

Back to the past? Discourse coalitions in Italy's emerging nuclear policy debate

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ABSTRACT

Nuclear energy is a technology that has long been subject to controversy, shaped by major global events, shifting public opinion and volatile policy agendas. Among industrialised democracies, Italy is a particularly distinctive case. Following a pioneering role in the 1950s and an ambitious, albeit partially implemented, nuclear programme in the 1970s, the Chernobyl disaster and the 1987 referendum resulted in the complete phase-out of nuclear power. A second referendum in 2011, following the Fukushima disaster, reaffirmed public opposition to any attempt to revive nuclear power. Despite these precedents, nuclear energy has recently returned to the political agenda. This initiative is embedded in broader European debates on the potential of nuclear power in decarbonization and energy security in the context of the crisis triggered by Russia's invasion of Ukraine. This article uses discourse network analysis of media data to investigate the re-emerging debate on nuclear policy in Italy. Specifically, it examines the structure of the debate, the types of actors involved, their framing strategies, how discourse has evolved over time and how pro- and anti-nuclear coalitions have formed. The findings reveal that the Italian nuclear policy debate exhibits a hub-and-spoke structure, with influence concentrated among a small number of dominant actors. Over time, the debate has evolved from initial structuration to consolidation and pluralization in terms of actors, coalitions, and concepts. Nevertheless, despite some differences, pro-nuclear actors and coalitions retain significant visibility and influence.

1. Introduction

Nuclear energy has long been a controversial technology, facing issues of public acceptance and policy volatility, particularly following critical events such as the major accidents at Three Mile Island (1979), Chernobyl (1986) and Fukushima (2011) (e.g. Ref. [1–5]). These events have prompted a rethink, suspension or downsizing of nuclear power programmes in several democratic countries, where policymakers must balance industrial or energy security priorities with evolving views of public opinion on this technology. Among industrialised democracies, Italy occupies a unique position in nuclear energy policy. The country played a pioneering role in the early development of nuclear technology in the 1950s [6]. However, it was only in the 1970s, in response to the oil crisis, that Italy launched a major nuclear programme. Nevertheless, the programme was implemented only partially, and nuclear power remained a marginal part of the country's electricity mix (approximately 3% in the late 1980s). Following the Chernobyl disaster, a moratorium was first imposed on nuclear plans, followed by a referendum in 1987 and the subsequent phase-out of all nuclear power plants (NPPs).

Consequently, Italy became the only large Western European country to abandon nuclear energy in the early 1990s. Prior to Germany closing its last NPPs in 2024, Italy was also the only G7 member without nuclear technology in its energy mix, despite being highly dependent on imported fossil fuels.

The Italian nuclear debate was revived in 2008 by the centre-right Berlusconi government, which introduced new legislation (Law 99/2009) for the deployment of NPPs. However, this initiative encountered mounting opposition by several civic society and environmental organizations, centre-left and green political parties and regional and local governments. In the wake of the Fukushima disaster, a new referendum was held (on 12–13 June 2011) to halt Berlusconi's government nuclear plans. This consultation had a voter turnout of 55%, with around 94% of respondents voting against the restarting of a nuclear programme in Italy. The results confirmed those of the 1987 referendum, showing that the majority of Italian citizens were against nuclear energy.

Despite the referendums of 1987 and 2011, the nuclear option has recently become a potential reality for Italy once again. The new right-wing government, led by Giorgia Meloni and appointed in October

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2022, was elected on a platform that included the potential relaunch of nuclear power. In February 2025, the government issued the Bill on Nuclear Energy ('DdL Energia Nucleare') providing for a new legal framework for constructing and operating NPPs in Italy. In contrast to 2008, the Italian government's plans this time have been formulated within the context of the evolving debate on the potential role of nuclear energy in decarbonising European Union (EU) energy systems, amid the energy crisis triggered by Russia's full-scale invasion of Ukraine, which had an immediate and profound impact on the country. Before 2022, Italy imported roughly 40% of its natural gas from Russia, with gas accounting for around half of national electricity generation [7]. The sudden reduction and subsequent diversification of gas supplies exposed Italy to severe price volatility and raised concerns over security of supply [8]. This crisis re-opened strategic discussions on long-term energy options, including the potential role of nuclear power, which re-emerged in public and political arenas despite Italy's long-standing anti-nuclear trajectory. However, previous historical events suggest that the recent moves by the Italian government do not necessarily mean that Italy will rejoin the nuclear power club. The difficult process of localising and constructing the Italian national nuclear waste repository illustrates that nuclear technology and facilities still encounter significant issues regarding public acceptance and political support (e.g. Ref. [9]). This indicates that contestation and framing will be central to Italian nuclear policy, with different actors trying to shape the discourse to increase the legitimacy of policy options favouring or contrasting nuclear developments.

Recent research has advanced the understanding of nuclear technologies primarily from techno-economic and resource-centered perspectives. Long-term energy system modeling studies explore the potential contributions of different fusion reactor designs to future electricity systems (e.g. Ref. [10]), while other work examines the material constraints associated with deploying DEMO-type fusion power plants, highlighting the strategic importance of critical raw materials such as beryllium, lithium, and tungsten [11]. Additional studies address Europe's structural dependence on Russian nuclear fuel-cycle services and the challenges of achieving strategic autonomy by 2030–2035 [12], as well as the geological and geopolitical implications of Europe's uranium resource base [13].

While this body of research provides essential insights into the new technological, material, and geopolitical dimensions of nuclear energy, none of these studies investigates how nuclear power is discursively constructed within a national political arena, nor how actors mobilize competing frames to support or oppose nuclear energy in the context of a renewed policy debate. To our knowledge, this is the first study to apply discourse network analysis (DNA) to the nuclear energy debate in Italy—a country where nuclear power has historically been contested and where discussions of a potential nuclear return have re-emerged multiple times, especially following the 2022 energy crisis.

Against this background, the aim of this paper is to analyse the emerging discourse on nuclear policy in Italy by addressing the following research questions: (i) Which types of actors participate in the nuclear debate? (ii) What frames do they adopt? (iii) How has the discourse evolved over time? (iv) Are discourse coalitions emerging in Italian nuclear policy? To answer these questions, we employ discourse network analysis (DNA) of the media to document policy actors' claim-making and track their positions over time. While previous studies have examined the causes of Italy's historical fluctuations in nuclear policy (e.g., Ref. [6,14,15]) and the evolving public attitudes regarding these technologies among Italian citizens (e.g., Ref. [16,17]), none have analysed the re-emerging nuclear discourse in the country. This paper fills this gap, while also contributing to research on the role of discourse in energy policymaking.

The rest of the paper is organised as follows. Section 2 presents a literature review that briefly situates the Italian case within the Western European nuclear policy landscape and explains discourse analysis, including its application to nuclear energy debates. Section 3 outlines

the methods and data used in the study. Section 4 presents the results. Section 5 discusses the findings, and Section 6 offers concluding remarks, providing insights on how the Italian case can inform the analysis of nuclear energy policy in the broader Western European context. Our study shows that the Italian nuclear discourse is organized in a hub-and-spoke structure, where discursive influence is unevenly concentrated in a few central actors linked to a broader periphery of less central ones. Over time, the debate shifts from initial structuration to consolidation and finally to pluralization, with influence becoming more widely distributed, yet dominant actors from both pro- and anti-nuclear coalitions continue to drive the discussion. Although the debate is not one-sided, pro-nuclear actors—despite their internal differences—hold significant structural power in shaping the national energy discussion, also representing the overwhelming majority of actors involved.

2. Literature review

2.1. Nuclear energy policies in Western Europe

In Western Europe, nuclear energy has been the object of sustained political contestation, but national trajectories have diverged markedly in terms of institutional continuity and political legitimacy. In France, nuclear power has historically been embedded in a state-led energy regime, supported by strong technocratic elites and a centralized administrative apparatus, ensuring long-term policy continuity despite public debate [4,18]. In Germany, contestation over nuclear energy became embedded within a broader energy transition narrative, in which interest groups and party competition played a central role in shaping a politically structured phase-out within the framework of the *Energiewende*, rather than through abrupt institutional rupture (e.g. Ref. [19]). In Sweden, while an earlier commitment to nuclear phase-out was partially reversed, this shift occurred within a stable institutional framework and through discursive reframing of nuclear energy in response to profitability and energy security concerns, rather than through abrupt policy change [20]. Italy diverges from all these trajectories (e.g. Ref. [6,14,15]). The combination of two referendums, weak institutional anchoring, and fragmented political coalitions has resulted in a highly fragile and discontinuous nuclear policy path. This legacy has rendered nuclear energy particularly vulnerable to delegitimation, necessitating repeated discursive efforts to reframe it as a credible policy option. Although public support for nuclear energy in Italy increased following the 2022 energy crisis, it has remained structurally lower than in France and Germany, with significant differences across citizens holding different political views along the left-right spectrum [16].

2.2. Tracing policy through discourse

Policy development, particularly in emerging domains, depends not only on institutional decisions but on the discursive processes through which issues are defined and contested. Discourses—defined as ensembles of ideas, concepts, and categorizations that give meaning to social and physical phenomena [21]—shape how actors interpret reality and contribute to structuring policy outcomes. From this perspective, policy change is not understood primarily as the formal adoption of new regulations, but as a process of discursive reconfiguration through which certain policy options become legitimate, conceivable, or excluded from public debate [21]. Drawing on Hajer's concept of discourse coalitions, Bulkeley [22] shows how shared storylines among diverse actors structure the interpretation of policy problems and shape possible responses. In this sense, policymaking is best seen as a contest over meaning, where actors struggle to establish discursive hegemony by advancing publicly visible claims [23]. These claims, which reflect positions towards specific concepts, are not made in isolation. They form part of a strategic effort to influence agendas [24], often drawing on external expertise, previous policy conflicts, and evolving actor

configurations [25,26]. When repeated and aligned across multiple actors, these positions may coalesce into structured coalitions that shape the direction and framing of policy debates [21,27].

Media provide a diachronic and empirically tractable site for tracing these discursive interactions. While they do not neutrally reflect the debate, broadsheet print media offer a public arena in which actors make claims, seek attention, and legitimize their perspectives [28]. Over time, the cumulative pattern of alignments and oppositions observable in media claims can be mapped as discourse networks—relational structures linking actors to the ideas they promote or oppose [29,30]. Within these networks, actors' positions are defined by their discursive affiliations, and their influence is shaped by centrality or brokerage roles. Discourse network analysis (DNA) allows researchers to reconstruct how issue interpretations stabilize, polarize, or shift, moving beyond thematic content to capture the strategic and relational dimension of discourse formation. This perspective is particularly well suited to policy areas characterized by uncertainty, contestation, and evolving coalitional dynamics.

2.3. Studying nuclear energy policy through discourse

DNA was formalized by Philip Leifeld as a method integrating social network analysis with content analysis to capture the dynamic structure of policy debates [29,30]. It has become particularly influential in studying advocacy and discourse coalitions, especially in the fields of environmental, energy, and sustainability transitions (e.g. Ref. [31–33]). By mapping claims and tracking alignment or opposition over time, DNA reveals how discourse structures form, evolve, and potentially influence policy debates and outcomes. This has been particularly useful in tracing coalition dynamics, belief alignments, and discursive polarization over technological options, including in the field of nuclear energy (e.g. Ref. [30,34,35]). For instance, in Rinscheid's (2017 [36]) study of Germany's and Japan's post-Fukushima nuclear policy realignment, crisis-induced disruption prompted the fragmentation and reconfiguration of coalitions around competing policy frames, whereas in Japan the more unitary subsystem limited the scope of change and produced only incremental adjustments. In South Korea, Nam et al. [37] drew on DNA, revealing two enduring and polarized coalitions over nuclear energy. These coalitions adapted their discursive frames but remained structurally stable through policy reversals and public deliberation, highlighting the resilience of belief systems in adversarial subsystems. Focusing on the United States, Gupta et al. [38] combined the Narrative Policy Framework and DNA to study nuclear narratives coalition dynamics over time.

A further set of discourse-based but non-DNA studies deepens the comparative perspective. In Sweden, Faber [20] used Bacchi's WPR [39] approach to examine how the country's nuclear phaseout was interrupted in 2016. The profitability crisis was re-framed as a threat to grid stability, enabling actors to reverse previously agreed-upon policies. The study, grounded in post-structuralist discourse theory, exemplifies how crisis discourses can enable policy shifts. Ramana and Blaise [40] offered a discourse-oriented critique of Canada's policy on Small Modular Reactors (SMRs), arguing that institutional bias within the regulatory framework, coupled with the exclusion of SMRs from environmental assessments, facilitated the construction of a pro-nuclear narrative that lacked democratic legitimacy. In Germany, Wiertz et al. [41] examined how Russia's 2022 invasion of Ukraine restructured the discursive framing of Germany's *Energiewende*. Drawing on discourse analysis, the authors identified a shift from ecological modernization to geopolitical rationality, with nuclear energy temporarily re-legitimated under security imperatives. Shim et al. [42] conducted semantic network analysis across six countries, mapping nuclear energy frames such as energy security, climate mitigation, economic growth, and safety. Their co-occurrence-based method revealed frame salience and national discursive patterns. Similarly, Yamagata [43] explored how framing affected public acceptance of nuclear power in Japan, the UK, and the

USA. The analysis demonstrated how discursive cues—such as “new construction” or “no need for evacuation”—shaped public reactions, especially in post-Fukushima Japan.

These studies show that nuclear energy discourse is not merely a reflection of technical debates or market dynamics, but a contested arena of symbolic politics. Several theoretical frameworks underlie this comparative body of work. Hajer's [21] notion of discourse coalitions and the argumentative turn articulated by Schön and Rein [44] provide a foundation for understanding how actors draw upon shared storylines to build coalitional strength. These theoretical contributions help contextualize the methodological orientation of DNA and its emphasis on discursive patterns. Comparative analysis also confirms that while the frames (e.g. safety, climate, sovereignty, economy) are similar across contexts, their salience and interaction vary according to national histories, and discursive opportunity structures. Whether conducted through DNA, semantic networks, or qualitative analysis, all contributions underline the importance of actor coalitions and framing contests in shaping nuclear policy trajectories.

3. Methods and data

This study aims to investigate how the policy discourse on nuclear energy has evolved in Italy from 2019 to early 2025, a period marked by growing political interest in its potential inclusion in the national energy mix, culminating in the launch of the Bill on Nuclear Energy by the Meloni government on February 28, 2025. Italy currently has no active nuclear power plants and remains one of the few Western European countries without a clear long-term nuclear policy. Thus, unlike previous studies, applying DNA to established nuclear systems, this research explores how the policy debate is taking shape for a possible nuclear return. Through the lens of DNA, the study reconstructs the actors' constellations, claims, and frames that have emerged in the Italian media debate. It also asks whether discursive coalitions are beginning to form and how cohesive and polarized they have become across this period.

3.1. Time frame

The time frame under investigation—from January 2019 to February 2025—is divided into three analytically distinct phases, each initiated by a key policy development (Table 1). The first phase extends from January 1, 2019 to July 6, 2022. This period begins with the presentation of Italy's first National Integrated Energy and Climate Plan (PNIEC 2019), which does not mention nuclear energy as part of the national energy strategy. During this phase, the Russian invasion of Ukraine in February 2022 marks a turning point, leading to a sharp increase in

Table 1
Relaunching nuclear energy in Italy: A Time frame.

Phases	Start-end	Major developments
Period 1st	Jan 1, 2019–6 July 2022	<ul style="list-style-type: none"> Approval of Italy's first National Integrated Energy and Climate Plan (2019), which makes no mention of nuclear energy Russia- Ukraine War, raise of energy prices and growing concerns on the country's energy security (since February 24, 2022) European Parliament's approval of the EU taxonomy (July 2022)
Period 2nd	July 7, 2022–15 Nov 2023	<ul style="list-style-type: none"> October 2022 appointment of a pro-nuclear government (Meloni Government) November 2023 launch of Italy's Platform for Sustainable Nuclear Energy (PNNS)
Period 3rd	Nov 16, 2023–28 Feb 2025	<ul style="list-style-type: none"> Approval of PNIEC 2024 with reference to nuclear energy (July 2024) Expected approval of a nuclear legislative package in early 2025

Source: authors' elaboration.

energy prices and growing concerns for national energy security (in 2021, Italy's dependency on Russian gas was approximately 40%). It concludes with the European Parliament's approval of the EU taxonomy, which controversially classifies nuclear energy as a sustainable investment (see Table 1).

The second phase begins on July 7, 2022 and ends on November 15, 2023, and it encompasses the months between the taxonomy vote and the launch of Italy's Platform for Sustainable Nuclear Energy (PNNS), the first concrete institutional move toward re-engaging with the nuclear issue. This second phase is marked by the appointment, in October 2022, of a government led by Giorgia Meloni and the far-right party Brothers of Italy, which publicly endorsed nuclear energy as part of its electoral platform.

The third phase runs from November 16, 2023 to February 28, 2025 and reflects the final stages of the debate. This includes the approval, in 2024, of Italy's second National Integrated Energy and Climate Plan (PNIEC 2024), in which for the first time, the government refers to a concrete possible relaunch of nuclear energy, whose production could account for approximately 11% of the country's electricity demand by 2050. This step will then lead to the approval of Bill on Nuclear Energy in early 2025. These three phases provide a meaningful structure for analysing how discourse has evolved over time following the gradual re-entering of nuclear power into the national energy policy agenda.

3.2. Data collection

The first stage of the research aimed to collect data consisting of media coverage from two leading national newspapers. Compared to other sources such as position papers or legislative hearings, broadsheet newspapers are more likely to capture a broader spectrum of actors engaged in political debates [29]. Newspapers appear regularly and with high frequency, they offer a solid foundation for systematic empirical analysis over time. At the same time, newspaper data may not encompass all relevant actors within a discourse, for instance in specific local debates, and certain actor categories (e.g., governmental actors) may be overrepresented, while others (e.g., niche actors) underrepresented. For our analysis, we relied on the national daily editions of *La Repubblica* and *Corriere della Sera*. Both were selected following the "quality press" criterion (Barranco and Wisler 1999), meaning that they are general news-oriented outlets of established reputation. *Corriere della Sera* typically reflects a more conservative editorial stance, while *La Repubblica* leans more liberal. Together, they offer a view into the upper tier of Italian media discourse, which is especially relevant for understanding how policy discourses are constructed and legitimated in the public sphere.

Newspaper articles were collected through archival searches from the newspapers' websites using keywords related to nuclear energy and manually screened for relevance (see Appendix A). The final corpus includes all articles that explicitly discuss nuclear energy in relation to energy policy, technological innovation, or industrial strategy issued in the selected time-frame. Articles were excluded if without claims and if they referenced nuclear topics unrelated to Italy or used nuclear metaphorically or historically without policy implications. The final corpus contains 350 articles: 220 from *Corriere della Sera* and 130 from *La Repubblica* (see Appendix A).

3.3. Coding

Statements made by identifiable actors were then coded using the software Discourse Network Analyzer¹ [29]. Each unit of analysis corresponds to a claim—a publicly expressed position on nuclear energy—linked to a specific actor and concept. Five coders participated in

the coding process, following a shared protocol and applying iterative refinements to ensure inter-coder reliability. Each coding unit was coded with the following variables: actor's name, its affiliation, its type (e.g., political party, research institution, business association), concept, and level of agreement. Coding guidelines and the full codebook are provided in the supplementary materials (see Appendix A). A total of 517 claims were coded from 350 articles, a ratio that is consistent with other studies employing DNA (e.g. Ref. [45]).

One hundred thirty-nine individuals representing one hundred and five organizations were identified (see Appendix B). The organizations were classified according to their activities (see Appendix C). We treat organizations as actors/stakeholders. Actor organizations were grouped into eight categories: national government institutions, local government, political parties, business associations, companies, environmental NGOs (ENGOs), research institutions and others (international and foreign national authorities, political movement, foundations, other institutions). Concepts, or the discursive categories to which actors refer, were coded through five thematic frames. These frames were selected based on the existing literature on nuclear policy discourse (see Section 2.3 above) and through an examination of the national debate, including parliamentary hearings and official documents, to ensure that they accurately reflect the structure and language of the Italian nuclear discussion. The first frame, *competitiveness*, captures economic arguments concerning the cost of energy: nuclear is supported as a means to reduce electricity costs for households and businesses, while it is opposed for being too expensive to develop and maintain. The *industry and R&D* frame reflect positions on the technological frontier: proponents emphasize nuclear energy's role in driving industrial innovation and scientific advancement, whereas opponents argue for focusing investment on greener, more sustainable technologies. The *safety* frame includes positions that either stress the technical reliability and modern safeguards of nuclear plants or highlight persistent risks related to accidents and radioactive waste. *Security* relates to energy autonomy and geopolitical independence: nuclear is supported for enhancing national energy security, while it is rejected for increasing reliance on foreign materials and technologies. Finally, the *sustainability* frame deals with the environmental dimension: supporters view nuclear power as essential for achieving decarbonization goals, whereas critics question its green credentials, arguing that it is incompatible with a truly sustainable energy transition due to the long-term risks associated with waste management and mineral resource governance, as well as doubts about the feasibility of expanding nuclear capacity rapidly enough to meet the urgent demands of decarbonization in the face of the climate crisis (e.g. Ref. [46,47]). Each concept was coded for polarity, indicating whether the actor expressed support or opposition. The coding of selected articles was systematically compared; discrepancies were examined through discussion, ambiguities were clarified, and the codebook was subsequently refined to ensure consistency and accuracy.

3.4. Method of analysis

Upon completion of the coding process, multiple data types were exported from the DNA software. The first dataset consisted of tabular information covering the entire time span, with each row corresponding to an individual claim made by an actor. For the initial phase of analysis, we applied descriptive content analysis techniques, including the examination of concept and actors' frequencies, the distribution of agreement and disagreement with specific concepts, and cross-tabulations based on selected variables such as organization type, concept category, and others. To examine the evolving structure of actors' relationships and their connections to policy concepts across time, we have then constructed a series of weighted networks from the underlying relational data using the rDNA package and the RStudio software. In this article, we use the term actor to refer both individuals who make public claims and their organization. However, for the purposes of network construction and analysis, these individuals are grouped by their

¹ The software is freely available at: <https://github.com/leifeld/dna/releases>.

organizational affiliation. As a result, all claims made by individuals affiliated with the same organization are attributed to a single node in the network. All edge weights have been normalized on a continuous scale from -1 to 1 , with positive values denoting agreement or support and negative values indicating disagreement or opposition. Isolated nodes—those without any remaining ties above this threshold—have been removed from the final networks.

We first constructed a one-mode actor network covering the full observation period. In this network, nodes represent individual organizations, and edges capture their relationships based on the concepts. Both positive (green) and negative (red) edges have been retained. We have computed eigenvector centrality scores to assess each actor's structural influence within the network. This centrality metric not only reflects the number of connections a node has but also the importance of the nodes to which they are connected. The resulting network displays actors as nodes scaled by their centrality, with a continuous color scale indicating centrality values in the legend.

To explore how actors' positions and conceptual associations evolved over time, we have also constructed three two-mode networks (one for each period of analysis), each including both actors (blue circles) and concepts (green squares) as nodes (see below). Eigenvector centrality has been calculated for concept nodes, allowing us to identify which concepts occupy structurally central positions in the discourse. In each network, node sizes for concepts have been scaled according to their centrality, while edge colours again reflected their level of agreement/disagreement—green for positive associations and red for negative ones. In addition, for each time period, we have generated actor-only subgraphs to analyse coalition dynamics. These networks include both positive and negative ties. With the theoretical assumption that coalition formation is primarily based on shared support and alignment, we have applied the Louvain clustering algorithm to detect communities within each subgraph only on normalized positive edges. In all three periods, the algorithm has identified three distinct coalitions (see below). To assess the robustness and significance of these structures, we have conducted two different modularity significance tests (i.e., network randomisation and community stability). All tests returned a p -value < 0.001 , indicating that the detected coalitions are highly non-random and show stable community detection and structure.

Finally, to assess the degree of antagonism between the different coalitions, we have analysed cross-coalitions negative edges. As in previous networks, we have calculated eigenvector centrality for the whole network (therefore including both positive and negative edges, and the resulting nodes) to determine their prominence within the broader relational structure. The resulting networks encode actor centrality through node size, coalition membership through color, and organizations types in node shapes, with edge color reflecting tie valence.

4. Results

4.1. Overall discourse characteristics

This first section presents an overview of discourse activity: the claims as they are coded. The distribution across the three periods reveals a fluctuating trajectory in the number of nuclear-related claims (Table 2). With an average of 0.9 claims per week, the first phase registers a moderate level of discursive activity. In fact, during this phase, nuclear energy had not yet fully entered the public debate, to the extent that it was not included in the 2019 National Integrated Energy and Climate Plan. The phase concludes with a shift triggered by the outbreak of the war between Russia and Ukraine in February 2022, which, by causing an energy crisis, rising the energy prices, contributed to reopening the debate on nuclear energy in Italy.

The second phase, which follows the EU taxonomy vote reclassifying nuclear energy as a sustainable investment, registers 144 claims from 38 actors, with an average of 2.2 claims per week (Table 2). This indicates a marked increase in discursive intensity compared to the previous phase,

Table 2

Claims and actors presence per period in the Italian nuclear energy debate (2019–2025).

Phase	Claims	Claims per week (average)	Organizations	Individuals
Period 1 (183 weeks)	173	0,9	48	56
Period 2 (71Weeks)	154	2,2	38	43
Period 3 (67 weeks)	190	2,8	53	65
Total (321 weeks)	517	1,6	104 (*)	134 (*)

Sources: Authors' elaboration. Notes: (*) = totals for organizations and individuals count each actor only once across all periods.

despite a reduction in the number of actors. The third phase is marked by a renewed increase in the number of actors involved (53, the highest across all phases), alongside a higher discursive intensity, averaging 2.8 claims per week. This period aligns with the announcement of the Platform for Sustainable Nuclear Energy and expectations surrounding forthcoming legislation. Rather than following a linear trajectory, the discourse evolves in response to institutional cues, with variations in frequency and actor composition reflecting the timing and perceived salience of policy developments.

4.2. Actors in the public discourse

A crucial component of DNA involves examining the actors engaged in the discourse. As shown in Fig. 1 (see also Appendix D and E), the initial period—characterized by the absence of national or EU policies on nuclear energy—is marked by a greater presence of political parties, which account for 30 % of all claims. They are followed by national government actors (19.1 %) and companies (17.5 %), while all other categories have a marginal presence. This first phase is therefore dominated numerically by political voices, particularly from Matteo Salvini's Lega and the Ministry for Ecological Transition (MITE), led at the time by Roberto Cingolani (see Table 3). It can be described as a phase of political incubation, during which the idea of reintroducing nuclear energy begins to circulate more visibly. In the second and third phases—coinciding with the topic's return to national and EU political agendas, also in the context of the war-driven energy crisis—economic actors become the most present category (32 % in the second phase, 31 % in the third). Political parties remain active but decline in relative share (20 % and 16 %, respectively), as does the national government (around 22.2 % in both phases). Particularly during the second phase, which spans the months between the EU taxonomy decision and the launch of Italy's PNNS, corporate actors such as Newcleo and Edison begin to increase their media presence, and also some institutional actors like the Ministry for the Environment and Energy Security (MASE) under Pichetto Fratin gained shares (see Table 3).

The third phase begins with the formal institutionalization of the nuclear policy through the launch of the PNNS. It extends to the beginning of 2025, just before the anticipated Bill on Nuclear Energy. This phase is characterized by companies contributing most frequently to the debate. Alongside established and new industrial players, it began to be visible also the engagement of the Presidency of the Council of Ministers (PdCM). While the continued presence of the MASE guided by Pichetto Fratin underscores a stable role in government leadership. The slight rise in ENGOs presence in the third phase—from 4.9 % to 6.5 %—could indicate a limited re-entry of critical perspectives during legislative negotiations. More generally, the limited visibility of ENGOs and local governments highlights the predominantly elite-driven nature of the Italian nuclear energy debate.

The decline of political parties shares from 30 % in the first phase to under 20 % in the third, suggest a partial reduction of partisan presence

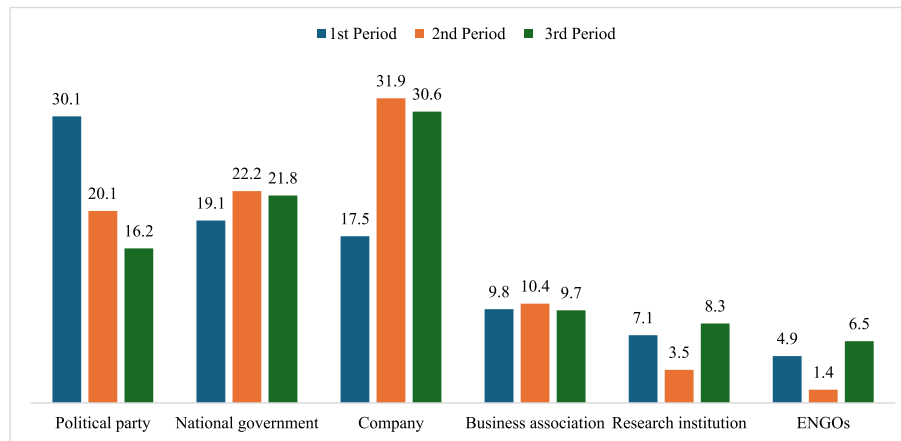


Fig. 1. Policy actors in the Italian Nuclear Energy Debate: share by group and period. Sources: Authors' elaboration. See Appendix D and E for details.

Table 3 Claims, actors presence, and organizational visibility per period.

Phase	Claims	Actors	Most Visible Organizations
Period 1 (2019–2022)	173	48	Lega (37), MITE (*) (26), ENEA (13), ENI (12), MSS (8)
Period 2 (2022–2023)	154	38	MASE (**) (19), Newcleo (18), Edison (9), Lega (7), Assolombarda (7)
Period 3 (2023–2024)	190	53	MASE–Pichetto (31), Edison (14), Ansaldo Nucleare (10), Azione (10), Confindustria (8)

Sources: Authors' elaboration. Notes: (*) = under the Ministry Roberto Cingolani; (**) = MASE, under the Ministry Gilberto Pichetto Fratin, replaced MITE with the right-government of Giorgia Meloni.

in favor of government actors. A trend that reflects the transition of some of the most active parties, such as Lega, Forza Italia and Fratelli d'Italia, into governing roles following the 2022 elections, which shifts their discursive activity from the partisan to the institutional sphere.

Across the full observed time frame, the most present organizations in the nuclear energy debate are governmental ministries and political leaders, followed closely by firms and associations representing Italy's core energy and industrial sectors. The three most consistently active actors—Lega (54 mentions), MITE (under Cingolani), and MASE (under Pichetto Fratin) (52 each)—represent the intersection of political endorsement and institutional authority (Table 4). Within the industrial domain, Newcleo (27 mentions) and Edison (25) emerge as the most present of the private sector, while the presence of Assolombarda and Confindustria (17 mentions each) indicates the mobilization of organized business (Table 4). The media presence of ENI (17) and Enel (11), the Italian's 'energy champions' is lower than that of other companies, like Newcleo.²

4.3. Content of the discourse

We now consider the concepts coded for the different actors (see Fig. 1 and Appendix D). Fig. 2 presents the distribution of supportive and oppositional claims on nuclear energy across the three periods. Supportive claims consistently outnumber oppositional ones, increasing from 80 % in the first phase to 89 % in the second, before slightly

² Newcleo was founded in September 2021 on the initiative of Italian physicist Stefano Buono, with the aim of developing new small modular reactors. Entering the energy sector for the first time, the company actively sought greater public visibility—visibility that long-established, state-participated operators such as Eni or Enel do not require.

declining to 86 % in the third. These figures represent the relative frequency of positions expressed in the debate, not the underlying structure of polarity or dominance among actors (see below).

Fig. 3 presents the distribution of conceptual categories referenced in nuclear-related claims across the three periods. Mentions related to sustainability (26 %) and competitiveness (25 %) are the most frequent, followed by industry and research (23 %), while references to safety and security are less common, at comparable levels. These proportions indicate which concepts have been more frequently evoked in public discourse.

These proportions suggest that the concepts of sustainability, competitiveness, and industry–research occur more frequently in the policy debate, appearing at nearly twice the rate of safety and security. However, as the analysis will later show, some of the less frequent concepts—particularly safety—nevertheless assume central importance during specific periods.

Fig. 4 tracks how each conceptual category evolves across the three phases. While sustainability peaks in the second period and then declines, industry (R&D) grows steadily, becoming the dominant category in the third phase. Competitiveness remains constant, while safety and security remain stable or modestly increase. The growing frequency of innovation-oriented arguments over time reflect a trajectory shaped by diverging interpretations of nuclear development: actors supporting Giorgia Meloni's government, together with ENI, advocate continued reliance on fossil fuels and renewables until nuclear fusion becomes viable, projected around 2050; environmental parties such as AVS, reject nuclear energy entirely, promoting an exclusive transition to renewables; the Democratic Party, largely absent from the debate, support renewables in a more inconsistent and fluctuating manner, it generally opposed to traditional nuclear energy but supports research into new, safer, and more efficient technologies; in contrast, institutional actors, such as MASE, center-left political parties, such as Azione and Italia Viva, as well as energy utilities and business associations (i.e. Enel, Edison, and Confindustria Energia) endorse a technological relay strategy, whereby small modular nuclear reactors—expected to be operational from 2030—would progressively replace gas-fired power plants, in parallel with the expansion of renewable sources.

In the first period (Fig. 5, A), research institutions and ENGOS highlight safety and sustainability, while political parties and government actors show a more balanced emphasis across categories. Business associations focus predominantly on competitiveness, and companies already begin to advance innovation-related arguments. Security remains marginal across all actor types. In the second period (Fig. 5, B), ENGOS and business associations push security and competitiveness to the foreground, while political parties reduce their use of safety arguments. National government actors emphasize sustainability and

Table 4
Visibility and position of Organizations in the Nuclear Debate (2019–2025).

Organization	Mentions	Type	Position (*)
Lega	54	Political Party	Pro-nuclear
MITE (Ministry Cingolani)	52	National Government	Pro-nuclear
MASE (Ministry Pichetto Fratin)	52	National Government	Pro-nuclear
Newcleo	27	Company	Pro-nuclear
Edison	25	Company	Pro-nuclear
Ansaldo Nucleare	19	Company	Pro-nuclear
Azione	18	Political Party	Pro-nuclear
ENEA	18	Research Institution	Pro-nuclear
Assolombarda	17	Business Association	Pro-nuclear
Confindustria	17	Business Association	Pro-nuclear
ENI	17	Company	Pro-nuclear
AVS	13	Political Party	Anti-nuclear
FI	13	Political Party	Pro-nuclear
Enel	11	Company	Pro-nuclear
PdCM (Draghi, Meloni)	11	National Government	Pro-nuclear
M5S	9	Political Party	Anti-nuclear
MIT (Ministry Salvini)	8	National Government	Pro-nuclear
IEA	8	Other (International Authority)	Pro-nuclear
Politecnico Milano	7	Research Institution	Pro-nuclear
EY	6	Company	Pro-nuclear
EU Commission	6	Other (International Authority)	Pro-nuclear
Federacciai	6	Business Association	Pro-nuclear
Regione Lombardia	5	Local government	Pro-nuclear
CNR	4	Research Institution	Anti-nuclear
Greenpeace	4	ENGOS	Anti-nuclear
IV	4	Political Party	Pro-nuclear
Legambiente	4	ENGOS	Anti-nuclear
MISE	4	National Government	Pro-nuclear

Sources: Authors' elaboration. Notes: (*) = the table includes only those actors whose discourse was exclusively or predominantly (i.e., over 90 %) in favor of or against nuclear power.

innovation equally, reflecting their strategic pivot toward long-term technological framing. In the third period (Fig. 5, C), ENGOS are the primary voices raising safety concerns, while competitiveness and industry is more addressed for most other actors. The business sector, in particular, anchors the discourse on economic renewal and technological autonomy, as institutional negotiations for policy adoption advance. The general decline in risk-oriented language corresponds with an increasing prevalence of affirmative, innovation-focused narrative.

4.4. Discourse networks

In this final section we present and discuss a network structure dataset consisting of organizations, the concepts they support or reject, enabling the construction of one-mode projections to analyse coalition structures and discursive alignment. Network metrics (e.g., centrality, modularity, density, and transitivity) were computed to analyse the evolution of the discourse across the three phases. This analytical strategy allows us to investigate not only which coalitions form and persist over time, but also how these coalitions change in terms of actors' composition, central figures, preferred discursive orientations, internal connectivity, and levels of polarization.

Fig. 6 shows the actors' network over the entire period, highlighting a structure where a few actors are strongly connected while many others have only limited ties. This pattern suggests a centralized configuration, whereby influence over the policy discourse—measured through network centrality—is concentrated among a small number of highly connected nodes. Most actors maintain multiple connections, but the network as a whole remains relatively loose and dispersed. These patterns indicate that while interaction is present, only a few actors consistently shape the discourse across the full-time span. This finding is reinforced by the strong negative degree assortativity, which points to a core–periphery pattern in which central nodes (hubs) are predominantly connected to peripheral ones (spokes). The network's diameter indicate that any actor can reach any other through no more than three steps. This suggests a compact structure where information or discursive alignment can spread efficiently. Within this configuration, MASE and

Lega emerge as the most central actors in terms of both connectivity and strategic position. They function as bridges between multiple areas of the network and link otherwise disconnected groups. These are followed by Newcleo, Edison, and MITE, who also hold prominent positions with substantial influence on network structure. On the critical or oppositional side of the debate, M5S and AVS maintain relatively high centrality scores, playing visible and structurally important roles in contesting the dominant discourse. This structure confirms a hierarchical and polarized configuration. The combination of moderate density and degree, a diameter of 3, and negative assortativity point to a network that is both integrated and stratified, with a few key players exerting significant discursive influence over a wider constellation of less connected participants (see Fig. 7).

Period 1 displays a one-mode network with the lowest overall density observed across the three phases, indicating that although many actors are related, the proportion of actual connections relative to all possible ones is comparatively lower. The metrics reflect an uneven distribution of ties, with some actors significantly more connected and embedded in the network than others. At the same time, the network remains compact in structure: the average path length between any two actors is just over one step, and no actor is more than two steps away from another, indicating that discursive exchanges can circulate quickly across the entire network. Actors tend to be interconnected in consistent ways—but the way they group into coalitions is not as compact or strongly organized as what we observe in the later periods. Three clusters are identified, each composed of a comparable number of actors (Fig. 7). The middle one displays a fully interconnected configuration, where all actors are directly linked to one another. The other two clusters exhibit slightly looser internal connections, though still maintaining a relatively dense internal structure. Patterns of internal linkage suggest that, already in this early phase, distinct coalitions were emerging with varying degrees of internal alignment (Fig. 7). Mean eigenvector centrality values are lower in Period 1 than in later periods, suggesting a more distributed structure of influence across actors. No substantial gaps in centrality scores are observed between the most central actors of different coalitions. Moreover, the relatively low

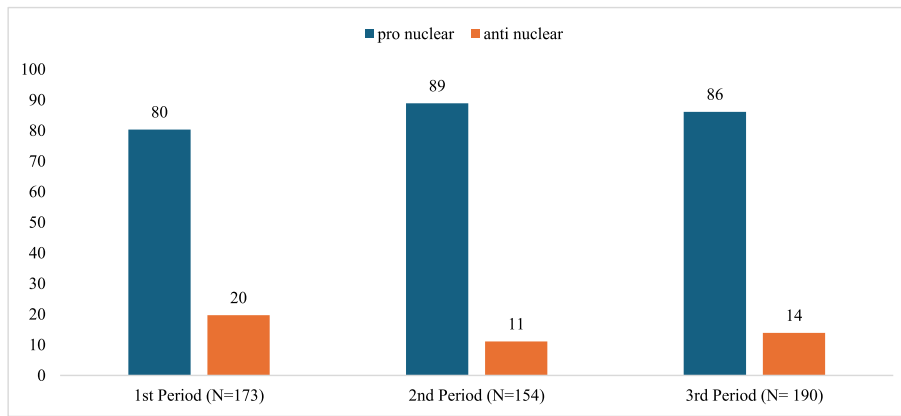


Fig. 2. Share of claims pro- and anti-nuclear in each period (%).
Source: Authors' elaboration.



Fig. 3. Share of concept categories (%) for all years (2019–2025).
Sources: Authors elaboration.



Fig. 4. Share of concept categories in each period (%).
Sources: Authors' elaboration.

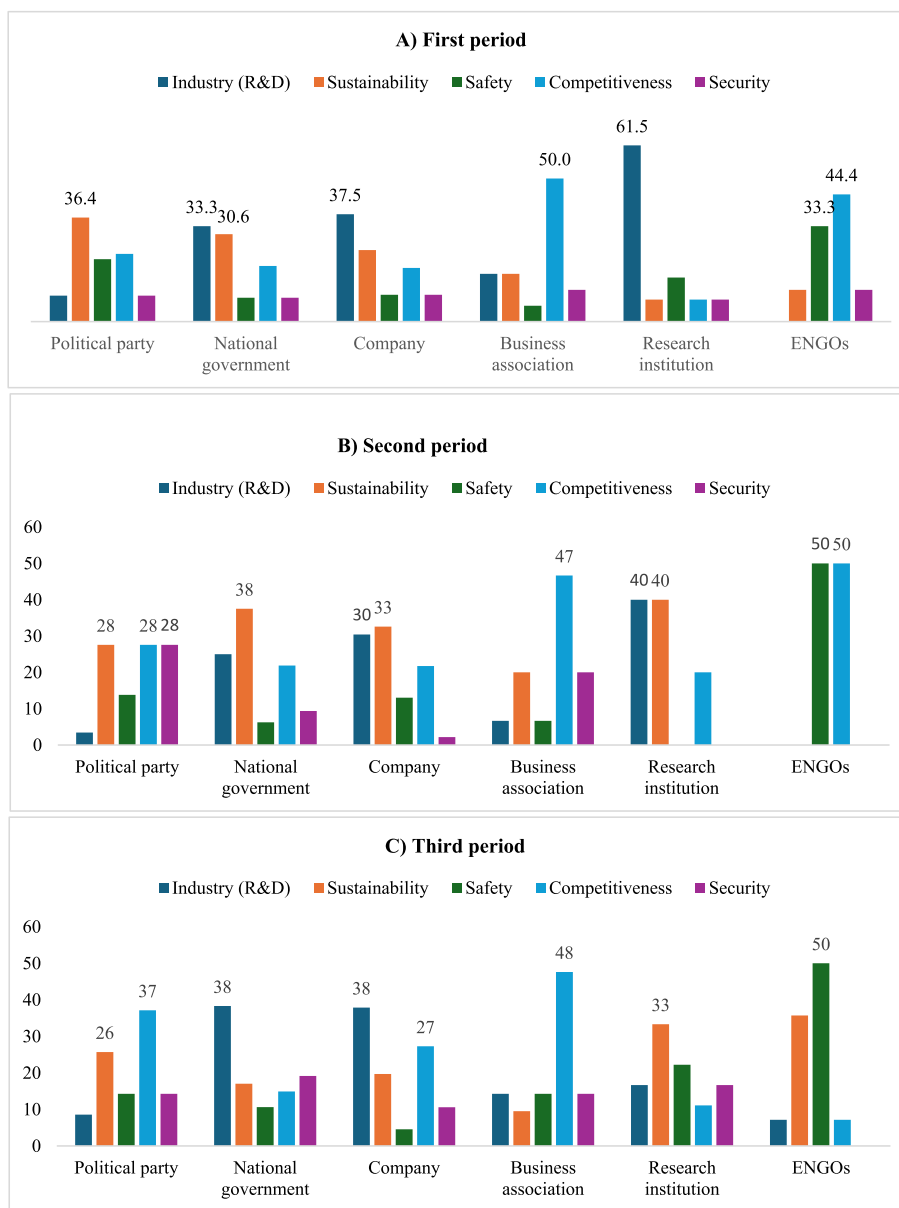


Fig. 5. Share of concept categories for actor's type (%): first period (A), second period (B) and third period (C). Source: Authors' elaboration.

maximum degree values within each cluster suggest the absence of clearly dominant hubs. Taken together, these patterns indicate a flatter network hierarchy in this initial period, with coalitions that are internally balanced in terms of actor prominence. Influence appears to be spread across a number of moderately connected nodes rather than concentrated around a single actor or cluster. Some actors, such as Lega and MITE appear visually prominent due to relatively high eigenvector centrality values; however, their influence does not dominate the network to the extent that would suggest a hub-and-spoke model. Within this structure, the anti-nuclear sector is especially prominent in Cluster 1, which includes central nodes such as M5S and ENEL, alongside several environmental organizations. Cluster 2 features MITE as a central key governmental institution linking various companies, such as ENI. Cluster 3 is characterized by the centrality of Lega followed by the Ministry of Economic Development (MISE), alongside a range of business associations of similar size, forming a coherent, pro-nuclear alignment. This distribution highlights an early stage in which discursive alignment begins to crystallize across recognizable coalitions without

yet producing a dominant centre of influence.

In the actor–concept network for Period 1, a nearly balanced distribution of positive (28) and negative (27) ties is visible, suggesting a polarized configuration of positions around key ideas (Fig. 8). The average eigenvector centrality of concepts nodes is 0.605, indicating that, overall, concepts are moderately connected to influential actors. However, centrality varies significantly: sustainability emerges as the most central concept, while security registers the lowest score, marking it as marginal in the structure. Competitiveness is also highly central, pointing to its prominent role in the debate. The standard deviation of concept centrality scores suggests that only a few concepts are strongly connected to central actors, while others remain peripheral. This indicates that a small set of concepts—primarily sustainability and competitiveness—structure the discursive space, while others are less integrated. Actor–concept associations reflect the initial configuration of positions, with emerging differences among actor clusters, but without a unified or dominant interpretive structure.

What emerges, therefore, is a policy debate that is beginning to

Network with Signed Edge Colors and Eigenvector Centrality

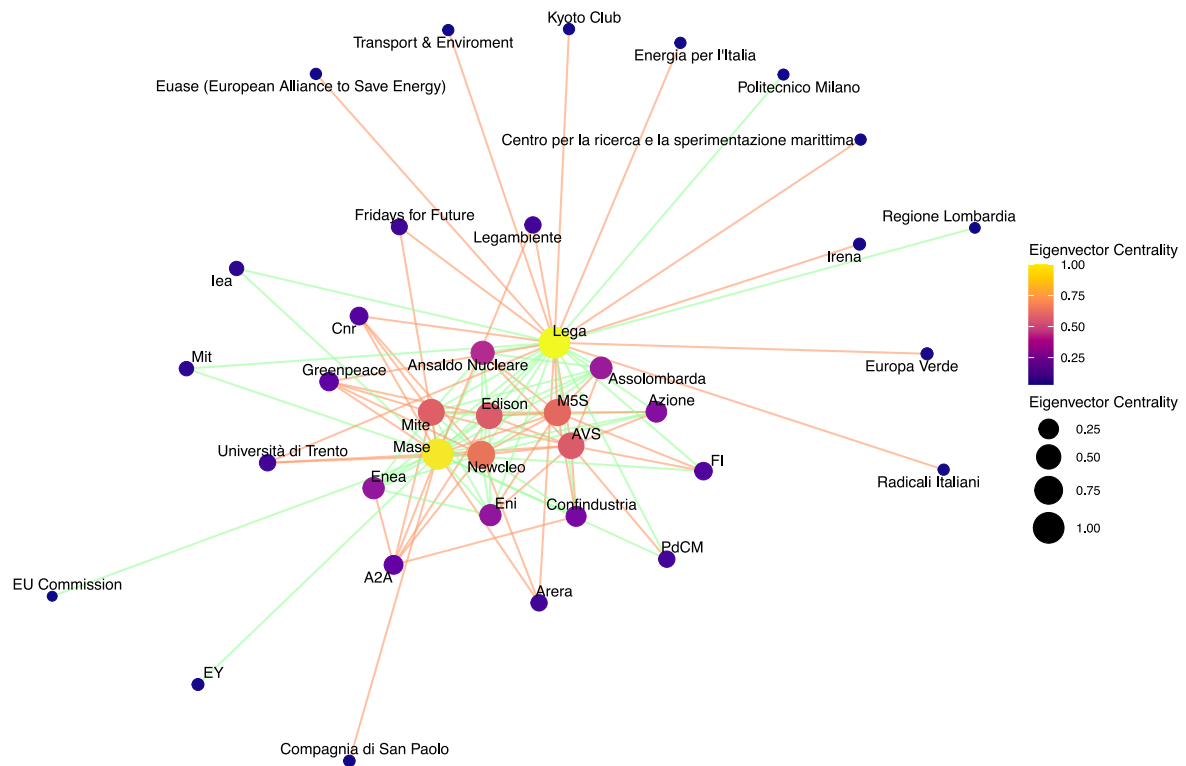


Fig. 6. Network structure and actors' centrality: one-mode network, full observation period (2019–2025).

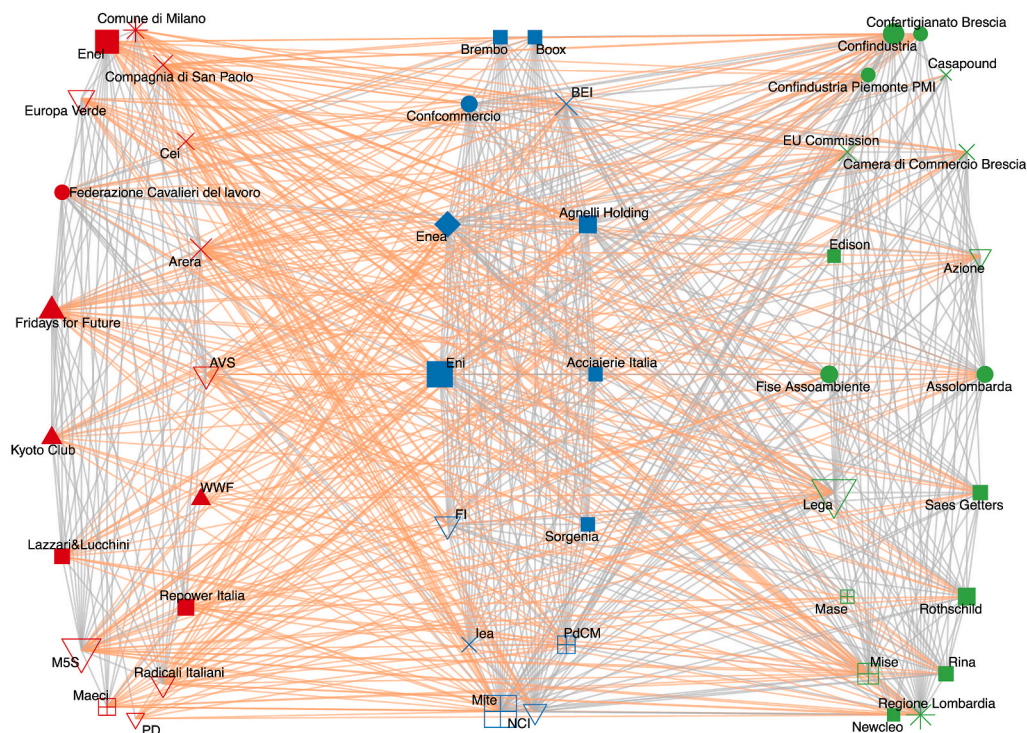


Fig. 7. Discursive coalitions (one-mode network) in the first period: 2019–2022.

Source: Authors' elaboration. Notes: Different coalitions are marked in distinct colours: red (cluster 1), blue (cluster 2), and green (cluster 3). Node shapes denote different actor types. Hollow triangle = Political parties; Filled Triangle = ENGO's; Filled Squares = Companies; Hollow Squares = National Government; Circle = Business Associations; Asterisk = Local Government; Cross Mark = National Authorities; Rhombus = Research Institutions.

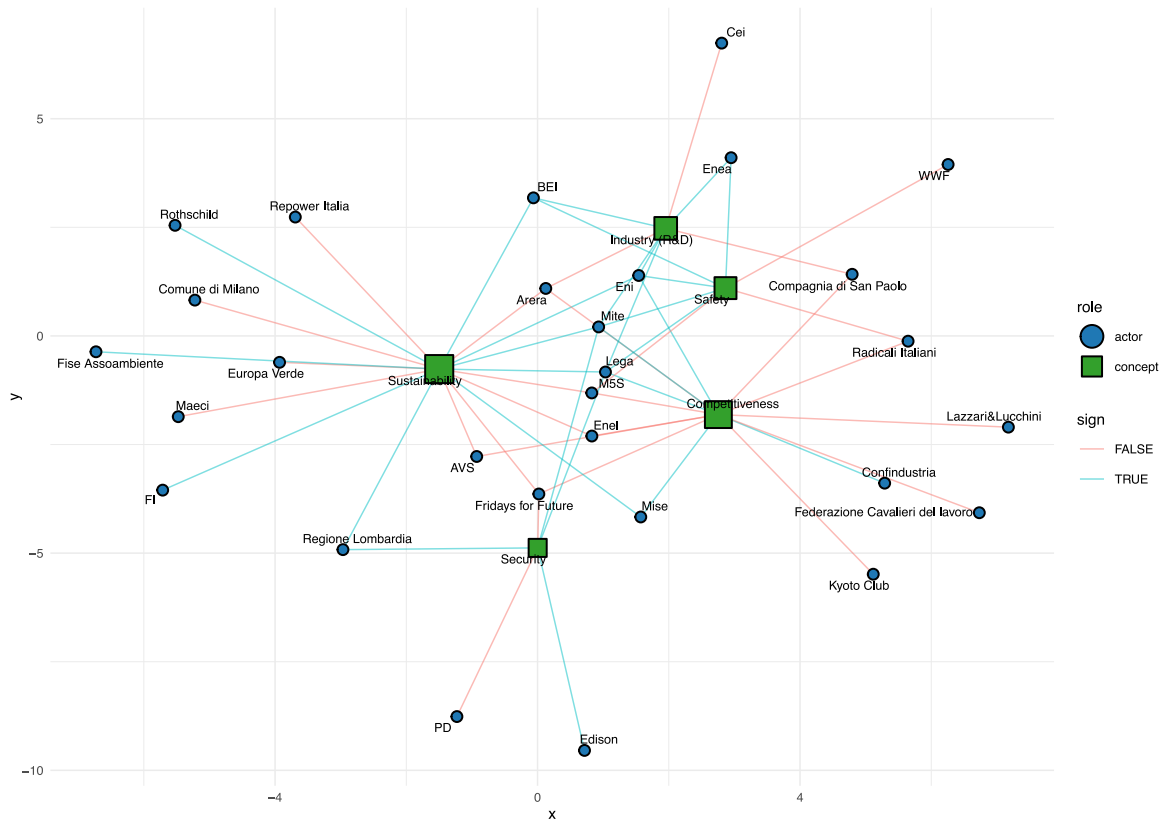


Fig. 8. Two-mode network (actors and concepts) in the first period:2019–2022.

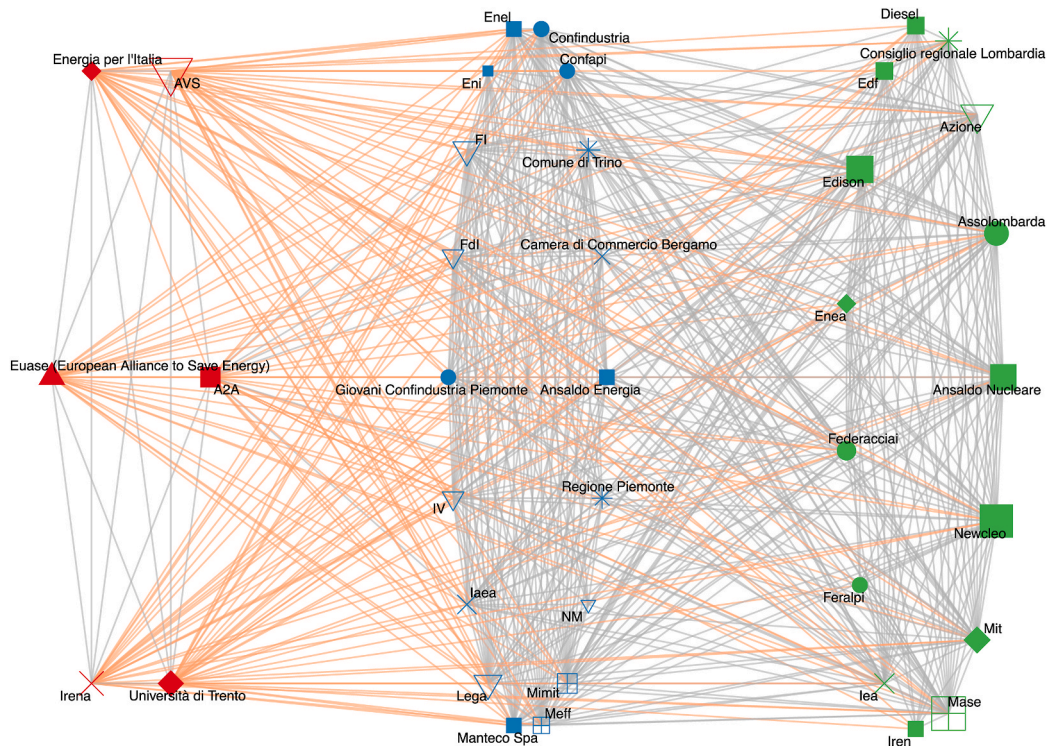


Fig. 9. Discursive coalitions (one-mode network) in the second period:2022–2023.

Source: Authors' elaboration. Note: Different coalitions are marked in distinct colours: red (cluster 1), blue (cluster 2), and green (cluster 3). Node shapes denote different actor types. Hollow triangle = Political parties; Filled Squares = Companies; Hollow Squares = National Government; Circle = Business Associations; Asterisk = Local Government; Cross Mark = National Authorities; Rhombus = Research Institutions.

structure itself both in terms of actor interaction and conceptual alignment, but without yet reaching a stage of consolidation. There are differences among actor clusters, but without a unified or dominant interpretive structure. Coalitions are distinguishable and concept centrality is uneven, but no single axis of meaning or cluster of actors dominates the field. This early phase remains marked by differentiation, polarization, and emerging but not yet stabilized alignments.

Period 2 reveals a shift toward greater structural integration and concentrated influence (Fig. 9). It presents a highly interconnected network, where most actors are similarly well connected. The structure is compact, allowing for rapid access between any two actors, and reveals a high degree of local clustering, with actors frequently forming tightly closed triads. This configuration suggests a strongly integrated field of discourse, in which communication and alignment circulate efficiently within and across clusters. Three clusters emerge again, but with different structural properties. Cluster 1, the anti-nuclear coalition, shrinks to only six nodes but becomes fully connected. Despite its small size, it exhibits the highest average eigenvector centrality among all coalitions in the entire network—among the others, AVS results the most central node in the cluster, indicating its structural prominence and discursive influence in the policy debate.

Cluster 2 includes 16 nodes and is characterized by high internal density and uniformly strong connectivity, indicating a tightly knit and active coalition. This cluster brings together governing parties, business associations, and major companies such as ENI and ENEL, along with institutional actors like relevant ministries, forming a strategic bloc that anchors central positions in the debate. It is important to note that, in this second period of the debate, ENEL—one of Italy's leading electricity utility (partially owned by the state)—shifts from an anti-nuclear to a pro-nuclear stance. While initially aligned with the opposition, likely in an effort to protect its significant investments in renewable energy, this repositioning coincides with the replacement of its general manager, from Paolo Scaroni to Flavio Cattaneo. Under the new leadership, ENEL appears to have reassessed the feasibility and profitability of nuclear energy, recognizing it as a credible and strategic option, and consequently chose to align itself with the pro-nuclear coalition. Cluster 3 expands to 17 nodes and shows a lower internal density, suggesting looser internal connections, though it still plays a significant role in the overall network. It is dominated by pro-nuclear firms such as Newcleo, Edison, and Ansaldo Nucleare, and, in particular, by MASE, which constitutes the most central node in the entire structure. Overall, period 2 reflects a phase of discursive consolidation, with one cluster increasingly structuring central positions in the network.

In the actor–concept network for period 2, the network appears smaller compared to period 1 but more densely connected, with a higher proportion of realized links relative to all possible actor–concept associations. This configuration suggests that the network, though smaller, reflects a more tightly focused and aligned discursive effort — actors are speaking more often to shared, central concepts. The number of positive edges (20) exceeds that of negative ones (14), indicating reduced polarity in conceptual alignments. Although ideological contestation is still present, the lower volume of negative connections implies a partial convergence or stabilization of positions towards positive ones. Some concepts dominate the discursive space and serve as focal points for actor engagement, while others remain peripheral or scarcely used. This suggests that the debate is structured around a few dominant themes, rather than being evenly spread across all conceptual categories.

One concept (sustainability) reaches the maximum centrality value, signifying its dominant position in the network, while another (security) is nearly disconnected. This uneven distribution implies that the debate during this phase is structured around one core concept—sustainability—which remains closely associated with central actors. Although other concepts continue to appear, their influence is significantly less pronounced. The conceptual architecture of the network thus becomes more concentrated: fewer actors engage more intensively with a small set of concepts, and the centrality of the

dominant one reflects both its prominence and its alignment with highly influential actors nodes. Overall, this period marks a phase of discursive consolidation, characterized by denser interconnections among actors, reduced polarity, and a clear asymmetry in the centrality of conceptual elements.

Period 3 sees a renewed expansion in network size and a reconfiguration of influential clusters (Fig. 11). The network shows the highest number of connections but a slightly lower density than in period 2. The global clustering coefficient is 0.801, indicating persistent triadic closure, though slightly less pronounced than in the previous phase. Three clusters are again identifiable, each expanding in size and maintaining high levels of internal connectivity (Fig. 11). Cluster 1, which includes environmental organizations along with AVS and M5S, exhibits a high internal density. Environmental and left-wing actors maintain a structurally prominent and well-integrated position within the network. Cluster 2, composed primarily of companies such as ENEL, Edison, and Newcleo, and including MASE as the most central actor both within the cluster and in the overall network, exhibits a densely interconnected structure characterised by intense internal communication among its members. Cluster 3 brings together Ansaldo Nucleare, ENI, the Presidency of the Council of Ministers, Lega, and the Ministry of Foreign Affairs, combining industrial and governmental actors into a politically central subgroup. While all clusters display relatively strong internal connectivity, the distribution of structural centrality among their members appears balanced, with no single cluster dominating in terms of influence within the network. This distribution suggests a transition toward a more decentralized and multipolar configuration of the discourse, in which influence is no longer concentrated in a small subset of highly central actors but is instead more evenly distributed across members of multiple coalitions.

The actor–concept network in period 3 maintains the same number of relationships as in period 2 but distributed across a larger and more heterogeneous set of actors (Fig. 12). Period 3 sees an expansion in participation (more actors), but this expansion dilutes the intensity of engagement per actor. The discourse is more dispersed — actors are engaging with fewer shared concepts — which contrasts with the concentrated alignment seen in period 2. The average eigenvector centrality of concepts nodes indicate a moderate level of influence, with concepts reasonably connected to central actors. Sustainability emerges once again as the most central concept, followed closely by competitiveness. Safety also appears as a moderately embedded concept, showing the highest number of negative associations, highlighting its contested status in the debate. Security remains the least central, indicating marginal engagement.

The distribution of 15 positive and 19 negative edges confirms that contestation has re-emerged, positioning this phase closer to the polarity of period 1 but with denser intra-cluster connectivity. The combination of a stable conceptual framework, a moderately sized and connected actor base, and the re-emergence of negative associations indicates a field characterized by internal differentiation and ongoing ideological or normative conflict. Compared to previous periods, this third configuration is less dense than the second but more contested; denser than the first, yet with less consensus than the second. It thus signals a phase of structural pluralization, in which multiple concepts maintain influence, actors are more evenly distributed in their connections to central ideas, and discursive alignments appear increasingly diversified while remaining strongly interconnected.

Overall, the analysis shows a dynamic evolution in both network structure and clusters organization. Period 1 is characterized by moderate connectivity and clustering, with limited centralization and a distributed structure of influence. Period 2 exhibits the most structurally integrated configuration of the three phases. It is characterized by the highest network density, highest transitivity, and the shortest average path length, indicating a tightly connected set of actors with strong triadic closure and efficient communicative proximity. Despite involving fewer nodes, the network features high median degree,

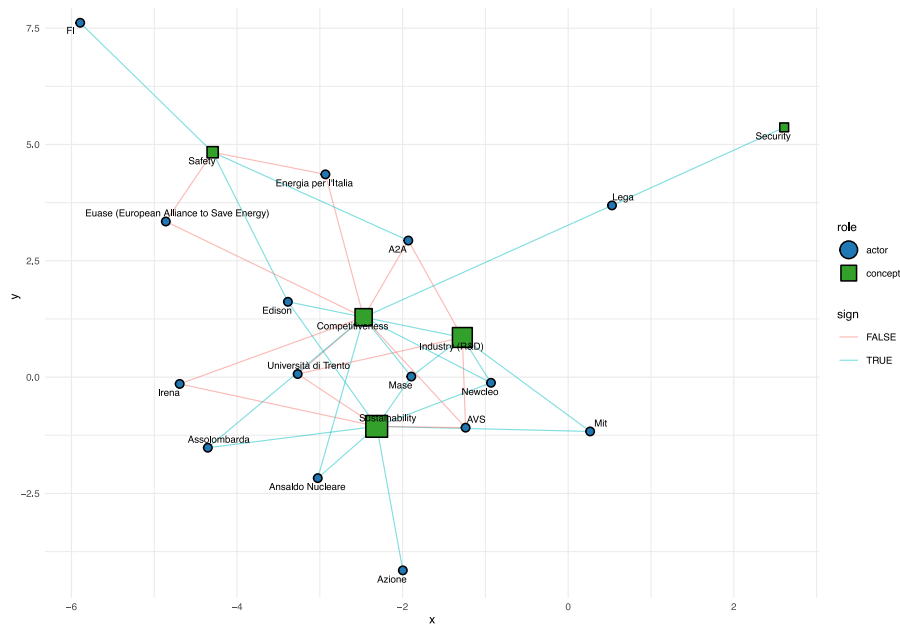


Fig. 10. Two-mode network (actors and concepts) in the second period:2022–2023.

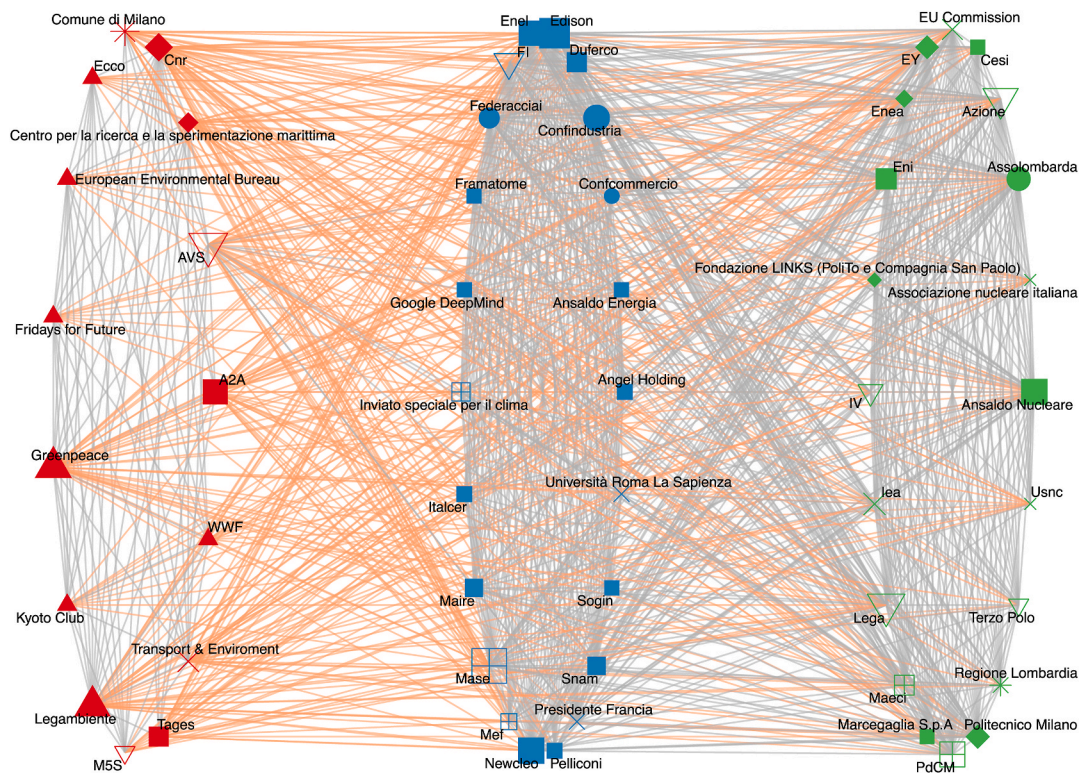


Fig. 11. Discursive coalitions (one-mode network) in the third period: 2023–2025.

Source: Authors' elaboration. Note: Different coalitions are marked in distinct colours: red (cluster 1), blue (cluster 2), and green (cluster 3). Node shapes denote different actor types. Hollow triangle = Political parties; Filled Triangle = ENGO's; Filled Squares = Companies; Hollow Squares = National Government; Circle = Business Associations; Asterisk = Local Government; Cross Mark = National Authorities; Rhombus = Research Institutions.

confirming that most actors are directly connected to a large number of others. These metrics jointly suggest a compact and strongly interconnected discursive space, with alignment concentrated around a dense core of actors. Period 3 marks an expansion in both the number of actors and ties, accompanied by the formation of well-defined and internally connected coalitions. Multiple actors emerge as influential

hubs, indicating a more distributed structure of discursive authority.

Among the concepts, sustainability remains consistently central to debates promoted by both pro- and anti-nuclear coalitions, whereas the prominence of safety and competitiveness fluctuates depending on events. Security, in contrast, is the least frequently invoked concept and is never central, almost entirely overlooked. This can be explained by

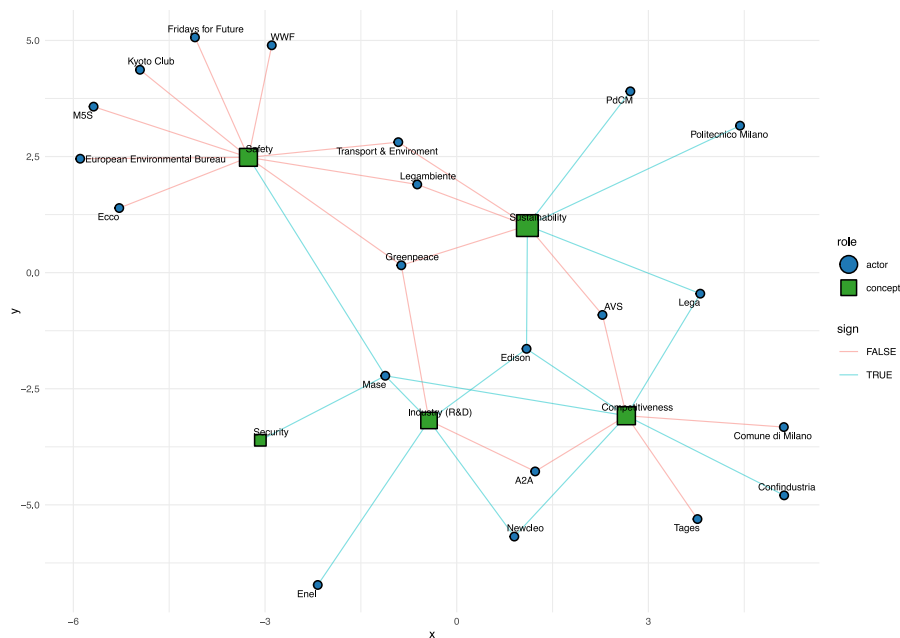


Fig. 12. Two-mode network (actors and concepts) in the third period: 2023–2025.

the structural characteristics of the nuclear fuel cycle. Recent evidence shows that the European Union remains highly dependent on Russia for key stages of the nuclear fuel cycle, including uranium conversion, enrichment, and fuel fabrication [12], making the notion of security, understood as energy independence, at least controversial.

Together, these results reveal a dynamic evolution in the actor–concept architecture of the policy debate. The first period is marked by initial polarization and emerging differentiation; the second displays reduced polarity and tighter alignment around a limited set of concepts associated with central actors; the third transitions to a more distributed, multipolar configuration in which discursive conflict re-emerges alongside conceptual diversification. The progressive shifts in network density, actor–concept centrality, and edge polarity illustrate how the structuring of policy positions evolves over time, capturing the transformation of the discursive field from early alignment to increasing pluralization. (see Figs. 9–12)

5. Discussion

The structure of nuclear policy discourse in Italy reveals a progressive transformation—from a fragmented configuration to a more cohesive and, later, diversified architecture. In the first period, the policy debate is moderately sized and relatively balanced: coalitions are distinguishable, concept centrality is uneven, but no single actor or concept dominates the debate. In this early phase, the Russian full-scale invasion of Ukraine and the consequent rise in energy prices, along with growing concerns over national energy security, led the Draghi government to tentatively reintroduce nuclear energy into the public discourse—specifically in reference to nuclear fusion. This cautious shift occurred while awaiting the European Parliament's decision on the taxonomy, which could classify nuclear as a sustainable energy source. At this stage, nuclear energy still appeared as a distant and uncertain policy option, which helps explain why the debate was characterized by emerging—but not yet stabilized—alignments. Emblematic in this sense is the case of ENEL, which initially aligned with the anti-nuclear coalition before later shifting to the pro-nuclear camp.

The second period marks a clear shift toward consolidation, defined by the formation of a dominant anti-nuclear coalition around which central positions are structured. This turning point is triggered by the

European Parliament's approval of the EU taxonomy, which classifies nuclear energy as a sustainable investment. The taxonomy does not specify the type of nuclear technology included—whether SMRs, which are more feasible but politically contentious, or long-term nuclear fusion that would require at least 25 years to implement. By treating all forms of nuclear energy as equally sustainable, the decision made the inclusion of nuclear power in Italy's energy policy a concrete possibility. This shift gained further momentum with the appointment of a new right-wing government explicitly supportive of nuclear energy. This development provoked a strong reaction from a small anti-nuclear cluster (featured by AVS)—and simultaneously reshaped the pro-nuclear discourse, prompting supportive coalitions to intensify their efforts to legitimize a pro-nuclear narrative widely adopting the sustainability frame.

By the third period, however, the structure begins to pluralize. The approval of the 2024 PNIEC and the next approval of the Bill on Nuclear Energy trigger a new wave of actors entering the debate, seeking to influence the imminent policy process and position themselves within a potentially profitable and feasible sector. On the pro-nuclear side, coalitions become more cohesive and strategically engaged. However, a key internal differentiation emerges between actors supporting SMRs—such as the Ministry of Economic Development and Lega—and those advocating for nuclear fusion, including the Presidency of the Council and ENI. The distinction lies in the timeline: small modular reactors are seen as a near-term solution, while nuclear fusion requires several years to become viable implying a long interim period reliant on fossil fuels and especially natural gas. This shift leads to a broader, more decentralized policy debate. Influence becomes more evenly distributed across three coalitions of actors, each with comparable internal cohesion. No single actor or concept dominates the field; instead, discursive positions diversify while remaining interconnected.

Considering the entire debate across the three periods, a pattern of centralization around a limited set of highly connected actors, exhibiting a core-periphery structure in which a few core nodes—such as MASE and Lega—serve as key connectors across the broader discursive field. Alongside these, in a less prominent position, actors like Newcleo, Edison, and MITE emerge as structurally central, while M5S and AVS occupy similarly influential positions on the critical side of the debate (while the Democratic Party is almost absent and holds no central position). The resulting configuration is characterized by a hub-and-spoke

architecture, where a handful of central actors maintain dense connections with a constellation of less connected participants. This structural pattern underscores the presence of a hierarchical arrangement in which discursive influence is not evenly distributed but rather concentrated in the hands of a few dominant players who guide and coordinate the nuclear policy discourse in Italy.

Even though the debate does not appear one-sided, the analysis shows that pro-nuclear actors—despite significant differences in their policy visions—hold great structural power in shaping the national energy discussion. Nevertheless, as the policy process enters its implementation phase, internal differentiation within the pro-nuclear camp is likely to become more significant. It is reasonable to expect that the axis between the Prime Minister's office and ENI—currently aligned with long-term fusion strategies—will grow in influence or, at the very least, actively seek to shape the evolving policy agenda.

6. Conclusions

Studying the discursive dynamics of the Italian nuclear debate provides insights that help to elucidate similar processes in other Western European countries. The Italian case shows that the reintroduction of nuclear energy in a country that previously abandoned it through referendums depends on a favorable combination of internal and external factors. Three conditions appear central to a potential recovery of support for nuclear energy. First, external crises can elevate nuclear power from a marginal option to a strategic response—such as the war in Ukraine, with its implications for Italy in terms of security of supply and energy prices—although they may also revive opposition, as in the cases of the Chernobyl and Fukushima disasters. Second, the EU's influence, for example through the classification of nuclear energy as a sustainable source in the EU taxonomy, can reshape national narratives and legitimize investment. Finally, the strategic capacity of resourceful policy actors—ministries, industry, and business associations—to frame the debate around innovation and sustainability is crucial. When these actors occupy central positions in the discourse, they can create more favorable conditions for reconsidering nuclear energy, even in contexts marked by historical opposition.

For countries considering a nuclear phase-out, the Italian case suggests that reversing public and political opposition is difficult and requires long-term strategies, gradual political and cultural shifts, as well as external factors beyond the control of national policy actors. For countries evaluating expansion, the Italian experience highlights how strong governmental and economic actors occupying central positions in the policy arena can shape public debate even in highly polarized settings. In this process, the EU can play a decisive role by providing political and industrial elites with renewed justification for engagement. From a comparative perspective, Italy's cautious re-engagement with nuclear energy contrasts sharply with France's long-standing, state-led nuclear regime. In Italy, decades of institutional disengagement and the legacy of referendums have fostered a tentative form of acceptance, with nuclear fusion perceived as more legitimate than fission, partly because it is associated with a distant future and weaker ties to past controversies. By contrast, France's institutional continuity has normalized

nuclear energy as a policy option, promoting broader acceptance of diverse nuclear technologies within a stable narrative of technological leadership and energy sovereignty (Butorac, Nicoli and Lalli 2026). This contrast helps explain why the Italian debate remains more politicized and more sensitive to governmental instability [16].

Overall, our study is particularly timely, as Italy is transitioning from public debate to the formal stages of the nuclear policy process. At the same time, this transition also constitutes a limitation of our analysis, since the policy process remains in its early phases and its long-term dynamics are still uncertain. Additional limitations stem from our empirical focus on two major mainstream broadsheet newspapers. While these sources are well suited to capturing dominant narratives and elite framing, they may overlook perspectives expressed in smaller, regionally rooted, or ideologically distinct outlets. Many such alternative sources lack accessible online archives, and their limited circulation constrained their capacity to shape national-level discourse during the period under analysis. Consequently, grassroots, oppositional, or marginalized voices—such as local stakeholders, community organizations, and environmental groups—are likely underrepresented, appearing only marginally in the coverage of *Corriere della Sera* and *La Repubblica*. This represents an important limitation, particularly given the polarized nature of nuclear energy debates.

Future research should explore how discourse responds to concrete policy developments and whether emerging actors and frames are able to reconfigure the debate. A comparative approach, focusing on countries where nuclear energy is already accepted but is experiencing discursive shifts—especially around SMRs and fusion—could further illuminate how technological preferences and national contexts shape policy narratives and coalition dynamics.

CRedit author statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A-E

A – Data Corpus and Codebook

Overview of the data corpus

Keywords (used for archival search from newspapers websites): Nuclear, energy.

Year	Corriere della Sera		La Repubblica		Total	
	Reviewed articles	Selected articles	Reviewed articles	Selected articles	Reviewed articles	Selected articles
2019	60	0	13	1	73	1
2020	51	11	22	1	73	12
2021	111	34	71	27	182	61
2022	350	71	227	34	577	105
2023	159	33	90	31	249	64
2024	168	68	82	26	250	94
2025 (*)	30	3	16	10	46	13
Total	929	220	521	130	1450	350

Notes: (*) as of February 2025.

Codebook

Unit of analysis: Claim – purposive strategic action in the form of a *statement* expressing the actor's position (opinion) on nuclear matter. It usually is a finished thought that consists of one or multiple sentences. Statements appearing in media as direct or indirect citations have been coded. In the case of a long-expression, covering several issues, its parts were coded separately.

Variables coded from each claim: individual actor, organization, type of organization, concept, level of agreement. The name of the media source and the date of the publication of the articles were also coded.

Individual Actor: A single person making a statement was coded by his/her name.

Organization: When coding organizations, the primary occupation of the person were found and coded.

Concept

Code	Explanation	Common phrases (Translation by authors)
Competitiveness	captures economic arguments concerning the cost of energy: nuclear is supported as a means to reduce electricity costs for households and businesses, while it is opposed for being too expensive to develop and maintain.	“The development of nuclear power is the only real strategy for reducing energy costs.”
Industry (R&D)	reflects positions on the technological frontier: proponents emphasize nuclear energy's role in driving industrial innovation and scientific advancement, whereas opponents argue for focusing investment on greener, more sustainable technologies.	“It is essential to continue investing in advanced research to make nuclear power competitive and sustainable as an energy source.”
Safety	includes positions that either stress the technical reliability and modern safeguards of nuclear plants or highlight persistent risks related to accidents and radioactive waste.	“The new nuclear power plants are safe and feature some of the most reliable safety systems internationally for new-generation nuclear power plants.”
Security	relates to energy autonomy and geopolitical independence: nuclear is supported for enhancing national energy security, while it is rejected for increasing reliance on foreign materials and technologies	“We believe that nuclear energy has a vital role to play in supporting our energy independence, meeting our demand cleanly 24/7.”
Sustainability	frame deals with the environmental dimension: supporters view nuclear as essential to achieving decarbonization goals, while critics challenge its green credentials and argue it is incompatible with a truly sustainable energy transition	“Nuclear power will become a necessary source of energy if we want to seriously tackle the problem of global warming.”

Agreement: Each concept was coded for polarity, indicating whether the actor expressed support or opposition.

The coding of selected articles was systematically compared; discrepancies were examined through discussion, ambiguities were clarified, and the codebook was subsequently refined to ensure consistency and accuracy.

B - List of Actors and Organizations

Period 1	
Person	Organization
Batistoni, Paola	Enea
Bernabei, Franco	Acciaierie Italia
Bessegghini, Stefano	Arera
Biraghi, Alberto	Confindustria Piemonte PMI
Birol, Fatih	Iea
Bocchiola, Fabio	Repower Italia
Bombassei, Alberto	Brembo
Bonelli, Angelo	AVS
Bonelli, Angelo	Europa Verde
Bonomi, Carlo	Confindustria
Borghi, Enrico	PD
Buono, Stefano	Newcleo
Calenda, Carlo	Azione
Cingolani, Roberto	Mase
Cingolani, Roberto	Mite
Conte, Giuseppe	M5S
Crippa, Davide	M5S
De Scalzi, Claudio	Eni
Della Porta, Massimo	Saes Getters
Di Maio, Luigi	Maeci
Di Stefano, Riccardo	Confindustria
Dialuce, Gilberto	Enea

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Period 1	
Person	Organization
Dodaro, Alessandro	Enea
Draghi, Mario	PdCM
Elkann, John	Agnelli Holding
Evi, Eleonora	Europa Verde
Ferrazza, Francesca	Eni
Fumagalli, Aldo	Boox
Giorgetti, Giancarlo	Mise
Gualtieri, Bassetti	Cei
Guidesi, Guido	Regione Lombardia
Iervolino, Massimiliano	Radicali Italiani
Lazzari, Anna	Lazzari&Lucchini
Lupi, Maurizio	NCI
Mancini, Gianfilippo	Sorgenia
Marcegaglia, Emma	Confindustria
Massetti, Eugenio	Confartigianato Brescia
Monti Nicola	Edison
Moratti, Letizia	Regione Lombardia
Mori, Giovanni	Fridays for Future
Pratesi, Fulco	WWF
Profumo, Francesco	Compagnia di San Paolo
Saccone, Roberto	Camera di Commercio Brescia
Sala, Giuseppe	Comune di Milano
Salerno, Ugo	Rina
Salvini, Matteo	Lega
Sangalli, Carlo	Confcommercio
Scannapieco, Dario	BEI
Scaroni, Paolo	Rothschild
Sella, Maurizio	Federazione Cavalieri del lavoro
Silvestrini, Gianni	Kyoto Club
Starace, Francesco	Enel
Tajani, Antonio	FI
Testa, Chicco	Fise Assoambiente
Testa, Federico	Enea
Tozzi, Mario	WWF
Unknown	Assolombarda
Unknown	Casapound
Von der Leyen, Ursula	EU Commission
Zaia, Luca	Lega
Period 2	
Person	Organization
Bardonali, Simona	Lega
Battiston, Roberto	Università di Trento
Benigni, Stefano	FI
Berlusconi, Silvio	FI
Birol, Fatih	Iea
Bonelli, Angelo	AVS
Borghesi, Stefano	Lega
Buono, Stefano	Newcleo
Calenda, Carlo	Azione
Carretta, Niccolo	Consiglio regionale Lombardia
Casale, Riccardo	Ansaldo Nucleare
Casasco, Maurizio	Fdi, Confapi
Cingolani, Roberto	Mit
Cirio, Alberto	Regione Piemonte
Dal Fabbro, Luca	Iren
Descalzi, Claudio	Eni
Dodaro, Alessandro	Enea
Frassoni, Monica	Euase (European Alliance to Save Energy)
Gallone, Alessandra	FI
Gava, Vannia	Mase
Gozzi, Antonio	Federacciai
Grossi, Rafael Mariano	Iaea
Gusalli Beretta, Franco	Confindustria
La Camera, Francesco	Irena
Lazzaro, Alberto	Giovani Confindustria Piemonte
Le Maire, Bruno	Meff
Lupi, Maurizio	NCI
Mantellassi, Marco	Manteco Spa
Marino, Giuseppe	Ansaldo Energia
Mazzoleni, Carlo	Camera di Commercio Bergamo
Mazzoncini, Renato	A2A
Monti, Nicola	Edison
Mottura, Lorenzo	Edison

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Period 2	
Person	Organization
Pane, Daniele	Comune di Trino
Parolini, Mauro	NM
Pasini, Giuseppe	Feralpi
Pichetto Fratin, Gilberto	Mase
Rosso, Renzo	Diesel
Salvini, Matteo	Lega, Mit
Spada, Alessandro	Assolombarda
Strarace, Francesco	Enel
Teani, Raffaello	IV
Tremaglia, Andrea	Fdi
Unknown	Edf
Unknown	Energia per l'Italia
Urso, Adolfo	Mimit
Period 3	
Person	Organization
Armaroli, Nicola	Cnr
Arrigoni, Paolo	Lega
Artizzu, Gian Luca	Sogin
Barelli, Paolo	FI
Barnabei, Salvatore	Enel
Bernini, Alessandro	Maire
Birol, Fatih	Iea
Bonelli, Angelo	AVS
Brianza, Giovanni	Edison
Brusco, Guido	Confindustria
Buono, Stefano	Newcleo
Calenda, Carlo	Azione
Carniel, Sandro	Centro per la ricerca e la sperimentazione marittima
Cattaneo, Flavio	Enel
Cecchi, Marco	Pelliconi
Corvaro, Francesco	Inviato speciale per il clima
Corvaro, Francesco	Maeci
Cozzi, Luca	Iea
De Scalzi, Claudio	Eni
Di Amato, Fabrizio	Maire
Di Marco, Nicola	M5S
Di Stefano, Manlio	Maeci
Fabbri, Fabrizio	Ansaldo Energia
Fontana, Attilio	Regione Lombardia
Gentile, Daniela	Ansaldo Nucleare
Giorgetti, Giancarlo	Mef
Governatori, Michele	Ecco
Gozzi, Antonio	Duferco
Gozzi, Antonio	Federacciai
Guidesi, Guido	Lega
Hansen, Lars Peter	Università Roma La Sapienza
Hassabis Demis	Google DeepMind
Lanzetta, Nicola	Enel
Macron, Emmanuel	Presidente Francia
Marcegaglia, Emma	Marcegaglia S.p.A
Mazzoncini, Renato	A2A
Meloni, Giorgia	PdCM
Monti, Nicola	Edison
Monti, Stefano	Associazione nucleare italiana
Mori, Giovanni	Fridays for Future
Mottura, Lorenzo	Edison
Orsini, Emanuele	Confindustria
Pertosa, Vito	Angel Holding
Pichetto Fratin, Gilberto	Mase
Quadrino, Umberto	Tages
Realacci, Ermete	Legambiente
Renzi, Matteo	IV
Resta, Ferruccio	Politecnico Milano
Ricotti, Mario	Politecnico Milano
Sala, Beppe	Comune di Milano
Salvini, Matteo	Lega
Sangalli, Carlo	Confcommercio
Santucci, Alessia	Enea
Scarabosio, Andrea	Fondazione LINKS (PoliTo e Compagnia San Paolo)
Simson, Kadri	EU Commission

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Period 3	
Person	Organization
Spada, Alessandro	Assolombarda
Squeri, Luca	FI
Tajani, Antonio	FI
Tajani, Antonio	Maeci
Terrail, Elisabetta	Framatome
Testa, Paola	EY
Unknown	European Environmental Bureau
Unknown	Greenpeace
Unknown	Kyoto Club
Unknown	Legambiente
Unknown	Terzo Polo
Unknown	Transport & Environment
Unknown	WWF
Urso, Adolfo	FI
Van Boxmeer, Francois	EU Commission
Vannacci, Roberto	Lega
Venier, Stefano	Snam
Veneri, Francesco	Usnc
Verdi, Graziano	Italcer
Villani, Domenico	Cesi

C - Organizations classification

Organization	Type
A2A	Company
Acciaierie Italia	Company
Agnelli Holding	Company
Angel Holding	Company
Ansaldo Energia	Company
Ansaldo Nucleare	Company
Arera	National Authority
Associazione nucleare italiana	Business association
Assolombarda	Business association
AVS	Political party
Azione	Political party
BEI	Other institutions
Boox	Company
Brembo	Company
Camera di Commercio Bergamo	Business association
Camera di Commercio Brescia	Business association
Casapound	Other institutions
Cei	Other institutions
Centro per la ricerca e la sperimentazione marittima	Research institution
Cesi	Company
Cnr	Research institution
Compagnia di San Paolo	Other institutions
Comune di Milano	Local government
Comune di Trino	Local government
Confapi	Business association
Confartigianato Brescia	Business association
Confcommercio	Business association
Confcommercio	Business association
Confindustria	Business association
Confindustria Piemonte PMI	Business association
Consiglio regionale Lombardia	Local government
Diesel	Company
Duferco	Company
Ecco	Research institution
Edf	Company
Edison	Company
Enea	Research institution
Enel	Company
Enel Green Power	Company
Energia per l'Italia	ENGOS
Eni	Company
Eni Plenitude	Company
EU Commission	Other institutions
Euase (European Alliance to Save Energy)	ENGOS
Europa Verde	Political party
European Environmental Bureau	ENGOS
EY	Company

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Organization	Type
FdI	Political party
Federacciai	Business association
Federazione Cavalieri del lavoro	Business association
Feralpi	Company
FI	Political party
Fise Assoambiente	Business association
Fondazione LINKS (PoliTo e Compagnia San Paolo)	Other institutions
Framatome	Company
Fridays for Future	ENGOS
Giovani Confindustria Piemonte	Business association
Google DeepMind	Company
Greenpeace	ENGOS
Iaea	Other institutions
Iea	Other institutions
Inviato speciale per il clima	National government
Iren	Company
Irena	Other institutions
Italcer	Company
IV	Political party
Kyoto Club	ENGOS
Lazzari&Lucchini	Company
Lega	Political party
Legambiente	ENGOS
M5S	Political party
Maeci	National government
Maire	Company
Manteco Spa	Company
Marcegaglia S.p.A	Company
Mase	National government
Mef	National government
Mise	National government
Mit	National government
Mite	National government
NCI	Political party
Newcleo	Company
NM	Political party
PD	Political party
PdCM	National government
Pelliconi	Company
Politecnico Milano	Research institution
Presidente Francia	Other institutions
Radicali Italiani	Political party
Regione Lombardia (governo)	Local government
Regione Piemonte	Local government
Repower Italia	Company
Rina	Company
Rothschild	Company
Saes Getters	Company
Snam	Company
Sogin	Company
Sorgenia	Company
Tages	Company
Terzo polo	Political party
Transport & Enviroment	ENGOS
Università di Trento	Research institution
Università Roma La Sapienza	Research institution
Usnc	Company
WWF	ENGOS

D – Types of Organizations and Concepts over time

Organization type per period

Organization type	Period 1	Period 2	Period 3	Total (°)
Research institutions	1	2	6	7
Political parties	9	8	6	13
Business companies	14	10	21	37
National government/Authorities	6	4	3	9
Business associations	8	7	5	14
Environmental NGOs	3	1	7	9
Local government	3	3	2	5
Others (international and foreign authorities, political movement, foundations, other institution) (*)	5	4	4	10

Notes: (*) = types with less than four claims; (°) = totals for organizations type count each actor only once across all periods.

Concept per period (frequencies of occurrence)

Concept	Period 1	Period 2	Period 3	Total
Competitiveness	40	43	45	128
Industry (R&D)	43	29	53	125
Safety	24	20	22	66
Security	16	19	28	63
Sustainability	50	43	42	135
Total	173	154	190	517

E – Organizations list with the number of claims per period

Organization	Period 1	Period 2	Period 3	Total
AVS	2	5	5	12
Arera	4	0	0	4
Assolombarda	3	7	7	17
Confindustria	5	3	8	16
EU Commission	2	0	4	6
Enea	13	2	3	18
Enel	3	1	7	11
Eni	12	1	4	17
FI	3	5	5	13
Fridays for Future	3	0	1	4
lea	1	2	5	8
Lega	35	9	9	53
M5S	8	0	1	9
Maeci	1	0	4	5
Mase	1	19	31	51
Mise	4	0	0	4
Mite	26	0	0	26
Newcleo	1	18	8	27
PdCM	3	0	8	11
Regione Lombardia	4	0	1	5
WWF	5	0	1	6
A2A	0	4	2	6
Ansaldo Nucleare	0	8	4	12
Azione	0	8	4	12
Edison	0	11	14	25
Federacciai	0	2	4	6
IV	0	2	2	4
Mit	0	8	0	8
EY	0	0	4	4
Greenpeace	0	0	4	4
Politecnico Milano	0	0	7	7
Total	139	115	157	411

Notes: the table includes only organizations with more than 3 claims in total.

Data availability

Data will be made available on request.

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