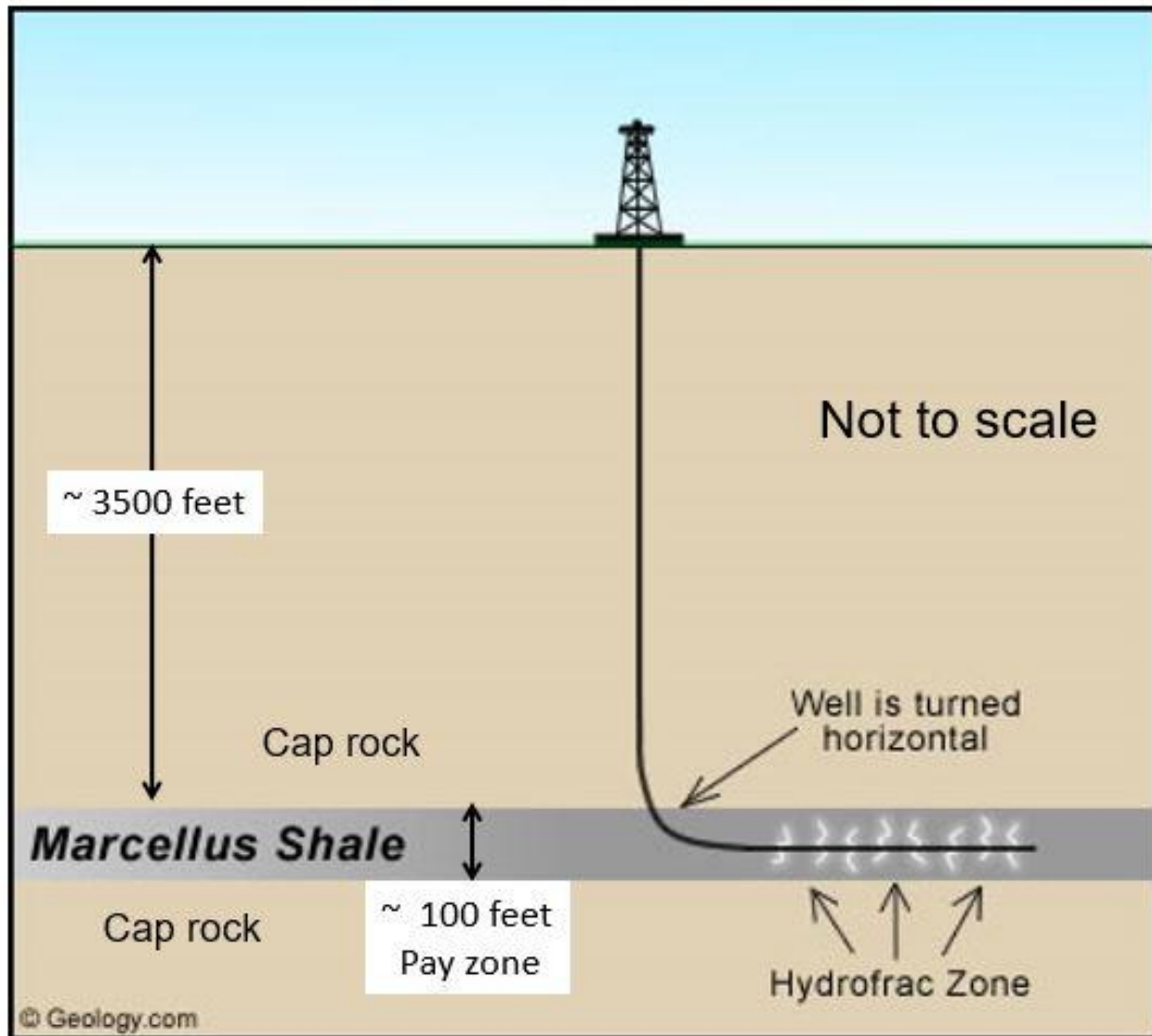
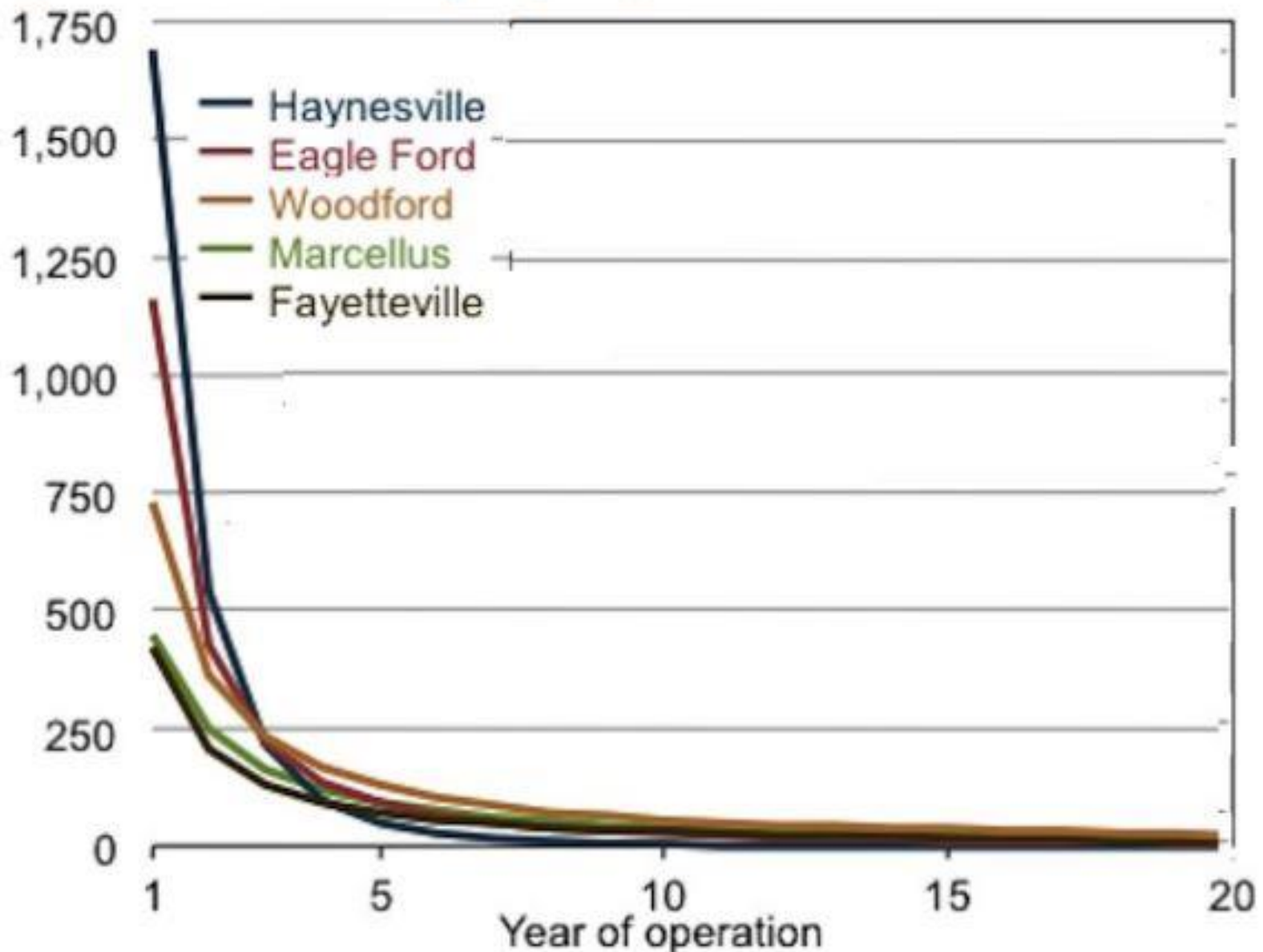


**Figure 4.** Observed global mean temperature from 1900 to 2009 and projected future temperature under four scenarios, relative to the mean temperature from 1890 to 1910. The scenarios include the IPCC [26] of ...

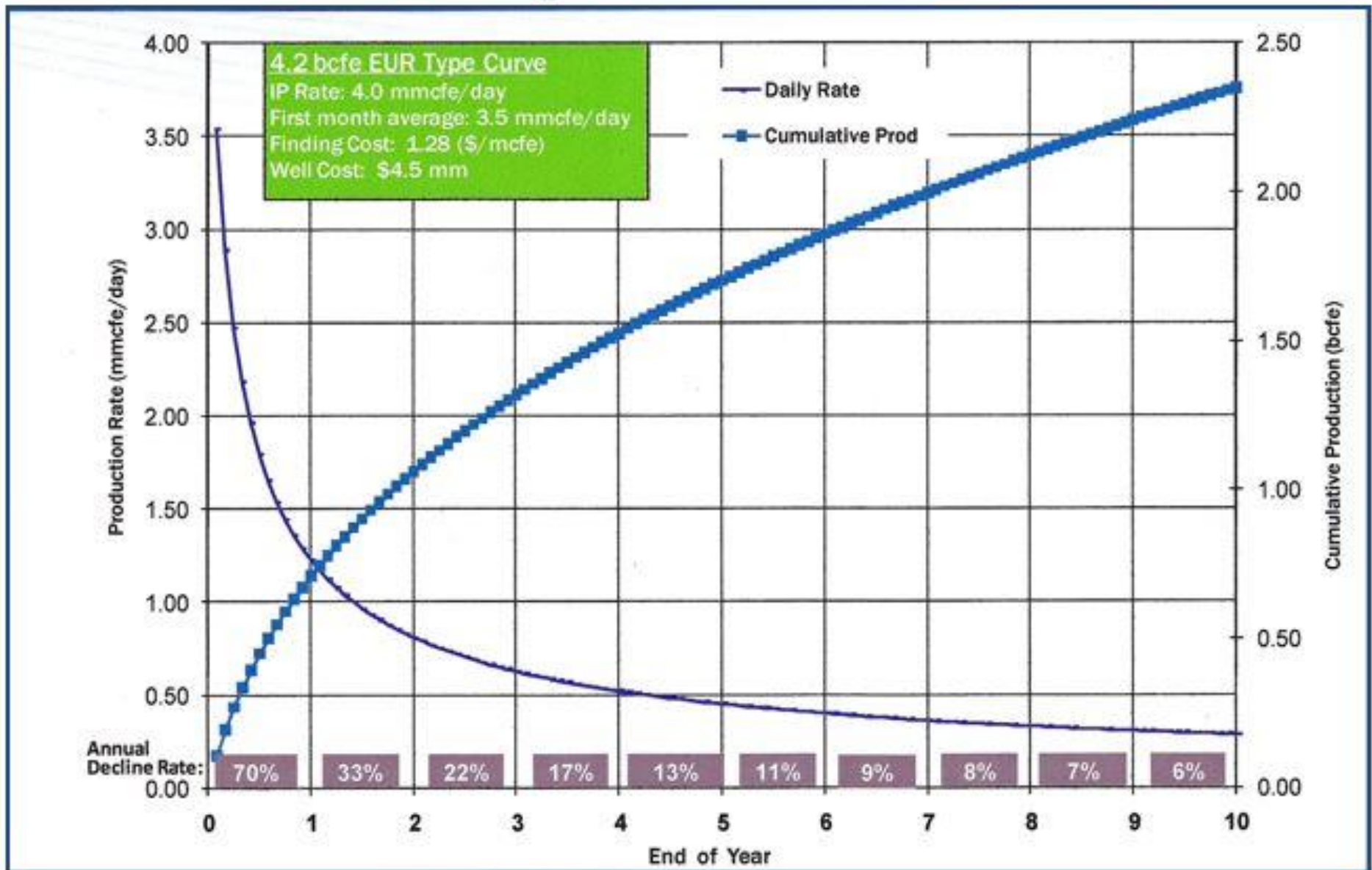
# “Horizontal” Drilling and Fracturing: The Concept



**Figure 54. Average production profiles for shale gas wells in major U.S. shale plays by years of operation (million cubic feet per year)**



# Key Data for Estimation of Well Productivity and Economics: PA



From: Chesapeake Energy (CHK) published *pro forma* data

**Table 3-56: Gas Well Count Data**

<b>Gas Well Count</b>	<b>1990</b>	<b>2005</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>
Number of Gas Wells	202,628	355,234	440,371	438,672	431,926	433,941	421,893
<i>Previous Estimated Number of Gas Wells</i>	<i>218,709</i>	<i>373,903</i>	<i>463,198</i>	<i>460,588</i>	<i>454,491</i>	<i>456,140</i>	<i>NA</i>
<b>Percent Change</b>	<b>-7%</b>	<b>-5%</b>	<b>-5%</b>	<b>-5%</b>	<b>-5%</b>	<b>-5%</b>	<b>NA</b>

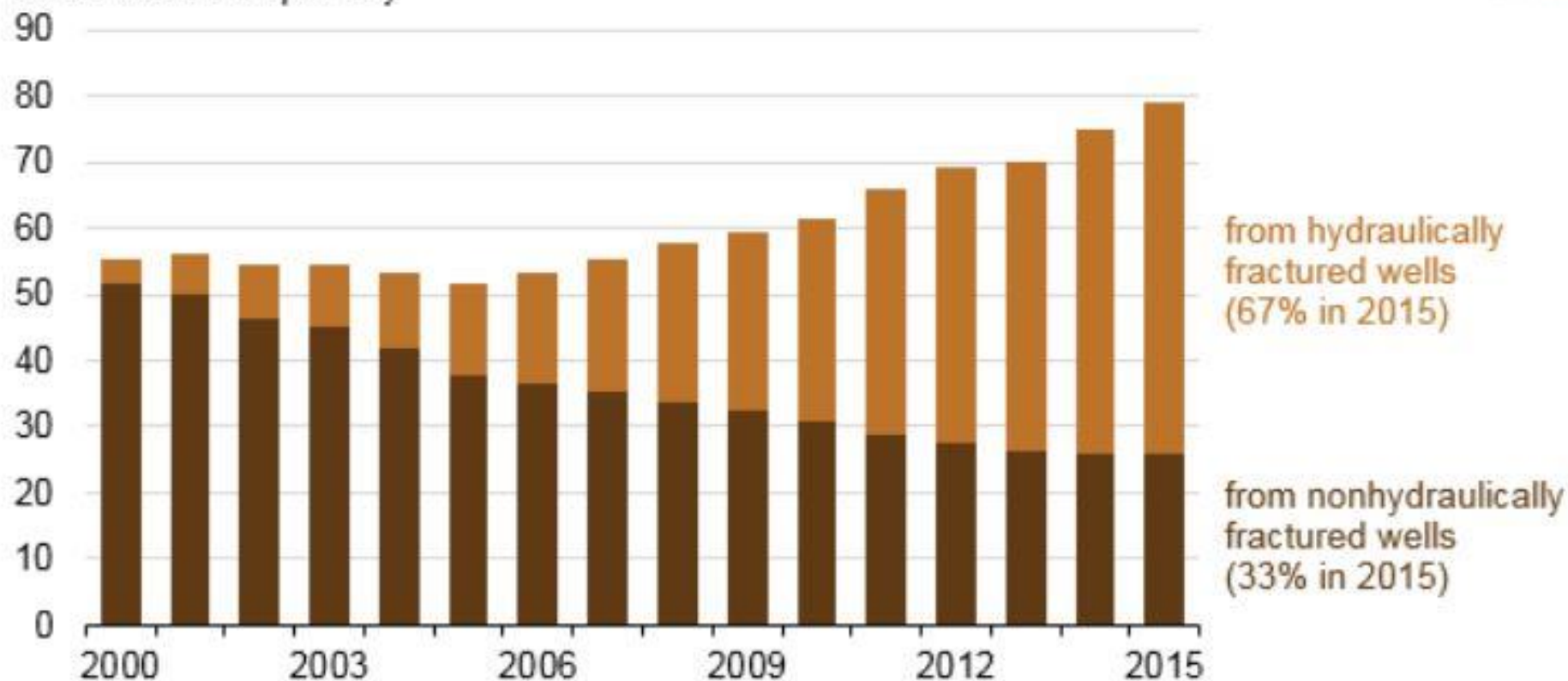
NA (Not Applicable)

MAY 5, 2016

## Hydraulically fractured wells provide two-thirds of U.S. natural gas production

### Marketed natural gas production in the United States (2000-2015)

billion cubic feet per day



Source: U.S. Energy Information Administration, based on IHS Global Insight and DrillingInfo Inc.

**Table 2.** Comparison of the timescales considered in comparing the global warming consequences of methane and carbon dioxide.

Publication	Timescale considered	20-year GWP	100-year GWP
<b>IPCC [35]</b>	<b>20 and 100 years</b>	<b>56</b>	<b>21</b>
Hayhoe et al. [2]	0–100 years	NA	NA
Lelieveld et al. [3]	20 and 100 years	56	21
Jamarillo et al. [4]	100 years	–	21
<b>IPCC [36]</b>	<b>20 and 100 years</b>	<b>72</b>	<b>25</b>
<b>Shindell et al. [37]</b>	<b>20 and 100 years</b>	<b>105</b>	<b>33</b>
Howarth et al. [8]	20 and 100 years	105	33
Hughes [20]	20 and 100 years	105	33
Venkatesh et al. [12]	100 years	–	25
Jiang et al. [13]	100 years	–	25
Wigley [38]	0–100 years	NA	NA
Stephenson et al. [14]	100 years	–	25
Hultman et al. [15]	20 and 100 years	72, 105	25, 44
Skone et al. [39]	100 years	–	25
Burnham et al. [16]	100 years	–	25
Cathles et al. [17]	100 years	–	25
Alvarez et al. [40]	0–100 years	NA	NA
<b>IPCC [34]</b>	<b>10, 20, and 100 years</b>	<b>86</b>	<b>34</b>
Brandt et al. [29]	100 years	–	25

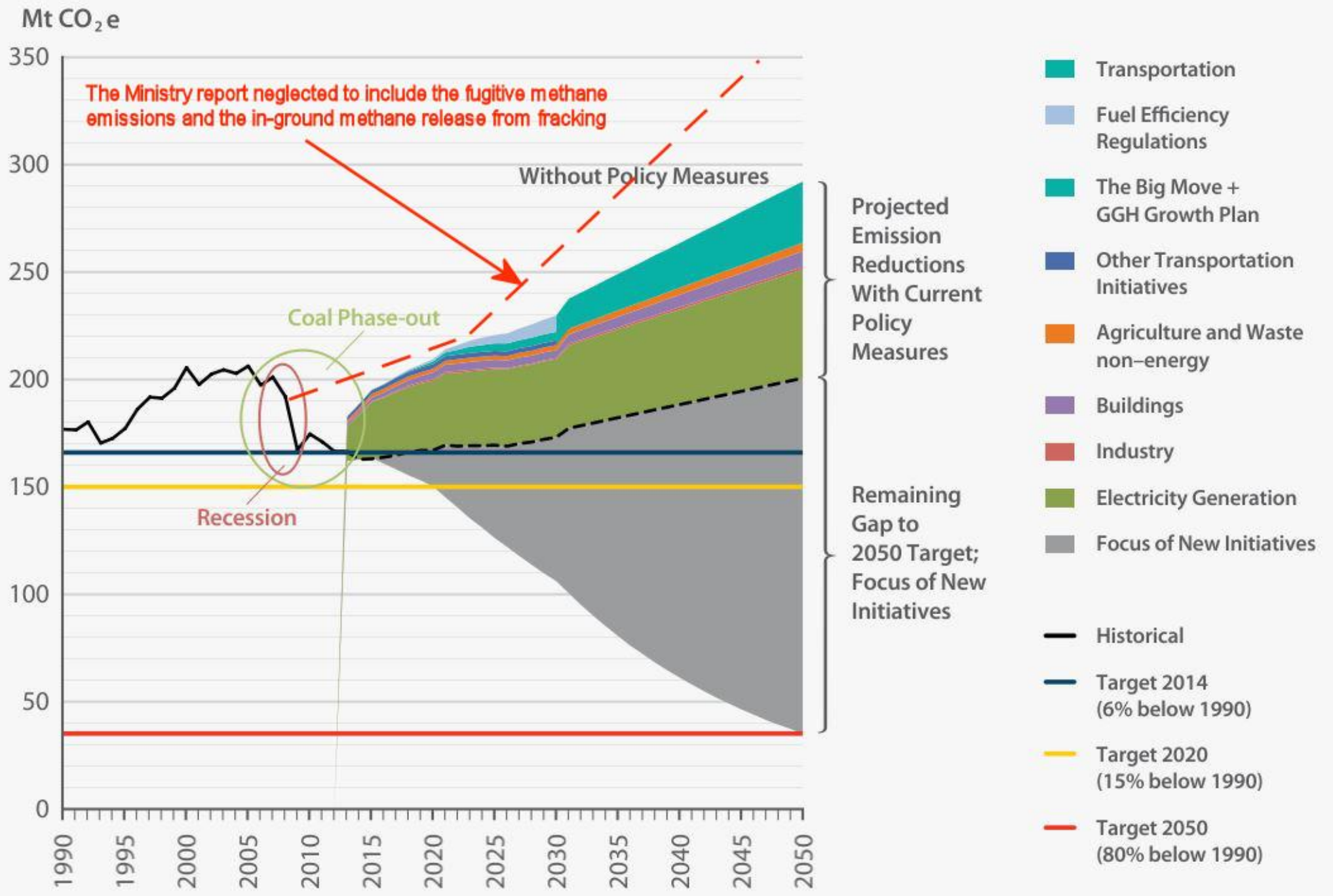
## SCHEDULE 1

### Greenhouse gases

Table 1: Greenhouse gases subject to mandatory reporting

	<b>Greenhouse gas</b>	<b>Formula</b>	<b>CAS Registry Number (<a href="#">see note 1</a>)</b>	<b>100-year global warming potential (GWP)</b>
1.	Carbon dioxide	CO <sub>2</sub>	124-38-9	1
2.	Methane	CH <sub>4</sub>	74-82-8	25
3.	Nitrous oxide	N <sub>2</sub> O	10024-97-2	298
4.	Sulphur hexafluoride	SF <sub>6</sub>	2551-62-4	22 800





This chart illustrates the historical and projected CO<sub>2</sub> emissions in Mt CO<sub>2</sub>e from 1990 to 2050. It compares historical data with three targets: 2014 (6% below 1990), 2020 (15% below 1990), and 2050 (80% below 1990). The chart also shows the projected emissions without policy measures and the remaining gap to the 2050 target, which is the focus of new initiatives. Key events like the recession and coal phase-out are highlighted, along with a note about neglected methane emissions in the 2010-2015 period.