



## Bioenergy in the Southeast: Current and past policies driving markets

**INTRODUCTION.** Research and development on alternative sources of energy has been a priority for the United States since volatile energy prices in the 1970's. This period of time, known as the "Energy Crisis," occurred due to an oil embargo and limited global supply of oil. To combat these problems, Congress passed the Emergency Petroleum Act in 1973, the Energy Policy and Conservation Act in 1975, and created the Department of Energy in 1977. These congressional acts from more than 30 years ago were the beginnings of a national interest towards developing alternative energy sources. The outcome has been support for research and development of non-petroleum energy sources such as biomass, which is a renewable and carbon neutral source of energy used for heat, electricity and transportation fuels.

Utilizing biomass provides significant benefits for reducing atmospheric carbon, by offsetting greenhouse gas emissions from fossil fuel combustion as carbon emitted from bioenergy is re-absorbed by growing trees and plants. **Greenhouse gas** (GHG) emissions are gases (carbon dioxide and water vapor) that absorb radiant energy from the earth, re-emitting it as infrared radiation, and contributing to the warming of the earth. A sustainable bioenergy industry would absorb some atmospheric carbon through carbon sequestration (long-term storage of carbon) in the terrestrial biosphere or underground while biomass feedstocks were growing. The bioenergy industry also creates local economies and it has been shown that biofuel refineries that produce ethanol in the Midwest generate state tax revenue where the majority of every dollar spent on production stays within

that state or region. The emergence of bioenergy facilities either for power or fuel also creates new market opportunities for items once considered a waste such as logging or agricultural residues.

State, federal and international policies significantly influence development of the biofuels industry. Different policies such as tax incentives, subsidies, renewable fuel standards, and energy mandates have an impact on how bioenergy will compete in the marketplace. Additionally, federal policies influence the research

**BIOENERGY** is a term used to describe the energy produced from biomass that will be used to produce electricity or heat or transportation fuels.

**BIOMASS** can be defined as any organic matter including forest and mill residues, agricultural crops and wastes, wood and wood wastes, animal wastes, livestock operation residues, aquatic plants, and municipal and industrial wastes.

**FEEDSTOCK** is simply a raw material used for the generation of energy or products produced from the manufacture of something else (byproduct).

**BIOFUELS** refer to fuel derived from biomass or their processing and conversion derivatives that are used within the transportation sector and are either in a liquid, solid, or gaseous state.



#### FIRST GENERATION BIOFUELS

- corn feedstocks derived to produce ethanol
- consumed as E10 in the US, 10% ethanol / 90% gasoline blend
- soybean feedstocks used to produce biodiesel
- blend of up to 5% biodiesel in diesel fuel



#### SECOND GENERATION BIOFUELS OR ADVANCED BIOFUELS

- cellulosic feedstocks (crops that don't produce food)
- examples: sorghum, switchgrass, miscanthus, wood
- research underway to produce cost competitive 2nd generation biofuels

dollars which may go towards supporting the bioenergy industry. Therefore, in order to better understand the bioenergy industry, it is necessary to understand the policies which influence it. The following is a synopsis of federal, state and foreign policies that may influence biomass and bioenergy production. The reader is encouraged to review these policies to ensure they are still the most current.

## Federal Policy

### CARBON POLLUTION EMISSION GUIDELINES FOR EXISTING STATIONARY SOURCES: ELECTRICITY GENERATING UNITS

## 1970's Energy Crisis Policy Impacts

#### EMERGENCY PETROLEUM ACT [1973]

*This Act provided temporary authority for the president to allocate fossil fuel resources in the event of an existing or imminent fuel shortage or interruption within the distribution system in order to protect the public health, safety, and welfare of citizens. This act also led the way for other energy policies.*

#### ENERGY POLICY & CONSERVATION ACT [1975]

*This comprehensive Act most notably created energy conservation programs, mandated fuel efficiency standards for the transportation sector, and authorized the creation of a strategic petroleum reserve.*

#### UNITED STATES DEPARTMENT OF ENERGY [1977]

*Congress created this department which brought together most Federal energy activities together such as the Federal Energy Administration, the Energy Research Development Administration, and the Federal Energy Regulatory Commission.*

**“CLEAN POWER PLAN”** Under the authority of the Clean Air Act (Section 111d) the Environmental Protection Agency (EPA) on June 2, 2014 announced a rule to regulate greenhouse gas emissions from existing fossil fuel fired electricity facilities known as the Clean Power Plan. The plan calls for a 32% reduction of carbon dioxide levels by 2030, based on 2005 carbon dioxide levels. It is expected that renewable power sources will be widely used to reach these emission reductions. Converting coal power plants to burn 100% biomass or a percentage of biomass with coal, also known as cofiring, has been popular for utilities since the 1990s. That was when utility companies began looking for projects that require little capital investment for aging coal plants and when the first demonstration projects were being implemented

across the United States.

**RENEWABLE FUEL STANDARD [RFS1 & RFS2]** The **Renewable Fuel Standard**<sup>1</sup> (RFS1) policy, under the **Energy Policy Act** (EPA) in 2005, was adopted to facilitate domestic fuel production from renewable feedstocks to improve energy security, create rural jobs, and reduce greenhouse gas emissions. The RFS1 required that a minimum of 4 billion gallons of renewable fuels be used in 2006, rising to 7.5 billion gallons in 2012<sup>2</sup>. The RFS1 focused on conventional feedstocks such as corn-based ethanol and soybean-derived biodiesel and emphasized developing a cellulosic-based fuel industry through the assistance of research on feedstock development, logistics, and project development. Two years later, the Energy Independence and Security Act (EISA 2007) was passed and the Renewable Fuel Standard was altered to focus more on second generation or **advanced biofuels** and a 15 billion-gallon cap was placed on corn derived ethanol. The revised Renewable Fuel Standard commonly referred to as the “RFS2” requires that annual renewable fuel volume targets steadily increase to an overall level of 36 billion gallons by 2022 with at least 16 billion gallons being derived from cellulosic biofuels

*Miscanthus, sorghum, and switchgrass are examples of feedstocks that are commonly referred to as **SECOND GENERATION OR ADVANCED BIOFUELS** because they are grown specifically for their fuel value. **WOODY BIOMASS** is a term used to describe trees and woody plants, including limbs, tops, needles, leaves, and other woody parts, grown in a forest, woodland, or rangeland environment that are the byproducts of proper forest management. When trees are specifically grown for fuel value they are referred to as **SHORT ROTATION WOODY CROPS**. These are examples of second generation or advanced biofuels feedstocks.*

**The Renewable Fuel Standard, 36 Billion Gallons (BG) by 2022**

**1. Conventional Fuels = 15 BG**

20%+ Lifecycle GHG reduction  
Example: corn based ethanol

**2. Advanced Biofuels = 21 BG**

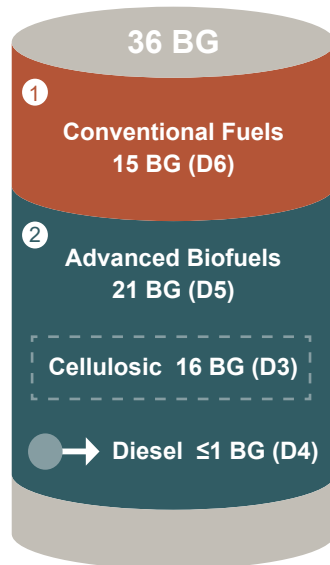
50%+ Lifecycle GHG reduction  
EPA approved feedstocks such as sugarcane ethanol, grain sorghum, and algae

**- Cellulosic = 16BG**

60%+ Lifecycle GHG reduction  
Examples: lingo-cellulose feedstocks such as switchgrass, miscanthus, woody biomass, and corn stover

**- Biomass Based Diesel ≤ 1 BG**

50%+ Lifecycle GHG reduction  
Examples: camelina, biogenic waste/oils/fats/greases and oil from annual cover crops



and up to 1 billion gallons from biomass based diesel.

The Environmental Protection Agency (EPA) calculates the percentage-based standard for the approaching year for cellulosic biofuel, biomass based diesel, and advanced biofuel. The RFS2 requires advanced biofuels to be derived from sustainable feedstocks such as sorghum, switchgrass, and woody biomass. Biofuel facilities using feedstocks that meet EPA’s approved lifecycle greenhouse gas (GHG) profiles are required to receive an approved *renewable fuel pathway before fuel production can take place*<sup>3</sup>. After receiving approval the EPA assigns a category based on the feedstock(s) used to produce the fuel. Cellulosic advanced biofuels are classified as D3, advanced biomass based diesel biofuels are classified as D4, advanced biofuels which include D3 and D4 are classified as D5, and conventional biofuels are classified as D6.

A **lifecycle GHG analysis** determines the total amount of greenhouse gas emissions related to the full lifecycle of the feedstock from the field to the final fuel component or sometimes referred to as “from the cradle to grave.” An approved renewable fuel pathway identifies the feedstock, the technology used to convert the renewable biomass into fuel, and the fuel type, and category. Fuel type examples include ethanol, biodiesel, cellulosic diesel and

<sup>1</sup><http://www.epa.gov/otaq/fuels/renewablefuels/index.htm>

<sup>2</sup>The corn ethanol industry well exceeded the 2012 final benchmark by producing 13.9 billion gallons of ethanol in 2011.

<sup>3</sup><http://www.epa.gov/otaq/fuels/renewablefuels/new-pathways/approved-pathways.htm>



## 1970's Energy Crisis Policy Impacts

### BIOMASS CROP ASSISTANCE PROGRAM (BCAP)

*Incentives to help owners and operators of agriculture and non-industrial private forestland grow advanced bioenergy feedstocks for energy production.*

### BIOMASS RESEARCH & DEVELOPMENT INITIATIVE (BRDI)

*A partnership between the DOE and USDA to fund projects that focus on feedstock development, biofuels and biobased products development, and biofuels and biobased products development analysis.*

### BIOREFINERY ASSISTANCE PROGRAM

*Loan guarantees awarded for the development and construction or the retrofitting of a commercial-scale biorefinery using applicable technology to produce biofuels or biobased products.*

### RURAL ENERGY FOR AMERICA PROGRAM (REAP)

*Loans and grants are provided to farmers and rural businesses to promote renewable energy development and energy efficiency.*

### BIOPREFERRED PROGRAM

*Program to promote the purchase of biobased products from federal government purchasing agents and to provide a voluntary labeling initiative so consumers are able to identify products that meet the requirements of*

compressed natural gas and electricity from renewable biomass.

**FARM BILL.** The first Farm Bill, the Agricultural Adjustment Act of 1933, originated during the Great Depression and has undergone many changes throughout the decades. The bill originally provided farm aid to help our nation's farmers address issues such as soil erosion, super-low level commodity prices, national hunger, inequitable export practices, lack of credit, and other issues in order to control and ensure an adequate food and fiber supply. In 1938, a more permanent farm bill known as the Agricultural Adjustment Act was passed with a built-in requirement to update it every five years. This requirement has allowed for the farm bill to address current agricultural interests and other programs such as disaster assistance programs, trade and foreign agriculture, rural development, research, conservation, renewable energy & energy efficiency, forestry, nutrition, commodity futures, and trade & taxes. Over the years, other programs have been added or removed, depending on the congress in session.

The first farm bill to address renewable energy and energy efficiency was the Food, Conservation, and Energy Act of 2008. This farm bill aimed to strengthen and develop a viable bioenergy industry. Programs created for this purpose under the 2008 farm bill included the Biomass Crop Assistance Program<sup>4</sup> (BCAP), Biomass Research & Development Initiative<sup>5</sup> (BRDI), Biorefinery Assistance Program<sup>6</sup>, and the Rural Energy for America Program<sup>7</sup> (REAP). The 2014 farm bill known as the Agricultural Act has set its priorities on reforming agricultural policy, reducing the deficit, and growing the economy. This new bill reauthorized the energy programs from the 2008 Farm Bill, expanded the Biorefinery

<sup>4</sup>Provides payments to producers that establish energy crops on marginal lands near biomass energy conversion facilities.

<sup>5</sup>Provides competitive grants for research and development and pilot projects that help the biofuels industry reach the commercialization stage.

<sup>6</sup>Provides loan guarantees to develop new or retrofitted advanced biorefineries

<sup>7</sup>A program to create local biomass energy markets and supply chains to provide heat and power for rural business, agricultural producers, and communities. Other programs include: Community Wood Energy Program and Forest for Biomass Energy Program.

**NC RENEWABLE ENERGY PORTFOLIO STANDARD & STRATEGIC PLAN FOR LEADERSHIP** *In an effort to promote more renewable energy generation, the North Carolina General Assembly adopted Session Law 2007-397 (Senate Bill 3<sup>1</sup>), known as the Renewable Energy & Energy Efficiency Portfolio Standard (REPS). The REPS requires that 12.5% of North Carolina electric retail sales from investor owned utilities by 2021 and beyond be acquired from renewable energy sources or energy efficiency measures. Rural electric cooperatives and municipal suppliers are subject to a 10% REPS requirement.*

Assistance Program to include biobased products and renewable chemicals. The 2014 Farm Bill also expanded the original BioPreferred Program (Farm Bill 2002) to include forestry products.

### State Policies

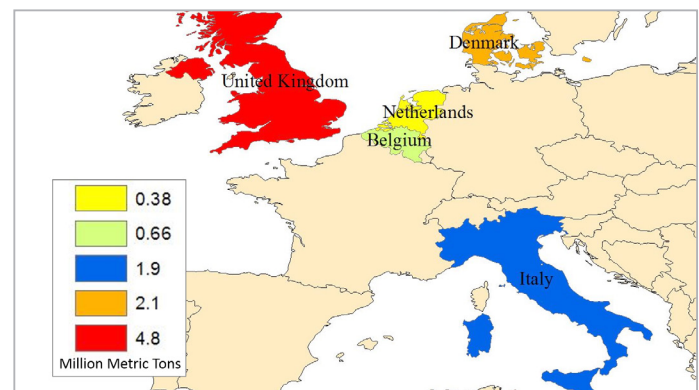
As of this time North Carolina<sup>8</sup> is the only southeastern state to have a renewable energy portfolio standard that requires utility companies to have a percentage of their portfolio come from renewable energy. Renewable energy incentives and policies vary from state to state but most states offer sales tax incentives, corporate tax credits, rebates and loan programs, and other incentives focused on specific renewables or efficiency measures. The Database of State Incentives for Renewables & Efficiency (DSIRE) allows the user to search for state specific incentives for the whole United States.

### Foreign Policies

**20/20/20.** Foreign interest in woody biomass feedstocks from Europe is a result of the European Union's (EU) commitment to reach greenhouse gases (GHG) reduction goals outlined in the Kyoto Protocol<sup>9</sup>. The only foreign policy that has had an influence on developing bioenergy export markets in the southeastern United States is the "20/20/20" goal that is part of the European Union (EU) Energy and Climate Change Package (CCP). The EU's '20-20-20' strategy adopted in 2007 requires a 20% reduction in GHG emissions by replacing 20% of fossil fuels with renewables and 20%

energy efficiency improvement for the European countries by 2020. European Union countries such as England, Denmark, Belgium, and Italy are importing wood pellets from North America, the Baltic States<sup>10</sup>, and Russia to use for industrial and residential heating to offset greenhouse gas emissions. The amount imported by member states of the EU is expected to increase significantly. There is also an increasing demand from Asian countries that will have an impact on the global trade of pellets.

### European Union countries that imported pellets from North America, the Baltic States, and Russia in 2014



**CONCLUSION.** Federal, State, and Foreign policies will continue to drive research and create new technologies that utilize biomass feedstocks. As history has shown over the past fifty years a global energy market will continue to be subject to price volatility, production shortages, and other uncertainties that will impact our energy needs. Diversifying our energy mix allows for innovation, efficiencies, and stability. A sustainable bioenergy industry creates rural jobs, reduces greenhouse gas emissions, enables energy security and creates new markets for products

<sup>8</sup>NC General Assembly: <http://www.ncga.state.nc.us/gascripts/billlookup/billlookup.pl?Session=2007&BillID=S3>

<sup>9</sup>An agreement that was reached at the United Nations Conference on Climate Change in Kyoto, Japan, in 1997.

<sup>10</sup>Estonia, Latvia, and Lithuania. Northern European countries located on the eastern coast of the Baltic Sea

## REFERENCES

that were once considered a waste.

Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electricity Generating Units, Federal Register 79 (18 June 2014): 34830-34958. Print.

Earley, Jane, and Alice McKeown. Red, White, and Green: Transforming U.S. Biofuels. Washington, DC: Worldwatch Institute, 2009. Print.

Grossman, Peter Z. U.S. Energy Policy and the Pursuit of Failure. West Nyack, NY, USA: Cambridge University Press, 2013. ProQuest ebrary. Web. 19 June 2015.

Gupta, Ram B., and Ayhan Demirbas. Gasoline, Diesel and Ethanol Biofuels from Grasses and Plants. New York: Cambridge University Press, 2010. Print.

Kole, Chittaranjan, Chandrashekhar P. Joshi, & David R. Shonnard. Handbook of Bioenergy Crop Plants. Boca Raton: CRC Press, 2012. Print.

Mousdale, David M. Biofuels: Biotechnology, Chemistry, and Sustainable Development. Boca Raton: CRC Press, 2008. Print.

Rosillo-Calle, Groot, et al. The Biomass Assessment Handbook: Bioenergy for a Sustainable Environment. London: Earthscan, 2007. Print.

Seifried, Dieter, and Walter Witzel. Renewable Energy the Facts. London: Earthscan, 2010. Print.

Walker, Seth. RISI. Personal Interview. 25 June 2015.

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