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ENVIRONMENTAL WORLDVIEW AND FAITH IN SCIENCE AS MODERATORS OF THE RELATIONSHIP BETWEEN BELIEFS ABOUT AND ATTITUDES TOWARD NUCLEAR ENERGY

by

ADAM D. CARTON

Under the Direction of Marci Culley

ABSTRACT

Global climate change (GCC) may be the most pressing social and environmental issue of our time. The use of fossil fuels tops the list of human behaviors that contribute to GCC. Several 'alternative' energy sources are now being considered in an effort to mitigate GCC, including—controversially—nuclear energy. Examined here were environmental worldview and faith in science as moderators of the relationship between beliefs about and attitudes toward nuclear energy (ATNE). Participants were 272 college students who completed an on-line survey. Predictor variables were beliefs about whether nuclear energy contributes to GCC (GCC-beliefs) and to energy independence (EI-beliefs). Results indicated that environmental worldview

moderated the negative relationship between GCC-beliefs and ATNE. Results implied that the effectiveness of arguments salient to the current nuclear energy debate concerning GCC have a medium effect on ATNE except when people are more ecocentric in their environmental worldviews.

INDEX WORDS: Climate change, Global warming, Attitudes, Beliefs, Nuclear energy, Faith in science, Environmental worldview, Community psychology

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ADAM D. CARTON

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

In the College of Arts and Sciences

Georgia State University

2010

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2010

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1 Introduction

Global climate change (GCC) is perhaps one of the most pressing social and environmental issues of our time. GCC is the result of accumulating greenhouse gas emissions in the atmosphere, mostly due to human activities (International Panel on Climate Change; IPCC, 2007). Although there are both anthropogenic (e.g., fossil fuel use) and celestial (e.g., solar radiation) causes of GCC, the vast majority of scientists agree that it is largely caused by humans (IPCC, 2007; Oreskes, 2004). The IPCC (2007) predicted that 150 million people will be displaced due to GCC by the year 2050. This displacement will undoubtedly give rise to major social issues in the coming years, and—as was observed in New Orleans after Hurricane Katrina—it will most strongly affect members of marginalized cultures who paradoxically are the least responsible for current carbon emissions (St. Louis & Hess, 2008).

Given the social and environmental issues related to GCC, psychologists have begun to pay more attention to this timely issue. The American Psychological Association recently developed a task force to address GCC issues. Among community psychologists, there has been increased focus on GCC. For example, there is a forthcoming special issue of the *American Journal of Community Psychology* on community psychology and GCC (see Reimer & Reich, in press), and an interest group (Environment and Justice) was recently formed following the Society for Community Research and Action's 2009 biennial meeting.

The role(s) that psychologists might play in this issue are important given that human behavior plays a central role in GCC (Price, 2008). As Oskamp (2000) posited, psychologists are in a unique position given that human behavior is both causing and can help to ameliorate the negative effects of GCC. Of the behaviors known to contribute to GCC, fossil fuel-intensive energy consumption is at the top (IPCC, 2007). In an effort to mitigate GCC, less fossil fuel-

intensive energy sources are now being considered. Relevant to the current study, this includes nuclear energy, which has been increasingly marketed by proponents as a "green" solution to GCC.

For the first time since the 1979 accident at Three Mile Island, policy initiatives that call for the construction of new nuclear power plants and billions of dollars in taxpayer-based federal nuclear energy subsidies have emerged (Federal News Service, 2010 February 16; U.S. Dept. of Energy, 2009 May 7). In part, this historical shift in energy policy results from the fact that nuclear power plants emit substantially less CO_2 during normal operations than do fossil fuel-fired plants (e.g., coal-fired plants). About 30 nuclear reactors—most of them slated for the southeastern U.S.—are being proposed. This resurgence of nuclear energy has been coined a "nuclear renaissance" by proponents and a "nuclear relapse" by opponents (see Culley & Angelique, 2010).

1.1 The Nuclear Renaissance/Relapse: Climate Change and Energy Independence

U.S. legislators have begun to heed scientists' warnings about GCC, as evidenced by the recent passage of the energy bill outlined by the U.S. House of Representatives (H. R. 2454, 2009). The U.S. Senate is currently working to develop its version of the energy bill (S. 1733, 2009) currently titled: "A Bill to Create Clean Energy Jobs, Promote Energy Independence, Reduce Global Warming Pollution, and Transition to a Clean Energy Economy." Several republican senators, including John McCain (R-Arizona), have stated that they will not favor an energy bill unless it provides substantial funding for nuclear energy. McCain recently stated that "we [the U.S.] need to build 100 nuclear power plants in the next 20 years...otherwise we're not going to reduce greenhouse gas emissions" (Johnson, 2009, October 5).

On February 16th 2010, U.S. President Barack Obama held a press conference to announce that the first $8 billion of federally-subsidized loan guarantees (of an estimated $54 billion in total) would be awarded to utility Southern Nuclear for two new nuclear reactors on an existing site in Waynesboro, Georgia. He said: "Nuclear energy remains our largest source of fuel that produces no carbon emissions." He further stated: "make no mistake—whether its nuclear energy or it's solar or wind energy—if we fail to invest in the technologies of tomorrow then we're [the U.S.] going to be importing those technologies [from other countries] instead of exporting them" (Federal News Service, 2010 February 16). These sentiments echo those of former US President George W. Bush (Bennhold, 2004) and have been praised by Republican congressional leaders like McCain.

Relevant to the current study, two "talking points" for nuclear energy have consistently been put forth by proponents: that it contributes little or nothing to GCC and that it will enhance U.S. energy independence. Both points have been called into question (see Culley & Angelique, 2010; Culley & Angelique, in press; Smith, 2006). For example, the Institute for Environmental and Energy Research maintained that more than one reactor per week would have to be built between 2010 and 2050 to reduce CO2 emissions to 2000 levels (Makhijani, 2007; Smith, 2006). This would be impossible, given the timeframe required to plan, license, and build nuclear reactors. Moreover, the importance of uranium fuel stocks and reactor parts are also inevitable (Makhijani, 2007; Smith, 2006; Wald & Bradsher, 2010, February 19), which weakens the energy independence argument. Given the current discourse surrounding GCC and nuclear energy policy, the question remains: Are GCC- and energy independence (EI)-beliefs related to attitudes toward nuclear energy (ATNE)? With the current study, I investigated ATNE and their relation to beliefs about nuclear energy (specific to GCC and energy independence) and

worldview. To provide some context for this study, I first review the literature on attitude formation generally and ATNE more specifically. I then turn to the measurement of ATNE and the lack of research specific to perceptions of nuclear energy as it relates to GCC and energy independence. Highlighted next is connection between ATNE and worldview, with an emphasis on environmental worldview and faith in science. I then provide an overview of the research purpose, orienting concepts, rationale, and hypotheses.

1.2 Attitude Formation and Attitudes Toward Nuclear Energy

Attitudes are thought to encompass affect, behavior, and cognition (Katz & Stotland, 1959) and are seen as relatively flexible over time and context. Several definitions of attitudes have surfaced over the years. Consistent with Krosnick, Judd and Wittenbrink (2005), the definition used for the current study is positive or negative evaluations of an object (nuclear energy). There are several theories of how attitudes are formed. Festinger (1957) conceptualized the cognitive dissonance phenomenon wherein people rationalize their behaviors toward an object by changing their attitude towards that object. Adding another layer to the understanding of attitude formation, Bem (1967) asserted that attitudes are formed after people appraise their behaviors. In other words, behaviors come first and attitudes follow. Relevant to the current study, those who utilize the expectancy-value model of attitude formation (discussed in greater detail below), view attitudes toward an object as a function of the expected outcomes or beliefs (and resultant values) associated with that object (Fishbein, 1963; Fishbein & Hunter, 1964).

History of public attitudes toward nuclear energy. The social sciences literature on nuclear energy reached its zenith in the 1970s and 1980s with the 1979 Three Mile Island (a partial core meltdown) and 1986 Chernobyl (a reactor core explosion) accidents. The majority of the public in the U.S. and Europe generally supported nuclear energy until a few years before the

accident at Three Mile Island, a highly publicized event that sunk already declining ATNE (van der Pligt, 1985). ATNE in the years between the two accidents nearly returned to pre-Three Mile Island levels but did not fully recover (Rankin, Melber, Overcast, & Nealey, 1981; van der Pligt & Midden, 1990). Eiser, Hannover, Mann, Morin and van der Pligt (1990) showed that following the Chernobyl accident, ATNE in general were contingent on attitudes toward related nuclear issues (e.g., nuclear waste disposal, nuclear weapons). Other researchers saw a clear drop in support for nuclear energy after Chernobyl (e.g., Drottz-Sjöberg & Sjöberg, 1990). Verplanken (1989) showed that ATNE in Eastern Europe were negative even before the accident at Chernobyl, and they continued to drop even further a month after the accident only to return to pre-Chernobyl levels a year and a half later. After a considerable amount of research on nuclear energy following the Three Mile Island and Chernobyl accidents, research on this topic remained somewhat dormant until recently.

As Culley and Angelique (in press) discussed, the American public is by no means pro-nuclear. Indeed, according to a 2006 Pew poll of a nationwide sample of 1,502 adults (margin of error + or - 3%), Americans appear to be largely split on the issue (44% favor, 49% oppose). According to a Civil Society Institute poll (2006) of a nationwide sample of 1,016 adults (margin of error + or - 3%) that yielded similar findings, this split does not hold when people are asked whether they would live near a nuclear plant (81% say no) or when asked to weigh nuclear energy against other energy alternatives. Respondents preferred to explore conservation efforts (88%) or renewable energy sources such as solar (85%) and wind (81%) over expanding nuclear energy, and 75% reported that they would be *concerned* if nuclear energy was focused on at the expense of renewable energy solutions.

Site-specific attitudes toward nuclear energy. In the U.S., a group of researchers at the University of Tennessee at Knoxville (Hughey, Lounsbury, Sundstrom & Mattingly II, 1983; Hughey, Sundstrom & Lounsbury, 1985; Lounsbury, Sundstrom & Shields, 1979; Sundstrom, Lounsbury, DeVault & Peelle, 1981; Sundstrom, Lounsbury, Shuller, Fowler & Mattingly II, 1977) laid the foundation for research on site-specific ATNE. This group of researchers studied public attitudes toward proposed nuclear reactors at what was to be the largest nuclear plant in the world in Hartsville, Tennessee. Their original purpose was to assess the local public's attitudes toward these reactors before, during and after construction. However, the site was never finished and they were only able to study public attitudes before and during construction, which notably halted after the accident at Three Mile Island.

These early ATNE researchers were primarily interested in beliefs about and attitudes toward the proposed reactors (e.g., whether they would bring increased tourism, commercial development, jobs, and how these beliefs affected residents' attitudes toward these reactors). They found that the public was generally favorable toward the reactors before construction but became much less favorable over time, particularly after the Three Mile Island accident (those who reported they would either *Probably* or *Definitely* permit construction of the local reactors decreased from 69% in 1975 to 45% in 1980). Relevant to the current study, they also found that expectations or beliefs about the anticipated outcomes resulting from construction were related to area residents' ATNE, thus supporting the expectancy-value model of attitude formation. Perceived hazards, expected community disruption, and perceived economic benefit were the strongest predictors of ATNE.

Measuring nuclear attitudes. For nearly every paper on ATNE, it seems that there is a different way to measure ATNE. Many researchers simply asked participants whether they

supported nuclear energy with a single item (e.g., Drottz-Sjöberg & Sjöberg, 1990; Eiser et al., 1990; Spears, Eiser, & Van der Plight, 1989). For example, Eiser and colleagues (1990) provided an item (measured on a nine-point scale) on which participants indicated their ATNE ranging from *Extremely Pro-Nuclear* and *Extremely Anti-Nuclear*. Hughey and colleagues (1983) combined items that measured willingness to live near a nuclear plant and whether participants would permit construction of new plants to assess site-specific attitudes toward a proposed nuclear plant to measure ATNE. Several other researchers assessed whether participants would permit construction of nuclear plants (e.g., Ansolabehere, 2007; Ansolabehere et al., 2003; Lounsbury et al., 1979; Siegrist, Keller, & Cousin, 2006). The one-item measure used by Ansolabehere (2007) and colleagues (2003) was deemed appropriate for the current study because (a) the use of one-item measures in nuclear-related literature is common-place, (b) it was easy to administer, and (c) it maintained sufficient content and face validity. That is, this single item appeared to fully capture the construct of interest. In sum, ATNE have been measured in several different ways and there does not appear to be consensus on its measurement. Further, previous ATNE researchers have largely focused on site-specific attitudes or assessment of attitudes post-Three Mile Island and Chernobyl disasters. In the current study, I explored global—as opposed to site-specific—ATNE and beliefs salient to recent public discourse related to GCC and nuclear energy. There has been a dearth of psychological literature specific to these beliefs about nuclear energy.

Nuclear energy and global climate change. Little is understood about ATNE as they relate to GCC. It appears that no research exists within the published psychological literature that links these two issues, and only a handful of studies have been published on the topic within other bodies of literature outside of psychology (e.g., Ansolabehere, 2007; Curry, Reiner, de

Figueiredo & Herzog, 2005; Poortinga, Pidgeon & Lorenzoni, 2005). Curry and colleagues (2005)—from Massachusetts Institute of Technology's Lab for Energy and the Environment—appear to be the only researchers that have assessed GCC-beliefs but they did not look at how such beliefs related to ATNE specifically. They found that about half of European participants believed that the use of nuclear fuel either increased CO_2 or had no impact on CO_2 (24% believed nuclear energy *Increases Carbon Dioxide*, 28% believed it had *No Impact*, 12% believed it *Decreased Carbon Dioxide*, and 36% were *Not Sure*). On a similar note, according to Ansolabehere (2007)—who works from Massachusetts Institute of Technology's Center for Advanced Nuclear Energy Systems—concern about GCC did not appear to influence US public ATNE, though this research did not specifically address the perceived effect of nuclear energy generation on GCC. Instead, Ansolabehere assessed the extent to which participants perceived nuclear energy as generally harmful to the environment, not how its use may affect GCC in particular. Poortinga and colleagues (2005) did not explicitly address the perceived relationship between nuclear energy and GCC either, though they presupposed that the use of nuclear energy would cut greenhouse gases with their use of two items: "It is better to accept nuclear power than to live with the consequences of climate change" and "I am willing to accept the building of new nuclear power stations if it would help to tackle climate change". Therefore, although these researchers explored ATNE and GCC, they did not assess whether participants perceived a link between the two. One aim of the current study was to begin to fill this gap in the literature.

Nuclear energy and energy independence. The psychological literature on the concept of energy independence (relying on sources of energy that are found within the U.S. and not other countries) is non-existent. However, it appears that perceived energy independence has become salient in discussions about GCC and energy policy which may shape ATNE. For

example, Former President George W. Bush supported nuclear energy because he viewed it as a 'domestic source of energy' (Bennhold, 2004) and Obama has lauded it for the same reason (see Federal News Service, 2010 February 16). This assertion has been called into question before (see Culley & Angelique, 2010; Culley & Angelique, in press; Smith, 2006). Interestingly, it appears that perceived energy independence is a salient argument for the support of nuclear energy in France which has, in part, provided a rationale for its use as the source of 76% of the electricity in France (see Palfreman, n.d.)—there is, however, a strong anti-nuclear movement in France. So, although the psychological literature is bereft of references to energy independence, it appears that energy independence may have some influence on perceptions of nuclear energy. The current study explores this notion further.

1.3 Worldviews and Attitudes Toward Nuclear Energy

The effect of worldview on risk perception with respect to nuclear energy has been explored in the psychological literature (see Peters, Burraston, & Mertz, 2004; Peters & Slovic, 1996; Slovic, 1999). ATNE and risk perception are distinct; ATNE are influenced by risk perception (Sjöberg, personal communication, 2010 March 26). However, with the current study, I am investigating worldviews as they relate to ATNE—and not risk perception. I am focusing on ATNE because attitudes are more specific than risk perception. That is, I am interested in the extent to which individuals positively or negatively evaluate nuclear energy as an outcome rather than how they assess the risks associated with nuclear energy. There is no literature linking worldview with ATNE but there are several investigations that have shown a link between worldview and risk perception. Given the link between ATNE and risk perception and the exploratory nature of the current study, worldviews are seen as appropriate for the current analysis.

Worldviews have been conceptualized as "generalized attitudes toward the world and its social organizations" (Peters & Slovic, 1996, p. 1430). These global attitudes are thought to be a cognitive filter through which information about the world passes (Jenkins-Smith, 1993) and individuals are thought to play an active role in assessing all information through this worldview filter. Peters and Slovic measured aspects of worldview that did not capture orientations to human-environment relations or faith in science which are included in the scope of the current investigation. Given the essence of nuclear energy (using nuclear fission to boil and return water from a nearby water source) and its toxic history (see Alexievich, 2006), I argue that nuclear energy is inextricably linked to the environment and to science. It follows, then, that a person's environmental worldview and/or faith in science will likely alter the relationship between their beliefs about nuclear energy and ATNE—which is the thesis of the current investigation. To provide the reader with some context, I next review the psychological literature on two distinct worldviews: environmental worldview and faith in science.

Environmental worldview. For years, psychologists have studied how people view themselves in relation to the natural environment (see Pirages & Ehrlich, 1974). The most widely-used measure for environmental worldview is the New Ecological Paradigm (NEP; Dunlap & Van Liere, 1978; Dunlap, Van Liere, Mertig & Emmet Jones, 2000), which assesses two dimensions that have traditionally surfaced in individuals' orientations toward human-environment relations. The first dimension has been termed the Human Exceptionalist Paradigm or the Dominant Social Paradigm (Dunlap & Van Liere, 1978; Dunlap et al., 2000) which captures the anthropocentric, Judeo-Christian idea (see Nooney, Woodrum, Hoban, & Clifford, 2003; Lundmark, 2007) that humans are the lone organisms on the Earth that have intrinsic value. In other words, people who subscribe to this anthropocentric ideology believe that the

Earth exists for humans to use for their own purposes. The second dimension reflects the NEP or eco-centrism (Dunlap & Van Liere, 1978; Dunlap et al., 2000), which captures the idea that humans are merely part of an interdependent web of organisms on the Earth. Simply put, anthropocentrism reflects the belief that the Earth belongs to humans, while eco-centrism reflects the belief that humans belong to the Earth.

An examination of the larger literature outside of psychology yielded only one paper that examined the relationship between environmental worldview and risk perception as it relates to nuclear energy (Whitfield, Rosa, Dan & Dietz, 2009), but none linking it with ATNE specifically. These researchers did not find a significant relationship between environmental worldview and risk perception. I argue that this relationship may be more complicated than reflected by main effects. The relationship between environmental worldview and ATNE is of interest given the salience of new pro-nuclear energy rhetoric in current discourse surrounding GCC (e.g., “green” solution to GCC and “carbon-free nuclear”) that may be speak to those previously less supportive of nuclear energy, For example, before making his case for “green” nuclear energy, President Obama noted, “I know it's been long assumed that those who champion the environment are opposed to nuclear power” (Federal News Service, 2010 February 16). Given that nuclear energy is being touted as a ‘green’ alternative to fossil fuels and that eco-centrists believe that the fragile interdependence of life on Earth is being threatened by GCC, this argument may be more salient for eco-centrics who may have previously been anti-nuclear. In sum, Whitfield and colleagues (2009) did not find a significant link between environmental worldview and risk perception, but I hypothesize that it affects the relationship between beliefs about nuclear energy and ATNE.

Faith in science. A person's faith in science reflects the extent to which they believe that scientists can solve the problems of humankind. A person who does not have faith in science is more likely to believe that—given human error—science is risky. Researchers have utilized participants' faith in science as a predictor of nuclear risk perception in only a few studies (see Hine, Summers, Prystupa & McKenzie-Risher, 1997; Sjöberg, 2001; Sjöberg, 2008; Sjöberg & Drottz- Sjöberg, 2008; Summers & Hine, 1997). One investigation has shown that faith in science predicted ATNE (Baxter, 1988). Sjöberg and Drottz-Sjöberg, who are psychologists, have focused on "trust in science"—which is not distinct from faith in science (Sjöberg, personal communication, 2010 March 26)—and have found it to be predictive of risk perception with respect to site-specific nuclear waste storage. In their 2008 paper, they ran the expectancy-value model to predict ATNE in one aspect of the study and the importance of trust in science in another. Notably, the current study utilized aspects of both. Baxter—a sociologist—wrote a dissertation on ATNE in general, which is germane to the current study. Hine—a psychologist—and colleagues (along with Summers and Hine) were interested in local attitudes toward a proposed underground nuclear repository and the associated waste transportation to that site. Baxter (1988) found that women had a lower faith in science as well as lower favorability toward nuclear energy. Hine and colleagues (1997) found that faith in science mediated the relationship between aboriginal status and support for a nuclear repository. Summers and Hine (1997) found that those who had lower faith in science were less favorable to the idea of their community serving as a hub for the transportation of nuclear waste and were marginally less favorable toward a nuclear repository. Given that there are only a handful of published papers that have explored the effect of faith in science on nuclear risk perception—and that only one of these was specific to ATNE—the current study added to the literature on this topic.

1.4 Gender and Attitudes toward Nuclear Energy

Both ATNE and nuclear risk perception have been shown to be gendered, though findings have been mixed. For example, a meta-analysis revealed that, compared to women, men were less concerned about its environmental risks in general and less concerned about the potential risks of nuclear energy (e.g., proliferation of nuclear materials for weapons) (Davidson & Freudenburg, 1996). Three Mile Island anti-nuclear activists have referred to this gendered phenomenon as "nuclear macho" (Culley & Angelique, 2003). Other researchers, however, recently found that men and women did not differ in ATNE (e.g., Freudenburg & Davidson, 2007) nor nuclear risk perception (Sjöberg & Drottz- Sjöberg, 2008). Therefore, whereas the effect of gender on ATNE or risk perception does not appear to be straight-forward but the majority of the literature has shown that, compared to women, men are more likely to hold more favorable ATNE and perceive less risk associated with nuclear energy.

1.5 Purpose

The current study explored two worldviews (environmental worldview and faith in science) as moderators of the relationship between beliefs about nuclear energy and ATNE. That is, I assessed whether there were multiplicative effects between worldview and beliefs about nuclear energy (GCC- and EI-beliefs) on ATNE. The central research question is: Do worldviews (environmental worldview and faith in science) moderate the relationship between beliefs about nuclear energy relevant to the current debate (GCC-beliefs or EI-beliefs) and ATNE?

1.6 Orienting Concepts

The current study—which was exploratory in nature—was guided by two orienting concepts. First, beliefs were considered to be consistent with what previous ATNE researchers

defined as "expectations" in their assessment of site-specific ATNE (e.g., Hughey et al., 1983; Hughey et al., 1985; Lounsbury et al., 1979; Sundstrom et al., 1981; Sundstrom et al, 1977). Although I did not test the full expectancy-value model (Fishbein, 1963), this model guided the inclusion of the two belief variables (GCC-beliefs and EI-beliefs). Given the historical shift in energy policy and the current discourse surrounding GCC and nuclear energy, I expanded upon previous conceptions of expectancies (or beliefs) measured by researchers over thirty years ago to assess beliefs about nuclear energy with respect to GCC and energy independence. Because the pro-nuclear rhetoric has shifted since the 70's to incorporate "carbon free" and "energy independent" arguments, the current belief variables (GCC-beliefs and EI-beliefs) reflected this change in rhetoric. I expected that one would likely be perceived as positive (contribution of nuclear energy to energy independence) and that the other would likely be perceived as negative (contribution of nuclear energy to GCC).

Second, because worldview has been foundational to an individual's global assessment of risk (Dake, 1992)—and, more specifically, to risk perception as it relates to nuclear energy (Peters & Slovic, 1996)—worldview was useful as an orienting concept for the current study. This is because GCC-beliefs are akin to risk perception and ATNE are dependent upon risk (Sjöberg, personal communication, 2010 March 26). These three constructs have not been assessed in the same investigation within the psychological literature. The conceptualization of worldview as a filter of perception (cv., Jenkins-Smith, 1993) guided my treatment of the two worldview variables as moderator variables. In other words, the messages embedded in the current nuclear energy rhetoric (that it is 'green' and 'independent') are filtered through worldview whereby the messages (and resultant beliefs) will be more or less salient depending on worldview. Little is understood about how environmental worldview and faith in science

affect ATNE and it follows that each of them could magnify the relationship between beliefs about nuclear energy and ATNE. Each of these constructs revealed unique aspects of participants' worldviews, which added substance to the existing ATNE literature.

1.7 Rationale

There are environmental injustice implications associated with the location and licensing process of existing and proposed nuclear reactors (see Alldred & Shrader-Frechette, 2009, Culley & Angelique, in press-b). Also, given that the assertions of nuclear proponents related to nuclear energy being "carbon-free" (e.g., Smith, 2006) and "energy independent" (e.g., Wald & Bradsher, 2010 February 9) have been called into question, more research should be devoted to exploring how these marketing frames affect ATNE. That is, these "soundbytes" or pro-nuclear frames do not reflect the complexity—and controversial nature—of the short- and long-term ramifications surrounding nuclear energy but they may shape ATNE. Also, GCC-beliefs and EI-beliefs have not been fully examined within the literature. Previous research has also not assessed the ways that worldviews affect the relationship between beliefs about nuclear energy and ATNE. With the current study, I have attempted to untangle the complexities surrounding these beliefs and how they—jointly with worldview—affect ATNE.

1.8 Hypotheses

In this study, I conducted two moderation analyses. I explored six hypotheses (see Figures 1-2 for hypothesized moderation models):

1. Holding gender constant, GCC-beliefs will be negatively associated with ATNE.
2. Holding gender constant, EI-beliefs will be positively associated with ATNE.
3. Participants' environmental worldview will moderate the relationship between GCC-beliefs and ATNE.

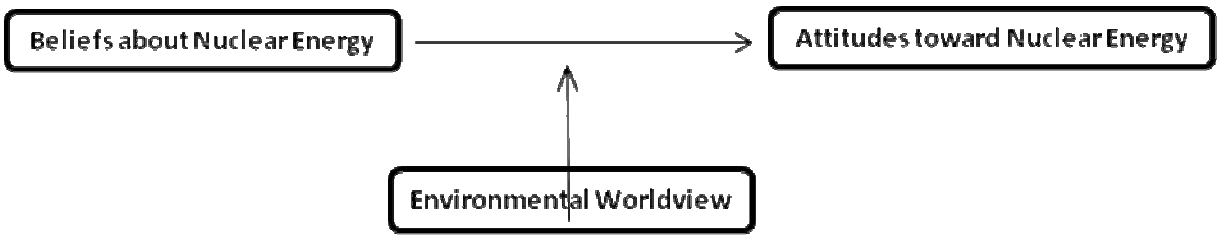

Figure 1. *Hypothesized Environmental Worldview Moderation Model*

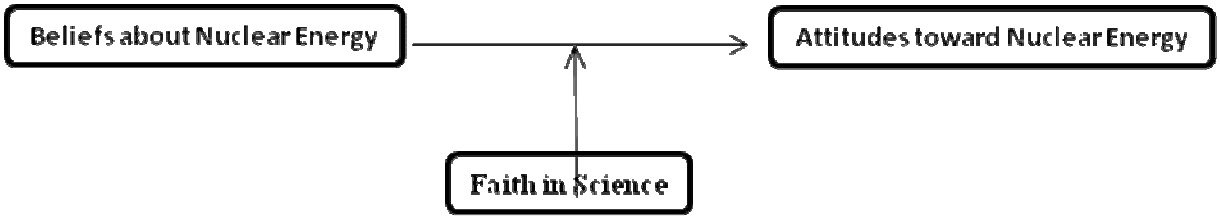

Figure 2. *Hypothesized Faith in Science Moderation Model.*

4. Participants' environmental worldview will moderate the relationship between EI-beliefs and ATNE.
5. Participants' faith in science will moderate the relationship between GCC-beliefs and ATNE.
6. Participants' faith in science will moderate the relationship between EI-beliefs and ATNE.

2 Method

2.1 Participants

The sampling frame for this study was the roster of Georgia State University (GSU) students enrolled in lower-level psychology courses during the 2009 spring semester. As a course

requirement, students participated in psychological research studies. Course instructors offered alternatives to participation so that students were not coerced into volunteering. Participants received class credit in exchange for their participation. Data collection met the ethical guidelines set forth by the American Psychological Association and the study was approved by the GSU Institutional Review Board.

Two hundred seventy-nine college students enrolled in entry-level psychology courses at GSU agreed to participate in this study. Of these 279 participants, seven did not complete the survey and were omitted from further analysis; therefore, 272 participants finished the survey. Participants ranged in age from 18 to 48 (M = 20.69, SD = 4.38) and were racially diverse (39% *White*, 30% *Black*, 10% *Asian*, 7% *Latino*, 7% *Multiracial*, and 5% *Other*). Just less than half of the sample (45%) identified as politically *Middle Of The Road*, 31% identified as *Somewhat* or *Very Liberal*, 20% as *Somewhat* or *Very Conservative*, and 4% as *Other*. About half (55%) of the sample identified as *Christian*, 15% as *Spiritual But Not Religious*, 13% as *Atheist* or *Agnostic*, 13% as *Other*, and 5% as *Muslim*. The majority of the sample (74%) identified as *Women*, which is higher than the university population (approximately 60% women) (GSU, 2009) but is comparable to students who are enrolled in psychology courses (77% women and 58% are members of "minority" groups). None of the respondents indicated that they identified as *Transgender*. Overall, participants were representative of the sampling frame: they tended to be young adult women who were racially, politically, and religiously diverse (although mostly *Christian*).

2.2 Procedure

Students were recruited via "Sona Systems", an online research management system used at GSU. After giving consent and clicking a link to view the questionnaire, participants

completed a survey entitled *Energy Attitudes and Perceptions Survey* via "PsychData", an online survey tool. The current study represented only a part of this larger survey that, in total, took approximately 40 minutes to complete. This larger study included items that were not relevant to the proposed study, such as open-ended questions about barriers and facilitators to environmentally-conscious behavior.

2.3 Measures

See Appendix for a full list of questionnaire items used for the current study. Items were used to assess five variables (in addition to demographics): (a) ATNE, (b) GCC-beliefs, (c) EI-beliefs, (d) environmental worldview, (e) and faith in science. These are described in more detail below.

Attitudes toward nuclear energy. Attitudes toward nuclear energy were assessed using a one-item measure (Ansolabehere et al., 2003; Ansolabehere, 2007) that assessed the extent to which participants felt the U.S. should increase or decrease its use of nuclear energy. Participants answered the following: "With respect to nuclear energy, please indicate whether you feel the U.S. should increase or reduce its use, or not use at all". Responses were measured on a five-point scale ranging from *Not Use* to *Increase A Lot*.

Beliefs about nuclear energy's contribution to climate change (GCC-beliefs). To indicate the extent to which they believed that nuclear energy contributed to GCC, participants answered the following: "How much do you think nuclear energy contributes to global warming?" A higher score was indicative of the belief that the use of nuclear energy resulted in more GCC. Participants answered this question on a five-point scale ranging from one to five, *Does Not Contribute* to *Contributes A Lot*.

Beliefs about nuclear energy's contribution to energy independence (EI-Beliefs). To indicate the extent to which they believed that nuclear energy contributed to energy independence, participants answered the following: "To what extent do you think nuclear energy gives the US energy independence from other countries?" A higher score was indicative of the belief that the use of nuclear energy resulted in more energy independence. Participants answered this question on a five-point scale ranging from one to five, *Does Not Contribute* to *Contributes A Lot*.

Environmental worldview. Participants' environmental worldview was assessed using the New Ecological Paradigm scale (NEP; Dunlap & Van Liere, 1978; Dunlap et al., 2000), which measures eco-centric and anthropocentric beliefs. Higher scores were indicative of an eco-centric environmental worldview whereas lower scores were indicative of an anthropocentric worldview. This 15-item scale has seven items that are reverse-scored (which indicate anthropocentrism). These 15 items were on a five-point Likert-type scale, ranging from *Strongly Disagree* to *Strongly Agree* and seven were reverse-coded. This scale was of acceptable reliability for the current study (α = .77). Environmental worldview was used as the moderator variable in the first model (see Figure 1).

Faith in science. To assess participants' faith in science, I adapted Baxter's (1988) Science and Technology Scale and Dunlap and VanLiere's (1985) Dominant Social Paradigm Scale. A factor analysis revealed that, of these eight combined questionnaire items, four loaded together well (eigenvalue > .7) and these items were of acceptable reliability (α = .75). Each of these items were on a five-point Likert-type scale, ranging from *Strongly Disagree* to *Strongly Agree*. I argue that these four items fit well together because they were all related to the capability of science to address the problems of humankind whereas other items referred to how

science affects freedom and quality of life. Items indicative of a lack of faith in science were reverse-scored and these four items were then averaged. Faith in science was used as the moderator variable in the second model (see Figure 2).

Gender: Covariate. Participants indicated the gender with which they most identified by selecting one of the following: *Female*, *Male*, or *Transgender*. Gender was used as a covariate in both moderation analyses within the proposed study. Of the demographic variables we thought may influence this model (including age and political identification), gender was the only demographic variable that was significantly correlated with ATNE.

3 Results

3.1 Preliminary Analyses

Missing data were excluded from analyses. To gain a sense of how predictor and outcome variables related before analyses, I entered them into a correlation matrix (See Table 1). Given that gender was related to both predictors (GCC- and EI-beliefs) and outcome variables, it was appropriately used as a covariate. Data met all assumptions. That is, it was determined that (a) residuals were normally distributed based on an examination of a histogram for standardized residuals against the normal curve, (b) residuals appeared to be linear based on a scatter plot of each predictor and the corresponding residuals which were equally distributed around the Loess line and Ordinary Least Square lines, (c) data were heteroscedastic based on scatter plots of the residuals and each predictor, (d) data were not multicollinear given that the variance inflation factor did not surpass 1.5 (a 4 is generally considered problematic) for any variable within either moderation model. Because data met all assumptions, I continued with analyses as planned.

Table 1. *Correlation Matrix for Variables Within the Current Study*

	GCC	Indie	NEP	FaithSci	Gender
ATNE	-.496**	.313**	-.032	.021	.320** (271)
	(279)	(279)	(272)	(272)	
GCC-beliefs		-.322**	-.015	.023	-.244** (271)
		(279)	(272)	(272)	
EI-beliefs			-.081	.076	.306** (271)
			(272)	(272)	
NEP				-.206**	-.054 (271)
				(272)	
FaithSci					.073 (271)

* $p < .05$. ** $p < .01$.
Note. Pearson's *r* coefficients are reported as well as *N* in parentheses. ATNE = Attitudes toward nuclear energy. GCCbeliefs = Beliefs about climate change and nuclear energy. EIbeliefs = Beliefs about energy independence and nuclear energy. NEP = Environmental worldview. FaithSci = Faith in Science. BJW = Belief in a just world. Gender: Women = 1, Men = 2 (no respondents identified as Transgender).

3.2 Analyses

To test the six hypotheses, two separate moderation analyses were conducted using a series of hierarchical multiple regressions, each with four different blocks of variables. Hypotheses were tested using a 95% confidence interval. Gender was entered as a covariate in the first block of each of the three moderation models. The second block entered was comprised of the two belief variables (i.e., GCC-beliefs and EI-beliefs). The third block entered represented the moderator variable which was environmental worldview for the first moderation analysis and faith in science for the second analysis. The fourth and final blocks entered into each of the two analyses were specific to each interaction term. For example, the fourth block within the environmental worldview moderation analysis contained interaction terms for environmental worldview by contribution toward climate change (GCC-beliefs) and by contribution to energy independence (EI-beliefs). Interactions were assessed using the corrected version of the Johnson and Neyman approach (Johnson & Fay, 1950; Johnson & Neyman, 1936; Potthoff, 1964).

Specifically, I used the "MODPROBE" command for use with the Stastistical Package for the Social Sciences software (Hayes & Matthes, 2009). These analyses gave me the ability to show that the effect of the focal predictor on the outcome predictor is statistically significant at any point along the moderator continuum between certain thresholds. This technique has been favored over the most typical moderation analysis (cites). Researchers typically assess the effect of the predictor on the outcome at three points on the moderator: at the mean and at ± one *SD*; the somewhat arbitrary selection of these three points along the moderator continuum may miss important effects at other points.

3.3 Descriptives

The distribution of ATNE was positively skewed. Most participants (63%) were not supportive of nuclear energy or maintained *Reduce Somewhat* or lower attitudes. The majority of participants (59%) strongly believed that nuclear energy contributed to GCC (that it *Moderately Contributes* or *Contributes A Lot*). About 55% of participants believed that nuclear energy contributed to energy independence (making the U.S. *Slightly More* or *Much More Independent*). Only about 2% of the current sample were strictly anthropocentric, or maintained a *Somewhat Disagree* (2.5 or less out of five, one being *Strongly* anthropocentric) or lower attitude toward eco-centrism. Conversely, about 65% were strictly eco-centric, or maintained a *Somewhat Agree* or higher (3.5 or more out of five, five being *Strongly* eco-centric) attitude toward eco-centrism. Faith in science appeared to be leptokurtic and positively skewed, whereby only 19% of participants maintained a *Somewhat Agree* or higher (3.5 or more out of 5) attitude.

3.4 Gender and Beliefs About Nuclear Energy

By itself, gender accounted for about 10% of the variance in ATNE. Men were more supportive of nuclear energy than women, $b = .64$, $t(265) = 3.31$. GCC- and EI-beliefs

significantly explained more variance than the model containing gender alone. As EI-beliefs grew stronger, ATNE became more positive, $b = .21$, $t(265) = 2.29$, $p = .02$. Holding other predictors constant (Gender and GCC-beliefs), EI-beliefs explained about 10% of the variance in ATNE.

3.5 Environmental Worldview Moderation Analysis

The interaction between GCC-beliefs and environmental worldview explained significantly more variance in the model above and beyond the combined effect of gender, EI-beliefs, and GCC-beliefs, R^2-*change* = .01, $F(5, 265) = 4.02$, $p = .046$. There was a small interaction between GCC-beliefs and environmental worldview, $b = .23$, $t(265) = 2.01$, $p < .05$. Because the omnibus *F* test revealed a significant interaction, I further analyzed this moderation with the MODPROBE command. Results indicated that when environmental worldview was 4.26 or lower (scores ranged from 2.07 to 4.87 out of 5 on the NEP scale), the negative effect of GCC-beliefs on ATNE was significant at any given point. That is, this negative relationship was statistically significant only when environmental worldviews were more anthropocentric or moderately eco-centric (when scores range between 2.07 and 4.26). There was not a relationship between the predictor and the outcome when participants' environmental worldviews were strongly eco-centric (or between 4.26 and 4.87). For simplicity, Figure 3 illustrates the effect of GCC-beliefs on ATNE at ± one *SD* on environmental worldview.

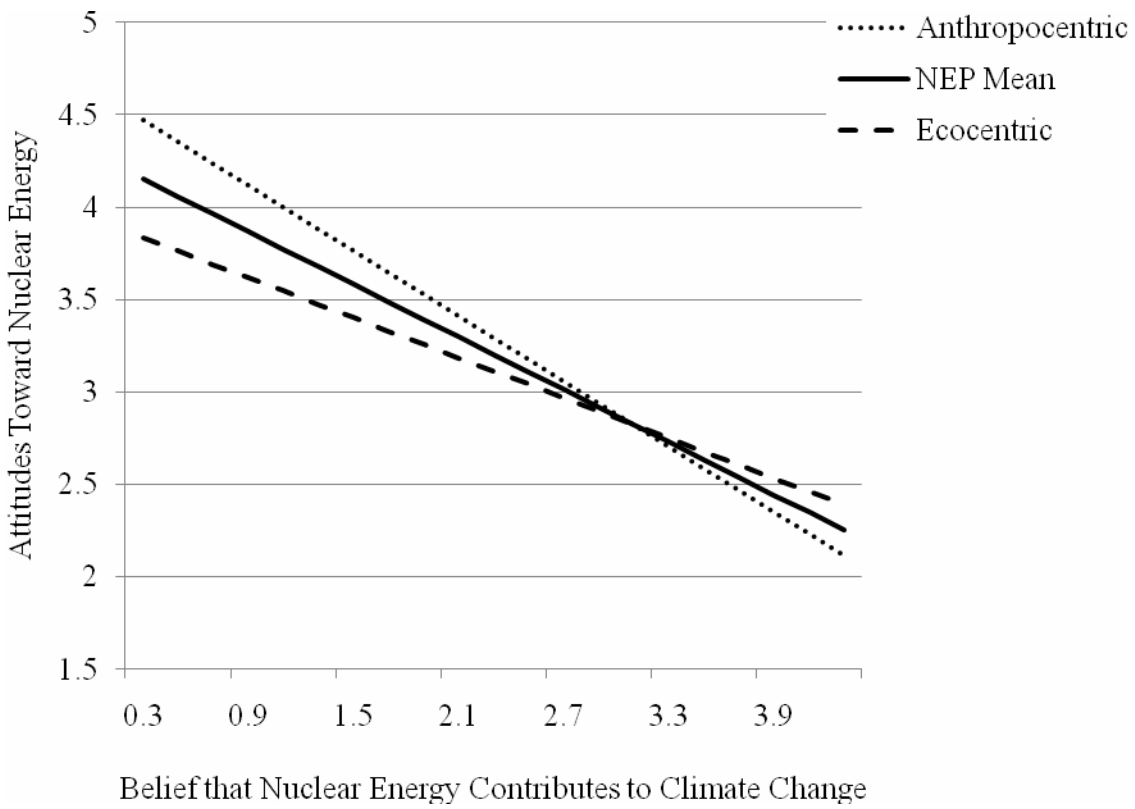

Figure 3. *Simple Slopes for GCC-beliefs with Environmental Worldview on ATNE*

Note. ATNE = Predicted attitudes toward nuclear energy. GCC-beliefs = Belief that nuclear energy contributes to climate change. NEP = environmental worldview. Anthropocentric = -1 *SD* on environmental worldview. Ecocentric = +1 *SD* on environmental worldview.

3.6 Faith in Science Moderation Analysis

The interaction between EI-beliefs and faith in science did not significantly explain more variance in the model above and beyond the combined effect of gender, EI-beliefs, and GCC-beliefs, R^2-*change* = .005, $F(5, 265) = 1.74$, $p = .19$. Because this omnibus F-test was not significant, I did not further probe this interaction. The main effect of faith in science also did not significantly predict ATNE.

4 Discussion

The current study explored ATNE in the context of recent public discourse around GCC and nuclear energy. Three of six hypotheses were supported. EI-beliefs had a small effect on ATNE. Data supported the hypothesis that environmental worldview would moderate the relationship between GCC-beliefs and ATNE. Only when participants' environmental worldviews were highly eco-centric did the medium negative effect of GCC-beliefs on ATNE become non-significant. This was a small moderation effect. I interpret this as meaning that for eco-centric-leaning individuals, there may be other reasons why they have low ATNE when they believe that nuclear energy is "green" in terms of greenhouse gas emissions. In comparison to coal and oil, nuclear energy does produce less greenhouse gas overall and for anthropocentric-leaning and moderate eco-centric individuals this predicts positive ATNE. However, for eco-centric-leaning individuals the belief that this nuclear energy is "green" does not necessarily mean that they will have positive ATNE.

It is also important to note the hypotheses that were not supported. I maintain that environmental worldview moderated the relationship between GCC-beliefs and ATNE but did not moderate the relationship between EI-beliefs and ATNE because there is a more obvious link between environmental worldview and GCC (they both pertain to the earth and its environment). Conversely, whereas environmental worldview pertains to the environment, energy independence instead pertains to the localization of energy production and jobs (which may not be perceived as environmental in nature).

4.1 On Previous Literature: Similarities and Differences

Data were generally congruent with the orienting concepts on which the current study relied. First, I will discuss the current findings as they relate to those of the researchers utilizing

the expectancy-value model—a model that I did not methodologically examine but one that guided my conceptualization of the relationship between the predictors and outcome variable. That is, I did not assess the extent to which participants rated their beliefs about nuclear energy as being positive or negative in nature (cf., Fishbein, 1963). I instead assumed that GCC-beliefs were generally negative beliefs and that EI-beliefs were generally positive beliefs in terms of their respective relationships with ATNE. Despite this difference in approach, current findings were congruent with those reported by previous ATNE researchers (cf., Hughey et al., 1983; Hughey et al., 1985; Lounsbury et al., 1979; Sundstrom et al., 1981; Sundstrom et al, 1977) and risk perception researchers (cf., Sjöberg & Drottz- Sjöberg, 2008). That is, expectations—in the current study, GCC-beliefs and EI-beliefs—were predictors of ATNE; however, the negative effect of GCC-beliefs on ATNE is only statistically significant when participants are more anthropocentric. Also, given my conceptual understanding of the way worldviews work as a filter on the relationship between beliefs about nuclear energy and ATNE, the moderation effect of environmental worldview on the relationship between environmental worldview and GCC-beliefs were expected. However, no previous researchers have assessed whether these variables were related in this way.

The current investigation shares the outcome variable used by Ansolabehere (2007) and Ansolabehere and colleagues (2003). In congruence with the current study, Ansolabehere and colleagues (2003) found that, on average, participants maintained *Reduce Somewhat* attitudes toward nuclear energy. In contrast to Ansolabehere's (2007) findings, our participants held substantially less favorable attitudes toward nuclear energy sources. This might be explained by a number of differences in our samples. For example, as compared to Ansolabehere's (2007) representative sample of the American public, the current college sample was largely

compromised of young, diverse adult women who differed from the US population. Ansolabehere and company's (2003) sample was also substantially different than the current college sample. Ansolabehere (2007) found that participants in the South (the setting for the current study) were more likely than participants from other geographical areas in the US to be supportive of all energy sources. This was not the case for the current sample, which clearly showed much less support for nuclear energy. Ansolabehere's (2003) earlier study showed that participants were less supportive of nuclear energy—much like the current study—whereas Ansolabehere's (2007) later study showed that participants were relatively more supportive (but still not in full support). These differences illustrate that college students from diverse backgrounds currently do not support nuclear energy just as a representative sample of the U.S. public did not (Ansolabehere et al., 2003).

Previous research did not fully address the relationship between worldview and ATNE. Instead, the bulk of this research has delved into its effect on risk perception with respect to nuclear energy. For the current study, neither worldview moderator variables (environmental worldview nor faith in science) affected ATNE or GCC-beliefs (which is similar to previous findings related to risk perception). These findings are incongruent with the only existing investigation with respect to the relationship between faith in science and ATNE. Assuming that GCC-beliefs are indicative of nuclear risk perception, the null results with respect to environmental worldview is congruent with previous research (cv., Whitfield et al., 2009). However, these findings are incongruent with other studies focused on risk perception, broadly. For example, Peters and Slovic (1996) found worldview to be an important predictor of risk perception, and—more specifically—other papers have highlighted the importance of faith in science in predicting risk perception (see Sjöberg, 2001; Sjöberg, 2008; Sjöberg & Drottz-

Sjöberg, 2008) and ATNE (see Baxter, 1988). None of these previous papers have assessed worldview as a moderator of ATNE so it is difficult to compare the current study with previous literature in terms of interactions.

Finally, current data show that ATNE still appear to be gendered whereby those who identified as men held more favorable attitudes than those who identified as women. This finding is congruent with earlier ATNE research (see Culley & Angelique, 2003; Davidson & Freudenburg, 1996; Vleeming, 1985) but incongruent with contemporary ATNE research (cv. Ansolabehere et al., 2003; Freudenburg & Davidson, 2007; Sjöberg & Drottz- Sjöberg, 2008). Future researchers may investigate this from a feminist perspective to better understand why ATNE are gendered and whether it has to do with the nuclear macho phenomenon described by Culley and Angelique (2003).

4.2 Implications

The current study is the first study to examine the effects of GCC-beliefs and EI-beliefs (both salient in the current nuclear energy debate) on ATNE. Most other research has largely been conducted post-disaster (after Chernobyl and Three Mile Island) or during site-specific planning and construction of nuclear facilities. Findings suggested that beliefs relevant to current nuclear energy discourse influences ATNE in ways that are dependent on worldview. For those with a more eco-centric environmental worldview, the arguments made by nuclear proponents concerning nuclear energy and GCC appear to be less effective in garnering positive ATNE from college students. In addition, regardless of worldview, as college students' GCC-beliefs become stronger, they are more likely to maintain unfavorable ATNE. This illustrates an important point for nuclear opponents and proponents alike: GCC-beliefs are a salient predictor of ATNE. Therefore, it may be beneficial for nuclear proponents to utilize this marketing frame.

Conversely, I argue that it may be beneficial for nuclear opponents to call into question nuclear proponents' assertions that nuclear energy is a 'carbon-free' or 'green' solution to GCC—assertions which have been called into question (see Smith, 2006; Wald & Bradsher, 2010, February 19), and which have implications for ATNE among college students.

4.3 Limitations and Future Research

The current study was limited in several ways that could be addressed with future research. First, representative community samples that reflect those living near proposed nuclear reactors should be preferred over college samples because community members will likely bear the majority of proximal risks (e.g., radiation release, sabotage, etc.) or benefits (e.g., increased local tax base). Further, given that the outcome was measured with one-item, reliability could not be determined. However, balancing this is the fact that only a handful of researchers have assessed attitudes toward nuclear issues by using scales with more than one item (e.g., Eiser, van der Plight & Spears, 1989; Lee & Balchin, 1995; Peters & Slovic, 1996 Sjöberg, 2003). In other words, it is fairly commonplace within the literature to measure ATNE with a single item. That this measure was related to the constructs in a way that was congruent with my understanding of the relationship between beliefs about nuclear energy and ATNE provided some evidence of the predictive validity of the current model. I believe this one-item measure also maintained sufficient content validity. That is, the ATNE survey item pertains to favorability toward nuclear energy via U.S. energy law preference and this is the essence of the current paradigm of favorability or non-favorability toward nuclear energy. Future researchers might instead consider Lee and Balchin's (1995) 30-item ATNE scale, a more complete and nuanced measure of ATNE.

Future researchers might also utilize qualitative methods to develop a richer understanding of the public's perspective of the "nuclear relapse/renaissance". For example,

what do those who live near Plant Vogtle in Georgia (the site to receive the first of the federal subsidies for new reactors) think about Obama's proposed taxpayer-supported loan guarantees for the proposed reactors? Interestingly, previous researchers have noted that public meetings regarding the proposed reactors have been dominated by powerful supporters of nuclear energy from outside the area (see Culley & Angelique, in press). As these authors noted, in these meetings, it appeared that the voices of African-American residents (who comprise more than 62% of the area population) were largely absent, which raises troubling questions about environmental injustice and citizen participation. What are the beliefs and attitudes about nuclear energy in general and Obama's speech specifically maintained by people of color living in the shadows of the reactors versus the nuclear proponents who dominated the town hall meeting? The answer to such questions could shed some light on how the nuclear renaissance is experienced differentially across groups. Qualitative data could also shed light on why men are more supportive of nuclear energy than women, which was shown to be the case in much of the classic ATNE research (see Davidson & Freudenburg, 1996). Some researchers have previously—and non-cogently—offered biological arguments to explain why ATNE are gendered (e.g., Drottz-Sjöberg, & Sjöberg, 1990) whereas other researchers, operating from a feminist perspective have asserted that women may be more anti-nuclear than men because of their heightened concern about the effects of radiation on children (Nelkin, 1981). Researchers might re-assess this from a feminist lens to illuminate the socio-political underpinnings of this phenomenon. More specifically, researchers might ask why men are supportive of nuclear instead of focusing on why women are not.

Finally, future research might focus on renewable energy sources as they have been central to discourse about GCC and energy independence. Researchers should continue to delve

into the preferences of the public in terms of renewable energy sources vs. non-renewable energy sources. Previous researchers (Ansolabehere, 2007; Ansolabehere et al., 2003; Culley, Carton, Ogley-Oliver, Street & Weaver, 2010) have shown that people in the U.S. and U.S. college students overwhelmingly support renewable energy sources over non-renewable energy sources. Given that ATNE research has been around since the 1970s it is time that researchers got more precise in their measurement of this construct. Also, it is essential that ATNE researchers continue to delve into pro- and anti-nuclear rhetoric to explore additional beliefs about nuclear energy (e.g., regarding environmental justice) that may have an impact on ATNE.

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6 Appendix

6.1 Nuclear Attitudes (Ansolabehere et al., 2003; Ansolabehere, 2007)

To make more electricity to meet the country's needs over the next 25 years, new power plants will have to be built. Companies and government agencies need to start planning today. How should we meet this demand? With respect to nuclear energy, please indicate whether you feel the U.S. should increase or reduce its use, or not use at all.

Not Use, Reduce a Lot, Reduce Somewhat, Keep Same, Increase Somewhat, Increase a Lot

6.2 Perceived Effect of Nuclear on GCC

Global warming, also referred to as global climate change, may play a large role in the means by which we generate electricity. How much do you think nuclear energy contributes to global warming?

Does Not Contribute, Slightly Contributes, Somewhat Contributes, Moderately Contributes, Contributes a Lot

6.3 Perceived Effect of Nuclear Energy on Energy Independence

A major talking point in the debate surrounding the future of energy is whether the technology will make the US less reliant on other countries to produce its electricity. To what extent do you think nuclear energy give the US energy independence from other countries?

Much Less Independent, Slightly Less Independent, Slightly More Independent, Much More Independent

6.4 Environmental Worldview (NDunlap & Van Liere, 1978; Dunlap et al., 2000)

Below are some questions about your worldview. Please indicate the extent to which you agree with each statement.

We are approaching the limit of the number of people the earth can support.

Humans have the right to modify the natural environment to suit their needs.

When humans interfere with nature it often produces disastrous consequences.

Human ingenuity will insure that we do NOT make the earth unlivable.

Humans are severely abusing the environment.

The earth has plenty of natural resources if we just learn how to develop them.

Plants and animals have as much right as humans to exist.

The balance of nature is strong enough to cope with the impacts of modern industrial nations.

Despite our special abilities humans are still subject to the laws of nature.

The so-called "ecological crisis" facing humankind has been greatly exaggerated.

The earth is like a spaceship with very limited room and resources.

Humans were meant to rule over the rest of nature.

The balance of nature is very delicate and easily upset.

Humans will eventually learn enough about how nature works to be able to control it.

If things continue on their present course, we will soon experience a major ecological catastrophe.

Strongly Disagree, Somewhat Disagree, Neutral, Somewhat Agree, Strongly Agree

6.5 Faith in Science

Science and Technology Scale (Baxter, 1988)

Science and technology have improved our quality of life.

Complex technologies will always be risky because of the chance of human error [reverse-coded].

Strongly Agree, Sometimes Agree, Neutral, Somewhat Disagree, Strongly Disagree

Dominant Social Paradigm (Dunlap & VanLiere, 1984)

Most problems can be solved by applying more and better technology.

We cannot keep counting on science and technology to solve humankind's problems [reverse-coded].

Strongly Agree, Sometimes Agree, Neutral, Somewhat Disagree, Strongly Disagree