

## Application and discussion of block chain technology in energy Internet of things

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*Abstract: The decentralization, transparency, fairness and openness of block chain technology are consistent with the concept of energy Internet, and its application in energy Internet will further promote the construction of energy Internet. This paper first introduces the basic concepts and key technologies of block chain and Internet of things, and then summarizes and analyzes the existing problems of Internet of things, and then puts forward the concept of integration of Internet of things and block chain, and expounds the role of block chain technology in different aspects of energy Internet, such as source, network, load, storage, etc., in measurement authentication, market transaction, collaborative organization, energy finance Use.*

*Keywords: Internet of things; Block chain; Decentralization.*

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### 1. INTRODUCTION

As a distributed database [9], block chain technology has great potential to change people to people cooperation mode and business cooperation mode, and it is a technology of "creating trust". The application of block chain technology in the energy Internet will greatly improve the efficiency of the energy Internet, and realize a real self-organizing and self-regulating energy system [1].

Due to the transparency and reliability of data, the application of block chain extends from a single currency to different types of assets, trying to record each asset transaction in the form of creating asset value, so as to achieve a more macro decentralization of the whole market. Its specific applications include smart contracts, smart assets, decentralized applications, decentralized autonomous enterprises, etc.

### 2. BLOCKCHAIN OVERVIEW

#### 2.1 Definitions and principles

The basic principle of block chain mainly includes three ideas: transaction, block and chain. Transaction: an operation on the ledger results in a change in the status of the ledger, such as adding a transfer record. Block: record all transactions and status results over a period of time, which is a consensus on the current ledger status. Chain: it is composed of blocks in series according to the order of occurrence, and is a log record of changes in the status of the whole ledger. If the block chain is regarded as a state machine, each transaction is a change of state, and the block generated by each

consensus is the confirmation of the result of the change of state caused by the transaction in the block by the participants.

## **2.2 Energy Internet concept in blockchain Technology**

1) Both block chain and energy Internet embody the idea of decentralization. In the block chain system, there is no centralized database, and each node keeps all the information of the block chain, with equal rights and obligations; distributed energy and micro grid in the energy Internet will become an important part, "consumers are producers", emphasizing the equal sharing of energy between individuals.

2) Both block chain and energy Internet embody autonomous collaboration. The block chain system is operated and maintained by all nodes in the network, and there is no unified management organization; the self-scheduling and ecological operation of the system are emphasized in the energy Internet.

3) Block chain and energy Internet can promote the establishment of market-oriented and financial platforms. The use of block chain technology can establish a fair and open market mechanism, and at the same time, it can serve the transactions of other financial products well; the energy Internet emphasizes the establishment of an open energy market, which will also promote the formation of energy financial derivatives.

4) Block chain and energy Internet have the trend of intelligence and contracting. In the block chain system, contract execution can be automated and intelligentized through smart contracts or "programmable currencies"; there will be a large number of intelligent generation, transmission, distribution, use and storage devices in the energy Internet, which need to guarantee the automatic execution of energy system transactions through a series of smart contracts.

## **3. INTEGRATION MODE OF INTERNET OF THINGS AND BLOCKCHAIN**

Under the current networking mode of the Internet of things, the connected devices usually use the centralized agent mode or server / client mode for communication, and the devices can only be verified and connected through the ECS. Such a centralized agent model has been applied for decades, and still supports small-scale Internet of things network [2]. As we see now, it cannot meet the needs of the growing Internet of things ecosystem. Then it brings the high cost of central control, the increasing difficulty of privacy protection, the vulnerability of personal access to the network, and the high cost of multi-agent cooperation. The emergence of block chain provides a feasible solution.

## **4. TYPICAL APPLICATION OF BLOCK CHAIN TECHNOLOGY IN ENERGY INTERNET**

The integration of information and physical system is one of the important characteristics of the energy Internet, which is conducive to the real-time situation awareness and rapid decision-making of the physical system, and effectively improves the operation efficiency of the energy system. Accurate information will guide the physical system to make reasonable decisions. However, once the information system is damaged or attacked, the wrong information may bring disaster to the actual physical system Sexual impact [3].

### **4.1 Virtual generation resource transaction**

With the development of energy Internet, many distributed power sources, such as distributed wind power, distributed photovoltaic power generation, etc., will be incorporated into the large grid

operation. However, the capacity of distributed generation is small, and its output is discontinuous and random. It is an important way to realize the distributed energy consumption by integrating distributed energy, demand response, distributed energy storage, centralized management and unified scheduling, and then realizing the coordination of different virtual power generation resources [4]. In the future energy Internet, the selection and transaction of virtual power generation resources should meet the requirements of openness, transparency, fairness and credibility, and low cost.

The energy Internet of things is the product of multi energy integration, information physical integration and multi market integration, which will profoundly affect all aspects of energy production, transmission, storage and consumption in the future, and promote the efficient and clean use of energy capacity. The construction of the energy Internet of things cannot do without the introduction of new technologies and the penetration of new thinking. As a new database technology, block chain technology has a wide application potential in the future energy Internet of things due to its decentralization, openness, transparency and other characteristics consistent with the concept of energy Internet.

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