BIPARTISAN POLICY CENTER

Memo

To: Task Force on Ensuring Stable Natural Gas Markets

From: BPC Staff – Jennifer Macedonia and Lourdes Long

Subject: The Impact of EPA Utility MACT Rule on Natural Gas Demand

Introduction

A series of power sector developments, including the reduced price of natural gas and the forthcoming combination of environmental policies for air, water, and waste, is changing the economic viability of some power plants. This memo summarizes preliminary analysis conducted by BPC to better understand the potential impacts of forthcoming EPA standards for electric generating units. While the analysis considered a wide range of scenarios corresponding to a range of EPA regulations, this memo focuses only on the forthcoming regulation expected to have the greatest impact on natural gas demand from the electric sector, the Utility Maximum Achievable Control Technology (MACT) Standards.

This memo will provide background on the MACT Standards and the results of the BPC modeling to analyze the impacts of the MACT rule on electric utility generation and natural gas demand.

EPA Regulations & Natural Gas Demand

Utility Maximum Achievable Control Technology (MACT) Standards

The EPA is bound by a court order to finalize a Utility MACT Rule by November 2011, following a previous rulemaking and litigation cycle. On March 15, 2005, EPA issued the Clean Air Mercury Rule (CAMR) to reduce mercury emissions from coal-fired power plants from 48 tons to 15 tons by 2018 – a reduction of 70%. To accomplish this goal, mercury was delisted as a hazardous air pollutant (HAP) and a cap-and-trade policy was enacted under section 111 performance standards of the Clean Air Act (CAA).[1]

On February 8, 2008, the US Court of Appeals for the DC Circuit vacated CAMR because it violated the CAA; CAMR attempted to regulate mercury under section 111 of CAA, which does

[1] U.S. Environmental Protection Agency. Clean Air Mercury Rule, Basic Information. http://www.epa.gov/camr/basic.htm

not apply to HAPs.[2] The ruling did not address the legality of using cap-and-trade under section 111, but did call for stricter regulation of mercury.

Consistent with the court ruling, EPA intends to propose a Utility MACT rulemaking by March 2011 with national emission standards for hazardous air pollutants (NESHAP) from electric generating units. Assuming EPA meets the court ordered deadline to finalize the Utility MACT by November 2011, these MACT standards for the power sector will be over a decade late from the mandate issued under section 112 of the Clean Air Act Amendments of 1990.

The Utility MACT is expected to control a variety of hazardous air pollutants -- including mercury, other metals, and organic air toxics – through emission rate limits based on the emissions performance of the top twelve percent of existing facilities in the same category. Because many coal-fired power plants already employ a suite of emissions controls, the MACT emission limits are expected to be stringent and require add-on controls such as fabric filters, carbon injection, and either wet scrubbers or dry sorbent injection.

Industrial Boiler MACT

The recently proposed EPA Industrial Boiler MACT is assumed to be an informative model for the Utility MACT regulation. It may also be instructive to consider the Industrial Boiler MACT standard because the boiler MACT may have some impact on natural gas demand due to fuel switching and repowering at industrial facilities.

On April 29, 2010, EPA issued proposed rulemakings[3] to control air toxics from new and existing industrial and commercial boilers and process heaters under section 112 of the Clean Air Act. These regulations propose national emission standards for a variety of hazardous air pollutants -- including mercury, other metals, and organic air toxics. The proposal includes MACT limits that are expected to require add-on controls such as fabric filters, carbon injection, and either wet scrubbers or dry sorbent injection at many new and existing industrial facilities (e.g., refineries, chemical and manufacturing plants, and paper mills).

The proposed Industrial Boiler MACT could increase natural gas demand, in particular for some of the 578 major source industrial boilers currently burning coal that may choose to switch to gas (which would avoid add-on controls) rather than install add-on controls for HAPs (e.g., activated carbon injection to meet mercury limits, particulate upgrades to control for other hazardous metals, and either dry sorbent injection or wet scrubbers to control acid gases).

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[2] Davis, Tracy. "DC Circuit Orders Immediate Tightening of Mercury Control Rules." *Energy Legal Blog.* http://www.energylegalblog.com/archives/2008/03/25/1354

[3] http://epa.gov/airquality/combustion/actions.html

Overview of BPC Modeling

As part of a broader analysis of anticipated EPA regulations, BPC modeled the impacts of a Utility MACT scenario on the power sector using ICF's Integrated Planning Model (IPM) -- a simulation model of the U.S. wholesale electricity sector used to model the market effects of compliance with environmental policies. To utilize this Integrated Planning Model, it is necessary to make several assumptions about the economics of the U.S. electricity sector in order to fully characterize both the demand and supply sides of the model. These include electric demand, resource supply, existing capacity characteristics, new capacity, operating costs, and environmental policies. Many of the assumptions used in this analysis were based on the 2010 Energy Information Administration's Annual Energy Outlook (EIA AEO 2010).

The projected natural gas price is a key assumption for this modeling exercise. Following the publication of the EIA's AEO 2010 in early 2010, expert projections of the future natural gas price have continued to fall. Because the natural gas price is a key driver for decisions about future generation mix, a lower natural gas price than that assumed for this analysis could be expected to change the economics of operating and retrofitting an existing coal plant and may lead to increased natural gas demand from the electric power sector that is not reflected in these modeling results.

The Utility MACT policy scenario used for the BPC analysis assumes that, in order to operate past a 2015 compliance deadline, all coal-fired electric generating units (EGUs) must be fitted with controls for HAP. Because the Utility MACT regulation has not yet been proposed, assumptions are largely based on requirements and assumptions in the Industrial Boiler MACT proposal. To approximate the costs of complying with the Utility MACT, the policy scenario assumes the following control technologies will be required for coal fired EGUs: a baghouse (i.e., fabric filter) to control metals; for some plants, additional activated carbon injection (ACI) to meet a 90% mercury removal rate[4]; and Flue Gas Desulfurization (FGD) (i.e., a wet scrubber) to meet an HCl emission limit for acid gases.

Experts suggest that lower capital cost control technologies than those assumed in this MACT scenario may be available and could change the number of retirements and, thus, their impact on natural gas demand. In particular, dry sorbent injection -- which has significantly lower capital cost, but non-trivial operating costs, compared to a wet scrubber -- may be an option for some subset of power plants to meet the required HCl limit for acid gases under Utility MACT. Thus, dry sorbent injection may allow some plants that are projected to retire in this analysis – particularly smaller units with low capacity factor where it would be difficult to justify the capital cost of a wet scrubber -- to continue to operate and produce coal-fired generation.

[4] For mercury removal assumptions, the scenario assumes a plant that burns primarily bituminous coal and has installed FGD, baghouse, and selective catalytic reduction (SCR) (for NOx control) will meet the Utility MACT 90% mercury removal with no carbon injection. This is a simplified estimate based on an assumption that, for a bituminous coal plant with a baghouse, any additional cost for carbon injection (polishing ACI) would be modest. All other plants are assumed to require activated carbon injection.

The modeled Utility MACT policy scenario includes other *final* EPA regulations, as well as many state regulations. It assumes caps under SO_2 and NO_X trading programs, as promulgated under the Clean Air Interstate Rule (CAIR).[5]

However, the scenario does not include forthcoming requirements for greenhouse gases, coal combustion waste, or cooling water regulations. These additional requirements could increase the number of plant retirements and contribute to additional gas generation and increased natural gas demand not captured by this Utility MACT modeling scenario.

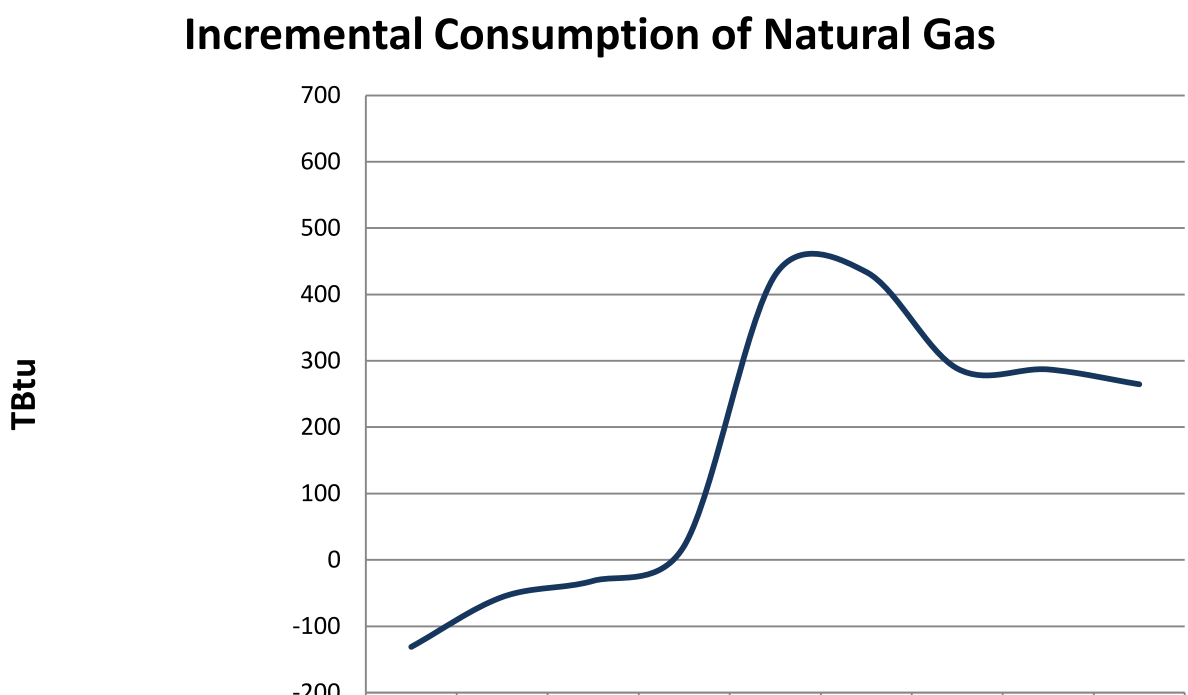
Modeling Results

Natural Gas Demand

Economic modeling results project the following changes in natural gas consumption from the power sector, as a result of a Utility MACT regulation to control toxic air pollutants. Figure 1 illustrates the projected change in natural gas consumption compared to a reference scenario that relies on the same assumptions, with the exception of environmental policies under the Utility MACT and the CAIR.

According to this analysis, natural gas consumption would increase beyond the projected business as usual level in 2015, coinciding with the compliance date for the Utility MACT regulation. With a high of roughly 450 trillion British thermal units (TBtu) in 2016, incremental natural gas consumption is projected to stabilize at nearly 300 TBtu above the reference level. According to this modeling exercise, the electric sector is projected to consume an additional 7% (1895 TBtu of incremental consumption) of natural gas between 2015 and 2020.

[5] CAIR has since been replaced with the Transport Rule, proposed in July 2010, with tighter yet caps on SO_2 and NOx, as well as trading restrictions and limits on the use of allowances built up in a “bank” from past years of over-compliance under the SO2 Acid Rain Trading Program. This policy scenario was modeled before the July 2010 Transport Rule proposal and does not reflect incremental changes from CAIR.



	2011	2013	2014	2015	2016	2017	2020	2025	2030
Reference	5675.4	3979.5	3820	3981.6	3908.1	4089.3	4230.7	4992	5965.5
MACT Only Scenario	5544.3	3923.5	3788.4	4002.9	4337.6	4523.1	4519	5279	6230.1
Incremental Consumption	-131.1	-56	-31.6	21.3	429.5	433.8	288.3	287	264.6

Figure 1: Incremental Natural Gas Consumption Projected from Utility MACT Regulation

In the three years preceding the compliance date, the graph shows natural gas consumption slightly below the business as usual level. This is likely an artifact of the regulatory assumptions used for the Clean Air Interstate Rule regarding banked SO2 allowances.[6] However, because the replacement Transport Rule, proposed after this modeling was undertaken, does not allow use of these banked allowances, such a decrease in natural gas consumption is no longer expected to occur.

Natural Gas Price

The natural gas prices projected for this Utility MACT scenario are reflected in Figure 2.[7] According to this modeling exercise, natural gas prices are expected to increase from roughly $6.20 (2006$)/MMBtu in the reference case to roughly $6.90 (2006$)/MMBtu in the Utility

[6] This Utility MACT scenario, modeled prior to the July 2010 Transport Rule proposed rulemaking, assumes that all banked SO2 allowances may be used. Therefore, the model projects that facilities would increase coal-fired generation, at the expense of natural gas generation, above the reference level in order to use all of the SO2 banked allowances prior to the 2015 compliance date -- when wet scrubbers on all units will eliminate the need for the extra SO2 allowances.

[7] The projected natural gas prices are based on input from EIA AEO 2010 and a function of the Utility MACT scenario run through ICF's IPM model.

MACT scenario after the 2015 Utility MACT compliance deadline and remain an average of $.57 (2006$)/MMBtu higher than the reference case through 2020. This increase in gas price is a function of the increased demand for natural gas projected under the Utility MACT scenario. As previously mentioned, the reference natural gas price is based on EIA AEO 2010 but is above current forecasts. A sensitivity run starting with lower natural gas price assumptions might show further increases in natural gas demand for the Utility MACT scenario.[8]

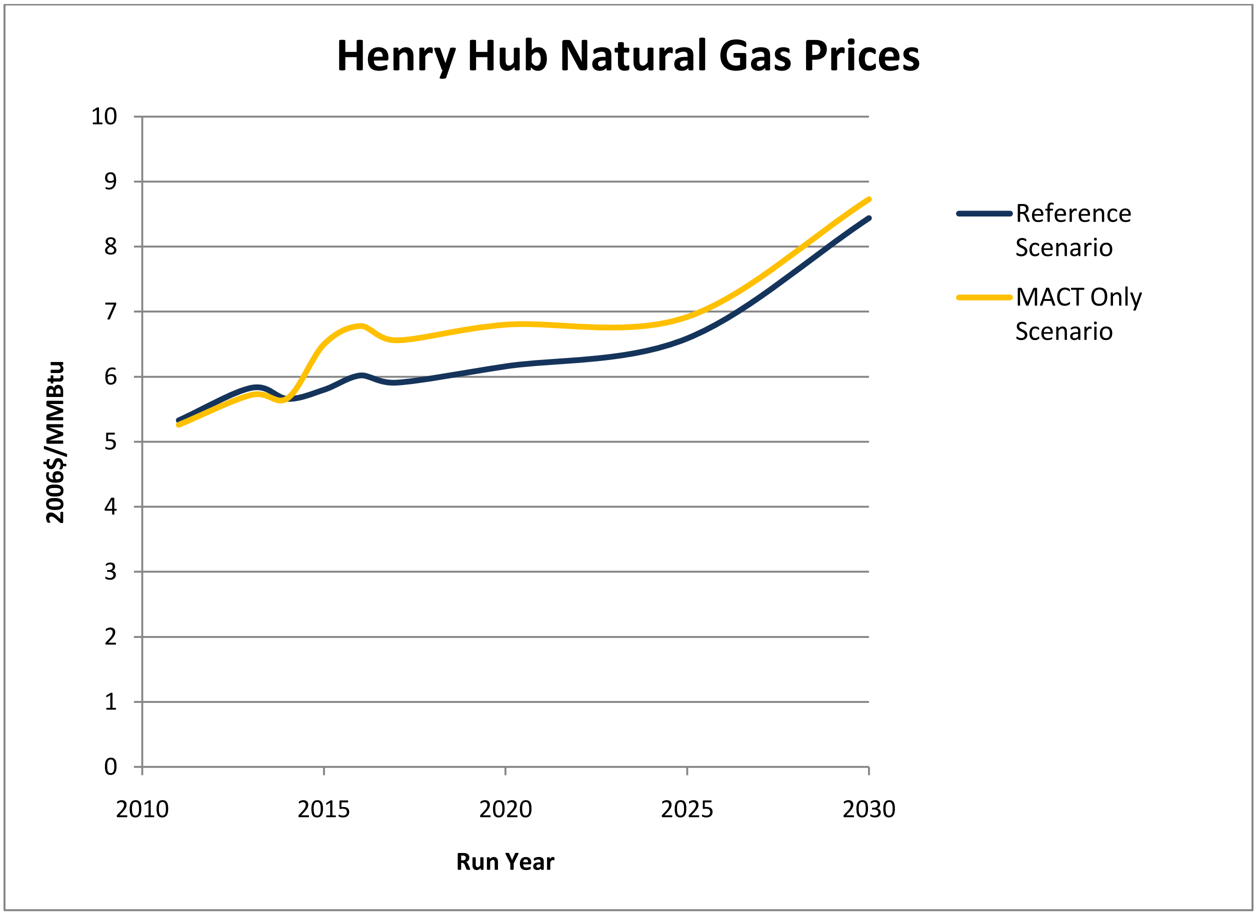


Figure 2: Projected Natural Gas Price under Reference and Utility MACT scenarios

Coal Retirements and Retrofits

Because of the absence of hazardous air pollutants in the exhaust from natural gas combustion, new and existing natural gas-fired capacity is expected to meet the Utility MACT without environmental controls. However, the Utility MACT rule will likely require many coal plants to either retrofit with environmental controls or retire. Given the significant capital cost assumed in this Utility MACT scenario for environmental control retrofits, coal-fired generators are

[8] Petak, Kevin R. Fundamentals Point to Demand Growth, Stronger Prices in the Long Term. *The American Oil and Gas Reporter.* October 2010.

generally projected to retrofit larger plants and retire some smaller plants. Smaller coal plants, which include many older plants that are only economical to operate during periods of high demand, are less able to recoup capital investments and more likely to be replaced with relatively inexpensive natural gas turbines. Figure 3 illustrates the importance of plant size in the decision of whether to retrofit or retire.

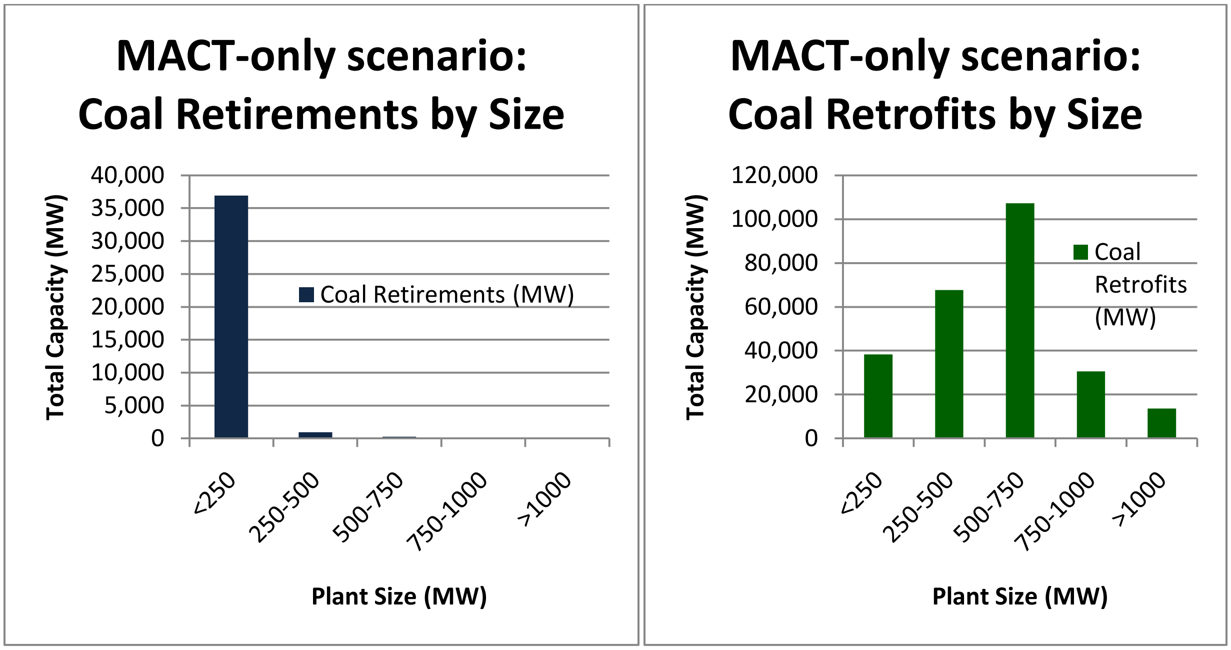


Figure 3: MACT Scenario Coal Retirements and Retrofits by Size

Generation Mix

Although the changes are not overwhelming, the most notable change in generation mix under a Utility MACT regulatory scenario is a decrease in coal-fired generation.

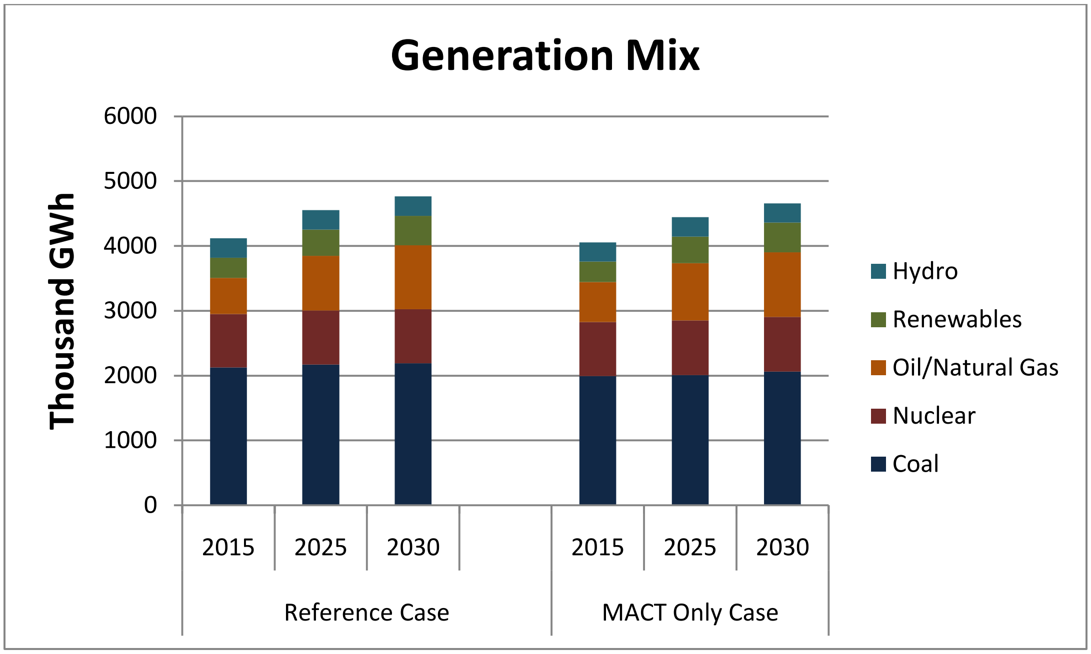


Figure 4: Generation Mix Projected for Reference Case and MACT Scenario

According to these modeling results, the decrease in coal generation is achieved in part by a decrease in overall generation (as demonstrated in Figure 8) -- as a result of demand response to a higher electricity price -- and in part to modest increases in natural gas and renewable generation. Figure 5 shows the incremental increase in natural gas generation between the MACT scenario and the reference scenario. This would include any new gas turbines as well as any existing facilities repowered to natural gas. But more importantly, there is a large amount of natural gas generating capacity that is currently underutilized; thus, the increased generation from existing gas generators makes up the lion's share of increase shown in Figure 5.

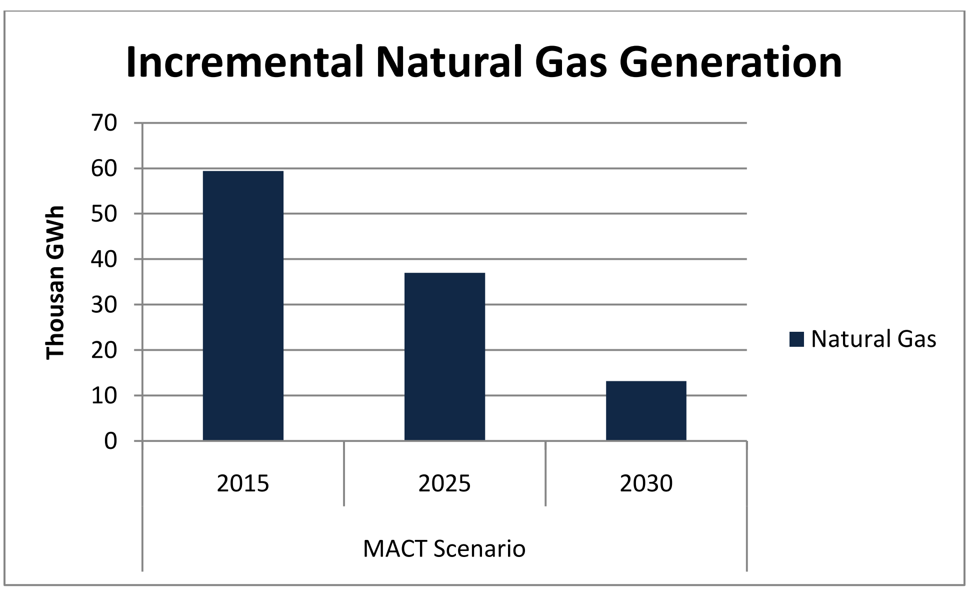


Figure 5: Incremental Natural Gas Generation under MACT Scenario

New Generation Capacity

Figure 6 shows the new electric generating units, by type, projected to be built for the business as usual reference scenario, as well as the MACT scenario. The vast majority of new capacity built, for both business as usual and the MACT scenario, is either renewable energy or natural gas. In either scenario, there are minimal new pulverized coal plants and the coal plants that are projected to be built are not equipped for carbon capture and sequestration. Figure 7 highlights the two largest technologies, new natural gas plants and wind capacity built for the business as usual and MACT cases.

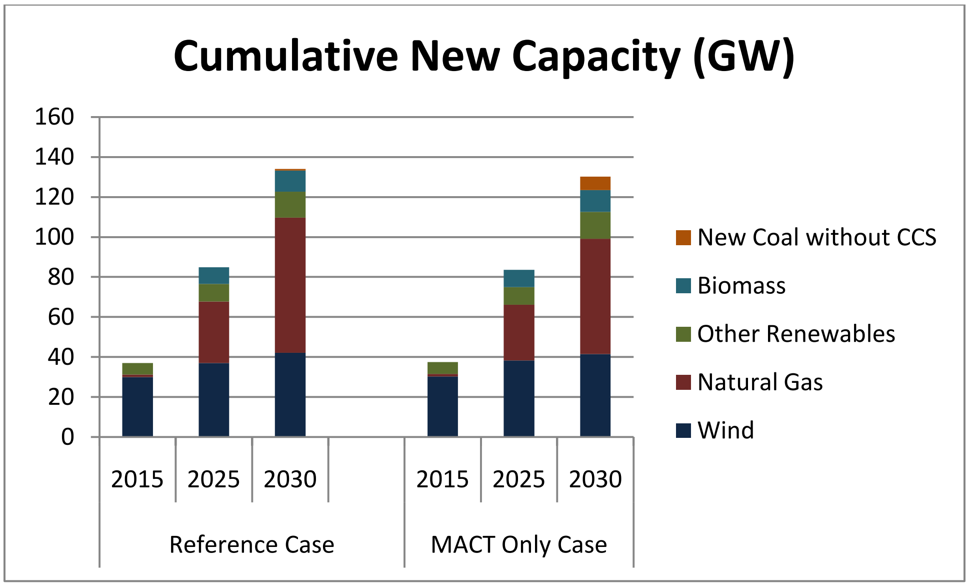


Figure 6: Cumulative New Capacity Projected for the Reference and MACT Scenarios

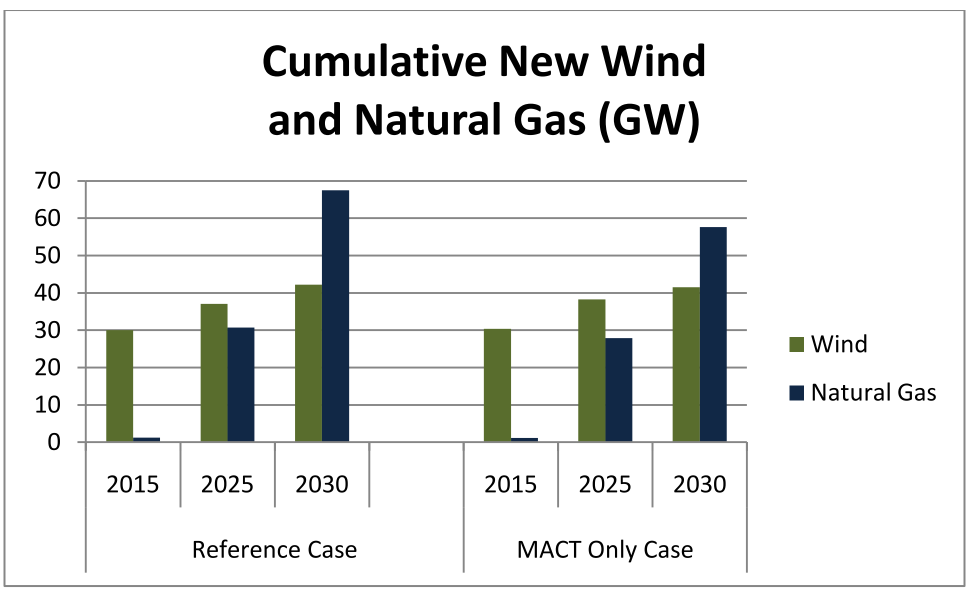


Figure 7: Cumulative New Wind and Natural Gas Capacity

Electricity Demand

As a result of the capital costs assumed for environmental retrofits under the MACT Scenario, an increase in wholesale electricity price results in a demand response that reduces the electricity demand going forward. Figure 8 compares the demand growth in the business as usual with the MACT scenario. The lower electric demand projected for the MACT scenario is likely the reason for Figure 7 showing fewer new builds of natural gas capacity under the MACT scenario.

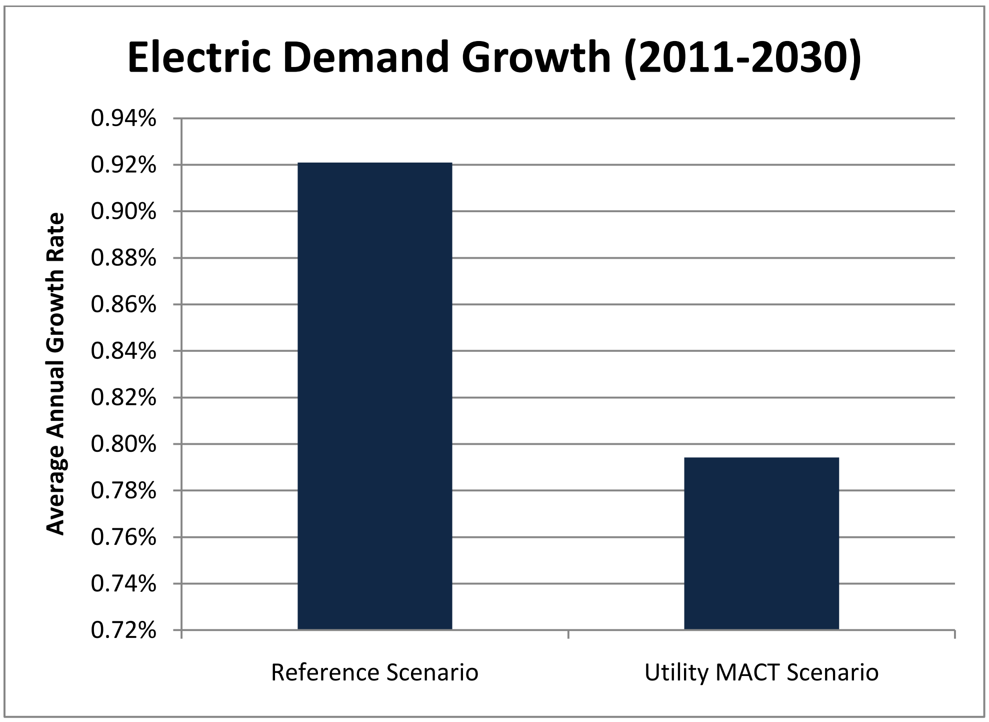


Figure 8. Projected Decrease in Electric Demand for Reference Case and MACT Scenario