# The 'Bridge Fuel' Fallacy

Public statements from the Marcellus-shale industry seem to be pulled from a grab-bag of arguments, with a different rationalization to suit each audience. According to industry PR, Marcellus drilling will solve the problem of 'energy shortages', or the problem of 'jobs,' or of 'energy independence', depending on whom the industry needs to convince (or, at least, to confuse). When one story falls apart, another one is tossed up to take its place.

To those concerned about the climate crisis, the industry's script is, "Marcellus natural gas will be a green 'bridge fuel' to take the place of other fossil fuels, while we transition to renewable sources of energy." But that rationalization, too, is empty; in fact, none of its three premises is true:

- First, natural gas may be no 'greener' than other fossil fuels;
- Second, Marcellus natural gas isn't replacing coal and oil; it simply adds to our already-unsustainable fossil fuel consumption;
- And, finally, we need to confess that no movement to renewables is under way, and that Marcellus drilling will make it even harder for such a transition to begin.

### *A greener fuel?*

Proponents of Marcellus drilling tout[1] that "Natural gas is twice as clean as coal." (Or, somewhat more precisely, that "Natural gas emits half as much carbon dioxide as coal per unit of energy.") Like many industry statements, this one is partially true. The true part is that in burning, natural gas emits less carbon dioxide than oil or coal. (That's because methane - the primary constituent of natural gas - has a higher ratio of hydrogen to carbon than the hydrocarbons found in oil and coal.)

A more honest comparison, however, would include the following[2]:

- The *burning* of natural gas (say, in an electric power plant) is only the very last stage of the Marcellus gas 'life cycle.' Each of the earlier stages -- *exploration, drilling, fracking, refining, compression, transportation* -- adds its own carbon dioxide emissions;
- The drilling and production of natural gas emit unburned methane into the atmosphere; this leaking methane has up to 70-times the climate impact of carbon dioxide[3];
- Marcellus wells produce other incidental hydrocarbons (liquids and gases) in addition to methane. Those byproducts must be separated from the 'dry' natural gas at the well site, and are either 'flared off' (burned) on site, or collected and transported for disposition elsewhere. Either way, these hydrocarbons ultimately add their own emissions to the total.

When its full climate impact is taken into account, Marcellus natural gas *"...is no better than coal and may in fact be worse than coal in terms of its greenhouse gas footprint."*[4]

### *Displace, or add-on?*

Even as Marcellus development has barely begun, natural gas is plentiful and selling at historically low prices. So one might expect displacement of other fossil fuels to be happening

already. But, at a recent industry conference, one gas company executive exhorted his colleagues, "We MUST create demand [for Marcellus gas][5]." He's right! The expanding supply of natural gas is running far ahead of demand, thus depressing prices; so why isn't natural gas attracting customers away from other fuels?

The most likely growth markets, where natural gas might displace other fuels, are electric power generation (displacing coal), and fuel for large vehicles (displacing gasoline or diesel). At present, about 30% of the U. S. natural gas consumption goes to power generation (7 trillion cubic feet per year, or 'Tcf/y')[6], while its usage in vehicular transportation is almost infinitesimal (0.03 Tcf/y).

Estimates from the U.S. Department of Energy indicate that the demand for natural gas in power generation may grow by 1.7 Tcf/y over the next 20 years, with the transportation sector adding less than 0.2 Tcf/y. Together, then, the demand from these two applications may grow by perhaps 2 Tcf/y. But the same DOE forecast indicates that the supply of natural gas from shale (not all of it from the Marcellus formation) will grow by more than 4 Tcf/y -- twice as much as the new demand for electric power and vehicles. Where will all this gas go?

Most of this new supply of natural gas will (i) offset the falling production from 'conventional' natural gas wells, and (ii) move the U.S. away from import, toward net export. of natural gas to/from other countries. Whether these trends are 'good' or 'bad' may be debatable. ('Energy independence' is another Marcellus rationalization, which we won't consider here.) But they don't show natural gas 'taking the place' of coal and oil. In fact, over the same 20-year forecast period, the DOE estimates that electricity from coal will grow over 50% faster than electricity from natural gas.

The numbers above come from the DOE 'reference case' forecast, which assumes no change in governmental policies. Of course, different policies could cause more fuel displacement to happen. But any such policies are certain to be resisted by the coal industry, as is already happening to the most tentative proposals from the current Administration. Which brings us to the third untruth.

**Transition? What 'transition'??**

'Central planning' is anathema to the American culture; we trust in the 'free market' to determine our future, through private capital acting in the pursuit of its own self-interest. Public policy input to corporate decisions is limited to gentle 'price signals' (tax policies, incentives, etc.) by which we may try to influence their profit-maximization calculations. The very words 'government intervention' suggest our deep ideological bias against granting any voice for the public interest in the running of business.

So redirecting market choices requires an overwhelming political consensus on (a) the necessity of such 'interference' and (b) the behaviors to be encouraged. Specifically, to have a transition to non-fossil energy, we would need a political agreement on the urgency of climate change and on the objective of reducing greenhouse gas emissions. In fact, we have neither.

Recently, political power in America is flowing toward the 'climate science deniers'. Even before the latest election, carbon 'cap and trade' (the Waxman-Markey bill) was stymied in the U.S. Senate. As to any hope for 'price signals', U.S. Senator Jim Inhofe (R. – Oklahoma) said of cap-and-trade that it would 'raise the cost of energy' – thus bringing a quick end to any consideration of such a policy. Trading in carbon credits (the 'Chicago Climate Exchange') has been disbanded[7].

Internationally, the Copenhagen summit collapsed, largely because the United States refused to make the first move toward limiting its own greenhouse gas emissions. And, just in case American

energy consumption falters, U.S. suppliers are preparing to export cheap coal and natural gas to the rest of the world, thereby undermining *their* carbon-management efforts.

Overall, the role of industry has been to resist (so far, successfully) any transition to renewable energy. The coal lobby opposes any governmental support for other sources of energy. In Pennsylvania, far from 'subsidizing' a transition to other fuels, the natural gas industry has fought against a 'severance tax' to pay even for the direct infrastructure impact of Marcellus development.

Overproduction of natural gas, and the transfer of real costs of all fossil fuels onto the public (infrastructure for transportation, cleanup of air and water pollution, diplomatic and military commitments to secure overseas sources of supply), leave the fledgling renewable alternatives at an impossible economic disadvantage. And, of course, the same artificially depressed costs of fossil fuels provide an additional disincentive to investments in energy conservation.

***CAFE: An example of 'transition'?***

Since the transportation sector is one potential market for natural gas (albeit extremely small), it may be useful to look at America's 35-year experience with the automotive 'Corporate Average Fuel Economy' (**CAFE**) program. What can CAFE predict about the likelihood of instituting a 'transitional fuel' policy in the United States, and about such a policy's chances of success?

The CAFE program was created in response to the OPEC oil crisis of the mid-1970s. It requires the entire 'fleet' of cars, as sold by each manufacturer every year, to meet a target average mile-per-gallon rating. (So, a car-maker can sell a certain number of 'gas-hogs', as long as it also sells enough high-mileage cars to achieve the required average.) The later 'Alternative Motor Fuels Act' (**AMFA**) modified CAFE's 'mpg' calculations, to account for cars using fuels other than petroleum.

We recognize that CAFE is an imperfect model for 'transitional energy' programs. CAFE's goal was, and is, to 'save oil' -- not to limit environmental damage. The CAFE program regulates the auto manufacturers (not the suppliers of automotive fuel); and the CAFE standards apply only to non-commercial vehicles, excluding the trucks and buses most likely to be candidates for natural gas. Furthermore, we might suggest that, compared to the oil and gas industry, auto manufacturers are much more susceptible to governmental influence. Still, how have CAFE and AMFA worked out in practice?

1. The auto industry has met the mandated CAFE standards. But the manufacturers have also learned to 'game' the CAFE calculations. The 'fleet' of America's family vehicles has split into two segments: small, efficient cars (similar to those in the rest of the world), and big expensive SUVs, which account for most of the auto-makers' profit margins.

2. The effect of AMFA has been almost entirely on 'biofuels', particularly ethanol. AMFA's overall impact on fuel economy is complex, and not necessarily positive:

    a) Although AMFA encourages alternative fuel vehicles, it provides no direct incentives for the refueling infrastructure to support them. Without such incentives, the infrastructure has not in fact developed. Only a few filling stations offer 'E85', for example; and other 'alternative fuels' are almost nonexistent.

    b) Most cars designated as 'alternative fuel' are actually 'dual fuel' (and the AMFA incentives are even better for dual-fuel than for purely non-gasoline cars). But, because the alternative fuels themselves aren't widely available, those dual-fuel

cars run on gasoline most of the time, usually less efficiently than ordinary gas-powered cars.

c) By offering 'dual fuel' cars, the manufacturer gets to sell more low-mpg cars and SUVs, while still meeting CAFE requirements across its entire fleet. So the actual fuel economy, averaged over all cars sold, is worse than it would have been if the dual-fuel credit weren't provided.

d) Even when biofuel (like 'E85') is being used, its climate-change impact may be as bad as gasoline, when the whole biofuel lifecycle is considered. It may well be that the petroleum-based 'inputs' for biofuel feedstock crops, plus the motor fuels consumed in farming them, offsets any climate benefit of running cars on E85.

3. AMFA's impact has not extended beyond its direct target -- auto makers -- to any 'pull-through' of fueling infrastructure. This may be partly due to the political power of both agri-business and the petroleum industry, which can directly command generous tax breaks and subsidies from government. Thus they may be fairly impervious to the feeble effort of policy-makers to influence them by market incentives.

4. Although CAFE is an example of relatively mild government involvement, it has been controversial from an ideological perspective. Such political resistance will certainly be even stronger against climate-protection measures. Recall that CAFE was a response to a sudden and undeniable oil crisis, visible every day in the lines of cars at gas stations. By contrast, the 'climate crisis' is a diffuse and gradual phenomenon, whose very existence is still debated in some quarters, including the United States Senate.

***Conclusion***

The promotion of Marcellus natural gas as a 'bridge fuel' is a convenient rationalization, which is very unlikely to come true. The scientific basis for any such hope is very weak; and the economic and political motivation, necessary to cause such a transition to happen, now appears to be totally absent.

The most environmentally responsible direction for Marcellus gas is to simply leave it in the ground.

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[1] America's Natural Gas Alliance (http://www.anga.us/learn-the-facts/power-generation/clean--efficient)

[2] Howarth, Robert W., *Assessment of the Greenhouse Gas Footprint of Natural Gas from Shale Formations Obtained by High-Volume, Slick-Water Hydraulic Fracturing,* (2010) (http://www.eeb.cornell.edu/howarth/GHG%20emissions%20from%20Marcellus%20--%20November%202010.pdf)

[3] The relative greenhouse impact of methane versus CO2 is reported as 25:1 or 70:1, depending on the timeframe over which the effects are compared. The larger number is used here, because the most important impacts on climate change will happen within the next two or three decades.

[4] Quoting reference #2, above.

[5] David L. Porges, President EQT Corp., quoted in Pgh Post-Gazette (November 4, 2010)

[6] http://tonto.eia.doe.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm

[7] WSJ, November 20, 2010. 'Cap and Retreat: The largest U.S. carbon market collapses.' (http://online.wsj.com/article/SB10001424052748704648604575621350381458566.html)