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Next-generation battery research and development: Non-politicized science at the Joint Center for Energy Storage Research

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ABSTRACT

Research on the politicization of science often highlights the role of the media or the effects of the public's prior beliefs. Less prominent are case studies addressing the direct communications from scientists working on a narrowly defined project. This paper introduces for consideration the United States Department of Energy-funded Joint Center for Energy Storage Research (JCESR), which fuses together basic research, battery design, and pathways to market. The central point is to assess whether, given its proximity to the climate change issue, JCESR's research has been politicized. Based on the results from interviews, observations, measures of public interest, and a survey of scientists working at JCESR, it is concluded that JCESR's next-generation battery research has avoided politicization and even thrived. This is attributed in part to bipartisan support among policy makers, the absence of any ideology-based impacts on beliefs about energy storage, and a perception among key actors that next-generation battery technology is not a pressing threat. JCESR also presents a collective ability to protect its scientific credibility while enhancing its political relevance. JCESR's battery storage research and development has been effectively buffered from the volatility of climate change.

1. Introduction

This paper focuses on the Joint Center for Energy Storage Research (JCESR) at Argonne National Laboratory in the United States, a research consortium targeting the creation of next-generation battery technology. Such technology replaces solid electrodes in the lithium-ion batteries used today with energy-dense organic liquids, lowering battery costs and increasing battery performance. These improvements in energy storage technology significantly reduce greenhouse gas (GHG) emissions (Hittinger and Azevedo, 2015), but this simple fact allows for JCESR's research to be politicized in line with the politicization of climate change research. Yet, it is concluded here that there is limited if any politicization of JCESR's research. While inherently tied to GHG emissions reductions, JCESR's work is conveyed in terms that highlight productivity, diffusion, and research collaboration.

While primarily an exploratory case study of JCESR, this paper fills in a critical gap in the literature by examining the non-politicizing prospects of next-generation battery technology. To this end, the paper opens with an overview of JCESR's origins, highlighting the strong political support that battery technology has received to date. This is followed by an introduction to research on science communication and the politicization of science, particularly how credibility is established and maintained and how frames are constructed by scientists and the media. On the assumption that science and technology are easily politicized when connected to climate change and GHG emissions reductions, the results of an analysis of public interest data and a survey of JCESR scientists are then presented. It is shown that the research consortium has avoided politicization because of the frames it employs, because of the frames used by the media to convey information about next-generation battery storage research, and because the public does not yet conflate battery storage with climate change. Overall, battery technology is not viewed as a viable threat to the status quo. In the final section of the paper, the implications for energy-related research consortia with goals parallel to climate change are discussed, as these types of projects – both in content and structure – are becoming increasingly the norm. Particular attention is given to relevant developments under the Trump administration, where science and energy policies in general are increasingly politicized.

2. Bipartisan support for battery storage technology

To promote the expansion of next-generation battery technology, the Energy Innovation Hubs concept has received bipartisan support via the North American Energy Security and Infrastructure Act of 2016. Under

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the Act, the DOE shall "enhance the Nation's economic, environmental, and energy security by making awards to consortia for establishing and operating Energy Innovation Hubs to conduct and support, whenever practicable at one centralized location, multidisciplinary, collaborative research, development, and demonstration of advanced energy technologies."[1] In 2013, the DOE selected JCESR, with its headquarters at Argonne National Laboratory, as the leader of the Batteries and Energy Storage Hub, tasked with focusing on "the next generation of electrochemical energy storage for both transportation and the grid" (U.S. Department of Energy, 2013). Integrating basic and applied research, JCESR's consortium brings together researchers from universities, government research institutes, and the private sector.

Bipartisan support is also identified in other policies and energy storage legislation that fosters next-generation battery research and development (R&D) to increase renewable power demand. For example, and designed to foster the development of renewable energy alternatives for electricity, the Storage Technology for Renewable and Green Energy Act of 2013 provides tax credits for businesses investing in the creation and use of energy storage facilities. The Energy Storage for Grid Resilience and Modernization Act of 2016 was later introduced in the House to continue these energy tax credits through 2026. While these developments have provided a bipartisan environment in which JCESR could thrive, nowhere in this legislation the specific form of storage technology denoted nor are specifics provided regarding the source of energy to be stored. The implication is that the tax credits could be disseminated equally to businesses storing energy produced from coal, nuclear, solar, wind, or another energy source. This draws in widespread support across the energy sector and promotes bipartisan support.

Advanced battery technology research is a high-risk and high-cost venture, requiring the careful and sustained promotion of linkages among the most vital players in the energy storage community. It also requires massive amounts of funding from Congress. Yet, bipartisan support may break down if an energy policy is conflated with other, more politically volatile policies. While there are indications that energy efficiency policies – e.g. solar, wind, and R&D in renewables and battery storage – are not as partisan as they once had been, there remain a number of conditions and caveats, notably the potential for battery storage research to be politicized when connected to climate change policy. It is also possible that key actors such as scientists, politicians, interest groups, or the media politicize science by emphasizing the inherent uncertainty about a consensus, finding, or body of evidence related to aspects of battery technology. Determining whether this is happening with respect to JCESR's activities and technology is the purpose of the present discussion.

3. Prospects for politicizing next-generation battery R&D

"Politicization" refers to the selective investigation of empirically derived evidence about facts and processes in the world. Science can be politicized to substantiate a political position, scientific evidence can be politicized to make claims that are not necessarily consistent with the evidence but advance a political goal, scientific processes may be misconstrued and thus politicized by corporate or government actors for political gain, and politicians may selectively discuss scientific evidence for a political or policy objective (Bolsen and Druckman, 2015; Bolsen et al., 2015; Nelkin, 1979). Science can be politicized by highlighting some form of partisan disagreement (Druckman, 2017), but it can also manifest when uncertainty is planted as a way to sow doubt (Druckman, 2017; Oreskes and Conway, 2010). This was the strategy employed by Republican consultant Frank Luntz when he recommended to lobbyists and members of Congress that, based on contrarian scientists, climate change be framed as scientifically uncertain (Nisbet, 2009), fueling the widespread use of an uncertain-science frame by conservative organizations and industry representatives (McCright and Dunlap, 2003; Oreskes and Conway, 2010).

When science becomes politicized, there are two viable options for scientists and research institutes. First, if politicization occurs directly through a claim against a research project, scientists and researchers can engage with authority those that are politicizing the science. If, however, the politicization is indirect – i.e. through claims against a parallel research project – researchers must remove as many opportunities as possible for further politicization by creating a buffer between their research and the research being politicized. These choices reflect the importance for scientists and researchers to protect their scientific credibility and enhance their political relevance through, respectively, *buffering* and *linking* (Keller, 2009, 2010). That is, scientifically neutral research can be preserved through the buffering of research from bias and politicization, "insulat[ing] the central work of the organization from external influences and surprises [to help] clarify the distinction between the organization and its environment, …[protecting] the so-called 'technical core'." (Keller, 2010: 361). At the same time, the relevance of the research can be enhanced by linking its technically and economically complex aspects to its societal benefits.

The individual scientist and the nature of his/her communications play key roles. Receiving messages from credible sources is effective in shaping the public's opinions (Druckman, 2001; Lupia, 2013), particularly when scientists and researchers advocate for a particular policy by using scientific knowledge to clarify and expand the options available to policy makers (Pielke and Roger, 2007). Yet, science-based communications and partisanship become intertwined if the messages themselves are in any way politicizing (Kitcher, 2001; Jasanoff and Wynne, 1998; Sarewitz, 1996, 2004; Jasanoff, 1987; Pielke and Roger, 2002, 2007), and there may be a cost to credibility if scientist-advocacy group connections politicize science or even give the impression of doing so, drawing attention in particular to scientists' potential biases (Pielke and Roger, 2007; Guston, 2000). Recent research does show, however, that the scientist's perceived credibility does not decrease when engaging in advocacy, even when pursuing policies to address climate change and energy-related concerns (Kotcher et al., 2017).

Given the possibility that next-generation battery technology can be politicized by its association with GHG emissions reductions, research on attitudes toward climate change must be scrutinized. While it remains unclear as to how the public best receives scientific information regarding climate change (Druckman, 2015; Lupia, 2013), to alleviate suspicion arising from politicized discussions of science (Kahan et al., 2011), multiple communicators – i.e. scientists as well as others of varying ideological persuasions – are most effective at communicating consensus about science (Hoffman, 2015). It has also been shown that consensus-oriented communications increase public beliefs about climate change (Ding et al., 2011; Lewandowsky et al., 2012; Lewandowsky et al., 2013; Maibach and van der Linden, 2016; Myers et al., 2015; van der Linden et al., 2014, van der Linden et al., 2015). On this basis, we can assume that dissention among scientists about next-generation battery research increases the prospects of politicization, which is possible for these "expert publics" given that political ideology influences that beliefs about regulating science (Scheufele, 2013). It has also been shown that one's cultural predispositions about scientific findings, including those regarding climate change consensus (Kahan, 2015), are actively impacting beliefs about climate change and other scientific phenomena (Brossard et al., 2008; Kahan et al., 2012, 2009; Kahan, 2013; Scheufele, 2013). Related to battery technology, for example, there is evidence of this with regard to electric vehicle adoption patterns in Austria: early adopters are less individualistic and more egalitarian (Priessner et al., 2018).

It is assumed here that science is politicized through frames highlighting aspects relevant for particular policies or issues (Druckman,

[1] This language is also reflected in the text of the Electricity Storage Innovation Act of 2016 and the Department of Energy Research and Innovation Act of 2017. Complete details can be found here: https://www.congress.gov/bill/114th-congress/senate-bill/2012/all-info?r=6.

2001), impacting people's beliefs, attitudes, and intentions. Media frames in particular have been shown to shape public attitudes about energy alternatives (Cacciatore et al., 2012; Delshad and Raymond, 2013), and they have bolstered public support for varying energy sources as well as government-sponsored energy programs such as the DOE's Energy Innovation Hubs (Dharshing et al., 2017). JCESR's research goals are also easily aligned with climate change given that GHG emissions reductions resulting from the widespread use of energy storage technology would be significant and a function of electric vehicles use or renewable energy sources "behind-the-meter" (Hittinger and Azevedo, 2015; Sistemes et al., 2016; Zhao et al., 2017; Fisher and Apt, 2017; Parfomak, 2012). Indeed, with successful implementation of next-generation battery technology, a transition of energy production from fossil fuels to renewables and the fostering of an energy infrastructure revolution would allow households to produce their own power in tandem with public utilities. The promotion of this information would exemplify a linking strategy for JCESR; yet, given the implications of this shift for fossil fuel-oriented interests, and given the potential for media-based frames to connect next-generation battery technology to renewable energy options and/or GHGs, one would expect JCESR's efforts to be politicized by those who stand opposed to fossil fuel reductions. To protect itself, the DOE, and other science-affiliated actors from the politicization of next-generation battery technology research, JCESR could implement a buffering strategy.

4. Research questions & methods of analysis

Given the proximity of JCESR's research to climate change and GHG-reducing technologies, our task is to determine whether JCESR's efforts are being politicized. This is approached in two stages. Focusing first on JCESR-originating information, Keller (2010) is invoked to confirm whether buffering and linking strategies are occurring. This is followed by an examination of media content for evidence of JCESR's politicization and, in turn, how the public might understand information related to JCESR.

The following interdependent, exploratory research questions are proposed:

RQ1: *How have buffering and linking strategies occurred by members of JCESR?*

RQ2: *How is JCESR-related media content conveyed to minimize its politicization?*

In an effort to answer RQ1 and determine whether both buffering and linking strategies are occurring, it is necessary to outline the extent of JCESR's practices along a host Keller (2010) buffering and linking parameters: writing reports, engaging in peer review by science experts, controlling the research agenda, engaging in intraorganizational buffering, seeking out decision-maker input, providing transparency about organizational procedures, summarizing findings for policy makers, and allowing decision-makers to review reports and nominate expert participants. Evidence is drawn from interviews with JCESR's administration, relevant documents from JCESR's archives, and JCESR's official online content (accessed January 5, 2017). These findings are then aligned with the results of two questions from an online survey administered to JCESR researchers in March 2018 to assess whether GHG emissions reductions are prioritized, which would imply that the research itself is motivated by efforts to address climate change. Specifically, respondents reported their agreement (5-point scale) with statements that their JCESR-related research (1) is driven by carbon emissions reductions and (2) will in fact lead to significant reductions in carbon emissions. The approach of this survey is consistent with other research surveying key actors in an attempt to understand R&D consortia-related phenomena (Rahm et al., 1999; Cohen et al., 2002; Lécuyer, 1998; Scott et al., 2001). Among the population of 149 researchers at JCESR as of March 2018, 47 responded (31.5 percent response rate). With the exception of Yue and Sun (2015), this is the first survey conducted in any assessment of government-supported battery storage research.

To assess media-based reporting about JCESR in line with RQ2, data are drawn largely from media reports citing JCESR. This is consistent with Pielke and Roger (2012) approach to understand basic research through an examination of media content, congressional content, and scientific journal content. Media reports of JCESR are based on 198 verified news articles about JCESR as presented in JCESR's news article database (http://www.jcesr.org/newsroom/in-the-news-2012/). A comparison between JCESR's self-curated list of media articles and an independently generated list curated by Google News shows approximately twice as many articles in the latter, which is attributed to duplicate postings.[2] The content of these 198 articles is then triangulated with the public's views toward next-generation battery technology. As Google Trends (https://trends.google.com/trends/)is a reliable indicator of public interest in specific policy issue areas (Oehl and Bernauer, 2017), and given research simultaneously examining online public interest and media coverage (Segev and Baram-Tsabari, 2012; Baram-Tsabari and Segev, 2015), Google Trends-based reports of web searches and news searches about "energy storage" serve as a proxy for the general public's views and interest in next-generation battery technology.

5. Results

Regarding RQ1, buffering and linking strategies are clearly occurring at JCESR. Evidence of writing reports and engaging in peer review by science experts is shown through JCESR's collaborations within and beyond the consortium, resulting in a network of more than 100 companies, universities, government research institutes, and non-profit organizations that spans the U.S. and abroad. In its first three years of operation, JCESR was responsible for the publication of more than 170 papers, the filing of 43 invention disclosures, and the filing of 25 patent applications. JCESR also actively contributes its algorithms for simulating more than 16,000 liquid organic molecules to the Materials Project database, used by hundreds of scientists daily and more than 4500 users worldwide.

Similar patterns can be observed across other parameters of buffering and linking (Keller, 2010). First, evidence of intraorganizational buffering is represented by JCESR's administration's oversight of efforts to bring together transportation and grid research efforts, as well as to manage the entire process of discovery, design, prototyping, and manufacturing. Indeed, JCESR engages in research prototyping and "science sprints," meaning that research efforts are distilled into focused 1-6 month-long projects for 5–10 collaborators (Crabtree, 2015a, 2015b), and each sprint is closely managed by JCESR's administration to foster the sharing of responsibilities among graduate students and postdoctoral researchers. Second, in terms of transparency, JCESR's procedures are detailed on its website, where announcements, interviews, and other disclosures are posted. JCESR's Energy Storage Advisory Committee meetings also provide a venue for strategies to be announced, funding allotments to be refined, and strategic prototype targets to be set. Third, evidence of JCESR's summarizing of findings for policy makers and, fourth, evidence of JCESR's allowing of policy makers' to be involved are exhibited by in-person meetings between JCESR administrators and representatives from the DOE. JCESR also engages with politicians, colleagues, and potential manufacturing partners, shown through the consistent sharing of research findings at universities, at battery-related conferences, on Capitol Hill, at the

[2] For example, on March 27, 2015, *UChicago News* published the article authored by Laura Alesio, "Author provides inside look at Argonne National Laboratory's efforts to build a 'super battery'" while the same article was published on March 30, 2015 at Phys.org.

Congressional Battery Energy Storage Caucus, and at the Senate Science, Energy and Natural Resources Committee meetings.

While climate change and GHG emissions reductions are not explicitly referenced in the buffering and linking strategies employed by JCESR, they are legitimate concerns for individual researchers. That is, researchers participating in the consortium generally believe that JCESR's research will have a major impact on carbon emissions reductions. This is based on how JCESR researchers denoted their agreement with the following two statements: "My JCESR-related research is motivated by the potential for significant reductions in carbon emissions," and "There will be significant reductions in carbon emissions as a result of JCESR's research." Shown in Fig. 1 and based on a 5-point scale of "agreement," 76 percent of respondents agreed or strongly agreed that their JCESR-based research is motivated by carbon emissions reductions, while 62 percent of respondents agreed or strongly agreed that there would be significant reductions in carbon emissions as a result of JCESR's research. The proportion of researchers agreeing or strongly agreeing with these two statements overshadows those who disagreed or strongly disagreed. Despite JCESR researchers' motivations to address climate change, though, there is no clear connection between JCESR and GHG emissions reductions based on an analysis of the research consortium's administrators' comments, its archives, and its online content.

Regarding RQ2, to establish the politicization potential of JCESR's research, an overview of U.S. public opinion toward renewable energy must first be presented. First, over the 1979 to 2006 period, people considered energy important, ranging from 72 to 92 percent of those surveyed, and there has been strong support for increased energy efficiency, research, and commercialization of renewable energy technologies (Bolsen and Cook, 2008). However, in the face of partisan endorsement, people in the U.S. have modified their support for energy efficiency policies, including those that would increase funds for R&D of renewable energy (Bolsen et al., 2014). That said, 89 percent of Americans now support the creation of more solar panel farms, and 83 percent support the creation of more wind turbine farms, and these views are consistent across ideological sub-groups (Pew Research Center, 2016). Economic incentives play a role in fostering these views: among the 41 percent of the American public who have already installed or have seriously considered installing solar panels at home, 92 percent cite saving money on utility bills as a reason (Pew Research Center, 2016). Support for energy efficiency and innovation has not been correspondingly reflected by the rapid deployment of low-carbon energy technologies (Peterson et al., 2015).

Narrowing the focus to public interest in energy storage, represented here by online general searches and online news searches from January 1, 2012 through May 31, 2017, we observe an increase in interest over time, presented in Fig. 2. To identify specific interests of the public with regard to energy storage, we can analyze co-occurrences between "energy storage" and other frequently sought topics.[3] Regarding online general content, "where a value of 100 is the most commonly searched query, 50 is a query searched half as often, and a value of 0 is a query searched for less than 1 percent as often as the most popular query,"[4] the public is most interested in the following energy storage-contextualized topics: "battery storage" (100), "battery energy storage" (95), "solar energy" (85), "solar energy storage" (80), and "energy storage molecule" (75). In terms of the public's interest in online news content contextualized by energy storage, the five most-commonly sought topics are as follows: "battery energy storage" (100), "battery" (100), "solar" (35), "solar energy storage" (30), and "renewable energy" (15). Public interest in energy storage, and next-generation energy storage technology in turn, is defined principally by the connections drawn between energy storage and solar energy.

Having established the public's general and news interest in energy storage, we can now answer RQ2 directly by focusing on JCESR-specific media coverage. Based on the 198 media-based articles covering JCESR's work, published from late November 29, 2012 to May 2, 2017, we observe in Fig. 3 a linear accumulation of articles over time with a slight increase in reporting since 2015. The ten outlets most frequently publishing JCESR-related content over this period are as follows (article count in parentheses): *Forbes* (7), *Crain's Chicago Business* (5), *Green Car Congress* (5), *Nature* (5), Phys.org (5), *Chicago Sun-Times* (4), *Midwest Energy News* (4), *Nanowerk* (4), *Christian Science Monitor* (3), and *Inc.* (3). The breadth of outlets indicates that JCESR's work is relevant for the science and engineering communities as well as for the business community.

In line with a co-occurrence matrix-oriented analysis (see Leydesdorff and Hellsten (2005)), the most frequently used words across all 198 JCESR-oriented articles are correlated with their degree centrality as measured by the Fruchterman Reingold Algorithm in NodeXL (Smith, 2014). To be precise, "degree centrality" measures the extent to which a word is connected to other words in the news article, and thus greater centrality implies greater word usage. Excluding irrelevant terms (e.g., "a," "the," etc.), the most frequently used words are listed alphabetically as follows: battery/batteries, cars/vehicles, cost, electric/electricity, energy, grid, innovation, lithium/lithium-ion, power, research, researchers/scientists/experts, technology/technologies. Further analysis confirms that "climate change" is mentioned in only 11.4 percent of articles ("global warming" is mentioned in 6.5 percent of articles), while there is no mention at all of GHGs or their related emissions. Media reporting on JCESR has thus eschewed highlighting climate change-related content, focusing almost exclusively on JCESR's R&D related to lithium-ion batteries, energy storage, and innovation, as well as the costs related to the electrical grid and automobiles. Potentially politicizing aspects of the JCESR research consortium – particularly efforts to reduce GHG emissions – are hardly reported.

6. Conclusion and policy implications

Former Energy Secretary Steven Chu claimed in 2011 that it was "within grasp … [to] get a battery where the business plans are one-third of the cost of today's batteries, where you can get ranges now that would allow cars instead of 100 miles on a single charge, go 300 or more miles on the same charge …. It's not a pipe dream 30 years from today or 20 years from today. It's in the next decade" (Warren, 2011). Thus far, JCESR has developed an organic redox flow battery in which there are two energy-dense liquids that store and release charge while passing through the battery and undergoing reduction and oxidation ("redox") reactions. This effectively replaces solid electrodes in the lithium-ion batteries used today with energy-dense organic liquids charging and discharging while flowing through the battery. In other words, a more inexpensive, recyclable, and higher performing battery in line with the one described by Secretary Chu is indeed within grasp.

In light of these advances, the JCESR case provides a key example of how research can be accomplished without politicization even when such research is proximate to other politically volatile concerns. In contrast to initial expectations that JCESR would be unable to buffer itself from the forces that have politicized climate change policy making, it has been shown that JCESR has effectively conveyed its work, highlighting the benefits and costs of next-generation battery research, avoiding politics and value-laden debates, and adhering to Keller (2010) buffering and linking strategies. The public has been focused on the connections between energy storage and renewables such as solar power, while the media concentrates on next-generation battery technology's ability to advance the science and, especially, the commercializability of energy storage. At the same time, the lack of JCESR scientists' uniform agreement about whether reductions in carbon emissions result from their work suggests that climate change-related

[3] Co-occurrence-of-terms analysis is based on the output generated by Google Trends. Except for "energy storage," the terms were also determined by Google.

[4] Scoring details can be found here: https://support.google.com/trends/answer/4355000.

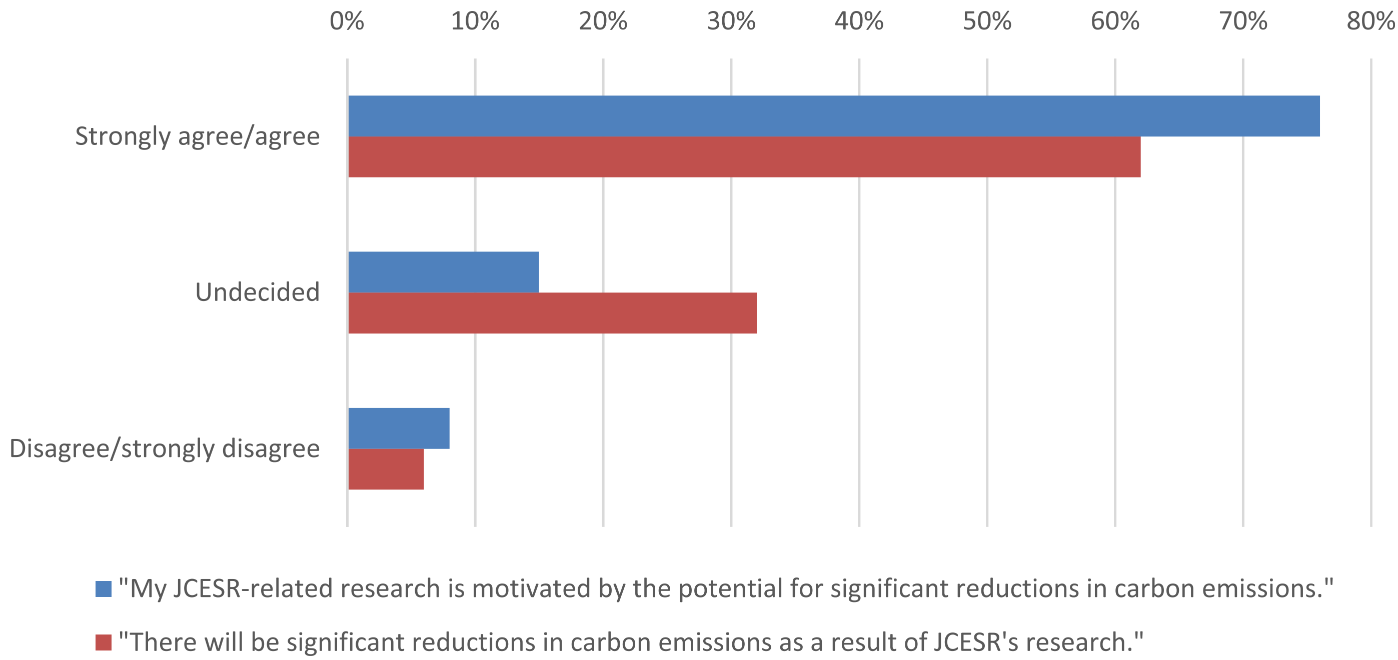

Fig. 1. Beliefs regarding carbon emissions reductions from JCESR-based research, percentage of respondents ($n = 47$).

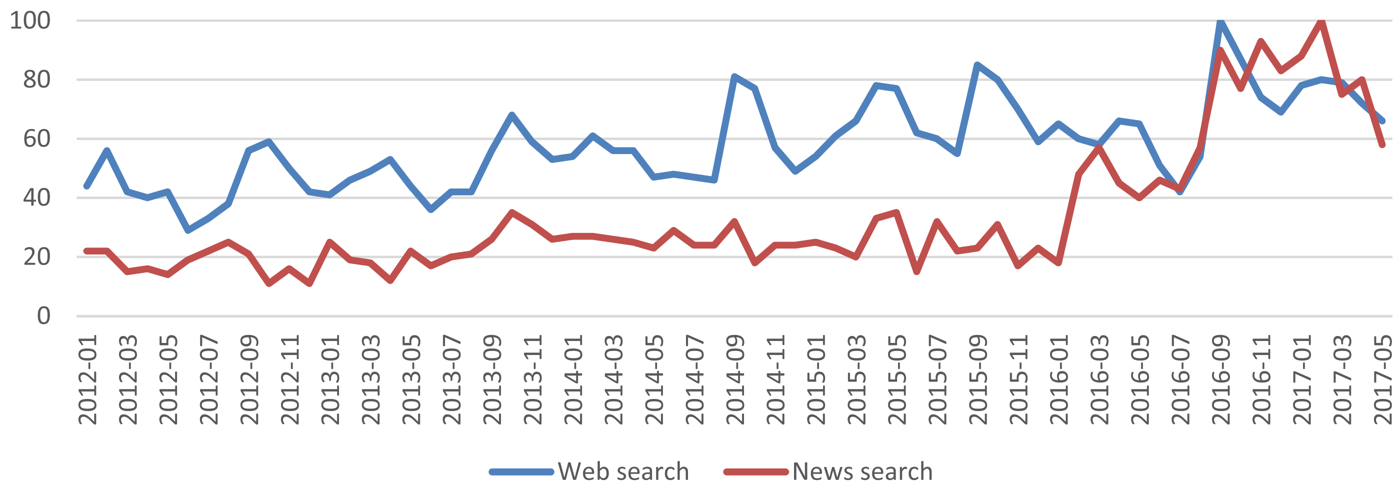

Fig. 2. Google search trends of “energy storage,” online general interest and news interest.
Source: Google general online search trends (https://trends.google.com/trends/explore?date=2012-01-01%202017-05-31&geo=US&q=%22energy%20storage%22) and Google online news search trends (https://trends.google.com/trends/explore?date=2012-01-01%202017-05-31&geo=US&gprop=news&q=%22energy%20storage%22) for “energy storage.” Data accessed June 7, 2017. “Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. Likewise a score of 0 means the term was less than 1 percent as popular as the peak”.

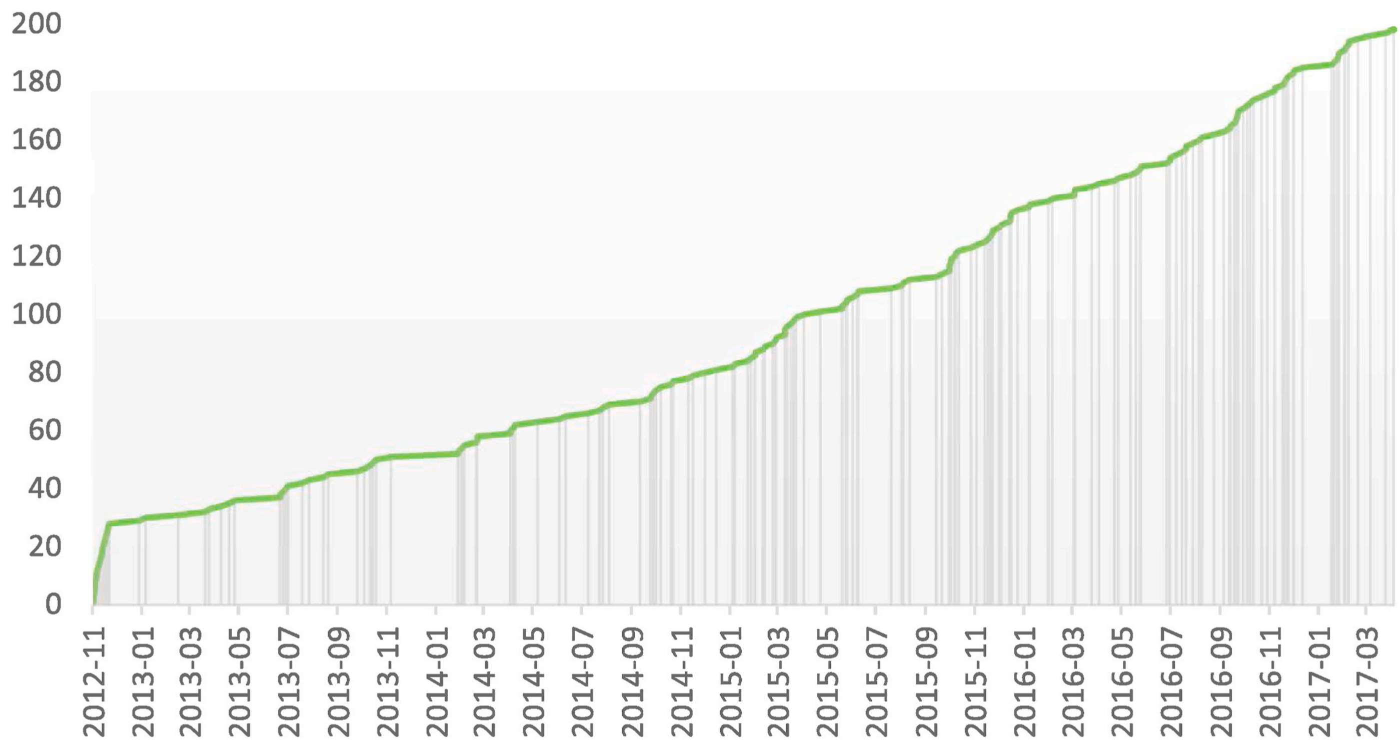

Fig. 3. Cumulative count of media articles highlighting JCESR in media.
Source: JCESR's news article database (http://www.jcesr.org/newsroom/in-the-news-2012/).

outcomes may not be prioritized at JCESR. This, in turn, fosters the perception among actors seeking to protect the existing status quo that next-generation battery technology is not an immediate threat. There is thus not yet a need to plant uncertainty about battery storage R&D.

Despite the fact that next-generation battery research has been depoliticized for the present, other forces – politicians attempting to reshape the energy policy agenda in particular – may attempt to politicize the issue and invoke identity-based cultural meanings. Under the Trump administration, for example, science and energy policies have not been free of politics: Obama's Climate Action Plan was promptly dismantled, and R&D tangentially related to climate change is being revamped. This has been part of a broader attempt by Trump to buffer his administration from climate change-related policies. Indeed, after winning the election, Trump immediately sought out climate change-focused DOE employees in an attempt to minimize work on the subject. Trump has also discussed reductions to the DOE's Office of Energy Efficiency and Renewable Energy's (EERE) 2018 budget (Mooney, 2017), and budget proposals have called for budget cuts at the National Institutes of Health from $31 billion to $25.9 billion, for a $200 million cut in earth science at NASA, for climate change-related research to be entirely dropped from the EPA list of duties, and for clean energy-related research to be dropped from the DOE (Atkin, 2017). The Trump administration also renamed the DOE's Clean Energy Investment Center as simply "Energy Investor Center," despite the fact that it was founded in 2016 to guide investors toward renewable technologies. In the same way, any mention of clean and alternative energy has been removed from the DOE website (Mooney and Rein, 2017). The Trump administration's changes to the direction of the DOE are ostensibly to preserve the purity of market forces for technology development (Mufson, 2017). If this is threatened, which is likely to be accompanied by diminished bipartisan support, we can expect increased exposure of battery technology to the kinds of identity-based cultural meanings identified in Kahan (2012, 2013, 2015) and Kahan et al. (2012). In short, JCESR's ability to avoid politicization, the planting of uncertainty, and bipartisan breakdown may be remarkable, but continued success for research consortia like JCESR under the present policy environment will require even greater buffering and linking efforts to maintain scientific credibility and enhance the research's political relevance.

CRediT authorship contribution statement

Matthew A. Shapiro: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Visualization, Writing - original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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