

Restoring Equilibrium to Natural Gas Markets: Can Renewable Energy Help?

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Introduction

Heightened natural gas prices have emerged as a key energy-policy challenge for at least the early part of the 21st century. With the recent run-up in gas prices and the expected continuation of volatile and high prices in the near future, a growing number of voices are calling for increased diversification of energy supplies. Proponents of renewable energy technologies identify these clean energy sources as an important part of the solution.

Increased deployment of renewable energy (RE) can hedge natural gas price risk in more than one way, but a recent report by Berkeley Lab evaluates one such benefit in detail: by displacing gas-fired electricity generation, RE reduces natural gas demand and thus puts downward pressure on gas prices. Many recent modeling studies of increased RE deployment have demonstrated that this “secondary” effect of lowering natural gas prices could be significant; as a result, this effect is increasingly cited as justification for policies promoting RE.

The Berkeley Lab report summarizes recent modeling studies that have evaluated the impact of RE deployment on gas prices, reviews the reasonableness of the results of these studies in light of economic theory and other research, and develops a simple tool that can be used to evaluate the impact of RE on gas prices *without* relying on a complex national energy model.

The Economic Theory of a Shifting Natural Gas Demand Curve

The report confirms that the gas-price reductions projected by these studies are consistent with economic theory. Increased RE will lead to an inward shift in the natural gas demand curve, leading to a reduction in natural gas prices. These reductions in gas prices benefit consumers by reducing fuel costs faced by electricity generators and by reducing the price of natural gas delivered for direct use in the residential, commercial, industrial, and transportation sectors. If policymakers are concerned about the impact of gas prices on consumers or are concerned about the macroeconomic impacts of higher gas prices, then policies to reduce gas demand might be considered appropriate.

Previous Renewable Energy Studies

Previous modeling studies have consistently found that increased levels of RE will put downward pressure on natural gas prices. The Berkeley Lab report reviews five studies by the Energy Information Administration (EIA), six by the Union of Concerned Scientists (UCS), one by the Tellus Institute, and one by the American Council for an Energy-Efficient Economy (ACEEE). Most of the studies evaluate national renewables portfolio standard (RPS) proposals, though some evaluate state RPS policies and others also include energy efficiency. As shown in

Figure 1, these studies consistently find that RE deployment will reduce natural gas demand, thereby putting downward pressure on gas prices.

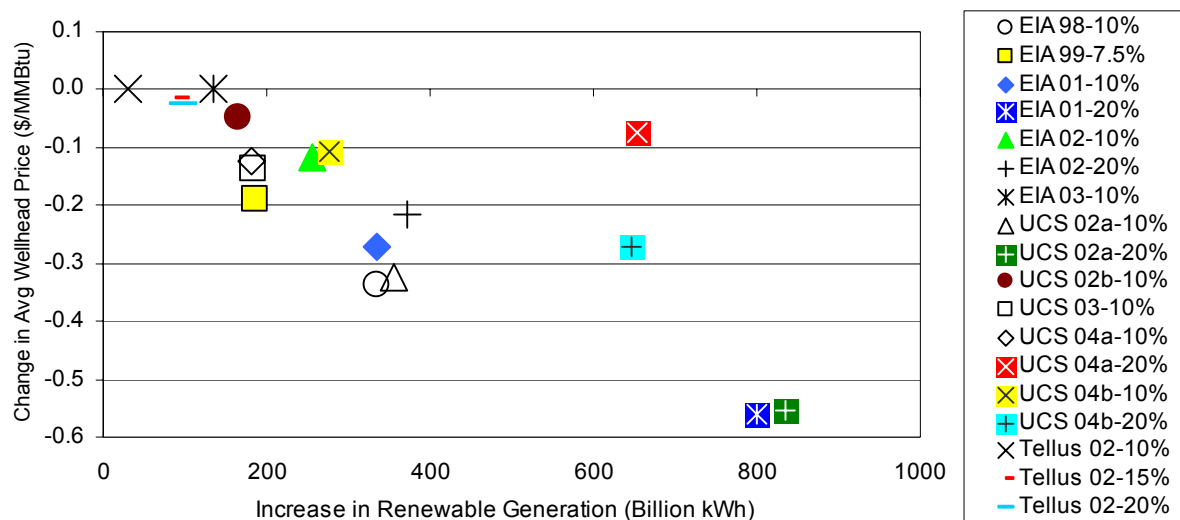


Figure 1. Forecasted Natural Gas Wellhead Price Reduction in 2020

In fact, despite some variation among the studies, they generally show that each 1% reduction in national gas demand is likely to lead to a long-term (effectively permanent) average reduction in wellhead gas prices of 0.8% to 2% (equating to inverse elasticities of 0.8 to 2). Some studies predict even larger impacts, especially in the near term. Reductions in wellhead prices will reduce wholesale and retail electricity rates and will also reduce residential, commercial, and industrial gas bills.

Overall, those studies that evaluate national RPS proposals (typically at the 10% or 20% level) find that these programs might provide national, natural gas bill savings from 2003-2020 that are as high as \$74 billion (on a net present value basis), with nine of fifteen analyses within the range of \$10 to \$40 billion in gas bill savings.

These consumer gas bill savings are significant. Considering the predicted reduction in consumer gas bills as well as an assumed one-for-one pass-through to consumers of reductions in electricity-sector gas costs, Figure 2 shows, by study, the range of consumer benefits delivered from increased RE generation, expressed in terms of \$ per MWh of renewable energy. Results suggest that each MWh of incremental RE provides, on average, national consumer benefits in the form of gas savings that range from \$6/MWh to \$35/MWh, with a general trend toward savings between \$7.50 and \$20/MWh.

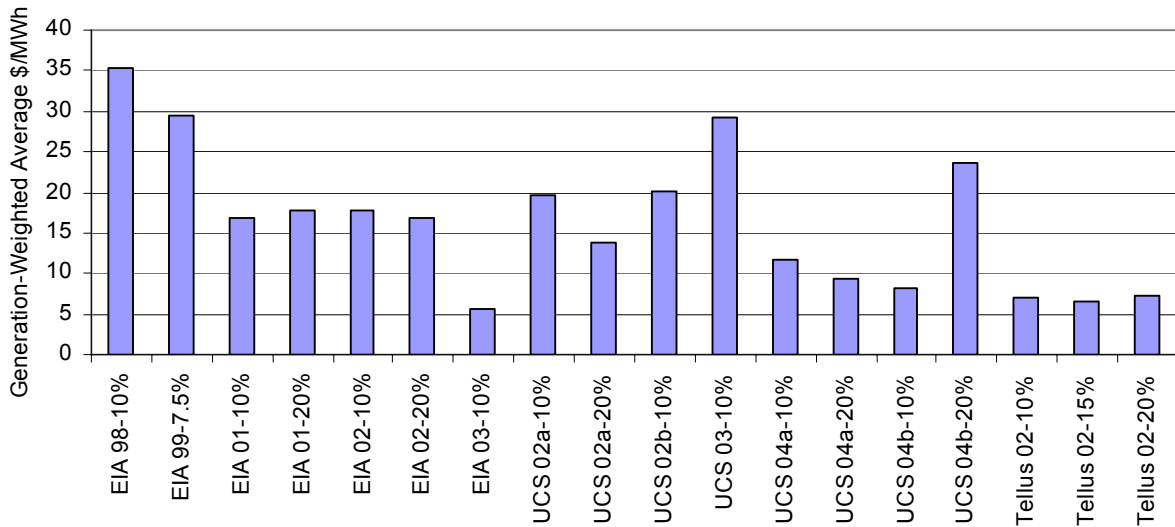


Figure 2. Consumer Gas-Savings Benefits of Increased RE Production (in \$/MWh)

Developing and Using a Simplified Analysis Tool

An important contribution of the Berkeley Lab report comes from its development of a simple analysis tool that can be used to evaluate the potential impact of RE on natural gas prices and bills. In developing the tool, Berkeley Lab used input assumptions that are consistent with those from recent national energy models (see the full report for additional details).

Presented here are results for three specific renewable energy deployment scenarios:

- **Existing State RPS Policies:** the expected impact of the existing 18 state RPS policies.
- **California RPS:** the expected impact of the California RPS (20% RE by 2010).
- **Aggressive Geothermal Deployment:** the potential impact of 10,000 MW of new geothermal capacity, resulting from equal annual additions (625 MW per year) from 2005 to 2020.

Figure 3 shows that the net present value (NPV) of *national* consumer gas savings from these three scenarios could be significant (through 2025; 7% real discount rate). The 18 existing state RPS programs are estimated to provide consumer gas savings that have an NPV of \$9 to \$22 billion. California's RPS alone is projected to result in national gas savings of \$4 to \$10 billion on an NPV basis. The aggressive geothermal expansion scenario, meanwhile, is projected to lead to consumer gas savings of \$6 to \$15 billion. In each case, the range of potential savings reflects uncertainty in the degree to which gas prices will decline with reduced demand (on the low end, each 1% drop in demand is assumed to reduce prices by 0.8%, while on the high end each 1% drop in demand is assumed to reduce prices by 2%).

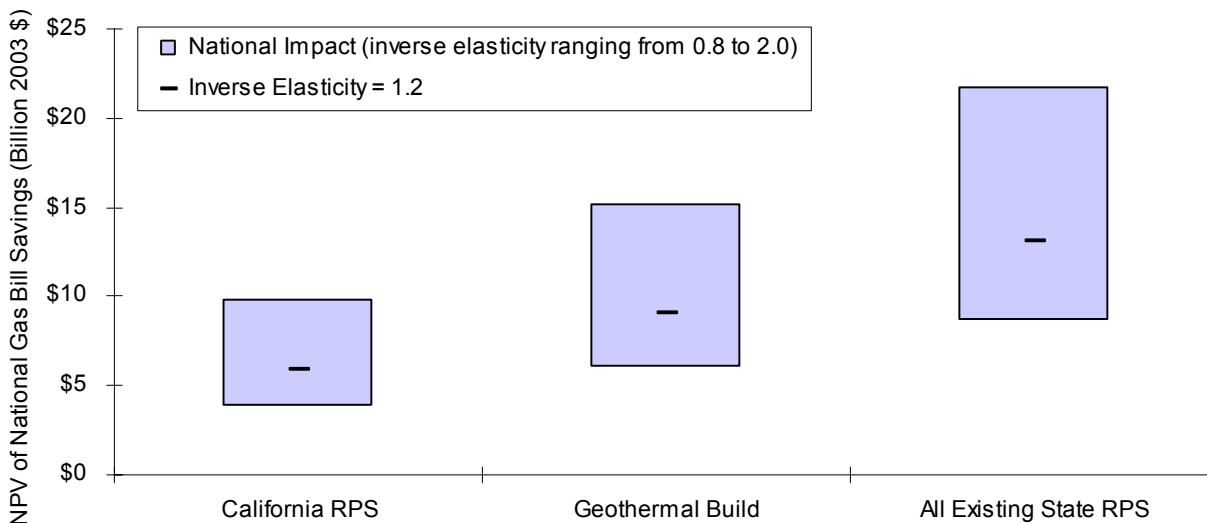


Figure 3. Projected Long-Term Impact of Three RE Scenarios on National Gas Bills

Conclusions

With the recent run-up in gas prices, deepening concerns about the ability of North American gas production to keep up with demand, and the continuing reliance on natural gas as a favored fuel for electricity generation, desire to restore equilibrium in natural gas markets is strong. Renewable energy can help to alleviate the threat of high natural gas prices over the short and long term, thereby lowering gas and electricity bills for consumers. Thirteen studies and twenty specific modeling analyses consistently show that increased use of renewable energy can begin to reduce natural gas prices, and the Berkeley Lab report is the first to demonstrate that these results are broadly consistent with economic theory, results from other national energy models, and limited empirical evidence.

Findings show that increased use of renewable energy benefits natural gas consumers at a level conservatively estimated to be equivalent to at least \$10 to \$20 for each MWh of incremental renewable generation. Given present concerns about natural gas prices, supporters of renewable energy would be well served to highlight the potential risk-reduction benefits of their favored technologies.

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The report "Easing the Natural Gas Crisis: Reducing Natural Gas Prices through Increased Deployment of Renewable Energy and Energy Efficiency," can be downloaded from <http://eetd.lbl.gov/ea/ems/re-pubs.html>.