An Enterprise Credit Evaluation Method for Power Grid Service Providers Based on Block Chain is Presented

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Abstract. As the main content of credit investigation, credit management is an important part of enterprise operation management, and it plays a dominant role in the management of enterprise personnel, funds, contracts, bidding and other management. The management of credit is essentially the management of data. Traditional credit investigation agencies collect user data through various technical means and establish a credit investigation management database. However, the reliability of data obtained in this way is not guaranteed. The emergence of blockchain theoretically solves the problem of data reliability, and provides a new method for credit investigation, but it can not guarantee the authenticity of the data itself, that is, the nodes that get the accounting can upload the fake data content to the blockchain.
without verifying the data content itself. How to reduce the damage caused by this uncertainty to the operation and management of enterprises is a major scientific problem that urgently needs to be solved.

Therefore, this paper will make research on the consensus mechanism supporting the reliability of data content and the data standardization technology of uploading to blockchain. The main research content includes: 1. Propose a dynamic weight voting consensus mechanism based on incentive mechanism; 2. Propose the standardization technology of data uploading to block chain based on smart contract. The proposal of two technologies provides theoretical support for the authenticity and standardization of blockchain data content. Finally, taking the power grid bidding management as an example, based on the consensus mechanism and the standardization technology of data uploading to block chain proposed in this paper, construct a power grid service provider credibility evaluation model.

1. INTRODUCTION

Credit management is essentially the management of data. With the development of Internet technologies, such as cloud computing, artificial intelligence, block chain, big data etc., have become the “Black Oil” for enterprise development. As an important part of enterprise operation management, credit management cannot be separated from the support of credit in personnel, funds, contracts, bidding and other management. The construction of a transparent, credible, reliable and shareable credit platform has become an important demand of enterprise operation management and commercial activities. Credit management is essentially data management. Traditional credit management agencies collect user data through various technical means, but the reliability of the data obtained through this way is not guaranteed. The emergence of block chain technology has solved the problem of data reliability to some extent and provided a new method for credit management, but it cannot guarantee the authenticity of the data itself and has not fundamentally solved the problem of data reliability.

Block chain is a decentralized account book that is decentralized, untrusted and traceable. Traceability is an important result of decentralization and untrusting. Cryptography, Smart contract, Consensus algorithm, P2P network, Merkle tree and other underlying technologies guarantee traceability. De-trust does not mean that trust is not required in the literal sense, but the original trust mechanism is replaced by the block chain technology. The technical understanding is credit blessing. Once the data is added to the block chain, it will be permanently stored and cannot be tampered with, or the cost of tampering will be far greater than the gains from tampering. It is precisely because the tamper-proof property of the block chain increases the cost of data correction, which also increases the difficulty of identifying the authenticity of the data on the block chain. Therefore, it is particularly important to identify the authenticity of the data on the block chain itself. Highly reliable block chain data is the basis of data availability and reliability. Secondly, in real life, there is still a game problem in the management of credit data. If providing fake data will not be discovered or the cost of punishment is very small, then it is difficult to eliminate the problem of authentic data. At the same time, a certain incentive mechanism is a non-technical means to ensure the authenticity and reliability of the data. The initiator of the incentive mechanism must be an enterprise that has sufficient resources. As the largest Internet of Things enterprise in the world, the power grid controls the most user resources and is a favorable soil to carry out incentive mechanism to ensure the authenticity of the data.

Yunnan power grid alone invests tens of billions of dollars in fixed assets and scientific and technological research and development every year, and these funds are eventually converted into projects for development. In general, bidding work is required for projects with a total cost of over 50,000 yuan, so cloud network generates a large amount of project procurement work every year. However, behind each project, there are one or more potential cooperators. How to efficiently choose credible and reliable service providers to cooperate has become a key problem facing the power grid. How to reduce the losses caused by this uncertainty to the enterprise's operation and management is an important scientific problem that needs to be solved urgently at present. It is also of great significance to the benign operation of the enterprise.
Therefore, firstly, this paper proposes “Dynamic Weight Voting Consensus Mechanism based on Incentive Mechanism” and “Standard Smart Contract Block Chain Technology” to carry out research on enterprise credit management mode. Through a reliable consensus mechanism and the use of smart contract technology to standardize the data on the block chain, the data of block chain standards are studied to ensure data itself availability, reliability and authenticity. Secondly, taking the power grid bidding management as an example, a credibility evaluation model of power grid service providers based on the consensus mechanism and the technology standardized the data on block chain proposed in this paper.

2. BACKGROUND

2.1. Research Status and Development Trend Analysis of Block Chain Technology at Home and Abroad

From 2008 when Satoshi Nakamoto published his paper "Bitcoin: A Peer-to-Peer Electronic Cash System"[1], to 2009 when Bitcoin creation blocks were generated, to 2015, which is considered the first year of the block chain, the Wall Street Journal declared that "the block chain will become the most important breakthrough in the financial system in 500 years", and to 2017 when the WannaCry worm virus broke out worldwide, extorting 300 dollars worth of Bitcoin from the victims. The words "block chain" and "bitcoin" seem to appear in the public eye. As the bottom technology of virtual currencies such as bitcoin, Ethereum and Leyte, block chain is not a new technology, but a recombination of existing technologies such as cryptography, smart contract and P2P, which is considered as an application mode of new technologies. The definition of block chain is given in Melanesian's book "Block Chain: Blueprint and Guidance of New Economy"[2]: an open, transparent and decentralized database. In addition, the block chain is regarded as a decentralized distributed account book. With the aid of a carrier such as a distributed database, the data is stored or transmitted safely by using encryption technology. The network distributed all over the world is used to ensure that the information cannot be forged or tampered with. The smart contract can be automatically executed without the approval of any centralized organization. Here, decentralization means that nodes in the network trust each other. In the paper "Development Status and Prospect of Block Chain Technology"[3], block chain technology is divided into narrow sense and broad sense. Narrow sense: a chain is formed according to time sequence, a non-falsifiable and non-falsifiable decentralized shared account book is guaranteed by cryptography, and a database can be verified in the system; Broad sense: a new decentralized infrastructure and distributed computing paradigm that uses encrypted chain block structure to verify and store data, uses distributed node consensus algorithm to generate and update data, and uses automated script code (smart contract) to program and operate data[3]. It is not difficult to find that decentralization is the core of block chain technology, the purpose of which is to solve the credit problem. Cryptography, smart contract and consensus mechanism are the means, while autonomy is the basic requirement of forming a system of block chain technology.

In 1991, Stuart Haber and W. Scott Stornetta first proposed encryption protection chain products for blocks. Later papers were published by Ross J. Anderson and Bruce Schneier & John Kelsey respectively in 1996 and 1998[4], which can be regarded as the prototype of block chain. At first, in Satoshi Nakamoto's paper [1], the "Block" and "Chain" were expounded separately. It was not until 2016 that they were combined to form the "Blockchain". In 2013, a team from the MIT Media Laboratory designed the Enigma[5] calculation model based on the block chain, and Enigma won the championship in the bitcoin project summer entrepreneurship competition held by MIT in 2014. In order to promote the development of block chain digital technology and transaction verification, the Linux Foundation initiated the Hyperledger fabric[6] open source project in 2015, with the main code contributed by IBM, Intel, major banks, etc. IBM Research Institute of Business Value and Samsung jointly built the ADEPT (Autonomous Decentralized Peer-to-Peer Telemetry) platform and opened it to GitHub. The platform consists of three parts: Blockchain, Telehash and BitTorrent. ADEPT attempts to build a centralized Internet of Things through block chain technology. In 2016, IBM
launched Block Chain Service (BaaS) on Bluemix cloud platform. Inspired by bitcoin, Vitalik Buterin
developed an open source public block chain platform with smart contract function from 2013 to 2014:
Ethereum EUM[7]. In 2016, Amazon cooperated with digital cash Group (DCG) to provide a block
chain experimental environment for enterprises. In 2017, SAP released the Leonardo ecosystem,
providing block chain cloud services, hoping to integrate cutting-edge technologies such as the
Internet of Things and machine learning. The British government clearly pointed out in "Distributed
Book Technology: Beyond Block Chain" that the block chain technology should be applied to the
traditional financial industry first. At the same time, ESMA (European Securities and Markets
Authority) believes that "the block chain has brought great and profound changes to the entire
financial industry"[8].

The tamper-proof and non-repudiation characteristics of the block chain determine that it is
naturally suitable for the financial field. Therefore, many large multinational financial institutions,
such as Nasdaq, NYSE and Citi, have been involved in the block chain since 2015. Many
multinational banks such as JPMorgan Chase, HSBC and Goldman Sachs have all joined R3CEV’s
block chain financial project[9]. Foreign financial fields mainly participate in block chain finance in
three ways: 1. Establish block chain innovation laboratories and incubators; 2. Developing venture
capital to explore cross-border cooperation; 3. Create a joint development alliance[10]. In addition,
foreign block chains are also booming in other fields, such as energy[11], medical [12], etc.

In the research on the application of block chain technology, Cai Weide[13] and others analyzed
the smart contract deeply and put forward the application of parallel execution model of code on the
chain. Zhang Ning [14], Yang Dechang[15]and others have explored the application of block chain in
energy Internet. Hao Kun [16] and others proposed a decentralized distributed model based on block
chain to solve the problems existing in traditional distributed storage, which improved the concurrent
processing capability of the system. In terms of licensing chain, Beijing University of Aeronautics and
Astronautics and Peking University jointly developed the North Aviation Chain. In the aspect of
integrated chain, the paper[17] studies the application system development method and block chain
modeling of block chain, and proposes a double-chain design model of account block chain and
transaction block chain.

2.2. Research Status of Credit Evaluation Technology Based on Block Chain at Home and
Abroad
At present, the research on block chain mainly focuses on scalability, privacy security, access control
and deployment of various applications[18], with little mention of the authenticity and effectiveness of
digital asset creation. Although the block chain has tamper-proof characteristics, the authenticity of the
data itself on the block cannot be guaranteed, and the current block chain mechanism does not
examine the authenticity of the data asset itself.

The digital assets in the block chain can be divided into digital cash and non-digital cash, all of
which are realized by a digital file about the assets, which can be traded and accessed in the block
chain system after being created[19]. The creation of non-digital cash digital assets mainly depends on
the corresponding digital files, which are created automatically or manually, and are usually input[21]
through semantic tagging[20], scanning RFID, sensor detection, etc. However, in the block chain
application scheme of such digital assets, all digital assets are directly created on the block chain by
the asset holder, and the authenticity of the creation depends on the self-discipline of the block chain
input executor and the audit outside the block chain, thus there is the possibility of inputting false or
erroneous data. For example, TIAN and WEBER proposed to use block chain technology to realize
the integration of supply chain data among enterprises, and the authenticity of digital assets depends
on the post-audit of the government or institutions[22,23]. BAHGA et al. and ALI et al. use sensors to
input data into the block chain, but there is no effective countermeasure against the instability of
sensors in their scheme[24].CHRISTIDIS[25] and others proposed to realize human-computer
interaction through smart contract, but their scheme can only carry out external audit after sensor input
is completed. Factom's authentication reporting system can only ensure the orderliness and
non-falsifiability of digital assets, and cannot guarantee the authenticity and effectiveness of user input information itself.

Wang Xing, Weng Jian and others proposed a scheme to create digital assets based on the reputation value of alliance members. The alliance members in the scheme are composed of different equipment, institutions and experts. The smart contract running on the alliance chain first collects the evaluation results given by alliance members to the same object at the same time, and then calculates the standard evaluation results weighted by the reputation value, and updates the reputation value of each member based on the standard evaluation results, thus realizing the block chain system based on the reputation value of alliance members[26].

The application of block chain technology to credit reporting is a clear direction, but the data exchange platform model is difficult to ensure the authenticity of data, and the security of the data sharing platform model cannot be guaranteed[27]. Yao Guozhang et al. (2016) believe that the use of block chain technology to realize the decentralization of credit management is the future trend. Block chain automatically records data of various financial activities and stores them in each network node. The information is highly transparent, tamper-proof, convenient and efficient to use, and the accuracy, integrity and timeliness of credit data obtained by financial institutions will be greatly improved[28]. The establishment of relevant technical rules and standards is also a problem that restricts the development of block chain credit reporting platform. In the field of credit investigation, many large enterprises have carried out block chain research and formed preliminary application. Wanda Network Technology Group started the research on super books in May 2016, launched the independent block chain technology research platform in June, and launched the application of block chain credit investigation based on Hyperledger in August of the same year. Ping An Group set up a financial science and technology department in 2016 to explore the application of block chain technology. In September of the same year, Ping An Group announced that two scene applications, asset transaction and credit investigation, had been launched for trading. In 2017, Jingdong Finance cooperated with Jianyuan Capital, Zhongxin Credit Evaluation and Zhongxin Credit Investigation and other institutions as a consensus node in the alliance chain of ABS platform for auto financing lease, realizing the integrity of underlying assets based on block chain technology. In April 2017, Tencent released a White Paper on the Block Chain Scheme to jointly promote the development of trusted Internet with its partners. In addition, institutions such as Cloud Prism Credit Reference, LinkEye, Tianyi Credit Reference and Bupi Network Hangzhou Credit Reference have also developed credit reference platforms based on block chains, in an effort to realize the large-scale application of credit reference block chains[29].

However, throughout the research at home and abroad, credit evaluation for block chain is mainly focused on the traceable characteristics of block chain technology. However, there is little research on authenticity verification of data itself of uploading to block chain. However, if the authenticity and validity of data itself cannot be guaranteed, the best credit evaluation mode will lose its usability. De-trust is not only a literal meaning of not needing trust, but also a credit blessing at the technical level by replacing the original trust mechanism with block chain technology[30]. The credibility of the data, the harmfulness of the information and the source of the information also become the problems that node participants need to identify[31]. If the data can be traced back, but the data traced back is not authentic, then it will not be able to guarantee the credibility and reliability of the data assets in the end. Fundamentally speaking, traceability is an important result of de-centralization and de-trust. The application of block chain technology has virtually established a complete credit system, thus realizing global low-cost value transfer[32]. Therefore, it is more and more important to study the authenticity of the data itself.

3. METHODS

Block chain is a decentralized, untrusted and traceable account book technology. De-centralization and untrusting are traceable results. Traceability cannot guarantee the authenticity and reliability of data content. Once data is written, it is difficult to modify it. If malicious data is written, it is impossible to
modify it even if it is traceable to the original data, or the cost of modification is far greater than the cost of regeneration. For this reason, this paper will carry out research on this key technical problem. The main research contents include: 1. Research on block chain structure design for credit management; 2. Research on standardization technology of data of uploading to blockchain based on smart contract; 3. Research on Dynamic Weight Voting Consensus Mechanism Based on Incentive Mechanism.

3.1. Research on Block Chain Structure Design for Credit Management

The block chain records the data information in the block chain through a chain structure to realize the continuity of data recording. The basic structure of the block chain is blocks. Each block is linked to the previous block through the information on the block header to form a chain structure. A block is a collection of data, recording each piece of data information or transaction content within a certain period of time. Each block consists of 2 parts: (1) a block header. Record the Hash value of the last block linked to ensure the continuity of the block. In order to ensure the traceability of data, the block header needs to record the timestamp of each block. In addition, the block header also includes data such as version number, random number, merkle root, etc. (2) Block body. Different from Bitcoin block chain, the blocks record not transaction data but enterprise credit-related data in a certain order, and the data format will be stored according to the requirements in 2.1.2. The block chain structure under the credibility evaluation model is shown in Figure 1.

![Figure 1: Block Chain Structure of Credibility Evaluation Model](image)

### 3.2. Research on the Standardization Technology of Data Uploading to Block Chain Based on Smart Contract

At present, there are many independent companies operating in the credit management industry. The credit data standards among companies are not uniform, or the phenomena of isolated data islands and data barriers are serious, or the phenomena of data duplication and data redundancy are serious. The main reasons are, on the one hand, the lack of corresponding incentive mechanism between enterprises and the fact that the credit database of users belongs to the core competitiveness of enterprises, making it difficult to exchange information and share the credit data of users that they have mastered. On the other hand, due to the non-uniform standards of credit data, transparent sharing is not possible.

Standardization of data of uploading to blockchain affects the reliability of block data and is the basis for sharing and unifying credit data. Therefore, it is especially important to establish a transparent, unified and shareable credit data storage standard. Therefore, this paper will focus on the standardization of data of uploading to blockchain and propose a standardization technology of the data of uploading to blockchain based on smart contract technology.

First of all, this paper defines the main information of enterprise data of uploading to blockchain, mainly including: industrial and commercial information, enterprise qualification, project experience, financial status, legal information, intellectual property rights and other major categories of data related to enterprise credibility. The specific data and definitions are as follows:

1. Industrial and Commercial Information
Industrial and commercial information is the general name of all activities in which the government, on the basis of examining the conditions for the applicants to enter the market, confirms the qualifications of the applicants to engage in market business activities through registration so that they can obtain the actual business rights.

Standardized data format definition: mainly includes information such as "company name", "registered capital" and "legal person". It is mainly structured data and can be defined by text fields.

2. Enterprise Qualification

Refers to the relevant documents and certificates that the enterprise meets the relevant industry regulations and can prove its own production and management capabilities.

Definition of standardized data format: mainly includes information such as "business license", "organization code certificate", "tax registration certificate", "production license" and "engineering construction qualification". Semi-structured data is the main data and text fields can be used for definition.

3. The enterprise service ability and performance

Refers to the enterprise management ability, industry performance, etc.

Standardized data format definition: mainly includes information such as "technical capability", "industry performance" and "project experience". It is mainly structured data and can be defined by text fields.

4. Financial situation

Refers to the enterprise financial situation, enterprise credit situation, etc.

Standardized data format definition: mainly includes information such as "debt ratio", "profit margin" and "salary level". It is mainly structured data and can be defined by numerical fields.

5. Legal Information

Refers to the litigation and arbitration cases and bribery crimes that have occurred in enterprises over the years.

Definition of standardized data format: it mainly includes materials such as "legal proceedings", "court or arbitration organization judgment", "litigation situation", etc. It is mainly structured data and can be defined by text fields.

6. Intellectual Property Rights

Refers to all the intellectual property acquired by the enterprise.

Definition of standardized data format: mainly including "utility model patent", "invention patent", "software copyright", "paper", etc., mainly semi-structured data, and text-based field definition can be adopted.

In order to ensure the unification and standardization of the data of uploading to blockchain, the project will use smart contract to conduct unified research on the data of uploading to blockchain, requiring that the proposed data must conform to the data format defined in this article and be allowed to be verified and agreed upon. At the same time, the model intelligence contract will embed the standardization rules for the data of uploading to blockchain: all the data of uploading to blockchain must contain at least the above 6 parts of data and must be written into the block body in the format required by the model before validation and consensus application can be initiated. The model will first verify the data format standard of the new block. According to different requirements, the model can set different data standardization formats, and the smart contract can also limit information such as the quantity and type of uplink block data according to different requirements.

The standardization of up-link data based on smart contract can provide unified standardized data for credit investigation data, which is the basis for breaking down credit investigation data barriers and realizing credit investigation data sharing.

3.3. RESEARCH ON DYNAMIC WEIGHT VOTING CONSENSUS MECHANISM BASED ON INCENTIVE MECHANISM

Consensus mechanism is the soul of the whole block chain system as the key technology to generate new blocks in the block chain. Credibility evaluation puts forward higher requirements for consensus
mechanism. Block chain technology ensures the traceability of data, while the credibility of block data is guaranteed by consensus mechanism. To form a highly credible credibility evaluation model, the research on consensus mechanism is one of the most critical and important contents of this project. Therefore, a dynamic weight voting consensus mechanism based on incentive mechanism is specially designed. The weights here are bidirectional and dynamic, that is, the weights of verification nodes and consensus nodes are dynamically adjusted. Different verification nodes have different weights, and the verification nodes are responsible for the consensus nodes. The consensus nodes will make consensus based on the review results provided by the verification nodes, while the consensus nodes will review the results provided by the verification nodes according to the final results generated by the model. The node that initiated the node application and successfully generated the node is given a TokenS value reward, and the node that failed is punished.

The design idea of dynamic weight voting consensus mechanism based on incentive mechanism is as follows:
1. Node B initiates an application for adding a Block;
2. The verification node VPeer evaluates the authenticity of the data content of the newly added block and gives the evaluation results, which are divided into "trusted Y" and "untrusted N". Each verification node has a different weight W (W has the same initial value). The block that has passed the VPeer review enters the consensus phase, otherwise the new node will end.
3. CPeer votes based on the evaluation results provided by all v peers. CPeer is divided into "class a consensus node A_CPeer" and "class b consensus node B_CPeer". A_CPeer and B_CPeer have different consensus weights. The B_CPeer is served by the top 31% authentication nodes with higher reputation TokenS. The block passed by the CPeer consensus generates a new block n block;
4. Model M counts the voting results of consensus nodes;
5. CPeer will review the results submitted by VPeer according to the results obtained from m statistics and score them. Giving a certain token to the verification node which is beneficial to the final result, and on the contrary, punishing and subtracting a certain token;
6. M adjusts the weight of the verification node according to the scoring data given by CPeer to VPeer.

The schematic diagram of generating new blocks by dynamic weight voting consensus mechanism based on incentive mechanism is shown in fig. 2:

Fig. 2 is a schematic diagram of fast generation of a new area of dynamic weight voting consensus mechanism based on incentive mechanism

The following is an example of the fast generation of a new area of dynamic weighted voting consensus mechanism based on incentive mechanism:
1. Node B applies for a new Block; to Model M;
2. Suppose there are 10 verification nodes VPeer to review and verify the true letter of the data submitted by b, of which 2 VPeer cast a vote of no confidence and 8 VPeer cast a vote of confidence. If the system setup obtains more than 60% of the trust votes of the verification nodes, the verification passes. Therefore, the application for the new Block Block enters the consensus stage.
3. In the consensus stage, the consensus node CPeer votes on the application for the new block according to the verification data of VPeer. Assuming that the system has a total of 5 C Peers, 1
Class A C Peers and 4 Class B C Peers, of which 4 C Peers have passed the vote and 1 Party B C Peers have failed the vote, the new block will be successfully added if the system is set to obtain more than 50% of C Peers’ votes. Therefore, the new Block block succeeded.

4. M dynamically adjusts the reputation values TokenS of VPeer and CPeer according to the final results. In this example, in the verification process, two Vpeers cast a vote of no confidence and their contribution to the result is negative. Therefore, the two Vpeers are punished by subtracting one token value from each other, and eight Vpeers cast a vote of confidence and their contribution to the result is positive. Therefore, the eight Vpeers are rewarded with one token value. Similarly, the consensus node CPeer in the consensus link is adjusted accordingly.

The dynamic weight voting consensus mechanism based on incentive mechanism adopts the method of "double authentication" to ensure the credibility of the block data content to the greatest extent. The verification node is responsible not only for its own authentication results but also for the consensus node, which is responsible not only for its own voting results but also for the final results. The dynamic weight voting consensus mechanism based on incentive mechanism is jointly supervised by alliance members, plays the role of external audit, and is the basis for establishing credibility evaluation model.

3.4. RESEARCH ON ENTERPRISE REPUTATION EVALUATION MODEL OF POWER GRID SERVICE MANUFACTURERS BASED ON BLOCK CHAIN

A certain incentive mechanism is a non-technical means to ensure the authenticity and reliability of data. The initiator of the incentive mechanism must be an enterprise that has sufficient resources. As the largest Internet of Things enterprise in the world, the power grid controls the most user resources and is a favorable soil to carry out incentive mechanism to ensure the authenticity of data. The power grid invests tens of billions of dollars in fixed assets and scientific and technological research and development every year, and these funds are eventually converted into projects for development. In general, bidding work is required for projects exceeding 50,000 yuan, so the power grid will generate a large amount of project procurement work every year. However, behind each project, there are one or more potential cooperators. The evaluation of cooperators' credibility is particularly important. How to efficiently choose reliable service providers to cooperate is also a key problem for power grid enterprises. How to reduce the damage caused by this uncertainty to the operation and management of power grid enterprises is an important scientific problem that needs to be solved urgently at present, and it is also of great significance to the benign operation of enterprises. Therefore, this paper will build a dynamic weight voting consensus mechanism based on incentive mechanism and an enterprise credibility evaluation model based on the up-link data standardization technology based on smart contract technology under the background of power grid enterprise bidding management.

A_CPeer can only be composed of power grid enterprises, B_CPeer is composed of power grid service manufacturers, VPeer is completely composed of power grid service manufacturers, and the model is based on alliance chain. An alliance chain is made up of service providers in one industry, which can not only ensure the professionalism of forming VPeer but also ensure the fairness of block generation. A_CPeer is the basis for providing incentive mechanism, which is provided by non-technical means. If service providers want to obtain cooperation with power grid companies, they need to package enterprise credit data on the block chain for peer experts to review. Peer experts' review is crucial and is the basis to ensure the authenticity of data content. Power grid companies can require service providers to provide token value in "business score" or "general qualification" in conducting bidding and other commercial activities. Those with high token value have the qualification of preferential cooperation, which is the basis of incentive mechanism. From this, we can obtain the enterprise reputation model of power grid service manufacturer shown in fig. 3:
In Fig. 3, two service manufacturers A and B plan to participate in the bidding of the power grid, and the power grid enterprises organize the bidding work after receiving the bids from A and B. During the bidding period, the evaluation experts enter the alliance chain to inquire about the token value of the two service providers when conducting the two-part evaluation of "business scoring" and "general qualification". If the service provider does not have token information, it is required to apply for a new block in the alliance chain, pack and upload the required enterprise credit data according to the requirements of the smart contract, or else it is not allowed to participate in the bidding. If both have token values, the token values of A and B are compared, and the larger one wins.

If service providers want to participate in the bidding business activities of power grid enterprises, they must enter real enterprise credit data into the alliance chain and package to form new blocks. Therefore, the model itself has its own incentive mechanism.

4. RESULTS AND DISCUSSION: Model Validity Demonstration and Data Analysis
The power grid business covers a wide range and has cooperation with various service providers. Looking around the world, it can be said that it is the company that has the most resources in the enterprise. Yunnan Power Grid Company alone spends as much as 10 billion yuan each year on production, science and technology, information, management and other fields. These funds will eventually be converted into projects, and projects with more than 50,000 yuan will require bidding. Yunnan Power Grid will invest 1.39 billion in science and technology and 13.57 billion in fixed assets in 2018, with a total investment of about 15 billion. With a bid of 1 million yuan, Yunnan power grid has to carry out 15,000 bidding and purchasing. As shown in Table 1:

| Amount of Funds Invested (100 Million Yuan) | Target Amount (10,000 Yuan) | Purchase Quantity (Times) |
|-------------------------------------------|-----------------------------|--------------------------|
| 150                                       | 100                         | 15000                    |

In general, the power grid needs to carry out "bidder qualification requirements", "initial evaluation" and "formal evaluation" in the bidding process. The evaluation of bidders' qualification requirements is divided into two parts: general qualification evaluation and special qualification evaluation. The formal evaluation needs to be divided into "price evaluation", "business evaluation" and "technical evaluation". 1. The general qualification evaluation needs to evaluate "enterprise business information", "assets situation" and "contract performance ability". 2. Special qualification requires review of "qualification" and "certificate". 3. The initial review needs to review the "basic information (legal representative)" of the service manufacturer, "false bidding", "enterprise integrity requirements" and "legally rejected bidding items". 4. Business review needs to review the "comprehensive strength of the enterprise", "financial status" and "project performance". 5. Technical review needs to review "personnel ability", scientific research and technical ability, and "award-winning situation", as shown in Table 2:

| Assessment | Contents of review items |
|------------|--------------------------|

Table 2 Analysis of Requirements for Enterprise Bidding Review
There are about 30 items that need to be reviewed in one bidding (the items that need to be reviewed according to the project need in the technical review are uncertain), of which 15 items (i.e. items that only need to be verified) are reviewed, accounting for 50%. Confirm that the review items account for about 30% of the procurement review work. If one procurement review takes 3 hours, the time taken for confirmation review is 1 hour. Since the evaluation experts are not allowed to bring communication equipment into the evaluation site during the bidding procurement, the evaluation experts can only check the information submitted by the bidders manually, but cannot verify its authenticity. Therefore, a credit evaluation platform that can support the bidding procurement is particularly urgent. Based on the per capita 500 yuan of each evaluation expert, the annual power grid procurement evaluation fee can be saved by 7.5 million yuan, as shown in Table 3:

| Procurement Review Quantity | Time (hours)  | Time Saving (hours) | Time Saving Cost (RMB 10,000) |
|-----------------------------|---------------|---------------------|-----------------------------|
| 15000                       | 45000         | 15000               | 750                         |

From the analysis and demonstration of the above bidding procurement data, it can be seen that the construction of a credible credibility evaluation platform for power grid service manufacturers will bring great benefits to the power grid to carry out bidding-based commercial activities.

5. Conclusions
In this paper, an enterprise credibility evaluation model based on block chain technology is proposed. Firstly, the block chain structure is designed according to the needs of enterprise credibility evaluation. Secondly, enterprises use smart contract to standardize the data of uploading to blockchain. Then, in order to obtain highly reliable data, this paper proposes a dynamic weight voting consensus mechanism based on incentive mechanism. The consensus mechanism requires that the verification node must be composed of manufacturers in the same industry, which can not only ensure the professionalism of the verification node, but also ensure the fairness and transparency of professional evaluation as a means to ensure the authenticity of data. Finally, based on the above work, a credibility evaluation model of power grid service manufacturers with incentive mechanism is proposed. Due to the wide business coverage of power grid enterprises, the model naturally has its own incentive mechanism. The power grid enterprise credibility evaluation model based on block chain guarantees the authenticity of data content on the chain through technical and non-technical means, and is a better model for enterprise credibility evaluation. In order to verify the validity of the model, we carry out argumentation and analysis, according to the analysis, we can see that the model could achieve 7.5
million benefits.

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