May 2019

# Green Energy at Any Cost: How Ethanol Producer Magazine Uses Science to Frame Ethanol Production

Ashley Kappers
*University of Wisconsin-Milwaukee*

# GREEN ENERGY AT ANY COST: HOW *ETHANOL PRODUCER MAGAZINE* USES SCIENCE TO FRAME ETHANOL PRODUCTION

by

Ashley M. Kappers

A Thesis Submitted in

Partial Fulfillment of the

Requirements for the Degree of

Master of Arts

in Media Studies

at

The University of Wisconsin-Milwaukee

May 2019

ABSTRACT

GREEN ENERGY AT ANY COST: HOW *ETHANOL PRODUCER MAGAZINE* USES SCIENCE TO FRAME ETHANOL PRODUCTION

by

Ashley Kappers

The University of Wisconsin-Milwaukee, 2019
Under the Supervision of Professor David S. Allen

This thesis investigates the use of science by media to shape discussions about policy in society. Specifically, it investigates how one influential trade publication, *Ethanol Producer Magazine*, used science in its construction of pro-ethanol production stories. This study is a multi-method analysis of *Ethanol Producer* Magazine's feature articles. To determine how sources and writers use science to frame ethanol production during policy changes in the industry, 36 feature stories from four issues in 2009 and 2010 of *Ethanol Producer Magazine* were analyzed. The results of this study found that *Ethanol Producer Magazine* is a publication that presents one side of the story of ethanol production. *Ethanol Producer Magazine* cites organization leaders (CEOs, Presidents, and Vice Presidents) of ethanol production companies more frequently than other sources to frame ethanol production. Organization leaders were allowed to discuss the technological advancements in the industry and call into question scientific conclusions that might run contrary to the interests of ethanol production. While the research of academic scientists is often referenced, those scientists are not given a voice to explain their research. Instead, *Ethanol Producer Magazine* relies on organization leaders to explain scientific data. *Ethanol Producer Magazine* often used science to respond to political or policy developments. The results also show that when policy is perceived as being negative towards ethanol production, *Ethanol Producer Magazine* used science to delegitimize that policy.

## TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF ABBREVIATIONS

| | |
|---|---|
| B2B | Business to Business |
| EPA | Environmental Protection Agency |
| *EPM* | *Ethanol Producer Magazine* |
| GHG | Greenhouse Gas Emissions |
| IDLUC | Indirect Land Use Change |
| RFS2 | Renewable Fuel Standard (revised 2009) |

## ACKNOWLEDGEMENTS

First and foremost, I want to thank my advisor David Allen. His guidance, patience, and thoughtfulness throughout my research, writing, and editing process is greatly appreciated. Thank you, David, for helping this research come to life and for being an excellent mentor throughout my graduate career.

Thank you to my thesis committee, Lia Wolock and Michael Mirer, for providing your insights into this thesis. I am honored to have you both on my committee and appreciate your time supporting me.

I would also like to thank the faculty, staff, and my fellow graduate students of the Journalism, Advertising, and Media Studies department. Each course, seminar, conversation, and person in the department helped me progress through this thesis. Thank you for allowing me to continue to pursue my education and remain curious.

# Chapter 1

## INTRODUCTION

This thesis investigates the media use of science to shape discussions about policy in society. Specifically, it will investigate how one influential trade publication, *Ethanol Producer Magazine*, used science in its construction of pro-ethanol production stories.

Journalists choosing non-science sources for news reports on science-related policy is not new. Science communication scholars point to how media use both science and non-science sources to frame stories. While the media have presented positive statistics depicting ethanol as an economic benefit to farmers and a cleaner solution for fuel, scientists have reported that the destruction of natural land such as marshes and forests to make room for more cornfields has led to an increase in carbon emission from the states that produce the most ethanol (Lark *et al*., 2015).

In my thesis, I will analyze how *Ethanol Producer Magazine* uses science to frame ethanol production. I will specifically focus on how the magazine's construction of pro-ethanol stories questions proven scientific research on the negative land use impacts ethanol production leaves behind. While exploring the sources used in feature stories in the magazine, I will analyze potential political and environmental policy implications *Ethanol Producer Magazine* has on the United States. Although a considerable amount of research has been devoted to framing of news media, there is not yet research on how trade publications frame science or ethanol production. Current research on ethanol and media has mainly focused on public perception and framing (Delshad & Raymond, 2013), how newspapers frame ethanol production (Kim *et al*., 2014), local perceptions of ethanol production (Bain & Selfa, 2013), how politicians use science to frame

policy (Nisbet, 2009), and the timeframe of media framing of the ethanol movement in the United States (Wright & Reid, 2011).

**Study Purpose and Significance**

The impact of framing science in *Ethanol Producer Magazine* that this thesis will study is influenced by numerous factors. How science is and is not discussed has links to continuing the difficulty of discussing environmental science, especially in the area of political and policy discussions. The thesis begins with a short history of the rise of ethanol production in the United States. It then examines media framing before looking at how the media, including trade publications, play a role in the framing of environmental issues. More specifically, it will review the literature on how media use science to frame issues and how the sources relied on by the media, specifically politicians and scientists, use science to frame issues. It will also review the literature on how mainstream media frame ethanol production.

**The Rise of Ethanol**

In 2007, President George W. Bush signed the Energy Independence and Security Act. The federal law mandated that all gasoline for motor vehicles to be mixed with at least 10% ethanol (Summary of the Energy Independence and Security Act, modified 2018). The act was signed to address a number of issues up for debate in the United States. Those issues included an attempt to lower carbon emissions released into the atmosphere and to decrease the United States' reliance on foreign oil. The legislation was also an attempt to promote renewable energy through the use of agricultural products. The new act required the creation of the Renewable Fuel Standard program, which was to be implemented by the Environmental Protection Agency (EPA).

The Act created new opportunities for farmers in the rural Midwest, which was accompanied by a rapid rise of ethanol production. In 2008, the United States produced about 10 billion gallons of ethanol. By 2016, that amount had increased to about 697.2 billion gallons. The U.S. Energy Information Administration (EIA) states that ethanol production increased by 67% from 2008 to 2016 (EIA 2018). In May 2009, the EPA released an announcement for the second stage of the Renewable Fuel Standard or as it more commonly known, RFS2. The new rule increased the volume of renewable fuel required to be blended into transportation fuel (Renewable Fuel Standard Program, modified 2018). Ethanol and other renewable fuels would now need to achieve the same greenhouse gas (GHG) emission standards compared to traditional gasoline and diesel fuel. The EPA cited the need for the new standard based on new research on indirect land use change and the ethanol production boom. Mathews and Tan (2009) define indirect land use change as the conversion of grazing land or natural wetlands into crop cultivation. The EPA's research found that corn ethanol production without inclusion of indirect land use change reduces GHG emissions by 61%. However, with the inclusion of indirect land use change, GHG are only reduced 16% when ethanol is compared to regular gasoline (Renewable Fuel Standard Program, modified 2018).

In Wisconsin alone, around 500 million gallons of ethanol are produced a year (Lark, *et al*., 2015). Since President Bush signed The Energy Independence and Security Act in 2007, big changes in land use across Wisconsin have been observed (Lark, *et al*., 2015). A University of Wisconsin-Madison study found a shift of more than 7 million acres of cropland to ethanol production has led to the extensive release of carbon emissions from the soil. As a result, Wisconsin has become a top contributor to greenhouse gas emissions (Lark *et al*., 2015). Even though the use of ethanol in gasoline reduces the amount of fossil fuels being burned, there are

concerns that the impacts outweigh the benefits in terms of being environmentally friendly. The result is that very often there is confusion among citizens about whether ethanol use and production benefits society.

# Chapter 2

# LITERATURE REVIEW

## Framing and media effects

The term "frame" refers to the way that the audience organizes thoughts, feelings, and other perceptions into meaningful narratives. Frames are then persistent patterns of cognition, interpretation, and presentation. The selection, emphasis, and exclusion by which the individual conducting the framing organizes discourse occur through a verbal or visual manner (Gitlin, 1980). Examples include a newspaper article, photojournalism, or an interview. Frames that occur among groups of individuals are narratives that helps the group make sense of experiences (Gitlin, 1980). Erving Goffman (1974) described a frame as "schemata of interpretation" which allows individuals to "locate, perceive, identify, and label" issues, events, and topics. Words are considered triggers through preexisting worldviews. Frames help individuals make sense of the world around them. For example, Jasanoff (2005) describes the process of framing in terms of science and technology as "a kind of storytelling by communities situated in particular times as places, which allows people to order and make sense of complex experiences . . . and take meaningful action and so reduce their feelings of helplessness and alienation" (p. 23). In short, no one can avoid framing. What is more important to answer is which frames are being "activated" by the public and why (Jasanoff, 2005).

Communication and media scholars have come to rely on the concept of framing to analyze media and make sense of the symbolism in which society consumes information. Entman (1993) defines framing as the selection of some aspect of a perceived reality to make a text more salient. The frame is then used to define, diagnose, evaluate, and prescribe a text. In other terms, a text becomes more noticeable, meaningful, or memorable to the audience

(Entman, 1993, p. 53). In relation to framing in political communication, framing calls attention to various aspects of reality and hiding other ideas. Media effects research offers an explanation of how individuals in society define issues in politically strategic ways. The frame can lead the audience to have a different reaction than someone who watched the same story based on how the story was reported (Entman, 1993). Previous experience with the issue or individuals involved in the story will also influence frame perception (Entman, 1993).

News fragmentation, or fragmentation bias, is prevalent not only in environmental communication but news in general. News fragmentation and framing go hand-in-hand. In a mediated society citizens do not get the full picture of a news story. According to Bennett, fragmentation bias exists in self-contained dramatic capsules of news that are intended to be isolated from each other in time and space so that information becomes difficult to assemble into a bigger picture (Bennett, 2003). It is then left up to members of the audience to intercept the message and place it into their lives accordingly. However, not all individuals place the message the same way into their lives. The emotional coherence of the news segment is fragmented in such a way from other aspects of the story that makes the world seem chaotic and leaves little role for citizens to use the information provided to them. An example Bennett provides would be if a newscast first started discussing a fire that occurred earlier in the day and then weaved the story into the defeat of the Boston Celtics in a game that evening (Bennett, 2003). In terms of linking fragmentation bias to environmental stories, long-term trends and historical patterns are rarely used in the news. Bennett (2003) suggests this is done because it is hard to turn them into simple stories for the audience to digest. News fragmentation is important to understand due to the lack of credibility of potential unreported news. Fragmentation bias also leads viewers confused and left to piece together how the story should impact their present or future.

**Difficulties with Environmental Communication**

The discussion about engaging the public on risks to the environment has presented many challenges. Although there has been little academic literature on the subject, what has been written gives a clear explanation of the challenges the United States has been facing regarding biofuels. Scannell and Gifford (2010) state in their research that the impacts of climate change or other environmental risks are often perceived by citizens to be uncertain, a future problem that does not deserve immediate attention, or not personally relevant. The potential impacts are especially relevant in rural communities where agriculture is a main economic source. Environmental risk has not yet been successfully communicated, leaving limited resources for the public (Scannell & Gifford, 2010). Issues that have competing values tend to override the need for immediate environmental concern for citizens. Scannell and Gifford (2010) found in their study of rural communities that respondents were more likely to be concerned about public health, safety, finances, and terrorism than environmental risk. Part of the problem could be due to the inability to see the effect of climate change or environmental risk as a developing problem. Effects such as ozone depletion in the atmosphere or the destruction of natural land cannot be observed over a short amount of time. Environmental communication is often difficult for the general public to grasp because personal impacts might not be immediate observable.

In terms of climate-change impacts caused by the production of ethanol, quality news coverage is only likely to reach a small audience that is already informed on climate change and environmental risk (Nisbet, 2009). Nisbet (2009) discussed how the tendency to dismiss the urgency of environmental issues in the United States, especially at a local level, is tied to the problem's complexity and lack of visible impacts presented in media coverage. Nisbet found that the intricate nature of environmental issues, such as ethanol production, dictates that no single

news headline can encapsulate the complexity of the issues. Due to a large political-party divide on the importance of environmental action and the fragmented nature of the United States media system, the audience cannot pay attention to just one thought process (Nisbet, 2009). Nisbet (2009) suggests active observation of news is brought about by several content choices from which individuals can choose. If individuals are also interested in a news topic, they are more likely to turn to the news station, newspaper, or Internet site of their liking that reinforces their beliefs (Nisbet, 2009).

Nisbet's study also identifies a set of frames that reoccur in media coverage of science-related policy debates. Examples of the frames he found are "social progress" (defines science issues as a means of improving quality of life), "conflict and strategy" (defines science issues as a battle of groups/who is winning and losing the debate), "economic development and competiveness" (defines science issues as economic investment), and "public accountability and governance" (defines science issues as research or policy either in the public interest or serving special interests) (Nisbet, 2009). Often the media's way of framing science is only effective if the audience's preexisting interpretations from other stories reported in the media support that the frame that is used (Nisbet, 2009). An example is how Democratic and Republican policy makers are often framed differently in media reports based on their remarks on an environmental issue (Nisbet, 2009).

Environmental-risk communication in the media is often framed as an economic or policy issue. In fact, debate about environmental issues tends to be more about how to look at the issues and less about the facts or values involved. Miller and Reichert argue that journalists do not report environmental risk, instead they report the news (Miller & Riechert, 2000). Journalists are taught to find news based on a specific set of news values. The news industry considers

environmental risk not newsworthy because nothing observable has happened as of yet (Miller & Riechert, 2000). Instead, a discussion of environmental risk is a probability that is only reported on when attributed to an event. The discussion of environmental issues or risk tends to enter the news media during a disaster or protest.

Miller and Riechert's (2000) research found that media often relied on authoritative voices, such as the government, during natural disasters. Scientists were generally not included in the conversation because journalists believe members of the public want to hear from officials they know and trust. Due to existing news values, media participate in framing by accepting and modifying the frames presented to them by sources of information. The focus on immediate events makes the timeliness of their reporting valid. Journalists use dominant news values to devalue potential impacts of environmental issues (Miller & Riechert, 2000). For example, there is always the potential that climate change could impact the world in a dangerous way. However, the news media are not able to find that information as a statement of fact. Stories about the potential of an impact would be endless and repetitive.

**Influence of trade publications**

Trade publications make up one of the largest genres of print publications in the United States. According to Sweeny and Hollifield (2000), there are approximately 9,000 trade publications in print with more than 22 million copies circulating annually in the United States. The term "trade publication" refers to a publication that covers news for a specific interest group or industry (Sweeny & Hollifield, 2000). Despite their popularity, influence, and reach, studies on trade publications are uncommon. One problem that scholars face is accurately defining trade publication typology. Sweeny and Hollifield (2000) assert that the difficulty could be due to the fact that trade publications are different from newspapers. The ways in which trade publications

are organized by content differ between each publication. The authors argue that this may be because trade publications are generally supported entirely by advertising rather than subscriptions (Sweeny & Hollifield, 2000).

Other scholars have noted that trade publications may indirectly influence public opinion. By publishing important information related to specific industry issues, readers might find the information more credible (Nelson, 1984). However, there is still little research on how much intermedia agenda setting takes place through trade publications.

Previous studies have found that trade publications act as a channel of communication between the industry and the development of political and social issues. Sweeney and Hollifield (2000) noted that trade-publication reporters generally have greater expertise in the industry compared to general-interest journalists. Since trade publications are focused on a specific industry, writers are able to recognize the importance of emerging industry stories, able to find sources to support claims, and generally remain positive about social and political news that supports their specific industry (Sweeney & Hollifield, 2000).

Agricultural trade publications are not only influential for general-news journalists to learn more about the specific industry, but also because they target farmers and industry workers. According to Banning and Evans (2001), a survey by the Gallup Organization in 2000 revealed that 65% of respondents considered farm publications to be their dominant source of information about the industry. The considerable influence of agricultural trade publications shows just how much farmers trust these publications. Banning and Evans (2001) state that many respondents trust trade publications more because they provide information about and from farm-related industries, fairs, and the farm economy. The authors also suggest that trade-publication journalism still exists because readers believe the writers are more credible than general-news

journalists. Since coverage on agricultural issues tends to matter on how crops will fair, economic projects, environmental issues, and farm policy, getting the facts correct matters to trade-publication readers (Sweeny & Hollifield, 2000). The extreme pressures that vary from year-to-year for family farmers are important for them and farm-related trade publications provide that information.

**How media and journalists frame science**

Media and journalists provide the general public with science-related stories that relate to everyday life. According to Goodman and Goodman (2006), most Americans receive environmental news from media sources. Their research has found that how media frame aspects of an issue defines how the public perceives the story. The study by Goodman and Goodman (2006) on the framing of biosolids (treated sewage) found that journalists' framing of aspects of an issue define the issue for the public. More specifically, when the public's personal experience with biosolids was minimal, the science was often confusing with journalists using negative synonyms such as "sludge" and "pathogens" (Goodman & Goodman, 2006). The study found that most of the sampled media did not provide a definition of biosolids. Instead, media platforms described biosolids in negative terms such as "sewage sludge," "smelly," and "unsavory" (Goodman & Goodman, 2006). The researchers also found that media sources focused solely on the negative aspects of biosolids and their related processing. For example, one report stated that all biosolids are "full of pathogens and are inherently dangerous" when in fact the statement does not encompass the entirety of the biosolid process (Goodman & Goodman, 2006, p. 368). Goodman and Goodman (2006) argue that the way media and journalists choose to frame the science around biosolids does not provide enough information or context for the public. Goodman and Goodman (2006) state that a more comprehensive definition of science-

related issues needs to be provided by media as well as a less-biased approach to reporting a news story.

The public understanding of scientific information varies depending on how facts are introduced, explained, and addressed in media. Ruhrmann, *et al.,* (2015) stress the importance of acknowledging how media frame science. The results of their study of the framing of molecular medicine found a high variance in journalistic framing of science in terms of research findings. A majority of stories examined in the study found that journalists chose a scientific certainty or uncertainty frame (Ruhrmann, *et al*., 2015). Ruhrmann, *et al.*, (2015) also discussed what journalistic frames are typical in representing scientific evidence. Examples from their findings are "scientific uncertainty and controversy" (scientific and social controversies associate with uncertainty), "scientifically certain data" (above-average frequency of depicting scientific certainty), "everyday medical risks" (medical doctors and patients are common actors in the frame), and "conflicting scientific evidence" (Researchers report conflicting scientific results) (Ruhrmann, *et al*., 2015). The authors argue that institutional, political actors, and social problems not only shape the frame produced by media, but also how the audience responds to the message about science (Ruhrmann et al., 2015). An example explained by the authors is a news clip about the social repercussions and ethical implications of stem cell research. The clip shows politicians and stakeholders arguing with scientists. Both sides show positive and negative responses based on the audiences' perception and information provided before showing the interview.

Journalists and media sources make stories about science more noticeable through framing. Trumbo (1996) states that framing starts at the top of the inverted pyramid through the idea of salience. For example, a journalist's choice of headline and lead paragraph are what

draws the reader in. The story then becomes more salient as it is more noticeable, meaningful, or memorable to the audience (Trumbo, 1996). Trumbo's (1996) study of how journalists frame science found that media often choose an emotional frame. The study found that for science-related news stories, public attention to an issue would remain low until headlines increasingly become more salient (Trumbo, 1996). While scientific and political stakeholders are important to mention in the framing of a scientific story, Trumbo (1996) points out that as a story matures, the public will start to feel an emotional tie to the story whether it be positive or negative. The author argues that more attention needs to be placed on the emotional framing media use when reporting on science stories because the members of the public trust their personal feelings and experiences first and foremost. The frame a journalist chooses to use is secondary when considering how the audience will absorb the information.

**How scientists frame science**

As scientists release new results from their studies to the public, how they choose to frame their research is important to understand. A large part of what scientists use to complete their research is a research question or hypothesis. Powell (2007) states that risk frames shape scientists' knowledge and perception about the risks in their hypotheses. The author argues that different disciplinary perspectives shape how scientists frame science. For example, different disciplines have a particular knowledge approach for which they confront the unknown (Powell, 2007). Powell (2007) also states that interactions with colleagues and exposure to media shape how scientists frame science. Disciplinary information, such as interaction with a colleague in the same department or field and like-minded stakeholders, influence how a particular scientist views and frames their results. Powell (2007) argues that interdisciplinary interactions, such as those from other departments or outside of science such as media, influence the types of

information to which they are exposed. Powell's (2007) study found that scientists with a more disciplinary background frame their results for a very specific audience. For example, Powell (2007) found that scientists who work for utility companies would publish more research supporting the idea that electromagnetic fields do not pose health risks. The same study found that scientists in academia tend to be more multidisciplinary and frame science for a larger audience (Powell, 2007).

Scientists must also learn to actively frame information to make their information relevant for various publics. Nisbet and Mooney (2007) argue that scientists struggle to continuously craft their frames for the public. In turn, scientists frame science by countering other groups' frames of their research. For example, Nisbet and Mooney (2007) surveyed scientists on how they would communicate information of evolution to the public. Most scientists in the study failed to think strategically about how to accommodate current religious connotations of the evolution debate (Nisbet & Mooney, 2007). Nisbet and Mooney (2007) also concluded that scientists frame science in simple terms. For example, if scientists were quoted by a journalist about their climate change research, the scientists would frame their story summarizing their results not directed at a specific group of the public (Nisbet & Mooney, 2007). Nisbet and Mooney (2007) suggest that scientists frame science with the expectation that public confidence in the validity of science would increase. However, the authors suggest current political, economic, and religious frames in media hold a stronger precedent to the public than a scientists' frame (Nisbet & Mooney, 2007). Nisbet and Mooney (2007) cite the idea that politicians have more of an influence on public opinion than scientists.

**How politicians frame science**

Environmental framing is seen in various media every day. Generally, most consumers of news see politicians discussing new policy ideas behind an environmental issue (Lakoff, 2010). Lakoff (2010) argues that politicians use science to help gain support for their agenda. Conservative and progressive parties vary in framing strategy for environmental issues that work with and against environmentalism (Lakoff, 2010). The framing of science for politicians is focused on diagnosing the problem, passing policy and the motivation to do so. For politicians who are skeptical about climate change issues, framing risk is done in a positive manner. Hoffman (2011) states that many conservative policy makers tend to frame climate change as beneficial for farmers. Benefits such as "longer growing seasons" and "more carbon dioxide levels in the air for plant growth" are common statements from skeptical lawmakers (Hoffman, 2011, p. 16). The framing of science through conservative parties in the United States has been studied the most (Lakoff, 2010). According to Lakoff (2010), politicians frame science as a question of human morality. First, the frame "God created nature for human use and exploitation" is common with conservatives (Lakoff, 2010). Through the frame, conservative politicians suggest that since God created the Earth and the inhabitants on it, that global warming is natural (Lakoff, 2010). Second, conservative politicians frame science through a "let the market decide" ideology. Environmental regulation and government subsidies for sustainable energy, green technology, and green jobs are framed as interference in the market (Lakoff, 2010). Conservatives frame environmental science as "immoral" because it does not let the market be natural or rewarding (*e.g.*, lower taxes).

Progressive political framing relies on a personal connection to science. According to Lakoff (2010), progressive politicians frame science through the idea of personal responsibility.

In other words, science is framed as a way to connect to the natural world by taking environmental choices for oneself and to benefit the world (Lakoff, 2010). Lakoff (2010) states that active framing done through progressive politicians can be seen through policies for conservation, energy, and recycling. Progressive politicians also frame science as a public duty. In terms of environmental science, framing is more "worldly" in that personal choices impact others (Lakoff, 2010).

**Framing ethanol as science**

Despite numerous studies about the economic and policy frames surrounding ethanol, the science behind its production is rarely discussed. Bain and Selfa (2013) came to the conclusion that since it is economically beneficial, biofuel is mostly grown in fields close to biofuel production plants. However, the establishment of corn crops changed land use across Iowa in negative ways. The study was beneficial to understanding the framing of ethanol as science because participants confirmed that the expansion of crops used for ethanol affected land-use practices. However, the participants dismissed concerns of land use changes with positive comments of economic gain (Bain & Selfa, 2013). In turn, the media have often dismissed environmental concerns. Without mention of supporting scientific data, ethanol is expressed as a positive impact on the economy, politics, and environment (Bain & Selfa, 2013).

By ignoring the environmental risk of biofuel development, media put forward a positive frame for ethanol. Wright and Reid's (2010) research, however, found positive and negative environmental frames. In early 2008, ethanol was still being framed in a positive way for America to rely on its own energy production and to reduce carbon emissions. However, in late 2008, negative frames were beginning to emerge (Wright & Reid, 2010).

**Framing ethanol as policy**

The relationship between media framing and public opinion on the issue of alternative energy has been widely studied. Some studies have researched public attitudes toward the movement, especially when policies have been passed regarding the issue. Delshad and Raymond (2013) studied how media framing influenced public support for biofuels and the policies created around the issue. Biofuels are considered the umbrella term for fuels that are derived plants. Ethanol, which is processed from corn, is one example of a biofuel. Others are made from wood and various prairie grasses (Delshad & Raymond, 2013). News media tend to frame biofuel issues, and environmental news in general, as being a solution for climate change. The authors suggest that this framing creates an ideological divide between political parties (Delshad & Raymond, 2013). Although many rural farmers consider themselves to be conservative, liberal ideology tends to be strongly associated with pro-environmental protection. Delshad and Raymond (2013) argue that framing ethanol production as a climate-change policy has the potential to characterize ethanol as a liberal movement, putting it in a negative light for rural communities.

Delshad and Raymond (2013) also found that the way media frame biofuel changes over time. From 1999-2003 they found that national media framed biofuels in a positive way, with most articles mentioning the environmental and economic benefits, as well as being beneficial for national security. However, from 2004-2008, biofuels were framed in a more negative way. Dominant frames during this period included environmental costs, higher prices for food, and the economic cost of production. Delshad and Raymond (2013) suggest the change of dominant frames occurred because ethanol production critics started reporting public food supply shortages due to the increase in production. The economic recession in the late 2000s also elevated

negative frames of ethanol production (Delshad & Raymond, 2013). However, the authors focused on national media frames, and not those of local news. Another factor Delshad and Raymond (2013) expressed about public perceptions of ethanol were the levels of attentiveness with the news. Individual attitudes towards biofuels are likely to be influenced by prominent media frames and previous knowledge or awareness of the subject.

The study of media framing of ethanol is not a new area of investigation. The public's perception and acceptance of alternative energy has been studied for decades. Like most policy issues, there is an ongoing discourse that ebbs and flows as it frames that discourse for the audience. Gamson and Modigliani's (1989) analysis of media framing and the public discourse around nuclear power argues that interpretation of frames by the public differs based on age and personal beliefs. The study surveyed a sample of Americans and placed the respondent's overall attitudes on the issue of nuclear power into schemas. Examples of the schemas included: progress (continue alternative power), NIMBY (Not In My Back Yard--unpleasant or potentially dangerous), devil's bargain (seeing no benefit, only a terrible price to pay), and runaway (position about nuclear power is more resigned) (Gamson & Modigliani, 1989). The frames the news media used around and after nuclear disasters such as Hiroshima and Chernobyl were studied. Gamson and Modigliani (1989) found that respondents who had lived during the time of nuclear fallout reported more negative attitudes towards nuclear power than those who did not. The authors argued that personal exposure from media and culture led to predispositions about alternative energy. The authors also concluded that public opinion on nuclear power could be understood as adding an issue to culture via media. Some respondents started paying closer attention to the news at different times in their lives and thus have a different frame of nuclear power than others (Gamson &Modigliani, 1989).

In addition to looking at how media framing influences the public's attitudes towards alternative forms of energy, studies have also looked at how media have framed biofuels as a way to solve social problems. Environmental issues, such as ethanol production, have been framed as declarative statements with little empirical evidence (Wright & Reid, 2010). Wright and Reid (2010) found in their research that little effort was made to fully explain how an increased production and use of ethanol could help social issues. Instead of using empirical evidence, news media at times use emotional ties and firm convictions to frame environmental stories (Wright & Reid, 2010). Examples include success stories of rural farmers who relied on little except the hope of biofuel production. While the research did not focus on strictly local news media, it was an important step in understanding how media across the country exaggerated opportunities and also used emotion to frame the biofuels movement.

This study also showed how news media tried to entice the public by making appeals to what might be considered the larger public good. The authors claim that this framing masked political and economic tendencies of large, alternative-energy companies (Wright & Reid, 2010). Similarly, Kim, *et al.*'s (2014) analysis of how ethanol is framed in American news found that ethanol has been presented primarily as a policy issue. First, numerous legislative acts (*e.g.,* The Energy Independence and Security Act of 2007) were introduced and debated through media (Kim, *et al.,* 2014). Policy and ethanol were tied when discussing rising food prices. Ethanol became a common framing topic, and according to the authors, more regulation from the government followed (Kim *et al.*, 2014).

## Chapter 3

## RESEARCH QUESTIONS AND METHODS

While media coverage of ethanol and its production have been widely studied, no one has examined how trade publications use science to frame their coverage of the ethanol issue. As a result, building on the existing literature, this study begins with the following research questions:

RQ1: How do the sources in *Ethanol Producer Magazine* feature articles use science to frame ethanol use?

RQ2: How do the contributors who write the stories for *Ethanol Producer Magazine* use science to frame ethanol use?

RQ3: Does the way *Ethanol Producer Magazine* uses science to frame the ethanol issue change in response to political or policy developments?

### Background of *Ethanol Producer Magazine*

*Ethanol Producer Magazine* started publication in 1995. The magazine is the world's largest and longest-running magazine dedicated solely to covering the ethanol industry to date (*Ethanol Producer Magazine*). The trade publication is published by BBI International. Other publications produced through the same producer include *Biomass Magazine, Pellet Mill Magazine,* and *Biodiesel* Magazine. *Ethanol Producer Magazine* is published monthly. Every ethanol plant in North America is automatically sent a copy, while farmers and interested stakeholders subscribe to either a physical or digital copy (*Ethanol Producer Magazine*). The magazine recognizes itself as a "business-to-business" publication covering the ethanol industry (*Ethanol Producer Magazine)*. Over the years, the company has also released a weekly e-newsletter, *Ethanol Week*, which includes links to top stories in the ethanol industry throughout the week. *Ethanol Producer Magazine* strives to be "the magazine ethanol producers turn to" which includes news and commentary and features on plant optimization, research, science,

technology, equipment, environmental health and safety, compliance, marketing, policy, and industry events (*Ethanol Producer Magazine)*. As of early 2019, *Ethanol Producer Magazine* has subscribers in 46 countries and circulation of approximately 11,250 (*Ethanol Producer Magazine*).

*Ethanol Producer Magazine* is a vibrant publication that is filled with well-crafted images for the reader. The magazine itself has a glossy finish and contains approximately 130 pages in each issue. Since the publication is "business-to-business," there are ads on almost every page. An ad index is included at the beginning of each issue. Examples of ads include new technology, production plants and locations, equipment rentals and implements, dealerships, crop and seed companies, and upcoming conferences. Many of these ads tend to link the industrialized process of ethanol production with the color green or images of the natural environment. The images in *Ethanol Producer Magazine* focus on the workers and the product they are working with. Front cover images feature either an individual or individuals in the production industry, cornfields, or the process of ethanol production in action. The magazine also offers images before every feature story. Generally, these images take up two pages and include a small introduction to what the story is about. For example, the images used in a policy story in the September 2010 issue showcased a large cornfield with dark storm clouds overhead. Most feature stories include a headshot of individuals interviewed for the story.

**Content Analysis**

To answer the research questions, I will conduct a content and textual analysis. The content analysis will consist of categorizing sources from feature stories in *Ethanol Producer Magazine*. The categories are based off of my research questions as well as information composed from my literature review. The categories I will be using for this thesis are

"Politicians", "Academic Scientists", "Industry Scientists", "Federal stakeholders", and "Organization leaders". For the purpose of this thesis, politicians represent individuals that serve as elected local, state, or federal representatives of the public. Academic scientists are individuals that research in academic settings, while industry scientists research for companies or organizations. Federal stakeholders represent federal organizations such as the Environmental Protection Agency (EPA), Department of Natural Resources (DNR), and Department of Energy (DOE). Organization leaders represent individuals that are representatives, presidents, or CEOs of an ethanol production agency or supporting organization.

I will be content analyzing four issues of *Ethanol Producer* Magazine to determine who the contributors writing the stories for the magazine are using as sources. More specifically, I will analyze the June and July 2009 issues and the September and November 2010 issues. I have chosen these specific issues because the second Renewable Fuel Standard Act policy change was first introduced in the summer of 2009. The first implications of the updated policy took effect in the fall of 2010. The June 2009 publications have nine feature stories, while the 2010 publications have six. Since the magazine publishes monthly, I will be content analyzing 36 feature stories. Through the analysis of each feature story, I will categorize all sources according to their affiliation to the categories listed above. Once all 36 stories have been analyzed, I will count how many sources are in each category. A table will be provided to show each category and the total number of sources counted. The analysis will be used to answer RQ3.

**Textual Analysis**

The textual analysis will analyze each feature story in the June 2009 and November 2010 issues of *Ethanol Producer Magazine*. Each issue has approximately six to nine feature stories, depending on the publication date. I have chosen these two specific issues because they were

published around the time the EPA started implementation of the new Renewable Fuel Standard program. During this time, there was pushback from ethanol producers on the validity of the EPA's research of ethanol production and land use change. I plan to use the two issues of *Ethanol Producer Magazine* to assess how each category of sources is using science to frame ethanol. The textual analysis will answer RQ1 and RQ2. Through the textual analysis, I seek to move beyond just looking at what sources are being used and move into how writers and sources are using science to frame ethanol use. This qualitative analysis will allow me to look more closely at how each story is constructed, how some scientific information is prioritized over other information, the wording that is used in framing the information, and other information that might not be obvious from data gathered in the content analysis. I aim to add an explanation as to why and how certain sources and contributors use science to frame ethanol use. I will also analyze patterns between the categories of sources from the content analysis.

My research will attempt to understand how *Ethanol Producer Magazine* not only frames science in their articles, but also how the magazine uses science to tell the story about the environmental uncertainty of ethanol production. It will also attempt to provide more understanding as to why the conversations of environment issues are referenced through politics and economics and not through science, if indeed this study finds that they are.

# Chapter 4

# RESULTS

Throughout this chapter, the quantitative and qualitative results will be discussed together. The content analysis reports how many sources were found in the analyzed feature stories in the June 2009, July 2009, September 2010, and November 2010 issues of *Ethanol Producer Magazine*. The results of the textual analysis are meant to provide more depth to the content analysis. The textual analysis examined how science was used by the sources and *EPM* writers to frame the discussion of ethanol. Reporting both the quantitative and qualitative results together provides a greater understanding of how science was framed in *Ethanol Producer Magazine.* This chapter will suggest that who was allowed to speak influenced how writers framed the ethanol debate and it will examine how those frames contributed to the fragmentation of knowledge about ethanol.

## Who is Allowed to Speak?

One of the great powers that journalists have in telling a story is determining who is allowed to speak. The content analysis, results of which can be found in Table 1, demonstrates what types of people journalists relied on to create stories.

**Table 1. Frequency of categories cited**

| | June 2009 | July 2009 | September 2010 | November 2010 | Total |
|---|---|---|---|---|---|
| Politicians | 0 | 2 | 2 | 0 | 4 |
| Academic Scientists | 10 | 3 | 3 | 0 | 16 |
| Industry Scientists | 7 | 2 | 0 | 3 | 12 |
| Federal Stakeholders | 8 | 6 | 3 | 0 | 17 |
| Organization Leaders | 24 | 31 | 21 | 20 | 96 |

Table 1 displays counts for source type, categorized by year and month.

The analysis shows that in the four publications analyzed, six politicians, 16 academic scientists, 12 industry scientists, 17 federal stakeholders, and 96 organization leaders were cited in *Ethanol Producer Magazine*'s stories. The results in Table 1 show that organizational leaders are given a larger voice in the publication's ethanol coverage than politicians, federal stakeholders, academic scientists, and industry scientists. The results also show that academic and industry scientists were not relied on for information after 2009. While it is difficult to make determinations about source selection from a content analysis, it is interesting to note that the decline of scientists as sources coincides with the adoption of the Renewable Fuel Standard. The standard was introduced in 2009, but the implications on how ethanol was produced and the impact of Greenhouse Gas emissions did not take effect until 2010. The avoidance of scientists as sources in stories after 2009 is an interesting issue to consider.

Once writers choose who to use as sources to tell their stories, they must determine exactly how the story will be told and how the information provided by their sources will be used. Table 2 shows the dominant frames were used within each source category.

**Table 2. Frames used by category**

| Politicians | Academic Scientists | Industry Scientists | Federal Stakeholders | Organization Leaders |
|---|---|---|---|---|
| Policy | Economic | Science | Policy | Policy |
| | Science | | Science | Economic |
| | | | | Science |

Table 2. displays which frames were found in each analysis of sources, categorized by source category

The analysis shows that when politicians were used as sources, they were used to support a policy frame. When academic scientists were used as sources, their comments were used to support economic and science frames. However, industry scientists were only used for the science frame. Federal stakeholders were used as sources in stories where policy and science

were the dominant frames. The only sources that are used to support all of the dominant frames (policy, science and economic) were organization leaders.

Table 2, along with the results reported in Table 1, reveals the dominant role that organizational leaders as sources played in helping to frame stories about ethanol in this publication. Not only were organization leaders relied on more widely to provide information to the contributors, but they were also viewed as important for providing information for all of the dominant story frames that help construct the debate about ethanol. While other sources were allowed to contribute to frames associated with their area of expertise (*i.e.*, politicians on policy issues, etc.), only organization leaders were allowed to contribute to every frame and all debates about ethanol. These results support the claim that writers for *EPM* only want the audience to hear a select voice discuss ethanol production in the industry and, perhaps, reveals much about the real audience for this trade publication.

**Sources, Frames and Science**

While the content analysis tells us who was allowed to speak within the stories, it doesn't reveal much about how science was used by the publication writers to frame the ethanol debate. The following qualitative analysis looks at how the information provided by sources was used by the writers to construct frames about the impact of science in the ethanol debate. Using examples from stories, the following attempts to explain how science was used by writers to construct a variety of frames.

**Politicians and the Policy Frame**

The quantitative analysis of *Ethanol Producer Magazine* found that six politicians were quoted or mentioned in feature stories. The June 2009 issue included two politicians, while the November 2010 issue had none. Specific politicians were quoted in feature stories related to

policy issues that were introduced by members of either the Senate or House. For example, an article titled "The Difficulty with DOE Funding" cites Sen. Jeff Bingaman (D-New Mexico) and Sen. Lisa Murkowski (R-Alaska). Both sat on the U.S. Senate Energy Committee at the time. The senators announced a new act that would form a clean energy investment fund and the creation of a Clean Energy Deployment Administration (Bevill, 2009, p. 104). The statement Bingaman and Murkowski provided includes:

> [T]his new administration would encourage deployment of technologies that are perceived as too risky by commercial lenders; thus encouraging the advancement of riskier technologies, which have a high potential to address climate and security needs (Bevill, 2009, p. 104).

Similarly, another feature story titled "Weathering the VEETC Storm" cites representatives introducing a bill for the benefit of renewable fuel standards. Reps. Earl Pomeroy (D- North Dakota) and John Shimkus (R-Illinois) discuss extending tax credits for ethanol producers. However, the representatives state that renewable fuels, such as ethanol, will need to be more independent in the future. For example, they state:

> The tax credit is a bridge to a future where renewable fuels standards create the market without requiring the tax credit drawing on the federal treasury. However, we aren't there yet (Jessen, 2009, p. 52).

The politicians cited in the articles analyzed contribute to a policy frame by using science to help gain support for their agenda. According to Lakoff (2010), politicians tend to frame the risk of ethanol production in a positive matter. Since *Ethanol Producer Magazine* used a Democrat and a Republican to frame ethanol in these stories, it is difficult to assert that the frame is strictly liberal or conservative. However, the quotes used by political figures are common

conservative frames. For example, conservatives tend to frame environmental issues as "immoral" because they do not let the market be "natural" (Lakoff, 2010). The introduction of the tax credit by Reps. Pomeroy and Shimkus framed ethanol as an interference to the market and that ethanol production cannot survive in the market without a tax credit. Their statement assumes that the renewable fuel standards created by the EPA are unable to meet policy and economic goals.

The quotes provided from the analysis do not outwardly rely on scientific language, however, the politicians provide political insight to help understand the science of ethanol production. For example, Bingaman and Murkowski give vague information about how new, risker technologies need to be implemented to allow a potential answer for climate change. While the politicians never use scientific language or evidence, they frame the science of ethanol production as a way to reach climate policy goals. They assume the legitimacy of the science behind ethanol production and then use that established science to justify policy decisions. The contributors writing for *Ethanol Producer Magazine* is more than likely being discrete about what mandate the politicians were talking about because it relates to the EPA's Renewable Fuel Standard.

Other politicians used science to frame ethanol use as a "risk" that is worth taking for the good for the environment. Policy frames often tended to envision ethanol as being a solution for climate change (Delshad & Raymond, 2013). Sen. Bingaman and Sen. Murkowski continue to use science to frame ethanol as policy by stating that new technology has the potential to address security and environmental needs. Their statement contributes to the policy frame of ethanol use by addressing several interested parties. By framing ethanol as a way to address fuel security in the United States, conservatives will likely support the environmental aspects of ethanol

production. Even though the senators' support for technologies in the renewable energy sector sound positive, they frame ethanol production as a "risk" that is worth taking. Their support for the science of ethanol production as a way to achieve their qualified agenda is reinforced by their bipartisan political backgrounds.

**Academic scientists**

The content analysis resulted in 16 academic scientists cited throughout the feature articles analyzed. The June 2009 issue included 10 academic scientists while the November 2010 issue had none. The results of the textual analysis show that academic scientists were used to help create the economic and science frame.

***The Economic Frame***

In the June 2009 issue an article titled "Doing the Math," Professor David Peters, a sociology professor from Iowa State University, was interviewed about his method to help rural communities, farmers, and policymakers understand how corn and ethanol prices impact profit. Peters' work allows stakeholders to calculate what the prices for corn and ethanol would have to be for an ethanol plant to make a profit. While describing his method, Peters states:

> We've learned about investors getting back double their investments. It was wildly profitable when the Energy Policy Act of 2005 went into effect and the price of ethanol shot up to $2.60 per gallon with corn at almost $2 per bushel (Christiansen, 2009, p. 70).

Within the feature story and in the section titled "More Than Money," Peters discussed how the public benefits from ethanol production through the reduction of greenhouse gas emissions.

> The benefits for people in larger cities burning ethanol blends and having cleaner air—while not a benefit to the ethanol producer itself—is a benefit to the communities and to

government and to lowering health care costs (Christiansen, 2009, p. 73).

Peters also discussed how policy makers need to consider price supports for ethanol:

> You need to try to smooth that out because we need to preserve the industry, our rural development, our clean air, and our energy independence. Ethanol producers are making strides to become more efficient and to squeeze out more ethanol, but this country needs to determine whether it is a national priority (Christiansen, 2009, p. 73).

In terms of the potential growing job market for ethanol production, Peters is quoted:

> From a rural development perspective, this is something that rural communities see that they can invest in. Ethanol has had a positive impact on rural development, that's all true. For many towns it was the biggest thing to ever happen, as far as industry. People need to better understand how the prices of corn and ethanol really impact the bottom line (Christiansen, p. 73).

*Ethanol Producer Magazine* writers use science, as provided by academic scientists, to construct the economic frame. Previous literature discusses how media tend to frame ethanol as being beneficial due to the economic growth seen in rural communities. In "Doing the Math," quotes from an academic scientist are used to back up how effective ethanol policy and production has been economically and how it can be used to solve social problems. For example, the contributor includes suggestions from the academic scientist that price supports from policy makers would help all Americans by producing cleaner air, healthier citizens, energy independence and positive rural development. Using language such as "this is the biggest thing to have happened in terms of industry," ethanol is framed as a guiding light for rural communities and farmers. The academic scientist, using economic evidence, praises ethanol production as a social good.

The writers also use evidence from the academic scientist to make emotional ties to community and ethanol production. Peters, the academic scientist, is quoted saying that people need to "understand" how ethanol impacts the economy (Christiansen, p. 73). Including quotes regarding who is and who is not "understanding" the ethanol debate helps frame ethanol as in need of help from policy makers. This use of emotion also suggests that policy makers (especially the EPA) do not understand the social and economic significance of ethanol production.

***Science Frame***

*Ethanol Producer Magazine* contributors often use research by academic scientists to construct a science frame about ethanol production. Examples of research articles cited throughout *Ethanol Producer Magazine* stories include information on new technological advancements for storage, land use, and ethanol production. The writers often referenced academic researchers and their publications, but those stories do not contain direct quotes from the scientists. While the contributors used information from published research by academic scientists, the stories suggest that the contributors for the publication never interviewed academic scientists or used them directly as sources of information. The following examples demonstrate how this information was incorporated by a writer into the article "Wet Storage Strategies":

> The key to longer storage is to exclude the oxygen, according to researchers at the Iowa Beef Center at Iowa State University, which serves as the university's extension program to cattle producers . . . (Christiansen, 2009, p. 95).
>
> Researchers in the Department of Agricultural Economics at Purdue University, who published "Distillers Grain Handbook: A Guide for Indiana Producers to Using DDGS for Animal Feed" in December 2008, point out that if the daily consumption of WDGS

> per cow is eight pounds, a truckload of the wet co-product would last six days for a herd of 1,000 cows . . . (Christiansen, 2009, p. 94).
>
> The MATRIC publication says recommended levels of forage for bagging with WDGS are 15 percent grass hay, 22.5 percent alfalfa hay or 12.5 percent wheat straw on a dry matter basis. The corresponding as-is percentages of the mix for the added forages are 6.3, 10.5, and 5.1, respectively. If too much forage is added, the mixture may become too dry and will not compact well inside the bag and some air may become trapped (Christiansen, 2009, p. 96).

Writers for *EPM* used the research of academic scientists to construct a science frame. The mention of research universities known for their strong agricultural programs frames ethanol production as being widely studied and a progressive topic.

Providing the names of the authors of the research articles, and their institutional affiliations, is a way of providing legitimacy to the scientific claims. Different disciplinary perspectives have the potential to shape how scientists frame their results for audiences. From the research articles cited throughout *Ethanol Producer Magazine*, the writers framed the work of academic scientists in a way for the ethanol production community to understand. For example, Christiansen provided results from various publications that give specific scientific measurements that ethanol producers might understand.

The writers also use science to construct a pro-ethanol story. *Ethanol Producer Magazine* contributors explain research done by academic scientists without the scientists explaining it themselves. While scientists have shaped how they release their results for a pro-ethanol producer audience, how the *Ethanol Producer Magazine* contributors use the results leaves uncertainty for the readers. By ignoring explanatory information from the research, the audience

assumes they are the intended audience. Without mention of the explanatory data, the results are framed as a positive impact on the economy, politics, and environment in the favor of ethanol production.

It is interesting to consider that of all the source categories examined for this study, it was only scientists (both academic and industry) that the publication's writers elected not to quote directly. In fact, there is little evidence that the contributor interviewed the academic scientists at all, relying solely on their interpretation of publish research. This study could not determine the reason for that decision.

**Industry Scientists and the Science Frame**

Scientists that work in the ethanol industry were not widely found in the articles examined for this study. The content analysis found 12 instances of industry scientists in the articles analyzed. The June 2009 issue found seven instances and the November 2010 issue had three. The scientists were cited by name, however, direct quotes were not used in the stories. Many of the references to industry scientists were taken from articles published in other publications. For example, in the article "Wet Storage Strategies," the story writer relies on an industry scientist to discuss a storage technique:

> According to Pedro Nogueira, a ruminant nutritionist for Kenpal Farm Products Inc. in Centralia, Ontario, one advantage of storing WDGS mixed with forage is that the blend is easier to break during winter months. Kenpal Farm Products published Nogueira's article "Storage of Wet Corn Distillers Grains" in its January 2009 issue of "Dairy Briefs" (Christiansen, 2009, p. 95-96).

In "Perfecting the DDGS Pellet" an industry scientist is cited on the biomass of wood:

> DDGS has four to nine times less lignin content than varieties of wood. In general, the

> lower lignin content of non-woody biomass gives it less tensile and compressive strength, according to French agronomist Olivier Pastré in a report for the European Biomass Industry Association (Christiansen, 2009, p. 86).

The works and publications of industry scientists were also mentioned in part throughout the publications analyzed. For example, Christopher Veit, senior marketing manager of biomass at Novozymes, mentioned the work of scientists at the company and how they have used their previous experience to study enzyme interactions (Bevill, 2009, p. 102).

The information provided by industry scientists used science to construct a positive frame for the ethanol debate. More specifically, it contributes to the idea of scientific certainty. In ways similar to how academic scientists and their research data was framed to be beneficial for ethanol producers, the same is true for industry scientists. Writers relied on the science of industry scientists to add legitimacy to claims about ethanol and its production.

**Federal Stakeholders**

*Ethanol Producer Magazine* references federal stakeholders, such as officials from the EPA, 17 times throughout the articles. The June 2009 issue found eight instances of federal stakeholders being used as sources. The November 2010 issue found none. Federal stakeholders as sources were used to establish both a policy frame and a science frame.

***Policy Frame***

Federal stakeholders were often referenced in discussions related to policy and technology. In the article "EPA's biogenic emissions rule could affect entire ethanol industry," the Environmental Defense Fund is mentioned by the article contributor for its approval of the EPA's inclusion of biogenic carbon emissions:

> Groups such as the Environmental Defense Fund as well as hundreds of private citizens, most of whom are concerned about proposed biomass-to-power facilities in their areas, said there is no such thing as "carbon neutral" emissions and all emissions should be accounted for, regardless of their origin. The Environmental Defense Fund applauded the EPA for recognizing the importance of "accurately accounting" for GHG emissions from biogenic sources in its final rule, although it did confess that not all biogenic feedstocks are equal. The group recommended the EPA devise a method to account for each biogenic feed stock separately and take into consideration carbon shifts across regional landscapes (Bevill, 2010, p. 41).

It is important to note that this is the first and only time "private citizens" are mentioned throughout the publications analyzed for this study. However, no specific names are given. As a B2B publication, the sources used in stories generally remain closely tied to industry. However, claiming that "private citizens" do not agree with organization leaders frames these citizens as against ethanol production.

In the article "The Push for E15," Margo T. Oge, director of the Office of Air and Radiation at the EPA, discusses the EPA's involvement in waivers by ethanol producers to allow more ethanol to be blended into fuel. *Ethanol Producer Magazine* cites her statement about how the Renewable Fuel Standard could be met for 2009:

> One option cited by Oge is through the increased use of flex-fuel vehicles and increased availability of E85 across the nation. A second option would be through the use of non-ethanol renewable fuels that do not face the same blending limitations as ethanol. The third option would be to approve the use of a midlevel ethanol blend for use in conventional vehicles (Voegele, 2009, p. 49).

"The Road to a Low Carbon Future" in the June 2009 publication discusses how the California Air Resources Board (CARB) voted to assign indirect land-use change (ILUC) carbon values to crop-based fuels (Voegetle, 2009, p. 54). While mentioning the push-back from those in the ethanol industry, Dean Simeroth, chief of CARB Criteria Pollutants Branch, states:

> It's important to remember that the regulation aims to reduce carbon emissions from fossil fuels. It sort of gets lost in the concerns about how different parts [of the regulation] are going to affect people, but the real intent of the regulation is to reduce greenhouse gas emissions from gasoline and diesel (Voegele, 2009, p. 54).

In scientific terms describing what CARB does, Simeroth is quoted as saying:

> Corn-based E10 and low sulfur diesel represent the LCFS's baseline fuels. The carbon intensity value of other fuels are measured on a life cycle basis and compared to these baseline fuels. Each year the carbon intensity of any alternative replacement fuel is compared to the LCFS standard for that year. Fuels that have carbon intensity values below that standard generate credits, while fuels with higher carbon intensity values generate deficits. In order to comply with the LCFS for a given year, a regulated party must show that its credits are equal to or exceed the deficits they have incurred that year (Voegele, 2009, p. 56).

Answering why the state of California has decided to implement the land-use change regulation from the EPA, Simeroth stated:

> ILUC impacts are triggered when an increased demand for crop-based fuels drives up feedstock prices. The price increases cause farmers to grow more of that particular crop. Supplies of these displaced food and feed commodities decline, leading to higher prices. In response, farmers bring nonagricultural land into production in order to take advantage

of higher commodity prices. This conversion of land results in carbon emissions (Voegele, 2009, p. 57).

The writers for *EPM* use federal stakeholders to establish the policy frame. First, the headline "EPA's biogenic emissions rule could affect entire ethanol industry" negatively frames the EPA in the ethanol-production debate. The writers advance a narrative it is the EPA that is limiting farmers and ethanol producers. The EPA is also framed as negative because the writer states the regulations could impact the "entire" industry. The language used in this headline makes the situation seem dire and everyone needs to pay attention to what may happen to ethanol production levels.

Previous literature states that media ignore environmental risks by framing ethanol in a positive way (Wright and Reid, 2010). *Ethanol Producer Magazine's* writers devote one article in the issues examined in this study that was dedicated to assessing the potential influence ethanol production has on indirect land-use change. However, the contributor who wrote the analyzed publications continue common policy frames by framing ethanol production as a solution for climate change (Voegele, 2009, p. 54) (Bevill, 2010, p. 41). The inclusion of information from CARB works to maintain peace with all sides of ethanol production. While the writers for the trade publication challenge the policy frame by suggesting that ethanol practices of likely conservative farmers and managers is negative, information on why their practices are harming the environment is provided. Such information not only frames ethanol production as a potential problem through proven science, but also that the industry needs to pay attention to potential policy recommendations from federal stakeholders.

***Science Frame***

*Ethanol Producer Magazine* uses information from federal stakeholders to establish the science frame. This happens mainly in stories about new ethanol-production advances. The article "Generation Power at the Plant: CHP Boosts Efficiency," discusses the cost of powering an ethanol production plant. Ethanol producers, as well as the EPA, are cited providing information about how to reduce carbon emissions from the production process. While the EPA is cited in the article, a direct source is not listed nor did the publication access information by directly speaking to anyone from the EPA. Retka Schill, the author of the article, wrote:

> According to the EPA, CHP [combined heat and power] can be combined with VOC [volatile organic compound emissions] destruction in other configurations. The thermal oxidizer can be integrated with a waste-heat boiler to produce steam from the thermal oxidizer exhaust. High-pressure steam from the waste-heat boiler is then used in a steam turbine-generator unit to produce electricity, and low-pressure steam from the back end of the turbine is used to meet process heat requirements (Retka Schill, 2009, p. 63).

The writer's choice of sources and how the article was written contributes to the science frame by using positive language towards new technology, but it does not provide information about risks to the environment.

While writers often used federal stakeholders to establish the science frame, no direct sources were provided. For example, in the story "Generation Power at the Plant: CHP Boosts Efficiency," the writer chose to provide information about CHP provided from the EPA. However, the reader is left to assume that according to the EPA, the research about CHP is directed towards powering ethanol plants and not another form of industry or science.

**Organization Leaders**

The analysis of *Ethanol Producer Magazine* found that the publication used organization CEOs, presidents, vice presidents, or other executive leaders a total of 96 times in the stories analyzed. The June 2009 publication found 24 instances of organization leaders sourced, while the November 2010 issue had 20. The trade publication used organization leaders as a source in all 31 articles that were analyzed and many of the sources were referenced in more than one article per publication. Organization leaders were cited in articles related to topics of RFS2, other policy, technology, and economics. Organization leaders were the only sources used to establish all three of the frames examined in this study: policy, economic and science.

*Ethanol Producer Magazine* contributors and organization leaders frame ethanol production as positive through criticism of the EPA, accusations of flawed science towards the EPA, and a call for more political support. Throughout the analysis, the policy, economic and science frame often overlapped and interacted with each other in support of ethanol production. The contributors of *EPM* used organization leaders so frequently that the information provided can be used interchangeably. Information provided below demonstrates how science was used to establish a dominant frame within a story.

***Policy Frame***

The textual analysis shows that sources were often used to discuss policy, especially in regard to discussion about EPA standards or rules for ethanol production. The CEOs of the Renewable Fuels Association, Growth Energy, Poet, and the National Corn Growers Association were all quoted in stories related to policy. In the article "EPA issues proposed rule for RFS2," Renewable Fuels Association president and CEO Bob Dinneen commented on policy issues related to greenhouse gas:

> The science of market-mediated, secondary impacts is very young and needs more reliance on verifiable data, and less reliance on unproven assumptions. Done correctly, such an analysis will demonstrate a significant carbon benefit is achieved through the use of ethanol from all sources (Voegele, 2009, p. 26).

Similarly, Poet Biorefinery CEO Jeff Broin stated:

> While many scientists have found significant flaws in the models used to calculate indirect land use change, I think the very concept is flawed and stems from a lack of understanding of ethanol and agriculture (Voegele, 2009, p. 26).

Tom Buis, Growth Energy's CEO, argued for the importance to peer-reviewed science about the process of ethanol production and its importance for the progress of the renewable fuel industry (Voegele, 2009, p. 26). However, Buis was skeptical about the EPA's ability to regulate the industry. He stated in the article, "The science on indirect land use is unsettled and the theory is not ready for regulatory usage . . . it does not include the indirect effects of other fuels" (Voegele, 2009, p. 26). The National Corn Growers Association's president also released a statement to *Ethanol Producer Magazine* saying, "We understand a great deal of work needs to be done on modeling and a great effort needs to be put into using current and correct data regarding indirect land use" (Voegele, 2009, p. 26).

In the November 2010 issue, *Ethanol Producer Magazine* reported again on RFS2 and EPA regulations. CEOs and other ranking members of organizations were quoted throughout various stories regarding Greenhouse Gas emission (GHG) levels, the EPA, and biogenic emissions in the GHG levels. As Valero Energy Corp.'s CEO commented on the EPA rule:

> The equal treatment of biogenic emissions and petroleum-based emissions creates a clear disincentive for manufacturers of alternative fuels, and will adversely affect their ability

to obtain permits in a timely fashion, require additional capital to install emission controls, limit production flexibility and diminish capacity for market expansion to meet increasing renewable fuel standard blend volume requirements (Bevill, 2010, p. 40).

Valero's CEO continued:

> The fermentation process at a 50 MMgy plant releases 157,000 tons per year of CO2. When combined with other emissions, a production facility that size would emit approximately 277,000 tons per year of CO2. This would place nearly every ethanol plant in the U.S. within the constraints of the EPA's Tailoring Rule, which will subject all sources that emit more than 100,000 tons per year of CO2 equivalent to permitting requirements beginning July 1 (Bevill, 2010, p. 40).

On the issue of the EPA including the combustion of biological materials, such as corn, for total Greenhouse Gas emission levels, Vice President of Research for the Renewable Fuels Association Geoff Cooper stated, "Obviously this is not practical, it's not scientifically justified, and frankly, it's lunacy to think our industry could do something like that" (Bevill, 2010, p. 40).

The National Corn Growers Association commented:

> NCGA strongly feels that the supporting science is appropriate for EPA to continue to consider biomass fuels and fuels produced from biomass as carbon neutral as the IPCC and others do…reversing the long-standing principle of biomass carbon neutrality would not be a correct policy response (Bevill, 2010, p. 41).

In the article "The Push for E15," *Ethanol Producer Magazine* used quotes from the CEO of Growth Energy to discuss raising ethanol to an E15 blend. The article itself also focuses on how Growth Energy filed a fuel-waiver request to the EPA to allow ethanol producers to produce

a higher-ethanol blend. The writer quoted Tom Buis, Growth Energy's CEO, several times throughout the article:

> "The timing was based more on the fact that ethanol producers have run up against that arbitrary regulatory cap of only 10 percent ethanol into our nation's gasoline," he says."[We] need government to raise it in order to let us move forward in clean green energy" (Voegele, 2009, p. 46).

Growth Energy's CEO and Co-chairman discussed why the EPA needs to allow producers to blend E15:

> The United States needs to move to higher ethanol blends in order to keep pace with the Renewable Fuels Standard, which mandates the use of 36 gallons of renewable fuel by 2022. for all practical purposes, we have already reached the E10 blend wall . . . a saturated E10 market is a primary reason for the U.S. ethanol industry's current financial condition, and that delaying action in removing the blend barrier would hinder the viability of current ethanol plants and set back the development of viable second-generation fuels (Voegele, 2009, p. 48).

*Ethanol Producer Magazine* writers reporting on policy stories used organizational leaders to shape how the audience received information. This helps establish the information as credible because high-ranking members of their organization are relaying facts, often presented as hard science or critiques of science. The contributors make the articles regarding policy more salient for the audience by making headlines and those quoted more memorable. Headlines such as "The Push for E15", "EPA issues proposed rule for RFS2", and "Is the RFS Broken?" cast ethanol and industry sources as the "hero" of the policy feature stories and government policymakers as threats. Since ethanol producers and farmers during the time frame analyzed are

fighting new enforcement standards on ethanol production practices, headlines that embolden pro-ethanol stakeholders frame the EPA and environmentalists as wrong. If the target audience has read previous publications of the magazine, they will notice the same names and organizations are used each article. The publication contributors also choose to include direct quotes from organization leaders that make emotional claims. Velero's CEO stated that nearly all ethanol plants emit more than 100,000 tons of CO2 a year, so all would fall under the EPA's requirement to include their production in their GHG report. To farmers and ethanol plant managers, they see this information as detrimental for their industry and damaging to creating renewable energy.

All stories analyzed in the textual analysis categorized as a policy frame discussed the EPA, the inclusion of ethanol production carbon emissions in the GHG report, and indirect land-use changes. The writers used the same sources throughout all of the articles. Their contribution to the policy frame is memorable. Not only did the writers include direct quotations from organizational leaders on policy issues, but rarely did they quote federal stakeholders. Writers and organization leaders used science to frame ethanol production in a positive-policy manner by, in turn, framing the EPA as "harmful." Throughout articles related to the EPA and organization leaders, *EPM'*s writers framed the EPA as attempting to limit the industry and the future of renewable fuel.

For example, *EPM'*s contributors included quotes from organization leaders stating that the denial of permits for E15 production hinders the industry. Other organization leaders threatened to start exporting ethanol to other countries and that rural communities would see exporting as a threat. Due to the historically conservative nature of rural communities, many might see exporting ethanol as violating the primary objective of the 2007 Renewable Fuel

Standard. This "threat" frame is used to fight policy decisions that are seen as damaging the industry and also delegitimizes scientific studies that support those policies. As one organization leader said, ethanol production cannot function without carbon emissions, thus the regulation from the EPA hurts industry (Bevill, 2010, p. 40).

The inclusion of information from organization leaders challenging the EPA's science contribute to the policy frame. The inclusion of conflicting evidence not only creates fragmentation between sources, but also makes the story more salient. The pro-ethanol, anti-EPA frame provided throughout the featured articles is questionably the most fragmented. Rarely do the writers or the organizational leaders support their claims with facts. For example, Voegele's story in the June 2009 publication starts with a two-paragraph summary of the EPA's proposal (Voegele, 2009, p. 26. However, Voegele does not provide any direct quotes nor does she provide figures from the report (Voegele, 2009, p. 26). Instead, she relies on emotion to frame the EPA's new policy. As she wrote:

> The U.S. EPA released its proposed rulemaking for the second stage of the renewable fuels standard (RFS2) on May 5. The EPA's proposed rule for the RFS2 expands the scope of the program to include all transportation fuels, including gasoline and diesel intended for use in highway vehicles and engines, as well as non-road locomotives and marine engines. As directed by the Energy Independence and Security Act of 2007, the proposed rule requires that some renewable fuels achieve greenhouse gas (GHG) emission reductions compared to the gasoline and diesel fuels they displace. A fuel pathway is established for each fuel that accounts for GHG emissions produced over the fuel's full lifecycle, including emissions resulting from the production and transport of the feedstock, production, distribution, blending, use and land use (Voegele, 2009, p. 26).

> Indirect land use change effects are also included in the fuel pathways of biofuels. With the inclusion of indirect land use change emissions, the EPA estimates typical corn ethanol reduces GHG emissions by 16 percent when compared to gasoline. Without the inclusion of indirect land use change, corn ethanol is shown to reduce these emissions by 61 percent.

Another way the *Ethanol Producer Magazine* writers and organization leaders challenge the EPA's policy is by claiming "flawed science." The language used to describe the EPA proposals leads to a controversial understanding of what the EPA is trying to provide for the industry. Language such as "flawed," "unsure," "unsettled," "not practical," and "not scientifically justified" are used to undercut the EPA's findings and new regulations on reporting carbon emissions and land-use changes. Some organization leaders also expressed their uncertainty by stating that the EPA does not understand the agriculture and science behind ethanol production, nor does it include reliable data in its reports. *Ethanol Producer Magazine* tends to frame ethanol production as the solution for environmental concern. As such, any harm to potential production is framed as negative for the audience.

***Economic Frame***

Organization leaders discuss the economic benefits of ethanol production throughout the analyzed stories. For example, while discussing the move to E15, Growth Energy CEO Tom Buis mentions in the June 2009 publication that producing more ethanol would "create jobs, reduce the dependence on imported oil, help the environment, and help develop more technology" (48). Buis also states, "[G]oing to 15 percent would create 130,000 new green collar jobs, provide about $25 billion into the U.S. economy and displace 7 billion gallons of imported gasoline each year" (Voegele, 2009, p. 48).

The November 2010 publication of *Ethanol Producer Magazine* continued to discuss a potential E15 blend. Geoff Cooper, vice president of the Renewable Fuels Association, provided his analysis on the policy restriction and the decision to start exporting more ethanol:

> One of the founding principles of the industry was, let's do what we can to increase our domestic fuel supply and reduce the amount of oil that we import, so here we are now in a situation where the U.S. ethanol industry is standing at the ready to produce more ethanol and to assist in reducing the amount of foreign oil that we need, and yet the industry is being held back because of the limit on E10. The situation underscores the need for immediate approval of E15 (Jessen, 2010, p. 52).

In an article titled "Is the RFS Broken?", six different organization leaders are quoted multiple times. The article asked whether the renewable fuel standard is truly useful if the EPA will not allow for E15 blends. The article also noted that the EPA has lowered the amount of ethanol to be produced in the United States in 2010 from 100 million gallons to 6.5 million gallons (Bevill, 2010, p. 56). Mark Stowers, vice president of science and technology at Poet, stated:

> EPA is sending a signal to the investment community that they don't see cellulosic ethanol developing at a rate that is consistent with the RFS. There's a lot of investment in this technology that is maturing and it would be sad to see that shortened by lack of investment (Bevill, 2010, p. 56).

Ted Kniesche, vice president of business development at Fulcrum Bioenergy, added, "It really does signal in a negative way to the market that the program isn't working as designed" (Bevill, 2010, p. 56).

The quotes demonstrate how *Ethanol Producer Magazine* used science to frame ethanol production as an economic issue. A common economic frame found in the feature articles is the idea of "green jobs." More specifically, the economic frame focuses on the benefits farmers gain from increased demand for ethanol production. The contributors of *Ethanol Producer Magazine* stories use direct quotes from organization leaders to frame more ethanol production as the answer to creating more jobs for rural communities while also creating renewable energy jobs. The organization leaders also frame ethanol as a way for rural farmers and communities to see an economic boom. For example, Growth Energy CEO Tom Buis stated that if the ethanol industry were able to blend E15, 130,000 new jobs would be created and the industry would provide an additional $25 million to the United States economy (Voegele, 2009, p. 48).

Since *Ethanol Producer Magazine* is a B2B trade publication that covers the industry, it makes sense that writers would include quotes from CEOs about the positive economic impact of ethanol production. The publication supports the businesses that sponsor them through including advertisements and including quotes from top business leader in the ethanol production industry. However, it is also important to understand how the writers frame that debate for readers of the publication through their selection of sources and information.

***Science Frame***

Organization leaders were often quoted in *Ethanol Producer Magazine* about new technological and scientific advances in the ethanol industry. A common advancement mentioned throughout several articles was cellulosic ethanol. According to the article, "Cobs to Switchgrass to Gasoline Parity," some ethanol producers have begun harvesting the cellulose of switchgrass and corn to create ethanol instead of using the whole cob or plant (Retka Schill, 2009, p. 108). The article cites Dupont Danisco Cellulosic Ethanol LLC as a company to

jumpstart the movement towards cellulosic ethanol. While discussing how the new source of ethanol will be produced, a direct source is not provided. The contributor wrote:

> Careful not to divulge too many details, the management team provides an overview to EPM [Ethanol Producer Magazine] of the DDCE process. Dupont has contributed the thermochemical pretreatment process it has been working on for five years based on a dilute alkaline process. The enzymatic hydrolysis to convert the cellulose and hemicellulose into fermentable sugars is based on the Accellerase enzyme platform developed by Genencor, although DDCE is customizing the enzyme cocktail to integrate it with preprocessing and fermentation environments (Retka Schill, 2009, p. 110).

The conversation of the future of ethanol production continued in the article with quotes from Joe Skurla, president and CEO of Dupont Danisco Cellulosic Ethanol LLC. When asked how his technology will benefit ethanol production, Skurla said:

> We will be entering the market globally as a provider of cellulosic ethanol technology. That will mean licensing, royalties, providing proprietary equipment, maintenance contracts and support. DDCE has a team already looking for a location for the first corn cob-based commercial facility, likely to be co-located with a corn ethanol plant to make use of existing infrastructure . . .. It's important to put your money where your mouth is, and that makes your mouth more credible (Retka Schill, 2009, p. 108).

In the article titled "Generating Power at the Plant: CHP Boosts Efficiency," Rod Pierson, director of plant operations for Poet Biorefineries, discussed how combined heat and power (CHP) is more efficient for powering ethanol plants. Pierson stated that ethanol plants "use approximately 7 MW of power and 75,000 pound per hour of steam for process heat for the 45 MMgy plant" (Retka Schill, 2009, p. 63). The director also provided information for how the

technology works for the ethanol plants:

> CHP is a good fit for ethanol plants because energy is the second highest cost after corn. A typical 50 MMgy dry mill will have steam loads of 100,000 to 150,000 pounds per hour and power demands of 4 to 6 megawatts (MW), depending on its vintage and mix of operations…The thermal oxidizer can be integrated with a waste-heat boiler to produce steam from the thermal oxidizer exhaust. High-pressure steam from the waste-heat boiler is then used in a steam turbine-generator unit to produce electricity, and low-pressure steam from the back end of the turbine is used to meet process heat requirements (Retka Schill, 2009, p. 62-63).

While discussing how CHP helps the overall production of ethanol, the writer for *Ethanol Producer Magazine* explained how plant managers believe the new technology benefits the economy and environment:

> "We save $15,000 a month in electrical bills," says Doug Sommer, EKAE plant manager. The EPA figures the heat and electricity supplied to the plant requires approximately 23 percent less fuel than typical separate onsite thermal generation and purchased electricity. That in turn reduces carbon dioxide emissions by an estimated 14,500 tons per year, which is equal to removing the annual emissions from 2,400 cars and planting 3,000 acres of forest (Retka Schill, 2009, p. 64).

*Ethanol Producer Magazine* published feature articles regarding how technological advances are working around RFS mandates from the EPA. In the article "Generating Alternatives," NDCPower is highlighted for creating new uses for ethanol, such as electric power and commodity chemicals (Bevill, 2010, p. 62). General manager Jessica Mitchell is quoted

throughout the article discussing how technology can advance new ethanol uses. As the writer wrote:

> NDCPower's technology employs an electro-chemical process in a fuel cell to generate electricity and, depending on the feedstock used, various saleable chemicals. For example, ethanol produces acetic acid while methanol produces formic acid. Mitchell likens the inner workings of the fuel cell to a gigantic battery. "It operates at room temperature and pressure and there are no moving parts," she explains. "We do not combust the molecule, like you would in a traditional generator or steam turbine or similar types of technologies. We have catalysts inside the unit that drive the reaction (Bevill, 2010, p. 62).

Mitchell also mentioned how NDCPower's work could help ethanol producers meet the EPA's greenhouse gas regulatory measures. The contributor wrote:

> For producers seeking to gain a leg up on future greenhouse gas regulatory measures, NDCPower's fuel cells offer two advantages. First, because ethanol is used as the feedstock to generate electricity, it has the potential to be deemed a renewable source of energy, which could alleviate some of the pressure to comply with demands for reduced intake of fossil fuels. Second, the technology converts CO2 that would typically be emitted into the atmosphere into a chemical byproduct, virtually eliminating all CO2 emissions from the units. "If you combust ethanol, all of the carbon ends up converted to CO2 to make power, but you don't make anything else," Mitchell says (Bevill, 2010, p. 63).

The sources used by the writers of *EPM* help create a science frame around ethanol production. However, the writers use science in the publication to focus on science *for* ethanol

production, not the science *of* ethanol production. Writers and organization leaders framed science as an "opportunity." The writers entice the reader with new technological advancements in the industry.

However, through positive language of new and developing technology, the contributors of the magazine are able to hide the fact that much of the new technology is intended to make ethanol production more efficient to increase profits, not for renewable energy efficiency. For example, in the article "Generating Alternatives," a discussion of creating an alternative source from an already alternative fuel source is provided. Due to the RFS2 mandate, the writer encouraged readers to follow the money. Instead of following the EPA's mandate to make ethanol production a truly renewable energy source, *Ethanol Producer Magazine* uses "opportunity" to establish a new way for farmers and ethanol plant managers to profit from ethanol. Using language that ethanol producers are already familiar with, and supported by quotes from organizational leaders, the audience will compare current production with the potential for change. Using "opportunity" allows the audience of *Ethanol Producer Magazine* to have "hope" after reading how the contributors and sources in previous articles framed the potential outcome from the EPA's mandates. The ability to get around the mandates using science to create new fuel sources frames ethanol production as a changing renewable fuel for some and a cheap way out for others.

The staff writers of *Ethanol Producer Magazine* use organizational leaders as sources to support new scientific advancements for ethanol production, but often ignore environmental concerns. While discussing new ways to reduce costs for ethanol production plants, sources also discuss technology for producing ethanol cheaper. Without mention of supporting scientific data, new technology is backed as producing lower carbon-emission levels -- the same as planting

3,000 acres of forest (Retka Schill, 2009, p. 64). The writers and organization leaders using this information to frame new ethanol production technology as positive never state that they will actually reduce emissions or plant the acres of forest needed to offset ethanol production carbon emissions. The positive frame expressed to the audience that these opportunities are possible is enough to show that ethanol is doing good things for the environment. Organizational leaders contribute to the journalistic science frame to oppose the EPA regulations and delegitimize EPA regulations.

# Chapter 5

# DISCUSSION

## Research Questions Revisited

This study began with the following research questions:

RQ1: How do the sources in *Ethanol Producer Magazine* feature articles use science to frame ethanol use?

RQ2: How do the contributors who write the stories for *Ethanol Producer Magazine* use science to frame ethanol use?

RQ3: Does the way *Ethanol Producer Magazine* use science to frame the ethanol issue change in response to political or policy developments?

To answer RQ1, I took the data collected from Tables 1 and 2 in the content analysis and analyzed each source and category in *Ethanol Producer Magazine*'s feature stories. I analyzed articles in the June 2009 and November 2010 issues for the textual analysis. While analyzing the sources used in the publications, I specifically looked at how each source and category used science to frame ethanol production. Political sources in *Ethanol Producer Magazine* used science to frame ethanol to gain support of their specific agendas. Politicians were only found as sources in policy frames. While the research of academic scientists was used to frame ethanol use, the scientists were rarely directly quoted preventing them from a deeper understanding of that research. The only exception is Peters, the sociologist from Iowa State University. The audience is left to assume the research is intended for the ethanol industry. The work of industry scientists was used to frame ethanol production in ways that validated their scientific certainty for the industry. Many industry scientists provided research to support ethanol production. Federal stakeholders were used as sources in policy and science frames throughout *Ethanol*

*Producer Magazine*. Federal stakeholders used science to discuss mandates for the ethanol industry. Federal stakeholders presented data to show how land use is related to ethanol production.

Organization leaders provided information for all aspects of *Ethanol Producer Magazine* and, as a result, had the greatest voice in the discussion about ethanol. Since organization leaders were used frequently throughout the magazine, it was difficult at times to discern what frame they were using to discuss ethanol production. Many times, they were using frames interchangeably in the same feature story. In terms of policy, organization leaders were found to use science to frame ethanol through discussion of permits and mandates. The organization leaders provided information as to why mandates are not scientifically justified for the ethanol industry. For the economic frame, organization leaders used science to show how ethanol production is positive for job creation, national security, and the national economy. The analysis also found that organization leaders were given a voice in the debate about the science of ethanol production. They were allowed to discuss the technological advancements in the industry and call into question scientific conclusions that might run contrary to the interests of ethanol production.

As stated in Nisbet and Mooney's (2007) research, scientists must start to learn how to actively frame their results for various publics. With scientists framing their results for a more public audience, they are able to counter potential, indirect frames used to discuss their work. However, information is still easy to disseminate as something different. By making the results and implications of their research more clear, scientists will not only be benefiting society more actively, but their research will be used as intended. The analysis proved to be interesting because although the writers of *Ethanol Producer Magazine* articles used the work of the

academic and industry scientists for their stories, the voice did not seem genuine, mainly due to the fact that there were few direct quotes from the scientists discussing their own work. Previous research states that farmers do not benefit by hearing information from scientists because they do not understand the information presented (Powell, 2007). However, this is not an industry issue, instead a societal issue. It is odd that a journalist would not go directly to the source to get a quote on evidence provided. To say that scientists' research should not be heard because the audience does not want to hear from them says something about how science is perceived.

RQ2 asked how contributors who write for *Ethanol Producer Magazine* used science to frame ethanol production. To answer this research question, I did the same analysis as I did for the sources in the publications. However, I specifically focused on the stories told by the contributors. Throughout the analysis, it became clear that RQ1 and RQ2 would be answered similarly. *Ethanol Producer Magazine* used specific sources and the sources' information to frame stories of ethanol production a very specific and narrow way. For example, when policy was used to discuss ethanol production contributors used information from sources in the category of federal stakeholders, organization leaders, and politicians. As the results show, these sources did not provide similar insights. For example, the writers for *EPM* used science to frame ethanol production as being "in danger" reflecting the language used from organization leaders to criticize ideas associated with federal stakeholders. The choice to give organization leaders voice to oppose federal stakeholders reveals much about how contributors construct reality. Their decisions about how to tell the story, and who they allow to speak, plays a powerful role in that construction.

In terms of economics, the writers often used science to frame ethanol production as being progressive and trustworthy. To do this, they relied on information from academic

scientists and organization leaders. The writers used scientific data from these specific sources to show that the economic benefits of ethanol production benefit rural communities. In terms of the economy, contributors often used science to provide context for the benefits that ethanol could provide, asking the audience to support policy decisions that would aid ethanol production.

Writers for *Ethanol Producer Magazine* used organization leaders, federal stakeholders, and academic scientists as sources to support new scientific advancements throughout *Ethanol Producer Magazine*. The contributors also used science, often reflected in references to advancements in science and technology, to frame the ethanol industry as forward thinking. However, how they framed the advancements was narrow and aimed at a very specific audience. The stories often included complex, detailed and technical discussions—information that would seem to be primarily of interest to organizational leaders. The writers often ignored discussing the science of potential environmental risks brought up by federal stakeholders and politicians, and instead used science to discuss how the industry might reduce costs and how new advancements might be used to get around EPA mandates.

The results of this thesis show that *Ethanol Producer Magazine* allows organization leaders to speak about science more than any other type of source. This could be due to the nature of the perceptions about the publication's audience. However, how the contributors chose what information to include is also important to discuss. Throughout the analysis, it was clear that the contributors that write for *Ethanol Producer Magazine* do not quote scientists, but instead uses organization leaders or academic scientists to explain scientific data. Although the writers for *EPM* cite journal articles written by academic or industry scientists, the scientists are rarely directly quoted. The writers make the effort to reach out to organization leaders, but not scientists. This limits the ability of scientists to play a role in the interpretation of their own work

leaves the work of interpreting science to organizational leaders who bring with them a vested interest in the industry. The choice to not directly talk to scientists about their work contributes to the dominant way a story is framed. The journalist seems very credible by citing a journal article and interpreting the results. However, this allows a journalist to choose what information to use, rather than allow the scientist the opportunity to provide an interpretation. The contributors could partake in framing their stories this way because they do not want scientists providing contrary interpretations. For example, not talking with scientists might make it easier for writers to use only those EPA figures that benefit their claim. This, however, is only speculation since the goal of this study was not to discover why the writers make the choice they do, but only to determine how they use science to establish dominant news frames.

To answer RQ3, I analyzed sources categorized according to their affiliation. This specific information can be found in Table 1. I also analyzed the frames found in each category. Information regarding which frames were found in each category of sources see Table 2. The results from the content analysis helped answer RQ3. The results show that *Ethanol Producer Magazine* often used science to respond to political or policy developments. When a specific policy was introduced, and the magazine perceived it as being either favorable or unfavorable for the industry, the publication used science to frame its response. Examples include new technological and scientific advancements for ethanol producers and ways that ethanol can help reduce climate change. The results also show that when policy is perceived as being negative towards ethanol production, *Ethanol Producer Magazine* used science to delegitimize that policy. As the EPA's indirect land use mandate went into effect towards the end of 2009, fewer federal stakeholders and politicians were used as sources in *Ethanol Producer Magazine.* Results in Table 1 show that eight federal stakeholders were cited in June 2009, while none were cited in

November 2010. As time went on, the diversity of voices diminished with the publication increasingly giving voice to industry leaders. Toward the end of 2010, the publication chose to rely on sources and information that supported ethanol production. By the November 2010 publication, the EPA's Renewable Fuel Standard 2.0 was in effect. For the ethanol industry, this meant less ethanol could to be produced, while all ethanol plants are mandated to report carbon emissions from the combustion of corn sources.

**Fragmentation Bias and *Ethanol Producer Magazine***

The stories analyzed for this thesis demonstrate how the frames that writers for *Ethanol Producer Magazine* use to tell the ethanol story, and the sources they use to construct those frames, presented a fragmented picture of reality. According to Bennett (2003), the audience tends to get more information when the media are open to a greater diversity of source information. *Ethanol Producer Magazine* uses organization leaders to discuss science much more frequently than any other type of source. As discussed in the previous chapter, out of the publications analyzed, only four politicians were cited while 96 organization leaders were cited. The audience reading the publication is only hearing a few voices, or information streams, regarding the news and science of ethanol production. While it is difficult to remove bias from reporting, as Bennett (2003) notes, increases in types and amount of information might lead to a greater diversity of information. While the contributors writing for *Ethanol Producer Magazine* do use various information streams, the voices used are too similar.

*Ethanol Producer Magazine* and its writers use science to frame news about ethanol in the areas of policy, the economy, and the science of ethanol. As shown in the results, the publication fragments science mainly through picking and choosing which sources will be included in feature stories, what information to include, and what will be left out, and then by

using those sources to construct frames through which to tell the ethanol story. While it is impossible to have a story without a frame, for *Ethanol Producer Magazine*, it is important to think of what kind of frame would create a less fragmented publication. A potential frame for the publication to consider is an "environmentally positive" frame. Not only would the publication still be able to use science to tout the economic advantages of ethanol, but it would be able to focus more on the environmental benefits of the industry. While the industry considers itself "renewable," there isn't much conversation within the magazine about its environmental impact.

Bennett (2003) discusses how fragmented news coverage quickly strays from solutions or workable policy. Exposing the audience to conflicting points of view, such as fearful threats or personalized battles between parties, leaves readers confused. The audience is left uncertain how they should include this new information into their lives and what they already know and believe. In the case of *Ethanol Producer Magazine*, the writers use sources to construct frames that present a mix of threats to the industry. The writers frame the EPA as unknowledgeable and flawed, even though federal stakeholders try to provide information that would make ethanol sustainable. However, sustainable ethanol production as proposed by the EPA and other federal stakeholders would become less economic for ethanol producers and organization leaders. This is demonstrated throughout the policy-frame discussion in the previous chapter. Organization leaders are quoted extensively stating that the ethanol industry cannot afford more regulation because it would damage the current process.

News that is fragmented leads to a reality of its own. For *Ethanol Producer Magazine*, the story plots contain broader social contexts, but only to make the simple story more dramatic. For example, the story "EPA's biogenic emissions rule could affect entire ethanol industry" reads true, because the EPA did want to include biogenic emissions in Greenhouse Gas emission

reporting. However, the journalist's construction leads to a fragmented reality. The stories related to the EPA jump back and forth between interviews or sources, factual information, and plots. Not only is this confusing for the reader, but the audience could misread information. Fragmentation bias, similar to the game of "Telephone," spreads a positive frame for ethanol. By using selective scientific information and sources, *Ethanol Producer Magazine* constructs a fragmented, yet supportive, message about ethanol production.

**Trade publications as objective news sources?**

Previous studies have examined how environmental news frames influence farmers and society,but those studies have focused on traditional media outlets. This study expands that examination by looking at a B2B publication. Little is known about how writers within B2B publications frame their stories or the work they do. What this study seems to suggest is that *Ethanol Producer Magazine's* audience, at least based on the way stories are framed, is relatively narrow. While the circulation of *Ethanol Producer Magazine* is approximately 11,250 subscribers spread across 46 countries, it appears from the framing of the stories that content is aimed at a small circle of readers. *Ethanol Producer Magazine* uses science to frame what the industry wants to discuss in a way that reflects the industry's interests. However, it rarely discusses how science relates to ethanol production. For example, organization leaders would want to know how to save money powering ethanol plants or the science of new ethanol production techniques. The magazine focuses on the industry and how to make ethanol production more profitable by framing it as environmentally friendly. For example, contributors and organization leaders provide exact information of how many "green collar" jobs will be established if the EPA's mandates are not passed, and instead more ethanol is be produced (Voegele, 2009, p. 48). *Ethanol Producer Magazine* uses specific scientific language to discuss

methods such as energy processes, cellulosic ethanol, and enzymatic hydrolysis throughout their feature stories. *Ethanol Producer Magazine* seems to frame its stories for a small and specific audience.

*Ethanol Producer Magazine* is a publication that presents one side of the story of ethanol production. The results of this thesis show that a B2B publication frames information in an attempt to influence policymakers and stakeholders. The results of this thesis also show that B2B trade publications should not be considered an objective news source. Even though *Ethanol Producer Magazine* should not be considered an objective news source, a large amount of individuals have access to the messages it presents on the falsification of scientific data. This frame continues the difficulty of environmental communication and fragmentation bias. These ideas might indicate how future studies of B2B publications should be approached. For *Ethanol Producer Magazine* and potentially other B2B publications, it may be best to study the publications as public relations or advertising texts. Future studies may then recognize the publication for what it is instead of thinking what it ought to be. Future studies might also investigate how writers who work for B2B publications see the work that they produce. This thesis did not investigate that question.

Another interesting question this thesis did not investigate is how the audience views the information contained in this B2B publication. Does the audience consider this publication to be news? Does *Ethanol Producer Magazine* appear to the audience to be fairly and widely sourced? Are the frames that dominate the stories in *Ethanol Producer Magazine* obvious to the audience or is science used to hide the reality that is constructed across the stories?

*Ethanol Producer Magazine* is an influential trade publication. Not only is the magazine a publication that caters to a very specific industry, but also it has the potential to sway readers

by using information to construct reality. *Ethanol Producer Magazine* has the potential to directly influence how the audience perceives the science of ethanol production through the actors used to discuss new advancements in the industry. How trade publication writers choose to use science to discuss news in the ethanol production industry is important for how the farmers understand their ethanol-related work and lives. News coverage in *Ethanol Producer Magazine* is related to economic projects, policy, and environmental issues. If the audience is only receiving one publication that is related to their trade, the frames and information provided become even more powerful. The language used to discredit federal stakeholders in *Ethanol Producer Magazine* might come to reflect how the audience will perceive information from the stakeholders such as face-proven science.

A bigger question for this study regarded how science is used in ethanol production. It became clear that *Ethanol Producer Magazine* writers and sources viewed science in a pragmatic way. In other words, what picked science to emphasize and what not emphasize. If science conflicts with that they want to be true, scientific results are false. However, previous studies, as well as other studies outside of this thesis, and those that did not have a voice in the publication, have a dogmatic view of science. These studies view science as indisputably correct and give respect to science. Federal stakeholders, and potentially the unheard voices academic scientists, provide scientific results that are hidden by the pragmatic messaging of *EPM*. While ethanol production has the potential to be truly renewable, science provided by federal stakeholders shows that current production is not sustainable.

Future studies might investigate the credibility of the magazine with farmers and readers. The magazine includes consistent sources, which helps frame the publication as credible if a reader keeps up with their subscription. Although this thesis did not study advertisements, B2B

trade publications include pages of ads throughout each issue. Many ads are for local, family-owned companies related to ethanol production. Seeing information about individuals "just like them" might spark credibility throughout familiarity among readers.

**Who is missing in *Ethanol Producer Magazine*?**

The results discuss how politicians and federal stakeholders are generally left out of the conversation of the science of ethanol production in *Ethanol Producer Magazine.* However, there are other voices missing in the publication. Although a large part of the ethanol process, farmers, are left out of the conversation. Could farmers' insights contribute to discussions about how to create a more sustainable industry? Since the publication uses science to frame the discussion of ethanol production through the lenses of policy, the economy, and science, might farmers' perception of their work be impacted? Previous literature suggests that farmers are excited about potential economic booms in rural communities and are not concerned about land use changes (Bain and Selfa, 2013). However, have the farmers that read *Ethanol Producer Magazine* been influenced by how the writers use science to frame ethanol production? It is possible that publications like *Ethanol Producer Magazine* are creating a false reality for farmers and the public. Without including perspectives from scientists, the target audience stays in an "echo chamber" of information. Since *Ethanol Producer Magazine* is automatically sent to all ethanol plants and is one, if not the only, trade publication of its kind, the magazine has influence over its readers. Organization leaders and *EPM* writers provide information that the industry is doing well, therefore, any threats are not to be tolerated or believed. This behavior is dangerous and ultimately feeds fragmentation bias because the frames presented are believed to be true.

The inclusion of farmers and the public on ethanol production topics can lead to participation from several perspectives. The lack of consideration from *EPM* writers of the

public as “expert” in terms of ethanol production is a problem. As scientists release more information about potential risks ethanol production has to the environment, the more political, pro-ethanol-production readership becomes.

**Limitations**

This study on the B2B publication, *Ethanol Producer Magazine,* is one of the first of its kind. Throughout the research process, there was no evidence that another analysis of ethanol trade publications exist. Some of the limitations of this study relate to the study’s methodology. There are some feature articles in the magazine that did not always include science or used science to frame ethanol production. However, different questions could be raised in future studies examining the benefits of *Ethanol Producer Magazine*. Since it is difficult to place a B2B publication in the same category as traditional news, viewing each feature story through the lens of framing technique of objective news sources could influence how the conclusions of this study were viewed.

This study did not directly study why the writers used the sources they do. *Ethanol Producer Magazine* was not reached out to for their reasoning on sourcing choices. This study makes assumptions about how *Ethanol Producer Magazine* and its staff writers create dominant frames. Other studies may come to different conclusions as to how the publication creates dominant frames. There are other ways to frame ethanol production besides science. Other studies on *Ethanol Producer Magazine* could analyze how another context is used to frame ethanol production. Examples could be the environment, climate change, profits, technology, or the public sphere. These are only a few suggestions, however, there are many other opportunities. A different result could occur from another context of framing ethanol production.

The decision to look at how science is used to frame ethanol production undoubtedly influenced the results. For example, this specific timeframe was used because I previously read the June 2009 publication before the analysis took place. I knew coming into this study how the publication chose to discuss science and how it used science to frame ethanol production, to an extent. I knew that many sources the staff writers chose to include did not agree with the EPA and they worked to discredit the EPA's scientific reports.

The current study used a very specific and small time frame to analyze feature stories from *Ethanol Producer Magazine*. Different conclusions are possible if other years or timeframes are analyzed. For example, this specific study looked at issues in the ethanol industry during the Obama administration. A study analyzing more recent issues such as in the Trump administration could show widely different data. With a ten-year span between the publication dates and the completion of the current study, the ethanol industry has evolved. New mandates, policy changes, viewpoints, and scientific advancements exist for ethanol production that were not discussed in this study.

References

Bain, C., Prokos, A., & Liu, H. (2012). Community support of ethanol plants: Does local ownership matter? *Rural Sociology*, *77*(2), 143-170.

Bain, C., & Selfa, T. (2013). Framing and reframing the environmental risks and economic benefits of ethanol production in Iowa. *Agriculture and human values*, *30*(3), 351-364.

Banning, S. A., & Evans, J. F. (2001). Fading voices: A 10-year trend within an agricultural advertiser-media-reader triad. *Journal of Applied Communications*, *85*(2), 2.

Bennett, W.L. (2003). *The Politics of Illusion*, University of Chicago Press, 41-78.

Bevill, K. (2010, November). EPA's biogenic emissions rule could affect entire ethanol industry. *Ethanol Producer Magazine*, 40.

Bevill, K. (2010, November). Is the RFS Broken?. *Ethanol Producer Magazine*, 56-59.

Bevill, K. (2010, November). Generating Alternatives. *Ethanol Producer Magazine*, 62-64.

Bevill, K. (2009, June). The Forefront of Enzyme Production. *Ethanol Producer Magazine*, 102-106.

Corbett, J. B., & Durfee, J. L. (2004). Testing public (un) certainty of science: Media representations of global warming. *Science Communication*, *26*(2), 129-151.

Christansen, R. C. (2009, June). Doing the Math. *Ethanol Producer Magazine*, 70-73.

Christansen, R. C. (2009, June). Perfecting the DDGS Pellet. *Ethanol Producer Magazine*, 86-89.

Christansen, R. C. (2009, June). Wet Storage Strategies. *Ethanol Producer Magazine*, 94-97.

Delshad, A., & Raymond, L. (2013). Media framing and public attitudes toward biofuels. *Review of Policy Research*, *30*(2), 190-210.

Deutscher, H. (2009, June). The Economics of Distillers Grains. *Ethanol Producer Magazine*, 78-81.

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication*, *43*(4), 51-58.

Ethanol Producer Magazine (2019). *About Us*. Retrieved at http://ethanolproducer.com/pages/about/.

Ethanol Producer Magazine (2019). *Advertising*. Retrieved at http://ethanolproducer.com/pages/advertising.

Gamson, W. A., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology*, *95*(1), 1-37.

Gitlin, T. (1980). Making democracy safe for America. *Columbia Journalism Review*, *18*(6), 53.

Goffman, E. (1974). *Frame analysis: An essay on the organization of experience*. Cambridge: MA: Harvard University Press.

Goodman, J. R., & Goodman, B. P. (2006). Beneficial or biohazard? How the media frame biosolids. *Public Understanding of Science*, *15*(3), 359-375.

Hoffman, A. J. (2011). Talking past each other? Cultural framing of skeptical and convinced logics in the climate change debate. *Organization & Environment*, *24*(1), 3-33.

Jasanoff, S. (2011). *Designs on nature: Science and democracy in Europe and the United States*. Princeton, NJ: Princeton University Press.

Jessen, H. (2010, November). U.S. Ethanol Enters Global Marketplace. *Ethanol Producer Magazine,* 50-53.

Kim, S. H., Besley, J. C., Oh, S. H., & Kim, S. Y. (2014). Talking about bio-fuel in the news: Newspaper framing of ethanol stories in the United States. *Journalism Studies*, *15*(2), 218-234.

Lark, T. J., Salmon, J. M., & Gibbs, H. K. (2015). Cropland expansion outpaces agricultural and biofuel policies in the United States. *Environmental Research Letters*, *10*(4), 044003.

Lakoff, G. (2010). Why it matters how we frame the environment. *Environmental Communication*, *4*(1), 70-81.

Mathews, J. A., & Tan, H. (2009). Biofuels and indirect land use change effects: the debate continues. *Biofuels, Bioproducts and Biorefining*, *3*(3), 305-317.

Miller, M. M., & Riechert, B. P. (2013). Interest group strategies and journalistic norms: News media framing of environmental issues. In *Environmental Risks and the Media*(pp. 61-70). Routledge.

Nelson, B. J., & Knudsen, D. D. (1986). Making an issue of child abuse: Political agenda setting for social problems. *Violence and Victims*, *1*(3), 215-219.

Nisbet, M. C. (2009). Communicating climate change: Why frames matter for public engagement. *Environment: Science and policy for sustainable development*, *51*(2), 12-23.

Nisbet, M. C., & Mooney, C. (2007). Framing science. *Science*, *316*(5821), 56-56.

Nisbet, M. C. (2009). Framing science: A new paradigm in public engagement. In *Communicating science* (pp. 54-81). Routledge.

Powell, M. C. (2007). New risk or old risk, high risk or no risk? How scientists' standpoints shape their nanotechnology risk frames. *Health, Risk & Society*, *9*(2), 173-190.

Retka Schill, S. (2009, June). Cobs to Switchgrass to Gasoline Parity. *Ethanol Producer Magazine,* 108-111.

Retka Schill, S. (2009, June). Generating Power at the Plant: CHP Boosts Efficiency. *Ethanol Producer Magazine*, 62-65.

Ruhrmann, G., Guenther, L., Kessler, S. H., & Milde, J. (2015). Frames of scientific evidence: How journalists represent the (un) certainty of molecular medicine in science television programs. *Public Understanding of Science*, *24*(6), 681-696.

U.S. Energy Information Administration (2018). *U.S. fuel ethanol production capacity continues to increase.* Retrieved at https://www.eia.gov/todayinenergy/detail.php?id=36774.

United States Environmental Protection Agency (modified 2018). *Renewable Fuel Standard (RFS2): Final Rule.* Retrieved at https://www.epa.gov/renewable-fuel-standard-program/renewable-fuel-standard-rfs2-final-rule.

United States Environmental Protection Agency (last modified 2018). *Summary of the Energy Independence and Security Act.* Retrieved from https://www.epa.gov/laws-regulations/summary-energy-independence-and-security-act.

Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology*, *30*(1), 1-10.

Sweeney, S., & Hollifield, C. (2000). Influence of agricultural trade publications on the news agendas of national newspapers and news magazines. *Journal of Applied Communications*, *84*(1), 2.

Trumbo, C. (1996). Constructing climate change: claims and frames in US news coverage of an environmental issue. *Public Understanding of Science*, *5*, 269-283.

Voegele, Erin (2009, June) EPA issues proposed rule for RFS2. *Ethanol Producer Magazine*, 28.

Voegele, E. (2009, June). The Push for E15. *Ethanol Producer Magazine*, 46-49.

Voegele, E. (2009, June). The Road to a Low Carbon Future. *Ethanol Producer Magazine*, 54-57.

Wright, W., & Reid, T. (2011). Green dreams or pipe dreams?: Media framing of the US biofuels movement. *Biomass and Bioenergy*, *35*(4), 1390-1399.