



HIA Alternatives Analysis for Scoping

New Orleans is highly vulnerable to storms and the accompanying storm surge that inevitably follows. New Orleans is widely recognized as one of the most vulnerable cities in North America to climate change¹. Hurricane Katrina showed the world that this unfortunate title was duly earned. Unfortunately, New Orleans was just the first city to be destroyed by climate change as Hurricane Sandy proved.

The way we create and use energy has a direct impact on the health of our citizens and the long-term sustainability of our city. For this reason the Alliance for Affordable Energy and the New Orleans City Council have been struggling to find the right balance of energy resources that are both affordable and sustainable. It is very challenging to find this balance without knowing the costs associated with health and environmental risk. It is our hope that partnering with the Louisiana Public Health Institute to conduct an HIA, we will determine how to assign costs to health impacts associated with the cost and sources of energy.

The timing for the New Orleans energy HIA is ideal as we are at the beginning stages of deciding how to replace a significant amount of energy currently supplied by Michoud power plant. Though Michoud is a natural gas plant, and natural gas is considered a cleaner fuel, the plant is over 40 years old, well past its 30 year expected life span. Michoud is nameplated for 780MW of energy with an annual energy output for of 2,203,200 MWh².

It has been determined that New Orleans will not need to replace the full 780 MW. To comply with MISO capacity requirements, only 640 MW of the 780 MW need be replaced. Entergy New Orleans has been pro-active in replacing the needed power. Thus far, ENO has recovered 320MW with Ninemile 6 (120 MW)³ and Union Generating (200 MW)⁴. We are left with needing to replace another 320 MW. Some of the need will be covered with energy efficiency and rooftop solar, but for the purposes of the HIA, we are only considering utility-scale sized power plant alternatives.

¹ Moore, J and Stone, L. (2009) *Carbon Footprint Report*. City of New Orleans.

² U.S. Environmental Protection Agency eGRID 2010 data Version 1.0.

³ New Orleans City Council Docket No. UD-11-03 ENO Ninemile 6 generating unit. The unit nameplate value is 550MW, 20% of which is supplied to Entergy New Orleans.

⁴ Louisiana Public Service Commission docket No. U-33244 Entergy Application to purchase Union Generating Plant. Unit nameplate value 2000MW, 200MW slated for Entergy New Orleans.

To begin the scoping process, five utility-scale alternatives to the proposed natural gas power plant are presented below in the HIA Scoping Alternatives Matrix. The five alternatives are on-shore wind, off-shore wind, municipal waste, solar farm, and hybrid solar gas plant. The alternatives were chosen based on suggestions from previous Renewable Energy IRP filings and public meetings.

Each alternative in this Scoping Analysis has been screened using several metrics important to health, environment, feasibility, and cost. The metrics are wholesale cost per kWh, EPA listed criteria pollutants, traffic impact to community, risk of accident at power plant, acreage needed for the project, and amount of potential MW production.

HIA Scoping Alternatives Matrix

	Proposed	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Fuel Source	CT gas plant	On-shore Wind Farm	Off-shore wind	Municipal waste energy⁵	Solar Farm	Hybrid Solar gas plant
Wholesale Cost by kWh⁶	\$.04	\$.05	\$.20	\$.08	\$.07	\$.06
Pass through fuel cost per kWh⁷	\$.03-\$.0765	None	None	None	None	\$.024-\$.0612
Criteria pollutants⁸	NOx SOx CO CO ₂ CH ₄ N ₂ O VOCs	None	None	NOx SOx CO CO ₂ CH ₄ N ₂ O VOCs PM	None	NOx SOx CO CO ₂ CH ₄ N ₂ O VOCs
Traffic impact	Depends on siting	Traffic decreased	No impact	Traffic pattern shift to industrial area	No impact	Depends on siting
Accident risk	Risks associated with natural gas combustion	Hurricane risks	Hurricane risks	Risks associated with combustion &	Hurricane risks	Risks associated with natural gas combustion

⁵ World Bank. (2014) Kunming Konggang Waste Incineration Power Plant Environmental Auditing Report.

⁶ U.S. Energy Information Administration.

⁷ U.S. Energy Information Administration.

⁸ U.S. Agency for Toxic Substances and Disease Registry.

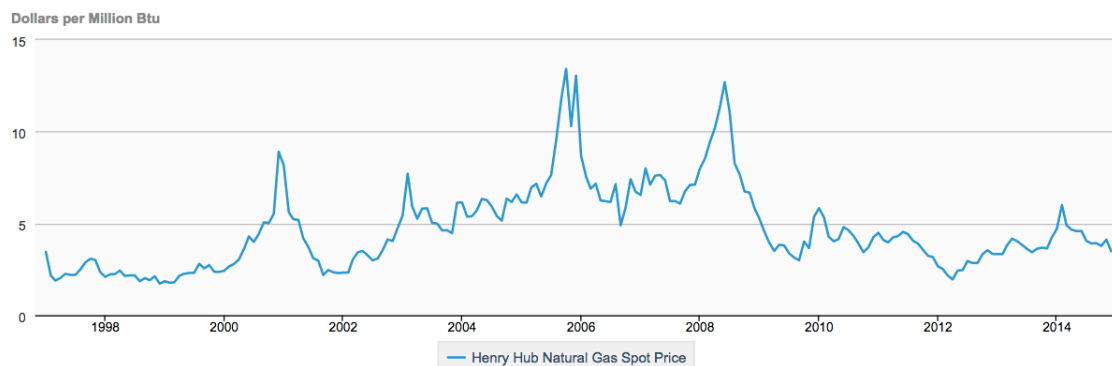
	& Hurricanes			Hurricanes		& Hurricanes
Area needed (per MW)	3-5 acres	60 acres/MW	60 acres/MW	1 acre	5 acres	TBD
MW Capacity Potential	200MW	200 MW	200MW	26MW	200 MW	200MW

Cost Analysis

Predicting future cost of energy is a challenging task. Prices are subject to global markets, which are impacted by extreme weather, political upheaval, pending legislation, and other unforeseeable events. In this section, we will explain the cost values assigned in the Alternatives Matrix for wholesale costs and pass-through fuel costs.

Natural gas prices have historically been highly volatile. From the chart below it is easy to see the sharp ups and downs that prices have taken. What is not visible in the chart are the impacts to families, businesses, and utility planning. When prices are high, people assume that prices will stay high. The reverse is also true. Hence, when gas prices are below \$6/MBtu then utilities prioritize building natural gas power plants. When prices are above \$6, then other types of energy production become more favorable.

Henry Hub Natural Gas Spot Price

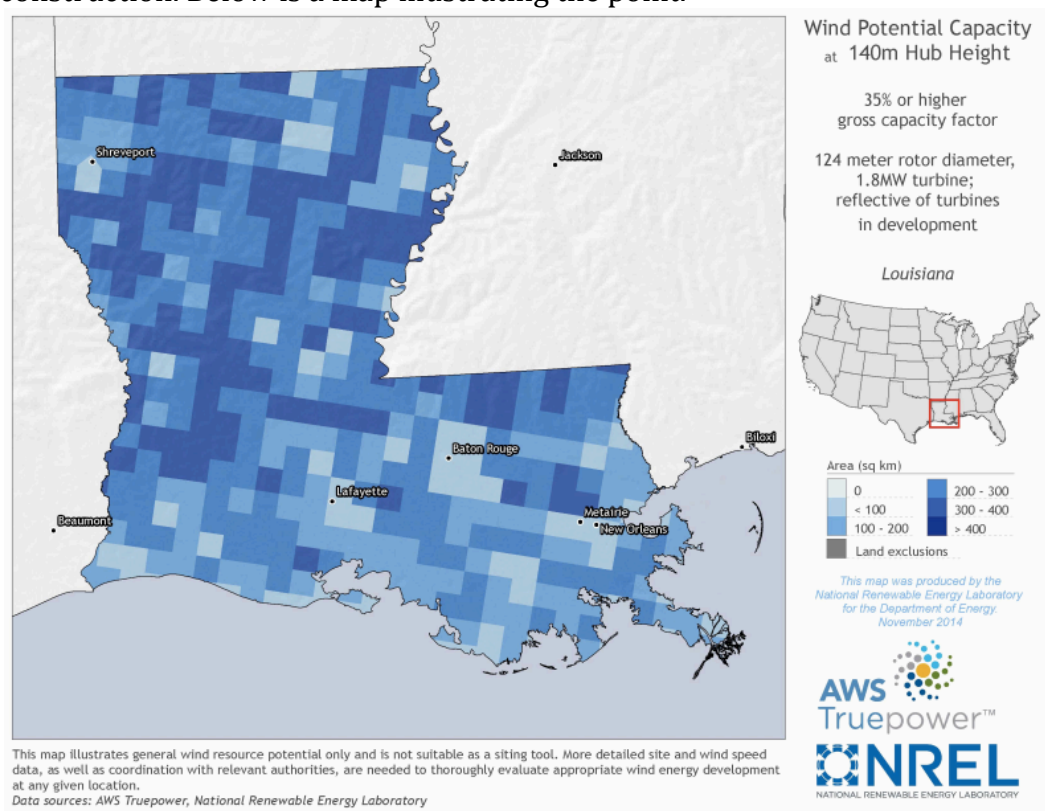


Source: U.S. Energy Information Administration

The recent decrease in price is due to increases in US production driven by technological advances in fracking techniques. Professional economists predict that gas prices will remain low for some time. Using current gas prices, the cost to construct a new natural gas plant amortized over 30 years is about \$.035 per kWh or \$35 per MW. This cost would be included in the rate base. The fuel to run the gas-

fired power plant is paid through the Fuel Adjustment Charge and is predicted to be about \$.04-\$.0765 over the 30 year life of the plant⁹.

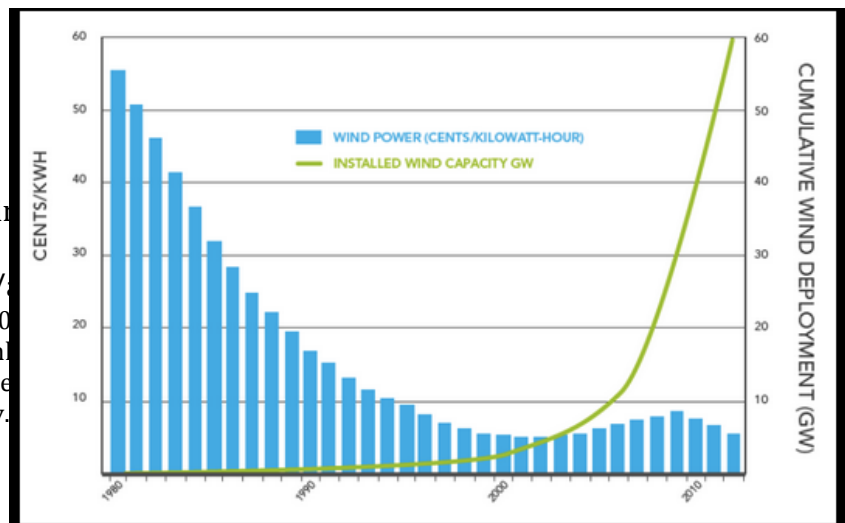
Wind costs in the southern region have decreased dramatically but this trend is slowing. The Investment Tax Credit that fueled the growth in wind production across the U.S. was not extended by the outgoing congress in December 2014. Therefore, we expect the cost to increase slightly but remain cost competitive with fossil fuel energy sources. A recent DOE report stated that the average cost for wind energy in the US is \$.025/kWh.¹⁰ The report claims that the sample size was small and that the cost may be higher for lower quality wind regions. Therefore, we increased the cost for wind energy for New Orleans by \$.025/kWh based on NREL data showing that a higher turbine height would be necessary and increase cost of construction. Below is a map illustrating the point.¹¹



⁹ U.S. Energy Information Administration. *Release Overview*. Accessed at: <http://www.eia.gov/forecasts/>

¹⁰ US Department of Energy (2014) 2014 Wind Energy Report. Accessed at: <http://emp.lbl.gov/sites/all/files/lbnl-wind-energy-report-2014.pdf>

¹¹ WindExchange. National Renewable Energy Laboratory. Accessed at <http://apps2.eere.energy.gov/wind/windexchange/>



Since wind is essentially free, there are no pass-through fuel costs. In Arkansas, OG&E expects the fuel savings from wind to save customers \$2.3 billion over the expected twenty-five year life of their Wind asset production.¹² Below is a chart of expected wind capacity installations and resulting decrease in production cost showing that installed on-shore wind should be around \$.05/kWh.

Solar farms have also decreased in price to around \$.05-\$.07/kWh. Several recent long-term Power Purchase Agreements in Austin, North Carolina and Long Island have shown very cost competitive prices for ratepayers.¹³ The notion that solar is an intermittent resource is being challenged as technology improves and utilities gain better experience. Solar is predictably available when it is needed most, on hot summer days at peak. Further, the capacity credit being offered to solar has increased.¹⁴

The Hybrid solar gas is able to use both the sun and heat from combustion of natural gas. Hybrid solar and natural gas plants are very cost competitive currently and seems to be a comfortable renewable source of energy for utilities less experienced with integrating non-baseload sources of energy. Florida Power and Light was able to bring a plant online for approximately \$.03/kWh. Further, the plant uses 20% less fuel and this is a direct pass through savings to customers.¹⁵

Off shore wind production is still quite expensive compared to on-shore. The technological constraints for installing and delivering wind power from ocean platforms increases the cost of production. Off-shore wind may also have higher operations and maintenance costs due to salt water and storm conditions. The fuel savings is still substantial and will be more of a cost factor as natural gas prices rise again. The Energy Industry Association quotes a cost of \$.20/kWh for off-shore wind.

The waste to energy plant is very expensive because of the scrubbers needed to keep the air and water quality impacts to a minimum. The project developers need a range of \$.07-.09/kWh to make the financing work. The range depends on the trash tipping fees, construction, and building material costs.

There are many other factors that impact cost assumptions. For example, the societal cost of carbon is estimated by the EPA at between \$11-\$52/ton and a central value of \$33/ton. We limited our scope to generalities for the purposes of analysis with other metrics like pollution.

¹² Oklahoma Gas & Electric, Arkansas Public Service Commission, Docket 12-067-u-Doc

¹³ Austin Energy (2013) *Fourth Quarter and Year End Report*. Accessed at: <https://austinenenergy.com/wps/wcm/connect/1eafeb32-410a-4d4e-85aa-4ea352aa8c5c/4thQtrFY2013Report.pdf?MOD=AJPERES>

¹⁴ *ibid*.

¹⁵ White, F. (2013) *A Solar Booster Shot for Natural Gas Power Plant*. Pacific Northwest National Laboratory. Accessed at: <http://www.pnnl.gov/news/release.aspx?id=981>

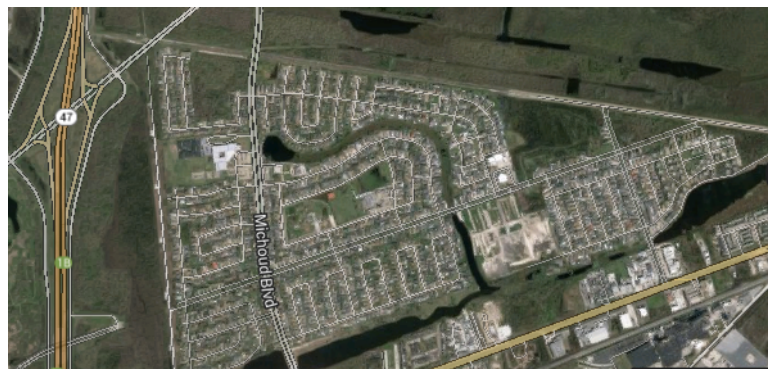
Criteria Pollutants

The criteria pollutants are of serious concern. Though the CT gas plant will be an improvement over the current Michoud plant, combustion of natural gas will emit pollutants of concern. Following is a chart of the criteria pollutants and their health impacts.

Pollutant	Health Impact
NO _x	Reacts with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death.
SO _x	SO _x can react with other compounds in the atmosphere to form small particles. These particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death.
CO	Heart disease
CO ₂	Greenhouse gas
CH ₄	Powerful greenhouse gas with a global warming potential 25 times that of carbon dioxide
N ₂ O	Powerful greenhouse gas with a global warming potential 298 times that of carbon dioxide
VOCs	Conjunctival irritation, nose and throat discomfort, headache, allergic skin reaction, dyspnea, declines in serum cholinesterase levels, nausea, vomiting, nose bleeding, fatigue, dizziness
PM	Respiratory problems, asthma, premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms, such as irritation of the airways, coughing or difficulty breathing.

Traffic Impacts to New Orleans East

The deconstruction of the Michoud plant will likely impact the community. The plant is located near residential homes. None of the other projects are likely to not be sited in the same location because the deconstruction will take the power plant out of service. The city will need another power source during the



deconstruction. Below is a map of the area and the Michoud Power Plant.

Conclusions and Exclusions

Based on the analysis it is clear that only two of the five alternatives are viable options for Orleans Parish. Space is at a premium in New Orleans and the amount of MW needed to replace Michoud is significant. To replace 320 MW of power with solar, approximately 1600 acres are required. New Orleans simply does not have this amount of space in one location. Similarly with wind power, Approximately 50 acres are needed for 1 MW, hence it would take 16,000 acres to build 320 MW of wind power on shore.

Off-shore wind power is still too expensive compared with the other options and is being eliminated from the HIA for this reason. Many families in New Orleans are living on the margin and simply cannot afford food or medicine when the utility bill spikes. More than 40% of New Orleans residents are renters in multifamily households, whose average annual income is typically just over half that of homeowners¹⁶. As a result, renters typically pay a higher percentage of their income for energy. This lowers their discretionary income and makes them much more vulnerable to fluctuations in energy prices, which are increasing at a faster rate than housing costs; between 2001 and 2009, renters in multifamily units faced an average rent increase of 7.6 percent, while energy costs for these renters rose by 22.7 percent¹⁷.

For the purposes of locating dispatchable, utility-scale power within Orleans Parish, we are recommending 3 alternatives to move forward to the scoping phase: municipal waste to power, solar farm, and hybrid solar gas plant. These three options fall within our cost criteria and feasibility.

¹⁶ The Benningfield Group. 2009. "U.S. Multifamily Energy Efficiency Potential by 2020," 3–9.

¹⁷ Joint Center for Housing Studies of Harvard University. 2011. "America's Rental Housing: Meeting Challenges, Building on Opportunities,".