Potential Impacts of Austin Energy Biomass Plant

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Abstract

An evaluation of the likely rate impacts of the planned Nacogdoches biomass power plant on Austin Energy's customers shows that the biomass plant will tend to increase the average utility bill for residential customers by about 5%, or $5.17 per month. This estimate is based on current rates and conditions and is much higher than the Utility's estimate of -$1.50 to $2.50 per month. Burning wood for power releases more carbon to the atmosphere than coal, oil, or natural gas. The biomass plant will increase the CO2 emissions by Austin Energy under any scenario. When compared to the alternative of building a new natural gas-fired power plant, the biomass plant will still release more CO2 for the next 10 to 90 years, depending on the sources for the biomass fuel. This study was constrained by Austin Energy's decision not to release studies and detailed information about the biomass plant based on the Utility's exemptions to the Texas Public Information Act granted by the Austin City Council.

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Introduction

This study independently evaluates the likely impacts of a planned 100 MW biomass power plant near Nacogdoches, Texas. Both the effect on rates for residential customers of Austin Energy (AE) and the effect on CO2 emissions are examined. The biomass plant is to be fueled by wood wastes from the forests of East Texas and various other sources of wood waste.

AE will not own the plant, but will buy all power from the plant for the first 20 years of operation, starting in 2012. The Utility has released general information indicating that:

- the biomass plant will cost the Utility $2.3 billion over 20 years of operation.
- residential ratepayer impact will be in the range of -$1.50 to $2.50 per month.

A Public Information Request was filed with AE based on the Texas Public Information Act in order to verify the above information provided by the Utility related to biomass power costs and rate impacts. The studies, analyses, and/or calculations used to obtain these figures were requested. However, AE declined to provide this information, as the Utility considers the Power Purchase Agreement (PPA) with the biomass plant developer, Nacogdoches Power LLC – and all information based on the PPA – to be confidential and proprietary information that is exempt from the Public Information Request as "competitive matters" based on an Austin City Council resolution in 2005 (Resolution #2005121-002).[1]

In order to independently evaluate the likely ratepayer impacts of the biomass plant, public data from AE and other sources was used to estimate the effect on electric rates if the plant were operating in 2010. Most of the information produced by the Utility on its rates and operations is one to two years out of date. For example, a recent presentation given by the Utility's General Manager on December 9, 2010 was based almost entirely on figures from 2008 and 2009.[2] As a result, it was not possible to compile all the necessary data for the year 2010. Some data for 2009 had to be substituted.

[1] A revised resolution was adopted by the Austin City Council in 2011 (#20110310-003) which simplified the language, but maintained most of Austin Energy's exemptions to disclosing information.

[2] See *Austin Energy Resource, Generation and Climate Protection Plan Implementation*, presentation by Larry Weis, General Manager, December 9, 2010.

The biomass plant is scheduled to begin operating in 2012, and therefore some utility costs may change from 2010. The Utility considers its power pricing and planning documents to be confidential, so there is no local data to assess future energy costs and rates. The most likely change from 2010 to 2012 would be for natural gas prices to increase. The Utility depends on gas for about 28% of its power generation.

Average Power Cost from Biomass Plant

Using the limited available information, it was possible to estimate the average power cost for the biomass plant. This is based on the $2.3 billion that will be spent on purchasing power from this biomass plant over the next 20 years. According to Austin Energy, the biomass plant is estimated to have a 90% capacity factor, meaning the 100 MW plant will have an average output of 90 MW. As shown in Table 1, the biomass plant will have an average power cost of 14.6 ¢/KWh. There is some indication that the biomass power costs paid by AE will start out lower than the average calculated here and increase to a higher rate, however AE has provided no information about what this escalation rate, if any, might be.

Table 1

Average Power Cost Estimate for Austin Energy Biomass Plant

Metric	Value	Units
Plant Average Power Output[1]	90	MW
Hours in Year	8,760	hours
Annual Energy Output	788,400	MWh
20-year Power Purchase Cost[2]	$2,300,000,000	$
Average Annual Power Purchase Cost[3]	$115,000,000	$
Average Power Cost	**$0.146**	$/kWh

1) Source: Stuart Reilly of Austin Energy in phone call of 1/19/11.
2) Mr. Reilly confirmed that $2.3 billion cost estimate was for power purchase only.
3) Assumes a constant fixed power rate over contract period.

While this rate of 14.6¢/kWh represents the average cost of the biomass power to the Utility, it does not necessarily represent the full cost to the customer. AE's customers will likely pay more for the biomass power, since AE will need to add some overhead costs for delivering the power to customers. Any markup for biomass power could not be determined for this study, so only power purchase costs are reported here.

Rate Impact of Biomass Plant

The higher cost of power from the biomass plant will cause rates to go up for Austin Energy's customers. The average rate impact resulting from the biomass plant was estimated using system-wide data from an Austin Energy report and information from the Public Utility Commission of Texas.[3] The current average cost of power from AE is not reported by the utility, however, the AE report gives the 2009 average cost over all customer classes of 8.53¢/kWh. As shown in Table 2, the biomass plant would cause average power rates to increase to 8.89¢/kWh. This represents a 4.17% cost increase system wide. Based on this average increase, a typical monthly residential bill would increase by $4.15. However this figure is based on the simplistic assumption that the rate impact would be spread evenly over all customer classes (residential, commercial, and industrial), which is seldom the case.

Table 2

Average Rate Impact of Biomass Plant
(Assumes cost distributed evenly across all customers)

Metric	Value	Units
Total Annual Energy Delivered (2009)[1]	12,627,724	MWh
Average Power Rate (2009)[1]	0.0853	$/kWh
Annual Power Sales Revenue	$1,077,144,857	
Biomass Plant Annual Power Purchase	$115,000,000	
Annual Power Sales with Biomass Plant	$1,192,144,857	
Biomass Plant Annual Energy Delivered	788400	MWh
Biomass Plant Average Power Cost	0.1459	$/kWh
Total Energy Delivered including Biomass Plant	13,416,124	MWh
Average Power Rate with Biomass Plant	0.0889	$/kWh
Percent Increase in Rate with Biomass	**4.17%**	
Typical Monthly Residential Bill for 1000kWh[2]	$99.38	
Residential Bill with Biomass Plant	$103.53	
Increase in Monthly Residential Bill	**$4.15**	

1) Source: *Austin Energy Open Meetings/Open Records Resolution Annual Report 2009*, March 19, 2010.
2) The monthly bill of $99.38 is for an Austin Energy residential customer using 1000 kWh in July 2010 and is based on information from the Public Utility Commission of Texas.

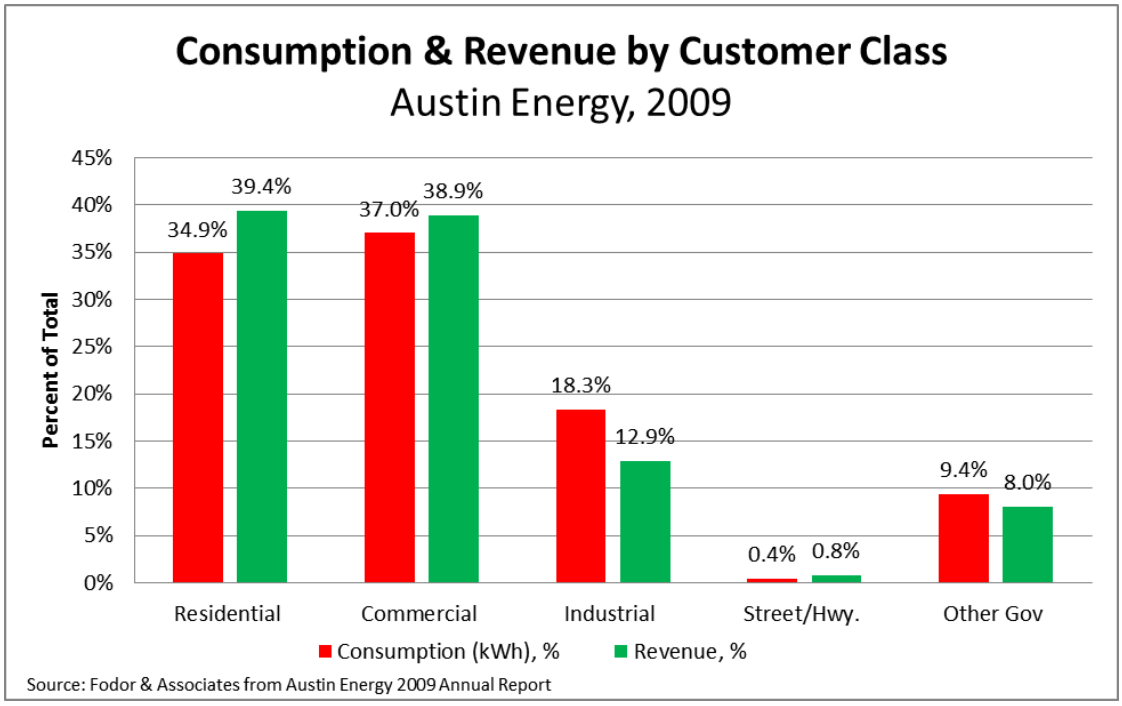
Residential customers will likely be impacted more by the increased cost of biomass power than will commercial and industrial customers. Larger utility customers in

[3] *Austin Energy Open Meetings/Open Records Resolution Annual Report 2009*, March 19, 2010, page 3.

Austin are under power contracts and pay more of their power bills based on demand than usage. Their energy costs per kilowatt-hour is very low (1 to 2 cents), but their demand costs are high. The biomass plant will be a baseload plant, meaning that it will provide a steady baseload output to the utility. Other power plants will provide the peaking loads — typically gas turbines. So natural gas prices will tend to affect industrial rates, but the biomass plant will tend to have less effect on industrial power costs. This will shift more of the cost of the biomass plant to the residential customer.

As shown in Figure 1, residential customers generate a greater share of the utility's total revenues (39.4%) than their share of power consumption (34.9%). It is just the opposite for industrial customers, which generate a greater share of consumption than revenue. This means that any increased power costs will tend to affect residential customers more.

Figure 1



A presentation by Austin Energy's General Manager in January of 2010 shows that the goal of increasing renewable energy sources to 35% by 2020 will increase residential rates by 22%, but commercial rates will only increase by 19.2% and

industrial rates by 11.7 percent.[4] The rate impact of the biomass plant for residential customers can be estimated based on applying these same relative rate impacts by customer class.

As determined previously, the biomass plant will result in an estimated 4.17% overall rate increase utility wide. Distributing this increase to each customer class based on AE's reported impacts of renewable energies, results in a greater share of the cost to the residential customer. The biomass plant will cause residential rates to increase 5.2%, commercial rates 4.5%, and industrial rates 2.8 percent.

A 5.2% increase in a typical monthly residential electric bill of $99.38 is an increase of $5.17 per month.[5] This cost increase is based only on the cost of purchasing the biomass power and does not include any additional overhead costs that may be added by the Utility.

In conclusion, the biomass plant is likely to increase residential power bills in Austin by about $5 per month. This estimate assumes that energy prices in 2012 (when the plant opens) will be similar to those in 2010. In future years, rising energy prices would tend to reduce the rate impact of the biomass plant.

Greenhouse Gases and Forest Biomass

Austin Energy (AE) has a goal of using 35% renewable energy sources by 2020.[6] The primary impetus for this goal is to reduce CO2 emissions based on the 2007 *Austin Climate Protection Plan*. AE has a target of reducing CO2 to 20% below the 2005 level by 2020. Presumably the biomass plant was approved based on the Utility's goal of reducing CO2 emissions. However, as described below, the biomass plant will not help the Utility achieve this goal.

Using biomass instead of fossil fuels to produce electricity holds the promise of reducing net CO2 emissions into the atmosphere that are contributing to climate change. However, not all biomass sources are the same in terms of CO2 impacts. Trees are unique in that they can continue growing and accumulating carbon for

[4] *Resource & Climate Protection Plan to 2020 Recommendations*, Plan and Update, by Roger Duncan, General Manager, Austin Energy, January 28, 2010, page 19.
[5] The monthly bill of $99.38 is for an Austin Energy residential customer using 1000 kWh in July 2010 and is based on information from the Public Utility Commission of Texas.
[6] *Austin Energy Resource, Generation, and Climate Protection Plan to 2020*, April 22, 2010

100 years or more. When trees are cut and used for biomass, the carbon that is released when the wood is burned is not captured again until the tree regrows to its former size. Depending on the size of the tree, regrowth may take 40 years or more.

The climate impact of the biomass plant also depends on whether the plant will be replacing an existing fossil-fueled plant or adding new generation capacity to the system. In the case of the AE biomass plant, the plant will increase the total generating capacity of the Utility and will not be replacing any existing fossil fuel-fired plant. As a result, the biomass plant is technically increasing the total CO2 emissions by AE.

In this case the biomass plant must be compared with the alternative of building a new fossil fuel-fired plant using coal, oil, or natural gas. In either case, the new plant will add to Austin's CO2 emissions. The remaining question is whether the biomass plant will add less CO2 than a new fossil fuel power plant?

Nacogdoches Power, LLC has said that the biomass plant "Uses a renewable fuel and results in roughly twice the greenhouse gas benefits of other types of renewable energy."[7] No substantiation is available from Nacogdoches Power or AE for this claim.

As a fuel source, wood releases more carbon than fossil fuels. Producing a unit of energy from forest biomass releases about 45% more CO2 into the atmosphere than coal, and three times more than natural gas. As a result, when trees are cut and burned for power generation they will release more carbon into the atmosphere than would fossil fuels. This carbon is gradually captured and stored by the next generation of trees over a period of many decades.

A study was conducted for the Massachusetts Department of Energy Resources in 2010 that evaluated the lifecycle carbon impacts of using forest biomass for power generation.[8] This study by the Manomet Center for Conservation Sciences may be the most comprehensive analysis on the topic to date. According to the Manomet study, a wood-fired biomass plant would initially release more CO2 than a new fossil-fuel powered plant. However, as the trees that are harvested for biomass are

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[7] Project Summary, 100 MW Biomass-fired Facility, Nacogdoches County, Texas, presentation slides by Nacogdoches Power, LLC, 8/15/08.
[8] *Biomass Sustainability and Carbon Policy Study*, June 10, 2010, by Manomet Center for Conservation Sciences for the Massachusetts Department of Energy Resources, http://www.manomet.org/node/322.

replanted, they begin to store carbon again. Each year more trees are harvested for biomass and more trees are replanted. Eventually the rate at which new trees are growing and sequestering carbon is great enough that it offsets the increased amount of carbon released by burning wood instead of fossil fuels. This is the point at which the biomass plant starts to produce less net CO2 than a fossil fuel-fired plant.

The Manomet study was based on burning wood biomass harvested from the forest. AE claims that the Nacogdoches biomass plant will be operated with "wood waste." The meaning of the term "wood waste" is somewhat misleading, as some of the potential wood sources already have markets, and are therefore not waste. For example, all wood from mill residues currently are sold for various purposes such as particle board, pulp and paper, garden mulch, and soil amendments. Diverting mill residues to biomass power production would create greater competition for this resource and could affect prices of other products in the same way that use of corn for biofuels affected global corn-based food prices.

To gain a better understanding of the sources of the biomass plant's fuel supply, a Public Information Request was filed with AE. Copies of the "fuel studies" cited by AE were requested along with a detailed breakdown of the fuel supply by source. AE declined to provide this information claiming it be a "competitive matter" exempt under the Texas Public Information Act. Without knowing the sources of the wood waste fueling the plant, it is impossible to accurately estimate CO2 impacts. The following analysis addresses a range of possible scenarios regarding CO2 impacts for this plant.

AE has stated that the biomass plant will use wood waste and will be "carbon neutral."[9] According to AE, the biomass plant will require one million tons of wood waste per year. Wood waste includes:

- Forest residue (thinnings/slash)
- Mill residue (reject lumber, end cuts, sawdust/shavings)
- Urban wood waste (clearing/trimming, pallets/packaging wood)

AE also states that "No virgin wood fiber, other than from storm debris, shall be collected or used in association with plant operations."[10] It is not clear what the

[9] *Nacogdoches Biomass Project*, Austin Energy Presentation to City Council, August 21, 2008, slide 6 (see: http://www.austinenergy.com/biomassProposalCityCouncilPresentation0808.pdf).
[10] Biomass Contract Amplifications, AE web site at http://www.austinenergy.com/about%20us/Company%20Profile/biomassContractAmplifications.htm

Utility means by "virgin wood fiber," since the thinnings and slash included under "wood waste" above would appear to fit into this category.

Forest wood waste, or "forest residue," appears to be the largest potential source of biomass for the power plant. Studies by the Texas Forest Service indicate that the potential supplies of forest biomass state-wide are sufficient for the proposed biomass plant.[11] The second largest biomass source, mill residue, already has established markets and it is not clear whether this will be a cost-effective fuel source. Urban wood waste resources are assumed to be relatively small, though no estimate of the size of the potential urban wood waste resource was available. If the biomass plant is operated primarily with forest wood waste, then the findings of the Manomet study would apply to the CO2 impacts.

Two scenarios are examined based on the assumption that the plant will use primarily forest wood waste.

Best-Case Scenario

If the biomass plant could be supplied with adequate quantities of waste wood that would otherwise enter the landfill or decay naturally in the forest, then the power production process could eventually approach carbon neutrality.[12] However, if the plant is fueled by trees or forest biomass, then another dynamic applies and the biomass plant will release more carbon into the atmosphere than a fossil fuel-fired plant for many decades.

In the best-case scenario we assume the biomass plant's fuel could be limited to the tops and limbs of trees harvested for timber. This would not include the thinning or culling of live trees. Under this scenario, the wood waste would still produce more CO2 when burned than any fossil fuel source. However, when compared to a timber harvest where tops and limbs are left in the forest, the carbon impact from burning these trimmings is made up fairly quickly. According to the Manomet study, 68% of the carbon removed in this manner is replaced in 10 years. This indicates that the biomass plant could reach parity with a natural gas-fired power plant in about 10 years. After this point, biomass would have an increasing advantage over natural gas.

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[11] *Biomass from Logging Residue and Mill Residue in East Texas, 2008*, by Texas Forest Service, October 2009.

[12] There are energy requirements for the collection and transportation of wood waste to the plant that will prevent it from being fully carbon neutral under any scenario.

This best-case scenario does not achieve the Utility's goal of reducing CO2 emissions by 2020. Under this scenario, the biomass plant actually produces more CO2 than would a new natural gas-fired plant through 2022.

The best-case scenario seems unlikely for a number of reasons. First, AE has said that their "wood waste" will also include "thinnings." Thinnings typically include small diameter live tree that are removed to reduce competition and increase growth of timber trees. Second, the process of thinning may also include removal of cull trees that are either not of suitable grade for timber or of a non-commercial timber variety. This significantly changes the CO2 impact, as described below.

Worst-Case Scenario

According to AE, Texas House Bill 1090 "Biomass Power Generation & Revised Renewable Energy Requirements" provides the following definition:

> "Forest wood waste includes residual tops and limbs of trees, unused cull trees, pre-commercial thinnings, and wood or debris from noncommercial tree species, slash, or brush."[13]

This definition of waste wood is comparable to the assumptions used in the main scenario of the Manomet study. In this scenario forest land is harvested first for timber with a partial harvest that selects the largest diameter trees. Then a portion of the remaining trees are harvested for biomass. Most of the tops and limbs from the timber harvest and the biomass harvest are collected for biomass.

The Manomet study compares the relative CO2 impacts of this wood biomass with fossil fueled alternatives. Power generation with natural gas represents the lowest carbon impact of all the main fossil fuel sources and would be the most likely alternative fuel source for Austin Energy. The Manomet study finds that this biomass fuel scenario will initially generate significantly more CO2 than natural gas and will continue to generate more CO2 for the next 90 years before finally achieving parity with a natural gas power plant. After 90 years, the biomass plant will gradually begin to outperform the natural gas plant.

[13] *Nacogdoches Generating Facility/Austin Energy Talking Points*, provided by AE in response to a Public Information Request, file dated March 2011.

There are a number of problems with using biomass power plants that will not produce any carbon advantage over fossil fuels for 90 years. First, the life of the biomass plant is far less than 90 years and the AE power contract is only for 20 years. Second, the time horizon for addressing climate change is much shorter than 90 years. Greenhouse gases must be reduced quickly over the next 20 years to prevent large-scale climate changes. A new biomass power plant that will produce more CO2 than a natural gas plant for the next 90 years will be of no benefit to the immediate goal of reducing near-term carbon emission.

Environmental Impacts of Large-scale Forest Biomass Harvesting

Removal of forest biomass can impact the soil productivity through soil compaction by heavy equipment and by removal of organic matter that replenishes soil nutrients. These changes can reduce the productivity of the forest by 15% with the first harvest.[14] Any forest practice that results in a measurable decline in forest productivity is not a sustainable activity. If forest biomass harvesting practices are allowed to degrade forest soils and reduce productivity, this raises questions about whether this truly constitutes a renewable resource.

Due to the potential adverse impacts of large-scale forest biomass collection on the natural landscape and on soil productivity, forest diversity, and water quality, the Manomet study recommends additional safeguards be considered:

- Establish a transparent self-monitoring, self-reporting process for bioenergy facilities designed to foster sustainable wood procurement practices.
- Require bioenergy facilities to purchase wood from forests with approved forest management plans.
- Require bioenergy facilities to submit wood supply impact assessments.
- Establish formal criteria for approval of wood supply impact assessments—possible criteria might include limits on the amount of harvests relative to anticipated forest growth in the wood basket zone.

The study reports that other states and countries have recently adopted biomass harvesting guidelines to address these types of concerns, typically through new standards that ensure enough coarse woody debris is left on the ground, particularly

[14] Source: *Ten-Year Results from the North American Long-Term Soil Productivity Study in the Western Gulf Coastal Plain*, posted on the AE Website at http://www.austinenergy.com/tenYearSoilStudy.pdf.

at nutrient poor sites, to ensure continued soil productivity and enough standing dead wildlife trees remain to promote biodiversity.

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