

# SMART CONTRACT CODE REVIEW AND SECURITY ANALYSIS REPORT

This document may contain confidential information about IT systems and the intellectual property of the Customer as well as information about potential vulnerabilities and methods of their exploitation.

The report containing confidential information can be used internally by the Customer, or it can be disclosed publicly after all vulnerabilities are fixed - upon a decision of the Customer.

## Document

<b>Name</b>	Smart Contract Code Review and Security Analysis Report for Plug - Second Review
<b>Approved by</b>	Andrew Matiukhin   CTO Hacken OU
<b>Type</b>	Yield Farming, Staking
<b>Platform</b>	Ethereum / Solidity
<b>Methods</b>	Architecture Review, Functional Testing, Computer-Aided Verification, Manual Review
<b>Git repository</b>	<a href="https://github.com/plugblockchain/plug-yieldFarming/tree/61300c65e45452e5ef496ca85902182aa97a4c4f">https://github.com/plugblockchain/plug-yieldFarming/tree/61300c65e45452e5ef496ca85902182aa97a4c4f</a>
<b>Timeline</b>	27 APRIL 2021 - 7 MAY 2021
<b>Changelog</b>	27 APRIL 2021 - INITIAL AUDIT 7 MAY 2021 - SECOND REVIEW

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## Introduction

Hacken OÜ (Consultant) was contracted by Plug (Customer) to conduct a Smart Contract Code Review and Security Analysis. This report presents the findings of the security assessment of Customer's smart contract and its code review conducted on May 7<sup>th</sup>, 2021.

## Scope

The scope of the project is the smart contracts from Git repository:

<https://github.com/plugblockchain/plug-yieldFarming/tree/61300c65e45452e5ef496ca85902182aa97a4c4f>

We have scanned these smart contracts for commonly known and more specific vulnerabilities. Here are some of the commonly known vulnerabilities that are considered:

Category	Check Item
Code review	<ul style="list-style-type: none"><li>▪ Reentrancy</li><li>▪ Ownership Takeover</li><li>▪ Timestamp Dependence</li><li>▪ Gas Limit and Loops</li><li>▪ DoS with (Unexpected) Throw</li><li>▪ DoS with Block Gas Limit</li><li>▪ Transaction-Ordering Dependence</li><li>▪ Style guide violation</li><li>▪ Costly Loop</li><li>▪ ERC20 API violation</li><li>▪ Unchecked external call</li><li>▪ Unchecked math</li><li>▪ Unsafe type inference</li><li>▪ Implicit visibility level</li><li>▪ Deployment Consistency</li><li>▪ Repository Consistency</li><li>▪ Data Consistency</li></ul>



Functional review	<ul style="list-style-type: none"><li>▪ Business Logics Review</li><li>▪ Functionality Checks</li><li>▪ Access Control &amp; Authorization</li><li>▪ Escrow manipulation</li><li>▪ Token Supply manipulation</li><li>▪ Asset's integrity</li><li>▪ User Balances manipulation</li><li>▪ Kill-Switch Mechanism</li><li>▪ Operation Trails &amp; Event Generation</li></ul>
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## Executive Summary

According to the assessment, the Customer's smart contracts are well-secured.

Insecure	Poor secured	Secured	Well-secured
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You are here

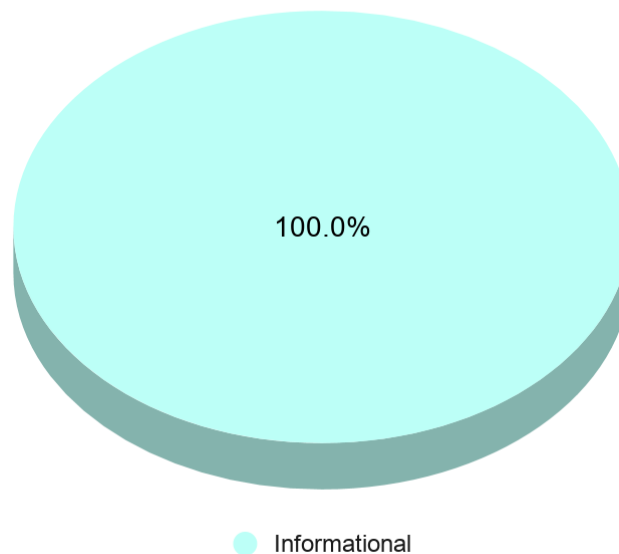


Our team performed an analysis of code functionality, manual audit, and automated checks with Mythril and Slither. All issues found during automated analysis were manually reviewed, and important vulnerabilities are presented in the Audit overview section. A general overview is presented in AS-IS section, and all found issues can be found in the Audit overview section.

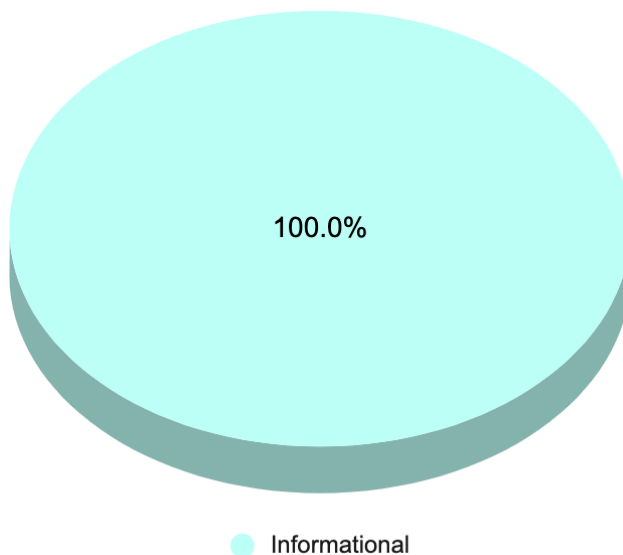
Security engineers found **5** informational issues during the first review.

Security engineers found **2** informational issues during the second review.

*Graph 1. The distribution of vulnerabilities after the first review.*



*Graph 2. The distribution of vulnerabilities after the second review.*



## Severity Definitions

Risk Level	Description
<b>Critical</b>	Critical vulnerabilities are usually straightforward to exploit and can lead to assets loss or data manipulations.
<b>High</b>	High-level vulnerabilities are difficult to exploit; however, they also have a significant impact on smart contract execution, e.g., public access to crucial functions
<b>Medium</b>	Medium-level vulnerabilities are important to fix; however, they can't lead to assets loss or data manipulations.
<b>Low</b>	Low-level vulnerabilities are mostly related to outdated, unused, etc. code snippets that can't have a significant impact on execution
<b>Lowest / Code Style / Best Practice</b>	Lowest-level vulnerabilities, code style violations, and info statements can't affect smart contract execution and can be ignored.



## Audit overview

### ■ ■ ■ ■ Critical

No Critical severity issues were found.

### ■ ■ ■ High

No High severity issues were found.

### ■ ■ Medium

No Medium severity issues were found.

### ■ Low

No Low severity issues were found.

### ■ Lowest / Code style / Best Practice

1. **Vulnerability:** Too many digits  
**Contract:** PlugYieldFarm

Literals with many digits are difficult to read and review. Please consider using *Scientific Notation* or separate with underscore for better readability. Ex.:

- 2\_000\_000
- 2e6

Fixed before second review

2. **Vulnerability:** Public function that could be declared external  
**Contracts:** Staking

**public** functions that are never called by the contract should be declared **external** to save gas.

Fixed before second review

3. **Todo** found. Please consider finishing it

**Lines:** PlugYieldFarm.sol#22

```
address private _communityVault; //TODO: need to confirm where are the  
token minted to for now
```

#### 4. Lines

- 107, 108, 120, 140, 179, 181, 189, 202, 223, 246, 247, 258 and 276 in the Staking.sol
- 41, 47, 67 and 141 in the PlugYieldFarm.sol

of the code are above the recommended [maximum line length](#).

**Fixed before second review**

5. It's recommended to move some logic of the Staking contract to separate functions to increase code readability.

## Conclusion

Smart contracts within the scope were manually reviewed and analyzed with static analysis tools. For the contract, high-level description of functionality was presented in As-Is overview section of the report.

Audit report contains all found security vulnerabilities and other issues in the reviewed code.

Security engineers found 5 informational issues during the first review.

Security engineers found 2 informational issues during the second review.

Category	Check Items	Comments
Code Review	Style guide violation	TODOs

## Disclaimers

### Hacken Disclaimer

The smart contracts given for audit have been analyzed in accordance with the best industry practices at the date of this report, in relation to cybersecurity vulnerabilities and issues in smart contract source code, the details of which are disclosed in this report (Source Code); the Source Code compilation, deployment, and functionality (performing the intended functions).

The audit makes no statements or warranties on security of the code. It also cannot be considered as a sufficient assessment regarding the utility and safety of the code, bugfree status or any other statements of the contract. While we have done our best in conducting the analysis and producing this report, it is important to note that you should not rely on this report only - we recommend proceeding with several independent audits and a public bug bounty program to ensure security of smart contracts.

### Technical Disclaimer

Smart contracts are deployed and executed on blockchain platform. The platform, its programming language, and other software related to the smart contract can have its vulnerabilities that can lead to hacks. Thus, the audit can't guarantee the explicit security of the audited smart contracts.