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## **A Way out of Darkness: Thinking about the Future of Spain through the Promises of Electricity and Energy Abundance, 1898–1931**

**Résumé**

Cet article historicise l'électricité et l'abondance énergétique et leur relation avec la reconfiguration du pouvoir politique dans un contexte de déclin national (auto-perçu). Il analyse la manière dont l'électricité a été utilisée pour générer toute une série de récits sociaux sur la modernisation nationale et, plus important encore, il met en lumière les façons contestées dont l'électricité a été interprétée selon certaines des lignes qui divisaient le paysage idéologique de l'Espagne au début du 20e siècle. En tant que tel, l'article aborde « l'électricité » et « l'électrification » comme des sites de controverse dénotant des préférences, des visions et des idéaux opposés sur la manière d'organiser la nation et la communauté espagnoles futures et, surtout, sur la manière de faire face aux défis du moment.

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**Plan de l'article**

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- Electrifying Spanish Catholicism
- Libertarian Electricity
- Conclusions

## INTRODUCTION

- 1 In 1927, the Spanish lawyer and author Emilio Zurano Muñoz (1857–1943) published the book *Las corrientes del estrecho de Gibraltar como fuentes de energía eléctrica* (The Sea Currents of the Strait of Gibraltar as a Source of Electric Power). The work discussed the possibility of exploiting the Mediterranean and Atlantic’s tidal currents converging at the strait of Gibraltar to boost the country’s overdue industrialization, as Zurano estimated the amount of electricity to be produced in 30.7 billion horsepower (HP):

At the point where the Mediterranean Sea and Atlantic Ocean meet, Spain has an endless treasure of billions of electric HP that can be used according to the solid principles of Science ... Such electric power could reach the pitheads in such quantities that would melt the most resistant metals; national transportation could also take advantage of electricity beyond need at lower prices and without any competition; nitrogen fertilizers may be also extracted [via electricity] ... in higher quantities for the needs of our agriculture; all industries could profit from it beyond any limit up to the high of convenience.<sup>1</sup>

- 2 Zurano, a strong supporter of the monarchy, inserted this energy-utopia within a clear nationalistic narrative, given the importance that claims over the British overseas territory of Gibraltar traditionally had within Spanish ultranationalist circles. Although Zurano was not able to describe the technical procedure to store and transport such an incredible amount of power, energy production, he contended, would compensate Spain’s decline so that the country would regain its “rightful place” amongst other well-developed and industrialized nations.<sup>2</sup> These claims

occurred at a key moment in Spanish history, during the crisis of the Bourbon Restoration era (1874–1931) and when memories of the so-called “Disaster” (the loss of the last remnants of the overseas empire after the Spanish-American War of 1898) lingered on.

Overall, Zurano’s work echoed widespread transnational understandings of electricity and energy abundance as the key to attain a better future in early 20<sup>th</sup> C. A great deal of literature has discussed how electricity, once it got industrialized in the West during the last third of the 19<sup>th</sup> C., began to be represented as a socio-technical transformative force infused with collective values and integral to notions of development, economic growth, and civilization.<sup>3</sup> These culturally constructed perceptions of electricity as a progressive cultural agent usually revolved around narratives of energy abundance. In a European context of growing colonialism, nationalism, and capitalist competition, different cultural sources participated in shaping energy-based visions of human society whereby endless energy provision would facilitate industrial, urban, and economic flourish without material limits. I argue that the articulation of these collective visions about a brighter “electrical future” acquired an unprecedented urgency in a country such as Spain, where collective cravings for an ever-growing supply of electricity during the first third of the 20<sup>th</sup> C. were shaped by perceptions of national (and imperial) decline.<sup>4</sup> Debates around

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of Science and work. This is how our industrial activities will flourish” (Ibid., 11).

<sup>3</sup> Benjamin K. Sovacool, Brent Brossmann, “Fantastic Futures and Three American Energy Transitions”, *Science as Culture*, vol. 22, n° 2, 2013, 204–205. Utopic but also dystopic technological fictions were almost omnipresent in scientific, political, and public discourses in 19<sup>th</sup> C., and became an integral part of popular culture. On the limits of those electrical dreams Iwan Rhys Morus, “The Nervous System of Britain: Space, Time and the Electric Telegraph in the Victorian Age”, *British Journal for the History of Science*, vol. 33, n° 4, 2000, 455–475; on the practicalities of those visions, see Graeme Gooday, “Electrical Futures Past”, *Endeavour*, vol. 29, n° 4, 2005, 150–155.

<sup>4</sup> See David Edgerton, *The Rise and Fall of the British Nation: A Twentieth-Century History* (London: Allen Lane, 2018). On the energy basis of nationalism, see Sorcha O’Brien, *Powering the Nation: Images of the Shannon*

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<sup>1</sup> Emilio Zurano Muñoz, *Las corrientes del estrecho de Gibraltar como fuentes de energía eléctrica* (Madrid: Imprenta de Juan Pueyo, 1927), 7–8. All original quotations from Spanish translated by the author unless otherwise stated.

<sup>2</sup> Energy production was therefore described as “a way for Spain to look victorious and with haughty superiority over the wounds inflicted on us by History. This is how our triumph will be great and glorious, rising from the pedestal

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technology and nation in Spain were certainly not new. For example, Spanish engineers had already tried to articulate a technological national culture through canals, railways, and urban developments in the 19<sup>th</sup> C.<sup>5</sup> Hence, electricity was appropriated through an already existent technological nationalist narrative. Nevertheless, its reception was inseparable from end-of-the-century discussions of decadence and national disaster. Within this framework, the transition to a new energy regime represented by (hydro)electricity galvanized much of the collective hopes for national regeneration, especially given Spain's traditional lack of good energy resources and poor coal endowment.<sup>6</sup>

- 4 This article therefore historicizes the hope for electricity and energy abundance and their relation to the reconfiguration of political power in a context of national decline. It analyses how electricity was used to generate a whole series of social narratives on national modernization and, most importantly, it highlights the contested ways in which it was interpreted along some of the lines that divided the country's ideological landscape at the beginning of the 20<sup>th</sup> C. Within a period of national uncertainty, political and social crisis, in which different industrializing, modernizing — even nationalizing — schemes coexisted, I examine encounters with electricity involving three different social, technical, and ideological actors: members of the Spanish engineering community, the Catholic Church, and the libertarian labour movement. Therefore, this essay offers a re-reading of engineers as “system-builders” in canonical Hughesian narratives by looking at their engagements with wider and

differentiated socio-political and national concerns, while at the same time introducing other influential actors in the Spanish political and public life of early 20<sup>th</sup> C. Although, as I will later show, narratives around energy abundance as the key to a brighter future found ample support among the public and were shared by different branches of the political spectrum — thus providing a potential common script — these different groups mobilized electricity within their specific and evolving political, social, and economic agendas and imaginaries, resulting in non-consensual energy futures and divergent energy scenarios. Therefore, this article addresses “electricity” and “electrification” — including the national grid — as sites of controversy that denoted opposing preferences, visions, and ideals about how to organize the future Spanish nation and community and, crucially, how to cope with the challenges of the moment. Hence, this text aims at contributing to current literature on past energy futures and energy imaginaries, specifically by showing what type of information they bring up about the open agendas that energy entails in relation to the discussion and projection of their role in shaping our future.

5 Inquiries on past energy futures and energy imaginaries constitute a recent and fruitful avenue for energy historians. Historical research indicates that not only economic and technological factors mattered in the advent of energy regimes. There is a growing focus on the study of the overlap between energy-related technologies and sources but also actors' discourses and cultural perceptions of energy. In particular, current research endeavours to understand how fantasies around energy sources were historically formed, evolved and which role they played in energy transitions. Energy imaginaries and other cultural aspects of energy are indeed critical for contemporary discussions about energy.<sup>7</sup> In fact, scholars in Energy Humanities

*Scheme and Electricity in Ireland* (Kildare: Irish Academic Press, 2017); Fredrik Meiton, *Electrical Palestine: Capital and Technology from Empire to Nation* (Oakland, CA: University of California Press, 2019).

<sup>5</sup> Tiago Saraiva, *Ciencia y ciudad: Madrid y Lisboa, 1851-1900* (Madrid: Ayuntamiento, Área de Gobierno de las Artes, 2006).

<sup>6</sup> On resource shortages and crisis — real or perceived — see Paul Warde, “Early Modern ‘Resource Crisis’: the Wood Shortage Debates in Europe”, in A.T. Brown, Andy Burn, Rob Doherty (eds.), *Crises in Economic and Social History: A Comparative Perspective* (Martlesham: Boydell Press, 2015), 137-160.

<sup>7</sup> Energy utopias and imaginaries have had an instrumental role in providing compelling narratives about the desirable future, allowing or blocking innovation, or allocating the risks and opportunities of new energy technologies differently, thus perpetuating or enabling energy transitions.

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are using insights from Science and Technology Studies to show how powerful energy imaginaries can shape how nation-states and the public understand energy sources and transitions, thus affecting energy choices and policies.<sup>8</sup> This article identifies the mechanisms and functions of past energy futures and shows a more complex picture of the approach to national energy imaginaries. Most of the literature tend to give the impression of coherent and homogeneous energy imaginaries at the national level, even if they are the outcome of negotiations and conflicts among several historical actors. By contrast, my contribution here emphasises the diversity of ideas and values that could result in alternative and discordant perspectives about energy transitions as embedded within larger and evolving processes of social and political change. In early 20<sup>th</sup> C. Spain, energy imaginaries mattered since most conversations around energy revolved around notions separated from energy sources or technologies and were aimed at addressing wider social, cultural, economic, and political challenges in a country that lacked electrification and an even industrialization. Although historian Thomas F. Glick has convincingly proved how the '98 defeat prompted the emergence of a "civic" public discourse around the importance of science and technology in Spain's modernization after decades of polemics, agitations and controversies, my perspective, nevertheless, emphasizes the contested nature of electrification, even though it certainly opened up potentially new avenues for cooperation.<sup>9</sup> It is certainly true that technology did not have to

be, in principle, as polemic as certain scientific discoveries, as, for instance, was the case with Darwinism, since it posed a direct threat to the Church's cultural hegemony. Nevertheless, technology, and, notably, the possibilities of industrializing the country had their own controversies. After all, industrial modernization contained vastly different worldviews and notions about what type of society could emerge. Hence, the patterns of reception of electricity in Spain were determined in large part by the specific profiles of the different ideological sectors involved and their political cultures.

Furthermore, this article addresses representations and cultural perceptions of electricity as a way of challenging the political and cultural promises of narratives of energy surplus as associated with civilizational advancements. The literature on electrical and energy history has for some time accepted the tacit assumption that society's ever-growing longing for energy was some sort of implicit precondition for the uptake of energy infrastructures, as they would simply accommodate the "natural" growing desire for more energy.<sup>10</sup> Current scholarship is questioning these teleological narratives by asking how that "need" for energy historically arose and evolved. This includes elucidating where, why, and how a social narrative promising energy abundance developed and perpetuated, and how it shaped social and cultural perceptions as well as expectations around energy in the past and in our current high-energy societies.<sup>11</sup> A genealogy of energy abundance (in a Foucauldian sense) is needed given that our current energy dependence goes beyond strict technical or economic rationality. As such, energy scholars are trying to address energy abundance within the inquiry of our current "energy epistemologies", that is to say, our

See, for instance, Ute Hasenöhr, Jan-Henrik Meyer, "The Energy Challenge in Historical Perspective", *Technology and Culture*, vol. 61, n° 1, 2020, 300-301.

<sup>8</sup> Sheila Jasanoff, Sang-Hyun Kim, "Sociotechnical Imaginaries and National Energy Policies", *Science as Culture*, vol. 22, n° 2, 2013, 189-196.

<sup>9</sup> Glick describes a Spanish political community sharply polarized over the goals, meanings, and contents of science and technology throughout the 19<sup>th</sup> C. amidst a problematic process of both nation building and setting up the modern liberal state. However, around 1900 a new consensus was reached, albeit tacit and informal, so that ideological enemies would participate "in the common task of modernization in a climate of civil discourse" (Thomas F. Glick, *Einstein in Spain: Relativity and the Recovery of Science* (Princeton, NJ: Princeton University Press, 1988), 8-9).

<sup>10</sup> A critique of this idea by exploring the central role of energy transport infrastructure in shaping supply and demand in Christopher Jones, *Routes of Power: Energy and Modern America* (Cambridge, MA: Harvard University Press, 2014).

<sup>11</sup> Nina Möllers, Karin Zachmann (eds.), *Past and Present Energy Societies: How Energy Connects Politics, Technologies and Cultures* (Bielefeld: Transcript Verlag, 2012), 7-42.

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ways of knowing, describing, and understanding our life with and without energies.<sup>12</sup> Along these lines, “energy abundance” emerges not only as the possible and tangible outcome of brand-new energy-technologies or infrastructures, but also as an ideological force that has historically connected ever-greater uses of energy with ideas of a self-sustained, persistent, and unlimited economic growth, national pride and societal wellbeing and progress. This “energy-civilisation equation” originated in a specific time and place, serving distinct purposes, and creating our current energy-intensive consumption patterns and landscapes.<sup>13</sup> As a result, our modern experience has been enabled and sustained by certain energy cultures that have historically included collective fantasies and expectations built around the fictions of cheap and abundant energy surplus.<sup>14</sup> This article contributes to these debates by interrogating ideologies of energy abundance in contexts of self-perceived national decline, but also in moments of profound political and social upheaval.

- 7 The first section of the article addresses Spanish engineers’ encounters with electricity. Elite professionals were especially concerned with the

<sup>12</sup> For an elaboration of the idea of energy epistemologies, see Imre Szeman, “How to Know about Oil: Energy Epistemologies and Political Futures”, *Journal of Canadian Studies / Revue d’études canadiennes*, vol. 47, n° 3, 2013, 145–168; Imre Szeman, Dominic Boyer (eds.), *Energy Humanities: An Anthology* (Baltimore, MD: JHU Press, 2017), 11–12.

<sup>13</sup> On this (Western-dominated) energy epistemology that emerged in the factories of industrial Europe in early 19<sup>th</sup> C. and was propelled by the Global North, see Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (Brooklyn, NY: Verso Books, 2016), 12; Cara New Daggett, *The Birth of Energy: Fossil Fuels, Thermodynamics, and the Politics of Work* (Durham, NC: Duke University Press, 2019), 1–12; an approach from the Global South in Elizabeth Chatterjee, “The Asian Anthropocene: Electricity and Fossil Developmentalism”, *Journal of Asian Studies*, vol. 79, n° 1, 2020, 3–24; on the sort of energy determinism these historical narratives entail, see Thomas Turnbull, “Energy, History, and the Humanities: Against a New Determinism”, *History and Technology*, vol. 37, n° 2, 2021, 247–292.

<sup>14</sup> Bob Johnson, *Carbon Nation: Fossil Fuels in the Making of American Culture* (Lawrence, KS: University Press of Kansas, 2014); Frederick Buell, “A Short History of Oil Cultures: Or, the Marriage of Catastrophe and Exuberance”, *Journal of American Studies*, vol. 46, n° 2, 2012, 286–287.

role that cheap and abundant (hydro)electricity would have in powering up a decaying nation, revitalizing economy and creating an industrial break-through through the systematic exploitation of the country’s energy assets via large technological systems. However, despite the general desire for increasing the output of energy, debates over the possibility of a “national grid” in the 1910s and 1920s would be shaped by the diversity of Spain’s engineering communities and their oftentimes opposite outlooks. The second section discusses Catholic confrontations with electricity. Although Spanish Catholics overall coincided in promoting an ever-growing supply of energy to reinvigorate the country, some practitioners and religious authorities — in particular, the clerical Right and militant conservative Catholics — thought of electrification as a disruptive element in a traditional and idealized agrarian country. Their discussions on the possibility of an energy transition would then revolve around how to ascribe identifiable Catholic values to electricity and how to promote a specific industrializing scheme able to fulfil a certain retro-modern utopia. Finally, Spanish anarchists shared the same energy-intensive visions, although they emphasized the need for a radical change in the ways of socially organizing energy resources and technologies. Moreover, since energy infrastructures materialized certain forms of social and political hegemony — mostly corporate and state power —, controlling the electrical network (or, at least, parts of it) would become a precondition to subvert the capitalist order and attain the dream of an egalitarian and libertarian Spain. From a much more pragmatic perspective, however, energy strikes in the 1910s were essential not in radically transforming the country, but in achieving labour improvements, such as the eight hour-day.

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## ENGINEERING THE NATION

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After the democratic experience of the Six Revolutionary Years (1868–1874), the Bourbon Monarchy was restored in 1874. The Restoration regime (1874–1931) represented a conservative reaction that sanctioned the triumph of a political and economic oligarchy consisting in the

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old agrarian aristocracy and a new bourgeoisie, whose wealth was mostly based on land ownership and public debt investments.<sup>15</sup> In that context, Spain lost the last remnants of its overseas empire (Cuba, Guam, Puerto Rico, and the Philippines) during the Spanish–American War of 1898. Due to the humiliating defeat of a technically obsolete navy, Spain could not sustain anymore the fiction of being a world superpower.<sup>16</sup> The '98 events were not simply identified with the weaknesses of the state or the political class but with the failure of Spain as a national project and the culmination of its decline throughout the 19<sup>th</sup> C.<sup>17</sup> The identity crisis that followed gave rise to all manner of opposition movements at the regional and national level, which included democrats and republican groups, socialist and anarchist labour unions, along with other political nationalisms in industrial areas such as Catalonia and the Basque Country.<sup>18</sup> In sum, the coexistence of different proposals to “regenerate” and (re)nationalize the country made visible the tensions among divergent political and social

groups with deep and passionate disagreements about the nation’s present and future.<sup>19</sup>

Spanish engineers eagerly participated in the debates prompted by the '98 defeat; some of them would even become key figures within the “regenerationism” intellectual movement.<sup>20</sup> Engineers constituted a group of elite professionals whose position was consolidated in the second half of the 19<sup>th</sup> C. as member of the emerging social groups organized around profession. Their social position was not only based on individual merit, but also on techno-scientific “useful-knowledge” acquired through formalized education, placing them in a privileged position. It is true, however, that they exhibited a huge variety of profiles regarding their training, practices, social and regional backgrounds, and political allegiances.<sup>21</sup> Yet, they shared the same positivistic views that brought together their scientific ethos and a program for social and national improvements as quintessential feature of their professional ideology. This was certainly a common disposition among European engineers

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**15** Industrial development was thus relegated to a secondary role in Spanish modernization, although the 1874–1918 period saw some industrial flourishing through extreme protectionist measures in some regions such as Catalonia, the Basque Country, Andalusia, or Asturias.

**16** Sebastian Balfour, “The Loss of Empire, Regenerationism, and the Forging of a Myth of national Identity”, in Jo Labanyi, Helen Graham (eds.), *Spanish Cultural Studies: An Introduction* (Oxford: Oxford University Press, 1995), 25–31. The “Disaster” — as the defeat was popularly known — has been considered a turning-point in Spanish history, albeit historians have recently reasserted its meanings; see, for instance, Juan Pan-Montojo, “Introducción. ¿98 o fin de siglo?”, in Juan Pan-Montojo (ed.), *Más se perdió en Cuba España, 1898 y la crisis de fin de siglo* (Madrid: Alianza Editorial, 1998), 9–30.

**17** Javier Álvarez-Junco, “La nación en duda”, in Juan Pan-Montojo (ed.), *Más se perdió en Cuba España, 1898 y la crisis de fin de siglo* (Madrid: Alianza Editorial, 1998), 405–476; Joseph Harrison, Alan Hoyle (eds.), *Spain’s 1898 Crisis: Regenerationism, Modernism, Postcolonialism* (Manchester: Manchester University Press, 2000). However, the “Disaster” should also be framed within a wider international (at least, European) end-of-the-century context marked by lingering anxieties about national decadence even in the “early-industrialized” countries.

**18** Eric Storm, “The Problems of the Spanish Nation–Building Process around 1900”, *National Identities*, vol. 6, nº 2, 2004, 143–156.

**19** “Regenerationism” — an intellectual and political movement which predated 1898 — gained momentum as a deliberately vague and ambiguous concept with all sorts of schemes to “regenerate” Spain. Clare Mar-Molinero, Angel Smith (eds.), *Nationalism and the Nation in the Iberian Peninsula: Competing and Conflicting Identities* (Oxford: Berg, 1996); Javier Álvarez-Junco, *Spanish Identity in the Age of Nations* (Manchester: Manchester University Press, 2011).

**20** For example, the civil engineer Pablo de Alzola y Minondo (1857–1912) published *Las obras públicas en España* (1892) (Public Works in Spain) where he argued for the invigorating effect of infrastructures as the carriers of the socio-political regeneration of the country. Leoncio López-Ocón, “Los científicos en la esfera pública en torno a 1898: el caso de las actitudes regeneracionistas de Lucas Mallada”, in Octavio Ruiz Manjón Cabeza, María Alicia Langa Laorga (eds.), *Los significados del 98: la sociedad española en la génesis del siglo XX* (Madrid: Biblioteca Nueva, 1999), 683–692.

**21** Manuel Silva Suárez, Guillermo Lusa Monforte, “Cuerpos facultativos del Estado versus profesión liberal”, in Manuel Silva Suárez (ed.), *Técnica e ingeniería en España*, vol. 4, *El Ochocientos: pensamiento, profesiones y Sociedad* (Zaragoza: Prensas Universitarias de Zaragoza, 2007), 323–386.; Antoni Roca-Rosell et al., “Industrial Engineering in Spain in the First Half of the Twentieth Century: From Renewal to Crisis”, *History of Technology*, vol. 27, 2007, 147–162.

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in the late 19<sup>th</sup> C., but the “Disaster” encouraged a common historical perspective according to which the decadence of Spain was the result of the abandonment of science and technology. Hence, since a new model of industrial development to revive the country was needed, engineers could easily become activists within “regenerationism”. As a matter of fact, technological imperatives arising from speedy attempts at industrial modernization together with the rise of nationalism introduced a common set of goals among Spanish engineering communities.<sup>22</sup> These ideas were constantly reiterated in engineering societies and through popular engineering journals. Through these platforms engineers created a public attitude favourable to science and technology while strengthening a sense of community by praising industrial development and engineering skills. Engineer’s ultimate goal was to enhance their social status and advance their political influence while strategically adopting a language of strictly scientific apoliticism.

- 10 At any rate, the advent of electrical technologies in Spain — which predated the ’98 defeat — coincided with their adjustment to national (and nationalistic) demands. As a matter of fact, discoveries in the newer field of electricity had received considerable attention from the Spanish specialized press since mid-19<sup>th</sup> C. The pace of publication of monographic magazines, nevertheless, accelerated in the last third of the century, a moment when the first electrical technologies were received without any considerable delay compared to other pioneering countries.<sup>23</sup> Despite this early reception,

<sup>22</sup> Nationalism, as a cross-cutting ideology able to bring together engineers despite the disparity of their political agendas has been studied in Jaume Valentines-Álvarez, “Seeing Like a Factory: Technocratic Nationalism in Catalonia, 1930–1939”, *History and Technology*, vol. 34, n° 3–4, 2018, 235–258. Also, Irina Gouzevitch, Ian Inkster, “Introduction: Identifying Engineers in History”, *History of Technology*, vol. 27, 2007, 101–106.

<sup>23</sup> Joan Carles Alayo Manubens, Jesús Sánchez Miñana, “La introducción de la técnica eléctrica”, in Manuel Silva Suárez (ed.), *Técnica e ingeniería en España*, vol. 6, *El Ochocientos: de los lenguajes al patrimonio* (Zaragoza: Prensas Universitarias de Zaragoza, 2007), 649–696. Some propagandists saw in this prompt and enthusiastic reception an example of the possibility of achieving industrial maturity and excellence, proving that the gap with the other

the debates around the role of electricity in the modernization of the country acquired a renewed urgency after 1898. A case in point was the reorganization of the specialized, prestigious journal *La Energía Eléctrica* (The Electrical Energy) (1899–1936) in 1900, just two years after the “Disaster”. The journal had been initially launched in July 1899 by Gumersindo Villegas Ortega, a senior officer of the Telegraph Corps in Madrid. However, from November 1900 onwards, important reforms were introduced, and the scientist and General Inspector of Civil Engineers, José de Echegaray (1832–1916) became its new editor. In this new period, the journal endeavoured to become the flagship of the Spanish nascent electricity sector, and its editorial office included remarkable engineers such as José García Benítez (who later assumed its direction), Eduardo Gallego Ramos (who would become editor-in-chief), as well as the most important members of the Restoration’s technical and scientific establishment.

Quite tellingly, in 1902 — on the occasion of King Alfonso the XIII’s coronation — the journal went on to edit the book *La ciencia y la industria eléctrica en España al subir al trono S.M. el Rey Don Alfonso XIII* (The Electrical Science and Industry in Spain by the time of His Majesty the King Alfonso XIII’s Enthronement). The publication was a memorandum addressed to the so-called “regenerationist” monarch, who was then 16 years old, and aimed at encouraging the promising applications of electricity. The desire to improve an electrical agenda for a regenerated country seemed to have catalysed the efforts of part of the Restoration’s technological establishment, with members of different corps of engineers contributing to the book. Thus, despite their heterogeneous social, professional, and political identities, this group of elite professionals infused electricity with a sense of collective purpose. Indeed, engineers writing in the book regarded electricity as the defining energy of a new age that was about to start and, subsequently, some chapters reified electricity as an

nations could close soon. Isolation, with the subsequent intellectual stagnation and delays in the incorporation of new ideas, had indeed pervaded end-of-the century public perceptions of Spanish science and industry.

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autonomous force for cultural and social change. The military engineer Francisco Del Río defined this energy in these terms:

She [electricity] has assumed the sovereignty of the Universe, and with the insolence of a parvenu, imposes its subordination to other sciences. ... It seems as if her very nature, subtle and untouchable, has allowed her to leak everywhere: in the wire that carries the news and in the van that brings us food; in the vehicle that give us movement and in the bulb that gives us light; also, in the cautery that heals and in the discharge that kills.<sup>24</sup>

12 Military engineer Eduardo Marquerie, along similar lines, defined electricity as the “soul of modern civilization”:

In the immense sea of modern industry, where different forms of *energy* [emphasis added] agitate and fight for the dominion of matter, the subtlest and unknown *force* [emphasis added], electricity, is the one that achieves ever greater triumphs, the one that extends from day to day the sphere of its applications and which constitutes, in short, the huge wave that invades everything, but not to destroy, like those that furiously crash on the shores, but on the contrary, giving new life and greater development to industries.<sup>25</sup>

13 Hence, Marquerie reasserted the role that electricity should play in bringing back “its lost *energy*, its *virility* to the industry and its former splendour to our beloved Spain”.<sup>26</sup> These examples prove Spanish engineers’ engagements with wider transnational and transcultural debates on electricity’s cultural identity in early 20<sup>th</sup> C. As Graeme Gooday (2008) has shown, the unresolved question of electricity’s causes and nature allowed for a variegated way of approaching this phenomenon at the end of

the 19<sup>th</sup> C.<sup>27</sup> Gooday contends that invoking electromagnetism, thus defining electricity as an “energy”, helped spread a notion of electricity that served engineers’ interests and their technocratic agenda; after all, as the chief-bearers of technical knowledge, male elite experts presented themselves as the only “masters” capable of “taming” this force of nature by producing, storing and transporting it. Moreover, defining electricity as a “force” or “energy” — as Del Río, Marquerie and others writing in *La ciencia y la industria eléctrica* were doing — portrayed male elite professionals as well-positioned to fulfil the social transformations associated with electricity in Spain. It is no surprise therefore that this group of engineers saw electricity as a way of restoring “virility” to the country. Gender identities — in this case, industrially-aligned masculinities — shaped engineers’ collective desires under the form of energy-masculinities that lead to several energy fantasies and electrical futures. As such, harnessing female electricity and increasing the output of energy could act as a compensatory utopia and a performance of (post-imperial) masculinities in a context of national decline.<sup>28</sup>

14 Furthermore, throughout the pages of the book, Spanish engineers elaborated upon a transnational narrative whereby the development of nations was to be measured on the amount of energy produced and consumed. However, these dreams of a “high-energy society” were adapted to fit local needs. Spanish economic historians have traditionally considered the shortage of energy resources as one of the main hindrances for Spain’s industrialization, in part owing to the irregular quality and the geographical location of coal resources that resulted in high extraction

<sup>24</sup> *La ciencia y la industria eléctrica en España al subir al trono S.M. el Rey Don Alfonso XIII* (Madrid: La Energía Eléctrica, 1902), 13.

<sup>25</sup> *Ibid.*, 184.

<sup>26</sup> *Id.*, emphasis added.

<sup>27</sup> These included its definition in terms of fluids during the first half of the 19<sup>th</sup> C., Maxwellians’ attempts at hegemonizing its definition as a mode of ether in the 1880s and 1890s, and engineers’ efforts to categorize electricity as a form of energy; see Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880-1914* (London: Pickering & Chatto, 2008), 37-61.

<sup>28</sup> Cara New Daggett, “Petro-masculinity: Fossil Fuels and Authoritarian Desire”, *Millennium*, vol. 47, n° 1, 2018, 25-44.

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and transport costs.<sup>29</sup> Some Spanish engineers in early 20<sup>th</sup> C. indeed defined power shortages and, fundamentally, coal dependence as “the iron circle” within which Spain’s industrial potential development was trapped: the national industry lacked a cheap energy supply to support self-sustained growth, and power plants were not installed since industrial demand was lacking.

15 Hence, by the time the exploitation of electricity was at its initial stages, the “coal question” arose in the public debate to describe socio-technical concerns about the capacities of national coals to trigger Spanish economic and industrial resurgence.<sup>30</sup> These anxieties involved engineers with broader worries about the role that energies should play in regaining national strength. For example, chapters such as “Rational Uses of Coal” (authored by the mining engineer Luis de la Peña) expressed not only cultural anxieties about high coal prices in Spain, but also transnational fears about the possibilities of resource depletion.<sup>31</sup> Hence, if national coals were poor and scarce, engineers were developing a variety of socio-technical imaginaries of a future not dependent on coal, envisioning a culture of self-sufficiency and limitless power supply through hydroelectricity as the secure path to modernization. Accordingly, some chapters explored the promises of cheap and abundant energy supply via the systematic exploitation of the country’s hydraulic assets, as in “Spanish Electricity Industries in 1902”, wrote by José Benito Ortega, military engineer and director of the Madrid-based companies, *Mediodía* and *Castellana*:

The shortage of coal, especially in regions where transport difficulties are high, has resulted in obtaining energy at such a price that industry cannot accept. Derived from this is the real fever that in Spain has spawned to report waterfalls (so abundant, fortunately, because of our mountainous terrain) that would allow us to take advantage of our natural forces to give exuberant livelihoods to the nation’s industry.<sup>32</sup>

16 Consequently, Spanish engineers (re)discovered water at the beginning of 20<sup>th</sup> C. and its industrial potentialities. Even before the 1898 “Disaster”, some thinkers articulated Spain’s modernization around water policy and hydro-technical imaginaries, particularly the Aragonian politician Joaquín Costa (1846–1911).<sup>33</sup> “Hydraulic regenerationism” would thus become a recurrent feature dominating national modernizing debates for decades, and it would relevantly impact the way in which natural resources were represented in the public imagination.<sup>34</sup>

17 Engineers writing in *La ciencia y la industria eléctrica* (1902), but, more broadly, through the pages of *La Energía Eléctrica* in the forthcoming decades, would borrow from “hydraulic regenerationism” the idea of shifting the gaze to the country’s “latent energies” and use them to transform the nation, both literally and figuratively. For example, an article published in January 1901, written by the military engineer and geographer Severo Gómez Núñez, was devoted to these energy utopias. Gómez stated that the “improvement of the national spirit” would be

<sup>29</sup> Carles Sudrià, “La restricción energética al desarrollo económico de España”, *Papeles de Economía Española*, n° 73, 1997, 165–188.

<sup>30</sup> Nathan Kapoor, “‘Who Has Seen the Wind’: Imagining Wind Power for the Generation of Electricity in Victorian Britain”, *Technology and Culture*, vol. 60, n° 2, 2019, 474.

<sup>31</sup> The chapter measured the years left for England to completely exhaust its coal reserves by calculating the nation’s consumption rates. Alarmingly, England only had 250 years left (*La ciencia y la industria eléctrica*, 45. (cf. note 24)).

<sup>32</sup> *Ibid.*, 191.

<sup>33</sup> Costa’s “hydraulic regenerationism” relied on a techno-utopia where national rebirth would come from the efficient management of water supplies through a vast programme of public works including dams and irrigation. Costa’s project however was fundamentally agrarian — even anti-industrialist. See Eric Swyngedouw, “‘Regeneracionismo’ and the Emergence of Hydraulic Modernization, 1898–1930”, in Eric Swyngedouw, *Liquid Power: Contested Hydro-Modernities in Twentieth-Century Spain* (Cambridge, MA: MIT Press, 2015), 39–66; Marina Frolova, “Landscapes, Water Policy and the Evolution of Discourses on Hydropower in Spain”, *Landscape Research*, vol. 35, n° 2, 2010, 235–257.

<sup>34</sup> Erik Swyngedouw, “‘Not a Drop of Water...’: State, Modernity and the Production of Nature in Spain, 1898–2010”, *Environment and History*, vol. 20, n° 1, 2014, 67–92.

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attained by mobilizing “countless non-listed waterfalls” that would provide energy to endless brand-new industries owned by “Spanish capitals and Spanish workers and directors”.<sup>35</sup> Since Spain had generous water resources, some engineers even foresaw surpassing coal-dependent European countries in a matter of time:

Our hydraulic power is much higher than that of England and Germany; the industrial supremacy of these nations, based on the wealth of their coal basins, must inevitably be replaced by the new electrical industries created on the basis of the “white coal” ... ; the thousands of HP produced by these mines will be eternal, and when the coals of Cardiff or Newcastle have thrown away their last tons, electricity, the prodigy of our century, will continue to exist in the whole world.<sup>36</sup>

18 Specially during World War I, coal shortages reasserted engineers’ energy utopia for an industrialized and economically independent nation relying on an unlimited power supply through hydroelectricity.<sup>37</sup> In October 1917, engineer

G. J. de Guillén García published the article, “The Hydraulic Power that Can Be Used in Spain is Greater than Ten Million Horsepower. Could It Be Used?”, pointing to the limitless possibilities of electricity and the need to transition to a non-coal dependent energy scheme:

Today, all waterfalls can be exploited with the help of electricity; with a simple wire, their force is transported hundreds of kilometres where it is wanted. So much so that in Barcelona part of the machines, looms, and so on, are moved with the energy produced by the immense waterfalls situated on the peaks of the upper Pyrenees, in the province of Lleida.<sup>38</sup>

García illustrated his energy dreams with Catalonia, one of the leading regions in Spain regarding energy production, and with emergent “national” companies which were mobilizing large amounts of capital, for instance, *La Canadencia* (865 million of pesetas), *La Energía Eléctrica* (40 millions), and *La Catalana* (50 millions).<sup>39</sup> 19

Yet, if the key to transform Spain into an industrial nation depended on the systematic exploitation of the country’s energy assets, the possibility of setting a national grid gave raise to engineers’ hopes for an accelerated modernization. At the institutional political level, discussions over the grid began in December 1918, when a Royal Order from the Ministry of Public Works asked the Permanent Electrical Committee — a consulting body created in 1911–1912 and dependent on said Ministry — to provide a draft for such infrastructure. In parallel, the twelfth panel of the First Congress of Spanish Engineering of 1919 — under the name “National Reconstitution” — appointed a subcommittee composed of engineers from different corps to outline a programme for a self-sustained industrialization that would include the grid. 20

<sup>35</sup> Severo Gómez Núñez, “Las pequeñas industrias”, *La Energía Eléctrica*, nº 5, 10 January 1901, 241. This article coincided with a campaign aimed at adapting the existing legislation to the improvements on long-distance power transmission in order to promote the industrial usage of Spanish rivers. *La Energía Eléctrica* particularly strived for the enactment of a new water act “aimed at preventing these resources and elements for industrial life to pass into foreign hands”, given the “too liberal” nature of prior legislation (Id.).

<sup>36</sup> “Boletín de la Unión Eléctrica Española. Nuestra potencia hidráulica (conclusión)”, *La Energía Eléctrica*, nº 21, 10 November 1908, 101–102. Spanish electricity industry was not lagging behind other European nations. For example, the 1901 statistics of the Ministry of Public Works showed an annual increase in the national production of 7,317 kW in average between 1893–1901. See Francesca Antolín, “Iniciativa privada y política pública en el desarrollo de la industria eléctrica en España. La hegemonía de la gestión privada, 1875–1950”, *Revista de Historia Económica*, nº 2, 1999, 417.

<sup>37</sup> In fact, the transition from thermoelectricity to hydroelectricity in Spain occurred between 1910 and 1920. From then until the 1960s the hegemony of water as the main source for electricity supply spread. See, Isabel Bartolomé Rodríguez, “¿Fue el sector eléctrico un gran beneficiario de ‘la política hidráulica’ anterior a la Guerra Civil? (1911–1936)”, *Hispania*, vol. 71, nº 239, 2011, 792.

<sup>38</sup> G. J. de Guillén García, “La fuerza hidráulica que puede utilizarse en España es mayor de diez millones de caballos útiles. ¿Podrán emplearse?”, *La Energía Eléctrica*, nº 20, 25 October 1917, 229.

<sup>39</sup> Those companies had, however, a significant foreign participation. “Crónica e información”, *La Energía Eléctrica*, nº 15, 10 August 1922, 200–201.

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21 According to those who supported the project, the national grid would facilitate the entire reorganization of the country's energy sector to solve both the low performance of Spanish electricity markets, and the scarce and dispersed distribution of energy resources. As such, the grid would include an ambitious programme of big dams to regulate Spain's unpredictable rivers and large power plants to consume low-quality coals in the northern mining areas. By connecting those hydroelectric and thermoelectric complementary systems, some engineers argued that the resulting unlimited and constant energy supply would immediately drag wider industrial demand. At the same time, the grid would promote other electricity-intensive industries — basically a fully-national electro-metallurgical and electro-chemical sector — and even the electrification of Spanish railroads. Nevertheless, not all agreed on that optimistic vision around energy abundance as the trigger for an industrial breakthrough. In the pages of *La Energía Eléctrica*, some engineers such as Sánchez Cuervo denounced in 1926 the “evil of electrification that is seemingly haunting Europe”, criticizing the naïve assumption that industrial development should rely almost uniquely on an unlimited increase in electricity supply.<sup>40</sup> As a matter of fact, businessmen were also moving away from those energy dreams, as they feared overproduction.<sup>41</sup> Moreover, given the diversity of identities within Spanish engineering communities, different views necessarily arose when discussing how the nation was to be produced through the grid.

22 Nationalistic energy imaginaries and dreams of energy abundance were instrumental to embed politics into energy infrastructures.<sup>42</sup> In fact,

<sup>40</sup> See, Bartolomé, “¿Fue el sector eléctrico un gran beneficiario de ‘la política hidráulica’?”, 812–813 (cf. note 37).

<sup>41</sup> Indeed, electrical companies worried about the absorption capacity of Spanish markets, which explains why they did not lobby for a coherent state-led hydroelectric policy during the Restoration (Id.)

<sup>42</sup> Johan Schot, Vincent Lagendijk, “Technocratic Internationalism in the Interwar Years: Building Europe on Motorways and Electricity Networks”, *Journal of Modern European History*, vol. 6, nº 2, 2008, 196–217; Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity*

some engineers conceived the national territory and its energy resources as essential inputs that could be centrally managed. However, choosing an over-centralized scheme for electrifying Spain had obvious political implications beyond strictly technological choices, including particular conceptualizations of the nation. In fact, territorial integration and the relationship between the different Spanish regions was a hot topic when defining the institutional organization of the Spanish Electricity Industry Association (SEIA). For instance, in 1903, Santiago Corella (the SEIA's president) supported a centralist strategy as he imagined the nation as a large electric network emerging from Madrid.<sup>43</sup> Consequently, some of the drafts for a national grid — three during the Restoration — were legitimizing a political view of the nation through the energy imaginaries that some engineers were creating in the midst of the Restoration political elites' attempts at re-nationalizing the country from the centre, particularly after the “Disaster”.<sup>44</sup>

By contrast, other engineers, especially those 23 with regional ties, were more prone to decentralization and, as a matter of fact, the dynamics of Spain's electrification would impose the logic of a grid growing from different local subsystems. This process was more consistent with the diversity and cultural significance of the different Spanish regions, given the country's multiple industrial and technological cultures and their diverse social and political actors. Indeed, some examples from the period show how electrical subsystems were even shaping regional or

after *World War II* (Cambridge, MA: MIT Press, 1998); Dominic Boyer, *Energopolitics: Wind and Power in the Anthropocene* (Durham, NC: Duke University Press, 2019).

<sup>43</sup> “Madrid will therefore be our central power-station...; regional associations will be transformer stations, from where through large feeders and power lines energy will be taken to the production or consumption centres”. “Suplemento. La Unión Eléctrica Española”, *La Energía Eléctrica*, nº 11, 10 December 1903, 17–18.

<sup>44</sup> Xosé Núñez, “Nation-Building and Regional Integration: The Case of the Spanish Empire, 1700–1914”, in Stefan Berger, Alexei Miller (eds.), *Nationalizing Empires* (Budapest and New York, NY: Central European University Press, 2015), 195–245.

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subnational developments.<sup>45</sup> The same would occur with the development of the Spanish electricity sector, as the spread of hydroelectric production would consolidate provincial markets.<sup>46</sup> These examples ultimately prove the contested nature of system-building and how complex the transformation of engineers' energy imaginaries into material assemblages could result.

### ELECTRIFYING SPANISH CATHOLICISM

24 One of the most outspoken supporters of the national grid was the engineer and Jesuit priest, José Agustín Pérez del Pulgar (1875–1939). Indeed, his articles originally published in the Jesuit scientific journal *Ibérica* (Iberian) sparked a debate within Spanish technological circles that remained alive for the next two decades.<sup>47</sup> In December 1915, his “Electric Power in Modern

<sup>45</sup> For example, the “Mancomunitat de Catalunya” (1914–1924) — a confederation of the four provinces of Catalonia — tried to delineate the contours of this new nation through technological policies, especially via large electrical, hydraulic, road, rail, and telephone networks. See Antoni Roca-Rosell, “Ciencia y sociedad en la época de la Mancomunitat de Catalunya (1914–1923)”, in José Manuel Sánchez Ron (ed.), *Ciencia y sociedad en España* (Madrid: El Arquero-Consejo Superior de Investigaciones Científicas, 1988), 223–252.

<sup>46</sup> The territorial concentration of electricity production in Spain resulted in deep local and regional asymmetries. Before the Civil War of 1936–1939, Spanish electrification was unevenly distributed with markets such as Catalonia and the Basque Country (400 kWh per capita) as main consumer areas, followed by Madrid, Valencia, Asturias, Cantabria, or Aragon (200 kWh per capita on average). Other regions such as Andalusia or Galicia were coordinated autonomously, and both Castiles and Extremadura constituted seemingly electric deserts. See Sudriá, “La restricción energética”, 174–175 (cf. note 29); Isabel Bartolomé Rodríguez, “La red nacional y la integración de los mercados eléctricos españoles durante los años de entreguerras: ¿otra oportunidad perdida?”, *Revista de Historia Económica*, nº 2, 2005, 269–298.

<sup>47</sup> The links between the Jesuits and the Spanish electricity sector were indeed strong. Pérez del Pulgar himself participated in the foundation in 1908 of the Catholic Institute of Arts and Industries (*Instituto Católico de Artes e Industrias*; henceforth ICAI) as part of the growing Catholic interest in expanding the pre-existing network of private educational institutions and to adapt them to the needs of a modern and industrialized society. As a matter of fact, it specialized in electrical engineering, a newer field not adequately covered in the older engineering schools. Furthermore, ICAI's teachers and technicians appeared to work closely with lay industrial promoters, electrical

Industrial Life” appeared; in it, Pulgar discussed the electrification of various European countries, including the initiatives carried out in Sweden and the works of Rathenau in Prussia. His aim was to demonstrate the “invigorating effects” of a “free or almost free” energy supply through a national grid.<sup>48</sup> Pulgar shared the ideas of some of his peers on the fundamental role of electricity “in modern industrial life”, thus promoting the same nationalistic energy intensive dreams.<sup>49</sup> As in other cases, Pulgar was concerned with solving the “coal question” by finding alternative energy assets and, in an international context of strong economic nationalism and interventionism, he supported a determined intervention of the state that should efficiently plan the use of national power sources. Therefore, his electrification scheme was aimed at taking advantage of all Spanish “coals” — black, white, green, blue:

The whole country would be then covered by a kind of spider web or net, whose threads would pass through the most suitable points for a convenient distribution, .... Thus, for example, it would pass through the most salient waterfalls, to take advantage of our white coal; through the grasslands, to use the green coal of the banks of the rivers ...; along the seashores, to consume the blue coal, supplied by tides and waves; through the coal mines ... to avoid coal transport by rail, and so on.<sup>50</sup>

companies, and official bodies such as the Permanent Commission of Electricity.

<sup>48</sup> José A. Pérez del Pulgar, “La energía eléctrica en la vida industrial moderna”, *Ibérica*, vol. 4, nº 104, 25 December 1915, 409–411; José A. Pérez del Pulgar, “La nacionalización de la energía eléctrica”, *Ibérica*, vol. 8, nº 196, 6 October 1917, 218–219.

<sup>49</sup> “One of the peculiar features of modern life is the use of increasing amounts of energy. Just as one cannot conceive a city without water or food supply in proportion to the number of its inhabitants, so today one cannot conceive a prosperous city and, moreover, a nation, without an adequate amount of HP available in one form or another, so that energy has become a necessity, even in social terms” (José A. Pérez del Pulgar, “Producción y distribución nacional de energía eléctrica”, *La Energía Eléctrica*, nº 1, 10 January 1921, 2).

<sup>50</sup> Id. Pulgar calculated in 1 million Kw the amount of energy that the national grid would distribute, namely, only a third of the country's 10 million HP of hydraulic wealth according to his estimations.

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25 Although Pulgar envisioned an energy provision from big and centralized production areas, this unlimited power supply was however aimed at ensuring the survival of small industry, particularly in remote and isolated rural areas. Some of Pulgar's colleagues would further expand these ideas as they drew upon the same repertoire of shared (Catholic) ideas and values. Gervasio de Artiñano (1873–1938), a Basque industrial engineer closely connected to the Jesuit ICAI and an MP as independent Catholic candidate in 1918–1919, reasserted the same energy-intensive visions in an article from April 1921 published in *La Energía Eléctrica*. From his point of view, low energy prices should benefit “small industries, crafts, and especially, the rural exploitations”, hence establishing a “common, popular, and truly national supply”.<sup>51</sup> Furthermore, energy supply should be link to “a kind of industrial and agricultural credit bank” based on the “cooperation and unionisation of small farmers”.<sup>52</sup> Therefore, the social consequences of electrifying Spain were as important as economic or industrial prowess, and this is how electricity was inserted into a precise Catholic agenda.

26 These views were indeed consistent with wider concerns within Spanish Catholicism at the beginning of the 20<sup>th</sup> C. The '98 “Disaster” radicalized positions on the role of the Catholic Church in the development of the country. Given that industrial and scientific underperformance were blamed for the 1898 defeat, liberals and secularizing sectors were thoroughly convinced that the Church's political influence was blocking the breakthrough into a modern and industrialized society. These beliefs, along with the recovery of the Church's cultural influence with the restoration of the Bourbon monarchy, explain the extreme virulence of secular-religious clashes in Spain during the first third of the 20<sup>th</sup> C. It is certainly true that some Catholic apologists — mostly clerical — inherited from 19<sup>th</sup> C. polemics their conservative ideas on the nature of science

and its opposition to traditional values. In particular, the clerical Right identified science with positivism, rationalism, materialism, and liberalism; and these positions were associated with the denial of absolute truth.

However, Spanish Catholicism was far from being monolithic and even some priests saw themselves as genuine practitioners of science and technology.<sup>53</sup> As a matter of fact, some Catholic authorities did consider industrialization as the driver for national regeneration, even borrowing some ideas from “regenerationist” thinkers. Hence, the fundamental question was not whether to industrialize Spain or not, but how to achieve this according to Catholic expectations on how an industrial nation should look like. These ideas were disseminated and discussed in widely read Catholic-oriented journals and ecclesiastical publications. In 1911, for example, the magazine *La Lectura Dominical* (The Sunday Reading) — which gather lay Catholics of different tendencies (predominantly conservatives) and members of religious orders (mostly Jesuits) — included a telling piece wrote by an unnamed engineer. In there, the author opposed the “Europeanization” of the country defended by progressive sectors to a true “national regeneration” that should combine modern techno-scientific developments, Christian ethics, and Catholic traditions:<sup>54</sup>

Not just the current positivist or materialistic civilization — if you want to call it that way — is to be hoped for, but another more perfect, the Christian one ... which has always met

<sup>51</sup> Gervasio de Artiñano, “España puede y debe ser la primera nación que establezca la red nacional de distribución de energía eléctrica”, *La Energía Eléctrica*, nº 8, 25 April 1921, 92.

<sup>52</sup> Id.

<sup>53</sup> Jaume Navarro, “Promising Redemption. Science at the Service of Secular and Religious Agendas”, *Centaurus*, vol. 59, nº 3, 2017, 173–188. Indeed, Spanish Catholics were profoundly divided at the beginning of the Restoration between the Carlists (members of a traditionalist political movement which aimed at establishing and alternative branch of the Bourbon dynasty), intransigent and ultra-montane circles (the so-called “integralists”) and the moderate and liberal sectors, often vilified under the brand *mestizos* (half-breed).

<sup>54</sup> “Europeanizing” the country was a somewhat widespread cliché in early 20<sup>th</sup> C. public debates which supposedly aimed at “redeeming” backward Spain through “European” values mostly identified with science, technology, and the secularizing agenda they allegedly incarnate.

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the demands of the spirit as well as material advances. ... The flag that we must display as an emblem of our regeneration is therefore that of the Christian civilization, Faith and Reason, Science and morality, virtue, and work.<sup>55</sup>

28 Therefore, against the anti-industrial intransigence of reactionary anti-modern Catholic ultras — more rhetorical than real — even conservative practitioners and authorities did consider that the Church should not abandon industrial entrepreneurship for moral and spiritual reasons. Moreover, the Church was deemed as the only institution capable of preventing the evils of the modern industrial world, as seen in other well-industrialized European nations. An article published in 1918 in the traditionalist newspaper *La Hormiga de Oro* (The Golden Ant) explored many of these ideas. The author of the piece titled “Black Coal and White Coal”, Leonardo Lorenzo — a member of the Claretian order — expressed his concerns with regards to the “coal crisis”, which was particularly intense around the Great War years. Coal shortages were not only causing an acute “industrial problem”, but also aggravating the “social question” posed by an increasingly numerous and organized working-class movement. Hence, he considered mandatory to “emancipate ourselves from coal”, given its nefarious economic and social consequences. Luckily, according to Lorenzo, God had bestowed hydroelectricity as an abundant energy resource upon the Spanish nation, as prove of His predilection:

We have in Spain, for our joy, an element that, if well used, can make us forget the blackness of the current situation. God foreseeing that the Spaniards ... would not enjoy staining their hands with black coal, has placed on the very surface of our soil immeasurable amounts of white coal, ... here we have our treasure, our great national wealth. Few nations have been as favoured by Providence as our Fatherland.<sup>56</sup>

Spain’s industrial resurgence could thus be 29 achieved through a “purely national” and unlimited energy resource “since Providence is responsible for continuously renewing hydraulic energy through that wonderful circulation of waters that will end only with the Earth’s final cataclysm”.<sup>57</sup> Lorenzo ended his article reifying electricity; however, it was not represented as an “energy” seized by the hand of the engineer, but as a subtle force that emanated directly from God sharing some of His ubiquity and immensity.<sup>58</sup>

Industrial renaissance was therefore import- 30 ant. Yet, as these extracts show, the social consequences of establishing the foundations of Spanish industrial flourishing upon electricity did not escape Spanish (and European) Catholics, even from an early date.<sup>59</sup> In 1889, the ultra-conservative journal *La Ilustración Católica* (The Catholic Illustration) included a piece titled “Electric Light and Power in the House” within its science popularization section authored by the Catalan civil engineer Melchor de Palau (1843–1910). In there, Palau pondered on the implications that the subdivision of power supply could have in solving “an extremely important problem in home economics as well as in our social customs”.<sup>60</sup> The Church had indeed equated centralized energy supply with big industry and its “nefarious” consequences, including the dramatic segregation of households and factory workshops, women and child labour, alcoholism, criminality, and the spread of socialist ideas. These evils could be summed up in the disintegration of the family as the perfect nucleus of society, as Palau put it:

The need to concentrate large numbers of people along with engines, so that force was

<sup>57</sup> Id.

<sup>58</sup> Electricity itself ended up being used to praise the glories of God Almighty: “How much will the Creator — who made me — be worth, when I, His creature, am worth so much!” (Id.).

<sup>59</sup> Michel Lagrée, *La bénédiction de Prométhée : religion et technologie, XIXe-XXe siècles* (Paris : Fayard, 1999), 86–87, 141–143.

<sup>60</sup> Melchor de Palau, “Progresos científicos. Luz y fuerzas eléctricas en casa”, *La Ilustración Católica. Seminario religioso científico-artístico-literario*, n° 3, 25 January 1889, 28.

<sup>55</sup> Ludovico, “Sección de polémica”, *La Lectura Dominical*, n° 908, 27 May 1911, 327–328.

<sup>56</sup> Leocadio Lorenzo, “Científica. Hulla Negra y Hulla Blanca”, *La Hormiga de Oro*, n° 7, 16 February 1918, 39.

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not wasted, has been a very powerful cause, albeit not the only one, for the dismemberment of families and the spread of social corruption caused by contact, ... Down with factories, down with casinos and clubs, down with everything that tends to create a fictitious and materialistic life with the pretension of permanence and the aim of annihilating the family system with its charming poetry and its perfume of inherited and transmissible virtues.<sup>61</sup>

31 What Palau proposed instead, quite in tune with the Church's own views, was "to go back to the old within the modern, to reconstitute the family but without dispossessing it of the advantages of the new technical advancements".<sup>62</sup> Indeed, Catholic congresses held periodically in Spain in the last decades of the 19<sup>th</sup> C. and early 20<sup>th</sup> C. — which tried to articulate unified responses within Spanish Catholicism in the face of the social and political climate of the Restoration — frequently included entire panels dedicated to the "social question" and tended to constantly address the inconvenience of "collective work". These events usually included lay experts from the civil sphere in an attempt to give greater legitimacy to the conclusions reached. The Fourth Catholic National Congress of Tarragona (1894), for example, introduced a report from Fernando Díaz Guzmán (professor of Physics and Chemistry at the Institute of Logroño) aimed at mitigating the spread of large industry and which contemplated "the distribution of power to the different workers' households, ... — This goal, the author believes, could be achieved through electricity".<sup>63</sup>

32 As such, electricity was seen as a way of reversing the inevitable process of concentration of energy and machines in large units. According to these views, decentralized energy provision would make it possible for women to work at home taking care of children and for men to be more independent, happier, but, most

importantly, easier to educate in Catholic morality. In the first decades of the 20<sup>th</sup> C., the Catholic conservative press continued to stress the moral aspects of distributed electricity to the point that *La Hormiga de Oro* would define this energy as a "social agent" in an article issued in its outreach section of February 1916. According to that piece, electric power would cooperate in creating a climate of cordial understanding between employers and workers and revive craftsmanship as a vector upon which society was to be organized: "This wonderful force, whose use spreads every day, can be by its easy transmission, a moralizing agent and a social factor, contributing somehow to restoring home life along with the organization of family workshops".<sup>64</sup>

Spanish Catholic authorities were also concerned 33 about another threat posed by a modern industrialism that was starting to take hold in Spain: the alleged imbalances between urban and rural developments and the subsequent marginalization of the countryside.<sup>65</sup> This was, of course, a widespread ideological cliché shared across European Catholicism that tended to idealize the countryside as a peaceful haven thanks to its religiousness. This imaginary focused on the harmony between the old rural upper classes, the skilled craftsmen, small farmers, and rural

<sup>64</sup> "La electricidad como agente social", *La Hormiga de Oro*, nº 7, 14 February 1914, 95. *Rerum Novarum* (1891) and Pope Leo XIII (1810–1903) defended a social Catholicism based on family and corporate doctrine as an alternative to class struggle within a mythical exaltation of the social organization of the Ancient Régime.

<sup>65</sup> An article originally published in March 1905 in *La Lectura Dominical* considered this asymmetry, particularly the dominance of big industry, as the main cause of the Russian revolution of January: "England, Germany and the United States, emporiums of industry, what have they become, in large part, but nations subjected with a chain of servitude to the despotic will of the working-class multitude? ... Without the abandonment of the fields, without the prevalence of industries, without the proud chimney of the factory dominating farms, cottages, and farmyards, would there exist, perhaps, the so-called social question? Would those who yesterday cultivated the field or tended the cattle have become factory workers, urban labourers, that have finally come to hear not the voice of the priest at the village's mass, but that of the fellow speaker in the political rally, ...?" (Christian, "Desequilibrio", *La Lectura Dominical*, nº 583, 4 March 1905, 132).

<sup>61</sup> Id.

<sup>62</sup> Id.

<sup>63</sup> "Memoria de los trabajos presentados a la sección cuarta del Congreso Católico de Tarragona", *Revista Católica de las Cuestiones Sociales*, nº 16, April 1896, 92–93.

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petty owners as the social basis for a return to a preindustrial society filled with Christian values.<sup>66</sup> However, in Spain, particularly after the '98 defeat, these narratives acquired more visibility. This process coincided with a re-reading of the Spanish ethos in a national-Catholic way at the turn of the 20<sup>th</sup> C., so that the countryside — especially that of the central plateau — was conceived as the spiritual reserve of the nation in the face of the threatening outside world represented by liberal and, again, “Europeanizing” ideas identified with secularization, materialism, and bourgeois ethics.

34 The Catholic press then propelled the narrative of the “Levitical cities” to describe the kind of provincial towns completely isolated from the hostile modern civilization and whose collective life had remained untouched and was still arranged according to the patterns established by the Church. These towns, however, could benefit from some elements of the modern industrial world. In 1906, for example, *La Lectura Dominical* presented an unspecified small town in Aragon “stranded from the railway lines and withdrawn into itself” which enjoyed “exemplary customs” and a social harmony that contrasted with big cities.<sup>67</sup> However, this did not impede the town from enjoying “all the advancements of mechanics and industry”, including electric lights on the streets. According to the author, this proved not just the compatibility between modernization and Catholicism but, crucially, that material progress without religion could lead to savagery. As such, the columnist considered this type of small villages as the embodiment of Spanishness against the “plague of faithlessness and moral misery that invades cities, fields and workshops, and that is finishing off the last remains of the pure and genuine Spain that have given Europe and America its true theological and literary culture”.<sup>68</sup>

<sup>66</sup> Julio de la Cueva Merino, “The assault on the city of the Levites: Spain”, in Christopher Clark, Wolfram Kaiser (eds.), *Culture Wars: Secular-Catholic Conflict in Nineteenth-Century Europe* (Cambridge: Cambridge University Press, 2009), 182-183.

<sup>67</sup> Christian, “La lepra”, *La Lectura Dominical*, n° 657, 4 August 1906, 485.

<sup>68</sup> Id.

Ideological narratives aside, the reality of the Spanish countryside remained in a conspicuous state of backwardness. In this context, and since the decline of agriculture was assimilated to the decline of the nation, Catholic attempts at regenerating the country in early 20<sup>th</sup> C. focused on the mechanization of agriculture as an alternative to the thorny question of the agrarian reform, which would have implied a stark shift in power relations in the countryside and the redistribution of land. Catholic narratives would then combine the depiction of a pristine and pre-modern countryside with the technical elements borrowed from the modern world. Overall, Catholic social action concentrated on sanitation, and providing services and infrastructure to the rural areas while developing a new conception of agriculture that should evolve from a merely extractive enterprise to a modernized and modernizing industry. The goal was to not just solve the problem of subsistence by increasing production, but also maintaining the population and thus reversing urban exodus.<sup>69</sup>

Electricity would perfectly fit these purposes as it would set in motion “more scientific farming procedures” through intensive agricultural methods and the acquisition of fertilizers.<sup>70</sup> In addition to this, electricity was instrumental to the industrial transformation of products including the mechanization of dairy industries, mills, bakeries, distilleries, and weaving factories. And, although the possibility of buying energy from external companies was contemplated, self-consumption was preferred through Catholic farmers’ unions and rural cooperatives. This would lead to villages based on a cooperative society that would fulfil the Catholic aspiration of a rural autarky. Of course, this scheme could not be easily extrapolated to the whole country

<sup>69</sup> For similar concerns in a later period, in particular, how electricity boosters in the United States hoped that electrical modernity in the countryside would stop rural exodus, see Ronald R. Kline, *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore, MD: JHU Press, 2000), 131-215.

<sup>70</sup> In fact, the national grid and its massive energy supply contemplated the possibility of establishing a national phosphate industry to replace imports.

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given the great geographical diversity and the variations in land ownership. Northern Spanish regions could, however, become a paradigm of this new energy and industrial landscape given the abundance of “green coal” in some areas. There, farmers could exploit modest water-courses to mechanize and illuminate villages, transforming old mills into small power plants, ultimately proving the feasibility of Catholic industrial designs.<sup>71</sup>

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**LIBERTARIAN ELECTRICITY**


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37 Spanish anarchists also connected their social views to the availability of electricity.<sup>72</sup> The numerous applications of electricity generated fascination and images of utopia and hope, permeating the social rhetoric of Iberian anarchism in early 20<sup>th</sup> C.<sup>73</sup> For the anarchists — and the Left in general — science and technology were fetishized as the only way to cure all social ills; moreover, they were utilized in the struggles against the Church’s cultural dominance, and the erosion of dogmatism and traditional social values. It is true, however, that the general take on electricity contained the same ambiguities

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**71** In 1912, for example, the Sixth Social Catholic Week, which was held in Navarre, contemplated a visit to the small village of Olite to examine “the state of prosperity of our social initiatives in that population”, including the flour factory, the cooperative and the electricity factory, all owned by the Catholic union (“VI Semana social en Pamplona. A los católicos sociales”, *Revista Católica de las Cuestiones Sociales*, n° 208, June 1912, 465-473 (at 471)). In fact, the specialized press of the time placed the Olite initiative as a pioneer in the implementation of rural electric cooperatives in Spain. See, for instance, José María de Guillén, “Las cooperativas agríco-eléctricas”, *La Energía Eléctrica* (Madrid), n° 11, 10 June 1915, 1-3 (at 3).

**72** The role of electricity as an ally of progressive and revolutionary forces had, in fact, a long tradition in European intellectual history, at least since the French Revolution. See Alain Beltran, Patrice A. Carré, *La fée et la servante. La société française face à l'électricité, XIX-XXe siècles* (Paris: Belin, 1991), 23; Paul R. Josephson, *Would Trotsky Wear a Bluetooth? Technological Utopianism under Socialism, 1917-1989* (Baltimore, MD: JHU Press, 2009).

**73** The prestige of electricity amongst Spanish anarchists makes the name “Electricia” appear in almanacs and secular calendars since early 20<sup>th</sup> C. along with other popular names such as “Germinal”, “Prometheus”, “Future” or “Redemption”. “Calendario Laico para 1903”, *Almanaque de La Revista Blanca para 1903*, n.p.

as those generally associated with science and technology.<sup>74</sup> Yet, since the last third of the 19<sup>th</sup> C., the instrumental role of technology in setting the foundations for a new society was repeatedly stressed. Above all, machines appeared in narratives ensuring productivity and, most importantly, superabundance in a future where the new ownership of the means of production would allow for a more equitable distribution of the fruits of nature. The Spanish anarchist and intellectual Anselmo Lorenzo (1841–1914) had reflected on how modern technologies made Malthusian theories useless before the assembly of the First International, held in London in 1871, as representative of the Spanish Regional Federation:

The proletariat counts for its benefit that production, favoured by scientific advances, is three times higher than necessary. There is incalculable production capacity. There is a surplus for everyone. There are conditions to continue producing so that no one lacks what needs and that there is still enough to sustain any sensible reserve. ... The obstacle for this abundance to favour everyone is the proprietary usurpation defended by Churches, States and Armies.<sup>75</sup>

The Spanish libertarian movement, however, 38 shared the same transnational anxieties of the turn of the 20<sup>th</sup> C. regarding the possibilities of the depletion of energy resources — especially coal. However, these fears were overcome by a disproportionate faith in modern technologies, particularly electricity.<sup>76</sup> Coal had, in fact,

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**74** The controversial role of the machine in modern capitalist societies gave rise to passionate outreach talks as the one held at the Workers' Association of San Martín (Barcelona) in 1910: “Is the machine convenient or not for progress?” (“Movimiento Sindicalista. España”, *Solidaridad Obrera*, n° 8, 02 April 1910, 4).

**75** Anselmo Lorenzo, “Al Congreso Sindicalista Internacional de Londres”, *Solidaridad Obrera*, n° 20, 2 October 1913, 1.

**76** The scientific column of *La Revista Blanca* — the leading anarchist magazine of early 20<sup>th</sup> C. — published on 15 January 1901 contained the following text: “What will become of us when coal and anthracite are exhausted? To which is generally answered with optimistic confidence: when that time comes, we will have had plenty of time to find a substitute, using chemical reactions, electricity, or

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a bad reputation within anarchist intellectual circles, being associated (as in Karl Marx) with great industrial capitalism, the centralization of production in large factories and the concentration of money and power.<sup>77</sup> In 1905, an article authored by Fernando Tarrida del Mármol (1861–1915), a Cuban anarchist in charge of the scientific outreach section of the influential and widely-read *La Revista Blanca* (The White Journal), defined hydroelectricity as the “incalculable energy stored in waterfalls” destined “for its use more or less close to transform the face of our globe”.<sup>78</sup> In a piece eloquently titled “White Coal and Its Miracles”, Tarrida stressed the greater convenience of hydroelectricity — thanks to its high-voltage distribution to the consumption areas — but, most importantly, its cleanliness. In this way, he expressed an environmental sensitivity not common among Spanish libertarian circles of early 20<sup>th</sup> C. In particular, he decried “the need for tall chimneys that vomit streams of black smoke that tarnish the beauty of landscape and pollute the air of regions”.<sup>79</sup> These ecological considerations extended to urban transport:

All kinds of carriages, from trucks to light carts, will run on electricity; the oil from the automobile and its nauseating smell will disappear, at the same time as the horses, which litter our streets, depositing hundreds of tons of manure on them. Thus, we will reach the golden age of hygiene, cleanliness, and purity of the atmosphere.<sup>80</sup>

39 However, the social transformations linked to the new, virtually unlimited energy supply went farther. As with Spanish Catholicism, Tarrida celebrated the decentralization of energy production

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natural forces” (Tarrida del Mármol, “Crónica científica”, *La Revista Blanca*, n° 62, 15 January 1901, 430). The article went on to cover different sources of electricity production: from waterfalls, to the “movement of waves and the force of the wind”, “solar heat”, or “telluric currents” (Id.).

<sup>77</sup> Sebastián Fauré, “La concentración capitalista”, *Solidaridad Obrera*, n° 60, 4 June 1909, 1-2.

<sup>78</sup> Tarrida del Mármol, “Crónica científica”, *La Revista Blanca*, n° 166, 15 May 1905, 700.

<sup>79</sup> Id.

<sup>80</sup> Id.

and provision, as would facilitate the return of home-based work: “Workers in many industries will be freed from the factory; home trades will flourish as in the past, with the difference that the working tools will be improved and activated by small electric motors”.<sup>81</sup> Tarrida expanded much of these ideas in another article of 1905 in which he discussed the recent discovery of radium by Marie Curie, speculating about the social consequences of an unlimited supply, this time from the energy contained in the atom. Most remarkably, Tarrida considered that this massive supply of force, impossible to be monopolized, would put an end to the “ridiculous” capitalist property system:

Calculate what such amount of energy can become, transformed into electricity for lighting, heating of rooms and for cooking food; to power factories, railways, ships, trams, and so on; that is, all the living conditions of everyday existence and those of industry transformed overnight! The costly facilities of today’s large industry, one of the excuses of modern capitalism, will be rendered useless; universal energy can no longer be monopolized in favour of the privileged, ... millions of miners, instantly freed from the obligation to extract from the bowels of Earth the enormous quantities of coal currently requested by bourgeois industry, which will come to increase the groups of producers of the needs and even of the superfluities of all in a society in which capitalism will become impossible.<sup>82</sup>

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<sup>81</sup> Id. Even from an early date, anarchist theorists understood the opportunities that decentralized energy supply offered in designing a future society relying on free and local administrations, in contrast to the socialist (later communist) model dependent on centralized production. In *Fields, Factories, and Workshops* (1899), the Russian anarchist Piotr Kropotkin (1842–1921) pondered on the flexibility and adaptability of electricity and its role in redefining the city-countryside divide. This process would result in a completely scattered and autonomous urban development, with federated clusters where the social bond would be richer. Moreover, the new means of transport and communication, along with the networked supply of energy, would provide the small rural community with technical infrastructure until then only available in big cities.

<sup>82</sup> Tarrida del Mármol, “Crónica científica”, *La Revista Blanca*, n° 160, 15 February 1905, 501.

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40 In short, electricity (thanks to the wonders of modern technology) could bring humanity to the dreamed land of superabundance as the precondition for universal emancipation. The causes for incumbent social inequalities were not to be sought in nature, but in the capitalist ownership system, in which land, raw materials (including energy) and the instruments of labour (for instance, machines) belonged to a narrow minority. The alternative, of course, was to collectivize those means of production — including energy resources and technologies — after a period of social revolution. Moreover, anarchists pointed to the greater efficiency and productivity that those assets would have in the future society as managed under the “scientific” principles of revolutionary syndicalism.<sup>83</sup> These narratives converge in early 20<sup>th</sup> C. with a certain anarchist or libertarian “regenerationism”, with tropes directly borrowed from “Costismo” — that is to say, the historical extension of certain features of Joaquín Costa’s social and economic doctrine; in particular, his stance on radically modifying the public management of Spain’s practically boundless raw natural resources and latent national energies. These ideas also included a particular reinterpretation of nationalism. For example, articles originally published at the turn of the century in *Solidaridad Obrera* (Workers’ Solidarity) — the official newsletter of the anarcho-syndicalist union CNT — repeated the same rhetoric about the presence of “untapped sources of wealth” in the Spanish soil and subsoil.<sup>84</sup> During the Great War years, a great deal

**83** Anarchists and, specifically, anarcho-syndicalists devised a new society where economy was to be organized by “technical experts” derived from horizontal groups of workers and consumers (as opposed to vertical socialist or state bodies) and integrated within federations of specific industry branches. These would appoint especial committees to manage large, medium, and small factories, infrastructures, and public services (including hospitals, sewers, railways, electricity, mines) in coordination with local, regional, and national confederations of workers.

**84** “Much more than half of Spain is in a position to promote and develop its cropping, to extract from its bosom the mineral wealth that it contains and that with wise measures, sound policy, and successful use of the Public Treasury would result in water fertilizing our fields, roads facilitating the transport of our products, and the pickaxe bringing to light the coal, iron, lead, and so on,

of articles denounced Spain’s political class and its capitalist plutocracy, which lacked any initiative or industrial mentality, unable or unwilling to exploit natural resources.<sup>85</sup> Consequently, only the libertarian revolution would put all the latent energies of the country to work.<sup>86</sup>

41 However, the rhetoric of superabundance thanks to the distribution of hydroelectricity after an inevitable anarchist revolution stood in stark contrast with the dire reality of a squalid energy supply, particularly of coal, during the continental conflict. Spanish neutrality during the European war was indeed followed by huge profits for those exporting coal and other raw materials. This left domestic supply with limited inputs that could not be properly distributed due to the disorganization of rail transport,<sup>87</sup> but also external imports by sea because of the constant torpedoing of Spanish ships. Above all, the period 1916–1918 saw Spain close to default, with the price of coal skyrocketing from 1.5 pesetas in 1914 to 3 in 1918, provoking a stark increase in prices of all essential goods.<sup>88</sup> To this, it must be added the action of profiteers and hoarders in the face of a state unwilling to adopt any measure to curve inflation. As a result, the energy situation in Spain around 1916–1918 created a serious economic and social crisis, soon turned into a political one, that initiated the downfall of an entire

which are so abundant in our subsoil. ... This is how we understand true patriotism” (“Contra la intervención”, *Solidaridad Obrera*, n° 560, 15 May 1917, 1).

**85** Libertarians thus confronted foreign “intelligent, daring, and bold capitalism” — credited for its capacity of generating a certain amount of wealth — with the Spanish version defined as “a capitalism without entrepreneurial spirit” (“El capitalismo y nuestro mejoramiento”, *Solidaridad Obrera*, n° 292, 14 August 1916, 1). According to this, Spanish entrepreneurs would only increase their profits at the expense of poverty wages or by opening the country and its natural resources to foreign companies.

**86** “This is the revolution that Spain lacks and that only the anarchists can bring about” (Ernesto Bark, “El problema de España”, *Solidaridad Obrera*, n° 628, 4 August 1917, 1).

**87** The “railway crisis”, that is to say, the need to renew all the railroad equipment after almost half a century of operation accentuated during the European war.

**88** Providencio, “Postal no. 1”, *Solidaridad Obrera*, n° 774, 31 May 1918, 1.

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regime closed to any reformist solution.<sup>89</sup> It is not a surprise, therefore, that both Spanish engineers and conservative Catholics supported the imperative of transitioning to hydroelectricity as a way of avoiding the collapse of the monarchy and alleviating the social and political tensions emerging from coal dependency.

42 As for the Spanish libertarian movement, the Great War marked a moment of clear awareness of the importance of energy infrastructures and of the workers who controlled the extraction and transport of energy resources (fundamentally, railway workers and miners) as a way of exercising pressure in the struggle to achieve labour improvements — even in unleashing a revolution capable of subverting the social relations of class and production.<sup>90</sup> Moreover, it is just before the continental conflict, in 1910, when the National Labour Confederation (*Confederación Nacional del Trabajo*) (CNT) was founded in Barcelona after a careful reflection on the new characteristics that industry was acquiring. The CNT was a confederation of anarchist or libertarian-oriented unions that did not want to join the dominant union, namely, the socialist General Union of Workers (UGT), founded in 1888 and affiliated with the Spanish Socialist Workers' Party (PSOE).<sup>91</sup> Taking the most industrialized countries as the reference, the CNT analysed

the change of scope in the strikes: from that moment on, they would be on a national scale and would affect strategic sectors, namely energy production and distribution.<sup>92</sup> Conflicts such as those of the American railroad workers of 1916 — which resulted in obtaining the eight-hour day — were followed with great enthusiasm.<sup>93</sup> In fact, a year later, the country experienced its first general strike, from 13 to 18 August, with the participation of 28,000 railway workers in charge of moving coal throughout Spain, who demanded improvements in job conditions and wages. The protest lasted longer than expected and acquired special virulence precisely in the northern Asturian mining basin, due to the solidarity of coal-miners.<sup>94</sup> Although Spanish railroad workers and coal-miners (mostly close to the UGT) would oscillate between the radicalism derived from their everyday working conditions and the reformism advocated by their political leaders, the CNT considered the conflict as a prove of the effectiveness of their anarcho-sindicalist strategy — namely direct action from workers' organizations. Most importantly, the 1917 strike proved the vulnerability of energy networks and their potential use as pressure points around which the labour movement could establish their demands, especially given the weaknesses of carbon-statecraft in Spain.<sup>95</sup>

**89** Since 1917, national unity governments and emergency measures taken by decree were the only means to alleviate the crisis of the Restoration political regime, leading to a gradual authoritarian drift. For an overview, see Francisco J. Romero Salvadó, "The Great War and the Crisis of Liberalism in Spain, 1916–1917", *The Historical Journal*, vol. 46, n° 4, 2003, 893–914.

**90** See Timothy Mitchell, *Carbon Democracy: Political Power in the Age of Oil* (London and New York, NY: Verso, 2013), 12–43.

**91** The new confederation was the result of a change in mentality in sectors of Iberian anarchism, especially those who began to deem convenient the use of unions as a tool of resistance and struggle, taking as an inspiration French revolutionary syndicalism. Consequently, Spanish anarchism was able to overcome the individualist and terrorist phase, that had characterized late 19<sup>th</sup> C. anarchism, to become a mass movement in early 20<sup>th</sup> C., by contrast to its overall marginalization in much of the European labour movement. See Murray Bookchin, *The Spanish Anarchists: The Heroic Years, 1868–1936* (New York, NY: Harper Colophon Books, 1977).

**92** Around 1916 some CNT leaders began to point to the necessary reorganization of the CNT into single industry-branches unions, finally adopted in the Sants Congress in June 1918.

**93** "Del Extranjero". *Solidaridad Obrera*, n° 299, 21 August 1916, 4.

**94** The strike was the outcome of the national campaign of agitation initiated in October 1916 by the UGT and CNT calling for government measures to deal with the energy crisis and the rising cost of essential goods. The lack of a unitary conception around the nature of the strike (revolutionary or not) and the non-convergence with the so-called Assembly of Parliaments (created in July 1917 by those political sectors repeatedly alienated by the Restoration's establishment and willing to democratize the regime) prevented any significant political change. See Gerald H. Meaker, *The Revolutionary Left in Spain, 1914–1923* (Stanford, CA: Stanford University Press, 1974), 62–99.

**95** On carbon statecraft, or the embeddedness of modern statecraft, political economy, and carbon-based fuels, see Mitchell, *Carbon Democracy* (cf. note 90).

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- 43 In February 1919, a new conflict started at the power plant of *Avenida del Paralelo*, in Barcelona, belonging to Barcelona Traction, Light and Power Company Ltd, popularly known as *La Canadenca* — “The Canadian” in Catalan because the Canadian Bank of Commerce of Toronto was the major stakeholder. The mobilization took a radical tone, with strikes, boycotts, civil disobedience, sabotage, and seizure of electrical infrastructures. What triggered the protest was the dismissal of eight office staff workers, since it was interpreted as a direct retaliation against the CNT — which Catalan businessmen refused to recognize — since workers were affiliated to the Water, Gas and Electricity CNT Union. In fact, the strike occurred in an atmosphere of growing influence of the anarchists and of perceptions of imminent revolution and the collapse of capitalism.<sup>96</sup>
- 44 Following the threats from the electricity company, the CNT responded by extending the conflict to the entire firm and promoting sympathy strikes in the sector. By 8 February, the movement was uniformly followed in *La Canadenca* and, on 21 February, workers interrupted the power supply to the trams and Barcelona’s industry.<sup>97</sup> On 27 February, tram workers, the Barcelona General Water Company, the Catalan Gas and Electricity Company and the Lebón Gas Company also paralyzed their activity in solidarity.
- 45 Without electricity, water, and energy, Barcelona’s factories were completely at the mercy of the decisions taken by the CNT in a protest that lasted 44 days. With more than 100,000 participants in the strike, the government had to pressure employers to accept worker’s demands by
- mid-March, including the recognition of unions, better wages, the reinstatement of dismissed workers, the release of thousands of workers arrested during the conflict, and the official decree of the eight-hour day (issued on 5 April). The fight between the unions and the electricity company was therefore settled with a landslide victory for the CNT, while the government and the Catalan business community obtained clear evidence of the danger posed by a well-organized and structured libertarian unionism. And although *La Canadenca* strike did not result in a revolutionary movement — despite the revolution being part of the ideological repertoire of the anarchists — more immediate objectives were achieved such as the eight-hour day and the affirmation of the CNT as a direct interlocutor with employers.
- La Canadenca* strike seemed to contradict some of what engineers like Pérez del Pulgar had argued for regarding the social consequences of a virtually unlimited energy supply through a national grid. On this point, Pulgar was wrong when he highlighted the higher reliability of hydroelectric power supply as it required less workers than other energy infrastructures — notably coal — therefore, less susceptible to being paralyzed.<sup>98</sup> At a time when the barricades in Barcelona were still burning, Juan de Urrutia y Zulueta (1866–1925), a Basque businessman and an essential figure in the development of the Spanish electricity sector gave a lecture at the ICAI in March 1919.<sup>99</sup> He discussed how setting

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<sup>96</sup> The Russian revolution of 1917, but particularly the pre-revolutionary conditions in countries of the extinct central empires (notably Germany) after 11 November 1918, were seen as the sign that the time had come “to seize the instruments of production, fields, factories and workshops” (Félix Monteagudo, “Excursión Regional de Propaganda y Organización”, *Solidaridad Obrera*, nº 979, 19 December 1918, 2).

<sup>97</sup> The Government temporarily confiscated *La Canadenca*, with the prior authorization of the British Embassy, assigning military engineers to restore electric supply to the city. For an overview, see Angel Smith, *Anarchism, Revolution and Reaction: Catalan Labour and the Crisis of the Spanish State, 1898–1923* (New York, NY: Berghahn Books, 2007), 290–323.

<sup>98</sup> “One could, therefore, chose its location [electricity production] without paying attention to anything other than the comfort and safety of the waterfalls, differing in this from all other industries, and even from coal mines, which demand numerous workers and previous routes of transportation” (José A. Pérez del Pulgar, “La nacionalización de la energía eléctrica”, *La Energía Eléctrica*, nº 22, 25 November 1917, 258). In this sense, Pulgar’s definition of hydroelectricity is related to Mitchell’s take on modern oil industry. See Mitchell, *Carbon Democracy* (cf. note 90).

<sup>99</sup> Juan Urrutia was one of the greatest advocates of the grid and founder of the most prominent Spanish electrical enterprises: *Hidroeléctrica Ibérica* and *Hidroeléctrica Española*. He became later director of the Official Chamber of Electricity Producers and Distributors and led the corporate organization of the Spanish energy industry until his death.

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up the national grid (defined as an “energy ring” around the country) would entail a great deal of cooperation and solidarity between producers and consumers, individuals and the state, so much so that the grid encapsulated his desires for social harmony in a moment of labour strife:

we are living in a century of great integrations, great socializations, great cooperation, great trade-unionism: workers’ unions, energy unions, unionism of capitals; and the state, acting as an intermediary, welding these great activities of all sort ... won’t this energy ring become a symbol of that unity?<sup>100</sup>

- 47 Spanish anarchists, of course, thought differently about the kind of aspirational scenarios the material assemblages of electrification could accomplish, even though they shared with engineers and Spanish Catholics the same optimistic take on energy abundance.

## CONCLUSIONS

- 48 Expectations and cultural representations of electricity in early 20<sup>th</sup> C. Spain were partially shaped by perceptions of coal scarcity, in particular the incapacity of domestic coals to fulfil the nation’s industrial revive in a context of national (and imperial) decline, but also economic, social, and political unrest. The transition to a new energy regime represented by (hydro) electricity therefore encapsulated many communal hopes for a brighter future. However, a complex blend of actors, their evolving agendas, expectations, and their distinctive social, religious, professional, political, national, and sub-national outlooks, also provided a context for a particular interpretation of electricity and gave rise to different energy imaginaries and scenarios. As such, electricity contained multiple, even contradictory and overlapping fantasies and no homogeneous national energy imaginary could emerge, due to the diversity, complexity, fragmentation, and polarization of Spanish society. “Electrification” would then emerge as

a highly politicized social construct connected to divergent modes of organizing social life and the future Spanish nation and community. These considerations are clearly relevant to historical analyses and beg for further inquiries on the historical importance and changing meanings of electricity over time — and energies in general — as a set of technologies, infrastructures, natural resources, but also of the values and ideas embedded within their mobilizations and use in several social, cultural, political and rhetoric contexts. Furthermore, these conclusions prove that energy history must be contextualized within wider frameworks of social and political change, since energies are adapted to or developed within existing socio-technological environments specific to place and time.

In Spain, energy utopias were aimed at fulfilling strategic goals with several ideological groups and clienteles trying to capitalize on the alleged transformational power of electricity to accomplish their social and political aspirations. For example, some of the engineers’ desires to reaffirm the nation’s industrial superiority through hydroelectricity would also shape certain forms of governance, including shifting power relations within the Restoration’s political establishment and gave more prominence to elite experts in the management of a strong and, eventually, centralized state. Energy abundance through the national grid also offered an opportunistic narrative to sublimate the many conflicts of the period (class struggle, unemployment, lack of democracy) focusing merely on techno-managerial solutions, hence avoiding deep political reform. Catholic authorities or Catholic-inspired engineers also wanted to embed traditional values into electricity networks as to promote the image of a nation of rural and independent small-property farmers. These visions had, of course, their limitations and, as a matter of fact, energy imaginaries in Spain did not serve the purposes of making the transition to hydroelectricity easier (which occurred in a localized and spontaneous manner according to several local conditions), or to obtain state support in the development of the national grid. Moreover, despite those energy-intensive visions, the

<sup>100</sup> J.G.B., “Utilización de la energía hidroeléctrica en España”, *La Energía Eléctrica*, nº 6, 25 March 1919, 73-74.

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material infrastructures of energy and, in particular, their vulnerabilities could endanger the whole regime by constricting the energy flows upon which the Bourbon Restoration depended.

50 In any case, energy imaginaries, through the scenarios they created, served the purposes of coping with fear of uncertainty in times of crisis. As such, electricity was mobilized by several political forces to respond to the many challenges of “modernization” as a process of rapid social and political change, and it was instrumental in creating competing programmes for the management of them. Some of the promises of electrical modernity were radical, even revolutionary, yet others were grounded on undemocratic, even reactionary and illiberal principles. Decentralized energy provision, for example, would deliver divergent social and national outcomes in both Catholic and anarchists’ agendas.

51 Finally, it is interesting to look at these historical examples from the perspective of contemporary energy debates. First of all, hydroelectricity being cleaner than coal was not a factor that mattered in early 20<sup>th</sup> C. debates, despite pastoral ideas of a pre-modern Spain being so widespread within conservative Catholics. The same would be true of concerns about the lack of cleanliness and healthiness in big factories of certain libertarian intellectuals. However, the legitimization strategies on the use of hydroelectricity rarely revolved around environmental issues but were mostly framed around notions of national or societal development, political independence (even energy autarky) and, ultimately, self-sufficiency. Interestingly, despite their differences, the political groups and programmes analysed in this article had in common a delusively and misleading approach to electricity’s capacity to

overcome any number of natural limitations and provide communal well-being through an energy narrative promising abundance.

Given the widely accepted objective of reducing 52 global energy use as means to reduce human impact on Earth’s systems, energy historians are tasked with appropriately dissect and explain how connections between resources, politics, technologies, society, and ideas — including epistemologies or ways of contemplating energies — have been arranged over the past centuries, especially considering that the future of energy policy will not be determined exclusively by shifts in energy resources or technologies. Even if we have started to worry about the implications of our current energy use, societies continue to indulge in a triumphalist narrative of growth without material limits (or consequences) and the modernist fiction of cheap and abundant energy surplus via “renewable” energies or “greener” technologies. It seems that we are reaching a post-abundance epoch and, maybe, energy abundance and the limitless horizon of growth has been a contingent and unrepeatable historical event. However, changing our current beliefs and ideas around energy and its social significance constitutes a challenge as important as transforming our carbon-based infrastructures. If historians start to understand how the idea of energy abundance and its relationship with civilizing advances originated in early-industrialized countries, we need more comparative research — probably based upon localized studies in other periods and locations. Only in this way we will understand better how these ideas were appropriated and reworked according to the characteristics of particular industrial cultures and political circumstances, whether in the Global South or in the many margins of the Global North.

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