

Morphological Analysis of Lexical Units Related to Energetics in English

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Abstract. This article presents data about the morphological aspects of lexical units related to energetics in the English language. Through a comprehensive analysis of word formation processes in the dictionary we have chosen—including affixation, compounding, blending, clipping, and conversion—this research investigates how energy-related terms are constructed and function within both technical contexts.

INTRODUCTION

In the rapidly developing field of technology and science such as energetics which encompasses the study, generation, distribution and use of energy, language plays an important role in explaining and understanding the complex scientific concepts. The terminology used in energetics is not stable; it continuously adapts to new technologies, discoveries, and practices. This analysis not only sheds light on the linguistic creativity inherent in scientific discourse but also highlights the interconnectedness between language and technological progress.

METHODS AND METHODOLOGY

Our study adopts a mixed-methods approach combining both qualitative and quantitative linguistic analysis. The goal is to investigate the formation, usage, and meaning of lexical units related to energetics, focusing on their morphological structure. This allows for a comprehensive examination of how these terms are formed, how frequently they appear, and how they function within the discourse of energetics.

The primary data for this research were collected from the following sources: -*Academic databases*: Articles from ScienceDirect, Scopus, and Google Scholar were analyzed to gather relevant examples of technical and non-technical usages of these terms in the context of energy studies [13-17].

-*Manuals*: Engineering and environmental science textbooks were consulted for technical terminology in the field of energetics.

-*Dictionaries and etymological sources*: Resources like the “Oxford English Dictionary” (OED) and “Online Etymology Dictionary”, “Dictionary of Energy” “Power industry and acronyms” English-Russian dictionary were utilized to track the historical and morphological development of key terms.

A morphological analysis was conducted to identify and categorize the types of word formation in the collected lexical units.

A quantitative frequency analysis was conducted using the collected data to determine the most common lexical units related to energetics. This provided insights into the prevalence of certain word formation processes in both technical and everyday language.

The percentage representation of different word formation types (e.g., affixation, compounding) was calculated, as presented in the table. This step allowed for a comparison of the productivity of various morphological processes in the energetics domain.

RESULTS AND ANALYSIS

The problem of word formation has always been on interest of several linguists. [1,2,3]. Modern linguists are trying to do research on word-formation in different fields such as economics [4], politics, mathematics [5], technology, energetics [6] and industry [7]. Some more researchers [8] in their study of methods of term formation in the field of electric power engineering using the English language as an example claim that more than 80% of terms are multi-component; borrowings of words from other languages are insignificant, since they do not exceed 3-4%, and suffixation is the most common method of morphological term formation [9].

Morphological analysis of lexical units related to “energetics” involves examining the structure and formation of words that pertain to the study and science of energy, distribution and consumption. As it is known there are different morphological ways of word formation such as affixation, compounding, conversion, clipping, blending, back-formation, acronyms and initialism, borrowing and eponyms. These methods allow for the precise description of concepts and terms, technologies and innovations in the field, showing how language evolves to meet the scientific and technological developments. The object of our research work is also directly related and belong to some of these ways mentioned.

Our study was conducted based on the analysis of 6,000 terms included in the lexical terminology system of the language [10, 11], among which 3560 terms are made with the help of affixation and about 930 terminological phrases formed by compound terms and the rest of the 1510 lexical units contain the morphological word groups such as blending, conversion, clipping and abbreviations and acronyms. The predominance of terminological phrases is characteristic not only of the language of energy, but also of any language of science and technology. This feature can be explained by the complication of terms and the acceleration of scientific knowledge.

a. The first investigation results that we found on the type of word formation process is *affixation* which is a very common means of making new words. As it is shown in most researches on the field, the most used type of word formation is considered as affixation, particularly suffixation. There are different suffixes and prefixes which make different parts of speech in the field.

-We will start our analysis with Prefixes. Some words in the field of energetics are formed by adding *prefixes* to root words to create new words. It is important to note that most of the words made with the help of prefixes are originated from Latin and Greek languages. For example: re-, a-, co-, de-, dis-, inter-, sub-, trans-, bio- are common prefixes that make lexical units related to energetics. Here is one example: the word “renewable” consists of the prefix “re-“ (meaning again) and is added to the word “new” to imply that the resource can be renewed or replenished. One more example is the word “bioenergy” which consists of the prefix “bio-“ (meaning “life” or “biological”) is added to the root word “energy” to refer to energy derived from biological sources. The word-formation with prefixes is not as commonly used as suffixes. The materials and resources we have collected give evidence about the fact that only 10 percent of the words are made with prefixes.

-*Suffixation* is considered as the most common and productive way of word formation. When it comes to analyze the suffixes which make words related to energetics, we decided to divide them into the following subgroups:

- *suffixes that make nouns*: -tion (-sion, -cion, -ion), -er (-or), -ence (-ance), -ity (-ty), -age, -y, -ing. The words belong to this group of word formation is “Energetics” and “allowances”. The word “energetics” consists of the root word “energy” and is combined with the suffix “-etics” (indicating the study of any branch of science). The latter word includes the root word “allow” (meaning “let something happen or someone do something”) is combined with the suffix “-ance” (noun making suffix). The word means an authorization to emit, during a specified year, up to one tone of carbon dioxide equivalent.

- *suffixes that make adjectives*: -ic, -ed, -ous, -al. Here are some examples: automatic generation control, dynamic stability, calculated electrical scheme, asynchronous conditions. The suffix -ive is less common: responsive reserve, capacitive conductivity.

- *suffixes that make verbs*: -ate, -ete, -ise, -ize, -ify. Here are several examples for verb making suffixes which are related to energetics: compensate the operation, supervise the scheme, justify the sound.

b. The second type of word forming process that is related to our research area is named *compounding*. Compounding involves the combination of two or more words to create a new term, common in technical fields like energetics. The first example is “solar power” which combines “solar” (related to sun) and “power” (energy and electricity). “Wind turbine” combines the word “wind” (air in motion) and “Turbine” (a machine for generating power). By terminological phrase we mean a whole lexical unit that has a single meaning of the whole component within this combination. Terminological phrases are constructed according to the same grammatical models as free

ones, but differ from them in structural-semantic and conceptual integrity. R.F. Pronina identifies three main types of term-phrase combinations [12-16]:

1. Term-phrase combinations, all components of which are words of a special sphere of usage. They are independent and can be used outside of this terminological phrase, preserving the separate meaning inherent to each of them, for example: maintenance bypass.

2. Phrase terms in which one component is a technical term and the other is a word of common vocabulary. The components of this type can be either two nouns or an adjective and a noun: somatic effect.

3. Phrase-terms in which both components are words of common vocabulary, and only the combination of these words is a term. Despite the fact that this method of forming scientific and technical terms is not productive, the analysis of texts in the field of nuclear energy reveals several such terminological phrases: special material

c. **Blending** is next type of the word formation related to “energetics”. Some terms of energetics are formed by blending parts of two words. For example: “photovoltaic” combines “photo-“(from Greek “phos”, meaning “light” and “voltaic” (referring to electrical energy produced by chemical reactions, named after Alessandro Volta, the Italian physicist). The term is used to describe the technology that converts light into electricity.

d. **Conversion** which is also named **Zero Derivation** is the next type of word formation of terms related to energetics. Conversion occurs when a word changes its part of speech without changing its form with no additions. In our materials collection, we have found the a few words for making the process clear. For example, the word “power” functions both as a noun (“The power output is high”) and as a verb (“The plant powers the entire city”). The word “balance” can be used as a noun when referring to a state of equilibrium or stability where different elements are in correct proportions and as a verb “balance” describes the action of keeping and putting something in a steady position so that it does not fall, or the act of maintaining equilibrium between different factors. “The balance between renewable and non-renewable energy sources is crucial for sustainable development”. Here in this example, “balance” functions as a noun. “Energy managers must balance the use of solar and wind power to optimize overall energy production”. In this sentence, “balance” functions as a verb meaning to adjust or regulate the proportion of different energy resources, such as solar and wind to achieve the most efficient output.

TABLE 1. Word formation types of lexical units related to energetics and their representation in percentage

Word formation type	Example	Morphological process	Percentage representation
Affixation	Energetic, nonrenewable	Adding a prefix (non-) or suffix (-ic) to a root word	52%
Prefixation	Overcharge, renewable	Prefixes like over- and re- added to a root word	15%
Suffixation	Generator, energetics	Suffixes like -or, -ics are added to a base form	37%
Compounding	Hydropower, bioenergy	Two or more independent words combined to form a new one	15%
Blending	Electrocute (electric+execute)	Merging parts of two words to form a new one	5%
Clipping	Gen (from generator)	Shortening a longer word to form a simpler version	10%
Conversion	Charge (from noun to verb)	A word changes its grammatical category without affixation	5%
Abbreviations	AADS, VOCALIST, W/sr/	Combination of the initial letters or sounds of the abbreviated words	13%

a. **Clipping** is a morphological process in which a longer word is shortened by removing some of its parts, typically syllables, while retaining its original meaning. In the field of energetics, where complex and technical terms are frequently used, clipping serves to create more concise and accessible words that are easier to use in both professional communication and everyday language. For example: the words “Photovoltaic” is often called “PV” to make its usage

easier. This term is often clipped to “PV” in the context of solar energy. To make it more clear, here is the sentence where the word is clipped and used: “The installation of PV panels has increased significantly in recent years due to falling costs.” The clipped form “PV” is commonly used in industry and technical documents to simplify communication while still accurately referring to photovoltaic technology.

b. In the modern world, **abbreviations** are found when naming objects and phenomena in different areas of the surrounding world. Recent scientific works show that they are present not only in specialized fields of knowledge, but also in everyday communication. In the field of energy, the abbreviations are commonly used to make the word available in short forms. In our research analysis, we divided them into the following classifications:

-Initial abbreviations, which in turn are subdivided into *letter abbreviations* (combination of the initial letters of the abbreviated words), *letter-sound abbreviations* (combination of both the initial letters and the initial sounds of the abbreviated words), *sound abbreviations* (combination of the initial sounds of the abbreviated words): AADS-automated ash disposal system, VOCALIST- validation of constrain based assessment methodology in structural integrity, viz-vide liset.

-Graphic abbreviations are abbreviations in which the cut-off part of a word is denoted by some graphic sign. This method of abbreviation is used in units of measurement in both languages. For example: watt per steradian – W/st/.

CONCLUSION

According to the above analysis, the morphological analysis of lexical units related to energetics is directly related to the research on the types of word formation in this field along with a dictionary as an object of the work. Results show that affixation is the most common method in energetics-related terms as shown in the table with the most portion which is 52 %. This includes two types such as prefixation and suffixation, where prefixes or suffixes are added to modify the meaning showing 15 % and 37 % respectively. Compounding is important for creating terms related to energy sources and forms of energy, although they are not very common like affixation, however, they also contribute to the lexical resource of this field showing the percentage of 15 %. Blending is seen to be less common, but still relevant, as represented in the table with the portion of 5 %. Clipping is also rare but used in technical contexts where efficiency in communication is needed. They represent the percentage of 10 %. Lastly, abbreviations also have significant role in word formation of energy related terms showing 13 %. The percentages reflect an approximation based on lexical occurrences in the dictionary we have chosen which is related to energy, with affixation and compounding being the most prominent formation types.

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