

To Identify Descriptive Renewable Energy Policy Elements with Special Emphasis to the Renewable Energy Sector

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Abstract: *Renewable energy (RE) policy in India is shaped by a large and fragmented body of global, national and state-level policy statements drawn from government documents, international agency reports and academic literature. This paper reports a structured, expert-consensus based study undertaken to identify and prioritise descriptive renewable energy policy elements for India's Renewable Energy System, with special emphasis on the renewable energy sector. Using the Nominal Group Technique (NGT), a three-phase process was followed. In Phase-I, a core group of four domain experts (drawn from a pre-identified panel of fifteen academicians, policy planners and industry/government specialists) compiled an initial working paper of 763 descriptive policy statements collated, edited and merged from secondary sources including the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA) and the Ministry of New and Renewable Energy (MNRE), together with policy documents of major Asian, Middle-Eastern and Western economies. In Phase-II, twelve domain experts reviewed, clarified and merged these statements into 258 descriptive policy elements, which were then keyworded and classified into nine policy dimensions: Administration & Organization (A&O), Life Quality Improvement (LQI), Employability, Training & Education (ET&E), Sustainability, Public-Private Partnership (PPP), Demand Side Management (DSM), Economic Growth (EG), Research & Development (R&D), and Inter & Intra-State Regulation (I&IR). In Phase-III, a weighted ranking exercise among ten domain experts reduced the 258 elements to a final prioritised set of 34 core policy elements (coded P1-P34). Administration & Organization emerged as the most heavily weighted dimension (52 elements, weight 9, Rank I), while Demand Side Management, though narrowly represented (14 elements), was assigned the lowest aggregate weight. The findings offer a compact, evidence-based and expert-validated framework that policymakers, regulators and renewable energy planners in India can use to prioritise interventions across*

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administrative, economic, technological and regulatory dimensions of the renewable energy sector.

Keywords: Renewable Energy Policy, Nominal Group Technique, Descriptive Policy Elements, Policy Dimensions, India.

Introduction

Energy underpins the growth of both developed and emerging economies, powering industry, agriculture, healthcare and education alike. India, the world's third-largest consumer and producer of energy, has introduced numerous renewable energy (RE) policies and programmes to meet its growing power needs, encourage sustainability and reduce dependence on fossil fuels. Some of these initiatives have been fully realised, some remain partially met, and others have fallen short of their objectives for a variety of reasons. Persistent growth in national energy consumption has prompted successive rounds of policy and programme development, yet earlier evaluations show that many stated goals remain unmet.[1]

Potential causes of such shortfalls include weaknesses at either the policy-planning or implementation stage: the absence of meta-policymaking and pluralistic, co-evolving analysis within the policy framework; inadequate feedback loops; a lack of systematic and transparent policy-strategy determination; poor articulation of optimal objectives; and an insufficient search for policy alternatives.[2] Systems scientists have long argued that a system's written and reported language can be examined to identify the descriptive elements that constitute it, and that this same lens can be applied to the wider set of management, technical and institutional problems surrounding a system such as India's Renewable Energy System (RES).[3], [4]

Reforming India's renewable energy policy framework for sustained growth therefore begins with a necessary first step: identifying the descriptive elements that make up the system. "Consensus methods" refer to the family of strategies and procedures used to identify such descriptive policy elements, generate ideas, and establish priorities among stakeholders. Typical consensus approaches include brainstorming, customer/stakeholder surveys, citizen juries and discrete-choice methods, each with its own strengths and limitations; unstructured formats can allow dominant individuals to control discussion, while more rigorous formats such as discrete-choice methods are resource-intensive to design. The Nominal Group Technique (NGT), introduced by Delbecq and Van de Ven (1971) as a way to identify strategic problems and develop innovative, appropriate programmes to address them, was selected for this study because it structures participation so that every expert's opinion is heard before ranking and consensus-building begin, making it well suited to a subject as complex, multi-stakeholder and rapidly evolving as renewable energy policy.[5], [6], [7]

Need and Significance of the Study

India occupies a pivotal position in the global renewable energy market, supported by strong government backing and an improving economic environment that has made the country one of the most attractive destinations for renewable energy investment; the sector is also expected to generate substantial employment.[8] Despite this progress, the overall pace of RE expansion in India has remained comparatively slow, constrained by unclear markets, complex technologies and limited or fragmented government policy. Addressing these constraints requires the participation of a wide range of stakeholders — lawmakers, environmental activists, academics, industry representatives and community members — and a structured method of converging their views into a workable set of priorities.[9], [10], [11], [12]

The need for the present study therefore arises from the observation that renewable energy policymaking in India is informed by an extremely large and heterogeneous body of descriptive statements scattered across global, national and state-level sources. Without a systematic method of consolidation, such material offers limited practical guidance to planners. By using the NGT to identify, merge, categorise and rank descriptive policy elements, this study clarifies which administrative, economic, technological, regulatory and social levers matter most for accelerating India's renewable energy transition. The resulting prioritised list is intended to guide policymakers, regulators, project developers and research institutions in designing targeted, evidence-based interventions, and to support more open, inclusive and accountable decision-making in the energy sector.[6], [13], [14], [15], [16]

Review of Related Literature

Delbecq and Van de Ven's (1971) original formulation of the Nominal Group Technique established it as a structured method for identifying strategic problems and generating innovative, actionable solutions through organised group participation. Since then, NGT has been applied across a wide range of sectors — including healthcare, education, industrial bottlenecks, transport, railway security, demand-side management and interstate operations — to elicit stakeholder opinion and build consensus on complex, multi-dimensional problems. Its central strength lies in gathering the views of academia, industry and research experts simultaneously, in a planned and equitable format that surfaces diverse perspectives before converging them into shared priorities.[6], [13], [15], [17]

In the energy domain specifically, published guidance from bodies such as the International Energy Agency (IEA), the International Renewable Energy Agency (IRENA) and India's Ministry of New and Renewable Energy (MNRE) provides an extensive descriptive base covering mineral security, emissions policy, tariff design, demand-side management, transmission planning and workforce development. The United Nations Development Programme's sustainable energy support framework similarly emphasises reducing the energy-access gap, increasing the renewable share in the energy mix and improving energy efficiency as interlinked priorities for national governments. Comparative national policy documents from economies such as Vietnam, Thailand, the Philippines, the UAE, Qatar, Russia, the United States, Brazil and Germany further illustrate how RE policy elements are

typically structured around administrative, regulatory, market and technological dimensions. Collectively, this literature underscores both the richness and the fragmentation of the descriptive policy base available to Indian planners, and it motivates the use of a structured consensus method such as NGT to convert this fragmented base into an actionable, prioritised framework.[17], [18]

Problem Statement

To identify descriptive renewable energy policy elements, with special emphasis on the renewable energy sector in India, and to prioritise these elements through expert consensus using the Nominal Group Technique.

Definition of Variables

Renewable Energy System (RES) of India: In the present study, RES refers to the integrated set of policies, institutions, technologies and market mechanisms that govern the generation, transmission, distribution and utilisation of renewable energy in India.[19], [20]

Descriptive Policy Elements: Statements drawn from global, national and state-level policy documents, reports and literature that describe existing or proposed renewable energy policy actions, as distinct from normative statements that prescribe what policy ought to be.[21]

Nominal Group Technique (NGT): A structured consensus method in which participants independently generate ideas, share them without discussion, clarify and merge overlapping ideas, and then rank or vote on priorities to reach a converged, weighted outcome.

Policy Dimension: A thematic category (e.g., Administration & Organization, Sustainability, Research & Development) into which related descriptive policy elements are grouped by domain experts.

Domain Experts: Academicians, policy planners, and specialists from industry and government organisations dealing with India's renewable energy system, selected to participate in the NGT sessions.

Weighted Ranking: The scoring mechanism used in Phase-III of the NGT process, where each expert's first, second and third priority choices are assigned weights of 3, 2 and 1 respectively, and aggregated to arrive at a final priority score for each element.

Study Objectives

- To compile and consolidate descriptive renewable energy policy elements from global, national and state-level secondary sources relevant to India.
- To categorise the consolidated policy elements into meaningful dimensions through structured expert consensus.
- To prioritise the policy elements and dimensions using the Nominal Group Technique in order to arrive at a core, high-impact set of elements for India's Renewable Energy

Hypotheses / Guiding Propositions of the Study

- H1: Descriptive renewable energy policy elements collated from global, national and state-level sources can be meaningfully consolidated and organised into a finite set of policy dimensions.
- H2: Expert consensus, obtained through the Nominal Group Technique, differentiates the relative priority and weight of these policy dimensions.
- H3: A structured NGT-based prioritisation process substantially reduces the initial pool of descriptive policy elements to a manageable, high-priority core set relevant to India's Renewable Energy System.

Collection of Data

Data for the present study were collected in two stages. First, secondary data were gathered from published reports, research papers and government policy documents — including material from the IEA [22] [23], IRENA [24] [25], and MNRE [26] [27], as well as policy documents from major Asian, Middle-Eastern and Western economies — and compiled into a working paper titled “Integrated Global, National and State Level Descriptive Renewable Energy Policy Elements.” Second, primary data were generated through structured NGT workshop sessions, in which domain experts independently generated ideas, shared and clarified them as a group, and then completed a formatted ranking questionnaire in response to the triggering question: ‘In your opinion, which policy factor has the most significant potential to affect Sustainable Renewable Energy?’[28], [29]

Sample

A panel of fifteen domain experts was pre-identified from academia, policy planning bodies, and industry and government organisations dealing with India's renewable energy system. Of these, a core group of four experts prepared the initial working paper in Phase-I. Twelve domain experts participated in the idea-generation and merging exercise of Phase-II, and ten domain experts took part in the final weighted-ranking exercise of Phase-III.

Tool

A self-developed working paper (used as the stimulus document) together with a structured NGT ranking questionnaire, requiring each expert to select and rank at least the top two to three most significant policy elements within each identified dimension, and to prioritise the dimensions themselves.

Analysis and Interpretation

The NGT process followed three linked phases, illustrated in Figure 1: a core-group phase that produced the finalised list of global, national and state-level RE policy objectives; a domain-expert phase that identified nine policy dimensions and placed elements within them; and a ranking phase that applied a weighted cut-off rule to converge on a final integrated list.

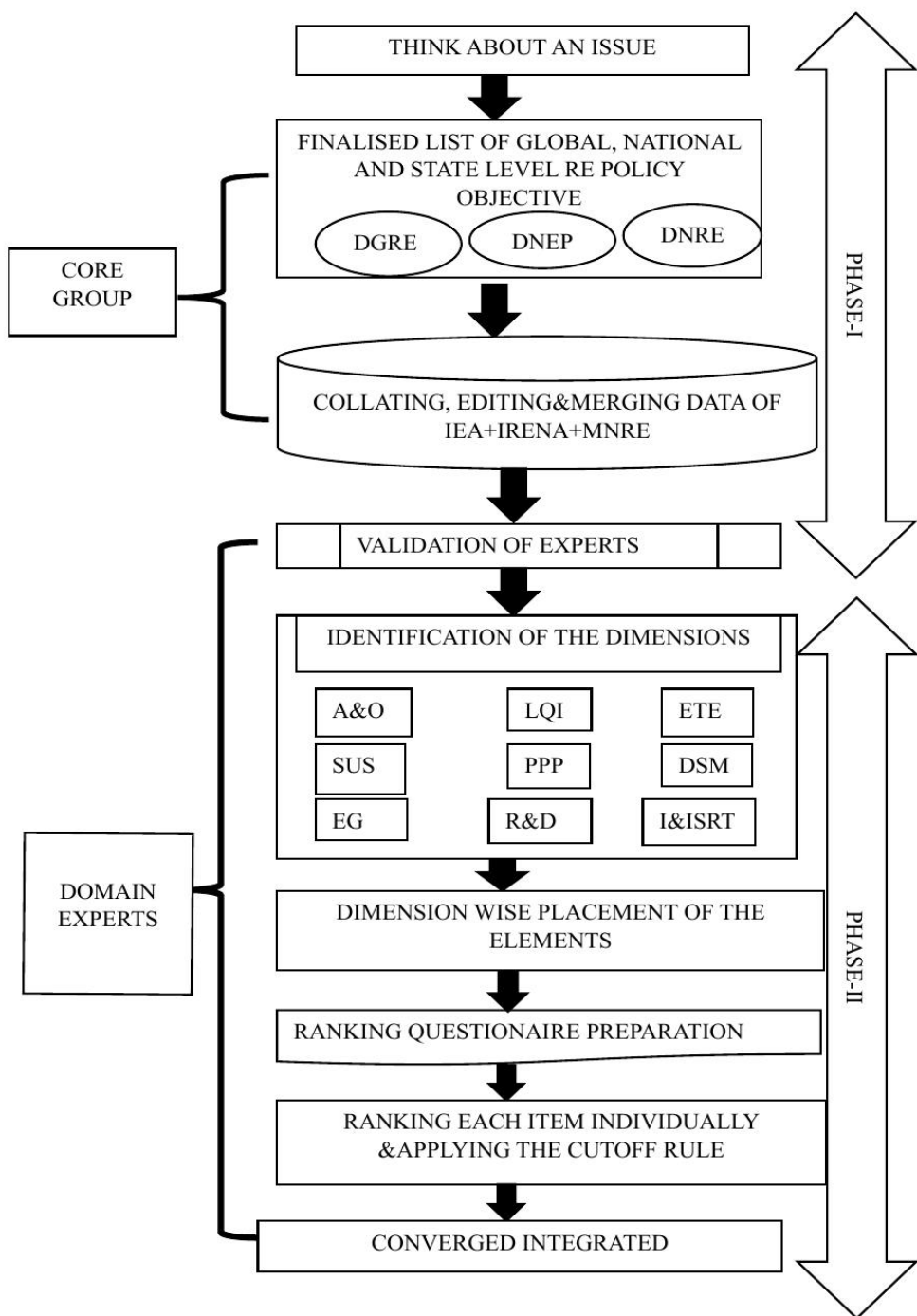


Figure 3.1 The NGT Process for Integrated Descriptive Renewable Energy Policy Elements

Figure 1: The NGT Process for Integrated Descriptive Renewable Energy Policy Elements

Table 1: Convergence of Descriptive Policy Elements through the NGT Process

Introduction	Introduction	Introduction
Phase-I	Initial descriptive policy statements collated from global, national and state-level secondary sources (IEA, IRENA, MNRE and comparable national policy documents)	763
Phase-II	Descriptive policy elements after review, clarification and merging by twelve domain experts, classified into nine dimensions	258
Phase-III	Final prioritised policy elements after weighted ranking (weights 3-2-1) by ten domain experts and application of the cut-off rule	34

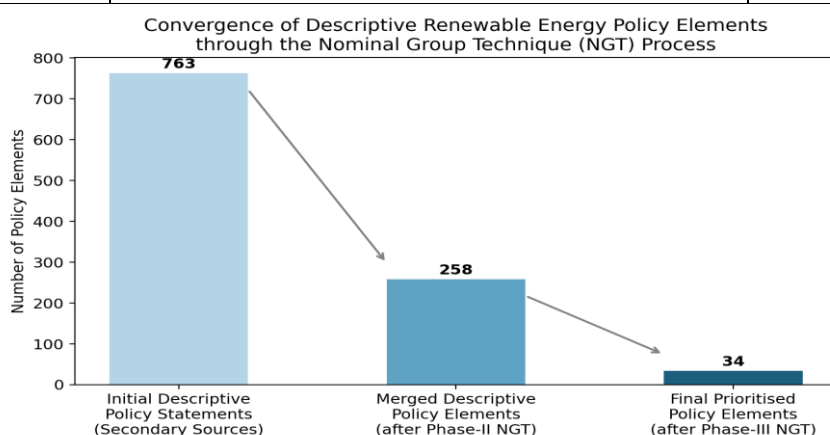


Figure 2: Convergence of Descriptive Renewable Energy Policy Elements through the NGT Process

Interpretation: Table 1 and Figure 2 show that the NGT process achieved substantial convergence, reducing the initial pool of 763 descriptive policy statements to 258 merged elements in Phase-II (a reduction of about 66 percent), and further to 34 prioritised elements in Phase-III (a reduction of roughly 87 percent relative to the merged set). This staged convergence indicates that, despite the apparent fragmentation of India's renewable energy policy discourse across global, national and state sources, a compact, expert-validated core of policy priorities can be reliably identified.

Table 2: Dimension-wise Distribution and Priority Weight of Merged Policy Elements

S.No.	Dimension	No. of Elements	Priority Weight	Rank
1	Administration & Organization (A&O)	52	9	I
2	Economic Growth (EG)	22	8	II
3	Inter & Intra-State Regulation (I&IR)	27	7	III
4	Life Quality Improvement (LQI)	30	6	IV
5	Employability, Training & Education (ET&E)	26	5	V

6	Sustainability	26	4	VI
7	Research & Development (R&D)	31	3	VII
8	Public-Private Partnership (PPP)	30	2	VIII
9	Demand Side Management (DSM)	14	1	IX

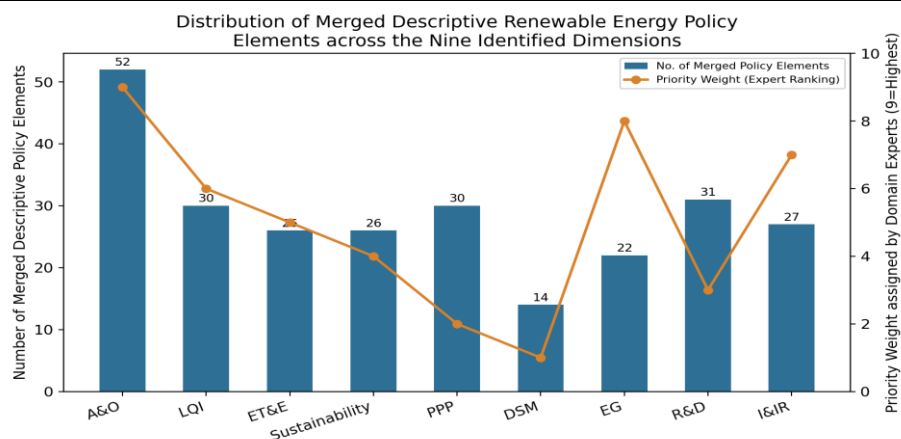


Figure 3: Distribution of Merged Descriptive Renewable Energy Policy Elements across the Nine Dimensions, with Expert-Assigned Priority Weight

Interpretation: Table 2 and Figure 3 indicate that Administration & Organization (A&O) is both the largest dimension, comprising 52 of the 258 merged elements, and the dimension domain experts weighted most heavily (weight 9, Rank I). This suggests that administrative and institutional measures — regulatory clarity, inter-agency coordination, RPO/RGO compliance mechanisms and regional advisory structures — are perceived as the most consequential lever for India's renewable energy transition. Economic Growth (EG) and Inter & Intra-State Regulation (I&IR) were ranked second and third respectively, underlining the continued importance of market design and interstate coordination even though these dimensions contain comparatively fewer elements (22 and 27). By contrast, Demand Side Management (DSM), while a well-established international policy lever, was both the smallest dimension (14 elements) and the lowest-weighted (Rank IX) in the Indian expert panel's assessment, suggesting either that DSM measures are viewed as more mature/settled or that they are currently a lower relative priority compared with administrative and regulatory reform.

Table 3: Final 34 Prioritised Descriptive Renewable Energy Policy Elements (P1-P34)

Code	Dimension	Descriptive Policy Element	Weight
P1	A&O	Regulating norms for market transparency and investment	9
P2	A&O	Policy to establish green corridors for EV / RE infrastructure	9
P3	A&O	Fulfilling of RPO goals across states	8
P4	A&O	NCEF-based financial aid to states for transmission corridors	7

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P5	A&O	Regional advisory system for coordinated RE integration	7
P6	A&O	Funds offered to states to build green energy systems	6
P7	A&O	Regulatory standards for RE Load Despatch Centres (LDCs)	5
P8	A&O	Simplification of rules to expedite RGO adoption	5
P9	A&O	Standard interstate rules for uniform compliance	5
P10	A&O	Leak-detection / technical-standard programme for gas grid	5
P11	A&O	Algorithm / mechanism for tracking RPO targets	4
P12	A&O	Central incentive plan offered to states to meet RPO targets	4
P13	LQI	Reassessment of conventional-capacity addition with green-skill and job focus	10
P14	ET&E	Transition of agriculture consumers from subsidy to sustainable models	8
P15	ET&E	Governing-body support to states via training and best-practice sharing	7
P16	ET&E	Consumer information policy for affordable, competitive energy	6
P17	ET&E	Ambitious RE production targets to meet future demand & jobs	4
P18	Sustainability	Transparent feed-in tariff structures for flexible generation	5
P19	Sustainability	RE & efficiency measures for energy-intensive core industries	6
P20	Sustainability	Power System Development Fund for pumped-storage projects	10
P21	Sustainability	Sustainable, transparent feed-in tariff eligibility criteria	5
P22	PPP	Streamlined PSU procedures to raise RE procurement by PSUs	8
P23	PPP	Policy engaging PSUs to buy surplus RE power	9
P24	DSM	Ancillary-services market for frequency regulation & flexibility	9
P25	EG	Robust IT / billing / blockchain-enabled RE trading infrastructure	9
P26	R&D	State-of-the-art forecasting tools for solar & wind resources	5
P27	R&D	Incentivised acquisition of cutting-edge RE technology	9
P28	R&D	Periodic revision of solar-rooftop targets with technical support	6

P29	I&IR	Market-based RE trading & balancing between surplus/deficit states	9
P30	I&IR	Uniform interstate transmission charge & ancillary-market structure	7
P31	I&IR	Inter-regional transmission infrastructure for RE trade	5
P32	I&IR	Fair CTU-connected interstate tariff structure	4
P33	I&IR	Basic interstate regulatory framework across states	5
P34	I&IR	Regional RE-balance mechanism with CERC / SERCs	6

Share of the Final 34 Prioritised Policy Elements (P1-P34)
across the Nine Dimensions

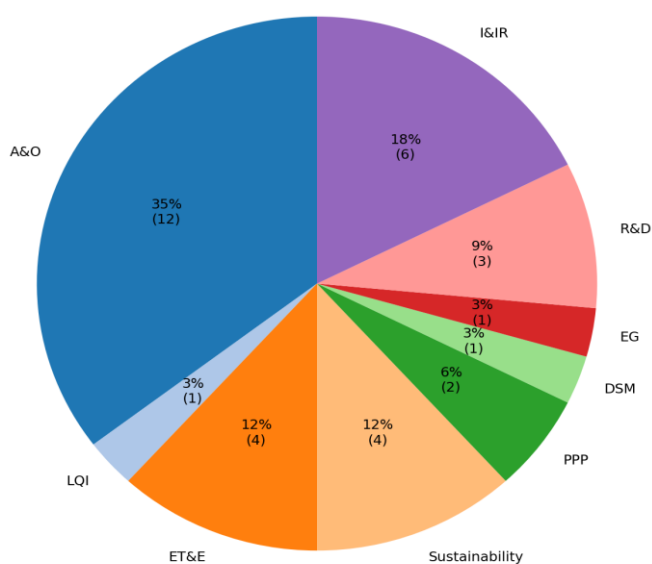


Figure 4: Share of the Final 34 Prioritised Policy Elements (P1-P34) across the Nine Dimensions

Interpretation: Table 3 and Figure 4 present the final set of 34 policy elements that survived the NGT cut-off rule. Twelve of the thirty-four final elements (about 35 percent) belong to the Administration & Organization dimension, reinforcing the earlier finding that institutional and regulatory measures dominate expert priorities. Inter & Intra-State Regulation contributes six final elements (18 percent), reflecting the continued salience of interstate transmission pricing, tariff harmonisation and regional balancing mechanisms. Single-element dimensions — Life Quality Improvement (P13), Demand Side Management (P24), and Economic Growth (P25) — nonetheless received some of the highest individual weights (10, 9, and 9, respectively), showing that a dimension's importance is not simply a function of how many elements it contributes, but also of how decisively experts converged on its single most critical element.

Conclusions of the Research Study

1. The study demonstrates that the Nominal Group Technique is an effective method for consolidating a large, fragmented body of descriptive renewable energy policy statements (763 initial items) into a structured, expert-validated framework of nine policy dimensions and 258 merged elements.
2. Administration & Organization emerged as the most heavily weighted and most populous dimension, indicating that regulatory clarity, institutional coordination, and compliance mechanisms are perceived by domain experts as the most significant lever for India's renewable energy sector.
3. Economic Growth and Inter & Intra-State Regulation, though smaller in element count, were ranked among the top three dimensions, highlighting the continued importance of market design, tariff structuring and interstate coordination.
4. The final prioritised list of 34 descriptive policy elements (P1-P34) offers a compact, actionable reference for policymakers, regulators, project developers, and research institutions seeking to design targeted interventions across administrative, economic, technological, social and regulatory dimensions of India's renewable energy sector.
5. The staged convergence achieved through NGT (763 → 258 → 34) confirms that structured, multi-stakeholder consensus methods can substantially reduce the complexity of renewable energy policy discourse without losing representational breadth across the identified dimensions

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