

Hawaii currently meets the majority of its electricity needs through oil-fired generation – causing rates to be nearly four times the national average. In response to rising oil prices and in line with State-led action combating climate change, Hawaii is aggressively pursuing alternative sources of energy for its electric sector. Hawaii’s Renewable Portfolio Standard (RPS) states that utilities must meet 40% of electricity sales with renewable sources of energy by the year 2030; however, the remaining 60% can come from fossil fuels. Lower natural gas prices as a result of the “shale gas revolution” is in part why the State and key stakeholders are deliberating importing large amounts of natural gas in liquefied form (liquefied natural gas or LNG) for use in the electric sector.

This study builds upon past Hawaii-based LNG studies and extends the analysis by assessing both the macroeconomic and electricity sector impacts of using natural gas for power generation. We draw upon two recent studies, by Facts Global Energy (2012) and Galway Energy Advisors (2013) for price estimates. In addition to economic outcomes, this study estimates GHG emissions impacts as well as qualitatively discusses other environmental impacts related to the extraction of natural gas.

## Environmental and Regulatory Context

State and Federal environmental regulations provide incentives and disincentives to use natural gas. Hawaii’s GHG regulations (requiring the electric sector to return to approximately 1990 levels of emissions by the year 2020) benefit natural gas over oil and coal because it burns relatively cleanly. On a lifecycle basis, however, natural gas may not have substantially fewer GHG emissions.

In addition, using natural gas may help Hawaii’s electric sector comply with pending Clean Air Act requirements in regards to Mercury and Air Toxics Standards (MATS) and National Ambient Air Quality Standards (NAAQS). But ongoing studies (currently by the EPA) in regards to the impact of hydraulic fracturing to nearby water resources have led to controversy on whether natural gas can appropriately be considered a source of “clean” energy. Much of the practice of hydraulic fracturing has to-date been exempt from major federal environmental policy and, with concern over local water resources, this is being revisited at both the federal level and within individual states.

## Method and Scenarios

We look at four main scenarios where there is no gas introduced in Hawaii (Baseline), gas is introduced at a Low Medium, and High price. For these core scenarios, we assume that the RPS is met. We relax this assumption to better understand the impact of introducing natural gas to Hawaii’s market for renewable energy. To analyze these scenarios, we use UHERO’s Hawaii Electric Sector Model (HELM) and the Hawaii Computable General Equilibrium Model (H-CGE) to estimate impacts such as electric sector costs, technology profile, and GHG emissions (lifecycle and out-of-stack); as well as gross state product, household income, and sector output.

## Key Findings

Using natural gas in Hawaii’s electric sector could:

- Reduce electric costs by up to 25%;
- Increase GSP by up to \$11 billion (in net present value);
- Decrease demand for petroleum manufacturing by approximately 30% by the year 2040;
- Decrease out-of-stack GHG emissions while possibly increasing overall GHG emissions; and
- Negatively impact the market for renewable energy, primarily by crowding out solar PV.

We find that natural gas could decrease electric sector costs by a range of 6% to 25%. This translates to a savings of \$0.01/kWh to \$0.05/kWh (relative to today’s rates of \$0.34/kWh) in 2040. Electric sector cost savings translate to increases in sector productivity and consequently increases in real GSP.

Over the model horizon, the increase in GSP from the baseline when gas prices are Low has a net present value of \$11 billion (assuming a 4% rate of discount and \$2014), and Medium, \$6.2 billion. When prices are High, there is a near-term negative impact on gross state product due to the cost of capital relative to the return on the investment.

If natural gas follows the Low or Medium price case trajectories, it is economical to have abrupt adoption of natural gas in the year 2020. In the High case, natural gas use is phased in much more gradually. By the year 2040, however, all cases exhibit nearly a 30% decline in petroleum manufacturing output.

Using natural gas in the electric sector serves to reduce out-of-stack GHG emissions in all cases, thereby helping the utility to comply with the State's GHG rules. However, it can also lead to an increase in overall GHG emissions—which is against the spirit of Hawai'i's GHG law (Act 234) that urges the minimization of “leakage” or the export of emissions from Hawaii to elsewhere. Production practices and sourcing is a large determinant of lifecycle-based emissions.

If the State's RPS remains in force, introducing LNG does not serve to displace sources of renewable energy within Hawaii, as currently priced. On the other hand, if the State's RPS is relaxed, importing LNG could reduce the amount of renewable energy adopted. Particularly when natural gas prices are Low, natural gas-fired generation crowds out solar PV at current prices. Thus the fate of LNG as a “bridge fuel” within power generation likely depends on the enactment and/or enforcement of policies protecting the adoption of renewable energy.

MAKENA COFFMAN, PH.D.  
DEPARTMENT OF URBAN AND REGIONAL PLANNING

PAUL BERNSTEIN, PH.D.  
RESEARCHER, UHERO

SHERILYN WEE, GRADUATE RESEARCH ASSISTANT  
UHERO

CLARICE SCHAFFER, GRADUATE RESEARCH ASSISTANT  
UHERO