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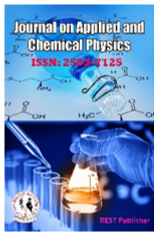

Importance of policy for Energy System Policy Making Transformation using the WSM Method

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Abstract: *The process of developing policies and laws that apply to energy the manufacturing, distribution, and consumption phases systems is known as energy system policy-making. Energy policies are important in directing the growth and evolution of energy systems, providing security of supply, promoting sustainability, and helping to mitigate climate change. Energy sector development is critical for societal advancement, economic prosperity, and environmental sustainability. It incorporates a wide range of potential energy sources such as nuclear power, energy from renewable sources, along with fossil fuels (including sunlight, breeze, water, as well as natural gas). To cut greenhouse gas emissions, battle climate change, and achieve an environmentally friendly and less costly energy future, the world must prioritize the transition to a more resilient and sustainable energy system. The formulation of energy system policy involves a variety of stakeholders, including governments, regulatory bodies, energy companies, industry groups, environmental protection organizations, and the general public. These stakeholders collaborate to establish the objectives of energy policy, develop strategies, and implement the plans. energy system policy is critical in combating climate change due to how it encourages the use all energy produced from renewable sources, efforts to improve energy efficiency, and low-carbon technology. in order to attain aggressive emission reduction targets, research in this sector can give knowledge on effective policy formulation, implementation tactics, and evaluation frameworks. as the world progresses approaching an economy with fewer greenhouse gases, it is critical to understand the causes, impediments, and consequences of the shift to cleaner energy. research can assist identify the optimum governance structures, market mechanisms, and regulatory frameworks for facilitating the changeover to renewable energy sources while achieving carbon reduction goals. access to affordable, dependable energy services is essential for socioeconomic development and the eradication of poverty. research has the potential to shed light on the financial plans and legislative frameworks that might increase access to energy, especially in neglected areas, while addressing concerns of poverty and inequality. In order for the energy system to keep up with technological advancement, policy makers must encourage the use of cutting-edge energy technology. research may give decision-makers knowledge about emerging technologies, prospective implications, and the regulatory frameworks necessary to promote their acceptance and integration into the energy system. In this research we will be using weighted sum method. Clean fossil fuel power generation, natural gas combined cycles (ngcc), integrated gasifier combined cycles (igcc), improved transmission and distribution systems, decentralized power-fuel cells, decentralized power-micro-turbines. Evaluation parameters: impact on energy and carbon intensity, impact on security, impact on energy security, status and technological potential, barriers to commercial use. Result: the WSM method of Ranking Energy System Policy Making in Natural Gas Combined Cycles (NGCC) is got the first rank whereas is the Decentralised Power-fuel Cells is having the Lowest rank. The WSM method of Ranking Energy System Policy Making in Natural Gas Combined Cycles (NGCC) is got the first rank whereas is the Decentralised Power-fuel Cells is having the Lowest rank.*

Keywords: *Energy system, impact on energy and carbon intensity, impact on security, impact on energy security, status and technological potential, barriers to commercial use.*

1. INTRODUCTION

It is also conceivable to connect the evolution of energy system models to the growth in relevance of scenario planning during the rest of the twentieth century. In the words of Chermack and colleagues (2001), scenario planning, initially presented by the RAND Corporation considerable 1940 and nicknamed “future-now thinking,” has grown in importance since the 1970s oil crisis. [1] Uncertainty management has consistently been a top priority for policymakers, comprising governors, engineers, managers, along with scientists. A high level of sensory uncertainty impacts the majority of the judgments that decision-makers have to arrive at in the energy business. [2] The most important findings and suggestions for individuals in charge of formulating energy policy are included in this overview along with the main takeaways from the conversation. While there are still certain areas where perception and analysis disagree, the statements listed below indicate harmony among stakeholders in the ENER

Network. [3] The Dutch National Environmental Policy Plan (NMP4), fourth edition, released in 2001, endorsed a transitional approach aimed at "system innovation" in critical socioeconomic areas such as energy. It claimed that expanding current efforts would not resolve long-term environmental problems like climate change. "Finding solutions the fundamental environmental problems dictates system innovation; long-term process of transformation featuring technological, economic, socio-cultural, and institutional changes," according to the plan (VROM 2001: 30). In the energy sector, the NMP4 intends to cut carbon dioxide emissions as a result of 40-60% by 2030 contrasted with 1990 levels. [4] The global as well as national energy problems have progressively intruded upon the daily lives and ordinary people in recent years. Most Americans have felt the consequences, which include quickly rising energy prices, fuel shortages, erratic Middle Eastern oil supply, and nuclear energy uncertainty. As a result of these changes, psychologists are becoming interested in the psychological effects of energy problems and doing research targeted at comprehending and solving these challenges. [5] The following section of the study presents its theoretical framework experimental methods. The third section describes the governance for electricity in Berlin prior to the formation of the initiatives. The following two parts concentrate on the construction and growth of the two distinct Berlin GIs, as well as the controversies over how to utilize the power grid in Berlin's energy transition. The third portion addresses the impact having GIs on Berlin's energy policymaking. The conclusion covers the scope and constraints of urban fossil fuel regulation, as well as grassroots efforts. [6] In 1999, fossil fuels were the world's dominant energy source, with a share of more than 80% (91,000 TWh) of America's primary energy supply, with electricity generation accounting for 64% (9400 TWh). This hegemony is linked to obvious environmental and climate challenges. Increased usage of renewable energy technologies is one answer to these concerns. [7] Many interconnected factors impact energy systems, include socioeconomic conditions, resource availability even constraints, technical capabilities, and political goals. Energy policy must contribute to various linked goals, including energy security, climate change, environmental sustainability, including alleviation of fuel poverty. This is a tremendous undertaking. [8] The United Kingdom as a whole may be able to shift toward a low-carbon economy despite sacrificing living standards. However, it will need public acceptance of new infrastructure, altering how we heat our houses, and a willingness to invest money to energy efficiency. [9] Historians might be valuable friends regarding those who are energy researchers and policymakers. This thesis is not just based on the idea that course of events repeats independently or offering academic historians have precognitive ability to foretell the future. While George Santayana's famous remark about the dangers of forgetting the past has gotten a lot of attention, we suggest that a more nuanced view of the connections between the past, present, and future is required. [10] Various studies that investigate the long-term trajectory of economic growth and the corresponding environmental challenges predict that economic growth will remain robust over the course of the following fifty years or so (e.g., IPCC, 2000; WEC, CPB, 1992). [11] The earliest foundation for delivering contemporary energy services consisted of centralized approaches to energy generation, distribution, and consumption. Electricity could be provided across long distances via electric wires after the development pf higher-voltage current (AC) generators in the late nineteenth century. [12] In 1999, petroleum and gas were the world's principal source of energy, which supplied nearly eighty percent (91,000 TWh) concerning the total quantity of primary energy and 64% (9,400 TWh) as part of total electricity generation. This domination comes with obvious environmental and climatic difficulties. One approach for overcoming these challenges is to increase the use about renewable energy technology. The European Union, for example, plans to boost renewable energy's share of power supply from about 14% in 1997 to 22% by 2010 (Lauber, 2002). [13] Various studies analyzing the long-term evolution behind economic growth underlying the accompanying environmental concerns presume believed to economic growth will continue to be robust over the next fifty years. (See, for example, IPCC, 2000; WEC, CPB, 1992). [14] Climate change mitigation has been identified as one of the most complicated global policy concerns, requiring multilateral, ambitious, and collaborative responses. Additional challenges arise as a result of the complexity generated by the relationship involving climate change and economic development, the evolution of the energy system, and effective resource management, amid other things. [15]

2. MATERIALS AMD METHOD

2.1 Parameters:

Impact on Energy and Carbon Intensity:

Climate change becomes an inherent fact of life. Pollution throughout the environment has a significant impact on climate change. Greenhouse gases have a large impact on global temperature since they contribute considerably to climate change. According to the National Oceanic together with Atmospheric Administration, 2015 was the warmest year on record dating back to 1880. [16] The world's population hit 7.6 billion in mid-2017, according to UN estimates, and is anticipated to surpass 8.6 billion by 2030 especially 11.2 billion by 2100. As a result of advancing technology or faster globalization, a growing global population has slowed consumption and output. By 2030, the global rate of urbanization is predicted to climb by 60%. Following the development of photovoltaic cells during the final years of the 1950s, they were solely employed for running earth-orbiting satellites over the early 1960s. [17]

Impact on Security:

Adequate electricity utilization has been acknowledged as a critical instrument for assisting with the development and growth of both urban, semi-urban, and rural cultures. This happens because power works as an inducement, employer, for driver of goods and services. Many daily operations in businesses, homes, production lines, and other types of facilities rely on consistent power. [18] Bangladesh's expanding energy demand cannot be met with existing stocks of coal, oil, and gas; these fuel sources will be depleted soon. New energy sources need to be researched and then incorporated into the national energy mix. [5] RE is a clean and infinite source of energy that has several benefits over traditional energy sources such as fossil fuels, ranging from the fact offering it is free and abundant. However, because wind particularly solar energy are both variable, RE is sensitive to both production and capacity restrictions. [19]

Impact on Energy Security:
Global trends are pushing mankind toward a more environmentally friendly and sustainable future. Countries are under economic and political pressure to overhaul their utilities and energy sectors with a goal to reduce CO2 emissions while providing dependable and affordable energy services. [7] OUTDO makes decision-making easier by also documenting decision reasoning (reasons for decisions plus explanations regarding these reasons). There are numerous benefits to documenting the decision-making process. [8] Many nations faced huge hurdles in controlling increasing temperatures and minimizing energy supply risk as their economies boomed. In 2010, China burned approximately 3249.4 million tons that live in equivalent standard coal (tce), and its total energy consumption surpassed that of the United States. [20]

Status and Technological Potential:
Industry advancement leads to a major growth in energy interest. As a result, developing nature-friendly technologies that have significant competency is vital to mitigating the harmful effects of nonrenewable energy sources. [21] The supply system (DS) delivers power to the final users and is the utility's initial point for communicating with customers. Because of deregulation and competition in the transmission business, utilities are under pressure to minimize operating expenses by eliminating losses and boosting reliability in order to enhance overall performance. In the early 1800s, electric motor cars (EVs) powered using batteries were invented and constructed. However, when contrasted with fossil-fuel cars, whose inventiveness and development outshone EVs, it fell short of providing high power

Barriers to Commercial Use:
Current global trends are moving mankind toward a future that is less destructive. Countries are facing economic and political pressure to restructure their energy sectors with the aim to reduce CO2 emissions while providing dependable and affordable energy services. In the United Kingdom, the development of natural gas-fired combined cycle (NGCC2) power stations is a temporary solution for reducing CO2 emissions. [22] Wind energy is quickly expanding and will play an important role via the foreseeable future's energy system. The great majority of current capacity (620 GW out of a total of 650 GW) is deployed above ground, nonetheless wind power offshore continues to represent a large untapped potential. The continuous advancement of industry results in a huge growth in energy interest. As a result, developing highly competent nature-friendly technology is vital to mitigating the harmful effects of nonrenewable energy sources.

2.2 Weighted Sum Method:
A selection theory Weighted sum sampling method WSM is very the well-known MCDM (multi-criteria decision-making) is one of the techniques And primarily some Alternatives based on criteria Easier to evaluate is one. WSM is valid handiest while all information supplied are in the same size or unit [23]. The in each column Rows are compressed, using their respective rank sums Columns are sorted If the rank sum is reduced The column molecule is searched Same as reference form will be others mixtures of rating matrix except summation have been studied. This approach is relevant to tuning parameter choice and different regions in which Subgroup variables of variables must be selected from the set This is when the SRD method is monitored The approach can be considered unsupervised (A goal vector is used) In addition to the SRD approach Can be used in molecular fitting research [24]. Factor weights for robot selection and are A weighted sum model with This model has no institution consensus on those values. In choosing robots, the best and weights and subjectivity Less expert on components Values are removed. The main purpose for getting rid of These values are any capacity at the last stage It is to reduce the impact of distorted desire to explain version and program A numerical example is presented the ranking change while in comparison to a version that does not do away with those excessive values [25]. Using weighted-sum beamforming, the microphone arrangement, which includes the variety and function of the microphones, determines the weight for every microphone signal. To determine the design parameters, diverse simulations had been finished if the listener had a head. To make amends for the and the impact is accounted for using the round head-related transfer function (HRTF). We perform simulations with respect to a round head version [26]. The Weighted Sum Model (GWSM) accounts for multi-year uncertainties with the aid of comparing the enterprise environment in West Africa. The deal with a first-rate problem now not blanketed through DBP, specifically, ranking countries throughout years by considering inside-country uncertainty and investor possibilities as criterion weights. Second, we enlarge the traditional weighted sum model [27]. of weights containing pure gas The sum equals A common way to use calculate the entire emissions by means of making a grey approximation to resolve the spectrally included RTE. An alternative method Non-gray or bar formula. To decide the depth of penetration, the sum rule need to be cautiously applied. Our effects display that Normal and superconducting to move the c-axis between positions A within energy There is trade, for a speed-dependent gap; This exchange in kinetic energy ought to be taken

under consideration to properly derive the penetration intensity from conductance sum regulation Naïve use of conductivity sum [28]. Important (1) part Determination of sum rule closely related the greater trendy trouble of improving the feature Out of test range is widely recognized the evaluation (holomorphic) of a complicated feature $\sigma(\omega)$ on a given area D can be persevered analytically over the complete domain inclusive of the last boundary from a subset of the boundary of this area. The weight trouble must be solved first. Furthermore, modelling the dynamic shape factor studied with the aid of MNS is extra tricky considering that discrete Sum laws of theoretical models are satisfying. In fact, any theory Notification of serious settlement dynamic structure issue measured in absolute devices should provide an explanation for how the regulation of composition is happy or why it is violated. All like the weight of white fuel a0 The sum of the weights zero = zero; Therefore, ϵt , calculated by the SNB version, is the sum of the differences among L and by the WSGG version of SQP Extraordinary path with help Calculated for length set of rules [29]. Weighted sum rules for exchange forces A very sensitive test Fourier components optimization measures, Roughly speaking, it proved. transfer potential of the two-particle interaction density. Sum (SNNMS) reduces the number of LDPC decoding network Correction factors. A single revision in a single layer by dividing the factors Through the SNNMS LDPC decoding network Good performance can be achieved a small increase in computational complexity. The weighted sum model does not require any supported solutions to be pruned with this optional correlation. To the best of our understanding, the priority relation is only implemented to given answers and non-stop multi-objective optimization troubles [30].

3. RESULT AND DISCUSSION

TABLE 1. Energy systems policy making

Clean Fossil Fuel Power Generation	Impact on Energy and Carbon Intensity	Impact on Security	Impact on Energy Security	Status and Technologic al Potential	Barriers to Commercial Use
Natural Gas Combined Cycles (NGCC)	5.6098	8.6091	7.8065	4.5472	8.7814
Integrated Gasifier Combined Cycles (IGCC)	4.9247	4.3527	5.6596	6.9807	5.2306
Improved Transmission and Distribution Systems	1.7715	8.8982	8.8018	6.2122	5.1646
Decentralised Power-fuel Cells	3.5841	4.7552	6.7777	1.6075	7.7633
Decentralised Power-Micro-turbines	8.1879	6.3892	3.3466	3.3713	8.3308

Table 1 This table shows WSM method. Here in this table Impact on Energy and Carbon Intensity, Impact on Security, Impact on Energy Security, Status Technological Potential, Barriers to Commercial Use.

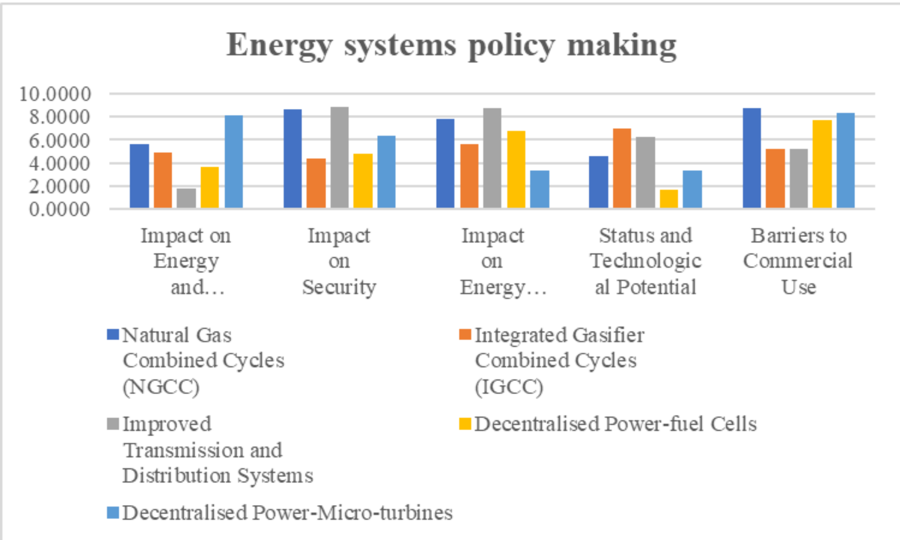

FIGURE 1. Energy systems policy making

Figure 1 shows the WSM method. Here in this table Impact on Energy and Carbon Intensity, Impact on Security, Impact on Energy Security, Status Technological Potential, Barriers to Commercial Use.

TABLE 2. Normalized Data

0.68513	1.05145	0.95342	0.55535
0.60146	0.5316	0.69122	0.85257
0.21635	1.08675	1.07497	0.75871
0.43773	0.58075	0.82777	0.19633
1	0.78032	0.40873	0.41174

Table 2 shows the WSM method. Here in this table Impact on Energy and Carbon Intensity, Impact on Security, Impact on Energy Security, Status Technological Potential, Barriers to Commercial Use.

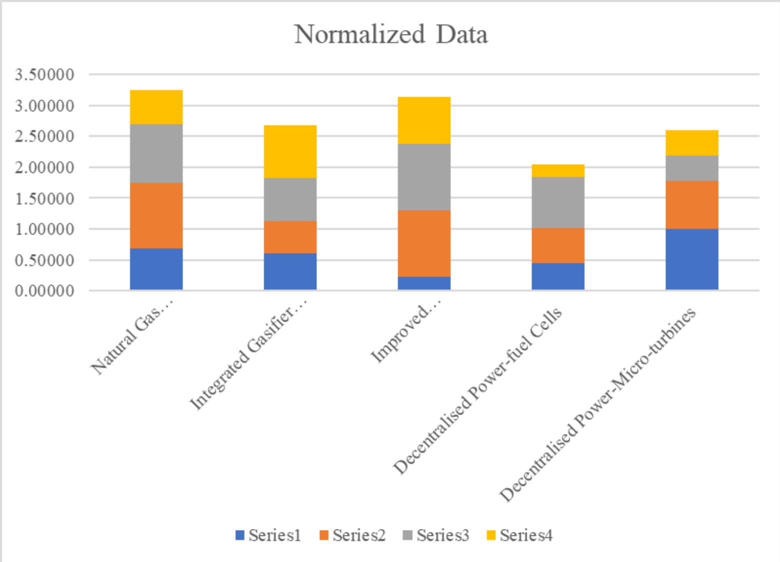

FIGURE 2. Normalized Data

Figure 2 shows the WSM method. Here in this table Impact on Energy and Carbon Intensity, Impact on Security, Impact on Energy Security, Status Technological Potential, Barriers to Commercial Use.

TABLE 3. Weight Distribution

Clean Fossil Fuel Power Generation	Impact on Energy and Carbon Intensity	Impact on Security	Impact on Energy Security	Status and Technological Potential	Barriers to Commercial Use
Natural Gas Combined Cycles (NGCC)	0.20		0.20	0.20	0.20
Integrated Gasifier Combined Cycles (IGCC)	0.20		0.20	0.20	0.20
Improved Transmission and Distribution Systems	0.20		0.20	0.20	0.20
Decentralised Power-fuel Cells	0.20		0.20	0.20	0.20
Decentralised Power-Micro-turbines	0.20		0.20	0.20	0.20

Table 3 shows WSM method of Impact on Energy and Carbon Intensity, Impact on Security, Impact on Energy Security, Status and Technological Potential, Barriers to Commercial Use.

TABLE 4. Weighted normalized decision matrix

0.13703	0.21029	0.19068	0.11107
0.12029	0.10632	0.13824	0.17051
0.04327	0.21735	0.21499	0.15174
0.08755	0.11615	0.16555	0.03927
0.2	0.15606	0.08175	0.08235

Table 4 shows the WSM method of Weighted normalized decision matrix Impact on Energy and Carbon Intensity, Impact on Security, Impact on Energy Security, Status and Technological Potential, Barriers to Commercial Use.

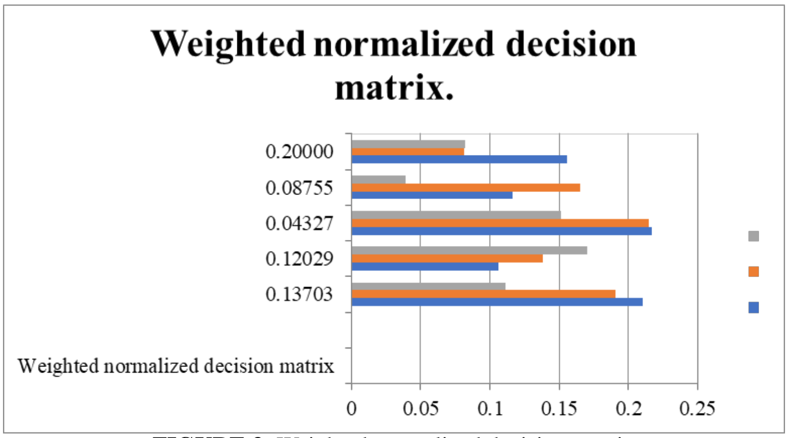

FIGURE 3. Weighted normalized decision matrix

Figure 3 shows the WSM method of Weighted normalized decision matrix Impact on Energy and Carbon Intensity, Impact on Security, Impact on Energy Security, Status and Technological Potential, Barriers to Commercial Use.

TABLE 5. Preference Score & Rank

Clean Fossil Fuel Power Generation	Preference Score	Rank
Natural Gas Combined Cycles (NGCC)	0.64907	1
Integrated Gasifier Combined Cycles (IGCC)	0.53537	3
Improved Transmission and Distribution Systems	0.62736	2
Decentralised Power-fuel Cells	0.40852	5
Decentralised Power-Micro-turbines	0.52016	4

Table 5 shows the Final Result in WSM method of Preference Score value.

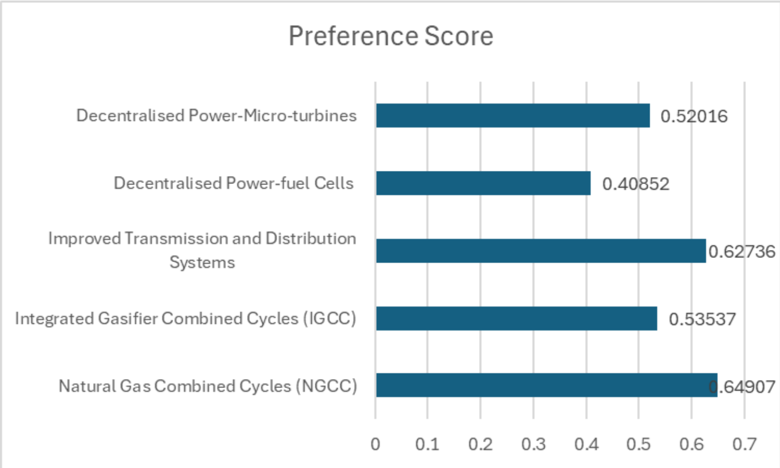

FIGURE 4. Preference Score

Figure 4 shows the WSM method of Ranking Energy System Policy Making in Natural Gas Combined Cycles (NGCC) is got the first rank whereas is the Decentralised Power-fuel Cellsis having the Lowest rank.

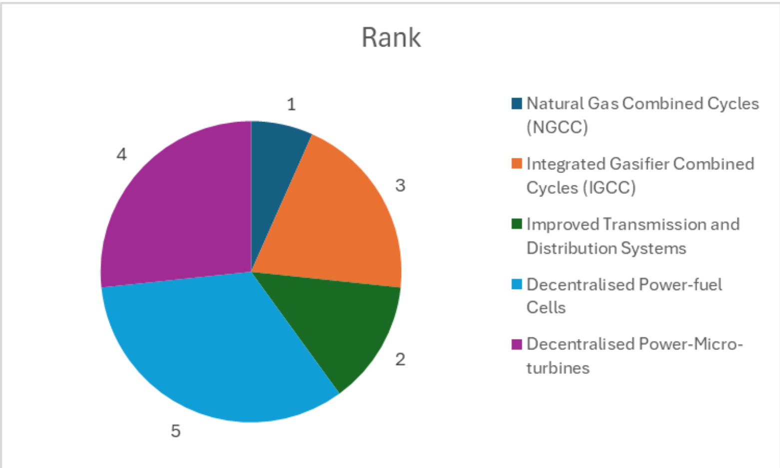

FIGURE 5. Rank

Figure 5 shows the WSM method of Ranking Energy System Policy Making in Natural Gas Combined Cycles (NGCC) is got the first rank whereas is the Decentralised Power-fuel Cells is having the Lowest rank.

4. CONCLUSION

Finally, good energy policy must be centered around a long-term vision who balances sustainability of the environment, economic prosperity, and social equality. It should promote renewable energy adoption, energy efficiency, grid modernization, decentralization, electrification of transportation, a fair transition, and international collaboration. By implementing these changes, we can create the aforementioned healthier and more robust energy system in the future. One important political outcome is that Germany's prevailing technocratic, elite-theoretic image of democracy appears to be erroneous. Ex-post "social acceptance" by the government, particularly ministerial agencies, is typical in their language. As previously stated, using more collaborative and deliberate ways to build infrastructure projects will most likely to be beneficial in terms of generating and maintaining desirable normative qualities. Using future visions and back casting technology from these visions generates a long-term perspective in the debate and resulting in insights into opportunities and barriers to implementing the various options needed to make the transition toward a climate-neutral society. the WSM method of Ranking Energy System Policy Making in Natural Gas Combined Cycles (NGCC) is got the first rank whereas is the Decentralised Power-fuel Cells is having the Lowest rank.

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