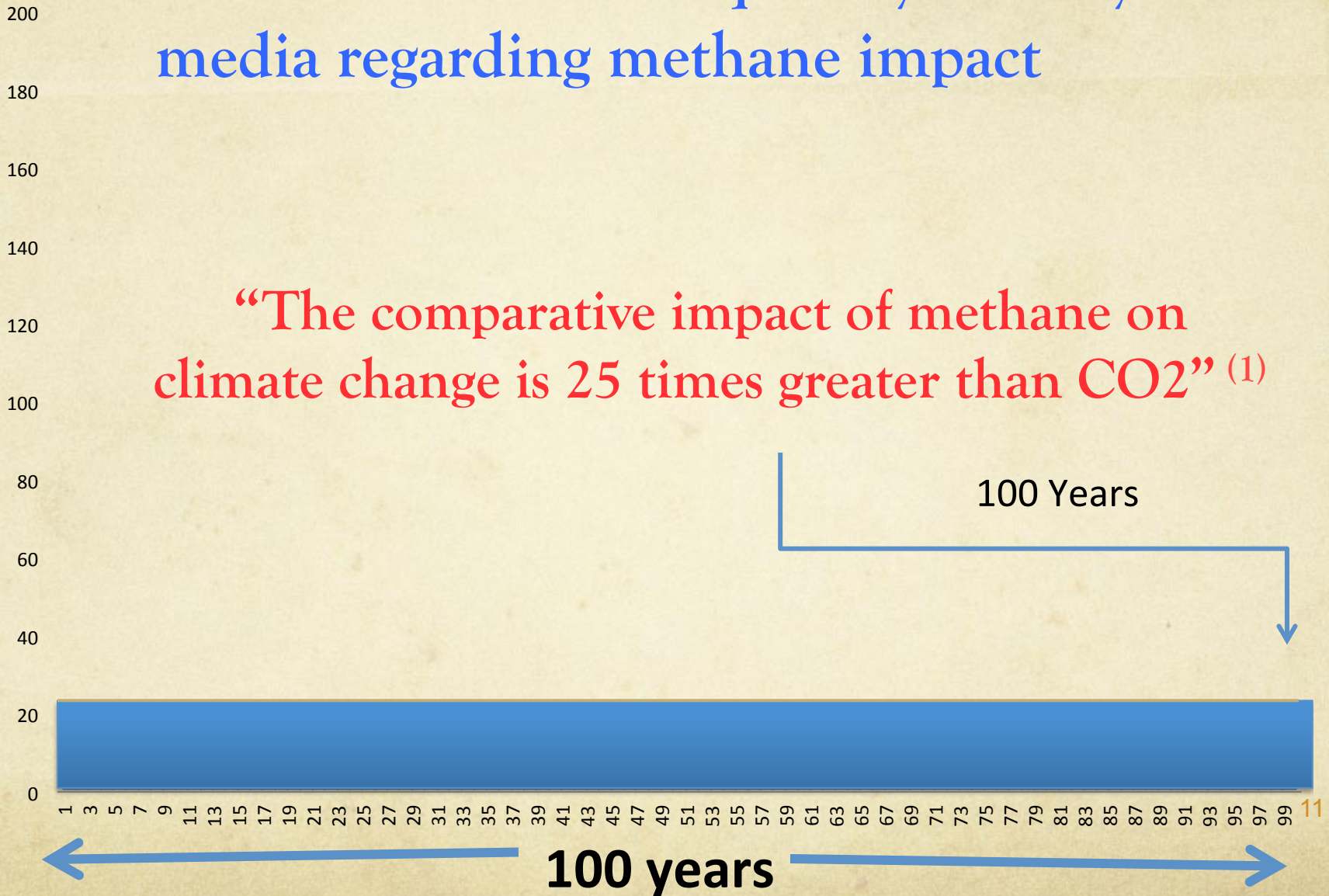
(1) IPCC Fourth Assessment Report, 2005, Table 2.14, Chapter 2, P. 212

(2) GWP values and lifetimes from 2013 IPCC AR5 p714

(3) IPCC, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE at 711 (2013).

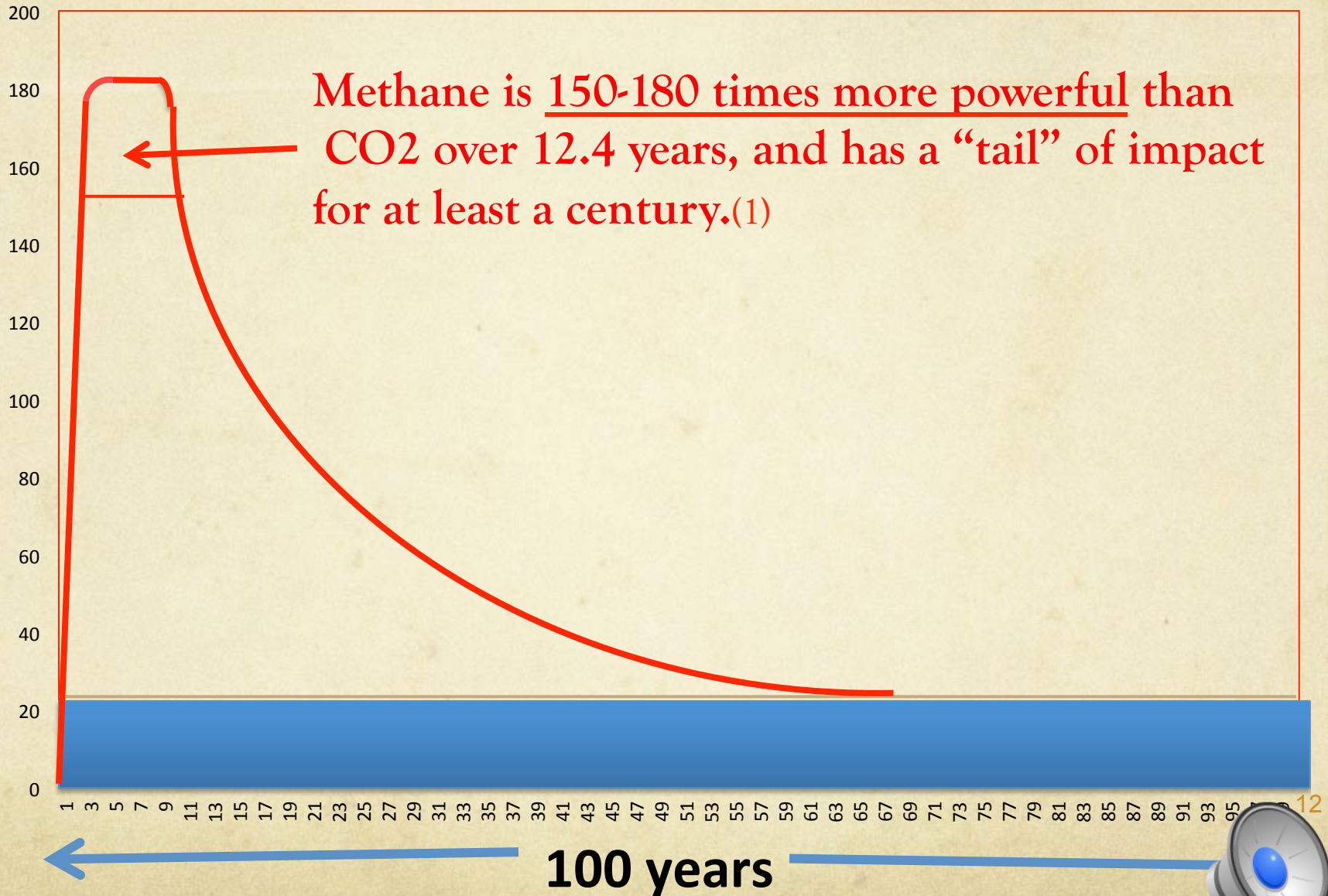
The obsolete citation frequently used by media regarding methane impact

“The comparative impact of methane on climate change is 25 times greater than CO₂” (1)



(1) <http://www3.epa.gov/climatechange/ghgemissions/gases/ch4.html>

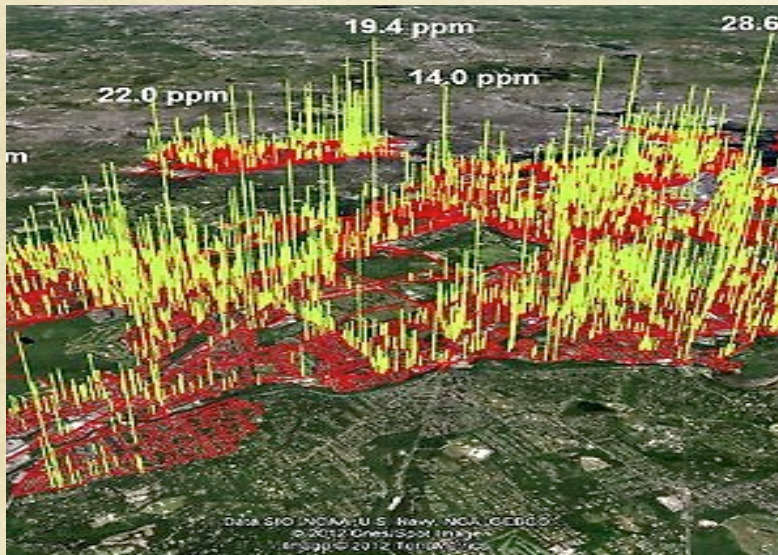
A revised citation that would be much more accurate



(1) GWP values and lifetimes from 2013 IPCC AR5 p714

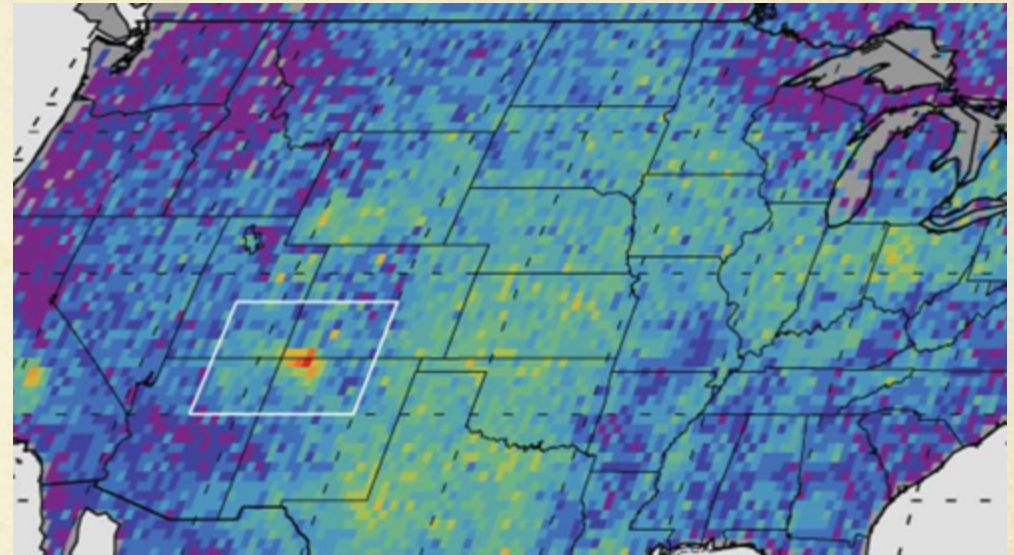


Note: We have not yet discussed leakage volumes – only impact over time, and life expectancy.



Methane leaks mapped along 785 miles of road in Boston.

Environmental Pollution
Vol. 173, Feb. 2013, pp 1-4

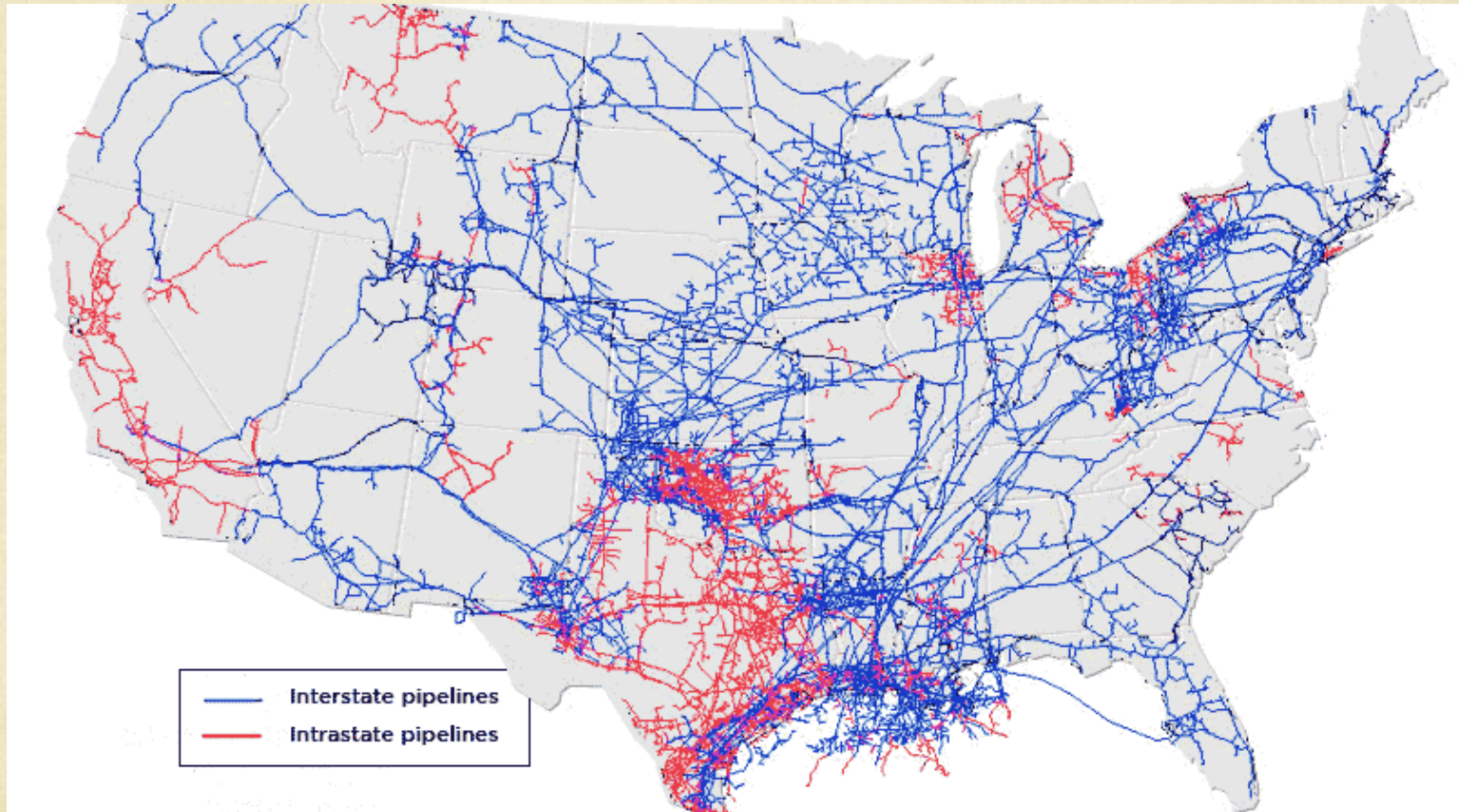


Scientific American, October 10, 2014

A satellite view of methane leakage from old and abandoned coal mines and abandoned natural gas wells not counted in any previous estimates.

NASA/JPL-Caltech/University of Michigan

The United States has 2/3rds of all natural gas infrastructure in the entire world – and most of the world's leaks.



<http://www.eia.gov/state/maps.cfm?v=Natural%20Gas>

Running the numbers

From this point on we:

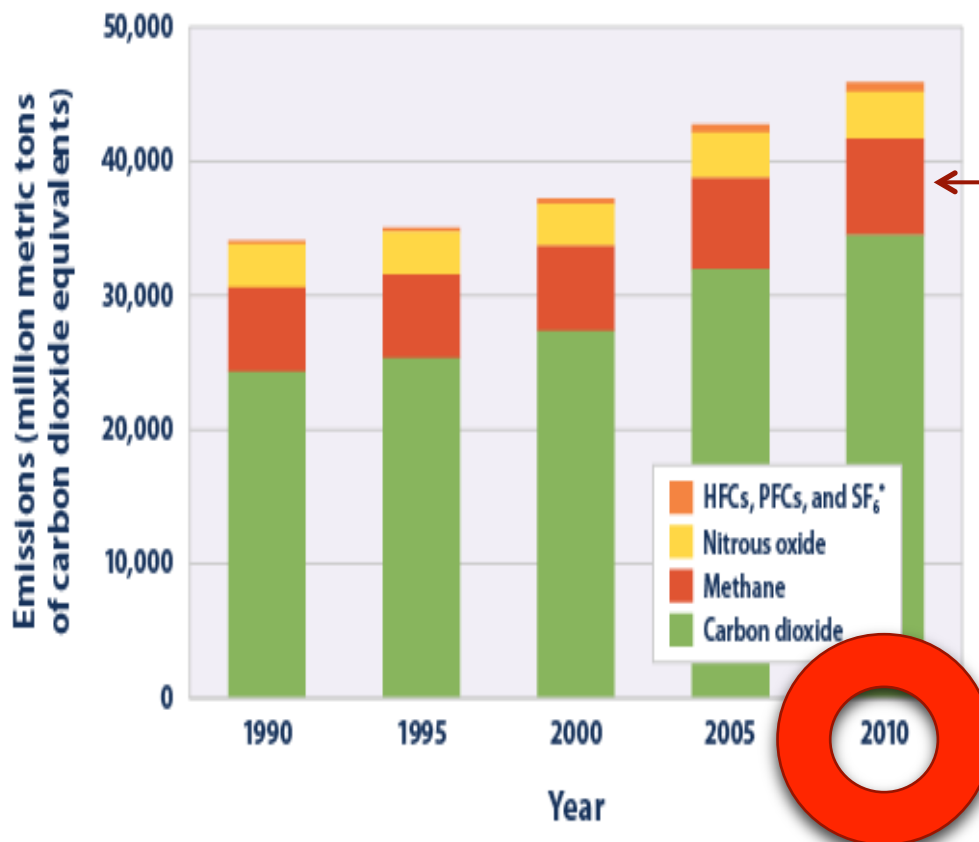
1. correct for potency;
2. correct for lifetime;
3. correct for leakage.

The cumulative results are astonishing

EPA's 2010 leakage impact (potency) estimates

(based on 2007 leakage data, 2007 potency, 100 year life)

Figure 1. Global Greenhouse Gas Emissions by Gas, 1990–2010



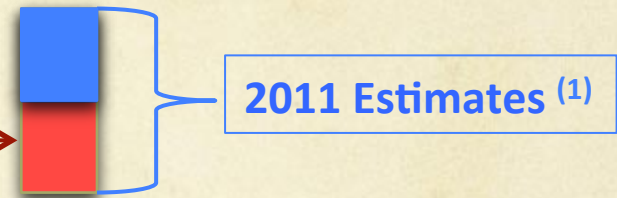
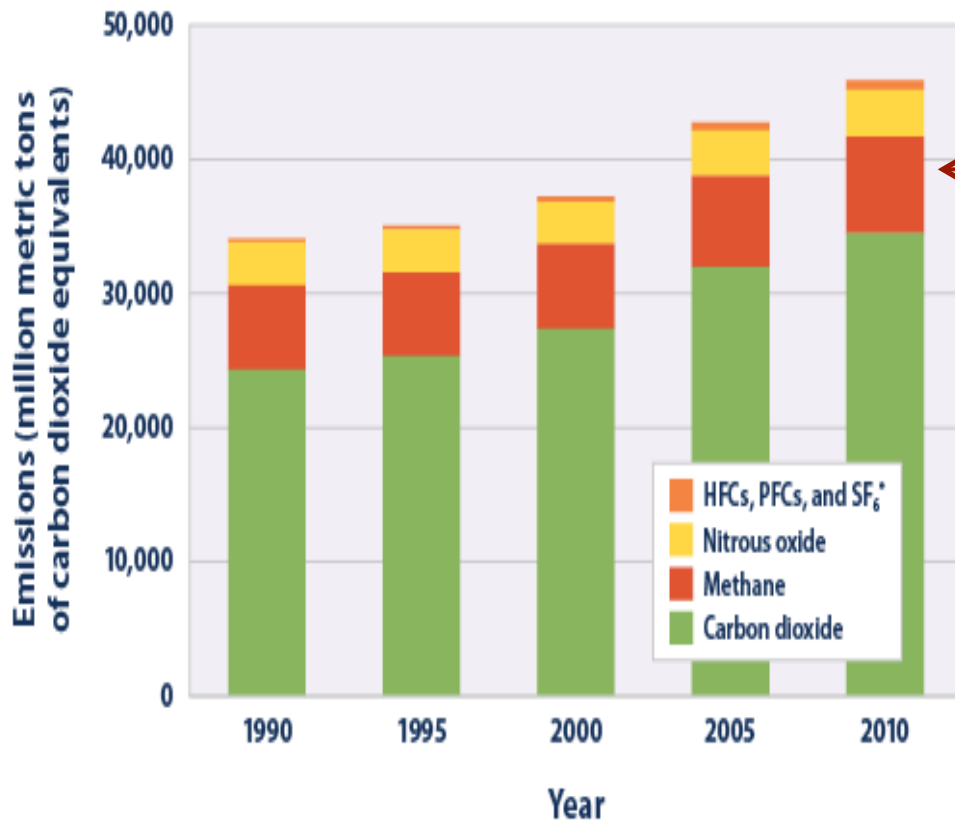
7,200 million metric tons of CO₂ equivalent caused by leaking methane

As shown in the three newspaper story examples in slide six, this is the most frequently cited impact.

U.S. EPA, DRAFT: *Global Anthropogenic Emissions of Non-CO₂ Greenhouse Gases: 1990–2030* (EPA Report 430-D-11-003), 2011. www.epa.gov/climatechange/economics/downloads/EPA_NonCO2_Projections_2011_draft.pdf.

In 2011, EPA increased its 2010 leakage volume estimate by a factor of two.

Figure 1. Global Greenhouse Gas Emissions by Gas, 1990–2010

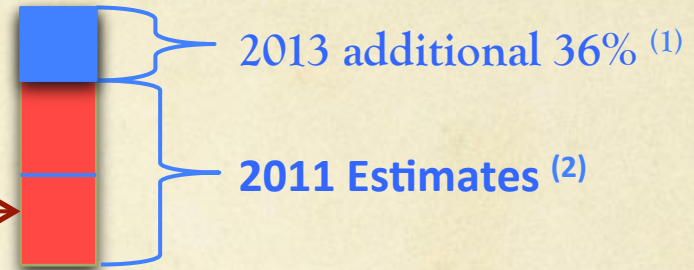
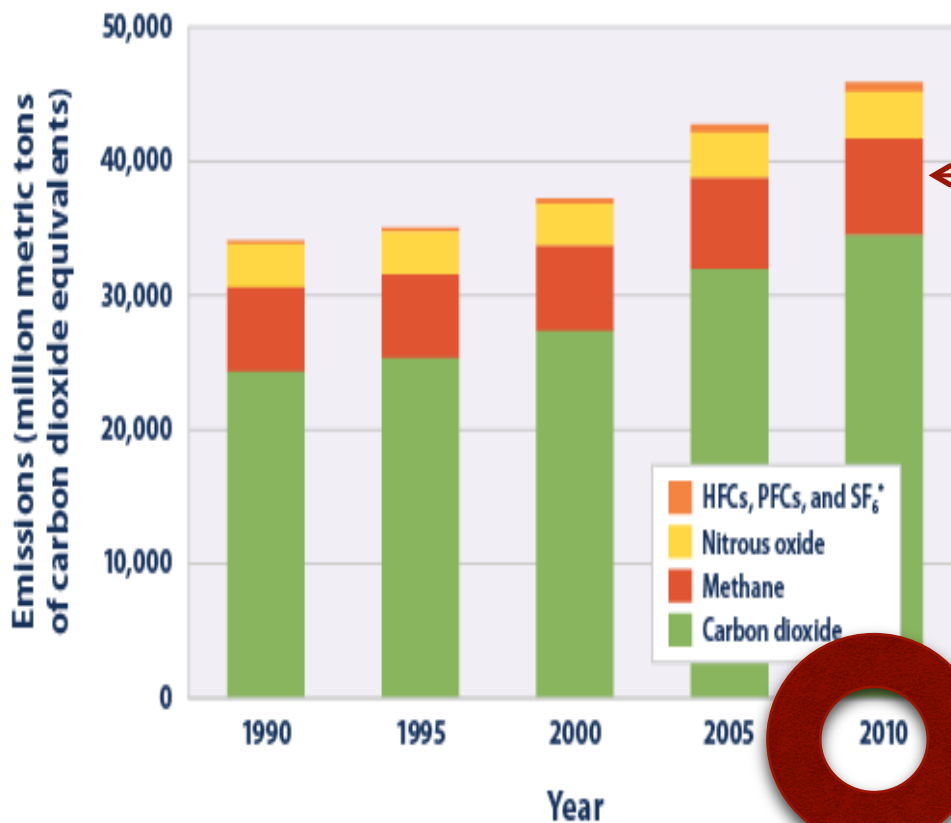


“In 2011, EPA increased its estimate of methane leakage in the natural gas supply chain by a factor of two, based on new data which... revised emission factors for gas well cleanups, condensate storage tanks, and centrifugal compressors.” ⁽¹⁾

⁽¹⁾ <http://www.edf.org/sites/default/files/US-Natural-Gas-Leakage-Model-User-Guide.pdf>.

In 2013, IPCC (AR5) increased the 100 year impact of Methane by 36%.

Figure 1. Global Greenhouse Gas Emissions by Gas, 1990–2010



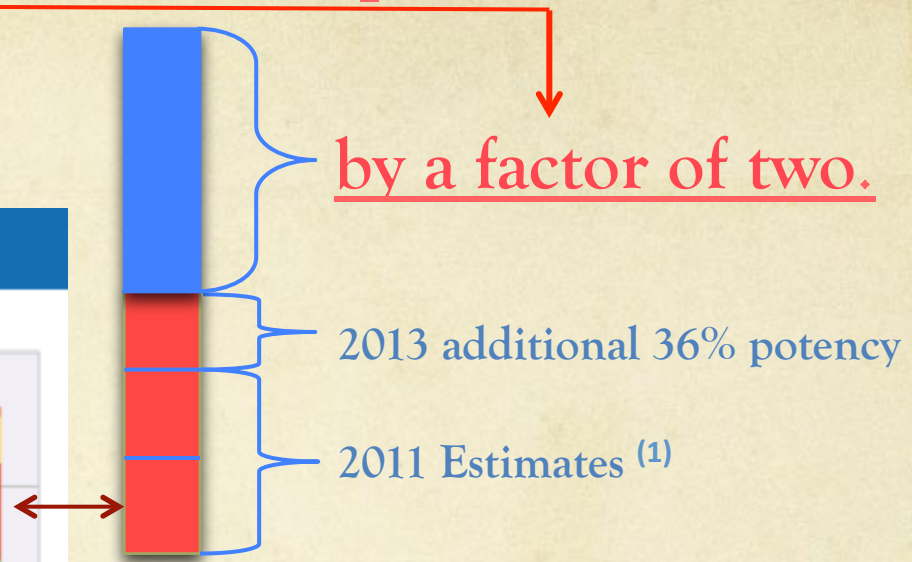
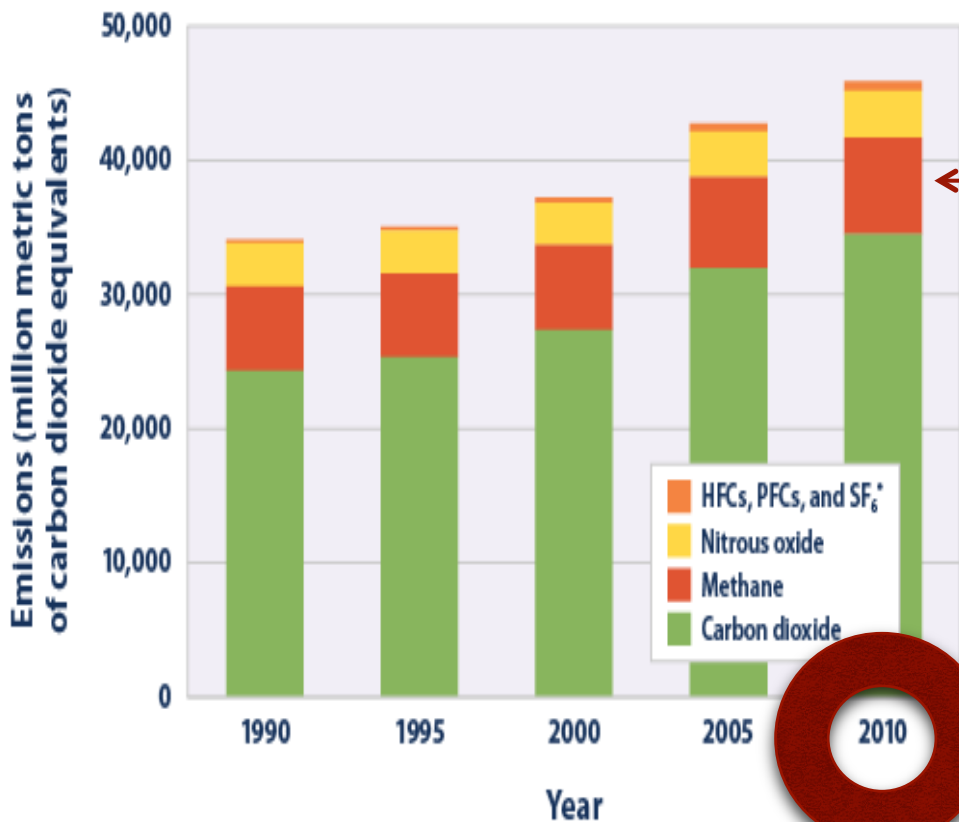
(1) GWP values and lifetimes from 2013 IPCC AR5 p714

(2) <http://www.edf.org/sites/default/files/US-Natural-Gas-Leakage-Model-User-Guide.pdf>.

In 2014, EPA again increased it's 2011 estimate of methane leakage

by a factor of two.

Figure 1. Global Greenhouse Gas Emissions by Gas, 1990–2010

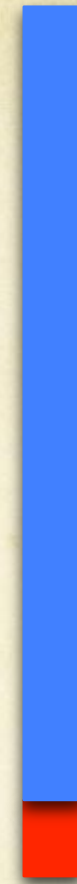
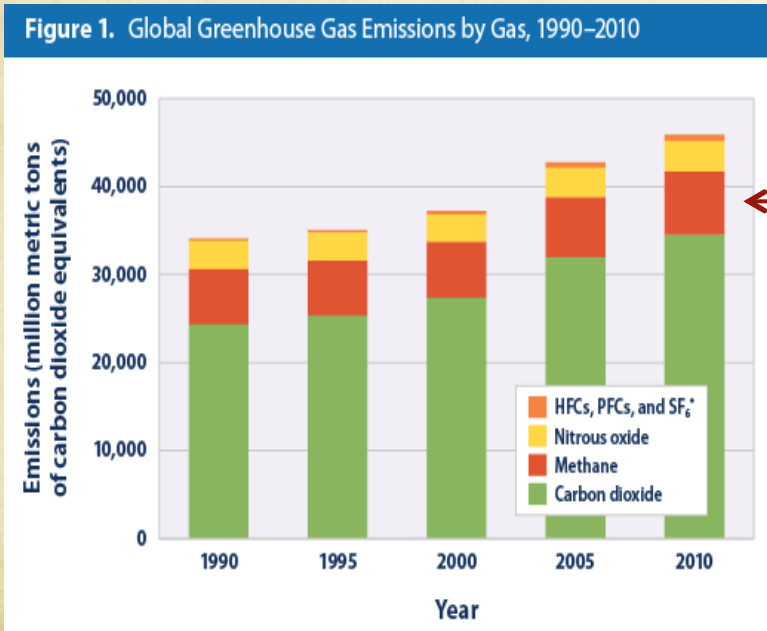


Reminder: These units are based on 100 year time frame

(1) <http://time.com/3487638/four-corners-arizona-new-mexico-colorado-methane-gas-global-warming-climate-change-utah/>

Correcting the 100 year impact to the 20 year impact – a $(86/34=252\%)$ increase.

Using the corrected data reveals the impact of methane to be 1,376% higher than usually reported

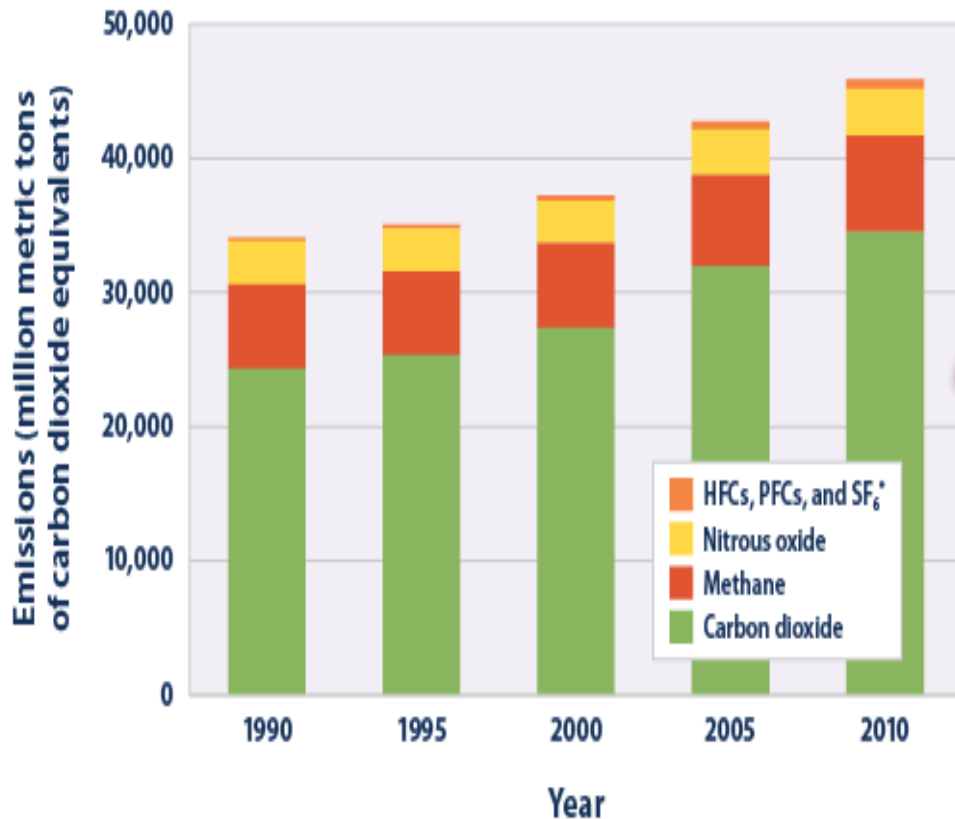


100 year data corrected for 2011 leakage, 2013 potency increase, and 2014 leakage revisions (prior slide)

20 year impact	100 year impact
1	1
72	25
86	34⁽³⁾

In 2015, scientists report that many U.S. previous leakage volume measurements are now suspected to be low due to problems with the measuring equipment. ^(1,2)

Figure 1. Global Greenhouse Gas Emissions by Gas, 1990–2010



“.....readings could be off by tenfold to a hundredfold for a particularly large leak.”^(1,2)

- (1) <https://minnpost.com/earth-journal/2015/08/us-inventory-methane-emissions-may-be-based-bad-measurements>
- (2) Also <http://www.tandfonline.com/doi/full/10.1080/10962247.2015.1025925#abstract>

WHY IS IT SO IMPORTANT THIS ISSUE BE REPORTED ACCURATELY?

1. If obsolete numbers are used, it significantly understates the risk to society.
2. If the impact of leaking methane is discussed in its 100 year impact, it hides the huge short term impact, which, if addressed, would buy the world time to fix other climate changing problems.
3. Taken together, current media behavior amounts to whispering “I am hot” when the message should be shouting “**Fire - Fire - Fire**”.

About the author

Francis Koster has a doctorate from the Program For The Study Of The Future, at UMass Amherst, with a concentration on “Why Leaders Do Not Listen to Warnings About The Basic Life Support Systems”.

A pioneer public advocate for energy conservation and solar energy, he founded the UMass renewable energy programs in the 1970's, and set up groundbreaking renewable energy programs for the Tennessee Valley Authority under President Carter. After leaving TVA, and following several years as a renewable energy and conservation consultant to major electric utilities and other interested parties, he was recruited to assist with innovation at The Nemours Foundation, a leading sub-specialty pediatric healthcare system now delivering well over 1 million seriously ill patient visits a year. His duties as Vice President for Innovation included Information Systems (implementing pioneer electronic medical records and telemedicine systems, creating electronic patient education material), and bringing innovation (at various times) to Human Resources, Marketing, Development, Media Relations, Training, and Risk Management. During this time, as a consequence of the emerging ability to map disease, he developed a strong interest in the environment's impact on the health of the public.

In 2007, he relocated to North Carolina, and began writing weekly columns about successful projects in environmental public health existing someplace in America. In 2013 these were turned into a book titled *Discovering The New America*. He has three more books due to be published during 2015.

In addition to the material written for the media, Dr. Koster has presented over 50 papers at various professional meetings, and currently is a frequent public speaker about improving society by imitating successful programs already in place, with a focus on the adoption of current and emerging science to solve issues on the horizon likely to impact the health of the public.