Landowner Acceptance of Wind Turbines on Their Land: Insights from a Factorial Survey Experiment

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ABSTRACT *This study uses data from a vignette experiment (n = 401) of large-scale agricultural landowners in western Canada to quantify attributes that enhance acceptance of wind farms on their land or in their municipality. The analysis addresses the role of community relationships and procedural fairness in the development of wind power. Random effects models indicate that landowners are more accepting of wind power if such projects include local or cooperative ownership, compensation payments to neighboring landowners, and community involvement in the development process. Results suggest that perceived injustices could be lessened if fairness considerations extended beyond monetary gain. (*JEL Q15, Q42*)*

1. Introduction

Over the past 30 years, wind energy in North America has evolved from a fringe concept into a mainstream and viable source of renewable electricity generation. In 2019, wind power met about 6% of electricity demand in Canada, representing the largest source of new electric capacity additions and ranking Canada ninth in the world for onshore installed capacity (CanWEA 2020). With improvements to turbine technology and renewable energy infrastructure, the cost of wind energy generation has fallen by roughly 70% since 2009. Coupled with favorable policy mandates and economic incentives, the cost-competitive advantage of wind energy along with a range of environmental and social benefits has spurred its rapid expansion in North America from 2008 to the present (IPCC 2011; Wiser and Bolinger 2019).

The expansion of wind power across Canada, however, is far from uniform. While the populous provinces of Ontario and Quebec account for over 43% of national installed capacity, Alberta (a large and less populated province in western Canada) accounts for about 12% (CanWEA 2020). Although Alberta is the third largest producer of electricity in Canada, its energy sector has long been dominated by fossil fuel extraction (oil, gas, coal), with roughly 90% of electricity generation based on coal and natural gas in 2018. In addition to these fossil energy resources, Alberta's lightly tapped wind potential presents a significant opportunity for transition to renewable energy sources (Bell and Weis 2009). Barrington-Leigh and Ouliaris (2017) evaluated scenarios for economically viable wind development based on wind speeds of 7 m per second at 80 m above ground. Excluding protected areas, Indigenous lands, and reasonable distances from population centers and transmission lines, and accounting for competing land uses, environmental concerns, and unsuitable locations that reduce the available land base by 75%, the analysis found Alberta's wind power generation potential to be around 169 TWh per year, which accounts for 24% of its 2015 energy demand (Barrington-Leigh and Ouliaris 2017).

Land Economics • November 2022 • 98 (4): 674–689
DOI:10.3368/le.98.4.012521-0008R1
ISSN 0023-7639; E-ISSN 1543-8325

Recent market evidence (Wiser and Bolinger 2019; Canadian Energy Regulator 2020) indicates that the expansion of wind power generation capacity in Canada is expected to continue, driven by low prices of capacity supply and legislated provincial targets for renewable energy generation (Canada Energy Regulator 2020; Government of Alberta 2020). Research by the U.S. Department of Energy, however, suggests that future wind power projects are destined to face more scrutiny by external stakeholder groups. As the most favorable sites—those with suitable wind resources and close to transmission networks and electricity customers—become scarcer, the future footprint of wind energy is destined to encroach on communities (especially on rural agricultural landowners). Without their engagement and support, the siting of new projects may face increasing resistance and outright rejection (see Glen 2019). The strong potential for opposition to wind farms underscores the need to better understand drivers of wind power acceptance, especially among rural landowners and the communities that provide an essential land base for further expansion of wind power.

As a response to the increasing scrutiny of future wind projects, this study involves a factorial survey with large-scale agricultural landowners who are able to host turbines on their land. This sample is distinct from other studies of wind farm development, which are often based on general populations. Focusing on landowners is critical for understanding the wind energy development process, which requires project developers to obtain landowner consent to build turbines, access roads, transmission lines, and easements from surrounding property owners. Available forms of compensation, complex lease agreements, and potential negative externalities of wind turbines beyond those of the landowners may include neighbor and broader community considerations that can complicate an individual landowner's decision to engage in wind power development (Syal, Ding, and MacDonald 2020).

Another distinctive feature of this study involves the use of a vignette experimental design (Auspurg and Hinz 2015), which presents a departure from often applied discrete choice experiments in energy and land economics and follows economic studies on discrimination (Kübler, Schmid, and Stüber 2018), fairness perceptions (Herz and Taubinsky 2018), ethical judgments (Ambuehl and Ockenfels 2017), and social acceptance (Liebe, Preisendörfer, and Enzler 2020). In comparison with stated-preference methods as the standard for estimating economic trade-offs and marginal utilities in the valuation of different electricity production technologies, vignette experiments (VEs) emphasize the effect of varying factors on the overall acceptance of a specific scenario when social norms and informal rules are central to the research. As such, these experiments offer an opportunity for landowners to reflect on alternative ways of developing a wind power project that considers neighbors and the broader community.

There is no shortage of literature documenting public perceptions of and preferences for renewable energy development, including preferences for wind power in Canada (Sherren et al. 2019), the United States (Firestone and Kirk 2019), and Europe (Liebe, Bartczak, and Meyerhoff 2019). Although the general public is broadly supportive of wind power, wind turbines are often met with strong local resistance. Overall, researchers agree that local acceptance of wind turbines beyond the project phase hinges on a number of community-specific factors pertaining to procedural justice (Simcock 2016), distributional justice (Larson and Krannich 2016), and trust in energy development processes (Fast and Mabee 2015; Mills, Bessette, and Smith 2019).

Economists examine supply-side factors in wind energy development with a focus on technical feasibility and efficiency (Lundquist et al. 2019) and related issues concerning the environmental valuation of spatial turbine siting (Garcia et al. 2016; Lutzeyer, Phaneuf, and Taylor 2018). These studies also examine the effectiveness of government incentives on the promotion and expansion of wind power (Alagappan, Orans, and Woo 2011), finding that developers respond most positively to cost-based grants in the form of feed-in tariffs over energy production tax credits when making project siting decisions. Studies also investigate the negative spillover effects of wind farms in terms of noise and visual effects leading to lower property values (Jensen et al. 2014; Vyn 2018).

Beyond effects on property owners, several studies examine local factors that may affect the community-level acceptance of wind power developments. The compensation of landowners, while constituting a positive economic benefit, can create perceptions of unfairness or distributional injustice (Baxter, Morzaria, and Hirsch 2013; Fast et al. 2016) that may contribute to intracommunity conflicts with landowners as the economic benefits and negative externalities of wind power are spatially segregated (Meyerhoff, Ohl, and Hartje 2010; Mills, Bessette, and Smith 2019). Risk stemming from community or rural-urban conflicts have motivated investigations into different forms of community-level compensation, ranging from direct payments to developer-led investments in community infrastructure or offsetting electricity costs (Baxter, Morzaria, and Hirsch 2013; Groth and Vogt 2014). Moreover, several studies (Ferguson-Martin and Hill 2011; Sovacool and Ratan 2012) suggest that local co-ownership structures can boost landowner and community acceptance of new developments. Finally, several studies focus on the role of community involvement and participation as a means for greater transparency, information sharing, and balancing complex and diverging stakeholder interests (Groth and Vogt 2014; Jacquet 2015; Jami and Walsh 2017).

Although the existing literature has produced important insights and lessons for wind energy acceptance, the absence of landowner views and how they relate to the broader community affected by wind farms clearly presents a gap in knowledge. As a consequence, our results diverge considerably from existing general population studies in Canada (Sherren et al. 2019) and the United States (Firestone and Kirk 2019). While these studies suggest strong support for climate-friendly policies and renewable energy technologies, the results presented here indicate relatively lower levels of support for renewable energy, particularly for wind power, with limited concern for actions that might address the worsening climate crisis. Thus, a clear distinction between community residents and agricultural landowners is relevant in understanding the opportunities and challenges of wind power development, especially as wind power projects extend further into agricultural landscapes. If in fact concerns over distributive or procedural aspects stand in the way of agricultural landowner acceptance of wind power as much as they appear to influence local residents, then decision makers need reliable landowner-specific insights to improve incentives and information systems to overcome such resistance. Several of these factors are prominent in ongoing discussions of renewable energy transition (Rand and Hoen 2017), with attention to community engagement and developer transparency (Firestone et al. 2018), but a specific focus on landowner acceptance using experimental techniques is missing from the literature. To the best of our knowledge, this article represents an early attempt to quantify factors in landowner acceptance of wind project development.

2. Experimental Approach

A landowner's evaluation of potential wind power projects is likely to involve many decision criteria that go beyond easily quantifiable attributes such as monetary payments, turbine or farm size, noise level, proximity, and other project attributes that are commonly found into choice or conjoint experimental designs. The integration of broader social factors into choice designs and the causal inference of preferences is less straightforward. Consequentially, most multifactorial survey experiments distinguish questions about the relevance of social factors, including perceptions of fairness or justice, attitudes toward wind energy, and people's social norms, from the process of preference elicitation. Separating these components of preference elicitation is a limitation of stated-preference methods.

As an alternative method, VEs can account for those social factors within short and descriptive scenarios based on relevant decision factors. Respondents in VE studies typically face multiple vignettes in the form of between-subject designs and are asked to evaluate each scenario according to their level of acceptance, support, or perceived fairness. The randomization of discrete and related attributes, presumed to be important determinants of respondents' decision-making, enables the identification of causal attributes based on theory-led experimental designs and contextual factors generated by the researcher (Auspurg and Hinz 2015).

VEs differ from stated-preference methods in that they do not ask respondents to make choices or rank alternatives from which trade-offs are derived. Instead, VEs provide an indirect measurement of individual evaluations of vignette attributes as part of a scenario, where attribute trade-offs lower the potential of social desirability bias (Auspurg and Jäckle 2017). As such, VEs allow researchers to estimate the relative importance of a set of attributes and levels in an individual's evaluation of an experimentally created context (Hainmueller, Hangartner, and Yamamoto 2015).

3. Study Design

The data set was drawn from an online survey conducted between December 2018 and March 2019 involving 401 rural (agricultural) landowners in Alberta. Potential participants were recruited from the members of an established online panel of agricultural operators maintained by the market research firm Kynetec (Guelph, Canada). Study participants were recruited from among all Alberta panel members (n = 3,000) who provided permission to Kynetec to conduct surveys online. Qualifying farm operators with sales of more than Can$10,000 per year and landownership of at least 10 acres were sent an email invitation, along with reminder emails over the course of the data-collection period. To achieve our final list of respondents, Kynetec also used telephone recruitment of panel members where phone numbers were pulled randomly from the database. Eligible landowners were at least 18 years of age and were the decision maker (n = 389) or one of the primary decision makers (n = 12) in the farming operation. Quotas ensured geographic coverage, and participants received Can$20 for completing the 20-minute questionnaire.

Table 1
Attribute Levels Used in the Study

Attribute	Levels
Location	On your property*
	On the other side of your county
	On your neighbors' property
Neighbor compensation	Not receive any compensation*
	Also receive some compensation
	Receive equal compensation amounts as the landowner hosting the turbines
Ownership structure	A private utility company*
	Your municipality
	A local cooperative
Inclusion	Only the landowners with turbines*
	All county residents
	Only the neighbors who are directly affected
Influence	Express concern about the project*
	Express concern and potentially sway
	Have direct say (e.g., through voting, public meetings)
Access to information	Will be confidential*
	Will be made available to some affected
	Will be publicly available

* represents status quo in the province.

Although there are random elements to the construction of this sample, this is a nonprobability sample, reflecting the challenges and investment required in securing the participation of these large-scale agricultural businesses. Therefore, we must be cautious in generalizing results of this study to the population of agricultural producers in Alberta. The study received human ethics research approval at the University of Alberta (Pro00084046).

Vignettes consisted of six attributes, each expressed in three levels (Table 1). These attributes were determined based on a previous study (Afanasyeva, Davidson, and Parkins 2022) involving extensive conversations with landowners as well as insights from other studies that take account of procedural and distributional concerns (Walker and Baxter 2017). First, we consider wind power project location and proximity to homes and the community to explore the complex relationship between proximity to wind farms and support for wind power (Jacquet 2012; Baxter, Morzaria, and Hirsch 2013). Baxter, Morzaria, and Hirsch (2013) find that survey respondents in Ontario had more positive attitudes toward the installation of wind energy projects in the province compared with locations in their own municipality. However, people living in a community with turbines had a more positive attitude toward wind power in general compared with residents in a turbine-free community. Since those insights are drawn from a sample of community residents, the results are not directly applicable to this study, so our results may differ. We model the proximity of wind project location, ranging from "on the other side of your county" to "on your neighbor's property" and "on your property."

Second, compensation is an important factor driving local acceptance of wind farms (Christidis, Lewis, and Bigelow 2017; Lienhoop 2018; Jørgensen et al. 2020). Jacquet (2012) suggests that compensation may trump concerns about proximity, especially when monetary incentives are distributed among the whole community, beyond affected individuals. This finding is confirmed by Hoen et al. (2019). However, the ability of compensation schemes to overcome community resistance is not undisputed when it comes to perceptions of process fairness, as localized monetary benefits can be construed as bribery (Aitken 2010; Kerr, Johnson, and Weir 2017). In this context, distributive justice (defined as the fair distribution of perceived burdens and public benefits from wind projects) comes into play (Langer et al. 2016). Proposed compensation schemes in the literature are diverse and range from direct financial compensation to adjacent property owners, proximity-based compensation to property owners, and community payments or (infrastructure) investments (Garcia et al. 2016; Lienhoop 2018). We adapt this evidence and model compensation based on aspects of its distributive fairness, ranging from landowner neighbors "not receiving any compensation" or "also receiving some compensation" to "receiving equal compensation amounts as the landowner hosting the turbines."

Third, across Europe, evidence suggests a strong and positive shift in the acceptance of wind power when communities are offered opportunities for local ownership (Musall and Kuik 2011; Cashmore et al. 2019). The North American experience differs considerably, as local ownership remains rare (Rand and Hoen 2017). Research conducted in Ontario indicates that although community ownership remains low, it can have positive effects on wind power acceptance (Fast et al. 2016; Walker and Baxter 2017). We model ownership options in the form of "your municipality," or "a local cooperative" to the common arrangement involving "a private utility company."

Fourth, procedural justice involves the perceived fairness of the planning process in terms of public inclusion, information sharing, and the ability to influence decision-making around wind project siting. These procedures are often identified as an important factor in the acceptance of wind power by local residents (Simcock 2016; Jørgensen, Anker, and Lassen 2020). Aitken (2010) suggests that increasing participation in the decision-making and planning process can increase the level of acceptance through higher perceived procedural justice and thus higher perceived fairness of the outcome. Several recent studies confirm the link between including the local community in decision-making and increased acceptance of wind projects (Liebe and Dobers 2019; Mills, Bessette, and Smith 2019). We adapt this factor and model community inclusion in spatial terms as including "all county residents," "only the neighbors who are directly affected," or "only the landowners with turbines" in the planning process.

Fifth, closely linked to inclusion is the capacity for local residents (and landowners) to influence or have a say in the final outcome of a planning process. This factor represents a second element of procedural justice. Walker and Baxter (2017) summarize that a change in policies imposing restrictions on local influence on turbine siting decisions in Canada has significantly increased community opposition (Baxter, Morzaria, and Hirsch 2013; Fast et al. 2016). Similar results have been reported for studies in Europe (Lienhoop 2018) and in the Unites States (Firestone et al. 2018). We model the degree of community influence in the siting decision process as the ability to "express concern about the project," "express concern and potentially sway," or "have direct say (e.g., voting)" on the proposed project.

Finally, access to information is the third element of procedural justice. Information provision and procedural transparency have been identified by several studies to affect perceived fairness, leading to more positive attitudes and acceptance of renewable energy and wind project development processes at the local level (Musall and Kuik 2011; Firestone et al. 2012). Using a discrete choice experiment, Brennan and Van Rensburg (2016) show that two-thirds of respondents preferred access to 100% of information, even if that had a negative effect on compensation levels. Moreover, required compensation levels were found to be lower if a community representative was appointed to the decision-making body. We adapt this concept and model the effects of transparency and access to information on landowner preferences for wind power projects ranging from lease payments and compensation amounts that "will be confidential," "will be available to some affected," and "will be publicly available." As a basis of comparison, the status quo attribute levels for wind power development in Alberta are noted in Table 1.

Based on the six attributes and their three levels, we generate a full factorial design of 729 unique vignettes. Next, we created a foldover design that allows for two-way interactions, so that attributes vary independently of each other within and across vignettes. The final design comprised 144 vignettes. Out of this, six vignettes were randomly drawn (without replacement) for each respondent, to avoid learning and order effects in vignette ratings (Auspurg and Jäckle 2017). With 401 participating landowners, each vignette was rated approximately 17 times, resulting in a total of 2,406 evaluations.

To provide a sufficient range of vignette judgments and avoid the risks of censored responses and outliers, the structure asked participants to rate each vignette on an 11-point scale from −5 to +5, where endpoints were described textually as "completely unacceptable" to "completely acceptable" (Kübler, Schmid, and Stüber 2018).

Drawing from the stated-preference literature (Mariel et al. 2021), all participants read a brief script at the beginning of the VE. The script informed respondents about the hypothetical nature of the task (Penn and Hu 2018) and set a baseline of understanding. Based on extensive interviews with landowners prior to this study, the script invited respondents to set aside concerns about financial feasibility, environment, and health effects, which were found to be of lesser concern to landowners than the attributes identified in the experiment design. The following script was provided to participants in advance of the vignettes:

> Although these are hypothetical scenarios and some may not seem like 'real' options, please respond as if you were actually in that situation. The results from this section may be used to guide policy makers and help make Alberta's energy system work better for rural communities. You may have more thoughts on wind energy, and we will be asking you more about that later in the survey. For the purposes of this scenario task, please assume that any concerns related to financial feasibility, impacts on the environment and wildlife, and human health will NOT be an issue. In other words, these described wind farms will be safe (for humans and animals), profitable, and have enough wind. Also, for these scenarios, assume the following benefits: a local wind farm will generate local tax revenue for your county/municipality, and landowners hosting wind turbines will receive substantial lease payments.

The following is an example of a vignette:

> There is an opportunity for [your municipality/local cooperative/private utility company] to develop a wind farm [on the other side of your county (over 60 km away)/on your neighbour's property/on your property]. For projects like this, other residents living nearby will receive [no compensation/some compensation based on their proximity to the turbines/equal compensation amounts as the landowner hosting the turbines]. Only [landowners with turbines/the neighbours who are directly affected/all county residents] will be invited [to express concern about/express concern and potentially sway/have direct say about (e.g., through voting, public meetings)] the project. Meanwhile, details about the lease payments and compensation amounts will be [confidential/available to some affected/

publicly available]. Given this situation and the assumptions stated before, how acceptable or unacceptable does this wind energy development sound to you?

The respondents were then asked on an 11-point scale from −5 to +5 whether this development was "completely unacceptable," "neither acceptable nor unacceptable," or "completely acceptable."

After the VE, the survey included several questions that allowed us to quantify determinants of wind energy acceptance that are independent of the VE. Questions included landowner experience with wind turbines, self-rated knowledge of wind energy, and levels of agreement with publicly debated concerns surrounding wind energy (Simcock 2016; Jørgensen, Anker, and Lassen 2020). These include noise pollution, effects on wildlife and bird populations, aesthetic landscape effects, and concerns regarding community conflict and rising electricity prices resulting from the expansion of wind energy.

To measure social norms as expressed through unwritten rules or expectations, we adapted questions developed in the literature (Farrow, Grolleau, and Ibanez 2017). With a focus on famer-specific environmental values (Silvasti 2003), we measured local and global environmental concerns and farm-level climate change concerns (Davidson et al. 2019), adapting established scale-question formats to our landowner subject pool. We also measured trust in community and energy sector stakeholders (Firestone et al. 2012) as well as respondent political affiliation (Davidson et al. 2019). In addition to sociodemographics, farm size, and farm type, we measured other attitudinal and perception questions using five-point scales from 1 (strongly disagree) to 5 (strongly agree).

Given the multilevel structure of our data, with a focus on vignette ratings as the dependent variable, we used a random effects (RE) model to account for the nested structure of the data at the respondent level and the presumed heterogeneity among respondents (Atzmueller and Steiner 2010). An RE model specification also allows for including second-order respondent characteristics (model 2 in Table 4). As the participating landowners were recruited from the same geographical region and industry (agriculture), we assume that the respondents did not differ in their understanding of the acceptance response. In other words, all landowners were assumed to evaluate a particular wind power scenario as "completely acceptable" if it fully met their preferences, thus obviating the need to correct differences in response scales, commonly known as differential item functioning (Greene et al. 2021) at the model estimation stage. Using the statistical software package Stata, we estimate random intercept models assuming that participants will express different acceptance thresholds for vignettes with varying attribute levels (Auspurg and Hinz 2015). We use likelihood ratio tests to verify preferred model specifications against ordinary least square models that will result in biased standard errors. The data set and coding used to derive the results are available at Borealis, the Canadian Dataverse Repository (Parkins et al. 2021).

4. Results

Descriptive statistics in Table 2 provide a snapshot of survey respondents, including characteristics of land management and related farm structure and farm type variables. Our respondents are reflective of larger, commercial crop and livestock farms (Table 2). The average size of operations in the sample was 2,982 acres, relative to an average of 1,237 acres in the farm census, thus making the survey data more reflective of larger and more commercially oriented farm operations in Alberta (Statistics Canada 2016). Respondents were mostly male (90%) in this group of larger farm operators compared with 31% female operators among all farms in the province. Data from the Alberta farm census (Government of Alberta 2018) also indicate that roughly 45% of farm operations are managed in partnership or as a corporation of two or more family members. Regarding the age of respondents, the median age falls within the 55–64 years old category, which is in line with the average age of farm operator at 55.7 years (Government of Alberta 2018). The distribution of farm operators is also compared here

Table 2
Respondent Sample Descriptive Statistics

Variable	*n*	Mean (SD)	Min.	Max.
Farm Manager Characteristics				
Gender (1=male, 0=female)	400	0.90 (0.30)	0	1
Age in years (1=18–24; 2=25–34; 3=35–44; 4=45–54; 5=55–64; 6=65–74; 7=≥75)	397	4.84 (1.20)	2	7
Primary decision maker for this farm (1=yes; 2=no)	401	1.03 (0.17)	1	2
Political affiliation				
Conservative	281	0.70 (0.46)	0	1
Liberal	12	0.03 (0.17)	0	1
New Democratic Party	17	0.04 (0.20)	0	1
Green	4	0.01 (0.01)	0	1
Other	35	0.03 (0.18)	0	1
Prefer not to say	56	0.13 (0.34)	0	1
Do not know	22	0.06 (0.23)	0	1
Farm Structure				
Type of Farm (*n*)				
Crops (206), livestock (47), mixed (146)				
Size (acres)	401	2,982.53 (4,063.85)	13	30,500
% household income from farming (1=0; 2=1–25; 3=26–50; 4=51–75; 5=76–100)	401	4.46 (0.89)	1	5
Energy Perception				
Likelihood of installation of renewables (4-point scale: 1=very likely; 4=very unlikely)	342	2.76 (0.90)	1	4
Importance of Alberta's energy sector (5-point scale: 1=not at all important; 5=extremely important)	401	4.09 (0.81)	1	5
Knowledge about wind energy (4-point scale: 1=nothing at all; 4=quite a bit)	401	2.52 (0.81)	1	4
Climate Change Concerns (5-point scale: 1=strongly disagree; 5=strongly agree)				
I am very concerned about climate change	401	2.89 (1.22)	1	5
We still do not know for sure whether climate change is real or caused by humans	401	3.55 (1.18)	1	5
Climate change will not be an issue here in Alberta	401	2.73 (1.11)	1	5
Alberta adopting renewable energy will help reduce climate change impacts	401	2.52 (1.26)	1	5

between sample statistics and (census) data: 65% (57%) aged 55 or older, 31% (35%) being 35–54 years old, and 3% (9%) being 34 years of age or younger.

Although our sample may not be representative of the population of rural Alberta agricultural landowners, it does offer unique insights into this particular group of large-scale land owners who are in a position to host wind turbines. They represent a point of view and a position of authority about how their land will be used and how it will contribute to or inhibit the development of renewable energy landscapes. The insights gleaned here warrant further exploration of comparable data sets in other parts of North America.

Against the background of a fossil fuel–dominated energy sector and its long-standing ties to rural landowners, the majority of respondents expressed the importance of the energy sector to them (μ 4.09, 5-point scale). The likelihood of installing renewable energy and knowledge of wind energy, however, were relatively low (< 3.0). Grounded in conservative political views and ties to the region's oil and gas industry, concerns over climate change were found to be relatively low. For example, in response to the statement that "we still do not know for sure whether climate change is real or caused by humans," 62% of respondents agreed or strongly agreed with this statement (μ 3.55). Only 28% of landowners agreed that adopting renewable energy will help reduce climate change effects (μ 2.52).

Regarding respondents' support for wind power relative to other sources of energy, results in Table 3 confirm landowners' strong support for the regional fossil fuel economy. A striking result is the fact that support for wind energy is situated among coal (to be phased out) and nuclear energy (not present in the province) as the least supported energy sources. These initial results clearly indicate that our sample of rural landowners remains very skeptical of renewable energy in the context of climate change mitigation or the adoption of renewables as the future of economic activity in the province. With this context in mind, and against the evidence from general population data in other studies (e.g., Firestone and Kirk 2019; Sherren et al. 2019), further development of wind farms in Alberta may face stiff resistance from rural landowners.

Table 3
Landowner Support for Energy Sources in Canada

Energy Source	*n*	Mean	SD	Min.	Max.
Natural gas	401	4.51	0.60	2	5
Oil from oil sands	400	4.43	0.71	1	5
Oil (other than oil sands)	399	4.27	0.73	1	5
Hydroelectricity	396	4.07	0.91	1	5
Bioenergy	389	3.98	0.79	1	5
Solar	401	3.94	0.97	1	5
Geothermal	383	3.92	0.86	1	5
Coal	394	3.62	1.13	1	5
Wind	397	3.44	1.21	1	5
Nuclear	383	3.05	1.27	1	5

Note: The mean is a 5-point Likert scale with 1 = strongly oppose and 5 = strongly support.

Vignette Evaluations

Figure 1 gives a first impression of landowner evaluations of wind power projects by contrasting the distributions of vignette ratings of (very) strong supporters of oil and gas (μ 4.22, σ 3.08), (very) strong supporters of wind energy (μ 6.36, σ 2.91), and those who stated equally strong support for both energy sources (μ 7.07, σ 3.06). The black bar in Figure 1 indicates landowners who expressed strong or very strong support for oil from oil sands on a 5-point scale from 1 (completely unacceptable) to 5 (completely acceptable). Gray indicates strong and very strong support for wind energy on the same scale. White bars indicate strong and very strong support for both oil sands and wind energy. The discrepancy in vignette ratings are landowners who did not express support for either of the selected energy sources.

Based on this analysis, the mean acceptance level between the three landowner groups is highly statistically significant based on two-sided *t*-tests. Vignettes were given a rating of "completely unacceptable" 303 times by supporters of oil and gas, whereas 36 scenarios were rated to be "completely acceptable." In contrast, landowners who expressed strong support for both fossil fuel and wind energy sectors gave 142 scenarios the highest rating. Given the small number of exclusive supporters of wind energy among landowners (n = 60), 21 scenarios were rated as "completely acceptable." Other landowners were found to state relatively consistent levels of acceptability with a slightly larger number of ratings in the range of marginal to positive acceptability between 8 and 11. Finally, there was some evidence of noncooperation with the VE, where 30 respondents did not follow instructions and provided the same response at –5 (completely unacceptable) for all six vignettes presented to them. Analyses indicate little difference in results when these participants are excluded. Therefore, we chose to include all responses in the results presented here.

Based on the descriptive statistics in Table 2, most landowners show limited support for wind energy or concerns for a climate change–induced need to shift from fossil fuel energy sources. This perspective is also observed in Figure 1, where the majority of vignettes were rated below the midpoint of 0 (i.e., 45% < 0, 42% > 0, and the remainder at the midpoint). The descriptive analysis thus points to important differences in wind energy acceptance based on the underlying preferences of landowners.

Since each landowner evaluated six vignettes, Table 4 presents the results of two RE regressions models. Model 1 is based on the vignette attributes (Table 1). A fixed effects specification of model 1 was estimated as a

Figure 1
Vignette Ratings by Stated Support for Different Energy Sources (n = 2,358)

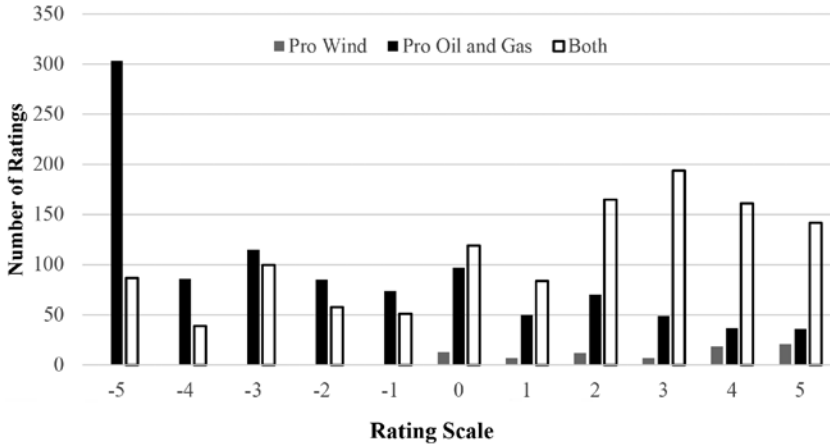

Table 4
Results of Random Effects Regression Models for the Vignette Attributes and Controls for Sociodemographic, Belief, and Knowledge Variables

Attribute	Attribute Level	Model 1	*p*-value	Model 2	*p*-value
Location (ref. your property)	On your neighbors' property	0.152*	0.052	0.157	0.232
	On the other side of your county	0.382***	0.000	0.409***	0.003
Neighbor compensation (ref. no compensation)	Receive equal compensation amounts as the landowner hosting the turbines	0.548***	0.000	0.569***	0.001
	Receive some compensation	0.907***	0.000	0.967***	0.000
Ownership structure (ref. private utility company)	Your municipality	0.282***	0.000	0.297**	0.016
	A local cooperative	0.418***	0.000	0.453***	0.000
Inclusion (ref. landowners with turbines only)	Only neighbors who are directly affected	0.723***	0.000	0.730***	0.000
	All county residents	0.584***	0.000	0.602***	0.000
Influence (ref. express concerns only)	Express concern and potentially sway	−0.257***	0.001	−0.297**	0.016
	Have direct say	−0.083	0.285	−0.102	0.366
Access to information (ref. confidential)	Will be made available to some affected	0.323***	0.000	0.371***	0.003
	Will be publicly available	0.303***	0.000	0.331***	0.006
Climate concern (environmental attitude)				0.659***	0.006
Community excitement about new wind farms (norm)				1.878***	0.000
Experience with wind farms (history)				−0.075	0.338
Age (young)				0.734	0.225
Knowledge about wind energy				0.395***	0.000
Small land holding (farm size)				0.541**	0.032
Conservative political views				0.574**	0.023
Constant		4.377***	0.000	2.730***	0.000
Number of vignettes		2,406		2,226	
Number of respondents		401		371	
Log-likelihood		−10,841.88		−5,237.74	
SD random effect		2.621		1.933	
SD error		2.028		2.212	
Intraclass correlation		0.625		0.605	

Note: Unstandardized coefficients. Standard errors are clustered at the respondent level.
*$p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

robustness check and yielded stable coefficient estimates in both sign and magnitude. Model 2 expands the initial model specification, with landowner characteristics deemed relevant to acceptance ratings. For both models, likelihood-ratio tests indicate that the RE model specifications are highly preferred over ordinary least square regressions. Moreover, attribute interactions between vignette variables of interest (e.g., turbine proximity, compensation) were not significant, and we only present the main attribute effects. Intraclass correlation coefficients of 0.625 and 0.605 indicate a high correlation among the six vignette evaluations per landowner. Coefficient estimates for each attribute are presented relative to the status quo for wind power development in Alberta.

Across models, compensation has the strongest effect on wind power scenario acceptance levels. Measured against no compensation for neighbors within a radius of 20 km, the most preferred attribute involves neighbors of turbine-hosting landowners to also receive some compensation (0.907). Note that this effect is stronger than the option for equal compensation levels between the hosts and surrounding landowners. The result that a gradient of compensation between host and surrounding neighbors is preferred reflects a preference for fairness in a proximity-based compensation mechanism, highlighted in previous studies (Walker and Baxter 2017; Mills, Bessette, and Smith 2019). Similarly, procedural justice emerges as another strong and robust effect estimate. Relative to including the contracting parties in wind energy development, landowner acceptance not only hinges on the inclusion of neighboring landowners that will be directly affected (0.723) but also on the inclusion of "all county residents" with an effect size that was slightly lower (0.584) confirmed by a Wald test statistic of 0.248. Yet landowner decisions appear to consider the effect of their choices on overall neighbor and community relations, which reflects on the desire for fairness in the energy infrastructure development process. This result was also found in Liebe, Bartczak, and Meyerhoff (2019). The role of ownership structure on landowner acceptance is also revealing. In western Canada (and Alberta), where large-scale corporate utilities own most of the wind energy infrastructure, we find results in line with Christidis, Lewis, and Bigelow (2017) that landowners express a clear preference for more local municipal ownership (0.282) and more equitable cooperative ownership (0.418). Controlling for economic and fairness factors, proximity is less influential on scenario acceptance. The magnitude of marginal effects for a perceived "fair" level of compensation relative to the placement of wind turbines on adjacent or distant land suggest that the placement of wind energy developments plays a minor role in landowner evaluation of potential projects.

Differences between landowner characteristics (and farm operations) as a source of heterogeneity may also influence the evaluation of wind energy scenarios. Therefore model 2 includes a series of control variables, including sociodemographic and land-use factors and landowner beliefs, knowledge, and political orientation. Based on these control variables, our results also confirm that landowner social norms and political orientation are driving landowner acceptance of wind energy. Regarding norms, vignette ratings of respondents' who agreed with the statement "For the most part, my local community would be excited about a new wind farm" were 1.878 points above average. Being politically conservative shapes landowner acceptance levels with vignette scenario ratings 0.574 scale point higher. This positive coefficient among conservatives may reflect a desire for energy independence and autonomy, a topic we address in more detail shortly. While being a factor in many citizen-focus studies on wind energy (Jørgensen, Anker, and Lassen 2020), previous experience with wind turbines has no effect on landowner ratings of vignette scenarios, although self-reported knowledge of wind energy is significant and positive. Overall, although several landowner characteristics matter to their vignette ratings, the effect of scenario attributes and thus landowner decision-making around wind energy development on their land remains robust between both model specifications in Table 4.

One final comment on vignette attribute variables involves the question of influence. Results indicate a negative coefficient for expressing concern and potentially swaying the outcome of a project (–0.257). Given the potential for deep conflict between neighbors who disagree on the development of new wind farms in a community, this outcome reflects a general sense that neighbors (or all county residents) should not be in full control over the final decision of a project. Being able to express concern is warranted, but more control over project outcomes is less desirable.

5. Discussion and Conclusion

Against the backdrop of strong support for fossil fuel extraction and limited concern for climate change or its mitigation policies, low levels of support for wind energy appears to stand in the way of landowner acceptance of wind energy in Alberta. Conventional pathways for the expansion of renewables across the region include large-scale private investment by corporate utility companies, no compensation for neighboring landowners or the community, limited means for information sharing, and inclusion in siting and designing new projects. All of these conventions run counter to landowner acceptance of wind power in this study.

With this context in mind, what are the characteristics of wind energy development that would render a project more acceptable to rural landowners? Our results identify several procedural and design elements that can enhance expansion of wind energy through landowner support. To illustrate these elements, we provide an optimal design based on the estimated attribute coefficients reported in Table 4 (underlined) that yield the highest levels of acceptability by surveyed landowners:

> There is an opportunity for <u>a local cooperative</u> to develop a wind farm on <u>the other side of your county</u>. With projects like this, neighbours within 20 km of a turbine will <u>also receive some compensation</u>. <u>Only the neighbours who are directly affected</u> will have the opportunity to <u>express concern about</u> the project. Detailed financial reporting including compensation rates <u>will not be publicly</u> available.

Although this ideal scenario suggests several implications for advancing renewable energy policy for oil-rich western Canada, it also reflects the general reluctance of rural landowners to accept wind turbines on their land and in the surrounding landscape. In short, landowners do not want turbines on their property—not even close to it—but want to receive compensation. We also see a desire for more access to information and more inclusion in decision-making that could render wind farms more acceptable.

A note of caution in this interpretation is also warranted. Our analysis has limitations in that our survey participants stretch across a region that is the size of whole countries. Despite their uniform evaluation of scenarios, some landowners are separated by more than 1,000 km, and respondents may differ in characteristics beyond the scope of this study. As is common to experimental valuations, although our sample of landowners found the design of certain scenarios acceptable, in practice, the work of designing and siting wind energy projects is a complex process between multiple stakeholders involving other infrastructure (e.g., power lines) and design elements extending beyond the scope of this study. In this sense, our findings inform possible avenues toward landowner acceptance of wind energy, with insights into key attributes that are likely to matter in the development and implementation of new wind farms.

Consistent with the broader wind acceptance literature in North America and Europe, our results indicate that landowners in Canada prefer forms of local, municipal, or cooperative ownership (Christidis, Lewis, and Bigelow 2017) that include "fair" forms of compensation beyond traditional lease payments to landowners hosting energy infrastructure (Walker and Baxter 2017). Results also show the importance of inclusive procedures. Greater transparency and inclusion beyond private contracting parties are preferred by landowners as much as they are by members of the public (Mills, Bessette, and Smith 2019). These results are consistent with studies such as Hoen et al. (2019), who identify fairness as a key predictor of support for wind energy among those who live in and around wind farms. This study adds further support for this finding: large-scale agricultural landowners, as potential hosts of wind turbines, are also keenly interested in fairness aspects of project development.

Regarding proximity, location attributes, and compensation, the literature offers a complex set of insights. Although proximity was negatively associated with landowner support in some studies (Jacquet 2012), other evidence points to a reversed relationship (Mills, Bessette, and Smith 2019). Similar to other studies that identify complexity between compensation variables and hosting decisions (e.g., Hoen et al. 2019), our results suggest a complex interplay between proximity, compensation, and ownership structure. Although this study confirms a positive relationship between distance and acceptance of wind turbines, local ownership and more equitable compensation of proximate wind development are also (arguably more important) factors in determining landowner acceptance of wind farms. One reason for this finding may be that wind energy remains relatively new in North American landscapes, and landowners have limited experience living in turbine-dominated landscapes more commonly associated with Europe (Rand and Hoen 2017).

In addition to these insights, there are two key areas of particular interest. First, regarding forms of ownership: a preference for local cooperative structures was somewhat unexpected but perhaps not entirely surprising. Despite extensive attention to community energy in the literature (Simcock 2016), there are very few examples of cooperative- or community-owned energy production in Alberta. Existing oil and gas infrastructure on agricultural land is almost entirely owned by private companies. While landowners preferred a form of ownership in the production of energy that is very rare in the region, the agricultural community has a long history of cooperative organization for production and transportation of agricultural commodities. This history extends to cooperative ownership of rural electricity transmission lines (MacArthur 2016). These experiences with cooperative ownership in other sectors may bode well for such structures on the emerging supply side of electricity generation, especially as energy supply becomes more decentralized in the years ahead.

Second, the compensation attribute in the vignette reveals an interesting pattern of responses. One might assume that respondents would seek to maximize compensation payments, which would reflect the idea that "other residents living nearby will receive equal compensation with the landowner." Although this option was preferred over the "no compensation" option (which was expected), it is interesting to observe that most respondents preferred "some compensation" for neighbors. This outcome tells us two things about the results of this study. First, landowners appear to care about relationships with their neighbors and thus intend to promote neighborliness through shared benefits from wind power. Second, respondents recognize that hosting a turbine on their land comes with costs, such as inconvenience and remediation risks, suggesting that those who host turbines should be compensated more than neighbors. This issue is a question of fairness and links directly to distributive justice as a key element of acceptability in wind farm developments.

Finally, there are several insights involving control variables. For example, with regard to political orientation, we find that respondents with more conservative views tend to rate vignettes more positively. These results may signal an opportunity for positive messaging to landowners about renewable energy development that is based on moral frames. Although there is emerging research in environmental psychology on moral framing (Hurst and Stern 2020), the integration of different message frames in economic experiments may yield valuable insights. Particularly in politically conservative jurisdictions like Alberta, more liberal framing (e.g., fairness or harm) may have less traction than conservative framing (e.g., independence or authority). Designing vignettes to reflect these divergent moral frames can lead to insights around how we talk about wind power and what we value in fostering dialogue on renewable energy more broadly.

Acknowledgments

We are grateful to Manuela Zindler for assistance in preparing tables and organizing the cited literature. Special thanks to our research participants, who provided valuable insights into their experiences with wind farms. We also thank the anonymous journal reviewers, who helped improve the overall quality of this article. Funding for this study was provided by the Social Science and Humanities Research Council (project 435-2017-0281).

References

Afanasyeva, Aleksandra, Debra J. Davidson, and John R. Parkins. 2022. "Wind Energy Development and Anti-Environmentalism in Alberta, Canada." In *Handbook of Anti-Environmentalism*, edited by David T. Tindall, Mark Stoddart, and Riley Dunlap, 329–343. Cheltenham, UK: Edward Elgar.

Aitken, Mhairi. 2010. "Wind Power and Community Benefits: Challenges and Opportunities." *Energy Policy* 38 (10): 6066–75.

Ambuehl, Sandro, and Alex Ockenfels 2017. "The Ethics of Incentivizing the Uninformed: A Vignette Study." *American Economic Review* 107: 91–95.

Alagappan, L., R. Orans, and C. Woo. 2011. "What Drives Renewable Energy Development?" *Energy Policy* 39 (9): 5099–5104.

Atzmüller, Christiane, and Peter M. Steiner. 2010. "Experimental Vignette Studies in Survey Research." *Methodology* 6: 128–38.

Auspurg, Katrin, and Thomas Hinz. 2015. "Multifactorial Experiments in Surveys: Conjoint Analysis, Choice Experiments, and Factorial Surveys." In *Experimente in den Sozialwissenschaften*. Vol. 1, *Aufl. Baden-Baden: Nomos*, edited by Marc Keuschnigg and Tobias Wolbring, 291–315. Baden-Baden, Germany: Nomos.

Auspurg, Katrin, and Annette Jäckle, A. 2017. "First Equals Most Important? Order Effects in Vignette-Based Measurement." *Sociological Methods and Research* 46 (3): 490–539.

Barrington-Leigh, Christopher, and Mark Ouliaris. 2017. "The Renewable Energy Landscape in Canada: A Spatial Analysis." *Renewable and Sustainable Energy Reviews* 75: 809–19.

Baxter, Jamie, Rakhee Morzaria, and Rachel Hirsch. 2013. "A Case-Control Study of Support/Opposition to Wind Turbines: Perceptions of Health Risk, Economic Benefits, and Community Conflict." *Energy Policy* 61: 931–43.

Bell, Jeff, and Tim Weis. 2009. *Greening the Grid: Powering Alberta's Future with Renewable Energy.* Drayton Valley, Alberta: Pembina Institute.

Brennan, Noreen, and Thomas M. Van Rensburg. 2016. "Wind Farm Externalities and Public Preferences for Community Consultation in Ireland: A Discrete Choice Experiments Approach." *Energy Policy* 94: 355–65.

Canada Energy Regulator. 2020. "Canada's Energy Future 2018: Technology Case Results. Ottawa: Government of Canada." Available at https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/2018/chapter-4-technology-case-results.html.

CanWEA (Canadian Wind Energy Association). 2020. "Installed Capacity." Available at https://canwea.ca/wind-energy/installed-capacity/.

Cashmore, Matthew, David Rudolph, Sanne Vammen Larsen, and Helle Nielsen. 2019. "International Experiences with Opposition to Wind Energy Siting Decisions: Lessons for Environmental and Social Appraisal." *Journal of Environmental Planning and Management* 62 (7): 1109–32.

Christidis, Tanya, Geoffrey Lewis, and Philip Bigelow. 2017. "Understanding Support and Opposition to Wind Turbine Development in Ontario, Canada and Assessing Possible Steps for Future Development." *Renewable Energy* 112: 93–103.

Davidson, Debra J., Curtis Rollins, Lianne Lefsrud, Sven Anders, and Andreas Hamann. 2019. "Just Don't Call It Climate Change: Climate-Skeptic Farmer Adoption of Climate-Mitigative Practices." *Environmental Research Letters* 14 (3): 034015.

Farrow, Katherine, Gilles Grolleau, and Lisette Ibanez. 2017. "Social Norms and Pro-environmental Behavior: A Review of the Evidence." *Ecological Economics* 140: 1–13.

Fast, Stewart, and Warren Mabee. 2015. "Place-Making and Trust-Building: The Influence of Policy on Host Community Responses to Wind Farms." *Energy Policy* 81: 27–37.

Fast, Stewart, Warren Mabee, Jaime Baxter, Tanya Christidis, Liz Driver, Stephen Hill, J. J. McMurtry, and Melody Tomkow. 2016. "Lessons Learned from Ontario Wind Energy Disputes." *Nature Energy* 1 (2): 15028.

Ferguson-Martin, Christopher, J., and Stephen D. Hill. 2011. "Accounting for Variation in Wind Deployment between Canadian Provinces." *Energy Policy* 39 (3): 1647–58.

Firestone, Jeremy, Ben Hoen, Joseph Rand, Debi Elliott, Gundula Hübner, and Johannes Pohl. 2018. "Reconsidering Barriers to Wind Power Projects: Community Engagement, Developer Transparency and Place." *Journal of Environmental Policy & Planning* 20 (3): 370–86.

Firestone, Jeremy, Willett Kempton, Meredith Blaydes Lilley, and Kateryna Samoteskul. 2012. "Public Acceptance of Offshore Wind

Power: Does Perceived Fairness of Process Matter?" *Journal of Environmental Planning and Management* 55 (10): 1387–402.

Firestone, Jeremy, and Hannah Kirk. 2019. "A Strong Relative Preference for Wind Turbines in the United States among Those Who Live Near Them." *Nature Energy* 4 (4): 311–20.

Garcia, Jorge H., Todd L. Cherry, Steffen Kallbekken, and Asbjørn Torvanger. 2016. "Willingness to Accept Local Wind Energy Development: Does the Compensation Mechanism Matter?" *Energy Policy* 99: 165–73.

Glen, Barb. 2019. "Wind Power Losing Love in Southern Alberta." *The Western Producer*, June 20. Available at https://www.producer.com/news/wind-power-losing-love-in-southern-alberta/.

Government of Alberta. 2018. "Census of Agriculture Provincial Profiles: Alberta Farm and Farm Operator. Highlights." Available at https://open.alberta.ca/publications/census-of-agriculture-provincial-profiles-alberta-farm-and-farm-operator-highlights.

———. 2020. "Renewable Energy Legislation and Reporting." Available at https://www.alberta.ca/renewable-energy-legislation-and-reporting.aspx.

Greene, William H., Mark N. Harris, Rachel J. Knott, and Nigel Rice. 2021. "Specification and Testing of Hierarchical Ordered Response Models with Anchoring Vignettes." *Journal of the Royal Statistical Society Series A* 184: 31–64.

Groth, Theresa M., and Chrstine Vogt. 2014. "Residents' Perceptions of Wind Turbines: An Analysis of Two Townships in Michigan." *Energy Policy* 65: 251–60.

Hainmueller, Jens, Dominik Hangartner, and Teppei Yamamoto. 2015. "Validating Vignette and Conjoint Survey Experiments against Real-World Behavior." *Proceedings of the National Academy of Sciences of the United States of America* 112 (8): 2395–400.

Herz, Holger, and Dmitry Taubinsky. 2018. "What Makes a Price Fair? An Experimental Study of Transaction Experience and Endogenous Fairness Views." *Journal of the European Economic Association* 16 (2): 316–52.

Hoen, Ben, Jeremy Firestone, Joseph Rand, Debi Elliot, Gundula Hübner, Johannes Pohl, Ryan Wiser, Eric Lantz, T. Ryan Haac, and Ken Kaliski. 2019. "Attitudes of US Wind Turbine Neighbors: Analysis of a Nationwide Survey." *Energy Policy* 134: 110981.

Hurst, Kirstin, and Marc J. Stern. 2020. "Messaging for Environmental Action: The Role of Moral Framing and Message Source." *Journal of Environmental Psychology* 68: 101394.

IPCC (Intergovernmental Panel on Climate Change). 2011. *Special Report on Renewable Energy Sources and Climate Change Mitigation*. New York: Cambridge University Press.

Jacquet, Jeffrey B. 2012. "Landowner Attitudes toward Natural Gas and Wind Farm Development in Northern Pennsylvania." *Energy Policy* 50: 677–88.

———. 2015. "The Rise of Private Participation in the Planning of Energy Projects in the Rural United States?" *Society & Natural Resources* 28 (3): 231–45.

Jami, Anahita A., and Philip R. Walsh. 2017. "From Consultation to Collaboration: A Participatory Framework for Positive Community Engagement with Wind Energy Projects in Ontario, Canada. *Energy Resource and Social Science* 27: 14–24.

Jensen, Cathrine Ulla, Toke Emil Panduro, and Thomas Hedemark Lundhede. 2014. "The Vindication of Don Quixote: The Impact of Noise and Visual Pollution from Wind Turbines." *Land Economics* 90 (4): 668–82.

Jørgensen, Marie Leer, Helle Tegner Anker, and Jesper Lassen. 2020. "Distributive Fairness and Local Acceptance of Wind Turbines: The Role of Compensation Schemes." *Energy Policy* 138: 111294.

Kerr, Sandy, Kate Johnson, and Stephanie Weir. 2017. "Understanding Community Benefit Payments from Renewable Energy Development." *Energy Policy* 105: 202–11.

Kübler Dorothea, Julia Schmid, and Robert Stüber. 2018. "Gender Discrimination in Hiring across Occupations: A Nationally-Representative Vignette Study." *Labour Economics* 55: 215–29.

Langer, Katharina, Thomas Decker, Jutta Roosen, and Klaus Menrad. 2016. "A Qualitative Analysis to Understand the Acceptance of Wind Energy in Bavaria." *Renewable and Sustainable Energy Reviews* 64: 248–59.

Larson, Eric C., and Richard S. Krannich. 2016. "'A Great Idea, Just Not Near Me!' Understanding Public Attitudes about Renewable Energy Facilities." *Society & Natural Resources* 29 (12): 1436–51.

Liebe, Ulf, Peter Preisendörfer, and Heidi Bruderer Enzler. 2020. "The Social Acceptance of Airport Expansion Scenarios: A Factorial Survey

Experiment." *Transportation Research, Part D* 84: 102363.

Liebe, Ulf, Anna Bartczak, and Jürgen Meyerhoff. 2019. "A Turbine Is Not Only a Turbine: The Role of Social Context and Fairness Characteristics for the Local Acceptance of Wind Power." *Energy Policy* 10: 300–308.

Liebe, Ulf, and Geesche M. Dobers. 2019. "Decomposing Public Support for Energy Policy: What Drives Acceptance of and Intentions to Protest against Renewable Energy Expansion in Germany?" *Energy Research and Social Science* 47: 247–60.

Lienhoop, Nele. 2018. "Acceptance of Wind Energy and the Role of Financial and Procedural Participation: An Investigation with Focus Groups and Choice Experiments." *Energy Policy* 118: 97–105.

Lundquist, J. K., K. K. DuVivier, D. Kaffine, and J. M. Tomaszewski. 2019. "Costs and Consequences of Wind Turbine Wake Effects Arising from Uncoordinated Wind Energy Development." *Nature Energy* 4 (1): 26–34.

Lutzeyer, Sanja, Daniel J. Phaneuf, and Laura O. Taylor. 2018. "The Amenity Costs of Offshore Wind Farms: Evidence from a Choice Experiment." *Energy Economics* 72: 621–39.

MacArthur, Julie L. 2016. *Empowering Electricity: Co-operatives, Sustainability, and Power Sector Reform in Canada*. Vancouver, Canada: University of British Columbia Press.

Mariel, Petr, David Hoyos, Jürgen Meyerhoff, Mikolaj Czajkowski, Thijs Dekker, Klaus Glenk, Jette Bredahl Jacobsen, *et al.* 2021. *Environmental Valuation with Discrete Choice Experiments: Guidance on Design, Implementation and Data Analysis*. Cham, Switzerland: Springer.

Meyerhoff, Jürgen, Cornelia Ohl, and Volkmar Hartje. 2010. "Landscape Externalities from Onshore Wind Power." *Energy Policy* 38 (1): 82–92.

Mills, Sarah Banas, Douglas Bessette, and Hannah Smith. 2019. "Exploring Landowners' Post-Construction Changes in Perceptions of Wind Energy in Michigan." *Land Use Policy* 82: 754–62.

Musall, Fabian David, and Onno Kuik. 2011. "Local Acceptance of Renewable Energy: A Case Study from Southeast Germany." *Energy Policy* 39 (6): 3252–60.

Parkins, John, Sven Anders, Jürgen Meyerhoff, Monique Holowach, and Sonak Patel. 2021. "Landowner Survey: Preferences for Wind Energy Development in Alberta." Borealis, the Canadian Dataverse Repository. https://doi.org/10.7939/DVN/T7KGUZ.

Penn, Jerrod M., and Wuyang Hu. 2018. "Understanding Hypothetical Bias: An Enhanced Meta-analysis." *American Journal of Agricultural Economics* 100: 1186–206.

Rand, Joseph, and Ben Hoen. 2017. "Thirty Years of North American Wind Energy Acceptance Research: What Have We Learned?" *Energy Research and Social Science* 29: 135–48.

Sherren, Kate, John R. Parkins, Taylor Owen, and Mikiko Terashima. 2019. "Does Noticing Energy Infrastructure Influence Public Support for Energy Development? Evidence from a National Survey in Canada." *Energy Research and Social Science* 51: 176–86.

Silvasti, Tiina. 2003. "The Cultural Model of 'the Good Farmer' and the Environmental Question in Finland." *Agriculture and Human Values* 20 (2): 143–50.

Simcock, Neil. 2016. "Procedural Justice and the Implementation of Community Wind Energy Projects: A Case Study from South Yorkshire, UK." *Land Use Policy* 59: 467–77.

Sovacool, Benjamin K., and Pushkala Lakshmi Ratan. 2012. "Conceptualizing the Acceptance of Wind and Solar Electricity." *Renewable and Sustainable Energy Reviews* 16 (7): 5268–79.

Statistics Canada. 2016. "Census of Agriculture." Available at https://www.statcan.gc.ca/eng/ca2016.

Syal, Sita M., Yiqing Ding, and Erin F. MacDonald. 2020. "Agent-Based Modeling of Decisions and Developer Actions in Wind Farm Landowner Contract Acceptance." *Journal of Mechanical Design* 142 (9): 091403.

Walker, Chad, and Jamie Baxter. 2017. "Procedural Justice in Canadian Wind Energy Development: A Comparison of Community-Based and Technocratic Siting Processes." *Energy Research and Social Science* 29: 160–69.

Wiser, Ryan H., and Mark Bolinger. 2019. *2018 Wind Technologies Market Report*. Berkeley, CA: Lawrence Berkeley National Laboratory. Available at https://emp.lbl.gov/publications/2018-wind-technologies-market-report.

Vyn, Richard J. 2018. "Property Value Impacts of Wind Turbines and the Influence of Attitudes toward Wind Energy." *Land Economics* 94 (4): 496–516. https://doi.org/10.3368/le.94.4.496.