



**Energyfi**

**ILO**

**SMART CONTRACT AUDIT**

**19.12.2021**

**Made in Germany by Chainsulting.de**



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## 1. Disclaimer

The audit makes no statements or warranties about utility of the code, safety of the code, suitability of the business model, investment advice, endorsement of the platform or its products, regulatory regime for the business model, or any other statements about fitness of the contracts to purpose, or their bug free status. The audit documentation is for discussion purposes only.

The information presented in this report is confidential and privileged. If you are reading this report, you agree to keep it confidential, not to copy, disclose or disseminate without the agreement of Energyfi. If you are not the intended receptor of this document, remember that any disclosure, copying or dissemination of it is forbidden.

| Major Versions / Date | Description   |
|-----------------------|---|
| 0.1 (19.12.2021)      | Layout  |
| 0.2 (19.12.2021)      | Test Deployment                                       |
| 0.5 (19.12.2021)      | Automated Security Testing<br>Manual Security Testing |
| 0.6 (19.12.2021)      | Testing SWC Checks                                    |
| 0.7 (19.12.2021)      | Verify Claims   |
| 0.9 (19.12.2021)      | Summary and Recommendation                            |
| 1.0 (19.12.2021)      | Final document  |
| 1.1 (20.12.2021)      | Added deployed contract addresses (Testnet)           |

## 2. About the Project and Company

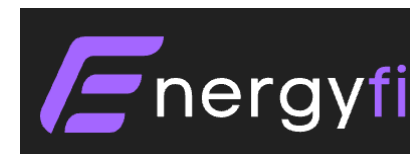
KYC APPROVED

**Website:** <https://www.energyfi.io>

**Twitter:** [https://twitter.com/Energyfi\\_io](https://twitter.com/Energyfi_io)

**Medium:** <https://energyfi.medium.com>

**Telegram:** [https://t.me/Energyfi\\_official](https://t.me/Energyfi_official)



## 2.1 Project Overview

Energyfi is a large-scale effort focused at promoting Green Blockchain usage. Decentralized Finance has its mastodons (Uniswap, Pancakeswap, Aave, and Unicrypt for exemple), Energyfi is combining all these features in one place to offer a green All-in-One solution. The ultimate goal is to facilitate the adoption of green networks and the establishment of environmentally friendly decentralized financing. Energyfi is very useful for assisting customers in utilizing Green networks and establishing a sustainable Decentralized Finance system. Its purpose is remarkable as it Increases consciousness on the environment, empowers decentralization, enhances transparency and Interoperability between chains.

Energyfi covers important functionalities like:

- Cross-chain Launchpad.
- Decentralized Exchange.
- Staking/Farming.
- Lending/borrowing platform.

### 3. Vulnerability & Risk Level

Risk represents the probability that a certain source-threat will exploit vulnerability, and the impact of that event on the organization or system. Risk Level is computed based on CVSS version 3.0.

| Level         | Value   | Vulnerability   | Risk (Required Action)  |
|---------------|---------|---|---|
| Critical      | 9 – 10  | A vulnerability that can disrupt the contract functioning in a number of scenarios, or creates a risk that the contract may be broken.      | Immediate action to reduce risk level.                              |
| High          | 7 – 8.9 | A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way. | Implementation of corrective actions as soon as possible.           |
| Medium        | 4 – 6.9 | A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.                                     | Implementation of corrective actions in a certain period.           |
| Low           | 2 – 3.9 | A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.       | Implementation of certain corrective actions or accepting the risk. |
| Informational | 0 – 1.9 | A vulnerability that have informational character but is not effecting any of the code.   | An observation that does not determine a level of risk              |

## 4. Auditing Strategy and Techniques Applied

Throughout the review process, care was taken to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices. To do so, reviewed line-by-line by our team of expert pentesters and smart contract developers, documenting any issues as there were discovered.

### 4.1 Methodology

The auditing process follows a routine series of steps:

1. Code review that includes the following:
  - i. Review of the specifications, sources, and instructions provided to Chainsulting to make sure we understand the size, scope, and functionality of the smart contract.
  - ii. Manual review of code, which is the process of reading source code line-by-line in an attempt to identify potential vulnerabilities.
  - iii. Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to Chainsulting describe.
2. Testing and automated analysis that includes the following:
  - i. Test coverage analysis, which is the process of determining whether the test cases are actually covering the code and how much code is exercised when we run those test cases.
  - ii. Symbolic execution, which is analysing a program to determine what inputs causes each part of a program to execute.
3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.
4. Specific, itemized, actionable recommendations to help you take steps to secure your smart contracts.

## 4.2 Used Code from other Frameworks/Smart Contracts (direct imports)

| Dependency / Import Path                          | Source  |
|---|---|
| @openzeppelin/contracts/access/Ownable.sol        | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/access/Ownable.sol">https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/access/Ownable.sol</a>               |
| @openzeppelin/contracts/math/SafeMath.sol         | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/math/SafeMath.sol">https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/math/SafeMath.sol</a>                 |
| @openzeppelin/contracts/token/ERC20/IERC20.sol    | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/token/ERC20/IERC20.sol">https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/token/ERC20/IERC20.sol</a>       |
| @openzeppelin/contracts/utils/EnumerableSet.sol   | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/utils/EnumerableSet.sol">https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/utils/EnumerableSet.sol</a>     |
| @openzeppelin/contracts/utils/ReentrancyGuard.sol | <a href="https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/utils/ReentrancyGuard.sol">https://github.com/OpenZeppelin/openzeppelin-contracts/tree/v3.0.0/contracts/utils/ReentrancyGuard.sol</a> |

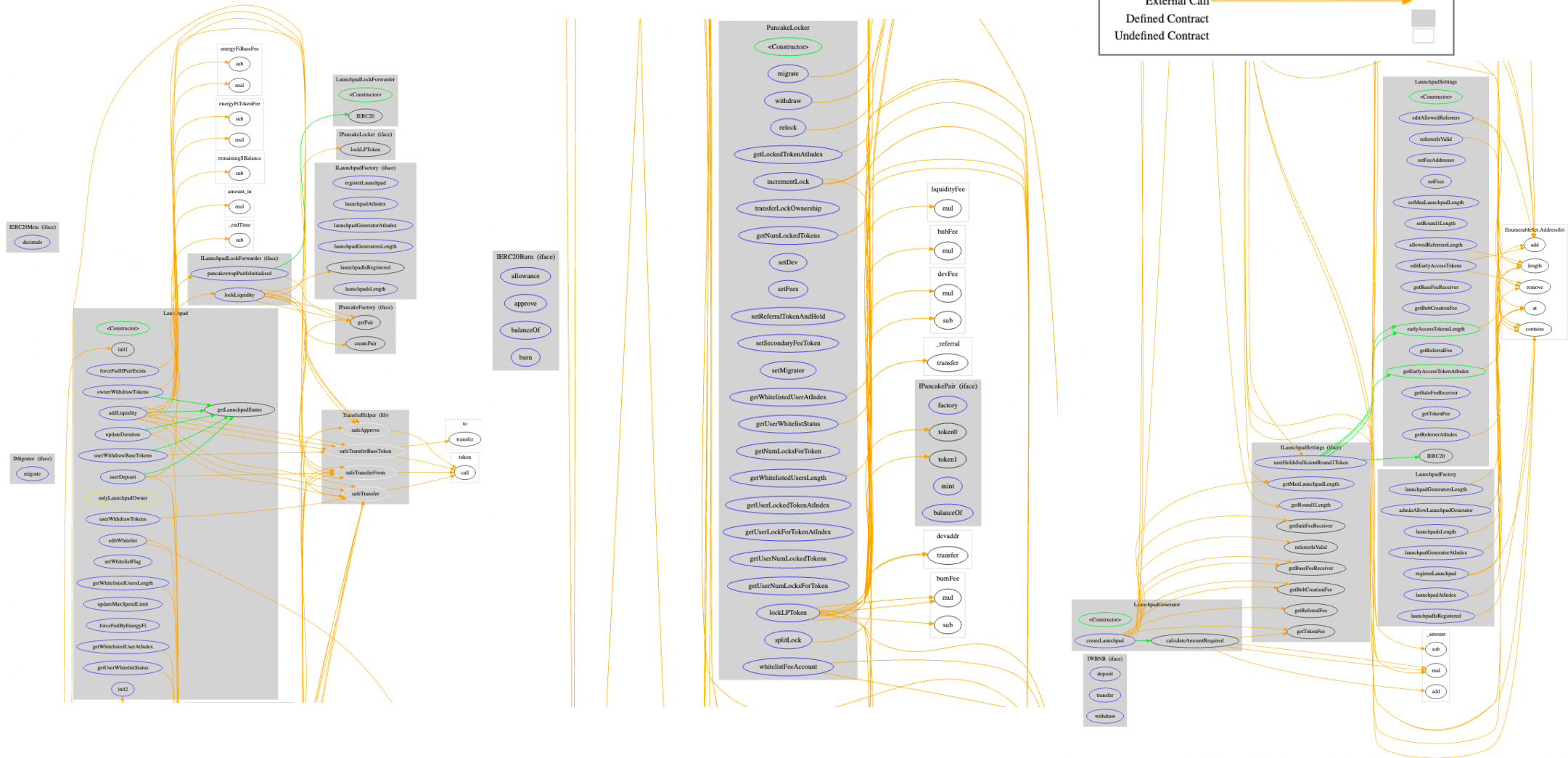


## 4.3 Tested Contract Files

The following are the MD5 hashes of the reviewed files. A file with a different MD5 hash has been modified, intentionally or otherwise, after the security review. You are cautioned that a different MD5 hash could be (but is not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of the review

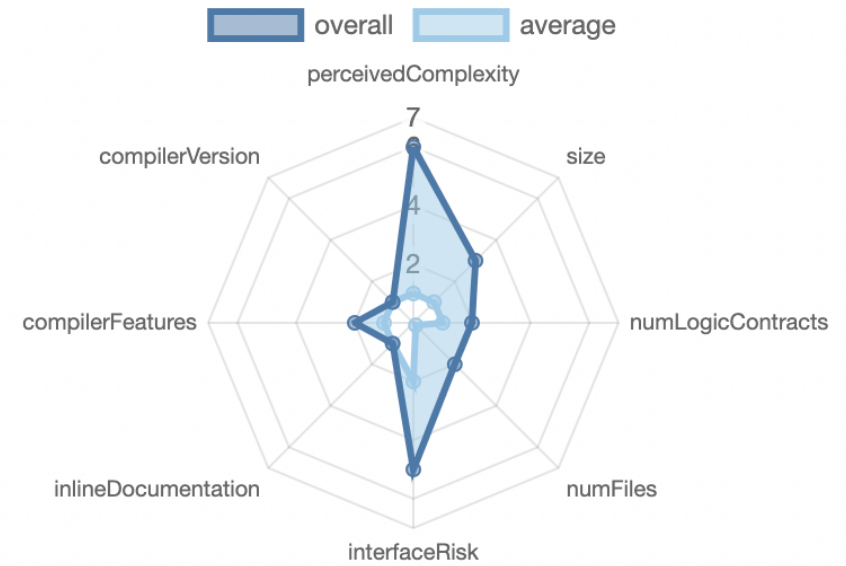
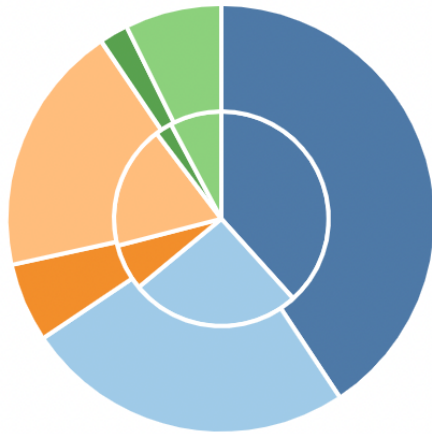
| File   | Fingerprint (MD5)                |
|--|----------------------------------|
| ./contracts/interfaces/IWBNB.sol                   | 074d5c1a97b2058b6f7219af05efbecb |
| ./contracts/interfaces/IPancakeLocker.sol          | f46fd5ecaea4cd224c752d164586f4bb |
| ./contracts/interfaces/IERC20Burn.sol              | 8fcf3e10b4b1ce65ac1d298744da45a8 |
| ./contracts/interfaces/ILaunchpadFactory.sol       | 298d5485ab328210b871a2d3e1781e10 |
| ./contracts/interfaces/ILaunchpadLockForwarder.sol | 1a356e7e1abb102ac001dc55eafe94b0 |
| ./contracts/interfaces/ILaunchpadSettings.sol      | c981df3372a0013be928637d5c8505cd |
| ./contracts/interfaces/IMigrator.sol               | 1a8fd82c93f2e14c9be4cc758f383c8f |
| ./contracts/interfaces/IERC20Meta.sol              | fed26c3c6e59fb0700cd2706647ce776 |
| ./contracts/interfaces/pancake/IPancakePair.sol    | 255fb420f347fea42591873d455122af |
| ./contracts/interfaces/pancake/IPancakeFactory.sol | ebcdbe3067dedb3a0b47996642aa6e4a |
| ./contracts/TransferHelper.sol                     | 8c6a2f686775acb4184c26ffaaa7b1e0 |
| ./contracts/Launchpad.sol                          | aae2f1bce0895be0eb2cbbc1c2e7970f |
| ./contracts/PancakeLocker.sol                      | cf343ed541f17294c34325eb9f513616 |
| ./contracts/LaunchpadSettings.sol                  | b3751f780d231dfb8a0497974e31cbd3 |
| ./contracts/LaunchpadFactory.sol                   | 2232b818d56ed120a412385b54e30b5e |
| ./contracts/LaunchpadGenerator.sol                 | f60f36576f460f921bc34ffa4a5caccd |
| ./contracts/LaunchpadLockForwarder.sol             | 05d7ce7e5f97889deae1f225db79fa9d |

## 4.4 Metrics / CallGraph













## 4.5 Metrics / Source Lines & Risk

source comment single block mixed  
empty todo blockEmpty





## 4.6 Metrics / Capabilities


| Solidity Versions observed  |  Experimental Features |  Can Receive Funds |  Uses Assembly       |  Has Destroyable Contracts |  |
|---|---|--|---|---|--|
| 0.6.12  |   | yes  |   |   |  |
|  Transfers ETH |  Low-Level Calls       |  DelegateCall       |  Uses Hash Functions |  ECREcover                 |  New/Create/Create2 |
| yes   |   |  |   |   | yes<br>→ NewContract:Launchpad   |

### Exposed Functions


















This section lists functions that are explicitly declared public or payable. Please note that getter methods for public stateVars are not included.











|  Public |  Payable |         |      |      |  |
|--|---|---------|------|------|--|
| 109  | 6   |         |      |      |  |
| External   | Internal  | Private | Pure | View |  |
| 100  | 55  | 0       | 0    | 56   |  |

### StateVariables

| Total |  Public |
|-------|--|
| 33    | 24   |

## 4.7 Metrics / Source Unites in Scope

| Type  | File                                   | Logic Contracts | Interfaces | Lines | nLines | nSL OC | Comment Lines | Complex. Score | Capabilities  |
|---|--|-----------------|------------|-------|--------|--------|---------------|----------------|---|
|    | interfaces/IWBNB.sol                   | _____           | 1          | 31    | 16     | 5      | 22            | 10             |    |
|    | interfaces/IPancakeLocker.sol          | _____           | 1          | 29    | 21     | 3      | 16            | 6              |    |
|    | interfaces/IERC20Burn.sol              | _____           | 1          | 50    | 22     | 7      | 37            | 9              | _____   |
|    | interfaces/ILaunchpadFactory.sol       | _____           | 1          | 51    | 16     | 3      | 28            | 13             | _____   |
|    | interfaces/ILaunchpadLockForwarder.sol | _____           | 1          | 43    | 25     | 4      | 23            | 5              | _____   |
|    | interfaces/ILaunchpadSettings.sol      | _____           | 1          | 63    | 16     | 3      | 37            | 19             | _____   |
|    | interfaces/IMigrator.sol               | _____           | 1          | 26    | 20     | 3      | 14            | 3              |    |
|    | interfaces/IERC20Meta.sol              | _____           | 1          | 15    | 14     | 4      | 8             | 5              | _____   |
|    | interfaces/pancake/IPancakePair.sol    | _____           | 1          | 46    | 15     | 3      | 33            | 11             | _____   |
|  | interfaces/pancake/IPancakeFactory.sol | _____           | 1          | 31    | 17     | 3      | 19            | 5              | _____   |
|  | contracts/TransferHelper.sol           | 1               | _____      | 105   | 87     | 43     | 38            | 19             |  |
|  | contracts/Launchpad.sol                | 1               | _____      | 675   | 638    | 405    | 203           | 211            |  |

| Type   | File                                 | Logic Contracts | Interfaces | Lines       | nLines      | nSLOC       | Comment Lines | Complex. Score | Capabilities  |
|--|--------------------------------------|-----------------|------------|-------------|-------------|-------------|---------------|----------------|---|
|   | contracts/PancakeLocker.sol          | 1               | _____      | 747         | 654         | 380         | 224           | 216            |  |
|   | contracts/LaunchpadSettings.sol      | 1               | _____      | 281         | 239         | 109         | 112           | 78             | _____   |
|   | contracts/LaunchpadFactory.sol       | 1               | _____      | 124         | 101         | 38          | 45            | 36             | _____   |
|   | contracts/LaunchpadGenerator.sol     | 1               | _____      | 228         | 218         | 149         | 56            | 80             |  |
|   | contracts/LaunchpadLockForwarder.sol | 1               | _____      | 161         | 149         | 93          | 39            | 58             | _____   |
| <br> | <b>Totals</b>                        | <b>7</b>        | <b>10</b>  | <b>2706</b> | <b>2268</b> | <b>1255</b> | <b>954</b>    | <b>784</b>     |  |

Legend:

- **Lines:** total lines of the source unit
- **nLines:** normalized lines of the source unit (e.g. normalizes functions spanning multiple lines)
- **nSLOC:** normalized source lines of code (only source-code lines; no comments, no blank lines)
- **Comment Lines:** lines containing single or block comments
- **Complexity Score:** a custom complexity score derived from code statements that are known to introduce code complexity (branches, loops, calls, external interfaces, ...)

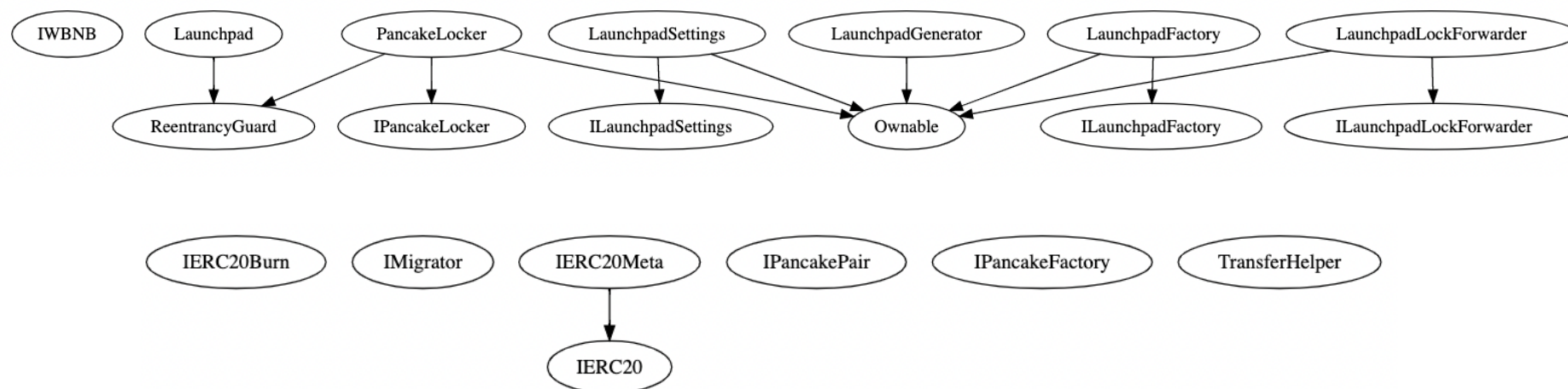
## 5. Scope of Work

The Energyfi Team provided us with the files that needs to be tested. The scope of the audit are the ILO contracts.

The team put forward the following assumptions regarding the security, usage of the contracts:

- The smart contract is coded according to the newest standards and in a secure way
- Token from ILO are correctly distributed and possible to claim
- Liquidity is correctly locked after ILO
- Pancakeswap pair is created after ILO
- ILO Factory is proper working and amounts for fees, liquidity, sale price, initial price are correct calculated

The main goal of this audit was to verify these claims. The auditors can provide additional feedback on the code upon the client's request.



## 5.1 Manual and Automated Vulnerability Test

### **CRITICAL ISSUES**

During the audit, Chainsulting's experts found **no Critical issues** in the code of the smart contract.

### **HIGH ISSUES**

During the audit, Chainsulting's experts found **no High issues** in the code of the smart contract.

### **MEDIUM ISSUES**

During the audit, Chainsulting's experts found **no Medium issues** in the code of the smart contract

### **LOW ISSUES**

During the audit, Chainsulting's experts found **no Low issues** in the code of the smart contract

### **INFORMATIONAL ISSUES**

During the audit, Chainsulting's experts found **no Informational issues** in the code of the smart contract



## 5.2 SWC Attacks

| ID                      | Title   | Relationships  | Test Result |
|-------------------------|---|--|-------------|
| <a href="#">SWC-131</a> | Presence of unused variables                      | <a href="#">CWE-1164: Irrelevant Code</a>  | ✓           |
| <a href="#">SWC-130</a> | Right-To-Left-Override control character (U+202E) | <a href="#">CWE-451: User Interface (UI) Misrepresentation of Critical Information</a> | ✓           |
| <a href="#">SWC-129</a> | Typographical Error                               | <a href="#">CWE-480: Use of Incorrect Operator</a>                                     | ✓           |
| <a href="#">SWC-128</a> | DoS With Block Gas Limit                          | <a href="#">CWE-400: Uncontrolled Resource Consumption</a>                             | ✓           |
| <a href="#">SWC-127</a> | Arbitrary Jump with Function Type Variable        | <a href="#">CWE-695: Use of Low-Level Functionality</a>                                | ✓           |
| <a href="#">SWC-125</a> | Incorrect Inheritance Order                       | <a href="#">CWE-696: Incorrect Behavior Order</a>                                      | ✓           |
| <a href="#">SWC-124</a> | Write to Arbitrary Storage Location               | <a href="#">CWE-123: Write-what-where Condition</a>                                    | ✓           |
| <a href="#">SWC-123</a> | Requirement Violation                             | <a href="#">CWE-573: Improper Following of Specification by Caller</a>                 | ✓           |


| ID                      | Title   | Relationships  | Test Result |
|-------------------------|---|--|-------------|
| <a href="#">SWC-122</a> | Lack of Proper Signature Verification               | <a href="#">CWE-345: Insufficient Verification of Data Authenticity</a>  | ✓           |
| <a href="#">SWC-121</a> | Missing Protection against Signature Replay Attacks | <a href="#">CWE-347: Improper Verification of Cryptographic Signature</a>  | ✓           |
| <a href="#">SWC-120</a> | Weak Sources of Randomness from Chain Attributes    | <a href="#">CWE-330: Use of Insufficiently Random Values</a>   | ✓           |
| <a href="#">SWC-119</a> | Shadowing State Variables                           | <a href="#">CWE-710: Improper Adherence to Coding Standards</a>  | ✓           |
| <a href="#">SWC-118</a> | Incorrect Constructor Name                          | <a href="#">CWE-665: Improper Initialization</a>   | ✓           |
| <a href="#">SWC-117</a> | Signature Malleability                              | <a href="#">CWE-347: Improper Verification of Cryptographic Signature</a>  | ✓           |
| <a href="#">SWC-116</a> | Timestamp Dependence                                | <a href="#">CWE-829: Inclusion of Functionality from Untrusted Control Sphere</a>                                    | ✓           |
| <a href="#">SWC-115</a> | Authorization through tx.origin                     | <a href="#">CWE-477: Use of Obsolete Function</a>  | ✓           |
| <a href="#">SWC-114</a> | Transaction Order Dependence                        | <a href="#">CWE-362: Concurrent Execution using Shared Resource with Improper Synchronization ('Race Condition')</a> | ✓           |

| ID                      | Title                                | Relationships   | Test Result |
|-------------------------|--------------------------------------|---|-------------|
| <a href="#">SWC-113</a> | DoS with Failed Call                 | <a href="#">CWE-703: Improper Check or Handling of Exceptional Conditions</a>     | ✓           |
| <a href="#">SWC-112</a> | Delegatecall to Untrusted Callee     | <a href="#">CWE-829: Inclusion of Functionality from Untrusted Control Sphere</a> | ✓           |
| <a href="#">SWC-111</a> | Use of Deprecated Solidity Functions | <a href="#">CWE-477: Use of Obsolete Function</a>                                 | ✓           |
| <a href="#">SWC-110</a> | Assert Violation                     | <a href="#">CWE-670: Always-Incorrect Control Flow Implementation</a>             | ✓           |
| <a href="#">SWC-109</a> | Uninitialized Storage Pointer        | <a href="#">CWE-824: Access of Uninitialized Pointer</a>                          | ✓           |
| <a href="#">SWC-108</a> | State Variable Default Visibility    | <a href="#">CWE-710: Improper Adherence to Coding Standards</a>                   | ✓           |
| <a href="#">SWC-107</a> | Reentrancy                           | <a href="#">CWE-841: Improper Enforcement of Behavioral Workflow</a>              | ✓           |
| <a href="#">SWC-106</a> | Unprotected SELFDESTRUCT Instruction | <a href="#">CWE-284: Improper Access Control</a>                                  | ✓           |
| <a href="#">SWC-105</a> | Unprotected Ether Withdrawal         | <a href="#">CWE-284: Improper Access Control</a>                                  | ✓           |
| <a href="#">SWC-104</a> | Unchecked Call Return Value          | <a href="#">CWE-252: Unchecked Return Value</a>                                   | ✓           |


| ID                      | Title                          | Relationships  | Test Result |
|-------------------------|--------------------------------|--|-------------|
| <a href="#">SWC-103</a> | Floating Pragma                | <a href="#">CWE-664: Improper Control of a Resource Through its Lifetime</a> | ✓           |
| <a href="#">SWC-102</a> | Outdated Compiler Version      | <a href="#">CWE-937: Using Components with Known Vulnerabilities</a>         | ✓           |
| <a href="#">SWC-101</a> | Integer Overflow and Underflow | <a href="#">CWE-682: Incorrect Calculation</a>                               | ✓           |
| <a href="#">SWC-100</a> | Function Default Visibility    | <a href="#">CWE-710: Improper Adherence to Coding Standards</a>              | ✓           |

## 5.3 Verify Claims


**5.3.1. The smart contract is coded according to the newest standards and in a secure way**

**Status:** tested and verified 


**5.3.2. Token from ILO are correctly distributed and possible to claim**

**Status:** tested and verified 


**5.3.3. Liquidity is correctly locked after ILO**

**Status:** tested and verified 

**5.3.4. Pancakeswap pair is created after ILO**

**Status:** tested and verified 

**5.3.5. ILO Factory is proper working and amounts for fees, liquidity, sale price, initial price are correct calculated**

**Status:** tested and verified 

## 6. Executive Summary

Two (2) independent Chainsulting experts performed an unbiased and isolated audit of the smart contract codebase. The final debriefs took place on the December 19, 2021.

The main goal of the audit was to verify the claims regarding the security of the smart contract. During the audit, no critical issues were found, after the manual and automated security testing and the claim have been successfully verified.

## 7. Deployed Smart Contract

Testnet

PancakeFactory: [0x37916420fB906d4333C680592292644b0a83F0D9](#)

PancakeLocker: [0x73CE39821b785E8C07cdbE3dC7158aE496fB40ce](#)

WBNB: [0x768A542AB79235BEbd44ADCF73d477f75091A440](#)

LaunchpadFactory: [0x059c8B92fD87D94A12B862C6CfEDfa3AfDF8820B](#)

LaunchpadLockForwarder: [0x5B9d756df5C50fd77B040E83418C279fB240CA03](#)

LaunchpadSettings: [0x1Ad47616A41969C2564a70d716dC677fEA10634A](#)

LaunchPadGenerator: [0x620CD45874b8D5Bb11B1C9aD06C5C235660C9df0](#)

