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The Importance of Blockchain in Nuclear Verification as a Solution to Reporting Hardships in Times of Crises

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POSTER

The Importance of Blockchain to Nuclear Verification as a Solution To Reporting Hardships in Times of Crises

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ABSTRACT

The COVID-19 pandemic illustrated how the world could shut down overnight and how adaptations need to occur immediately in order to continue the functionality of imperative operations such as those of the CTBTO. Because of the issues brought to light in the COVID-19 pandemic, it is imperative to learn how technology can be used to mitigate the challenges highlighted during the COVID-19 pandemic specifically ensuring nuclear nonproliferation practices remain in place. Utilizing secondary analysis, comparison was made on benefits blockchain has in maintaining continuous reporting in a time of crisis. Blockchain is a technology that helps mitigate some of the challenges that arose and became apparent during the COVID-19 crisis by ensuring uninterrupted reporting because it does not require human to human contact, paper records, or access to specific locations. Blockchain technology is not something that is only useful in a pandemic but can be extrapolated to times of war and severe weather or climate crises.

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INTRODUCTION

A key component to nuclear safety and security is the assurance that nuclear materials are not being diverted for weapons proliferation which is done through various forms of nuclear verification. However, certain verification measures such as inspections are reliant on regulators being physically present in states. Other verification measures are reliant on individuals within a state being able to operate communications avenues. The problem with this level of reliance is that many factors could influence whether regulators can perform their duties. The COVID-19 pandemic has illustrated firsthand how nuclear verification measures can be impacted by factors outside of an institution's control. Through studying how the nuclear verification industry was impacted by the COVID-19 pandemic, states and institutions can better be prepared to deal with other hardships that may arise in the future and ensure that nuclear verification can continue in any circumstances uninterrupted. This study seeks to understand if blockchain could be used as an additional verification measure to help overcome any hardships that may result from a disruption in current regulatory practices. The main question being studied is, can blockchain help nuclear verification go uninterrupted in times of reporting hardships?

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METHODS

Secondary Analysis

Secondary analysis was the primary method used in the study. Data surrounding the impacts of the COVID-19 pandemic on the nuclear industry were pulled from The World Nuclear Industry Status Report. Additionally, data from past research regarding blockchain technology and its relation to and applicability to nuclear verification measures was utilized.

Open Source

All data obtain for the study was done through open-source materials in order to learn how COVID-19 impacted the nuclear industry. While the researcher understands that open-source materials may not establish the most accurate image of nuclear verification, it does allow one to see the broader picture of whether/how the nuclear industry was impacted by the COVID-19 pandemic.

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RESULTS

What is a blockchain?

- Blockchain technology is a way to disseminate data that is immutable, or cannot be altered, has timely reporting, and is trustless, meaning parties utilizing the system do not need to trust one another. [2]
- Blockchain is established through encrypted blocks carrying data that is strung together via unique hashes, which acts as a footprint for each block. [2]
  - Each block carries its own unique hash as well as the hash of the block preceding it resulting in the formation of a chain. [2]
  - The connection of the blocks via the hashes makes it nearly impossible to tamper with data on a singular block without changing the hash on that block and all the blocks that follow. [2]

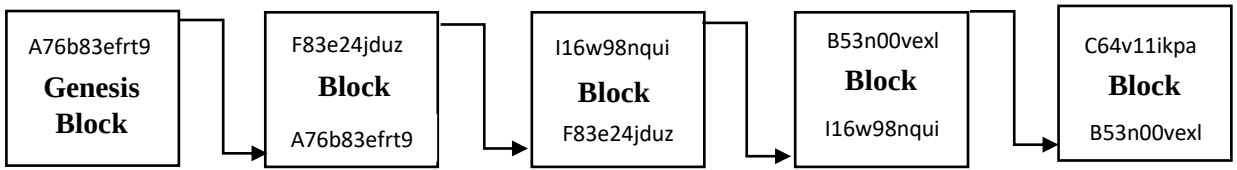

Figure 1: An illustration of how blocks interconnect via their hashes.

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RESULTS

How has COVID-19 impacted nuclear verification?

- During the COVID-19 pandemic physical inspections by safety authorities were halted in nuclear power plants. [3]
- During the COVID-19 pandemic the IAEA reported that regulatory practices had to be altered significantly due to state travel restrictions as well as health and safety measures. [1]
  - Namely, the agency had to work around these restrictions by driving to states versus flying, chartering planes, and adhering to quarantine protocols. [1]
  - Additionally, the IAEA stated that there was a disruption in reporting by some states due to postal disruptions or air travel disruptions. [1]

How can blockchain benefit nuclear verification?

- Tracking movement of nuclear materials on a blockchain via transit matching would allow regulators to see if any unusual activity occurred on the blockchain without having to be physically present in a country.
  - This is beneficial because many external factors could impact regulators going into a country such as a pandemic, natural disaster, or war.

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CONCLUSIONS

The ability to discern whether all nuclear material worldwide is accounted for is imperative to ensuring the NPT is upheld and nuclear proliferation is not occurring. However, there are certain instances such as in the case of a pandemic, as has been seen during COVID-19, natural disasters, or war that prevent regulators from being physically present to ensure that nuclear materials are not being diverted for covert uses. One way to continue to verify nuclear materials are only being used for peaceful purposes is to incorporate blockchain technology into regulatory practices. Through tracking the movement of nuclear materials on a blockchain, another layer of verification can be added to the nuclear verification system to ensure that no materials are being diverted. Blockchain technology can act as a backup system if regulators are unable to enter a state to do physical verification measures for any reason. By having nuclear materials located on a blockchain, regulators and states alike can know if there is a potential diversion through the real time reporting that blockchain provides. Blockchain is not a means to replace current nuclear verification measures but is to be used to aid in nuclear verification in times of crises.

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RESOURCES

[1] IAEA Board of Governors. “IAEA Safeguards implementation during the COVID-19 Pandemic: Progress Update.” February 4, 2021. https://www.iaea.org/sites/default/files/21/03/govinf2021-5.pdf.

[2] Nonneman, Stefan, Isabella Maschio, Luca Dechamp, Igor Nai Fovino, G. Renda, and T. Jacobi. “Distributed Ledger Technology Used in Nuclear Non-Proliferation Safeguards? Exploratory Research Project with Focus on EURATOM.” In *IAEA Safeguards Symposium 2018*. Vienna, Austria. November 2018. 2-10.

[3] Schneider, Mycle, et. al. “The World Nuclear Industry Status Report 2020.” September 2020. https://worldnuclearreport.org/IMG/pdf/wnisr2020-v2_lr.pdf.