CHAPTER 1

The Role of Myths in Our Climate-Energy Challenge

We are all capable of believing things we know to be untrue . . . the only check on it is that sooner or later a false belief bumps up against solid reality, usually on a battlefield.

George Orwell

In the summer of 1990, as he announced his army's surprise invasion of Kuwait, the Iraqi dictator Saddam Hussein told his people that the neighboring oil-rich country was rightfully theirs. Many believed him. When he announced Kuwait's annexation, as Iraq's 19th province, they celebrated with patriotic fervor.

Several months later, a US-led military coalition, which included Arab states, threatened to expel the Iraqi occupiers. Undaunted, Hussein assured his people that their army would annihilate its foes in the "mother of all battles."[1] By this time, some Iraqis were probably questioning, at least to themselves, the veracity of Saddam's claims. But under his brutal dictatorship there was little they could do. In early 1991, they watched in horror as coalition forces destroyed the fleeing Iraqi army. Thousands of their sons, brothers, and husbands were helplessly slaughtered in the desert by the massive firepower of the coalition.

As George Orwell said, a battlefield provides a solid reality check on false beliefs.

The US president who led the coalition was George H. W. Bush. His forces could easily have taken Baghdad and overthrown Hussein. Instead, they halted their advance in southern Iraq and then withdrew. They had

achieved their objective of liberating Kuwait – not to mention ensuring that this country would remain a reliable US oil supplier.

Twelve years later, however, Bush's son, following his father's footsteps in the presidency, told Americans that Saddam Hussein was developing weapons of mass destruction that could be used against the US homeland, threatening a repeat of attacks like those of September 11, 2001. Most Americans trusted the second President George Bush and supported his 2003 invasion of Iraq. They believed that overthrowing Hussein would ultimately save American lives by establishing a peaceful, democratic Iraqi government allied with the US.

Six weeks after the attack, under a banner that read Mission Accomplished, Bush declared the end of the conflict. By this time, many Americans were questioning the veracity of his claims. They could no longer overlook daily news of a growing insurgency against the occupying forces and intensified sectarian violence. In the ensuing chaos, most came to realize that the second President Bush and key members of his executive had overstated the threat Hussein posed to their security, and in the process deluded themselves and fellow Americans about the ability of military intervention to transform Iraq into a stable ally. Eventually, the government quietly acknowledged that it had found no weapons of mass destruction in Iraq.

In 1991, many Americans were amused at the blatant self-delusion of Saddam Hussein and his followers in the first Iraq war. The term "mother of all (fill in any word)" became a popular joke.

By 2003, however, the tables had turned. Although few were initially willing to admit it, many came to realize that in the second Iraq war it was the US government and most of its citizens who were delusional. Apparently, even a democratic country like the US, with its educated populace, independent media, separate judiciary, professional intelligence service, and established tradition of political opposition, is vulnerable to collective self-delusion.[2] George Orwell's comment about war's role in correcting delusion can apply to anyone, not just a people under the heel of a despot.

These contrasting histories of the first and second Iraq wars under the first and second George Bush presidents are a reminder that being selective with the facts cannot be dismissed as a temporary phenomenon

that only began in 2016 with the US election campaign and presidency of Donald Trump. Certainly, many of Trump's followers seem especially prone to ignore or disbelieve inconvenient evidence, preferring to accept his 'fake news' response to media reports of his falsehoods. But were the enthusiastic supporters of the second Iraq war really so different in their eagerness to see a threat, despite independent UN weapons inspectors saying otherwise?

Indeed, to all but the extremely naïve, it should be obvious that we humans have a propensity to delude ourselves and others. And though we can sometimes detect the delusions of others, we're less good at detecting our own, even when faced with contradictory evidence.

But that seems strange. Surely being incorrect about reality is a detriment to survival, and this must have always been the case. Or was it?

My dictionary defines delusion as "believing a falsehood to be true." This sounds like a fault we would want to correct. If we didn't correct it, surely nature would teach us some hard lessons.

Where survival is at stake, evolution would have forced our ancestors to develop critical thinking skills, to be vigilant for evidence that contradicted their beliefs about the real world in order to correct those beliefs. Otherwise, they might believe a shaman who prophesied that the prey they were stalking would migrate in one direction when evidence suggested otherwise. Or, they might succumb to the wishful belief that the neighboring tribe had peaceful intentions despite strong evidence to the contrary.

But as I read further in my dictionary, the story gets complicated. For the word delusion is akin to the word myth, which is defined as "a commonly held view about the world that may lack factual basis or historical accuracy." Anthropologists tell us that myths have played an important role in social evolution. Commonly held views about our origins, and the religious and social rules that govern our obligations to our families and tribes, ensured the social cohesion with which our prehistoric ancestors survived in nature and outcompeted other humans. Myths about the special powers and authority of individuals and groups among us fostered increasingly effective societal coordination and control, whether for making food or making war.

Thus, myths are stories about the world that can bind and strengthen us collectively in our competition with others. We are more likely to believe them when told by people we trust. And the people we trust are more likely to belong to our family or to groups with whose survival interests we most closely associate – whether tribal, ethnic, religious, socio-economic, or national. This combination of trust and shared belief enables people to coordinate their actions to mutual benefit.[3]

Even so, this strength from shared myths does not negate the fact that trusting a deluded leader is risky. Iraqis paid dearly for Saddam Hussein's delusion about the resolve and capability of countries that would oppose his occupation of Kuwait. Americans paid dearly for the second George Bush's delusion about the resolve and capability of groups that would oppose his occupation of Iraq.

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In the 30 years that I have led a graduate seminar in sustainable energy at my university in Vancouver, a mainstay of the first week of class is an exercise in which I ask the students to give their opinion on one of the controversial options to address climate-changing greenhouse gas (GHG) emissions. These options include massive expansion of nuclear power, greater use of biofuels like ethanol, widespread deployment of carbon capture and storage at coal-fired power plants, major development of large hydropower dams, and geoengineering of the earth's climate. Most of the students have strongly negative views of these options, and explain why with detailed, passionate arguments. Being in an environmental program, they usually argue that the only valid options are energy efficiency and renewable energy. And since their views are similar, I watch them nodding in approval as each presents his or her arguments.

Then comes part two of the exercise. I make them reverse their positions. I make them each provide the best possible evidence and argument for an option they don't like.

At least, that's what they're supposed to do. Most of them do a terrible job. They present feeble, easily countered arguments in support of nuclear power, geoengineering, and so on. So I make them do it again. And again. Eventually, some of them progress. Some even embrace the

exercise, keenly probing for the most convincing evidence and arguments in favor of a position they initially opposed.

Others, however, continue to perform poorly. As Chris Mooney noted in a 2011 essay in *Mother Jones*, they can't shift from "thinking like a lawyer to thinking like a scientist."[4] A lawyer is a hired gun, who must focus only on evidence and clever arguments to support the interests of those who hire him or her. In contrast, a scientist can change sides. Indeed, ideal scientists are alert to the best evidence and arguments that counter their current view, and are willing to embrace these. And there is no better way to understand a contrary position than by earnestly presenting it in its best light.

Note that I said 'ideal scientists.' I'm not suggesting all scientists behave this way all the time. But the ideal scientific model is to apply critical skepticism to positions one currently accepts, an open mind to positions one currently rejects, and a willingness to change one's mind after an unbiased assessment of previously unconsidered evidence and arguments. As I tell these graduate students, if they are to do well as academic researchers, they need to be excellent critical thinkers, and they need to apply that talent to their own currently held views.

In my career, I have tried to follow this model. I have pushed myself and research collaborators to know intimately the best evidence and counter-arguments to positions we hold, to even be excited at the prospect of changing our views in the face of new evidence.

This approach has led me to change my mind during the course of my career, sometimes rejecting arguments I once thought irrefutable. One example is the profitability of energy efficiency. In my early days as an academic, I believed we would make money acquiring energy-efficient vehicles, furnaces, appliances, building insulation, light bulbs, industrial equipment, and so on. The higher up-front cost of home insulation, a more efficient furnace, or a high-efficiency light bulb would be compensated by lower energy bills over time. But evidence from leading researchers in top academic journals kept poking holes in this assumption, so I focused my reading on carefully designed research making this case, and even applied some of my research to the topic. Eventually, the evidence compelled me to shift position. For a number of reasons, the unbiased evidence – rather than evidence produced by efficiency

advocates – shows that energy efficiency investments are often far less profitable than they initially appear. Researchers conducting hindsight studies find, for example, that insulating an older house often costs more than expected, while the energy savings are often less than expected. My own experiences over three decades of investing in efficiency in seven different houses, with careful recording of all costs and bill savings, provided supporting anecdotal evidence.

Maybe my position on the profitability of energy efficiency will change again. That would be fine. What matters is that my ideas are consistent with evidence and logic from leading independent research. If not, I should be conducting quality research that slowly compels other researchers to reconsider their views.

Another of my early assumptions was that we were rapidly exhausting our fossil fuel reserves, which would result in continuously rising prices of oil, natural gas, and coal. But contrary evidence undermined that assumption. Leading researchers kept demonstrating that the planet's fossil fuel resources are plentiful, especially if our estimates include unconventional forms of oil and natural gas, such as the huge quantities of these resources contained in shale rocks. And evidence from periods of high fossil fuel prices showed how quickly the improved potential for profits can trigger innovations and intensified exploration that increases global estimates of the reserves that are economical to exploit. Certainly, on a finite planet, fossil fuels are finite. But their exploitable quantity is enormous compared to what humans have thus far consumed. This means that innovations might at any time drive their cost of production, and therefore their price, down rather than up.

The emerging evidence two decades ago on the higher cost of energy efficiency and the abundance of fossil fuels changed my assumptions on these two issues. But some of my other early assumptions about energy have survived because the research of leading scholars continues to support them.

Many researchers, including me, have long shown how we have the technological capability to transform the global energy system to one with much lower GHG emissions. Although some people with a vested interest in the fossil fuel status quo have questioned this finding, researchers continue to demonstrate that at a moderate cost we can

transition the growing global energy system over several decades. This low-GHG energy system would be dominated by renewable energy, likely in combination with some nuclear power as well as natural gas and coal, where these latter two were used with carbon capture and storage technologies.

This transformation is popularly referred to as 'deep decarbonization,' since carbon dioxide is the most significant greenhouse gas.[5] Estimates of the cost of this energy transition have changed little since calculations by me and many other researchers decades ago. If realized gradually over several decades, it would cost just a few percentage points of Gross Domestic Product (GDP), which is equivalent to losing one year of economic growth over a 30-year period of sustained growth. This modest cost should be compared to the far greater cost and planetary chaos from instead continuing on our rising GHG path.

We have known this for some time. Ongoing research helps refine the numbers but does not affect the validity of this widely held view of the net benefit of an energy transition that would dramatically reduce GHG emissions. Thus, while climate scientists have long agreed on the fundamentals of GHG emissions and their effects, most energy-climate economists have held fairly similar views on the costs of deep decarbonization of the global energy system. Their views have a somewhat wider range when it comes to the monetary value of the damages from GHG emissions. But that is to be expected, given the difficulty of estimating the probabilities and impacts of catastrophic events (hurricanes, relentless droughts and wildfires, fast melting of permafrost and ice sheets, reversal of ocean currents), likely monetary values for biodiversity losses (such as the extinction of polar bears), and the relative weighting of far-distant versus near-term costs (what economists call 'the choice of discount rate').

Given this general consensus among climate scientists and near-consensus among climate-energy economists, our political leaders should have been implementing serious policies at least three decades ago to cause the energy transition, and by now global GHG emissions should be falling. But this did not happen. Instead, while some jurisdictions have recently stabilized and even slowly decreased their emissions, global emissions are still rising.[6] Many researchers now admit it is virtually

impossible to prevent global temperatures from rising by at least 2°C; there is too much inertia in the energy system for the rapid transformation required to stay within this limit.

But why did it come to this? Why were we unable to act on the climate-energy challenge three decades ago? Why are we still not acting today at anywhere near the required effort? And what can we learn about our past failures to rapidly reduce GHG emissions?

The longer I have worked on this issue, the more my focus has been drawn from my traditional field of expertise – the modeling of energy-economy systems – to the disciplines of political science, public policy, behavioral economics, sociology, psychology, and global diplomacy. It seems almost pointless for experts like me to produce yet another study showing how deep decarbonization is achievable and affordable if that finding continues to have negligible effect on the decisions made by individuals, firms, and governments.

I now believe that people with my expertise must learn from these other disciplines so that we might integrate our knowledge of the energy-economy system with their knowledge of how people make personal and collective decisions, including how they respond to challenges to their worldviews. From this perspective, the psychological research on our all-too-human propensity to delude is critical.

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The recent history of the two Iraq–US wars illustrates delusion operating at the level of countries. Sociologists, psychologists, and other social scientists also focus on delusion among individuals and groups. At the individual level, perhaps it's a friend who denies he has a drinking problem, or a relative who ignores her financially ruinous gambling addiction, or neighbors who insist that their son is an angel when he is a well-known bully. We have all encountered someone who refuses to accept an inconvenient truth that is obvious to those around them.

While we want to help people who are seriously deluded, many false personal views are not easily shed. And it can seem like meddling if we challenge the dearly held illusions of our friends, family, and neighbors.

Sometimes, however, we are forced to meddle. If someone's behavior threatens not just themselves, but others, we may have no alternative.

What if the drinker is poisoning his liver, but also jeopardizing innocent people by driving under the influence? What if the gambler is falling deep into debt, but also stealing from you to support her habit? What if the bully's threats, initially verbal, escalate to physical abuse of your children?

In some cases, events force individuals to acknowledge reality. The threat of divorce motivates the drinker to acknowledge his problem and act to save his marriage. Bankruptcy proceedings lead the gambler to admit her addiction and seek help. The bully's suspension from school motivates his parents to address his behavior. Indeed, our societies have developed legal and institutional mechanisms to protect people when the delusions of some could harm others. Drunk driving is illegal. Bankruptcy leads to loss of credit. Physical abuse incurs criminal assault charges.

In the case of individuals, perhaps a trusted friend, relative, or neighbor will intervene before our delusion gets crushed by reality. Because of that trust, we might be willing to listen. But when it comes to groups, the people we trust often harbor the same delusion.

In an oft-cited 1950s psychology experiment, students from two Ivy League schools, Dartmouth and Princeton, were separately shown the film of a previous game between their football teams.[7] This had been a controversial match, after which the Princeton team had accused Dartmouth of numerous flagrant fouls. But when each movie viewer was asked to record the number of Dartmouth fouls, Dartmouth students noticed only half as many as Princeton students. Depending on their group allegiance, the students saw different realities.

According to Yale professor Dan Kahan, who today conducts similar experiments, 'group ties' are responsible.[8] Just as our perception of reality is biased by our individual self-interest, so too is that perception biased by our group self-interest. In the football game, the students' school loyalty led to a cognitive bias toward evidence that supported the self-interests of their school. And this bias existed not just during the intense emotions of watching the game live in the stadium, but also in the dispassionate setting of a film screening room months later. And it didn't matter that these students attended elite institutions with reputations for promoting objectivity.

Watch any sporting event, professional or amateur, and you will see ample evidence of group cognitive bias. Fortunately, with sports the stakes are not high – although don't try saying that to the parents screaming at the umpire of a Little League baseball game. Unfortunately, group cognitive bias is strongly evident even when the stakes are high.

During his presidential campaign, many of Donald Trump's unfounded claims in speeches and on Twitter presented a textbook case of cognitive bias. He treated as factual unfounded insinuations about his political opponents, whether it was the true birthplace of Barack Obama or the US security threat from Hillary Clinton's use of a private e-mail server. What is interesting from the perspective of group delusion, however, is the striking difference in how those who voted for and against Trump dealt with evidence about him. He promised transparent and corruption-free government yet would not disclose his income taxes. He said he respected women, yet a video of his confidential comments and testimonials from several women indicated the opposite. He claimed he was an honest and sincere person, yet repeatedly made statements that were blatantly false.

Opponents of Trump have a long list of these indictments. Yet almost half of American voters opted for Trump on election day. When pollsters asked why, some explained that they didn't trust Hillary Clinton, so Trump was the lesser of two evils. But many of his supporters said they could not believe bad news about him once they had decided that, as the Republican nominee, he best represented their interests and views. Getting specific facts right didn't matter.

Salena Zito, writing in 2016 in the *Atlantic Monthly*, noted that "Trump's supporters took him seriously but not literally, while the press (and his opponents) took him literally, but not seriously."[9] In other words, the people who ultimately supported Trump came to feel he was more likely than Hillary Clinton to be a member of their group, more likely to be someone who shared their values, faith, views on government, and aspirations for resurrecting American dominance of the world's economy and politics. And, as they came