Chapter 11
Transformation of Traditional Gas Industries to Blockchain-Enabled Gas Industries:
A Secured Supply Chain Strategy for Tracking Gas

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ABSTRACT

The author considers the main purpose of this chapter to be the presentation of a modern approach to the digital transformation of traditional business processes in the gas industry. Using the example of a pilot project successfully implemented in the gas industry, the author shows the process of synthesizing a high-tech supply chain infrastructure based on blockchain. The presentation begins with a description of the main business processes of the supply chain. The functions for all participants of the system are described and visualized in detail. The main components of the system are considered: digital dispatcher, supply monitor, interaction interfaces, and production environment. A comparative analysis of the security of modern blockchain platforms is provided. The author carefully analyzes the technologies for creating and ensuring the security of smart contracts and offers a step-by-step method for implementing secure smart contracts. At the end of the chapter, the results of choosing the most secure blockchain platforms are presented.

INTRODUCTION

Recently, only a lazy person has not written or talked about blockchain technology. Blockchain – what is it: the technology of the future or self-deception in the light of its little knowledge and applicability today? It is possible to argue, answering this question, for a long time and persistently. This chapter discusses the

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technological features of ensuring the security of this new technology, which often remain "behind the scenes" or represent some superficial, short, and non-revealing description (Kustov & Stankevich, 2019).

The views on blockchain technology expressed by experts in the field of information security and information technologies in print and oral presentations can be defined as opposed and considered at two criteria levels (Kustov & Stankevich, 2018):

1. prospects for implementation;
2. the consequences of performance.

The second criterion directly follows from the first, and both allow us to divide experts into skeptics and enthusiasts. At the first level – "Prospects" – opinions are divided into those that express a sincere belief in blockchain and its existence within a variety of systems and services and those that deny it, referring to the possibility of an alternative, simpler, and, consequently, more reliable approaches to solving specific tasks. The second criterion – "Consequences" - divides experts into those who express unbridled delight in the light of the upcoming "revolution" (Swan, 2018), comparable to the creation of the Internet, and those who associate blockchain with the death of existing information and payment systems (Chris, 2017). To the point, the creator of the blockchain, Satoshi Nakomoto, did not expect such a sad outcome in any way (Satoshi, 2008).

However, in practice, a huge mass of positive examples of the use of new technology prevails (Eman et al., 2020), (Nin et al., 2021), (Ahmed et al., 2021). The gas industry is no exception, and much attention is paid to the distributed registry technology.

So, the author considers the *main purpose* of this chapter to be the presentation of a modern approach to the digital transformation of traditional business processes in the gas industry. In recent years, several blockchain pilot projects have been implemented in the gas industry. Using the example of a pilot project successfully implemented in the gas industry, the author shows the process of synthesizing a high-tech supply chain infrastructure based on blockchain. Three completed pilot projects are particularly indicative:

1. A pilot project to create a supply efficiency management system using blockchain technology.
2. Develop a technological platform prototype for automating concluding, monitoring, and executing contracts based on blockchain technology.
3. Development of a new digital Smart Fuel platform using blockchain technology.

As part of the first project, gas industry specialists tested blockchain technology and the Internet of Things concept in material and technical resources logistics.

Radiofrequency tags (RFID) and satellite positioning sensors (GPS) were installed by technical specialists on the shut-off valves and pipe products purchased for the gas production company. At the shipment stage of pipe product shipment from the manufacturer, a document with information about the delivery was formed after reading the RFID tags. The GPS sensor made it possible to monitor cargo movement to the storage base, the speed of its movement, the number, and the duration of stops on the way. All data received from the devices was recorded by a smart contract and reflected in the blockchain. In the future, information about warehouse and transport operations — entering products into a warehouse, moving to a berth for loading, delivery to a platform in the Pechora Sea — was transmitted according to a similar scheme. The blockchain provided an inextricable link between the physical delivery, all