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Perspective

New directions for interconnector research: drawing from social sciences and humanities perspectives to explore the Celtic Interconnector

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ABSTRACT

The current discourse on interconnectors primarily centers on the technical and economic aspects necessary for delivering a stable grid infrastructure powered by renewable sources and for integrating energy markets. This article, therefore, explores opportunities to broaden definitions of energy grid interconnectivity beyond the techno-economic sphere. It considers multidisciplinary perspectives and presents novel exploratory viewpoints from the social sciences and humanities. It examines ideas of interconnection by drawing on the Celtic Interconnector, an Irish-French initiative, to explore the cultural, historical, political, and geographical dimensions of interconnectivity. Insights are derived from two workshops with academics in Ireland and France, encouraging a more contextual understanding of energy interconnections beyond their physical and economic dimensions. The article builds on these insights to set out an agenda for future research and reflect on frames of reference for describing, analysing, and engaging with emerging interconnector processes and the multiple stakeholders involved.

1. Introduction

This discussion article explores new ways to understand, analyse and engage with electricity cross-border interconnectors, incorporating perspectives from the social science and humanities (SSH). Instead of adhering to conventional definitions of interconnectors as structural transmission lines without context, we focus on the human-centred elements of the Celtic Interconnector, a 700 MW high-voltage electricity link currently being built across the Celtic Sea between Ireland and France. The article seeks to trace and deepen our understanding of the features that connect this technology to people and places. As such, it aims to bring a multidisciplinary light that expands current conceptions of relevant knowledge contributions in this field, as well as on the

concept of interconnection itself.

The dearth of multidisciplinary and SSH contributions in this area is surprising, given the growing relevance and evolving nature of interconnector infrastructure [1]. There are many ways to interpret this blind spot, and one explanation could be that a degree of invisibility has surrounded public debates on the energy grid, particularly regarding interconnectors. Yet, as noted by Loloum et al. [2] “Invisibility and depoliticization are the first obstacles to thinking critically about energy systems.” (p.3). By extension, this rationale also applies to thinking critically about the stakeholders and citizens who engage with the grid network [3].

American historian of technology Thomas Hughes, acknowledged this gap and argued that: ‘electric power systems embody the physical,

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intellectual and symbolic resources of the society that constructs them', further stating that "to direct attention to technological affairs is to focus on a concern that is as central now as nation building and constitution making were a century ago" [4]. Moreover, previous research has shown that electrification and network consolidation projects are in fact intrinsic to modern nation-building strategies [5,6]. Indeed, electricity transmission systems tend to symbolise national grid imaginaries and social representations of electricity networks are often tied to issues of national and cultural identity [5,7]. As such, the flow of electricity between nation-states has mainly depended on international collaboration agreements with some form of state backing [8].

Nevertheless, historical studies of the period 1850–2000 suggest that the dynamics of European integration driven by cooperation on technological and infrastructural projects diverge from the typical narrative of exclusively politically driven alignment [8]. For example, during the post-First World War period, when ideas of international cooperation were in ascendancy [5], visions of European-wide power grids, such as Atlantropa, were proposed [5,9]. Atlantropa, as envisioned by the German project architect Herman Sörgel in the 1920s, was to unite Europe and Africa; its cornerstone was a vast hydropower dam between Gibraltar and Tangiers [8]. Critically, Sörgel claimed that a physical connection between nations was a stronger guarantee for peace than paper treaties [8,9]. However, these visions dimmed during the rise of economic nationalism in the 1930s. In the post-Second World War period, while transnational grids mostly developed along Cold War lines, several interconnections between politically nonaligned Eastern and Western Europe were tangible exceptions. These occurred in geographically proximal regions such as communist Yugoslavia and right-wing Greece, as well as Finland and the Soviet Union [10].

Transnational grid visions continued to evolve, and in Europe, increasing geographical interconnection that spans borders between member states is one of the pillars of the Energy Union strategy [11]. It could even be argued that, in many ways, the history of the European Union is also a history of energy, beginning with the European Coal and Steel Community, founded in 1952 [5]. Grid interconnections with dynamic electricity exchange, as opposed to locally isolated production and consumption within countries, are premised on ideas of an integrated internal energy market that aims to help stabilise the price of energy, boost investment opportunities, pool resources, reduce the need for storage, prevent energy shedding, and ensure energy resilience [12]. Examples include the power exchange between the Nordic countries, which began as early as 1915 [13]. The longstanding Nordic power cooperation is regarded as an exemplar of international power exchange, demonstrating that trading electricity with neighbouring countries can help stabilise energy prices and enhance supply security [13,14].

The transmission network is increasingly deemed crucial for enabling new connections to grid-based renewable energy resources such as wind, which require dedicated energy transport infrastructure, since their energy cannot be transported by ship or truck [15]. As such, the transmission network is essential for achieving current goals to decarbonise the European energy system by 2050, and the numerous hurdles to expanding the network can render the grid a bottleneck for the energy transition [16]. Greater interconnectivity across borders is valued in this context for energy resilience and economic reasons [17]. Currently, the EU aims for a 15 % electricity interconnection capacity by 2030.¹

However, expanding transmission systems is typically challenging, with numerous factors delaying progress; a lack of social and political

support is considered one of the biggest hurdles [16]. Indeed, recent research suggests that opposition to the energy transition manifests in many ways and is increasingly channelled through political stalling strategies and 'discourses of delay' [18]. Emerging research on interconnectors has examined the political and economic factors hindering their development in Europe [19]. Using a multi-level perspective, Flynn [20] analysed delays in the Northern Seas Countries Offshore Grid Initiative, highlighting weak political backing for a marine supergrid. Also looking at interconnectivity challenges in Europe, Puka and Szulecki [19] note that "[...] delays and even indefinite postponements at different stages are at times a diplomatic euphemism for dropping projects off the agenda" (p.126). Additionally, Yang et al. [21] discussed public and elite-led opposition to regional power connectivity, emphasising how shared identity and cultural exchange can shape perceptions of interconnectivity, and viewing cultural models as essential for fostering a sense of community.

We contribute to knowledge on grid interconnectivity through insights from two multidisciplinary workshops held in Paris and Cork in 2024, focused on the Celtic Interconnector. The workshops served as reflexive spaces for diverse theoretical discussions, critiquing various value propositions and expectations about the Celtic Interconnector and paving the way for future research. Over thirty participants, mainly from Cork and Brittany but also Dublin and Paris, participated in the workshops. The disciplinary background was varied and included sociology, history, literature, Irish studies, digital humanities, cybersecurity, anthropology, engineering, geography, and non-academic sectors (such as embassy representatives and International Energy Agency representatives). Three workshop debates emerged: 1) exploring different interconnector metaphors that transcend techno-economic framings; 2) embedding the Celtic Interconnector in cultural and political contexts; 3) expanding on public engagement as a key dimension of grid infrastructure development. Following a brief overview of the Celtic Interconnector project, we expand on the three workshop debates and conclude with fruitful research questions and closing reflections.

2. Overview of the Celtic Interconnector project

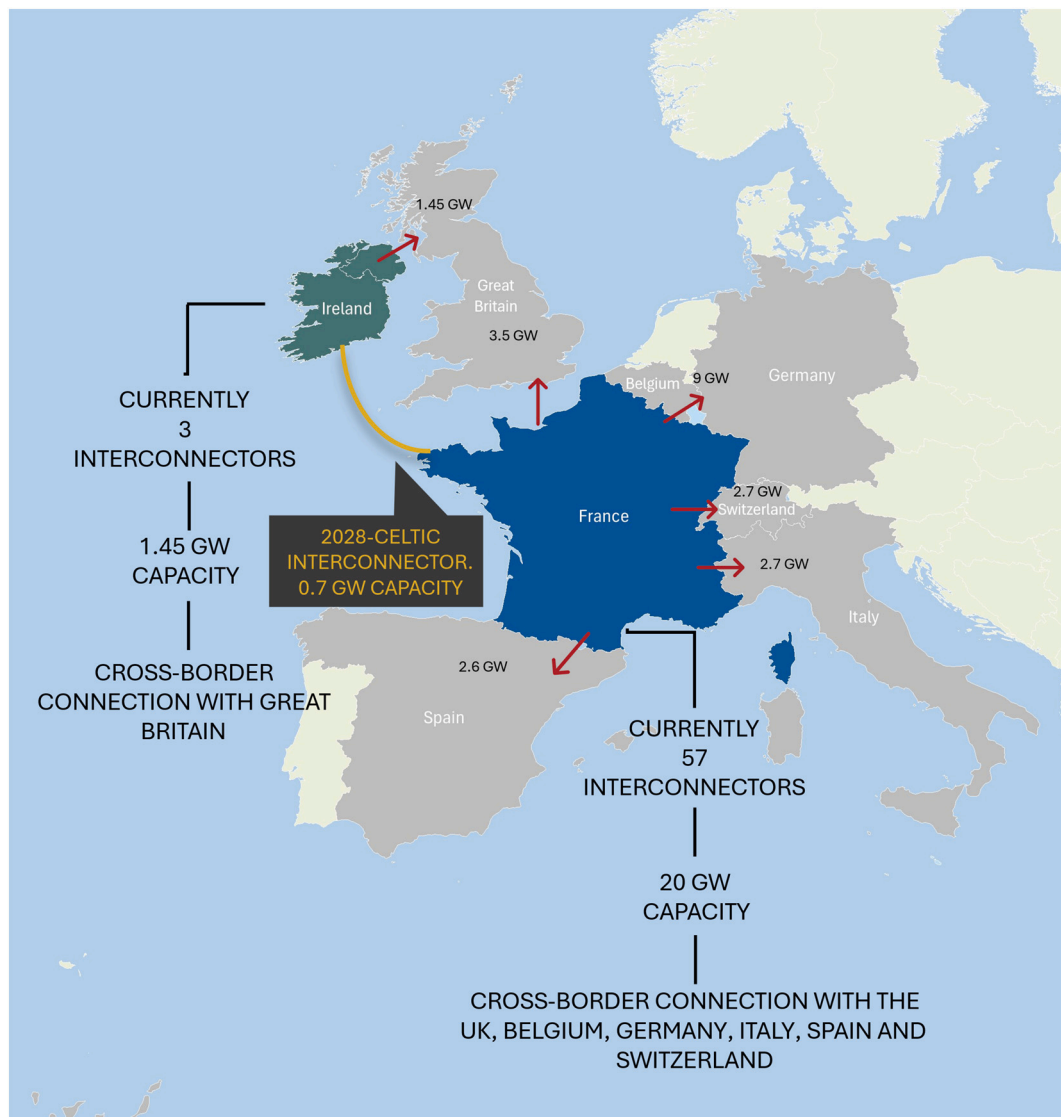
The new electricity link between Ireland and France provides an illustrative example of the human-centred elements of interconnectors. In relative terms, it has been a project that has benefited from both social and political support. Moreover, the two countries serve as examples of distinct pathways to decarbonisation.

The 700 MW high-voltage electricity link across the Celtic Sea is a foreseen connection that will transport electricity over 575 km, with 500 km of the cable running underwater. The Celtic Interconnector is a joint initiative by transmission system operators: EirGrid in Ireland and Réseau de Transport d'Électricité (RTE) in France. It will link the existing electricity substation in Knockraha (in east Cork, Ireland) to the substation in La Martyre (Finistère, Brittany, France). Initial feasibility studies for the project commenced in 2011, and pre-consultation and engagement started in 2018. In 2022, technical and financial agreements were signed in Paris, and construction began in late 2023. The interconnector was due to be finalised in early 2027. Due to delays in manufacturing and installing undersea cables, its completion date has been pushed back to 2028. The total cost of the project is estimated to be €1.6 billion.

As illustrated in Map 1, the completion of the Celtic Interconnector will significantly enhance Ireland's and France's interconnection capacity. While Ireland has historically maintained low levels of interconnection, limited to only Great Britain, France already benefits from robust electricity exchanges through interconnectors with six neighbouring countries.

Once finalised, the Celtic Interconnector will connect Ireland with its 'closest EU neighbour', France [22]. This development raises important questions regarding the opportunities and challenges that interconnectors can bring. Irish energy supply is a core concern due to its

¹ The 15 % cross-border capacity ratio indicates the proportion of import capacity compared to the total installed generation capacity across European Union countries. This metric helps to understand the extent to which these countries can rely on energy imports to meet their electricity needs in relation to their own energy production capabilities.



Map 1. Outline of current cross-border electricity interconnections in Ireland and France, and the Celtic Interconnector. Red arrows indicate existing connections and exchange capacity. The thick yellow line indicates the new Celtic Interconnector. All positionings are indicative.

geographical context as an island country (involving two political jurisdictions) on the periphery of Europe.

Ireland has low levels of electricity interconnection, primarily with the UK, and while Brexit hasn't directly affected this, it has created uncertainty in electricity policy [23]. However, the rapid growth of wind energy offers new opportunities for collaboration [24]. Developing wind energy off Cork's southern coast is a national objective [25], and connecting it to Brittany could unlock significant economic potential. Cork's industrial background and existing electricity infrastructure position it to benefit from the Celtic Interconnector. The region's offshore wind energy potential is seen as a game-changer for East Cork [26].

France relies on nuclear and hydro energy generation and is considered globally as one of the most decarbonised electricity systems, with both sources accounting for over 75 % of total production in 2023 [27]. The French energy system faces several challenges. Climate change is impacting water availability, and the ageing nuclear power plants, built between 1963 and 1991, require more maintenance [28]. The new Flamanville EPR plant in Normandy has been in trial operation since September 2024; however, this is an exception, and the sector requires a technological revival. Politically, nuclear energy faces enduring safety concerns, particularly following the Fukushima disaster, and the sustainability of uranium resources is also a topic of public debate [29].

The Celtic Interconnector cable's landfall in Brittany will bring strategic advantages. Brittany, with its strong identity rooted in unique language and heritage, currently relies on external sources for most of its electricity, producing just 8 % locally [30]. Its electrical connection to France is limited to two lines, creating an electrical peninsula that strains under peak winter demand. To manage this, measures like the EcoWatt program, which alerts consumers during forecasted peaks, have been implemented [31]. The interconnector arguably transforms Brittany from an area vulnerable to energy insecurity into a key energy link between France and Ireland. Additionally, a history of anti-nuclear protests led to the absence of nuclear facilities in the region, notably after local resistance cancelled a planned plant in Plogoff in 1981 [32].

3. Workshop insights: emerging SSH perspectives on the Celtic Interconnector

3.1. Theme one: metaphors of interconnectivity and connection

Research has shown that the linguistic properties of grid consultation and communication processes are highly relevant to participant engagement and local perceptions of cost-benefit analyses, yet they are seldom studied [33]. This section delves into five metaphors of

interconnectivity to expand the vocabulary and imagery for knowledge exchange in this space beyond techno-economic frames. Constructing and refining definitions and glossaries in response to a changing energy system presents a challenge with implications for policy domains, practice, and research [34]. Apart from the prevalence of the highway metaphor in the media and policy spheres, most of the ideas we present emerged in the workshop discussions and are exploratory, with limited examples of how they appear in current discourse.

3.1.1. Highway

Industry professionals, energy policy practitioners, and the media have been influential in shaping the mainstream discourse of interconnectors. They often use the analogy of energy highways or super-highways to describe interconnectors and associated technologies to wider audiences. The highway label denotes electricity transport over long distances, signalling the end of 'energy isolation' by connecting peripheral countries and regions. The highway notion is as old as the idea of transnational grids, which emerged in the 1920s [5]. The metaphor connects electricity infrastructure to a history of large-scale technical systems that shape the physical linkages necessary to transport people, water, waste, and energy [35].

Interconnector cables enable energy to be moved efficiently from where it is generated to where it is needed. Additionally, much like highways, there are ownership considerations insofar as transmission system operators own the transport infrastructure but do not own or account for most of the energy that flows through it. Indeed, 'energy highways' can equally support energy imports or exports with large carbon footprints from coal-fired power stations, nuclear or renewables. This is an ongoing issue for Ireland, as it remains dependent on imported electricity from the UK, and it does not count carbon pollution from electricity produced elsewhere in its national reports. Equally relevant are questions about the potential consumption of nuclear energy, as socially and politically, Ireland has opposed nuclear energy [36].

Across media and developers' reports on interconnectors, three key factors prevail in representing interconnectors as highways: heightened connectivity, increased efficiencies, and long-distance exchange. Less visible in such descriptions, however, is the low public awareness of these pieces of infrastructure [37], suggesting that they usually *bypass* communities, resulting in little or no connection between such infrastructure and local communities. The technical complexity inherent in grid 'electricity highways' and interconnectors is an acknowledged deterrent to participation [33]. The highway metaphor arguably lacks features that could increase local engagement, awareness, and the delivery of local benefits. Nevertheless, writing about the actual motorway network development in Ireland, Linehan [38] argues that it has been a highly contested concept, denoting anxiety about progress, growth, and change, and dismissing typical depictions of motorways as 'non-places and a source of modern anomie' (p.75).

The highway metaphor can be further expanded by linking it to "information superhighway" concepts, as these are increasingly key factors in the energy transition. The electricity sector in the future will continue to leverage digital capabilities to deliver new services, such as grid design, monitoring, control, and forecasting. Likely, its ability to interact fully with decentralised energy production will bring cooperation and trade opportunities at the local, regional and national levels. While digitisation opportunities in this space are still emergent, Müller and Sareen [39] argue that many unfulfilled opportunities for upstream and downstream collaboration would enhance energy user opportunities for engagement with the energy grid [40]. The use of the "information superhighway" serves as a helpful metaphor in this context, highlighting the integration and interoperability of various infrastructures within a ubiquitous digital web and emphasising the growing difficulty of distinguishing the energy system from the information and communications system.

3.1.2. Bridge

The symbolic meaning of bridges is one of the most widespread metaphors, evoking the idea of essential structures that connect two sides and symbolise the journey of moving across a divide. This metaphor is widely recognised and linked to transition, connection, and the significance of passage. This strength in metaphor is apparent in the symbolic adoption of bridges as the main design for Euro banknotes, along with other liminal architectural features—windows and doorways. As President of Ireland from 1997 to 2011, Mary McAleese made 'bridge-building' between divided communities in Ireland and Northern Ireland a central theme of her Presidency. In 2012, a new bridge on the M1 road linking Ireland and Northern Ireland was renamed the "Mary McAleese Boyne Valley Bridge" in tribute to her cross-community peace initiatives. Other European examples abound. For instance, when the 400-year-old bridge in Mostar in Bosnia was blown up in 1993, it was seen as deeply symbolic of the worsening civil war in the region.

The imagery of a bridge encourages reflection on the paths taken and the obstacles to be overcome. Bridges provide a safe passage over dangerous waters and offer a vantage point for a broader perspective. They are a crossing point between two distinct places and a meeting space that enables collaboration and the achievement of common goals, highlighting the common meeting or halfway point between different ideas/regimes. Bridge-building is also a metaphor for relationship-building and meaningful connections. As argued by Högselius [5] "If the grid interconnection serves to provide (or enhance) a political bridge between nations, the bridge can be used to foster social exchanges in sports, education, and culture, for example, promoting understanding between societies" (p.180).

3.1.3. Border

The barrier function of borders, as mechanisms that separate and grant governance autonomy and authority to different national regimes, and how they manifest psychologically, linguistically, and culturally, has occupied much discursive thinking in this space. Eagleton et al. [41] remind us that "all nationalisms have a metaphysical dimension, for they are all driven by an ambition to realise their intrinsic essence in some specific and tangible form. The form may be a political structure or a literary tradition" (p.8). The concept of 'border building' is intriguing in this context and illustrates the material, institutional, and discursive efforts involved in constructing and sustaining transnational systems. The Iron Curtain, for instance, was a significant effort to disconnect infrastructure and establish borders. Moreover, twin electric power lines on both sides of the French–German border mirrored that boundary instead of removing it. The eastern border of the EU has also been a current concern, as interconnection with Russia is currently under threat [42,43]. In the case of the energy transition, stark distinctions in energy paths within the EU are especially visible in border regions, as with France's nuclear programme following World War II and Ireland's current ambitious offshore wind energy goals.

Moreover, the connective function of interconnectors is interesting for various political and identity reasons, highlighting in the European case the growing relevance of complex multi-level governance arrangements and citizen memberships [44]. Drawing on constructivist approaches to border thinking, the existing literature suggests the need for deeper engagement with bordering processes such as contact zones, gateway building, system entangling, transition zones, or hybrid zones, which soften more rigid border relations through linguistic, cultural, or administrative systems [45–47].

3.1.4. Umbilical cord

One way to reimagine the networking structure of interconnectors is by drawing parallels with an umbilical cord that physically ties two systems. This metaphor suggests secure energy delivery within a *vesseled* protective supply network that supports life and growth. It stresses the role of the interconnector as a *connective* and *nourishing* tissue involved in the process of societal production and reproduction [48].

The unique properties of the umbilical cord, including its *regenerative* and *mediating* functions, have gained attention in political anthropology [48]. The analogy illustrates how interconnectors support various energy systems by balancing the production and consumption of energy. It also raises questions about the direction of energy flow and trade between countries. In cross-border interconnections, both nations can benefit from a shared supply (twins) within a larger Energy Union, serving a nurturing role (akin to a maternal role). However, this simplification overlooks the complex influences of historical, social, and political factors on energy flows between locations.

3.1.5. Networks

Infrastructural networks across countries and regions are viewed as essential tools that connect people and places, fostering cooperation, driving prosperity, and promoting peace—often inspired by an ‘ideology of circulation’ which values infrastructural integration as vital connecting points between dispersed people and countries [49]. However, the shape and standards that guide the formation of these transnational networks, while juxtaposing national and local systems, exist within negotiated international spaces where various actors and countries hold different positions of power and leverage (ibid). The active and multi-layered shaping processes of network building also include connections between evolving technologies, where interconnectors are increasingly relevant [4]. Yet, electricity systems are commonly perceived primarily as technological networks. This viewpoint reflects the focus of engineering disciplines that are often at the forefront of managing and planning these systems. However, social dimensions and ‘social networks’ are equally important in the electricity network. These aspects include the rules and standards that establish the technical specifications of the network, as well as the collaborative features of decision-making processes and the inclusion of end-users and frontline communities [50]. SSH led insights in this instance offer a more comprehensive socio-technical perspective on these networks. Furthermore, insights into public opinion and perceptions of electricity transmission grids in general remain limited and are often linked to environmental, health, and local economic impacts [7].

3.2. Theme two: Celtic interconnections, culture, heritage and other bonds

The representation of interconnector infrastructure as neutral and devoid of value, simplified and packaged within a technological definition that is universally applicable, overshadows the fluid and multiple ways in which culture and its social and historical connections point to complex realities and plural ‘interconnections’. In this section, drawing on insights from our workshops, we propose ways in which interconnectors are experienced and shaped within culturally dynamic processes. Discussion of these processes touches on issues of evolving European identity, citizenship, shared heritage, and emergent perceptions and discourses of energy security across borders. It is essential to note that the cultural and heritage aspects related to Celtic interconnections were strongly emphasised in the workshops, but they rarely feature in real-life news media or industry discourses concerning the Celtic Interconnector. This renders the ideas developed below as very exploratory in nature. To some extent, the academic backgrounds of the workshop participants help explain the wealth of discussion around this theme. Coupled with this, the notion of Celtic interconnection(s) introduced at the start of the workshops as a starting point for conversations around the human elements of the Celtic interconnector project pointed very strongly to this shared legacy that adds many layers of significance to this new bond currently under development.

3.2.1. Evolving European citizenship and imagined communities

Anderson’s work on nationalism and his contribution to understanding identity and belonging provide an avenue for thinking on how infrastructure can offer substance to ‘imagined communities’ [51]. In the context of the EU, this concept can be applied to analyse how

European citizenship and identity are formed not around traditional nation-states but through a transnational framework. Although the EU comprises several distinct countries, its members can envision a shared European identity rooted in common values, economic ties, and cultural exchanges. Anderson’s imagined communities *are not imaginary*, but rather imagined in the sense that one can envision a shared set of identifiers and experiences, even if individuals have never met. The Celtic Interconnector combines a shared architectural and technical artefact with historical discourse between the two communities. The delivery of a subsea cable connecting both regions in and of itself – and through this project – is an intriguing example of how European Union infrastructure can reinforce regional identities and strengthen inter-regional connections through discourse and activities surrounding conceptions of shared heritage and experience. Indeed, the interconnector is partly financed by the Connecting Europe Facility, which ostensibly promotes transnational connectivity in energy, transport and digital services for public/private connections. Apart from the economic and security rationale, the Celtic Interconnector promises to facilitate political integration and intraregional community development at the sociocultural level as part of the wider European project to build cohesion and integration.

3.2.2. Concepts of ‘Celtic’ heritage

In our two workshops, we examined the significance of naming the subsea cable that connects Cork and Brittany the ‘Celtic’ Interconnector. This designation extends beyond mere identification; it is a powerful emblem of the shared heritage and cultural identity that unites these two regions. The name encapsulates the history and interrelatedness that resonate in both communities, highlighting connections in culture, language, and identity that have developed over centuries. The dynamic maritime connections and cultural contacts between the south coast of Ireland and northwestern France have been documented as early as the seventh century [52].

Additionally, deep-rooted historical and textual connections link Latin, Breton, and Irish manuscripts that date back to the ninth and tenth centuries. These manuscripts serve as physical manifestations and tokens of a shared past. The complex cultural connections between Ireland and Brittany are also evident in more recent history and continue to the present day [53]. The suggestion of a shared Celtic identity impacts the branding of the interconnector as ‘Celtic’, proposing an opportunity to honour and acknowledge the multifaceted heritage that links Cork and Brittany.

Current academic collaborations and cultural exchanges continue to bring these two rich cultures together. However, the term ‘Celtic’ also needs to be handled with care as its modern use derives from an eighteenth-century construct with no purchase whatsoever on racial or ethnic ties.² Therefore, it is important to emphasise the cultural and linguistic resonance of the term ‘Celtic’ and resist its use as a meaningless generic label.

The layering of the Celtic Interconnector infrastructure onto this complex legacy of cultural and historical interrelationships might be seen to support the idea that the Celtic Interconnector is of special significance. Yet, real work is needed on both sides to address community interests and to find ways to leverage this new piece of infrastructure to build on this engagement. Presumed Celtic connections alone cannot do this work.

The living heritage connecting Ireland and France, encompassing historical narratives, cultural expressions, trade, transportation networks, and environmental stewardship, is a significant point of connection. Examples of fora that build on this connection include the Celtic Media Festival, a cultural institution that has been celebrating

² For an examination of the lexical uses of the terms “Celt”, “Celtic” and “Celticism” in the 19th century see Pierre Bazantay’s *Celtisme et romantisme* (Rennes: La Part Commune, 2012), 19–21

creativity and collaboration for over 40 years. The festival serves as an enriching platform where ideas, films, and artistic expressions can flow, reinforcing the cultural bonds between Ireland and France. Workshop insights also examined pressing ecological concerns that link the two Atlantic regions, particularly regarding coastal environments and the impacts of extreme weather. The workshop conversations underscored the need for coordinated responses to these challenges. The Celtic Interconnector initiative adds significant value to the cultural tapestry, with arguably considerable community interest in reinforcing these evolving connections.

Nevertheless, future research may benefit from examining the perspectives of those less enthusiastic about the Celtic Interconnector. Undoubtedly, there are also communities of resistors or activists, and perhaps those less energised by the prospects of the interconnector. It would be valuable to understand in future research how such views relate to the findings in this paper, which have unfolded around mutual connection and the celebration of heritage.

3.2.3. Energy security

A critical challenge for interconnectors is protecting bilateral infrastructure. Protection of 'hidden' submarine cables and infrastructure is a growing concern [54]. This dimension is highlighted by repeated incidents in the Baltic Sea, which have seen a series of undersea cable malfunctions since 2022, potentially indicating acts of sabotage and hostility. Furthermore, Russian operations off the Irish coast have highlighted a need for a new impetus and direction for Irish naval operations. In November 2024, the Irish Navy escorted the Yantar, a Russian intelligence vessel, out of Irish waters, an area of significant subsea energy and internet infrastructure. As European countries harness renewable energy sources, this may impact existing fossil fuel economies and ties, such as the EU's dependence on Russian oil and gas. Threats to critical infrastructure are not limited to physical damage; they also encompass concerns related to the IT systems that oversee their operation. As renewable energy sources are integrated, these infrastructures are undergoing a significant transformation towards decentralisation. While this shift offers many benefits, it also increases their vulnerability. Such weaknesses could be exploited to compromise the stability of the European electricity grid.

The Irish-French initiative underscores the necessity of defensive capabilities within the Irish navy and of interoperability between the French and Irish navies, as well as with other allies. However, the Irish Navy has undergone underfunding and under-resourcing from a comparatively low base, reportedly operating at 66 % of its agreed-upon strength, given its militarily neutral position [55]. Irish neutrality is a historically informed position, given Ireland's colonisation experience within the British Empire, and a stance that carries strong sentiment among the Irish public, both for maintaining neutrality and developing a more assertive stance. In this way, joint defensive responsibilities, due to the development of subsea infrastructure, deepen social, cultural, and military relations - traditionally a problematic concern for the Irish public- and may bring divisive symbolic attributes to the Celtic Interconnector in Irish political debates. Irish neutrality is part of Irish identity, both domestically and internationally, and has contributed to the success of Irish diplomacy across various arenas. Increasing defensive capabilities is not tantamount to changing the position of neutrality. However, the strong sentiments surrounding neutrality may raise concerns about increasing military spending to protect bilateral infrastructure. This is an evolving issue, and we can expect to see new developments in the near future.

Cybersecurity is an interrelated issue, and both France and Ireland acknowledge the critical nature of cyber threats and their potential implications for national sovereignty. They established national

cybersecurity agencies—the ANSSI³ in France in 2009 and the NCSC⁴ in Ireland in 2011—to safeguard their critical infrastructures. The interconnection of the electrical grids of both countries highlights the need for enhanced collaboration between these agencies to address future threats effectively. The Celtic Interconnector will facilitate improved digital exchanges between France and Ireland by incorporating fibre optic connections that will serve the various data centres in Ireland (at least 82 at the time of writing, with planning approval for an additional 40). These are a drain on Ireland's energy resources and a causal factor in necessitating interconnectors to mitigate supply risk. Data centres may also be sabotaged by hostile actors in 'soft war' tactics.

3.3. Theme three: deepening public engagement with the Celtic Interconnector

Exploring alternatives to current techno-economic frameworks is crucial for enhancing public engagement with interconnector infrastructure and related policies. Adopting a more inclusive approach at the institutional and policy levels can create meaningful connections and opportunities for communities. The two workshops provided valuable insights, highlighting potential areas for research and innovation, as well as topics that warrant further exploration from a policy standpoint.

One compelling theme was the relationship between interconnectors and marine environments. Participants discussed the possibility of interconnectors functioning as sensory technologies, which could foster biological growth and promote biodiversity along marine cables. This approach highlights the ecological benefits and challenges the perception of interconnectors as mere energy conduits. The concept of *sea-blindness* was also addressed in the workshop [56], an argument highlighting the need to fully grasp the implications of locating critical infrastructure on the sea floor. It allowed for reflections on the historical context of early twentieth-century Ireland, where the establishment of the new state led to an increased focus on land and territory at the expense of naval and coastal awareness. This cultural shift caused many to overlook the rich maritime heritage and the importance of coastal communities. Engaging with local fishermen and sea-dependent communities in this context could be vital for rekindling this connection and ensuring fishermen's voices are heard in energy conversations.

Decarbonisation ambitions introduce another layer of complexity to the energy landscape. The workshops highlighted the historical resistance in Brittany to nuclear power, rooted in cultural and environmental concerns. As efforts to align with decarbonisation goals progress, it's crucial to understand how public sentiment influences policy decisions and energy strategies. The long-term stability of market prices is also a pressing concern. The emerging dynamics suggest that while France may benefit from a buffer in energy supply, Ireland aims for greater energy security. Nevertheless, a successful interconnector exchange could also lead to oversupply, potentially imposing additional costs on consumers. The price volatility often associated with fluctuating renewable energy is likely to exacerbate this issue. To address these potential challenges, innovative solutions such as peer-to-peer energy markets or localised credit systems could empower and engage communities to utilise surplus energy more effectively and sustainably.

Recognising that general awareness of interconnectors is relatively low [37], enhancing communication and engagement strategies is crucial. The societal and local benefits, opportunities and challenges of the Celtic Interconnector are emergent, making it imperative to find effective ways to discuss this topic with the public. Preparing for open and transparent communication is particularly important amidst rising energy costs and burgeoning geopolitical tensions. One intriguing suggestion was to involve the arts as collaborative partners in promoting

³ Agence nationale de la sécurité des systèmes d'information (ANSSI), and it was established in 2009.

⁴ National Cyber Security Centre (NCSC) of Ireland established in 2011.

awareness. A curated exhibition on the Celtic Interconnector, such as the Ardnacrusha Museum, could serve as an educational platform to engage the public and spark discussion on energy issues.

Local population changes were also considered in the workshops. Such scenarios may include the possibility that climate refugees could relocate to Brittany from increasingly hot regions of southern France. Future research will be invaluable in understanding how these shifts in climate affect relationships with energy use, citizenship, energy literacy, and energy security as our society adapts to extreme heat and other climate change hazards.

4. Conclusion and future directions for SSH interconnector research

Discussing cross-border interconnectors, particularly through the lens of the Celtic Interconnector project, has allowed us to explore the intricate layering of historical, cultural, and social dimensions alongside the techno-economic framing that dominates current discourse in this area. The multidisciplinary approach adopted demonstrates that energy interconnections are more than just physical infrastructures; they encompass rich narratives and contexts that reflect the complex relationships between people and places. Thus, while the interconnector amplifies and accelerates energy exchange between the two countries, it also resonates with a legacy of Celtic interconnections, which have arguably contributed to the relatively positive way in which it has been received socially and politically up until now. Protest and controversy have stalled many similar projects in the past [19,57] and understanding the dynamics of a seemingly positive project is essential.

We also connected with less formal, social, cultural, and political interactions outside the acknowledged, industry-focused institutional spaces where most knowledge development has traditionally concentrated. This article responds to the limitations of the dominant discourse on energy and interconnectors, i.e., treating them as technical artefacts and economic instruments. Drawing from energy humanities and seeking to surface and expose “the energy unconscious” that underpins so much of modern life [58]. Across Europe, it seems there is a substantial lack of awareness of interconnectors [37] in spite of the European Energy Union goals, which seek to strengthen interconnectivity. Szulecki et al. [59] argue that the Energy Union is an ‘empty box’ with no fixed and meaningful meaning to drive policy and practice forward (p. 549). The lack of SSH research in this area exacerbates the issue; the principles of cooperation, solidarity, and trust that the Energy Union aims to promote [3,59] cannot be assumed to arise solely from material connection. As such, furthering multidisciplinary and grassroots engagement can enrich and add coherence to future attempts to better conceptualise Energy Union ideas. We advance this closing section of the paper by examining future research directions, which we have organised into three main questions (Table 1).

We conclude with a final reflection on the importance of SSH perspectives. The discussions around the human elements of the Celtic Interconnector were deliberately left open to allow for broad, multidisciplinary engagement with scholars and other stakeholders from Cork, Brittany, Dublin, and Paris. The richness of multidisciplinary opportunities is clear and vast, including geopolitical insights, linguistic and educational opportunities, culture and heritage studies, politics and international relations, among many others. Alongside these clear contributions, SSH researchers can also help connect and bridge gaps in science, policy and practice, bringing about a more reflexive and inclusive approach to interconnector research.

CRediT authorship contribution statement

Alexandra Revez: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Evan Boyle:** Project administration, Methodology, Investigation, Funding

Table 1
Three SSH-led research questions for future electricity interconnection studies.

Research question	Reflection points and sub-themes
1. How can more inclusive statements about interconnectors be developed to reflect diverse stakeholder perspectives better?	Future research opportunities regarding the framing and definition of interconnectors include examining the underlying values and assumptions in mainstream interconnector definitions and integrating new SSH insights into this area. Our engagement with metaphors regarding interconnectivity offers some initial reflections on this, and further work could explore the development of more inclusive statements regarding the social and environmental value of interconnectors.
2. What role do cultural narratives play in shaping the public discourse around interconnectivity and interconnectors?	In terms of culture and heritage, future work could be directed towards both methodological opportunities and comparative studies between contrasting interconnector contexts and socio-political cultures. It may include multidisciplinary projects that combine different knowledge domains, adopt historical perspectives, or engage with emergent system innovation and disruption amid current geopolitical changes [60].
3. How can participatory, co-creative and arts-based research methods be utilised to engage communities in dialogue about the value, impact and potential opportunities of interconnectors?	Participatory and co-creation approaches have significant potential for future research. Insights from the Celtic Interconnector suggest that relying solely on presumed Celtic connections is insufficient for engaging local communities and the public with this new piece of infrastructure. Real effort and new opportunities for engagement are necessary. The arts are also an exciting and promising field for pursuing some of these engagements. Agonistic democratic engagements could also be leveraged to connect with and understand the concerns and conflicting positions of those who are less engaged, as well as those who may be less positive or opposed to the Energy Union, and its interconnector projects.

acquisition, Formal analysis, Data curation, Conceptualization. **Anne Goarzin:** Writing – original draft. **Edmond Byrne:** Writing – original draft. **Jesse D. Peterson:** Writing – original draft. **Fionn Rogan:** Writing – original draft. **Claire Connolly:** Writing – original draft. **Aoife Deane:** Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **James Cuffe:** Writing – review & editing, Writing – original draft. **Roman Le Goff Latimier:** Writing – original draft, Conceptualization. **Caitriona Ó Dochartaigh:** Writing – review & editing, Writing – original draft. **David Espes:** Writing – original draft. **Brian Ó Gallachóir:** Writing – review & editing, Writing – original draft, Validation, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization.

Declaration of competing interest

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Data availability

Data will be made available on request.

References

- [1] Y.-K. Chen, et al., The role of cross-border power transmission in a renewable-rich power system—a model analysis for Northwestern Europe, *J. Environ. Manag.* 261 (2020) 110194, <https://doi.org/10.1016/j.jenvman.2020.110194>.
- [2] T. Loloum, S. Abram, N. Ortar, Introduction. Politicizing Energy Anthropology, in: T. Loloum, S. Abram, N. Ortar (Eds.), *Ethnographies of power: A political anthropology of energy*, Berghahn Books, New York, 2021, pp. 1–23, <https://library.oapen.org/handle/20.500.12657/91688>.
- [3] N. Dunphy, B. Lennon, A. Revez, B. Pearce, Energy Citizenship: Envisioning Citizens' Participation in the Energy System, Palgrave Macmillan, Cham, 2025, <https://doi.org/10.1007/978-3-031-70153-5>.
- [4] T.P. Hughes, *Networks of Power: Electrification in Western Society, 1880–1930*, JHU press, London, 1993.
- [5] P. Högselius, *Energy and Geopolitics*, Taylor & Francis, London, 2019, <https://doi.org/10.4324/9781315177403>.
- [6] T. Rupčić, Navigating the archives: writing the history of development of electrical infrastructure in socialist Yugoslavia (1945–1991), *J. Energy Hist.* 12 (1) (2024) 1k–15, <https://doi.org/10.3917/jehrhe.012.0170>.
- [7] H. Devine-Wright, P. Devine-Wright, Social representations of electricity network technologies: exploring processes of anchoring and objectification through the use of visual research methods, *Br. J. Soc. Psychol.* 48 (2) (2010) 357–373, <https://doi.org/10.1348/014466608X349504>.
- [8] V.C. Lagendijk, *Electrifying Europe: The Power of Europe in the Construction of Electricity Networks*, Aksant, Amsterdam, 2008, <https://doi.org/10.6100/IR638264>.
- [9] A. Gall, *Atlantropa: a technological vision of a united Europe*, in: E. Van der Vleuten, A. Kaijser (Eds.), *Networking Europe: Transnational Infrastructures and the Shaping of Europe, 1850–2000*, Science History Publications Ltd., Beach, MA, 2006, pp. 99–128.
- [10] P. Högselius, A. Kaijser, E. Van der Vleuten, J. Schot, *Europe's Infrastructure Transition: Economy, War, Nature*, Palgrave Macmillan, Basingstoke, 2016.
- [11] Commission Expert Group, "Towards a Sustainable and Integrated Europe: Report of the Commission Expert Group on Electricity Interconnection Targets," Brussels [Online]. Available: https://commission.europa.eu/news-and-media/news/towards-sustainable-and-integrated-european-energy-networks-final-report-commission-expert-group-2017-11-09_en, 2017.
- [12] M.Z. Jacobson, The cost of grid stability with 100% clean, renewable energy for all purposes when countries are isolated versus interconnected, *Renew. Energy* 179 (2021) 1065–1075, <https://doi.org/10.1016/j.renene.2021.07.115>.
- [13] A. Kaijser, Trans-border integration of electricity and gas in the Nordic countries, 1915–1992, *Polhem* 15 (1997) 4–43.
- [14] A. Kaijser, P. Högselius, Under the Damocles sword: managing Swedish energy dependence in the twentieth century, *Energy Policy* 126 (2019) 157–164, <https://doi.org/10.1016/j.enpol.2018.11.023>.
- [15] A. Klass, Future-proofing energy transport law, *Wash. UL Rev.* 94 (4) (2017) 827–897, https://scholarship.law.umn.edu/faculty_articles/635.
- [16] S. Luengo, Democratizing power transmission, *J. Environ. L.* 55 (1) (2025) 139–208 (doi: <https://www.jstor.org/stable/48835588>).
- [17] C. MacIver, K.R. Bell, G.P. Adam, L. Xu, Electrical interconnectors: market opportunities, regulatory issues, technology considerations and implications for the GB energy sector, *Energy Strat. Rev.* 38 (2021) 100721, <https://doi.org/10.1016/j.esr.2021.100721>.
- [18] S. Hayes, J. Gabbatiss, C. Butler, From climate scepticism to discourses of delay in UK editorials, *Public Underst. Sci.* 34 (7) (2025) 832–851, <https://doi.org/10.1177/09636625251315446>.
- [19] L. Puka, K. Szulecki, The politics and economics of cross-border electricity infrastructure: a framework for analysis, *Energy Res. Soc. Sci.* 4 (2014) 124–134, <https://doi.org/10.1016/j.erss.2014.10.003>.
- [20] B. Flynn, Marine wind energy and the North Sea offshore grid initiative: a multi-level perspective on a stalled technology transition? *Energy Res. Soc. Sci.* 22 (2016) 36–51, <https://doi.org/10.1016/j.erss.2016.08.009>.
- [21] M. Yang, X. Shi, Y. Zhou, J. Xiang, R. Zhang, Deepening regional power connectivity: beyond the industry-centric perspective, *Energy Res. Soc. Sci.* 90 (2022) 102614, <https://doi.org/10.1016/j.erss.2022.102614>.
- [22] CCI, Ambassador of France to Ireland Vincent Guérind: 'France: Ireland's closest EU neighbour'. <https://www.franceireland.ie/news/n/news/ambassador-of-france-to-ireland-vincent-guerind-france-irelands-closest-eu-neighbour.html>, 2023.
- [23] J.-Y. Le Drian, "France, Your Closest EU neighbour," in *The Irish Times*, ed. <https://www.irishtimes.com/opinion/france-your-closest-eu-neighbour-1.4449045>, 2021 (accessed 6 September 2025).
- [24] E. English, "Port of Cork to Open 100m Offshore Energy Facilities," in *Irish Examiner*, ed. <https://www.irishexaminer.com/news/munster/arid-41660321.html>, 2025 (accessed 6 September 2025).
- [25] EirGrid, Powering Up Offshore South Coast. <https://www.eirgrid.ie/offshore>, 2025 (accessed 05 November 2025).
- [26] EirGrid, Celtic Interconnector. <https://www.eirgrid.ie/celticinterconnector>, 2025 (accessed 25 February 2025).
- [27] T. Meyer, F. Weber, Energy geographies—an introduction to perspectives from France and Germany, in: T. Meyer, F. Weber (Eds.), *Energy Geographies: Negotiating the French-German Interface*, Springer VS, Cham, 2024, pp. 1–23, https://doi.org/10.1007/978-3-031-69797-5_1.
- [28] B. Ravaz, Post-nuclear redevelopment trajectories in France and Germany, in: T. Meyer, F. Weber (Eds.), *Energy Geographies: Negotiating the French-German Interface*, Springer VS, Cham, 2024, pp. 79–99, https://doi.org/10.1007/978-3-031-69797-5_5.
- [29] T. Wiertz, R. Sinder, The role of crises in shifting German energy geopolitics, in: T. Meyer, F. Weber (Eds.), *Energy Geographies: Negotiating the French-German Interface*, Springer VS, Cham, 2024, pp. 39–58, https://doi.org/10.1007/978-3-031-69797-5_3.
- [30] EURE Interreg Europe, State of play regional report: Brittany region (France), in: "Effectiveness of Environmental Urban Policies to Improve Resources Efficiency," Atlantic Cities Association, Rennes, Brittany, France, February 2022. Accessed: 15/11/2024. [Online]. Available: https://projects2014-2020.interregueurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1646259877.pdf.
- [31] T. Lartigau, A. Riere, *French Electric Power Balance Sheet 2010* (No. INIS-FR-14-0274). Réseau de Transport d'Electricite-RTE, 2011.
- [32] G. Simon, La mobilisation de "Plogoff", Bécédia (2016). <https://bcd.bzh/becedia/fr/la-mobilisation-de-plogoff> (accessed 6 November 2025).
- [33] S. Fink, E. Ruffing, T. Burst, S.K. Chinnow, Less complex language, more participation: how consultation documents shape participatory patterns, *Interest Groups Advo.* 10 (3) (2021) 199–220, <https://doi.org/10.1057/s41309-021-00123-2>.
- [34] G. Pescarolo, D. Alexander, A definition of cascading disasters and cascading effects: going beyond the "toppling dominos" metaphor, *Planet@Risk* 3 (1) (2015) 58–67, <https://discovery.ucl.ac.uk/id/eprint/1465510>.
- [35] D.E. Nye, *Consuming Power: A Social History of American Energies*, MIT Press, London, 1999.
- [36] S.O. Duibhir, When Ireland said no to nuclear power in Co Wexford, in: RTE Brainstorm, ed, 2024. <https://www.rte.ie/brainstorm/2024/0808/1411319-ca-rnsore-point-anti-nuclear-protests-wexford-ireland-history/> (accessed 6 November 2025).
- [37] G. Escribano, C. González-Enríquez, L. Lázaro-Touza, J. Paredes-Gázquez, An energy union without interconnections? Public acceptance of cross-border interconnectors in four European countries, *Energy* 266 (2023) 126385, <https://doi.org/10.1016/j.energy.2022.126385>.
- [38] D. Linehan, Reading the Irish motorway: Landscape, mobility and politics after the crash, in: *Spacing Ireland*, Manchester University Press, Manchester, England, 2016, pp. 75–88, <https://doi.org/10.7765/9781526111913.00014>.
- [39] K. Müller, S. Sareen, Digitisation and low-carbon energy transitions, in: S. Sareen, K. Müller (Eds.), *Digitisation and Low-Carbon Energy Transitions* ch. 1, Springer Nature, Cham, 2023, pp. 1–24, [uri: https://library.oapen.org/handle/20.500.12657/60852](https://library.oapen.org/handle/20.500.12657/60852).
- [40] S. Sareen, K. Müller, *Digitisation and Low-Carbon Energy Transitions*, Springer Nature, Cham, 2023 [uri: https://library.oapen.org/handle/20.500.12657/60852](https://library.oapen.org/handle/20.500.12657/60852).
- [41] T. Eagleton, F. Jameson, E.W. Said, *Nationalism, Colonialism and Literature*, University of Minnesota Press, Minneapolis, 1988.
- [42] V. Jack, L. MacKenzie, S. Clark, Europe's new war with Russia: Deep sea sabotage, in: *Politico*, ed, 2025. <https://www.politico.eu/article/russia-sabotage-undersea-cables-baltic-sea-europe-war/> (accessed 6 November 2025).
- [43] A. Sytas, J. Laizans, Baltic states switch to European power grid, ending Russia ties, in: *Reuters*, ed, 2025. <https://www.reuters.com/business/energy/baltic-states-switch-european-power-grid-ending-russia-ties-2025-02-09/> (accessed 6 November 2025).
- [44] H. Böhm, Borders and cross-border cooperation in Europe from a perspective of political sciences, in: J. Beck (Ed.), *Transdisciplinary Discourses on Cross-Border Cooperation in Europe* vol. 107, Peter Lang, Brussels, 2019, pp. 59–82, <https://doi.org/10.3726/b15288>.
- [45] A. Lampke, K. Bembnista, F. Weber, L. Gailing, H.P. Dörrenbächer, Energy borderlands in comparison: on the empirical productivity of the concepts around interconnected areas and conflict zones, in: *Linking Borderlands: Dynamics of Cross-Border Peripheries*, vol. 17, K. Bembnista and et al. Eds.: UniGR-CBS Working Papers, 2023, p. 57, <https://doi.org/10.5281/zenodo.8032941>.
- [46] D. Newman, On borders and power: a theoretical framework, *J. Borderl. Stud.* 18 (1) (2003) 13–25, <https://doi.org/10.1080/08865655.2003.9695598>.
- [47] B.K. Sovacool, et al., Sociotechnical agendas: reviewing future directions for energy and climate research, *Energy Res. Soc. Sci.* 70 (2020) 101617, <https://doi.org/10.1016/j.erss.2020.101617>.
- [48] P. Santoro, Liminal biopolitics: towards a political anthropology of the umbilical cord and the placenta, *Body Soc.* 17 (1) (2011) 73–93, <https://doi.org/10.1177/1357034X10394668>.

- [49] E. Van der Vleuten, I. Anastasiadou, V. Lagendijk, F. Schipper, Europe's system builders: the contested shaping of transnational road, electricity and rail networks, *Contemp. Eur. Hist.* 16 (3) (2007) 321–347, <https://doi.org/10.1017/S0960777307003967>.
- [50] H. Lovell, *Understanding Energy Innovation: Learning from Smart Grid Experiments*, Springer Nature, Bern, 2022, <https://doi.org/10.1007/978-981-16-6253-9>.
- [51] B. Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (Revised Edition), Verso, London, 1983.
- [52] J.-M. Picard, *Ireland and Northern France, AD 600-850*, Four Courts Press, Dublin, 1991.
- [53] Y. Bévant, L. Daniel, *Bretagne-Irlande: quelles relations? Centre de recherche bretonne et celtique*, Université de Bretagne occidentale, Editions CRBC, 2015.
- [54] C. Bueger, T. Liebetrau, Protecting hidden infrastructure: the security politics of the global submarine data cable network, *Contemp. Secur. Policy* 42 (3) (2021) 391–413, <https://doi.org/10.1080/13523260.2021.1907129>.
- [55] D. Pepper, Under-resourced naval service operating at just 66% of agreed strength, report finds, in: *The Journal*, ed, 2024. <https://www.thejournal.ie/parliamentary-report-naval-service-funder-resourced-understaffed-and-under-pressure-service-6480936-Sep2024/> (accessed 6 November 2025).
- [56] C. Bueger, T. Edmunds, Beyond seabindness: a new agenda for maritime security studies, *Int. Aff.* 93 (6) (2017) 1293–1311, <https://doi.org/10.1093/ia/iix174>.
- [57] G. Mullally, E. Byrne, A tale of three transitions: a year in the life of electricity system transformation narratives in the Irish media, *Energy Sustain. Soc.* 6 (1) (2016) 3, <https://doi.org/10.1186/s13705-015-0068-2>.
- [58] I. Szeman, D. Boyer, *Energy Humanities: An Anthology*, Johns Hopkins University Press, Baltimore, 2017.
- [59] K. Szulecki, S. Fischer, A.T. Gullberg, O. Sartor, Shaping the 'energy union': between national positions and governance innovation in EU energy and climate policy, *Clim. Pol.* 16 (5) (2016) 548–567, <https://doi.org/10.1080/14693062.2015.1135100>.
- [60] J. Köhler, et al., An agenda for sustainability transitions research: state of the art and future directions, *Environ. Innov. Soc. Tr.* 31 (2019) 1–32, <https://doi.org/10.1016/j.eist.2019.01.004>.