



Subject: Renewable Generating Technologies

Date: November 17, 2009

Contact: Philip Allison, (504) 840-2599

Background:

The Louisiana Public Service Commission is considering adopting a renewable portfolio standard that would require Entergy Louisiana, LLC and Entergy Gulf States Louisiana, L.L.C. to obtain a certain percentage of their power from renewable resources.

Electricity from renewable resources can include onshore and offshore wind power, biomass, solar power, hydrokinetic power, power from waste heat recovery, and the use of mill, crop, forest and timber residues to produce electricity.

While the Entergy utilities support the increased development and use of renewable resources, the companies are also obligated to seek the most economic sources of electricity for their customers. There are several renewable technologies in our state that appear promising and deserve more exploration and analysis. However, a premature Renewable Portfolio Standard (RPS) that requires Louisiana utilities to purchase a certain percentage of uneconomic electricity generated by renewable resources could drive up costs for customers. An RPS could also have the unintended effect of taking economical options off the table by picking technology winners and losers.

In addition, federal climate-change legislation may include a national RPS that may define renewables, and include or exclude resources. It could be potentially costly for the commission to implement a mandatory RPS before a national RPS is enacted and Louisiana utilities are mandated to comply with the requirements.

Key Messages:

- Entergy is looking at all available technologies and will continue to do so given how fast those technologies are changing. Many renewable technologies are simply too expensive at this point in time and would lead to higher bills for our customers if we were to make significant investments in those technologies.
- As regulated utilities, Entergy Louisiana and Entergy Gulf States Louisiana are obligated to seek the most economic sources of electricity for their customers. Fuel costs and power purchased from the market are passed on to customers, dollar-for-dollar. That means that customers are responsible for any additional costs that might arise from the generation of electricity from more expensive, renewable sources.
- When looking at potential new generating resources, the companies must consider all costs associated with the construction, ownership and maintenance of new resources as well as the costs associated with long-term purchased power agreements – not just the cost of the potential fuel source.

Renewable Generating Technologies

Feb. 12, 2010

Page 2 of 5

- To put a potential renewable portfolio standard into perspective, consider what it would take to replace Entergy Louisiana's largest source of emission-free power. To replace the amount of power that is generated by the Waterford 3 nuclear power plant (approx. 1,100 megawatts), you would need more than 64 million 2-foot by 4-foot solar panels. If you placed that many solar panels end-to-end, they would circle the earth twice.
- Entergy supports a voluntary clean energy program that is goals-based with realistic objectives and appropriate incentives for utilities to meet those objectives.

Entergy is one of the cleanest utilities in the U.S. and supports the increased development and use of economical renewable energy technologies.

- On an emissions-per-megawatt-produced basis, Entergy is one of the cleanest utilities in the U.S. and has received national recognition for its commitment to the environment.
- Entergy is active in the development and use of renewable energy. Entergy partnered with the city of New Orleans to install a 28-kilowatt rooftop solar system on the Warren Easton Senior High School. Entergy has also participated in the development and co-owns two wind power projects; one in Texas and one in Iowa. The Louisiana companies offer customers an opportunity to buy green power through their Geaux Green program.
- In 2001, Entergy partnered with Environmental Defense and became the first domestic utility to voluntarily enact a five-year plan to reduce greenhouse gas emissions to 2000 levels. Entergy beat the original target by 23 percent while still increasing sales 21 percent during the same period. In 2006, Entergy made a second commitment to stabilize CO₂ emissions from its power plants and controllable purchased power at 20 percent below 2000 levels through 2010.
- In September 2009, the Carbon Disclosure Project named Entergy Corporation to the Carbon Disclosure Leadership Index for the company's approach to climate change. It marks the sixth consecutive year the CDP has commended Entergy for its corporate governance with respect to carbon disclosure practices.
- Also in September 2009, the Dow Jones Sustainability Index named Entergy Corporation to their exclusive World Index and North American Index for 2009-2010. Entergy was one of only two U.S. utility companies selected to the world index.

Several renewable technologies in Louisiana appear promising and deserve more exploration and analysis.

- There are several alternative energy sources that appear promising for Louisiana, including biomass, waste heat recovery, combined heat and power and energy efficiency.
- Various types of biomass that can be used as potential fuel sources appear to be plentiful in Louisiana. Entergy Louisiana and Entergy Gulf States Louisiana currently buy electricity from two different facilities that generate power from rice hulls and sugar cane bagasse.

Renewable Generating Technologies

Feb. 12, 2010

Page 3 of 5

- Waste heat technology is a mature technology and many available sites are located in the state. Although there could be various challenges involved with negotiating mutually agreeable commercial terms with a project host, it has a lower technology risk.
- Combined heat and power (CHP) technologies are proven and mature, and a potential resource at industrial sites, which are numerous within the state.
- Energy efficiency may prove to be the lowest reasonable cost approach to a mandated RPS by offsetting some portion of the requirement to purchase more expensive renewable energy. The commission recently opened a new rulemaking docket on energy efficiency.
- Although there are promising technologies in Louisiana, there are practical limits to how much energy these sources can provide. This is especially relevant for Entergy's Louisiana utilities, since nearly 40 percent of the companies' electric load is consumed by large industrial customers.

Some technologies are either too costly or too immature from a technology development perspective to be realistic alternatives within the next five to 10 years in Louisiana.

Solar power

- Solar energy resources are more limited in Louisiana than they are in other areas of the country such as the southwest due to the amount of cloud cover that impacts the amount of solar energy received by an area.
- Solar power is intermittent, making it less available to meet real-time customer load requirements. If solar technology was widely used, utilities would have to begin planning for back-up resources to compensate for the intermittent availability of power, increasing the cost of the resource.

Wind power

- Although onshore wind power is viable in some regions of the U.S., there is little to no debate that onshore wind resources are non-existent in Louisiana. Entergy Corporation has actively participated in onshore wind energy and co-owns 80 megawatt wind facilities in Texas and Iowa.
- Wind, by its nature, is intermittent and can not necessarily be relied on by utilities to meet customer load requirements. That means that to use wind generation, a utility must have access to another source of power to supply electricity when the wind generation fails to produce. The costs of this additional generation must be included in any calculation of the economics of wind power.
- For offshore wind generation, the marine environment can be harsh. Based on experience with European offshore wind units, when those units break down or otherwise malfunction, it is difficult and costly to reach them for repairs.
- Another factor to consider when looking at wind power is that the wind quality near the shore, in terms of its ability to generate power, is fair at best. Utilities would have to make significant investments in transmission to deliver the power from offshore wind generation to load centers. For example, the distance between areas where offshore winds appear to reach the "Good" level and Houma and Morgan City are about 70 to 80 miles.

Renewable Generating Technologies

Feb. 12, 2010

Page 4 of 5

- As an example of the high costs associated with delivering offshore power to the coast, a recent Associated Press article on a proposed 30-mile undersea cable to be constructed between the islands of Maui and Oahu in Hawaii to move wind power has been estimated at anywhere between \$600 million to \$2 billion. This wide potential cost range illustrates just how unknown the actual cost is to interconnect an offshore wind project. (*Hawaii plans undersea power cable*, Associated Press, Oct. 30, 2009)
- One major area of concern for development of an offshore wind project is whether or not the turbine and related infrastructure are insurable from a catastrophic event such as a hurricane. Since Hurricane Andrew in 1992, property insurers have been unwilling to insure elevated, land-based utility structures such as transmission towers and lines. It is possible, if not probable, that insurers would be equally unwilling to insure elevated offshore wind turbines. In the event that these structures prove to be uninsurable, developers will be less willing or able to finance the projects.
- Based on a report authored by the U.S. Offshore Wind Collaborative, estimates based on the limited data from completed offshore wind projects suggest that a fully-installed offshore wind system would cost as much as \$4,600 per kilowatt compared with \$2,400 per kilowatt for an onshore system.

Hydrokinetic power

- Hydrokinetic power is a renewable resource that uses the natural current of a body of water to spin an underwater turbine to make electricity.
- Hydrokinetic power encounters many of the same challenges as offshore wind power – the technology is still in the development stage and is subject to significant uncertainty with regard to capital and operating costs, performance and reliability.
- There are numerous rural areas in Louisiana where it would seem theoretically possible to install a hydrokinetic project. However, in some of these areas there is little to no existing electrical infrastructure to tie in to. This means that the costs of adding the electrical infrastructure would need to be considered in any analysis of hydrokinetic power.
- To suggest that there will be tens of thousands of hydrokinetic turbines installed in Louisiana waterways over the next seven to 10 years ignores the numerous obstacles that must be overcome for this technology to develop. As a point of reference, it has taken the land-based wind industry nearly 30 years to reach the point where the technology is proven, the equipment is reliable and the capital and operating costs are well understood.

Mill, forest, timber and crop residues

- Using mill, forest, timber and crop residues as renewable resources would need to factor in adequate supply, storage and transportation of the materials.
- An additional challenge with using crop residues as a fuel source is that harvesting is seasonal in nature. This would require a generating facility to receive all of its fuel over a short period of time and store it in bulk in order to use it throughout the year

A renewable portfolio standard in Louisiana, which some argue is necessary to stimulate new technologies that will lower greenhouse gases, will in reality do little to reduce CO₂ emissions.

- Coal-fired plants produce more than 83 percent of the U.S. electrical sector's CO₂ emissions. However, because coal is generally cheaper than natural gas, it is the least likely fuel to be displaced by new technologies. In contrast, natural gas has a relatively low CO₂ content but is likely to be the first fuel source displaced by renewable technologies because of its higher cost.
- That means that a renewable portfolio standard would theoretically help bring alternative generation on line but at the expense of relatively clean-burning natural gas plants. Coal-fired plants would still be in use because of their relatively low cost.
- Most importantly, an RPS would not help develop the technology that is most urgently needed to address climate change: capturing CO₂ emissions from existing coal plants, which generate more than half of all electricity in the U.S. and a significant portion of electricity in Louisiana.

A mandatory RPS could force utilities to implement uneconomic renewable projects and increase electricity costs for the customers who can least afford it.

- The Entergy service territories in Louisiana are home to a large number of low-income and fixed income households. The potential cost increases that would be the result of an RPS would be unduly born by those residents of Louisiana who could least afford it.
- Some assessments of an RPS include the use of production tax credits as a way to reduce costs associated with renewable technologies. In reality, most of the existing production tax credits are set to expire before many, if any, renewable resources can be built.
- Proponents of a renewable portfolio standard contend that an RPS will create new jobs and foster economic growth. In an area of energy-intensive industries, increases in the cost of energy can have a significant impact on the region's economics and the continued operation of facilities. Any consideration of the potential jobs created through the implementation of an RPS should also take into account the existing jobs that would be lost through the RPS' implementation.

Customers have historically been unwilling to pay a premium for electric service.

- In partnership with the LPSC, Entergy Louisiana and Entergy Gulf States Louisiana are currently offering a green pricing tariff through the Geaux Green program.
- The Geaux Green program allows those customers who so choose the opportunity to purchase blocks of power generated from renewable resources – in this case rice hulls or sugar cane bagasse – for a small premium of \$2.50 per 100 kilowatt hours.
- After several years of marketing, approximately 530 of the companies' more than 1 million customers have signed up for the Geaux Green program. Those 530 customers represent less than 0.06 percent of the companies' combined customer base. The low participation may indicate that the vast majority of Louisiana customers are unwilling to pay a premium for electric service.