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Differing Perspectives of Biomass Energy in New York State: Comparing Newspaper and Website Biomass Communications

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by

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Abstract

For energy technologies such as biomass energy, an area concentrated on the alternative creation of energy through the use of organic matter such as wood, mass media and other online sources work to frame public perceptions of our energy system. In addition to being sources of information, they also serve as a space for public discourse. Two such sources for information that frame the implementation and study of biomass are newspaper reporting and online information through proponent websites. In this study we collected biomass proponent websites and biomass themed articles in four newspapers located near New York biomass research sites. To examine how biomass technology is framed for public readership in the state, we analyzed text using the socio-political evaluation of energy development (SPEED) framework, coding the materials to determine the tone of the materials as well as presence or absence of the following categories: technological, political, environmental, economic, aesthetic, health/safety and legal benefits and drawbacks. We found that newspaper and proponent websites vary in their content on biomass technologies, with newspaper articles generally putting more emphasis on economic aspects of the technology, and biomass industry websites putting more emphasis on environmental aspects. With this, we found that the aesthetic, legal and health/safety categories were minimal or nonexistent throughout all content. While there was a noted difference in the present categories of websites and news articles, we found that both were mostly positive in tone. Though this is true, the proponent websites were overwhelmingly positive with no negative aspects given.

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Acknowledgements

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Introduction

Biomass Energy

Over the course of civilization, biomass energy, or energy production utilizing plant materials, has been the main source of energy production. Traditionally, wood, a form of biomass, has been burned to provide heat. Though the use of traditional biomass energy has declined in the developed world since the industrial revolution, as energy from fossil fuel sources became more predominant, the last quarter century has brought about renewed research and development of modern biomass. Modern biomass energy not only utilizes the organic matter from plants as in the past, but also residue from agriculture and forestry, as well as organic components of municipal and industrial wastes (U.S. Department of Energy, 2013).

As newer technologies are developed to create more efficient biomass energy, more areas are utilizing the technology on individual and municipal levels. In 2007, 53 percent of all renewable energy consumed in the United States was biomass based (U.S. Department of Energy, 2013). Biomass technology is considered a sustainable energy source due to the renewable nature of the plants, though amounts of carbon dioxide and other gases are released during combustion (NYS Department of Environmental Conservation, 2014).

Currently, there are numerous forms of biomass energy utilized in the United States. These sources, called feedstocks, commonly include dedicated energy crops, agricultural crops, forestry residues, aquatic crops, biomass processing residues, municipal waste and animal waste. While fuel from agricultural crops, specifically corn ethanol, became heavily endorsed by the United States government in the early 21st

century, more attention has now turned to dedicated energy crops, which include herbaceous energy crops and short-rotation woody crops. Herbaceous energy crops including grasses such as switchgrass, miscanthus and sweet sorghum can be annually harvested after taking two or three years to mature. Comparatively, short-rotation woody crops are fast-growing hardwood trees, including hybrid willow, hybrid poplar and silver maple that can be harvested within five to eight years after planting (U.S. Department of Energy, 2013).

As the United States has continued development of biomass energy, New York State has followed suit, focusing in part on cellulosic production. The state has predominantly developed the production of biomass crops in unproductive and marginal farmland. With this, the state currently has more than 18.5 million acres of timberland dedicated to the generation of biomass crops (NYS Department of Environmental Conservation, 2014).

This increase in development of biomass technologies is linked to research and development of alternative energy sources within the last 30 years, specifically stemming from environmental issues. Increasing sharply after 1985, more Americans have expressed concern over the environment in opinion polls and by participating in voluntary organizations (Mazur & Lee, 1993). Biomass technology has become one part of the search for viable alternative energy sources throughout the United States.

Often drawn from media reporting, public perception of science technology determines acceptance and implementation on a commercial scale. This is also true in the case of biomass energy.

Role of Communication and Media

According to Stamm et al., in their paper "Mass communication and the public understanding of environmental problems," "communication, both mass and interpersonal, holds the key to improvement in public understanding of environmental problems" (2000, p. 219). They go onto explain that individual engagement and perception of environmental issues is generally greatly based on the receiving of communication messages through traditional and new media sources. Though the message receiver may require a certain level of understanding of science, or scientific literacy, exposure and attention to materials are the first steps to forming perception of messages.

Within both traditional and new media sources, sent messages affect public opinion, though it is often complex and difficult to demonstrate causation (Mazur & Lee, 1993). The main method of prescribing importance to a specific issue within media messages is through agenda setting, or "the placing of certain issues or problems foremost in the public mind simply by making them salient in news broadcasts or news publications" (Mazur & Lee, 1993, p. 682).

Newspapers specifically have a significant agenda setting effect on their readers (Benton & Frazier, 1976). By transferring detailed information to the public in a way that is salient to their readers' lives, newspapers not only relay information to the public, but mold public perceptions (Benton & Frazier, 1976; Zucker, 1978; Eyal, 1979). With this, a majority of audience members depend on mass media for knowledge and salience of environmental issues (Atwater, 1985). As mass media can also transfer detailed information about a single issue (Atwater, 1985), newspapers can generate information

sources on environmental issues, such as biomass energy, hence shaping public perceptions.

As new media sources are on the rise as a main source of communication throughout the globe, theory of information sending and its impacts on public perception can be applied to modern, digital mass media. With this, new media sources, such as websites, have characteristics that may help to form public perceptions across greater numbers of people. Through the wide-scale use of the Internet, more individuals have access to media sources and information than ever before, granted that the individuals have access to the technology, as well as the technological literacy necessary to utilize the equipment.

Access to information has dramatically increased with Internet access. With this increased access to current information, there is also increased access to archived information, as well as more ability to cover events or issues over a greater period of time. This is completely divergent from traditional media coverage, which has more stringent guidelines to create timely articles, causing episodic coverage (Stamm et al., 2000). While newspapers may be more useful at garnering information on a local level, new media sources, such as websites, provide information from one source that is more widespread in its impact.

Within traditional media sources, local newspapers and national news organizations continually rehash news segments, causing the nation to get very similar, uniform news (Mazur & Lee, 1993). New media sources often do the same, making some coverage similar no matter the origin of the message, whether it is on a local scale, from neighboring areas or produced nationally.

Finally, traditional media coverage is often focused on human interest and economic impacts, specifically to garner readership (Stamm et al., 2000). New media sources such as websites, however, can have a broader focus because there is more freedom in the type of information produced and viewpoints expressed. These different focuses stem from the communication goals and agendas of the individual or organization operating a website.

Theoretical Framework

Though both communication mediums in this overarching analysis differed in various ways (e.g., purpose of content and source type), the general analyses of newspapers and websites had similar foundational aspects. In both situations, we utilized a common theoretical framework in order to code the data. Use of Luhmann's theory of social functions tailored through the socio-political evaluation of energy deployment (SPEED) framework for both source types created a vehicle for comparison between communication mediums focused on and contributing to discourse on biomass energy.

In using this framework, we align with Luhmann's theory, which states that society can only utilize its common operational mode, communication, to respond to the environment accordingly and not directly to the environment (Feldpausch-Parker et al., 2013). In the case of our study, biomass-centered communications are seen as messages between major function systems in response to the environment. In the theory, Luhmann describes the major function systems as economy, law, science, politics, religion and education as most closely pertaining to science and technology (Feldpausch-Parker et al., 2013).

Building from this theory and tailoring it to energy systems, the SPEED framework offers the opportunity to use this framework in empirical study (Feldpausch-Parker et al., 2013). Focusing on emerging energy systems, the SPEED framework guided our analysis of social dimensions of the technology. In the SPEED framework, attention is placed on the risks and benefits through aesthetic, economic, environmental, health/safety, political/legal and technical functions. Use of this theoretical framework thus allows for the detection of driving social functions with openly public, New York State biomass communications.

Research Questions

During this study, we sought to address the following research questions:

- In what ways do newspaper coverage and proponent website content on biomass energy differ?
- What are the dominant tones and function systems of newspaper coverage?
- What are the dominant tones and function systems of proponent webpages?

Methods

Newspaper Analysis

In order to examine media coverage of biomass technology, we first looked at newspaper coverage to understand potential public perceptions on a local scale in New York State. We chose four counties known for abundant biomass activity as the focus for our analysis: Jefferson, Oneida, Lewis and Onondaga Counties. All study counties are located in close proximity to one another, in Central New York and Northern New York.

Four local newspapers from these counties were selected: the *Watertown Daily Times, The Observer-Dispatch, The Journal and Republican,* and *The Post-Standard,*. These newspapers represented the highest circulated newspaper in each county (Table 1). Newspaper articles were collected using the Access World News database.

Table 1

Local newspapers of the selected counties in New York State

County	**Newspaper**
Jefferson County	*Watertown Daily Times, The*
Oneida County	*Observer-Dispatch, The*
Lewis County	*Journal and Republican, The*
Onondaga County	*Post-Standard, The*

We focused our newspaper article search by using the following search terms: biomass, biofuel, bioenergy, switchgrass, miscanthus, willow, BCAP, cellulosic, Mascoma, Catalyst Renewables, Double A Willow, and Celtic Energy. The terms included a mixture of technical terms, biomass legislation and biomass industries in the chosen area. We used the start of the Biomass Crop Assistance Program, also known as BCAP, which was created as part of the Food, Conservation and Energy Act of 2008 to facilitate the development of non-food/feed crop biomass sources, as the starting point for our time frame: January 1, 2008 to September 30, 2013. As the search was conducted in September 2013, the collected articles date to that month and do not continue to the end of 2013.

After collecting all articles, we analyzed the data by type of article (article, letter, op-ed, editorial, feature), overall article tone (positive, negative, balanced, neutral) and

prevailing theme corresponding to the SPEED framework. Coding was based on the use of a codebook which served to guide our study (Appendix I).

Two coders were utilized for the analysis, to ensure inter-coder reliability. We each coded 10% of the collected articles separately, compared our results, discussed discrepancies until reached agreement and repeated this process with additional 10% of articles until inter-coder agreement achieved the required 85% and the minimum 0.7 for Krippendorff's Alpha. Once achieved, we continued analyzing the remaining articles individually.

Website Analysis

Continuing our study after our newspaper analysis, we then turned to collect data from industry websites. As the Internet continues to become a prominent source for information seeking and exposure, we collected text presented on webpages of New York State biomass proponents and those industry proponents in other states or located federally that included New York State interests. With the easy accessibility of information via the Internet, we believe that information posted by those outside New York State can directly or indirectly affect public perceptions of biomass in state.

To compile the data, we utilized the most prevalent search engine, Google, using search terms including: biomass, biomass industry, biomass industry in New York State, New York State biomass, and biomass conventions. With this, we also compiled data sources by following links on the Northeast Woody/Warm-season Biomass Consortium (NEWBio) website, a major partnership between the federal government, academic

institutions and research facilities in the biomass industry. The collected data included 27 different organizations and companies (Table 2)

Table 2

Proponent websites by location

New York State	New York State Biomass Energy Alliance NYSERDA – Biomass Research SUNY-ESF Willow/Woody Biomass at ESF Double A Willow Cornell University Biomass Conversion Lab Alliance for Clean Energy New York Catalyst Renewables Enviro Energy LLC InstantHeat Wood Pellets, Inc. Hudson Valley Grass Energy NY Biomass Trader
Other State	ReEnergy Holdings, LLC Biomass Power Association Northeast Biomass Thermal Working Group PA Biomass Energy Association Penn State Biomass Energy Center University of Vermont Grass Biomass Energy Alliance for Green Heat Rutgers Sustainable Energy Working Group NEWBio West Virginia University Woody Biomass
Federal	Biomass Thermal Energy Council The Pellet Fuels Institute Biomass Energy Resource Center Aloterra Energy Idaho National Laboratory USDA FSA Biomass Crop Assistance Program USDA ARS Regional Biomass Research Centers

When searching for websites, we collected a variety of webpages, including but not limited to home pages and about pages. Because of this, we analyzed the webpages by type of webpage (home, about, other). In addition to this, we analyzed the data by location of webpage owner/creator (New York State, other state, federal), type of website

owner/creator (for-profit organization, non-profit organization, academic institution, governmental organization), overall article tone (positive, negative, balanced, neutral) and prevailing theme corresponding to the SPEED framework. Within the analysis of webpage by location, we grouped together regional organizations and companies within the category of "other state" due to the fact that they were not federally located, nor were they only located in New York State. We utilized the codebook developed for the newspaper analysis, with slight adjustment for different characteristics (Appendix II). As this analysis was only conducted by a solitary coder, we did not check for inter-coder agreement.

Results

Newspaper Analysis

Through our search of newspaper articles, we collected a total of 182 articles, though after careful revision, only 104 of those articles were pertinent to our study of biomass communications. Within those 104 articles, the highest number of articles was collected from *The Watertown Daily Times* at 69 articles. Following this, the second largest amount came from Onondaga County's *The Post-Standard* with 24 articles. The last two newspapers, *The Observer-Dispatch* and *The Journal & Republican*, had six and five articles respectively (Figure 1). Around two thirds of all articles coded were from the *Watertown Daily Times*.

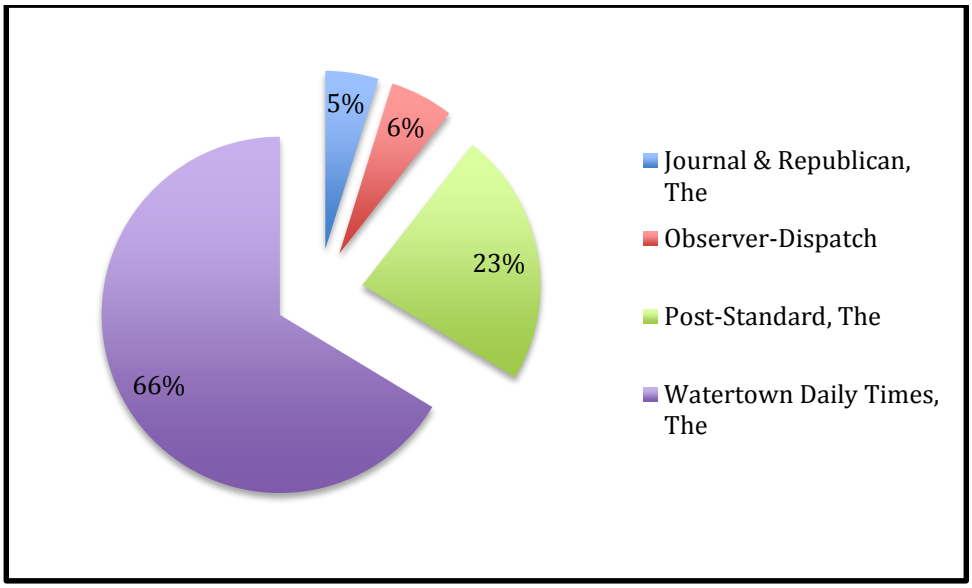

Figure 1. Percentage of articles by newspaper (n=104)

Article Publishing Years. With this difference in amount of articles from each newspaper, there was also a difference in the amount of articles per year. The time span, ranging from 2008 to 2013, saw fluctuations yearly. The year with the highest amount of articles, 2012, had 24 more articles than the lowest year, 2013, though collection of articles did not include that entire year, terminating in September (Figure 2).

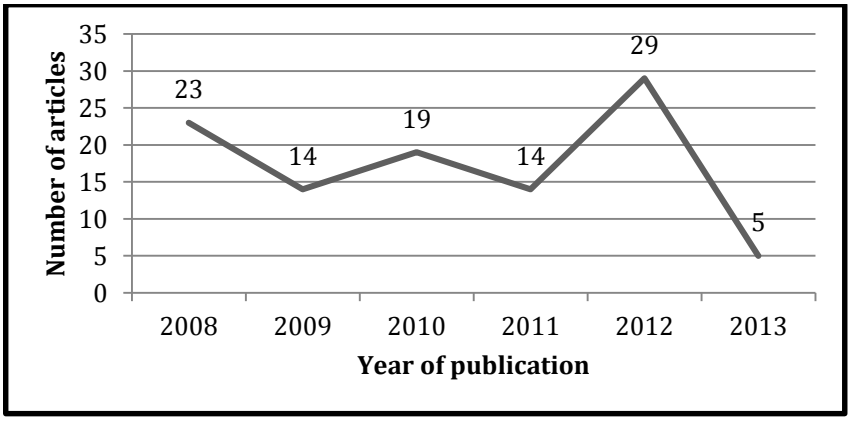

Figure 2. Number of articles by year for the combined four newspapers

Article Types. There was also a difference in the types of articles found among all the newspaper sources. The majority of articles were short news articles, which were 500

words or less and composed of traditional pyramid style news writing. Following this, features, those over 500 words and more subjective than articles, made up 23 percent of the collection. The rest collected were in vastly smaller amounts, with letters at five percent and editorials and op-eds both at two percent.

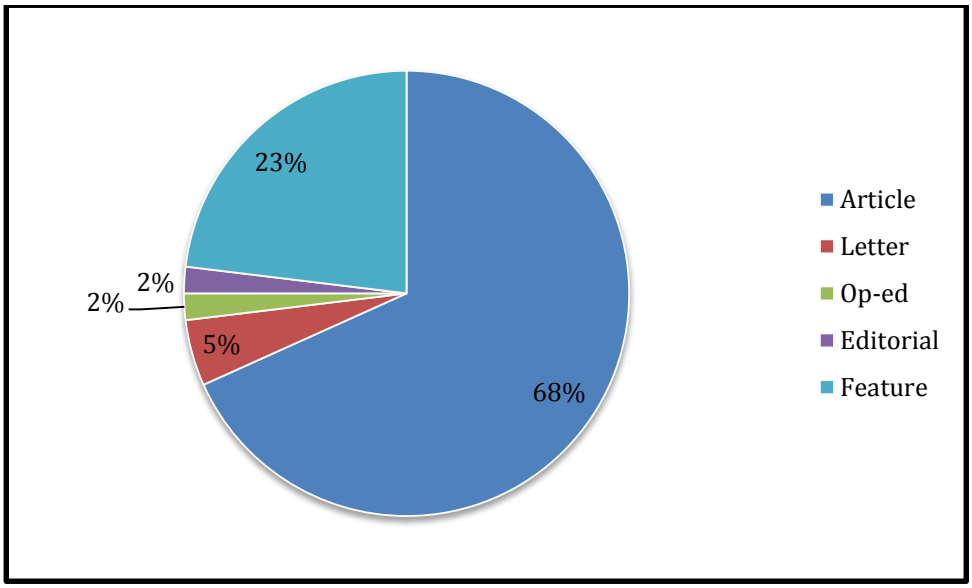

Figure 3. Distribution of articles by article type for the combined four newspapers,

Article Sections. Apart from the difference in types of newspaper articles, we also found that most collected articles were in local or regional news sections of each paper (77%). While nine articles were in business sections and six in opinion sections, the rest were in a sprinkling of sections, including but not limited to farm and garden, local editorial and agriculture. Three articles received did include information pertaining to their section when published.

Article Tone. As with the large majority of articles in one type of newspaper section, the vast majority of articles were positive in tone (72%). While 14% of articles

were coded as balanced, only a small number of articles were coded as neutral or negative, at seven articles in each category (Figure 4).

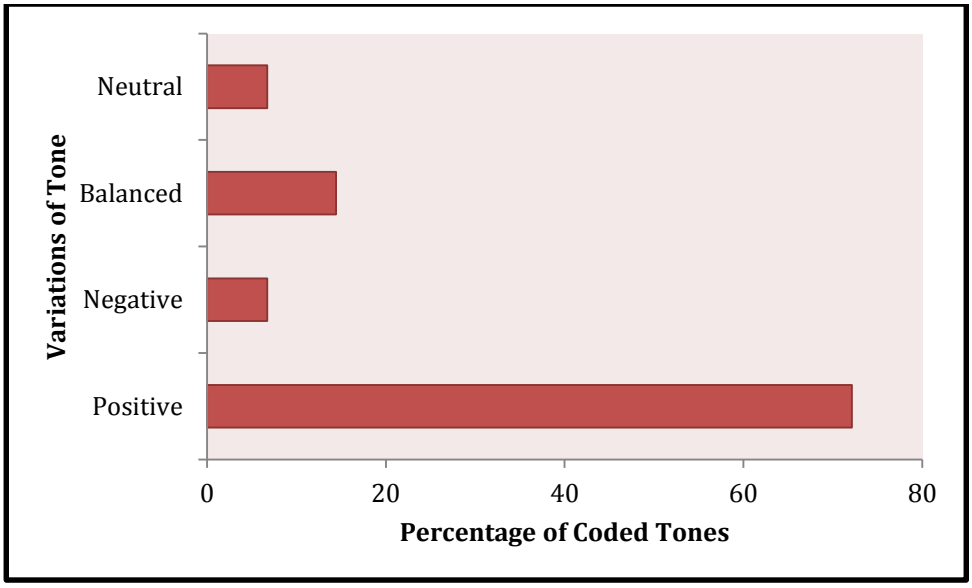

Figure 4. Tone of articles from the combined four newspapers.

Article Functioning Systems – Benefits and Risks. Along with coding for overall tone, we used the SPEED framework to code for presence or absence of function systems within each article, as well as the dominant system discussed within the article. Overall, the economic function system was the most common dominant theme at 45%, followed by political at 20% and technical at 17%. Receiving significantly less attention was the environmental function system (7%) and the legal function system (4%). Both the health and safety system and the aesthetic system were the least common overall, with no dominant coverage within any article for either function system.

In addition to the overall dominant categories, we further split each system into number of dominant benefits and dominant risks. Again, the economic function system received the most attention among other benefits, with 39 articles coded for including beneficial economic aspects. Most commonly these articles focused on job creation and

development of the region. For instance, in an article included in *The Watertown Daily Times*, the reporter stated, "A growing biomass industry will not only help our region meet goals for energy self-sufficiency, but it will be a stimulus to our local economy by keeping our land in production, diversifying our farming operations and creating jobs in agriculture, forestry and manufacturing" (Lawrence, 2010).

As the economic function system was dominant in benefits, it was also held the highest number in risks, though the number is substantially lower than the amount of benefits. With eight articles coded to note economic risks, most of the concern was based on the lack of development in the market currently and the uncertainty of the future. In a separate article in *The Watertown Daily Times*, one farmer stated, "I probably won't put any more until I get a market for it [biomass crops]. It takes a long time to develop" (Ellen, 2011).

The next highest function system for presence in benefits was technical aspects. As benefits ranked 18 coded articles, most focused on the ability to grow biomass crops on marginal land. In a 2009 article in *The Post-Standard*, the biomass supporter stated, "On many farms, there is a field that is too wet or too far away and not used to its fullest potential. We can give them a way to make good use of that land and keep it from growing up into brush (Potrikus, 2009). While the benefits of the technology were a dominant, the drawbacks of technology, though mentioned, were never found to be a dominant category. When mentioned, the articles pointed to the significant amount of time that the biomass system takes to start up.

Following this, the next most abundant benefits coded were comprised of political aspects, with 15 articles. Most focused on the fact that biomass energy could be highly

beneficial to New York State, partly by making the state more competitive. In a 2012 article in *The Observer-Dispatch*, a writer reported, "Over the last few years several wood pellet manufactures have popped up, marking the sate as a leader in the new industry" (Fries, 2012).

With six articles coded for political risk, this small sampling was the second largest grouping of coded risks. All articles involved focused on the negotiation process taking place in the town of LeRay, New York, where the municipality was reluctant to provide tax breaks for a local biomass facility. This we coded as a lack of governmental support. One article in *The Post-Standard* highlighted this with a quote from a resident disagreeing with state government's endorsement of the tax breaks, saying, "Would someone explain to our senator we have natural gas, oil and nuclear energy that are available now. We don't have to wait three of four years for the first willow crop to mature and be harvest" (Salit, 2012).

The next section with the most articles coded for benefits was for the environmental function system. With seven articles total, most articles mentioned buzzwords such as "sustainable," "green," "renewable," or "clean" to describe the environmental benefits of biomass energy. Like the technical aspects category, there were no environmental risks coded in any articles.

Following the environmental category, we coded legal benefits as dominant only twice throughout the collection of articles. Of the two instances, one focused on biomass development starting the signature of contracts between facilities, authorities and biomass producers. The other instance mentioned legislation present to support biomass, specifically the Biomass Crop Assistance Program, or BCAP. With these legal benefits

coded, there were also two dominant legal risks throughout the articles. Both articles dealt with a lawsuit in progress concerning an assessment reduction on a wood chip burning co-generation facility in Lyonsdale, New York.

For the last two categories, health/safety and aesthetic, there were no articles coded for dominance for either benefits or risks. Though this is true, there were instances of health/safety risks, as well as aesthetic benefits mixed among the articles. There was no mention of any heath/safety benefits or aesthetic risks. In the case of health/safety risks, some concern was shown over emissions from outdoor wood boilers. For aesthetic benefits, there was mention of planting willow for biomass could improve outdoor spaces.

Website Analysis

For the second part of our analysis, our group collected a total of 39 webpages. Of these pages, most were created by non-profit and for-profit organizations. A smaller amount was created by academic institutions and governmental organizations, 18% and 10% respectively (Figure 5).

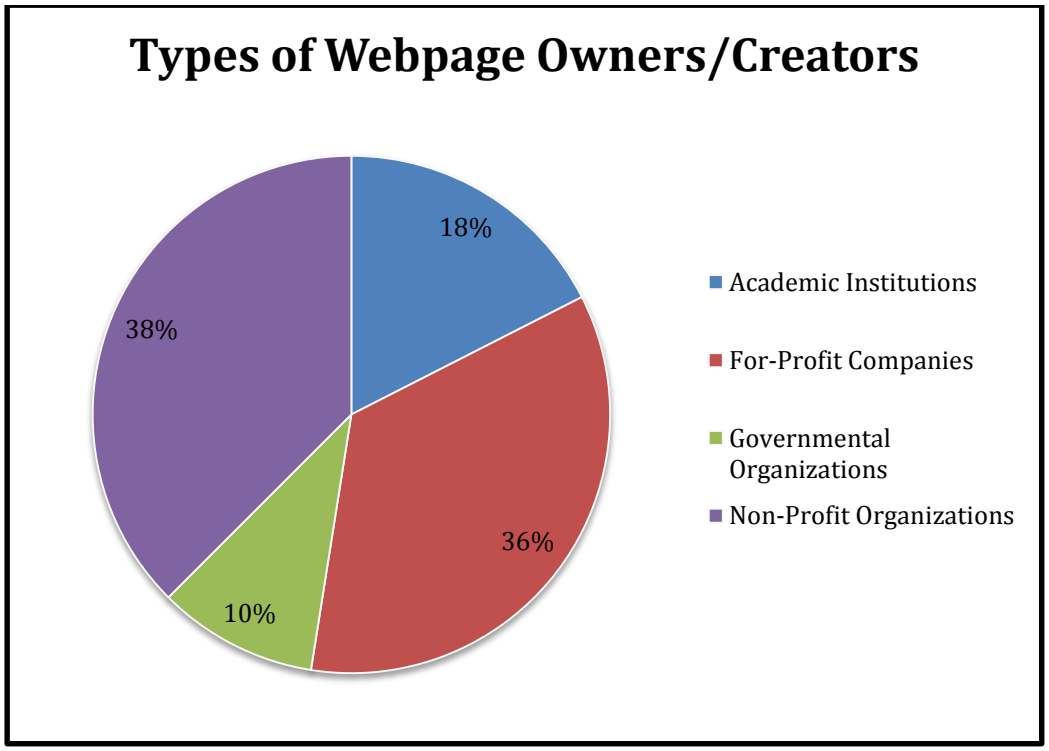

Figure 5. Breakdown of webpages by organization

Locations of Webpage Owners/Creators. Within our study, there was also a majority in the location of creators/owners. Almost half of all creators and owners were located in New York State, while the remainder was located either in other states or was a federal-level institution (Figure 6).

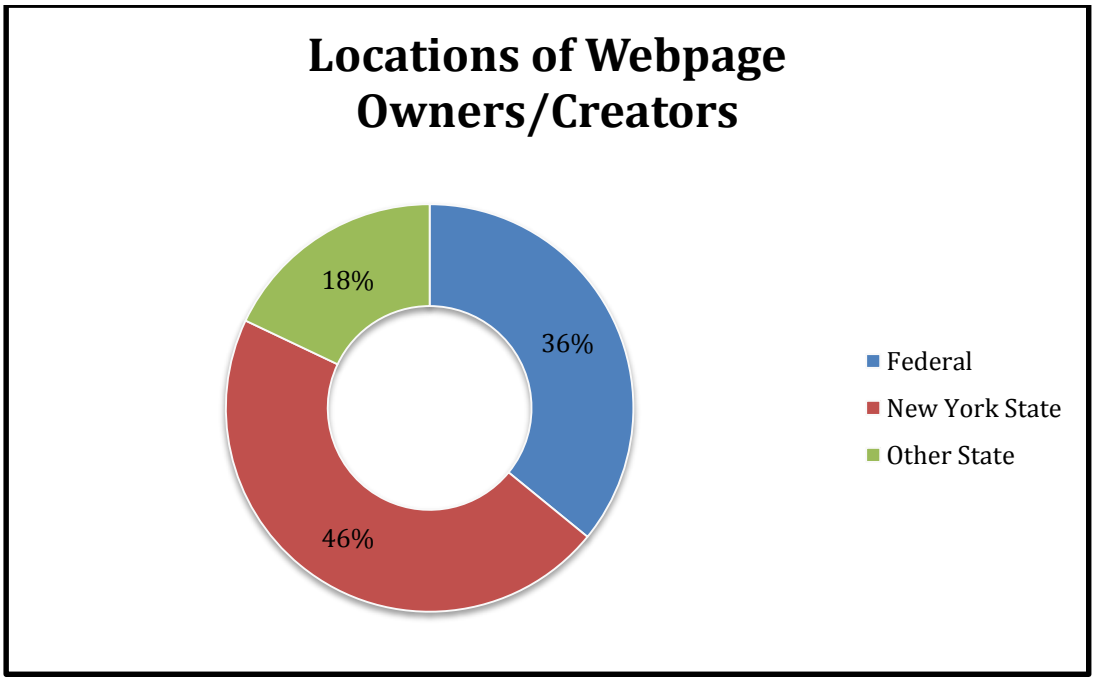

Figure 6. Website owner/creators by location.

Types of Webpages. Created by a variety of owners in multiple locations, the webpages consistently fell into two main type categories – "about" pages and "home" pages. The remaining pages, 21% of the collection, were an assortment, which we classified as "other" due to the fact that while they all focused on biomass technology, they all had different concentrations. For example, some webpages in this category focused on research at an institution (Figure 7).

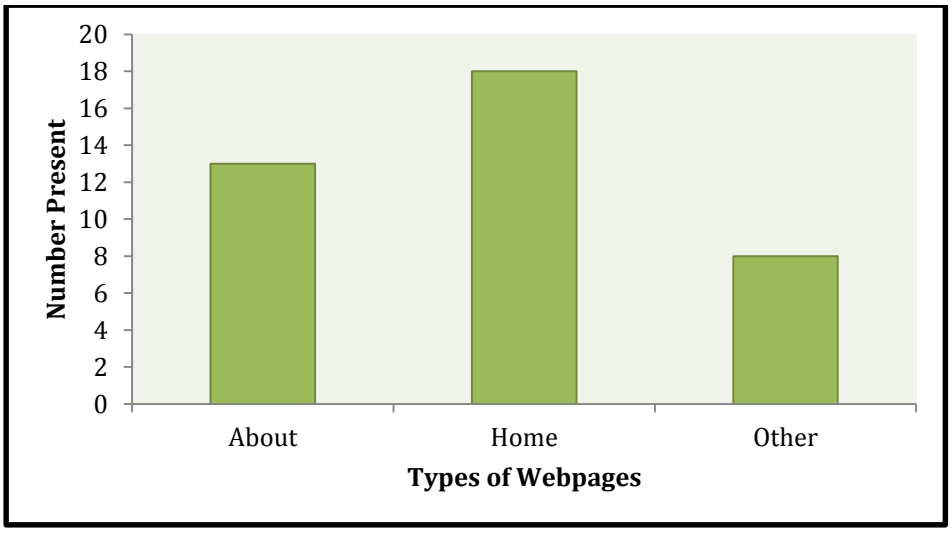

Figure 7. Webpages by type

Webpage Tone. While other aspects of the webpages were generally spread over a variety of function systems, we found that the overwhelming majority of webpages had a positive tone throughout the entire data set. Eighty-five percent, or 33 out of the 39 pages, were positive, while only 10% were neutral and 5% were balanced. No webpages exhibited an overall negative tone (Figure 8).

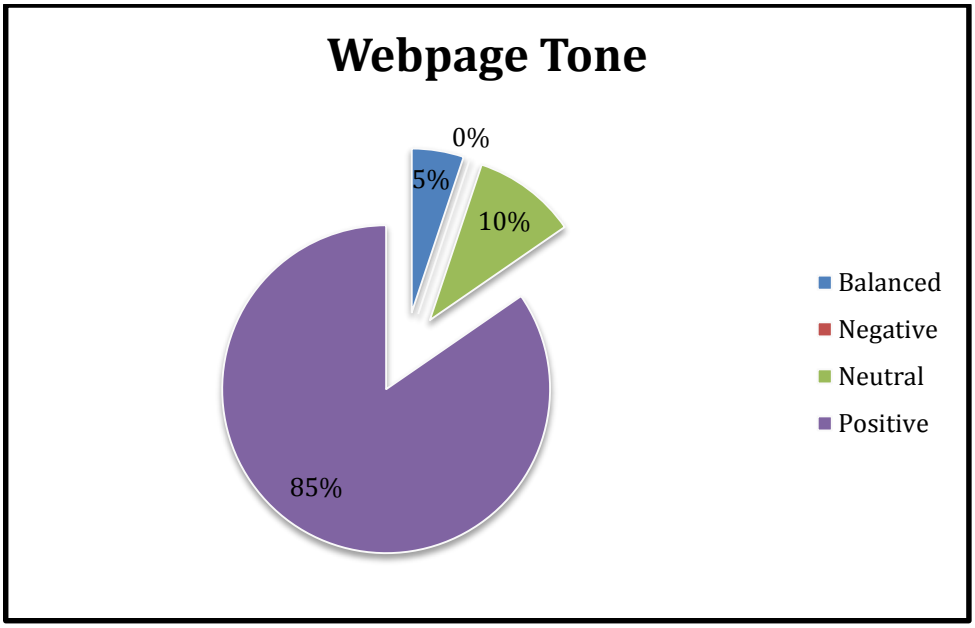

Figure 8. Overall tone of webpages

Webpage Functioning Systems – Benefits. Overall, the majority of webpages were highly positive. Only 8% of pages were neutral, a total of three pages, and no pages were coded to be predominantly negative. Though this is true, both a variety of benefits and drawbacks were coded throughout the pages. Within all 39 pages, there were 122 coded utterances of benefits or drawbacks. The greatest amount of coded utterances were benefits; the highest of those were environmental benefits (25%). Most pages noted the environmental benefits of the technology using buzzwords such as "sustainable," "renewable" or "green." Some pages went into more detail about the environmental benefits, such as in the Biomass Power Association's "About Biomass" page. In this section of the website, it states, "Biomass offers significant other environmental and consumer benefits, including improving forest health, protecting air quality, and offering the most dependable renewable energy source" (Biomass Power Association, 2014).

With this, environmental benefits were often combined in long lists with other benefits, particularly economic benefits. For example, in the Biomass Energy Resource Center's "about" page, the organization states, "BERC [Biomass Energy Resource Center] is a project-focused organization whose mission is to achieve a healthier environment, strengthen local economies, and increase energy security across the United States through the development of sustainable biomass energy systems at the community level" (Biomass Energy Resource Center, 2014).

Following environmental benefits, technical benefits were the next highest amount (23%). Of these utterances, most focused on the reliability of biomass technology, or they focused on the ability of biomass to use materials and lands deemed unusable in other agriculture projects. In the case of reliability of biomass technology,

one example focuses on the dependability of biomass over other energy sources. On the Biomass Power Association's "home" page, the organization states, "Because it is not affected by changes in weather or environmental conditions, Biomass power is an extremely reliable renewable energy source. Biomass can produce a steady and dependable flow of electricity 24 hours a day, and seven days a week" (Biomass Power Association, 2014).

With this, many focused on the use of otherwise unusable products. For example, Enviro Energy uses emphasized language on their home page to express the advantage of using these products. "Enviro Energy needs very poor quality, AUGUST cut hay! Weeds, briars, and small brush actually make your hay better for us. If it gets rained on, so much the better" (Enviro Energy, 2014). In other cases, the language was less dramatic. "Where others see forest residue or waste products, we see clean, abundant fuel – and are using it to make clean, reliable, stable and renewable energy" (ReEnergy Holdings, 2011).

Following these technical benefits stated, many pages wrote of the political benefits of biomass energy, focusing on energy independence for those who choose biomass energy over other energy sources. For instance, in the Biomass Energy Resource Center's "home" page, the organization states, "It reduces our dependence on foreign oil, enhances the value of our working landscape, and supports local job creation" (Biomass Energy Resource Center, 2014). These statements were often coupled with economic benefits, which were the next greatest amount of coded benefits (17%).

Within economic benefits, most focused on the ability of biomass to help local economies. For example, in the State University of New York College of Environmental

Science and Forestry's page devoted to "project areas" in biomass research, the institution states, "As these issues are addressed, woody biomass from NY's forest for the production of biofuels has the potential to provide markets for low value material, improve forest management, and support the development of new industries in the state" (SUNY-ESF, 2014).

Following these benefits, aesthetic benefits made up 5% of coded material and legal benefits made up 1% of all coded pages. No health/safety benefits were coded throughout the collection.

Webpage Functioning Systems – Risks. For risks coded throughout all pages, only a small percent of the webpages had risk content. Of these, the highest was technical risk, with all pages focused on the immaturity of biomass industries and technology. For example, the NEWBio "about" page clearly states this, saying, "Despite numerous environmental and rural development benefits associated with these perennial crops, the development of feedstock production systems, markets, and supply systems is in its infancy. The main technical barrier for deployment is the current high cost (relative to fossil fuels) to produce and deliver perennial energy crops to an end user" (NEWBio, 2012).

All other risks coded were negligible. Political risks, environmental risks and economic risks were all coded at 2% (had utterances on two pages each). Aesthetic risks, health/safety risks and legal risks were not present.

Discussion

Newspaper Analysis

Throughout our research, we have found that the newspaper articles analyzed were an overall positive and focused on economic function systems. This positive tonality is supported by research across other scientific articles, as described by Ho et al. "Extant research has shown that mass media has an effect on public perception of benefits outweigh[ing] risks of various sciences and technologies" (Ho et al., 2011, p. 608). This comes as a surprise, as a key tenant of journalism is to convey information in a balanced and objective tone. Ho et al. continues by explaining that positive framing is likely to act as "heuristic cues in influencing the benefits and risks consideration among the public" (2011, p. 609). This heuristic judgment comes from the amount of material that audience members experience on a daily basis, where mental strategies to process and cope with material in a limited amount of time often forces less in depth processing, especially for those outside of scientific fields (Ho et al., 2011). To perceive higher benefits from the framing of articles, audience members must use more conscious processing, which may not occur on a daily basis.

Other research has also found that scientific articles often utilize positive tonality and framing due to the "belief in the promise of science and technology" (Nisbet et al., 2002, p. 588). This is "conceptualized as representing respect for the intentions of scientists, a sense that science and technology provide useful results and products for society, and the assumption that future benefits from science and technology are likely" (Nisbet et al., 2002, p. 588).

Within our newspaper analysis, we found that articles mainly focused on the economic function systems. This is supported by past research, where findings show that

articles are often framed for salience with a wide audience. As a common newspaper's goal is to accumulate a wide range of readership, economic frames or functioning systems are often a direct link to myriad types of readers. As individual differences mediate perception and behavior resulting from exposure, the salience of issues is extremely important for audience members (Binder, 2010). Though political communication may be more salient for some, and technology more salient for others, economic functioning systems often engage the largest number of readers (Binder, 2010).

Website Analysis

Within our website analysis, we found that most proponent webpages were positive in tonality and focused most heavily on the environmental function systems. As the aggregation of webpages was produced by proponents of biomass energy and technology, it was expected that the webpages featured positive framing as to align with the goals of the for-profit companies, non-profit organizations and government entities. Unexpectedly, the academic institutions' webpages were also predominantly positive, though research goals are commonly expected to be objective and therefore balanced or neutral. As recently conducted research now shows, the complex roles and identities of message senders can lead to clashes surrounding the objectivity of science. According to Feldpausch-Parker, identity crises between scientists and proponents on issues can spur the creation of "overly positive and self-assured statements of knowledge and expertise in the areas of science (i.e., technical, environmental and health/safety) and social systems (i.e., political, legal and economic) (In press, p. 19). This positivity, coupled expertise,

can generally encourage public acceptance of the communications, overall promoting the acceptance of the science technology (Feldpausch-Parker, In press).

With this, it was also unexpected that the majority of webpages would stress the environmental function systems. As new media research is still relatively new, there is little explanation to why this would occur. It could be hypothesized that many biomass energy proponents prioritize environmental ideals, or perhaps that many proponents are framing their webpages in this way to capitalize on increased environmental awareness by the public. The latter may be supported by the high occurrence of environmental "buzzwords," such as "green," "alternative" and "renewable."

Though our findings show positive, environmental emphasis of biomass energy, little study has been done to show how new media "foster[s] public discussion of science-related issues" (Laslo et al., 2011, p. 847). Unlike newspapers, webpages allow for a larger range of people to express their own thoughts and viewpoints to the public discourse, which could explain our unexpected results (Laslo et al., 2011). New media, unlike traditional media sources, "make[s] it easier for anyone to participate in open discussion about scientific issues, by opening the public's primary source of information about science and technology as a space for debate and deliberation" (Laslo et al., 2011, p. 846). This can be beneficial as a wider range of viewpoints can be included into the public perception of biomass technology.

Conclusion

Throughout our study, we have accumulated findings that add to academic knowledge of science communication and its impacts on public perception. While some

findings, referring specifically to newspaper articles, further support the current research in the field, other findings, such as those from the website analysis, add new questions to the field of science communication. From our findings, more research should be conducted to understand the relationships among new media, function systems and public perception of science technology.

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Appendices

Appendix I

Newspaper Analysis Codebook

Code	Interpretation
Technical Benefit (TB)	Technology[1] is believed to be successful; belief in technology, in its potential.
	Technology takes advantage of existing resources.
	Technology makes use of idle/abandoned/marginal land.
	Technology successfully functioning.
	Technology takes advantage of existing infrastructure.
	Technology has advantages over conventional energy sources, reduces dependence on fossil fuels.
	Technology is easy to operate.
	Technology provides a reliable/stable fuel source.
Technological Risk (TR)	Technology may not work; suspicion of the effectiveness of the technology.
	Technology is not fully researched and therefore its technical characteristics and potential are still unclear.
	Technology is being developed more due to market political factors rather than its efficiency.
	Technology has limitations.
Economic Benefit (EcB)	Technology creates jobs.
	Technology is cheaper than other options.
	Technology may strengthen economy.
	Able to go commercial.
	Technology has the potential to be more efficient and economic.
	Technology contributes to the development of the region, makes it more competitive.
	Technology received governmental funding.
	Farmers/landowners express interest in technology.

[1] The word "Technology" is used in the meaning of biomass technologies.

Economic Risk (EcR)	Technology may be expensive; more expensive than other options; not cost effective, not viable without subsidies.
	Technology may have unforeseen/unexpected economic repercussions.
	Economic expectations failed.
	Technology will not help develop the region.
	Technology will create undesirable economic competition.
	Technology may have inconsistent demand or no demand at all.
	Technology cannot go commercial or it is uncertain.
	There are not enough financial incentives to make technology viable.
	Technology is denied in receiving tax breaks/subsidies/any financial assistance from authorities.
Political Benefit (PB)	Technology employment attempts will benefit New York State in various ways; give it a competitive advantage.
	Technology contributes to energy independence, enhanced national security, energy security, etc., independence of foreign oil/fossil fuels.
	Public approval of government's subsidizing bioenergy projects.
	Technology facilitates the creation of partnerships.
	Technology is supported by local/state/federal authorities.
Political Risk (PR)	Public frustration/disapproval/distrust with government's financing of bioenergy projects.
	More control over grants' spending is expected from the state.
	Switch to technology requires changes in culture and politics.
Legal Benefit (LB)	Planting crops approval.
	Legislation is present or being considered that would help or facilitate the technology (includes monetary incentives, grants and ownership rights): e.g. renewable portfolio standard, Biomass Crop Assistance Program, etc. are mentioned.
	Resolves liability issues.
Legal Risk (LR)	Land owners change minds on leasing for biomass crops.
	Exploitation of land owner's rights.
	Technology could lead to abuse of land-use, e.g., allow private developers to use public land for profit.

	Lawsuits in progress.
	Issues with determining liability.
	Reference to lack of /Calls for further state/federal oversight.
	Reference to calls for more stringent regulations.
	Contract are still being deliberated.
Environmental Benefit (EnB)	Technology is referred to as renewable, green, clean, pollution-free, sustainable, alternative, or environmentally friendly.
	Technology may reduce/divert GHGs or carbon emission.
	Technology serves conservation purposes.
Environmental Risk (EnR)	Doubts that technology is as environmentally friendly as it is portrayed.
Health/Safety Benefit (HB)	Technology is safer to work with as opposed to conventional oil practices.
Health/Safety Risk (HR)	Technology may pose health concerns.
Aesthetic Benefit (AB)	Technology has positive aesthetic impacts.
	Technology positively impacts the community.
	Technology is "popular" or "trendy".
Aesthetic Risk (AR)	Technology has negative aesthetic impacts.

SPECIFIC GUIDELINES FOR CODING:

DO CODE:

1. Biomass technology present.
2. Biomass technology clearly positive or negative, or can be described as neutral (e.g., factual details about biomass facility opening, percentage of electricity generated, price, etc.). or balanced.
3. Fits into one or more categories.

DO NOT CODE:

1. If it is not clear.
2. If not mentioning biomass specifically (i.e., mentions biofuels, renewable, green, alternative, etc. forms of energy).

NOTES:

1. Code according to overall sentiment of an article (can code an article ONLY as a risk or benefit).
2. Code article as positive if 2/3 of it address the benefits.
3. Code article as negative if 2/3 of it address the risks.
4. Article is neutral if no position is taken.
5. Article is balanced if the amount of risks and benefits sentiments is roughly equal.
6. Code categories present in article (including benefits/risks for each category).
7. Negations of risks are not benefits except if dealing with technical improvements over time, or comparing it to another technology that fills the same function.
8. Default to negative when sentence implies uncertainty (e.g., words like might, hope, would, could, but or "if the technology works…). Examine carefully what is uncertain. Code uncertainty as a risk when it hinders or hurts implementation of the technology.
9. When it comes to government funding, code only as economic, not political, rationale: if funding is awarded, that means that the discussion has passed the political realm and has moved on to the economic.

10. Include articles' demographics in the analysis and spreadsheet:

- Date published
- Name of Newspaper
- Type of article, if available:
    1) Article: Under 500 words, following the inverted pyramid format of news writing.
    2) Letter: Short letter, usually addressed to the editor or as a response to an article. These are uninvited letters.
    3) Op-ed: Invited editorial.
    4) Editorial: It presents the position of the newspaper, and therefore are usually anonymous.
    5) Feature: Generally longer than 500 words, does not follow the traditional model of news writing. It tends to be more subjective and provide considerable more detail. It is usually found in special sections of the newspaper.

Appendix II

Website Analysis Codebook

Code	Interpretation
Technical Benefit (TB)	Technology[2] is believed to be successful; belief in technology, in its potential.
	Technology takes advantage of existing resources.
	Technology makes use of idle/abandoned/marginal land.
	Technology successfully functioning.
	Technology takes advantage of existing infrastructure.
	Technology has advantages over conventional energy sources, reduces dependence on fossil fuels.
	Technology is easy to operate.
	Technology provides a reliable/stable fuel source.
Technological Risk (TR)	Technology may not work; suspicion of the effectiveness of the technology.
	Technology is not fully researched and therefore its technical characteristics and potential are still unclear.
	Technology is being developed more due to market political factors rather than its efficiency.
	Technology has limitations.
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	Technology is cheaper than other options.
	Technology may strengthen economy.
	Able to go commercial.
	Technology has the potential to be more efficient and economic.
	Technology contributes to the development of the region, makes it more competitive.
	Technology received governmental funding.
	Farmers/landowners express interest in technology.
Economic Risk (EcR)	Technology may be expensive; more expensive than other options; not cost effective, not

[2] The word "Technology" is used in the meaning of biomass technologies.

	viable without subsidies.
	Technology may have unforeseen/unexpected economic repercussions.
	Economic expectations failed.
	Technology will not help develop the region.
	Technology will create undesirable economic competition.
	Technology may have inconsistent demand or no demand at all.
	Technology cannot go commercial or it is uncertain.
	There are not enough financial incentives to make technology viable.
	Technology is denied in receiving tax breaks/subsidies/any financial assistance from authorities.
Political Benefit (PB)	Technology employment attempts will benefit New York State in various ways; give it a competitive advantage.
	Technology contributes to energy independence, enhanced national security, energy security, etc., independence of foreign oil/fossil fuels.
	Public approval of government's subsidizing bioenergy projects.
	Technology facilitates the creation of partnerships.
	Technology is supported by local/state/federal authorities.
Political Risk (PR)	Public frustration/disapproval/distrust with government's financing of bioenergy projects.
	More control over grants' spending is expected from the state.
	Switch to technology requires changes in culture and politics.
Legal Benefit (LB)	Planting crops approval.
	Legislation is present or being considered that would help or facilitate the technology (includes monetary incentives, grants and ownership rights): e.g. renewable portfolio standard, Biomass Crop Assistance Program, etc. are mentioned.
	Resolves liability issues.
Legal Risk (LR)	Landowners change minds on leasing for biomass crops.
	Exploitation of landowner's rights.
	Technology could lead to abuse of land-use, e.g., allow private developers to use public land for profit.

	Lawsuits in progress.
	Issues with determining liability.
	Reference to lack of /Calls for further state/federal oversight.
	Reference to calls for more stringent regulations.
	Contracts are still being deliberated.
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	Technology may reduce/divert GHGs or carbon emission.
	Technology serves conservation purposes.
Environmental Risk (EnR)	Doubts that technology is as environmentally friendly as it is portrayed.
Health/Safety Benefit (HB)	Technology is safer to work with as opposed to conventional oil practices.
Health/Safety Risk (HR)	Technology may pose health concerns.
Aesthetic Benefit (AB)	Technology has positive aesthetic impacts.
	Technology positively impacts the community.
	Technology is "popular" or "trendy".
Aesthetic Risk (AR)	Technology has negative aesthetic impacts.

SPECIFIC GUIDELINES FOR CODING:

DO CODE:

4. Biomass technology present.
5. Biomass technology clearly positive, negative, balanced, or can be described as neutral (e.g., factual details about biomass facility opening, percentage of electricity generated, price, etc.).
6. Fits into one or more categories.

DO NOT CODE:

3. If it is not clear.
4. If not mentioning biomass specifically (i.e., mentions biofuels, renewable, green, alternative, etc. forms of energy).

NOTES:

11. Code according to overall sentiment of a webpage (can code an article as a risk or benefit, unless considered a neutral fact).
12. Code webpage as positive if 2/3 of it address the benefits.
13. Code webpage as negative if 2/3 of it address the risks.
14. Webpage is neutral if no position is taken.
15. Webpage is balanced if the amount of risks and benefits sentiments is roughly equal.
16. Code categories present in webpage (including benefits/risks for each category).
17. Negations of risks are not benefits except if dealing with technical improvements over time, or comparing it to another technology that fills the same function.
18. Default to negative when sentence implies uncertainty (e.g., words like might, hope, would, could, but or "if the technology works…). Examine carefully what is uncertain. Code uncertainty as a risk when it hinders or hurts implementation of the technology.

19. When it comes to government funding, code only as economic, not political, rationale: if funding is awarded, that means that the discussion has passed the political realm and has moved on to the economic.
20. Include webpages' demographics in the analysis and spreadsheet (websites included have an impact on NYS):
    - Date website published/last edited, if available
    - Location of website owner/creator:
        1) New York State
        2) Other state
        3) Federal
    - Type of webpage:
        6) Home page, or the initial or main web page of a website, sometimes called the "front page."
        7) About page, or the webpage which describes the creator or owner of the website. This can be also called "About Us," "Our Mission," or any other combination of synonyms.
        8) Other page, which is neither a home page or an about page.
    - Type of website owner/creator:
        1) Academic institution
        2) Governmental Organization (Federal, state or local)
        3) For-profit company or corporation
        4) Non-profit company