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"Even our Dairy Queen shut down": Risk and resilience in bioenergy development in forest-dependent communities in the US South

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Wood-based bioenergy in the US South is a key element in a sociotechnical imaginary that brings together rural development, energy independence, and environmental sustainability; it is also a key element in another imaginary in which powerful interest groups from the private sector and government collude in ways that enrich them regardless of success of the endeavor, while simultaneously posing risks to the host community. We contend that bioenergy development can introduce new risks for local communities that are often overlooked in imaginaries promulgating bioenergy as a driver of community resilience. Based on ethnographic research in Soperton, Georgia, site of the failed Range Fuels cellulosic ethanol plant and current LanzaTech experimental plant, we show how various aspects of these imaginaries merge, overlap, and compete as different actors experience the opening—and sometimes closure—of these facilities in rural communities that are often economically depressed, politically conservative, and deeply rooted in forestry both economically and culturally.

Keywords Bioenergy; Forest-Dependent Communities; US South; Range Fuels; Cellulosic Ethanol; Imaginaries; Resilience

For centuries, the forests of the southeastern United States have provided economic and ecological benefits, and forests are an integral part of the cultural and social identity of many local communities in the region. Forest products industries, ranging from turpentine production to whole-log export, have contributed significantly to changes in local economies, communities, and landscapes. Over the past several decades, outmigration of young adults, mechanization in agriculture, conversion of agricultural lands to forests, and declining forest industries have played a role in the weakening of economies in many parts of the rural South. Within this dynamic context of ongoing change and regrowth, the emergence of wood-based bioenergy facilities in forest-dependent communities has led to both promises of new wood markets and disappointments that not all of these promises have materialized. Existing commercial-scale wood pellet production for the European renewable energy market and a nascent liquid biofuels industry using wood and grasses as feedstocks have been enthusiastically embraced in many sectors of this region for their potential contribution to energy independence and rural development.

At the same time, the promise of this new bioeconomy has also garnered opposition and concerns about social, ecological, and environmental risks as well as concerns about tax breaks, subsidies, and government incentives for bioenergy companies and about competition with established forest industries. Community members, citizen groups, nongovernmental organizations, and forest industry representatives sometimes oppose construction of new commercial-scale bioenergy facilities in rural, forested areas. Owing to heavy state and local investment in

new bioenergy facilities in forested areas, local communities, which are often small, economically depressed, and politically conservative, face particular economic risks when these large-scale and sometimes experimental facilities are located within their towns or counties.

We conducted ethnographic fieldwork on perceptions of bioenergy in the southeastern United States, and here we present a case study of one small town, Soperton, Georgia, the site of what was going to be world's first commercial-scale cellulosic ethanol production facility, Range Fuels. We first discuss the sociotechnical imaginaries that promote and drive bioenergy development. We then describe our research methodology and Soperton, Georgia. We discuss the perceptions of Range Fuels during the planning stages (and brief operational stage) as well as the reaction of different stakeholders when it failed and was then bought by LanzaTech, another company that also produces biofuels (among other products). We examine the closure of the Dairy Queen in Soperton as an event related to, and symbolic of, economic fallout in local communities when bioenergy projects fail to bring promised development. This case study exemplifies the economic, ecological, and physical risks, both real and perceived, borne by local communities in which bioenergy facilities are located, even as they are promoted as vehicles of resilience in the form of economic development for impoverished areas. It also demonstrates another imaginary, more political than technical, in which powerful interest groups from the private sector and government collude in ways that enrich them regardless of success of the endeavor. We show the complications that arise when multiple imaginaries meet on the ground in specific locations.

Conceptual framework: Bioenergy imaginaries

It is crucial to note that physical bioenergy products are deeply embedded in various discourses, and bioenergy itself is "perceived as a conceptual entity formed and advanced as a carrier of specific meanings for political and economic reasons" (Kuchler and Linnér 2012, 582). Using jatropha as a biofuel feedstock as an example, Vel (2014, 2816) defines *discursive commodities* (from Fairhead, Leach, and Scoones 2012) as "objects of trade that have obtained market value because of the narratives that science, technology, politics and business have created about them, but do not exist yet in the real world." Other bioenergy products and technologies that do not yet exist or are not yet operable on a commercial scale nonetheless acquire value when they reference discourses such as green development, rural employment, land tenure security, and renewable energy. Portz (2014) notes that pine in the southeastern United States is an established tree crop that has multiple end uses and guaranteed markets, including pellets for bioenergy production. Pine therefore may be considered a "conceptual entity" or "discursive commodity" only when it is transformed into a hypothetical product—or one not yet produced at a commercial scale—such as cellulosic biocrude.

Both actual and discursive commodities are embedded in what theorists of critical discourse analysis and science and technology studies call "imaginaries," or visions of the way the world ought to be and the way it ought to work. Eaton, Gasteyer, and Busch (2014, 227–28) note that bioenergy imaginaries "emanate from state actors who envision a future where energy and economic interests will be met with homegrown resources." These imaginaries are driven by various discourses, and Levidow and Papaioannou (2013, 36) argue that bioenergy innovations are a critical part of various "sociotechnical imaginaries" (see Jasanoff and Kim 2009) in which fuels and power sources are produced in an ecologically sustainable and socially just manner in which risks to local communities are deemphasized or ignored.

In the United States, energy imaginaries, which entail energy security and energy independence, merge with environmental discourses about renewable energy mitigating climate change and reducing emissions, thus strengthening the power of a sociotechnical imaginary promoting bioenergy development (Hitchner, Schelhas, and Brosius 2016). Another imaginary, in which bioenergy is not a practical solution to these problems, includes discourses about the adverse effects of biofuels on the global food supply, the use of arable lands for energy crops,

inequitable distributions of costs and benefits of bioenergy development, and direct competition with extant forest products industries; it also focuses on high-profile scandals and failures in renewable energy, such as Solyndra and Range Fuels, which exemplify corrupt collusion between government and business interests (Hitchner and Schelhas 2012; Hitchner et al. 2014; Sengers, Raven, and Van Venrooij 2010; Wright and Reid 2011). Different stakeholders promote or subscribe to different imaginaries, and they have different motives for doing so.

While proponents of bioenergy imaginaries often link bioenergy development to social and ecological benefits for communities, local community members who have experienced the economic, ecological, and social effects of bioenergy development firsthand are in a unique position to comment on how these imaginaries play out on the ground in areas where bioenergy is sourced and produced. Eaton, Gasteyer, and Busch (2014, 228) note that "attempts to achieve specific imaginaries through technological projects become sites of contest and conflict," especially in local communities in which bioenergy facilities are located (see also Devine-Wright 2007). Further, Vel (2014, 2803) argues that global discourses are framed on an international level (i.e., Intergovernmental Panel on Climate Change), while localized discourses operate in places where feedstocks are actually produced. The disconnect between the scales on which these discourses exist, circulate, and directly influence markets and behaviors reveals the complicated, sometimes conflicting dynamics between actors making decisions at different scales (Kuchler and Linnér 2012; Scott et al. 2014).

Attention to the scalar mismatch of costs, threats, and benefits of large-scale bioenergy development also elucidates the imaginaries in which bioenergy is literally produced and socially enacted, providing the context necessary to understand the effects of locating commercial-scale wood-based bioenergy facilities in small, rural, economically depressed communities. We show how various stakeholders spoke about different factors affecting potential threats and benefits in the context of the Range Fuels and LanzaTech bioenergy facilities in Soperton, Georgia. In doing so, we show that while global discourses promote bioenergy development as a mechanism for mitigating global climate change and as a vehicle for economic resilience in small and rural communities traditionally dependent on forest resources, local discourses are simultaneously circulating that often question climate science and resist government intervention in energy markets (e.g., in the form of subsidies for new bioenergy companies).

As noted by Molyneaux et al. (2016), broad-scale economic resilience is dependent on resilience of energy systems, and analyses of the resilience of these systems often overlook the role that renewable energy technologies can play in building adaptive capacity to uncertainties, in this case, fluctuations in oil prices, shifts and relocations of wood products industries and markets, and advancements in bioenergy technologies. Our research shows that several issues related to bioenergy technology, wood and energy markets, energy policy, and social and economic impacts are operating at multiple scales simultaneously, both literally and discursively, and have direct impacts on local communities experiencing bioenergy development firsthand. We contend that the imaginaries emerging from actors and systems that operate on large scales create effects in local communities that may not be very resilient. These imaginaries are sold as mechanisms to increase community resiliency, but they may in fact erode it further by appropriating resources such as tax abatements and limited industrial sites, which in turn undermines a community's ability to pursue other economic opportunities to strengthen and diversify economies.

Research methods

Using a complementary array of qualitative social science methods, we conducted ethnographic research in Soperton, Georgia, for three months and conducted sixty-eight structured and semistructured interviews with many different stakeholders: farmers, forest landowners, community members, local development board members, school board members, local politicians and community leaders, cooperative extension agents, loggers and others employed in the forest industry, and former employees of Range Fuels and current (at the time of the interview)

employees of LanzaTech. We participated in community activities; attended city council and county commissioner meetings; gave formal public presentations about our research project in various public venues; and temporarily joined local organizations, such as churches, a book club, a garden club, and a minority community organization. We kept field journals in which we recorded informal conversations with numerous other community members as well as our personal reflections on people and events at the field site. We used NVivo qualitative analysis software to code and organize transcripts and field notes.

Finally, we attended and participated in eighteen regional conferences and workshops on bioenergy and participated in at least twenty-seven regional and national bioenergy-related webinars and conference calls, which were mostly attended by bioenergy representatives and researchers working on technological advancement of bioenergy development. These were places where pro-bioenergy imaginaries were perpetuated and honed; meanwhile, the reality played out on the ground in the communities where bioenergy was actually produced. We wanted to capture the intersections and areas of divergence between the two. Our research in and around Soperton, Georgia, shows how the sociotechnical imaginary that promotes bioenergy as a driver of community resilience does not capture the risks and consequences of the potential failure of a bioenergy facility in a small, forest-dependent town and how it directly competes with a political imaginary in which government and business entities profit at the expense of communities and taxpayers regardless of whether a bioenergy project succeeds or fails.

Soperton, Georgia: Another southern town in distress

Incorporated in 1902, Soperton, Georgia (and surrounding Treutlen County), like many southern towns, is a forest-dependent community; it has long relied on forestry products (turpentine, lumber, pulp and paper, etc.) as a main source of revenue for landowners and as a source of employment for community members. Soperton is located in the heart of the "pineywoods and wiregrass" or longleaf pine ecosystem that used to be the dominant ecosystem of the southeastern United States, though this habitat has shrunk considerably (as much as 97 percent) as a result of development and land use change and is now considered endangered (Means and Grow 1985). The identity of the community is rooted in forestry; Soperton is known as the Million Pines City, a moniker that alludes to its history as the birthplace of intensive silivicultural practices. Beginning in 1926, a farmer named James Fowler was one of the first people (some say the first person) to plant pine trees as a crop (he planted more than 7 million slash pines on several thousand acres in the area); before this, trees were harvested and forests were allowed to naturally regenerate. The town of Soperton adopted its nickname in honor of Fowler's Million Pines Plantation, and each year the town hosts the Million Pines Arts and Crafts Festival. Also, in March 1933, the *Soperton News*, a weekly publication, became the first newspaper to be printed on paper made from the pulp of southern yellow pine using Mr. Fowler's trees; a copy of this first edition is now housed in the Smithsonian Institute in Washington, DC. Several people specifically linked forest-based bioenergy development in Soperton to its identity as the Million Pines City:

> Biofuels are a good opportunity for Treutlen County. Soperton is the Million Pines City. (community leader)
>
> We'd love to see Treutlen County as the capital of bioenergy. We've been known as the Million Pines community for so long. If they produce jet fuel, Treutlen County will be known as the granddaddy of all places. . . . In 1937, Jim Fowler, working with Dr. Herty, used pines from Treutlen County to make the first paper [from trees]. LanzaTech could put their chip operation on Fowler's property, and we could play on that. It's a unique situation evolving here. (community leader)

As a pioneer in southern forestry tree planting and development of pulp for new uses, it seemed logical to people in Soperton that they would be first in the next big advancement in forestry.

Soperton is very small (the town limits include just over three square miles), and its population hovers at just over three thousand. Built at the crossroads of railroad lines, as many southern towns were, it was once much more

Figure 1 Soperton, Georgia, is typical of many small towns in rural America. Most all industry has left this town, and Range Fuels offered hope for community revival.

prosperous and economically and socially vibrant than it is now. A number of interviewees expressed sadness about the economic decline of the town and the county (see Figure 1). Some described in detail the times in the past when the area was thriving and then how businesses dried up and young people went away. This history of outmigration is common in small towns throughout the Southeast, and the lack of industry only exacerbates the problem:

> This is an impoverished county. We have nothing. No manufacturing, just a little ag [agriculture]. . . . [This area] was so different when I was a child. There were two car dealers, a movie theater, a tractor dealership. Now we just shake our heads. . . . I just wonder what has happened to this little community. (forest landowner)
>
> Soperton's a cemetery now. This town died. (community member)
>
> With good roads and improved gas mileage, the little towns like Soperton dried up. Towns are getting farther apart from each other. . . . There was a black migration north in the 1950s. There was integration and consolidation. Industry moved north too. (forest landowner)
>
> The Industrial Age passed us by here. . . . There's no financial support [in the county] except the land base. (forest industry employee)
>
> We need jobs. In the past, we could have attracted industry. Now people ask, "Why don't they have industry here?" It's a gamble to come where there's no industry. (community leader)

Most interviewees expressed great pride in the history of their town, as well as the desire for more industry to come to the area, which would help stem outmigration and promote economic revival; most people said they would welcome most any new development, except for a toxic waste dump.

Range Fuels: When a plant comes to town

It is difficult to overstate the excitement in the bioenergy world about Range Fuels scaling up its gasification technology (which had been successful at its pilot plant in Colorado) to commercial scale in Soperton, Georgia. Commercial-scale production of cellulosic ethanol made from trees, mostly forest residues or woody materials left behind after logging operations, was going to be a breakthrough technology, revolutionize the energy landscape, create new markets for products that people wanted to get rid of anyway, and again position Soperton as a leader in forest-based innovations. All eyes in the energy sector were on Soperton; it was a huge opportunity for the bioenergy industry, government agencies promoting renewable energies, and landowners and community members in Soperton.

Construction began on Range Fuels in Soperton in November 2007, after the company received a US$76 million grant from the US Department of Energy, followed in 2009 by an US$80 million loan guarantee from US Department of Agriculture Rural Development through the Biorefinery Assistance Program authorized by the 2008 Food, Conservation, and Energy Act (although it did not actually receive all these funds). The company was also

backed financially by more than US$160 million of investor funds and a US$6.25 million grant from the state of Georgia (Lane 2011), as well as an US$80 million construction loan from AgSouth Farm Credit bank, on which it defaulted (Lane 2011). Range Fuels was expected to produce 40 MGY of cellulosic ethanol using yellow pine as a feedstock and gasification technology developed in its demonstration scale plant in Colorado. The Range Fuels groundbreaking was attended by high-ranking government officials, including the US secretary of energy. In Soperton, the initial announcement of the plant was met with great enthusiasm, as it would bring many jobs to Treutlen County as well as a new market for wood products, including forest residue that previously had little or no monetary value. Several people talked about the optimism they or other community members felt when they learned that Range Fuels would be located in Soperton, and they were particularly interested in potential employment opportunities:

> It was an opportunity to put Treutlen County on the map. (community leader)
>
> We were pumped when it [Range Fuels] was coming. We had monthly meetings, went to the plant, wore a hardhat. . . . We'd take anything as long as they use wood to do it. (forester)
>
> When I first came here, that was the big thing, because of job opportunities. People talked about it. The concerns at first were just: Who got hired? Were they local or not? People only care about money and getting employment. (community member)

Many interviewees had forestland and view it as an investment, an icon of community identity, and a common thread linking the past and the future through steady, dependable income that does not require a full-time commitment. Forest landowners were optimistic that a new market for woody biomass would drive up the prices for forest products:

> We need biomass to drive the prices up. (forest landowner/farmer)
>
> I'm for it. I know I'm biased. I grow trees for a living. . . . I hope it may increase prices, make more competition. (forest landowner)
>
> Everyone would benefit from bioenergy, but not to the extent of the big landowners. They can sell directly to the plant. (forest landowner)

This optimism about jobs for locals, an influx of money into the city and county from spin-off businesses, higher prices for landowners' wood products, and good publicity for Soperton fits into the imaginary promulgated by national and international actors where bioenergy would help small towns like Soperton and also contribute to the goals of energy independence and climate change mitigation.

This optimism dissipated when it became clear that Range Fuels would provide neither many local jobs nor higher prices for wood products and new markets for wood waste products. Range Fuels hired very few local people, and people were particularly upset about this:

> Range Fuels didn't hire local people, though one of their stated purposes was to employ local people. . . . Y'all done us wrong. There are qualified mill workers, but it's a buddy-buddy system. The guy doing the hiring . . . he hired his buddies. (community leader)
>
> They kept saying there would be jobs. But they brought in people from out of town, even the construction workers. (forest landowner)
>
> Range Fuels hired people from Dublin that were working in the paper company there. This was seen as jumping over Treutlen County folks. (community leader)

> We expected to see more local employment . . . but they imported people from Michigan and didn't use local qualified people. That was not right. (forest landowner)

Forest landowners questioned Range Fuels's promise to use waste wood that is currently left on-site (tops and branches), knowing the challenges of making this economically feasible. While landowner enthusiasm for this is high, in-woods chipping of forest residues is expensive, especially on smaller tracts. One forester's in-woods chipping experiment near Soperton found that the chips would have to sell for US$90 a ton; he is more enthused about whole tree harvesting and transport. This, however, does not fit into the imaginary that Range Fuels was promoting—that they would use waste products to create fuel. Also, landowners expected that the location of Range Fuels in Soperton would drive up wood prices, thereby increasing income for local forest landowners. This was not the case:

> People were optimistic, but not now. There were excited, thought it would help pulp prices if it was less distance to the mill. People were really enthusiastic about a mill here . . . that it would help stumpage prices. (forest landowner)

> We thought prices may go up, but they haven't. The mill just pays what they want to pay. There's too much pine and not enough demand. (forest products industry employee)

These failures to meet community and landowner expectations while the plant was constructed and operational further soured public opinion on bioenergy development.

Owing to technical problems in scaling up the technology, Range Fuels was only able to produce one batch of methanol from synthesis gas (which was possible in the 1920s and is a common process today [Lane 2011]). In 2011, Range Fuels declared bankruptcy and closed. The implications of Range Fuels's failure have been profound, both within the national biofuel industry and within the communities in and around Soperton. People talked about the disappointment, anger, lack of surprise, speculation, and blame they felt when the plant closed:

> I hated to see Range Fuels fold, but it didn't surprise me. (forest landowner)

> We were most, most disappointed. We had such high hopes, because we have so little. . . . A lot of people were—"enraged" is too strong a word. . . . But people had high hopes that it would provide jobs for the community. (forest landowner)

> I haven't heard much talk about it [bioenergy] recently. There was lots of talk. People were very excited, upbeat. Then you see something fail, you get skeptical. Now they're like "we'll just wait and see if it works. I'll believe it when I see it." (forest landowners)

> We were all excited about Range Fuels. . . . They just didn't do their research. . . . People were so disheartened [when Range Fuels closed]. No one talks about it now. . . . It just bust their heart. (forest landowner)

> There was a lot of hoopla about it [Range Fuels], that it would be the salvation of the county. The secretary of energy, the governor, they were all here. (forester)

> We were let down when it didn't go. It would have been an asset to the community. . . . Some people have a negative attitude about everything. But most people thought it would be an asset. It was our only option. (community leader)

While some people recognized that as a new and developing technology, there are bound to be failures, many interviewees discussed how they felt that Range Fuels was a scam from the beginning:

> It [Range Fuels] was shrouded in secrecy. . . . The Macon newspaper reported that information was deleted from the Range Fuels Report. . . . They had a lot of trade secrets. This is tax money. (forest landowner)
>
> Biofuels is a bad word around here now in Treutlen County. Everyone thinks we got took to the cleaners by Range Fuels. (community leader)
>
> They got all this government money and then went belly up. When it sold, taxpayers knew their money was not too good. . . . People had a bad taste in their mouths when it went bankrupt. It makes you think all they are after is my tax money. (community member)
>
> The government doesn't need to be in that business [bioenergy]. There's a lot of shady deals, people stuffing their own back pockets. . . . If it was going to work, private investment should take care of it. (farmer)
>
> Eighty million dollars and they don't know if it works. When you build a sidewalk, you should know what's on the other side. . . . There was too much show and tell [with Range Fuels]. I had a gut feeling something was wrong at the grand opening of Range Fuels. (community leader)

Several specifically mentioned that they knew that Range Fuels produced methanol instead of ethanol and that the company was dishonest about the true product during a public ceremony:

> They gave me a pint of "ethanol" [quotation marks in the air—he knew it was methanol, not ethanol]. (forest products industry employee)
>
> You should have seen their open house. It was a total dog and pony show. It was about a year ago. The undersecretary, and [politician] came down. There were tanker trucks moving in and out. They were supposed to be full of the ethanol. But I suspected that they were empty. I said to someone from Range, "I think that truck is empty. That tractor is bouncing way too much." He said to me, "Now [name], you know there ain't no damn ethanol in there." (community leader)
>
> At the grand opening, they had one truckload of methanol. There were government officials, and the CEO from Colorado. It was so staged—the truck was probably empty. Maybe it was a truck full of hops. (forester)

In addition to economic risks posed to the community by the presence of a bioenergy plant, people also expressed concerns about health, safety, and ecological risks. Several people mentioned "rumors" that the facility was unsafe (specifically fears that it would "blow up"), and they talked about how these rumors were spread (a former Range Fuels executive told us these rumors were spread online). A number of people mentioned the fact that a new school was being built close to the facility, and they expressed concerns about possible explosions, as well as increased pollution from the facility and traffic and about the dangers of increased logging truck traffic along the bus routes:

> There are rumors out there. One that caused an uproar was about the new school. The rumor was that it would blow up and kill children. (forester)
>
> There have been studies done about the danger zones around a facility like this one, and if it blows up, the school is in a danger zone. The school is also in a dangerous location if one of the hauling trucks explodes on Hwy 29. (community leader)
>
> There needs to be serious investigation in how the school was built there, when there was so much opposition. There needs to be some head rolling for that. (community member)
>
> People are worried, I'm worried, about gas leaks, explosions, truck accidents and more fumes from trucks. If there's an explosion, the wind could draft all kinds of stuff to the school. Others are saying this too, but now it's too late. (community member)

Several interviewees mentioned that Range Fuels provided evidence of the safety of the facility for the community, especially for the school, and that fears about health and safety were unfounded. Others mentioned

that most of the opposition was coming from just a few people and that most people in the community were not concerned about the health and safety issues:

> The plant was there before the school. The reason the school went there was because someone made money from the sale of that land to Range Fuels. (community member)
>
> Some people used Range Fuels as an excuse not to build the school. Some are just against a plant in Treutlen County. (forester)
>
> There were plans for a new school to be built close to the plant. It was an excuse for the Board of Education not to build a new school. A bunch of NIMBYs[1] cited public health and safety issues—what if it exploded? (forest landowner)
>
> There were complaints/concerns about siting the new school near the Range Fuels facility: possible explosion, pollution, traffic, things falling off trucks. . . . We've got some "engineers" here—they ain't got no more than graduated from Treutlen High, and now they's world-renowned engineers. (community leader)
>
> You got a bunch of nuts everywhere. But you could count them on one hand. Some people said it would blow up, wipe Treutlen off the map. Kill all the kids in school. . . . Some people didn't want the new school. There were four or five people fussing. (forester)

Other interviewees expressed concerns about other negative ecological effects in addition to risk of explosion and air pollution from the facility itself and increased traffic. Several people questioned how much water the facility would use and the temperature of the water coming out of the facility. Others worried about the environmental issues associated with using logging residues for biofuels, as these residues serve important ecosystem functions for wildlife and tree health. In any case, it was clear to us that while many of the fears were real, and widely shared, there were also a lot of intracommunity dynamics involved that got framed as opposition to the bioenergy plant.

LanzaTech: New company, new opportunities, new risks?

On January 3, 2012, the New Zealand–based company LanzaTech purchased the facility at auction for US$5.1 million and renamed it the Freedom Pines Biorefinery. LanzaTech is currently retrofitting the facility for use as a research and development facility that will focus mainly on chemicals produced using proprietary microbes and synthetic biology (Schill 2014). Several interviewees commented on the differences between Range Fuels and LanzaTech in their intentions and preparedness as well as in the way they interacted with the community. Although many community members were even more skeptical about bioenergy development after the failure of Range Fuels, they still noted differences between the two companies and largely felt that LanzaTech has a better chance of success:

> I was not impressed with the first wave of biofuels people [Range Fuels]. They were money people. They move money around in a big way. The second wave [LanzaTech] is impressive. They are here to do something. They are interested in ongoing business. (community member)
>
> People say Range got it over on us and the federal government. . . . People are leery. We'll see what happens. LanzaTech looks more organized. There's more money on the private side, not as much reliance on federal money. (community member)

Some people still felt optimistic about bioenergy as a potential driver for economic growth in Soperton and optimistic about the future of the area in general. It should be noted that community leaders felt more optimistic than anyone else we interviewed:

> There are maybe some people that are still skeptical, but mostly they're very optimistic. (community leader)

> My gut feeling is optimistic. . . . People are starting to buy homes in the county again. I don't want the town to be a ghost town. . . . This could help the community. (community leader)

However, some people are not at all confident that LanzaTech will be any more successful than Range Fuels was, and they expressed ongoing skepticism about bioenergy in general and this company in particular:

> I'm not banking on it [LanzaTech]. . . . The same guy that owned it before sold it to himself. He didn't lose money on it—the investors did, and we the taxpayers did. He's probably going to get the rest of those government loans and then sell it in pieces of stainless steel to the junkyard. (forest landowner)
>
> We hear a lot of rumors. I'll believe it when I see them buying wood and fuel coming out the other end. (forester)
>
> Large landowners were excited. . . . It's a different story now. I'm still skeptical. There's more distrust of bioenergy now because Range Fuels didn't follow through. (community member)
>
> Since the sellout and buy-back, people are pessimistic. . . . It [LanzaTech] would be a boon. I hope it works. I'm all for it. But I'm pessimistic. (farmer)

We interviewed several people who work with LanzaTech in different capacities (design, procurement, administration), and they all commented on how they have learned from some of the mistakes made by Range Fuels and are actively trying to do things differently, both technologically and socially. They all expressed satisfaction that they are proving success in areas where Range Fuels failed:

> People here rabidly support what we're doing. They [Range Fuels] didn't deserve the media it got. . . . Range Fuels only had three months of startup, and no money. We did well for what we were faced with. (LanzaTech employee)

LanzaTech did three main things differently within the community in response to mistakes made by Range Fuels. First, it established a community advisory board. Range Fuels also had one, but it was widely criticized as being ineffective, most of all by the people serving on it. An employee of LanzaTech told us,

> We live with the legacy of Range Fuels. . . . We've heard people say that Range Fuels was secretive. We learn from that. We've set up a Freedom Pines Advisory Board to communicate with the public.

One of the main points the company emphasized, and spread through the members of the advisory board, was that LanzaTech uses a different technology than Range Fuels did and that poses less risk of "blowing up":

> We have all the safety protocols. The school is outside of our exposure area. . . . LanzaTech uses much less pressure than Range Fuels did. Range Fuels ran pressure at 1800–2000 PSI. LanzaTech runs at about 40 PSI. (LanzaTech employee)

Second, it noted the criticisms that Range Fuels did not hire local people and has made a commitment to do so. Many interviewees seemed to believe that they would follow through on this promise:

> Hopefully, LanzaTech will employ sixty plus people. They want to hire locals if they can. Range Fuels subcontracted everything, even security, cleaning. LanzaTech will hire locals. (forester)
>
> They [LanzaTech] will use local help and resources. They say they'll hire local people. Range Fuels brought in engineers and technicians. That's the one thing I fault them for, that they brought in labor from other areas. (community leader)

> It [LanzaTech] will employ sixty people at first, up to two hundred—that's a lot for a small place like Treutlen County. They promise to hire mostly locals. (community member)

Third, LanzaTech did not negotiate with the state, county, or city for economic incentives to locate in Treutlen County. It did not need to, as it had private funding, but this was perceived by many as another distinguishing factor between the two companies, which again influenced people to look at LanzaTech more favorably than Range Fuels:

> Range Fuels got a twenty-year tax break, which was uncalled for. . . . LanzaTech doesn't need a tax break because they bought it for $5.1 million. . . . LanzaTech didn't get any tax breaks. That wouldn't be fair to taxpayers, to American citizens. LanzaTech didn't ask for a tax break. (community leader)
>
> People here have a better outlook now than before. . . . The county gave a twenty-year tax abatement to get them [Range Fuels] here. LanzaTech invested out of pocket, didn't ask for an abatement. That would eliminate 90 percent of their liability. They'd have no risk. . . . LanzaTech may only have $5 million invested. Range Fuels already spent $60 million. How would you feel about them spending taxpayer versus stockholder money? . . . They're in much better shape publicity-wise than Range Fuels. (community leader)

One interviewee stated the important role that bioenergy could play in the economy of this forest-dependent community, so long as facilities were able to operate reliably and grow steadily. He explained that slow, steady growth in strategic locations is the best way forward for bioenergy development, while numerous small facilities that come and go are economically, and potentially environmentally, harmful:

> We don't want to see shock to the system. . . . All these tire kickers, these little plants, they're a shock to the system. If they all come, there could be negative impacts. (forest products industry employee)

A large, privately funded operation such as LanzaTech could in time bring the promised development to economically depressed Soperton, or at least not contribute to the further decline of the town.

Discussion: Closure of the Dairy Queen as a symbol of economic and sociocultural loss

Almost every town in the US South has a Dairy Queen, and the Dairy Queen is emblematic of small-town life. Its reputation as a hotspot for family outings, lunch meetings, and teen date nights makes it a social fixture and an important cultural institution. In Soperton, the closure of the Dairy Queen represented not just the declining economy of the town but also the cultural losses associated with outmigration of young people to more economically prosperous towns and cities and the death of traditional industries and ways of life. Almost every person we interviewed in Soperton mentioned the loss of the Dairy Queen:

> Recently, we even lost our Dairy Queen. (community member)
>
> It was devastating when the Dairy Queen went away. (community member)
>
> I visualize the way things were, what used to be here, even twelve years ago. We had a Dairy Queen. There's no more Dairy Queen here. (community leader)
>
> Soperton could be a center hub for several counties. . . . I can see a Walmart here. There's no fast food. The Dairy Queen picked up and left. Downtown is majorly dilapidated. The roofs are falling in. But it's all run on a buddy system. (community member)
>
> Treutlen County was all turpentine and farm. The community can't function now. I guess all small communities have a hard time. Here there's a lot of unemployment and drugs. Shops come and go like birthdays. . . . It's bad here. Our Dairy Queen closed. (community member)

Figure 2 The closed Dairy Queen is a visible symbol of economic decay in small-town America.

> It's very sad, every southern town needs a Dairy Queen. (forest landowner)
>
> It was real sad when the Dairy Queen shut down. (forester)

The Dairy Queen in Soperton closed in 2011, during the time that Range Fuels was in operation and then closed. Although the failure of Range Fuels and the closure of the Dairy Queen were not directly related, the two events are tied together in the minds of many community members: If Range Fuels had brought the development that it had promised, the Dairy Queen would be thriving, as would other establishments. Some people did link the two events, and one commenter in an online newspaper in Florida said, "Range Fuels brought so little of the promise to the table the Dairy Queen closed" (Ryan 2012). When the Dairy Queen shut down and was not able to reopen, it became a symbol of the lack of the ability of the community to rebound from both economic and social and demographic losses. The risk is not just losing the economic base to support a fast-food restaurant; the loss of an iconic cultural institution also symbolizes a loss of resilience and breeds nostalgia for a past that was more vibrant and promising. Some people did express hope that one day industry would come to Soperton again and that a company like LanzaTech could help to revitalize this small-town economy by hiring local people. One man said,

> They [LanzaTech] need to hire some people from Treutlen County. We have some good people here. They hired a few, but most were brought in from other places and they moved to Dublin, not Soperton. I don't blame them. We don't even have a McDonald's here. . . . We don't even have a Dairy Queen anymore. (school official)

As this quotation illustrates, it is somewhat of a chicken-and-egg situation: Employment at new industries could bring back the Dairy Queen, but why would industry come to a place with no Dairy Queen? This is a conundrum felt deeply by many residents, and for many, the concurrent failures of Range Fuels and the Dairy Queen cemented the fate of Soperton as another southern town that is now, as one interviewee phrased it, "a cemetery" (see Figure 2).

Our research shows that several issues related to bioenergy technology, wood and energy markets, energy policy, and social and economic impacts operate at multiple scales simultaneously, both literally and discursively. They converge on the ground in local places where bioenergy is sourced and produced, and we contend that renewable energy development can introduce new uncertainties and new risks into energy systems and local communities. These risks and opportunity costs to local communities are often overlooked in imaginaries promulgating bioenergy as a driver of economic and ecological resilience. Using the example of the Dairy Queen, which has cultural meaning to community members transcending its functional status as a fast-food restaurant, we show that the closure of this iconic establishment is both a symbol of the risks borne by local communities as new technologies develop and also

a visible indicator of economic decline, which many people perceive as an omen for further economic distress in the community.

Conclusion

Forest-dependent communities in the southeastern United States have experienced a long history of boom and bust cycles in wood products and of failed promises to bring new economic development and employment opportunities to rural communities. As a result, many people in these communities are skeptical about advancements promising to provide jobs and new markets. However, bioenergy representatives and many local and national politicians are heavily promoting sociotechnical imaginaries in which bioenergy is a potential solution to rural poverty, dependence on foreign countries for fuels, and loss of markets for wood products. Prior to a bioenergy facility being built in a rural community, some community members feel that this is feasible, while others do not.

However, failing bioenergy projects can continue the cycle of disillusionment and distrust of the sociotechnical imaginaries pushed by government agencies and officials and industry leaders. Failures of specific bioenergy projects like Range Fuels have not only cost the states, counties, and towns in which these facilities were located millions of dollars in grants and loans; these failures have also led rural people already wary of government intervention in industry to feel even more betrayed by government policies that seem to benefit a few at the expense of the public in general and local communities in particular. These failures can crystallize opposition to bioenergy that has emerged out of these failures and a general distrust of government intervention in markets, which themselves are embedded in a political imaginary of ordinary people and communities suffering from collusion between government and business interests.

The fundamental disconnect between positive and negative views of bioenergy reveals the divergence of imaginaries in which wood-based bioenergy is, or is not, a potential solution to current and future energy problems. It also reveals differences in personal experiences with bioenergy in local contexts and policy arenas; for example, people promoting bioenergy through industry development or policy creation often do not live in rural communities in which bioenergy facilities are located and thus do not feel the effects of these facilities' success or failure. In fact, they may never see them firsthand or even think about them. The imaginary that promotes bioenergy development as a driver of economic resilience for rural and impoverished towns also downplays the risks, including economic opportunity costs, that community members experience and perceive when expensive new facilities with experimental technologies are located in these areas. This case study demonstrates how, in a place where forestry is deeply embedded in community history and culture and where the success of a wood-based bioenergy facility was supposed to "put Soperton on the map," its failure instead exacerbated an ongoing economic and social decline that resulted in the loss even of the Dairy Queen.

Notes

1 NIMBY stands for "not in my backyard"; people who protest new developments on this basis are sometimes referred to as "NIMBYs."

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