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Strategic Communication and Interest Groups in Climate Inaction

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11 "This nagging worry about the carbon dioxide issue"

Nuclear denial and the nuclear renaissance campaign[1]

Núria Almiron, Natalia Khozyainova, and Lluís Freixes

On December 8, 1953, the president of the United States at that time, Dwight Eisenhower, delivered a speech before the General Assembly of the United Nations in New York that would become famous worldwide. "Atoms for Peace", as the discourse was named, was the first step in a massive public relations effort to radically transform the world's perception of nuclear energy in the context of the Cold War and the U.S.'s urgent need to clean the image of atomic technology – following its military use in Hiroshima and Nagasaki at the end of the Second World War. The speech enthusiastically introduced the alleged benefits and possibilities of nuclear technology for civil uses. From that moment on, nuclear power was to be a permanently controversial reality.

Although the Soviet Union and Britain constructed electric generation nuclear power plants before the United States, it was the Westinghouse reactors, based on the design of the first nuclear submarines, that determined the future of nuclear power worldwide. Interestingly, during their first decade of life nuclear power plants provided more than enough evidence that their costs did not match the promise. The results of the world's first full-scale atomic electric power plant devoted exclusively to peacetime uses, the Shippingport plant in the United States, left no room for doubt: The electricity generated by the power station was ten times more expensive than that generated by conventional means.

The U.S. Atomic Energy Commission (AEC) – which is ideologically dependent on the propagandistic aims of the civilian use of atomic energy – and also the reactor manufacturers, essentially Westinghouse and General Electric – which are subsidized by the government – became the main promoters of nuclear power energy. However, the electric companies that were supposed to exploit the civilian plants could not make the numbers work.

Two researchers from the University of California, Arjun Makhijani and Scout Saleska (1999), thoroughly reviewed government, industry, and academic documents from the 1940s and 1950s in an attempt to find some economic clue as to what the propaganda campaign was founded on. They found the opposite: If anything, there was a growing disappointment, verbalized even by some of the protagonists of the moment, such as the vice president and research director of General Electric, C. G. Suits, who stated that nuclear energy was expensive, and not cheap as the public had been led to believe.

From the first civilian use of nuclear power energy it was therefore evident that generating steam by boiling water in a nuclear reactor to spin a turbine – which is how a nuclear power plant essentially works – was not the most efficient, least expensive, and least problematic way of obtaining electricity. It is now clear that what impelled the civil use of nuclear energy, and the birth of the nuclear power industry, was not rational thinking but rather (i) public relations – in particular an attempt mostly by the U.S. political sphere to redeem "the original nuclear sin" – and (ii) vested interests – in particular government and military interest in creating an excuse for ongoing military development of the technology (Coderch & Almiron, 2008; Verbruggen & Yurchenko, 2017). Since the aims were essentially propaganda and military purposes, at no time was attention paid to technical or economic considerations.

Unsurprisingly, construction, operation, and management problems inherent to nuclear power plants proved too high as barriers, to the extent that after a few decades of rapid and artificial growth (Coderch & Almiron, 2008, pp. 70–74) investment in nuclear energy stalled in many developed countries, constituting a meager 5 per cent of global primary energy production in 2018 (MIT, 2018). The nuclear industry has actually been in decline since the end of the 1970s, but a rhetoric depicting a *nuclear renaissance* gained momentum in the 2000s (van de Graaf, 2016). As we shall see, this endeavor represented a new mass public relations campaign orchestrated by an alliance of interests acting as a *discourse coalition*, as defined by Plehwe (2011): "[S]ocial forces acting jointly, though not necessarily in direct interaction, in pursuit of a common goal" (p. 130). These forces, the pronuclear movement, include the nuclear industry (with an unexpected group of supporters), the military, and the political sphere, including the state agencies and international organizations linked to it. As we shall see, the three are so entangled that it is difficult to address them separately.

On the other hand, the concept of *nuclear renaissance* has never been clearly defined by any of its proponents, although it can be understood as a revival in nuclear power justified by rising fossil fuel prices and new concerns about meeting greenhouse gas emission limits and energy security issues. During the 1980s and 1990s, the main arguments spread by the industry to justify nuclear stagnation were nuclear accidents (Three Mile Island and Chernobyl) and the emergence of the environmental movement (Coderch & Almiron, 2008). In the 2000s, alleged improvements in nuclear technology, as publicized by the industry itself, and the need to reduce greenhouse emissions were used by the nuclear industry to request a new preponderant role for nuclear energy in the world (van Graaff, 2015). Despite huge consensus regarding the failure, or simply inexistence, of such a *renaissance* (van de Graaf, 2015, 2016), the industry has continued to capitalize on the fears raised by climate change and energy security even after the Fukushima disaster.

This chapter aims to provide an explanation of how the revival campaign in the 2000s was by no means a natural and logical consequence of either the environmental context or the reality of nuclear power energy. As one prominent military leader of the pronuclear movement acknowledged: "[I]t did not just happen, it has been carefully planned" (Farsetta, 2008a). To meet our stated

aim, we trace the history of this public relations effort and argue that it is a mere continuation of the denial promoted by the nuclear industry since its inception. This denial narrative has to do with the persistent refusal by pronuclear advocates to acknowledge the main facts of the industry; therefore, in this chapter we first review what these facts are. Then we describe the *nuclear renaissance* campaign, including its main proponents and discourse; that is, how the nuclear revival has been framed by the pronuclear advocates. And finally, we discuss the results of this campaign and conclude that is incorrect to qualify the *renaissance* attempt as a complete failure. We argue that this campaign simply continues to apply the same strategy of denial promoted by the pronuclear advocates since the beginning of nuclear energy, a successful strategy based upon public disempowerment and the continuation of a basic Enlightenment narrative (Kinsella, 2005; Catellani, 2012).

Nuclear energy scrutinized

To put the nuclear denial campaign in context, we must first review the main issues with regard to nuclear energy. Those issues are the same today as the ones that caused its decline in the 1970s. More than sixty years after the industry's birth, these problems remain unresolved, and their existence explains not only the criticisms this source of energy receives, but also why the industry has had to invest so heavily in public relations. As Verbruggen and Yurchenko (2017) illustrate, "positioning nuclear power in the decarbonization transition is a problematic issue and is overridden by ill-conceived axioms" (p. 1). Those axioms have to do with unsolved questions regarding cost, safety, waste management, and proliferation risks.[2]

First, nuclear power plants have never been a competitive economic option in a free-market environment, as evidenced by the fact that all of the power plants in operation have been built by state bodies, or in a regulated monopoly environment heavily subsidized by states, and that the risks are assumed by consumers (directly or through the state) and not by the operators that run them.[3] Private investors have perceived excessive risks since the beginning, and these have not diminished over the years. The risks that discourage commercial interest in nuclear constructions have been thoroughly explained by pronuclear researchers from the Massachusetts Institute of Technology (MIT, 2009, 2018) and are acknowledged by prominent pro-market think tanks like the Institute of Economic Affairs (Wellings, 2009). These claims include, among others, the high historical construction costs and lengthy construction delays, generally much higher and longer than expected; a very capital-intensive technology with long construction periods (usually over ten years) and amortization (between twenty-five and thirty years), which triggers financial costs; a very limited availability of real construction costs for recently constructed power plants; electricity production costs similar to those of other less risky alternatives that require lower investments and shorter start-up times; a means of operation and maintenance higher than twice that observed in comparative studies for other electric generation technologies; the unavoidable uncertainty

surrounding future construction costs, especially due to the impact of increasing oil and raw material prices in all of the sectors involved in nuclear construction; and the fact that investors must deal with political challenges, popular opposition, and regulation, which involves obtaining a license and a location and the costs of a potential accident.

Second, aspects related to the security of nuclear technology essentially include the pollution generated by normal operation of the plants, the risk of accidents (either produced by natural disasters or human-induced), and the risk of attacks. The fact that there have already been three major accidents involving nuclear plants (Three Mile Island in the United States in 1977, Chernobyl in Ukraine in 1986, and Fukushima in Japan in 2011) means that nuclear accidents are the best known aspect of security issues. However, normal operation of the plants, including extraction of the minerals used, involves such high emissions of contaminating elements being discharged into the environment that the industry itself acknowledges it has no detailed information on either the total volume or the level of danger this entails (CBS, 2011). Additionally, although the potential catastrophe of a terrorist attack on a nuclear power plant has not yet been fully discussed by politicians and the media, it remains a dreadful possibility (UCS, n.a.).

Third, since its birth the nuclear energy industry has reiterated that the problem of waste would be resolved. Nowadays, proponents of nuclear energy propose some technical solutions to this (such as interim storage in dry casks and permanent disposal in geological repositories with excavated tunnels or deep boreholes for spent fuel management) but display a lack of ability to implement them. The extreme danger of radioactive waste, which extends far beyond human scope,[4] is the main stumbling block. MIT (2018), a pronuclear institution, acknowledges that the problem – siting such facilities – remains the same after six decades. The historically unsuccessful struggle to build safe nuclear geological repositories is well summarized on Wikipedia ("Deep Geological Repository", n.a.).

Finally, the issue of nuclear weapons proliferation[5] is another major problem. Nuclear energy has never been able to disassociate itself from its military past and origin. Nuclear technology generates or can be used to generate fissile material suitable for manufacturing atomic weapons, regardless of whether this material has been designed for use in electric power stations or other peaceful applications. Accidental nuclear war and the use of nuclear weapons by terrorists are some of the potential scenarios related to nuclear proliferation. Although the number of nuclear weapons in the world has radically diminished (from 70,000 in 1985 to 14,000 in 2018), it is still enough to end life on the planet, and, in fact, the use of a nuclear weapon is now more likely than any time since the Cold War (Borger & Sample, 2018).

To these major concerns, we must add the facts regarding the two most important claims embedded in the *nuclear renaissance* campaign: The claim that nuclear energy is the lowest greenhouse gas emitter of any method of electricity generation, and the claim that it fixes the energy security problem (van de Graaff, 2015). With regard to the former, nuclear power is, according to this

narrative, almost carbon-free and indispensable for mitigating climate change as a result of anthropogenic emissions from greenhouse gases. It must be noted, however, that the International Atomic Energy Agency (IAEA) and nuclear industry have not published real figures on this subject. By contrast, evidence shows that nuclear energy is a relevant greenhouse gas emitter. As van Leeuwen (2017) reminds us,

> a nuclear power plant is not a stand-alone system, it is just the most visible component of a sequence of industrial processes which are indispensable to keep the nuclear power plant operating and to manage the waste in a safe way, processes that are exclusively related to nuclear power. This sequence of industrial activities from cradle to grave is called the nuclear process chain.
>
> (p. 5)

With the exception of the nuclear reactor, "nuclear CO_2 emission originates from burning fossil fuels and chemical reactions in all processes of the nuclear chain" (van Leeuwen, 2017, p. 5). Van Leeuwen has actually estimated the CO_2 emissions from nuclear energy and, in view of its large consumption of specific materials, has forecasted that "it seems inconceivable" that CO_2 emissions might decrease in the future and that nuclear power does not emit other greenhouse gases. The "absence of published data does not mean absence of emissions" (p. 6). As van Leeuwen highlights, the figures published by the nuclear industry are not scientifically comparable to those of renewable energies because the former are based on incomplete analyses of the nuclear process chain. "For instance, the emissions of construction, operation, maintenance, refurbishment and dismantling, jointly responsible for 70 per cent of nuclear CO_2 emissions, are not taken into account" (p. 7). Van Leeuwen reminds us that we should also add to current emissions the *energy debt* ("the energy bill to keep the latent entropy under control from 60 years nuclear power has still to be paid") and the *delayed CO_2 emission* of nuclear power ("the CO_2 emissions coupled to those processes in the future have to be added to the emissions generated during the construction and operation of the nuclear power plants") (p. 7). In view of the aforementioned issues, van Leeuwen concludes that "stating that nuclear power is a low-carbon energy system, even lower than renewables such as wind power and solar photovoltaics, seems strange" (p. 7).

With respect to the second issue, since the oil crisis of the early 1970s energy security has been a high priority in energy policy for many countries. The International Energy Agency defines energy security as "the uninterrupted availability of energy sources at an affordable price". That nuclear energy can increase energy security or even fix this problem is highly debatable for at least three major reasons. First, because a scenario of only using nuclear energy is not feasible, and thus there will always be uncertainty related to the other forms of energy needed. Second, because only a handful of countries have uranium mines, and therefore only they could truly be considered independent in terms of energy resources when it comes to nuclear energy. And finally,

because uranium is also a limited resource on the planet. However, since this chapter focuses on the decarbonization rhetoric of the pronuclear movement mainly related to greenhouse gas emissions, we are not going to deal with this topic.

Another fact the nuclear denial narrative persistently ignores is that it is technically impossible to replace all the uses of fossil fuels with nuclear energy; nuclear power is simply not that scalable. The pretension of a more nuclearized world has elsewhere been called "the larger mirage" of the *nuclear renaissance* (Coderch & Almiron, 2008, p. 181). Considering the immense historical logistical and financial problems related to building nuclear plants ("plagued by delays, cost overruns, and design flaws" as the pronuclear think tank IEA put it; Wellings, 2009), the supposed aim of building the huge number of nuclear plants needed just to replace the electricity generated by fossil fuels today has been assessed as unrealistic – not to mention the fact that this would require an amount of cheap and available nuclear fuel (basically uranium) that simply does not exist (Abbot, 2011).

Finally, some of its critics even claim that nuclear power and variable renewable suppliers are incompatible with the future green transition for various reasons, including budgetary restrictions: "[T]he public budgets are limited, college curricula are competitive, scientists and engineers can be productively used for either nuclear survival or renewable technology inventions and innovations, not both at the same time" (Verbruggen & Yurchenko, 2017, pp. 6–7).

Nuclear denial and the *nuclear renaissance* campaign

The industry's persistence in keeping the narrative of nuclear energy disconnected from the facts has been accurately defined by some as a "nuclear denial" that "creates scientific ambiguity" and provides "cover for governmental and commercial interests to allow nuclear power to continue expanding worldwide" (Perrow, 2013, p. 57). This public relations strategy mirrors the denial campaigns pursued by the tobacco industry during the 20th century (Oreskes & Conway, 2010) and the climate change denial machine in the United States at the beginning of the 21st century (McCright & Dunlap, 2010).

Nuclear denial has been a communication strategy since the dropping of the atomic bombs on the Japanese population at the end of the Second World War. By *nuclear denial* we refer to the deliberate omission of the problems inherent in nuclear power at any level (Coderch & Almiron, 2008; Farsetta, 2008b; Osgood, 2008; Perrow, 2013; Verbruggen & Yurchenko, 2017). Nuclear advocates promote the idea that nuclear risks (such as nuclear waste, radiation, or potential for further accidents) are vastly overestimated and full of historical preconceptions, and that they cannot therefore serve as valid arguments against the industry. For instance, in his examination of the Fukushima case, Perrow (2013) states that

> the denial that Fukushima has any significant health impacts echoes the denials of the atomic bomb effects in 1945; the secrecy surrounding Windscale and Chelyabinsk; the refusal of studies suggesting that the fallout from

> Three Mile Island was, in fact, serious; and the multiple denials regarding Chernobyl (that it happened, that it was serious, and that it is still serious). (p. 64)

Kinsella (2005) was among the first to rigorously examine the nuclear discourse around four "master themes" that are prominent in it. The author used these four themes, adapted from Kenneth Burke's rhetoric theory, to explain how nuclear discourse was shaped in relation to environmental communication. These themes or tropes are still useful because they continue to pervade the pronuclear movement narrative. The four themes found in the nuclear discourse are *mystery*, *potency*, *secrecy*, and *entelechy*. *Mystery* refers to the fact that "nuclear science, technologies, and policies, products of human discourse, are widely portrayed as arcane, difficult, and out of the intellectual reach of ordinary people" (p. 53). *Potency* points at the fact that "human intervention in nuclear processes is a capstone of the subsequent modernist project and its conceptions of science, technology, progress, and control – a dramatic demonstration of the Baconian vision of knowledge as power" (p. 57). *Secrecy* is "a fundamental principle of the nuclear discursive formation", a most prominent feature of the history of nuclear development (p. 60). And finally, *entelechy* "is rooted in telos, the ultimate state toward which the system strives, but as this end state cannot be known with certainty, identifying it is a fundamentally rhetorical activity" (p. 66).

In relation to how these themes are applied in nuclear campaigns, Nisbet (2009) listed the different frames used by nuclear advocates to gloss over reality since its beginnings. He argues that during the first two decades, the technology was framed exclusively as *leading to social progress*, *economic competitiveness*, *and a better way of life* (the "Atoms for Peace" campaign); in the mid-1970s it was reframed as *public accountability* ("arguing that the industry had become a 'powerful special interest'" (p. 16)); the Bush administration reframed it again in 2001 as a "*middle way path* to energy independence" (p. 16), in reaction to rising energy costs and rolling blackouts in California; and finally it was reframed once more by the second Bush administration and the nuclear energy industry as a "*middle way* solution to greenhouse gas emissions" (p. 17).

However, unlike what happens in the climate debate and what happened in the case of tobacco, the narrative of nuclear power as a safe and green energy is a denial strategy supported by a large scientific community. "Nuclear 'deniers' at the academia are not a tiny minority but rather are respected members of the scientific community who specialize in radiation effects" (Perrow, 2013, p. 57). Therefore, they have enough expertise to see the objective risks and to reframe them in a way that seems acceptable. In particular, "most of these experts no longer contend that there is zero harm in low-level radiation, but rather that the range of uncertainty includes zero: In other words, low-level health effects may exist, but they are too small to measure" (Perrow, 2013, p. 57). Of course, the denial of the harmful radiation effects on human health is particularly problematic due to the very well reported impact on human health of the Chernobyl accident (e.g. Alexievich, 2006).

The nuclear deniers in the scientific community are not an isolated community, nor an independent one; their academic work, professional careers, and prestige are strongly dependent upon the existence and success of the civil use of nuclear energy, and therefore upon the success of the nuclear power industry.

The campaigners: the military, government, industry (and the scientific community linked to them)

If we examine which actors have been the main promoters of the association of nuclear energy and decarbonization we realize that the start date of the *nuclear renaissance* campaign can be situated well before the 2000s. In 1983, Alvin M. Weinberg, an American nuclear physicist sponsored to develop nuclear energy by the U.S. government,[6] certified the end of the first nuclear era by pointing to the fact that no new reactors had been ordered in the United States after 1978, and that the partial nuclear meltdown of Three Mile Island in 1979 had wounded the credibility of the nuclear industry. Throughout his career, Weinberg was a "tireless promoter of the expansion of nuclear energy as a means of averting what he called 'Malthusian disaster'." He recognized that "we nuclear people have made a Faustian bargain", with nuclear energy placing exceptional demands on society, and he was an ardent proponent of action to meet those demands (Roberto & Nestor, 2014, p. 8). Weinberg (1983, 1986) wondered what it would take to jump-start a Second Nuclear Era and, long before society was widely aware of the climate change danger, came up with the idea that "the ultimate reason to maintain nuclear energy is this nagging worry about the carbon dioxide issue" (p. 1052). In another paper, Weinberg and other colleagues formally announced a *nuclear renaissance* under the pretense of risks being low and in spite of public opposition (Weinberg, Spiewak, Phung, & Livingston, 1985).

Although the rebirth of nuclear energy did not materialize as Weinberg et al. had prophesized, the nuclear lobby adopted the claim about carbon dioxide emissions as the main pretext for keeping nuclear energy within the pack of viable energetic resources in the context of the climate change crisis. Since then, a number of energy experts, government officials, industry representatives, and journalists have reproduced the narrative of the emergence of a global *nuclear renaissance*. The *renaissance* was supposed to take concrete form in the construction of new nuclear reactors and a concomitant increase in global nuclear capacity.[7] Although nothing of this sort happened (van de Graaff, 2015), the discursive coalition unveiled the symbiotic relationship between the industry, politics, and military interests.

The nuclear power industry comprises the companies that own nuclear power plants, military uses, and the manufacturers of nuclear reactors and plants. The world's two foremost manufacturers of nuclear plants are state-owned companies – the French Orano and Russian Rosaton[8] – which means that in France and Russia the main lobbies for nuclear energy are governmental agencies, preventing any independent approach to the issue by officials, as nuclear energy has become one of the main state industries in those countries.

The third biggest manufacturer, GE/Hitachi, includes one of the world's fifty largest companies, GE, the tenth conglomerate by revenue in the United States (according to the Fortune Global 500) and a powerful lobby – GE acknowledged a U.S. Congress lobbying spending of $353.7 million for the period 1998–2017 (according to Opensecrets.org). On the other hand, the military use of nuclear energy is monopolized by the American and Russian navies. The nuclear energy industry thus represents a major state investment (because of the military expenses on nuclear-propulsion and strong state subsidies to build civil and military nuclear plants), a relevant economic sector (because of the magnitudes involved in the energy business), and a powerful lobby at the same time (by means of the international intergovernmental organizations and the international lobbies representing the interests of private companies).[9]

Though largely kept secret, politics and military aims are even more intertwined. As we mentioned in the introduction, the birth of nuclear energy was strongly linked to the allies' need to improve the negative image of nuclear power, mostly the United States, after the Second World War. However, this seeming redemption was not without purpose: The civil use of nuclear technology was and remains the main excuse for ongoing military development of the technology. The "peaceful atom" fully reveals itself as a myth at this stage. Although after the birth of the nuclear energy industry the peaceful use of nuclear energy became one of the pillars of the treaty of nuclear nonproliferation and nuclear disarmament, the truth is that the civil nuclear industry is more often than not the source of nuclear weapons proliferation (CND, 2018).

In this context, revolving door lobbying is an everyday reality in the entanglement between politics and nuclear weapons, with manufacturers of the main pieces of the U.S. nuclear arsenal investing millions of dollars in the election campaigns of lawmakers that oversee related federal spending, and employing former members of Congress or Capitol Hill staff to lobby for government funding (Smith, 2012; Smith & Hubbard, 2015). The military is actually among the experts that some think tanks trying to influence climate change policies include on their advisory boards, like the U.S. Center for Climate and Security (https://climateandsecurity.org/), an institute that belongs to the Council on Strategic Risks and comprises solely security and military experts.

Finally, the grid made up of the industry, politics, and military spheres managed to add an unexpected group of supporters to their public relations effort in the 2000s, as the pronuclear movement enlisted several environmental celebrities who turned to supporting nuclear energy as a necessary component (often necessary evil) in the fight against climate change. The most prominent of all, James Lovelock, published the article "Nuclear Power Is the Only Green Solution" in 2004, which can be considered the point when the *nuclear renaissance* campaign took off in the media. Other environmental celebrities that changed their opinion about nuclear power were Tom Wigley (BAS, 2014), one of the world's top climate researchers at the University of Adelaide, Australia, and George Montbiot (McCalman & Connelly, 2015), a world-famous British environmental writer. While the latter two have adopted similar stances, supporting nuclear energy as the least worst option to avoid particular threats

(geo-engineering, in the case of Wigley, and economic collapse, for Monbiot) and omitting (or ignoring) the impracticability of a rapid upscaled nuclear power program to advert a global warming crisis (Abbot, 2011), Lovelock has a long history of ties with the nuclear industry, big business, security services, and the anti-green movement (Sourcewatch, n.d.).

In the United States – coinciding with the goal set by George W. Bush's administration of promoting the construction of a few new reactors with substantial federal loan guarantees and subsidies, and the Lieberman-Warner Climate Change Bill supporting "zero-emissions" technologies – the Nuclear Energy Institute (NEI), the industry's main lobby, retained several public relations firms to implement the creation of advocacy groups with green grassroots-sounding names, like the Clean and Safe Energy Coalition (CASEnergy) (Farsetta, 2008b). At the center of these efforts were former U.S. Environmental Protection Agency (EPA) chief Christine Whitman and former Greenpeace member turned corporate consultant Patrick Moore, who actively advocate for nuclear power. CASEnergy was not the only grassroots coalition created by the nuclear lobby, however; other groups – like New Jersey Affordable, Clean, Reliable Energy Coalition or Americans for Energy Independence, the latter a pronuclear lobby group organized and funded by Westinghouse – appeared on the scene advocating for both the building of new nuclear plants and the extension of existing operating licenses (Farsetta, 2008b).

Interestingly, several of the new supporters of the pronuclear coalition due to climate change were also climate skeptics. For instance, Lovelock qualified his early work regarding the warming of the planet as "alarmist" (Carbonbrief, 2012), while Moore does not believe in the anthropogenic causes of climate change and has participated at climate change denial conferences (Desmog, n.a.).

In the UK, after Labor prime minister Tony Blair had told a Confederation of British Industry audience that nuclear power was "back on the agenda with a vengeance" (BBC, 2006), a similar campaign was launched with the participation of high-powered media directors, political advisers, and public affairs companies (Macalister, 2006; Mattinson, 2010).

Overall, the entanglement of interests between the military, the government, and the industrial elites, all of them promoting the growth of a pronuclear scientific community, produced a coalition of interests that shared the same narrative: Nuclear power as a "green" and "clean" energy.

The campaign: reframing the "Faustian bargain" as green

In this section, we review some key literature showing how the nuclear industry's denial narrative has progressively incorporated the "green" frame since Alvin M. Weinberg formally announced a *nuclear renaissance* for our "Faustian bargain" with nuclear energy in 1985. While a number of studies have addressed the media coverage of and public opinion on nuclear energy as a solution for climate change, research regarding how nuclear proponents (industry, government, military, scientists) have strategically framed nuclear energy as a solution to climate change is still underdeveloped.

According to Diana Farsetta, the strategic framing of nuclear power as clean, green, and safe started as early as 1992 in the United States, when the predecessor organization of the Nuclear Energy Institute (NEI) launched an advertising campaign making statements like "Nuclear plants don't pollute the air", "Nuclear plants produce no greenhouse gases", and "[Nuclear energy] means cleaner air for the planet" (2008b, pp. 39, 41). NEI again ran advertising campaigns in 1998 and 1999 in U.S. national newspapers and magazines with the same claim regarding the "environmentally clean" trait of nuclear energy. In 2006, aiming to garner public support for the Yucca Mountain project, a repository for nuclear waste, NEI launched what Farsetta calls a "multi-year, multimillion dollar campaign" (p. 38) under the direction of public relations firm Hill & Knowlton and polling and market research firm Penn, Schoen & Berland Associates. The Yucca Mountain campaign again framed nuclear power as an environmentally friendly electricity source.[10] According to Farsetta, nuclear companies were quick to take advantage of this by distributing materials that promised a green future with nuclear energy (p. 38). These advertising campaigns were only the tip of the iceberg in a public relations campaign that included the already mentioned creation of grassroots coalitions supporting nuclear energy on the basis of green arguments. Farsetta states that those communication efforts to rebrand nuclear as green were "only the latest in a series of public relations efforts to convince the U.S. public that fission is the ticket to a clean, efficient, and safe energy future" (2008b, p. 38).

In Europe, Karen Bickerstaff, Lorenzoni, Pidgeon, Poortinga, and Simmons (2008) – in their study on how UK citizens might interpret and make sense of a shift in political rhetoric around energy policy, which links nuclear power to meeting sustainability objectives – reviewed how the debate around nuclear power has been reframed in the United Kingdom since the end of the 20th century as part of the solution to the need for low-carbon energy options:

> The point we make here is that expansion of the nuclear power sector is increasingly being constructed, by industrial actors, scientists, a range of senior politicians and advisors to government within a prognostic policy frame – in other words it is being reframed as a solution to the problem of climate change.
>
> (p. 147)

According to Bickerstaff et al. (2008), the main frame that has been used by the industry with the goal of shifting public opinion is "risk trade-off", which means choosing the risks of nuclear power over the possible consequences of climate change, if not mitigated. Within this narrative, the climate change issue is so big that the risks of nuclear power should simply be put to one side, because if not the human species will be allowing the larger disaster to happen. These authors also discuss nuclear power being promoted as the only way for countries to meet their national carbon emission targets.

Banerjee and Bonnefous (2011) studied the discourse of one of the world's largest nuclear power generators (not named in the research) and described

how the company managed the conflicting interests in what the authors call "the sustainability debate". Interestingly, they concluded that "despite public espousals of integrating social and environmental concerns in an aim to make the nuclear industry more 'sustainable' there is no significant shift in the corporate world view with a 'business as usual' approach that places a priority on economic growth" (p. 3).

Regarding politics, Bern and Winkel (2013) investigated how discourses on nuclear energy developed over a twenty-year period (1998–2008) in the French and German parliaments. While the link to climate change was made by policy makers in both countries, "the greenhouse effect rationale was taken up more proactively in the French parliamentary debates" (Bern & Winkel, 2013, p. 308). Thus, political proponents of nuclear energy have framed nuclear energy as an appropriate reaction to this environmental challenge in both countries, but "using the greenhouse effect argument, the French pro-nuclear discourse has a clear moralist dimension; the nuclear energy option is seen as right and other alternatives as wrong" (p. 306). Interestingly, among the frames discovered for both countries was the "lack of knowledge of the anti-nuclear" frame. In particular, the three frames more frequently employed in the French parliamentary discussions during the period were the "French exception" (nuclear energy for energy independence, economic growth, and the environment): "Transparency ensures public support" (when citizens oppose nuclear energy it is because they are not properly informed), and "Technological progress ensures future" (technology skepticism being identified as "heretical" by the researchers) (p. 298). The three frames more frequently employed in the German parliament were "Peaceful use of nuclear energy for modern civilization" (the belief that nuclear energy is needed to establish and maintain a modern economy and the social welfare state), "Manageable risk of technology" (risk-management calculations are seen as rational and objective), and "Danger of energy gap" (that the risks described by the anti-nuclear movement are distorted facts and unnecessary scare tactics) (2013, pp. 298–299).

More recently, in her research on the creation and failure of the *nuclear renaissance*, Shashi van de Graaf describes how nuclear advocates have reframed the merits of nuclear power by means of two key arguments:

> Firstly, the growing importance of climate change as a policy problem meant that governments were in need of an affordable energy solution that could help to reduce carbon emissions. The nuclear industry capitalised on this by actively reframing nuclear power as a "green" energy technology. Public information campaigns and lobbying efforts were undertaken to advertise nuclear power as one of the lowest greenhouse gas emitters of any method of electricity generation. Secondly, increasing geopolitical instability in Russia and the Middle East raised concerns about an over-reliance on fossil fuel imports, prompting policymakers to seek alternative energy solutions that would improve their energy security. Nuclear power appeared to pose an ideal solution for countries seeking to improve

> their energy independence. The combination of these two compelling arguments – environment and energy security – were meant to be "game changers" in the nuclear debate that would convince sceptics of the need for nuclear energy.
>
> (2016, p. 1)

By way of summary, the literature review conducted in this section allows us to extract a list of subframes that help deconstruct how the green frame (nuclear energy as a solution to global warming) has been shaped by pronuclear advocates. These subframes include framing nuclear energy as: Low in carbon emissions; the most cost effective, secure, and environmentally friendly energy solution; essential in any energy mix; helping to meet CO_2 cut targets; bridging the energy gap; and with risks that are an acceptable trade-off for our dependence on its products and services.

The alleged cleanness and green attributes of nuclear energy constitute the core frame of the *nuclear renaissance* campaign. However, although prominent, it is not the only frame. There is another, already noted by some authors previously, which it makes sense to mention because it strongly reinforces the environmental frame. This frame refers to the aura of "trustworthiness" that is being created by nuclear advocates, with the aim of making the audience put nuclear risks to the back of their minds and simply "believe" in its benefits. One piece of research that yielded significant findings in this respect is that conducted by Hanninen and Yli-Kauhaluoma (2015) on the newsletters by the ONKALO repository, a deep geological repository for the final disposal of spent nuclear fuel that has been under construction in Finland since 2004 (in fact, it is still unclear whether it will be ever in operation). As the authors acknowledge, this research takes part in the academic discussion on the "nuclear power industry's attempts to build trust within local lay communities (Clarke, 2001; Durant & Johnson, 2010; MacKenzie, 1990; Sagan, 1993) and pronuclear storytelling (Anshelm, 2010; Catellani, 2012; Kinsella, 2005)" (2015, p. 142). The authors show how the industry aims to build public trust in a nuclear facility and lessen local resistance by socially constructing a nuclear community around the facility, an "imagery of togetherness associated with nuclear works, local culture, and the past" (p. 142). The study confirms that it has become increasingly important for the nuclear industry to persuade communities into taking a leap of faith and develop "a cocoon of invulnerability" (p. 134), what the authors describe as a "new trend in pronuclear storytelling" (p. 133) – a sort of *absolute trust in the benefits* frame. What those benefits are is not always clear. Since nuclear industry communication places much emphasis on its "expertise" and "scientific agency", these benefits are often communicated merely as "societal benefits", "environmental benefits", or "economic benefits" in the case of the ONKALO communications. This frame encourages the audience to trust nuclear experts, in line with the pronuclear storytelling identified by Kinsella (2005) in North America, a storytelling based on equating nuclear energy expertise with an esoteric scientific knowledge beyond the scope of ordinary citizens.

Discussion

In 2005, with respect to nuclear communication in the United States, the American scholar William J. Kinsella identified a tendency towards public "disempowerment" and the construction of a "modernistic" basic narrative. By *disempowerment* Kinsella was pointing to the fact that nuclear communication tended to present nuclear power as a subject beyond the control and intervention of ordinary people, and thus excluding their participation from the debate, narrowing the possibilities for discussion and the contrasting of different opinions on nuclear energy. With regard to the "modernistic" narrative, Kinsella described how nuclear energy is presented as an evolution in the history of humankind, linked to the narrative of progress within the ideology of the Enlightenment (with faith in science, reason, and technology occupying the place of religion).

Recent research shows how Kinsella's findings have been globalized by the nuclear energy lobby and adapted to a reframed version, including cleanness and greenness, among other traits. In 2012, Andrea Catellani published a piece of research with a semiotic analysis of the pronuclear rhetorical forms that emerged in Europe after the Fukushima accident, confirming that new forms of the traditional "modernist" narrative of nuclear energy had appeared, with the eventual presence of forms of "disempowerment" and the "meta-narrative" of the environment in nuclear discourses and hedonistic individualism. Regarding the former, Catellani (2012)states:

> The first form of adaptation is the appearance of the environment and of its protection. Following the postmodern theory of "grand" or "meta-narratives" (global narrative forms of sense organization, such as religions or political ideologies), some scholars have proposed considering the narrative based on menaces, destruction and protection of the environment as a new meta-narrative, which emerged after the (partial) elimination (at least in some parts of the world) of the traditional ones (Catellani, 2010; Jalenques, 2006). A meta-narrative can be seen as a supply of sense, signs and meaning, which can be mobilized and used by concrete social actors in their discourses.
>
> (p. 301)

In view of the historical account and literature review presented in this chapter, it seems obvious to us that the environmental narrative as promoted by the pronuclear movement over the last twenty years can be seen as a meta-narrative of nuclear denial, that is, a renewed attempt to provide a new source of meaning to the old pronuclear narrative based on simply denying the main facts of nuclear energy. As Abbot states, "the fervor with which the number of nuclear advocates have taken up the cause of climate change appears somewhat opportunistic" (2011, p. 1616). This resonates with previous frames attempted by the nuclear industry since the "Atoms for Peace" campaign. Farsetta has already pointed out that "the most striking thing about campaigns to promote nuclear

energy is how little the tactics and messages have changed over the decades" (2008b, p. 41).

This chapter's conclusions align with the aforementioned thesis. We can describe the *nuclear renaissance* campaign as being based on an opportunistic environmental claim that attempts to capitalize on the concerns raised by climate change and energy security in recent decades. A multiplicity of interests have built a discourse coalition that promotes a narrative based on new forms of the traditional "modernistic" narrative regarding nuclear energy, and the eventual presence of forms of "disempowerment", with nuclear energy mostly framed as a controversy between experts (the pronuclears) and nonexperts (the ones against nuclear energy). What these interests all have in common is that they are elitist interests – fulfilling the definition of a "power elite" as stated by C. Wright Mills: "Composed of political, economic, and military men" (1956/2000, p. 376) – and they have needed regular public relations efforts to justify themselves.

Although a small number of academics, journalists, and nuclear industry representatives continue to make the claim that a *nuclear renaissance* has been successful and is taking place, authors like Shashi van de Graaff have clearly shown that there is a huge gap between reality and the expectation of reality created by the campaign. The reasons provided by authors for this public relations failure are mainly the three big nuclear accidents (Three Mile Island, Chernobyl, and Fukushima), specific nuclear factors (related to the construction, operation, and management of nuclear power plants), and contextual factors (shifts in the perceptions, ideas, and priorities of society). While van de Graaff (2015), for instance, argues that the most important factors are contextual, authors like Elliott (2013) remind us how the Fukushima nuclear disaster produced delays and full reviews of nuclear energy programs around the world. However, we argue that the most important factor preventing any *renaissance* in nuclear energy is actually pointed out loud and clear by pronuclear proponents, as MIT again stated in its 2018 report: "The fundamental problem is cost".

We also conclude from our analysis that the *nuclear renaissance* public relations campaign has not been a total failure, since the idea of nuclear energy as a candidate for decarbonization has been successfully established, as revealed by its inclusion as part of the energy pack to fight against climate change in IPCC and government reports and the media. This success has been constructed using the same strategy as that of the tobacco and climate change deniers, neutralizing the reality of facts by casting doubts on them and thus generating scientific confusion. This confusion is then fed by the esoteric component of the denial narrative, which links our exploitation of resources on Earth to our beliefs in the superiority of human knowledge. Thus, nuclear energy continues to be associated with the mystery, potency, secrecy, and entelechy of the old modernist tale, while ordinary citizens are requested to leave their doubts aside and just trust – this time in nuclear science. This can even be done with a patronizing attitude, as was true of the moralist dimension of the pronuclear claim identified by Bern and Winkel (2013) in the French case.

The *nuclear renaissance* campaign, with its environmental reframing of the Faustian bargain (climate change as the modern evil), clearly seems to have failed

from a political economy point of view, but is far from a failure at the symbolic level. With regard to ideas, nuclear denial has proven to be a public relations success tantamount to the tobacco and climate change denial campaigns.

Notes

1 The authors would like to thank energy experts Marcel Coderch, Miguel Muñiz, and Ferran P. Vilar for their advice on the issues raised in this chapter.

2 For an extended review of these problems see Smith (2006), Caldicott (2007), Coderch and Almiron (2008), Cooke (2009) or Storm van Leeuwen (2017). It is noticeable that few volumes have been published after 2010 regarding costs and risks of nuclear energy. After the announced *nuclear renaissance* some authors refreshed the criticism to nuclear energy only to reflect that there has been no real progress on the risks and problems of nuclear energy since its birth.

3 The first nuclear reactor Westinghouse manufactured for the Shippingport plant was fully subsidized by the state, its operation failing to attract private investments because of the high costs involved. It was state subsidies and laws such as the U.S. Price-Anderson Act – passed in 1957 – that seduced private enterprise. This U.S. law, which was replicated in the other countries with nuclear power plants, transfers any subsidiary civil liability in the event of a nuclear accident to the state. Thus, operators would only be liable for the part that insurers were willing to cover, and the state would assume the rest. Consequently, heavily subsidized state programs were required for the civil nuclear power industry to take off around the world.

4 Plutonium-239, for instance, has a half-life of over 24,000 years, which means it will remain lethal for over 240,000 years. Other radio-isotopes remain radioactive for millions or even billions of years.

5 *Nuclear proliferation* refers to the spread of nuclear weapons, fissionable material, and weapons-applicable nuclear technology and information to nations not recognized as "Nuclear Weapon States" by the Treaty on the Non-Proliferation of Nuclear Weapons.

6 Alvin M Weinberg's work was always linked to U.S. national projects related to the development of nuclear power. In 1941, he joined the Manhattan Project's Metallurgical Laboratory. The following year he became part of Eugene Wigner's Theoretical Group, whose task was to design the nuclear reactors that would convert uranium into plutonium. In the 1950s he headed the ORNL, an American multiprogram science and technology national laboratory sponsored by the U.S. Department of Energy (DOE). Much of the research performed at ORNL in the 1950s was related to nuclear reactors (Roberto & Nestor, 2014).

7 According to van de Graaff (2015), a number of changes took place "which lent credence to the claim that a nuclear renaissance was about to take place across the globe, or was already underway": (1) the fact that ambitious growth targets and expansion plans were announced by several countries with civil nuclear power programs in Asia, Europe, and North America; (2) countries that had planned phasing-out existing nuclear power plants began to reevaluate their positions; and (3) figures from the World Nuclear Association, the largest nuclear lobby, indicated that an important number of other countries that did not use nuclear energy were seriously considering using it. Van de Graaf states that by 2010 "social and political commentators began pronouncing the nuclear renaissance to have failed, or to never have existed at all". This author provides a summary of the press coverage of the issue, which qualified the renaissance as a "myth". Van de Graaf (2015) justifies the failure of this campaign with "nuclear specific factors" (the factors related to the construction, operation, and management of nuclear plants) and "contextual factors" (related to change in the political and social context).

8 In 2018, the major manufacturers of nuclear reactors were state-owned Orano (former Areva, in France), state-owned Rosatom (Russia), General Electric/Hitachi (U.S./Japan), Kepco (South Korea), and Mitsubishi heavy industries (Japan).

9 The most important intergovernmental agencies are the Atomic Energy Agency (IEAC) (which still retains the slogan "atoms for peace and development"), the Nuclear Energy Agency (NEA), which belongs to the Organization for Economic Co-operation and Development (OECD), and the European Atomic Energy Community (EAEC or Euratom). Besides the many national and regional trade associations working on behalf of the nuclear industry, the World Nuclear Association (WNA) is the main global nuclear lobby.

10 The public relations campaign for the Yucca Mountain nuclear waste repository was ineffective – "opposition to the repository actually increased" (Farsetta, 2008b, p. 41) – and the Obama administration terminated the project in 2011. No nuclear waste repository had yet become operative in the United States by 2018, nor anywhere else in the world.

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