Audit Report - Solar Farm #410	2
Overview	2
Solar Farm Site Profile	3
Solar Panel details	4
Calculation of the Expected Carbon Credit Production	4
Legal Documents	4
Carbon Footprint Assessment & Calculations	6
Disaster Risk Assessment	6
Technical Innovations	6
Communication Channels	6
GCA information	7
Conclusion	7
Appendix - Calculations	8
Appendix - Protocol fees - Proof of payment	9
Appendix - Evidences Obtained From Solar Farm Owner	10
Appendix - Drone Footage	10
Appendix - Cost of Power Verification	10
Appendix - Assumptions document	12

# Audit Report - Solar Farm #410

### Overview

GCA: Fatima Khaziyeva Location: 417 N 1000 W, Salt Lake City, UT 84116, USA Coordinates: 40.77863681541915, -111.9200991890801

Solar Panels: Quantity: 20 Brand and Model: HY-DH108P8 400B by Solar Hyperion Warranty: 25 years System Wattage Output: 8.00 kW-DC | 5.80 kW-AC

Installation and Operations: Installation Date: After August 14th, 2024 PTO Date: N/A Short ID: 410

Carbon Footprint & Production: Average Sunlight per day: 4.832 hours Adjusted Weekly Carbon Credits = 0.1185 Weekly Total Carbon Debt = 0.0487 Net Carbon Credit Earnings Weekly = 0.0698 Protocol Fees: \$12,295.32 Final Cost of Power: \$0.1360 per kWh

## Solar Farm Site Profile

Tests performed by GCA	Results	Reference
Inspected the Residential Solar Energy System Purchase Agreement to verify the legal name of the entity owning the solar farm.	Owner: Solar Farm #410	Residential Solar Energy System Purchase Agreement
Inspected the Residential Solar Energy System Purchase Agreement, and conducted on-site verification to ensure the geographic coordinates of the solar farm are accurate.	40.77863681541915, -111.9200991890801	Residential Solar Energy System Purchase Agreement & Screenshot of GCA phone location
Inspected the Plan sets, and conducted an on-site physical verification to corroborate the size of the solar farm as stated in the documents.	8.00 kW-DC   5.80 kW-AC	Planset p.1 & Audit Pictures
Inspected the Mortgage Statement Document, and conducted on-site verification to confirm the address and the zip code of the property.	417 N 1000 W, Salt Lake City, UT 84116, USA	Mortgage Statement & Residential Solar Energy System Purchase Agreement
Conducted on-site verification to visually confirm the installation of solar panels on the property	There are two sections of panels. First section with 10 panels and the second section with 10 panels. For a total of 20 panels	Audit Pictures
Conducted on-site verification to visually assess the general condition and features of the property.	The solar panels are new and in good condition. They are located on the rooftop of the house.	Audit Pictures

### Solar Panel details

Tests performed by GCA	Results	Reference
Inspected the document and conducted on-site verification to confirm the brand and model of the solar panels installed	HY-DH108P8 400B by Solar Hyperion	Planset [p.12] Audit pictures
Inspected the Manufacturer Warranty Document to verify the warranties provided for the solar panels	30-year warranty by Solar Hyperion	Planset [p.12]
Inspected the Installation Approval by Salt Lake City County Building Department and conducted on-site verification to confirm the installation method of the solar panels	Installed professionally, adhering to industry norms.	Inspection and Permit document

### Calculation of the Expected Carbon Credit Production

Conducted calculations based on the specifications of the solar panels, historic data from WattTime and NASA, and any expected degradation to determine the expected carbon credit production per megawatt hour of electricity produced. For an in-depth understanding of these calculations, reference is made to the <u>'Assumption Documentation'</u>.

Coordinates: 40.77863681541915, -111.9200991890801 Average Sunlight per day: 4.832 hours Carbon Credit Production per MWh: 0.6736

Calculations: http://95.217.194.59:35015/api/v1/geo-stats?latitude=40.77863681541915&longitude=-111. 9200991890801

### Legal Documents

Tests performed by GCA	Results	Reference
Inspected the document to verify the ownership of the electricity generated by the solar panels	Ownership of the electricity generated by the solar panels has been confirmed.	Residential Solar Energy System Purchase Agreement
Inspected the document to verify the authorization for certifying carbon credit	The document has been inspected and verified for proper authorization to certify carbon credits.	Residential Solar Energy System Purchase Agreement

Inspected the document and verified the solar farm owner's signature authorizing the list of information permitted for online publication	The solar farm owner's signature authorizing the list of information for online publication has been inspected and confirmed.	Residential Solar Energy System Purchase Agreement
Inspected the document to verify the details concerning the long-term operation of the solar panels	The document detailing the long-term operation plans and specifications of the solar panels has been inspected and verified.	Residential Solar Energy System Purchase Agreement
Inspected the document and verified the solar farm owner's signature authorizing the installation and utilization of monitoring equipment	The solar farm owner's authorization for the installation and utilization of monitoring equipment has been inspected and validated.	Residential Solar Energy System Purchase Agreement
Inspected the document and verified the solar farm owner's signature authorizing additional auditor visits.	Confirmation was obtained on the solar farm owner's signature authorizing additional auditor visits as per the inspected document.	Residential Solar Energy System Purchase Agreement

## **Carbon Footprint Assessment & Calculations**

In the assessment of the carbon footprint of the solar farm using monocrystalline technology, the harmonized emission result of 40g CO2-eq/kWh was applied. This figure is anchored in assumptions such as ground-mount application, solar irradiation of 2,400 kWh/m²/yr, a performance ratio of 0.8, and a panel lifetime of 30 years. For an in-depth understanding of these assumptions, reference is made to the 'Assumption Documentation'.

Tests performed by GCA	Results	Reference
Conducted independent calculations to assess the weekly minimum carbon payment required		Detailed calculations [p1]

### Disaster Risk Assessment

In the disaster risk assessment of the solar farm, a conservative failure rate of 1% within the first 10 years of operation in the United States was adopted. This rate is derived from extensive research on historical failure rates and professional surveys, coupled with a conservative approach to accommodate unforeseen circumstances. Consequently, the per-year failure rate is calculated to be 0.17%. For a comprehensive explanation of the underlying assumptions and methodology, refer to the detailed information provided in the <u>'Assumption Documentation'</u>.

## **Technical Innovations**

Upon physical inspection, it was observed that the solar farm employs standard commercial solar panels and does not feature any distinct technological innovations.

## **Communication Channels**

The owner has acknowledged receipt and understanding of the established protocols for post-audit communication. This includes a comprehensive system for reporting any incidents, abnormalities, or significant changes that may occur following audit activities. Additionally, the owner confirms having received an updated list of contacts designated for post-audit communication purposes. A commitment has been made to adhere strictly to these protocols

and to promptly report any valuable changes or findings in accordance with the outlined procedures. The full details of these declarations and compliance are documented in the referenced <u>'Residential Solar Energy System Purchase Agreement'</u>.

## GCA information

This audit report has been prepared and finalized by an auditor who has fully complied with and signed the required clauses as outlined in the <u>'Auditor Disclosure and Declaration Document</u>'. These clauses include the auditor's non-ownership of solar farms, non-possession of Glow tokens unless staked, non-ownership of unretired carbon credits, restriction on owning stocks or tokens outside of broad market exposure index funds, absence of business conflicts of interest, and adherence to the Glow International Code of Conduct. Additionally, the auditor has agreed to maintain a low community profile, with an undertaking to retire if they exceed a threshold of 5,000 social media followers/friends, ensuring unbiased and impartial auditing. The full details of these declarations and compliance are documented in the referenced 'Auditor Disclosure and Declaration Document'.

### Conclusion

The audit confirms that the solar farm's location and specifications match the owner's reported information. The audit confirms that the solar farm meets these specifications, qualifying it for Glow Labs' incentive protocol.

The on-site inspection and monitor box installation was fully completed by Jared Morgan on September 16th, 2024

**Appendix - Calculations** 

carbon debt per KWh	value	details			
carbon footprint (CO2 g/KWh)	40	see assumption document			
convert grams to metric tons	0.00004	conversion			
solar irradiation (total h/y)	2400	see assumption document			
performance ratio	0.8	see assumption document			
panel lifetime (y)	30	see assumption document			
total carbon debt per KWh	2.304				
adjustment due to uncertainty	35%	see assumption document			
total carbon debt adjusted per KWh	3.1104				
Adjusted carbon debt	value	details			
annual interest rate	0.17%	see assumption document			
Commitment (y)	10	see assumption document			
total adjusted carbon debt per KWh	2.343				
weekly production	value	details	weekly Carbon debt	value	details
Power Output (MWh)	0.0080	based on solar production (see planset doc)	total carbon debt adjusted (KWh)	3.1104	calculated above
Hours of Sunlight Per Day	4.8320	based on NASA data API	Power Output (MWh)	0.0080	based on solar production (see planset doc)
Weekly Power Production (MWh)	0.2630		convert to KW	8.0000	conversion
Carbon Offsets per MWh	0.6736	based on WattTime data API	Total Carbon Debt produced	24.8832	
Weekly Carbon Credits	0.1072		disaster risk assessement per year	0.0017	see assumption document
adjustment due to uncertainty		see assumption document	Commitment (y)	10.0000	see assumption document
Adjusted Weekly Carbon Credits	0.1185		Adjusted Total Carbon Debt	25.3019	
	0.1165		Weekly Total Carbon Debt	0.0487	
NET Carbon Credit Earnings weekly	0.0698				

		Protocol fees calculations		Address:	417 N 1000 W/ Solt I a				
First Year Electricity Old Price	value		details	Coordinates:	417 N 1000 W, Salt La 40.77863681541915,				
Previous Electricity Price (paid by user) (in kW)		see electrical usage bill (June 2024)	uetans	API Link:	http://95.217.194.59:3			79700298 longitud	- 111 02011562
convert kW to mW		conversion			4.8320122950820	ors/api/vr/geo-s	lais natitude-40.7	7679026&01191100	
Hours of Sunlight Per Day		based on NASA data API		input average_sunlight	0.6735822277202				
				input average_carbon_certificates					
Power Output (MWh)	365.25	based on solar production (see planset doc)		system size	8.00 kW-DC   5.80 kW	AC			
number of days				# of panels	20				
First Year Electricity Old Price	\$1,866.14								
Lifetime Old Electricity Value	value		details						
First Year Electricity Old Price		calculated above	Getano						
Previous Escalator (estimated)			solarreviews.com/blog/average-electricity-cost-increase-per-year						
Commitment (years)	1.95%	see escalator reference for or. https://www.s	solarreviews.com/biograverage-electricity-cost-increase-per-year						
Present Value	\$20,877.63			_					
	\$20,077.00								
Protocol Cash Requirements	value		details						
Cashflow Discount	11.00%	see assumption document							
Commitment (years)	10								
Lifetime Old Electricity Value		Calculated above							
Present Value	\$12,295.32								
Protocol fees	\$12,295.32								
	Dotoile	ed Energy Cost Calculation - June 2	3034						
Total kWh usage	907	a Energy cost calculation - Julie 2		details					
iotai kiviii usage	907			details					
		Charges and Fees							
Winter Block 2 kWh	0.103725	Charges and rees		_					
Winter Block 2 kwh	0.103725			Out of the 4 charges from Rocky N	fountain Dower block 2	a alaa tha highar	abarra Thatwaa	used to coloulate th	a protocol foo
Summer Block 2 kWh	0.11721			in efforts to not under estimate the	fee.	s also the higher	charge. That was	used to calculate th	le protocor lee
Average Price per kWh	0.11047			To calculate the most accurate cos used, here is the link for Rocky Mo	t of power over the cour	se of a year, the a	verage of winter l	block 2 and summe	block 2 was
	0.1104/			net/content/dam/pcorp/documents/	en/rockymountainpower	rates-regulation/	utah/rates/001_Re	esidential_Service.p	df
Base Price of usage (usage x Average Price)	100.194								
				_					
	Fee amount								
Renewable Energy Adjusment	-0.11			_					
Energy Balancing Account	7.23								
Customer Efficiency Service	3.72								
Electric Vehicle Infrustructure	0.29								
Municiple Energy Sales/Use Tax	6.62			_					
Utah Sales Tax	5.4								
Total Fees	23.15								
Total Cost (Base Price + Total fees)	123.344								
Total Price per kWh (total cost / Total kWh use	0.1360								
	0.1000								
Price per kWh is based off of the avarage of the s	ummer and winter bl	ock 2 price from Rocky Mountain Power							
Base price of usage is calculated by taking the av			e block 2 usage.						
Detailed Account Activity									
ITEM 1 - ELECTRIC SERVICE	417 N 1000	W Salt Lake City UT							
	Residential	Schedule 1							
METER SERVICE PERIOD NUMBER From To	ELAPSED N DAYS P	TETER READINGS METER AMOUNT USED Trevious Current MULTIPLIER THIS MONTH	D						
51268905 May 15, 2024 Jun 14		9565 20472 1.0 907 kwh							
Next scheduled read date: 07-16. Date ma									
			014905						
NEW CHARGES - 06/24	UNITS	COST PER UNIT	CHARGE						
Basic Charge - Single Phase Energy Charge Summer Block 1 for 14 da	y(s) 187 kv	vh 0.0902790	10.00 16.88						
Energy Charge Summer Block 2 for 14 da	y(s) 236 kv	vh 0.1172100	27.66						
Energy Charge Winter Block 1 for 16 days	s) 213 kv	vh 0.0798930	17.02						
Energy Charge Winter Block 2 for 16 day	s) 271 kv	vh 0.1037250	28.11						
NEW CHARGES - 06/24 - CONTINUED	UNITS	COST PER UNIT	CHARGE						
Renewable Energy Adjustment									
for 14 day(s) for 16 day(s)		-0.0018000 -0.0006000	-0.08 -0.03						
France Dalassian Assault		0.0806000	7.23						
Energy Balancing Account		0.0806000	1.23						

	0.0004000	0.12				
Elec Vehicle Infrastructure	0.0030000	0.29				
Home Electric Lifeline Program		0.16				
Paperless Bill Credit		-0.50				
Municipal Energy Sales/use Tax	0.0600000	6.62				
Utah Sales Tax	0.0490000	5.40				
Late Payment Charge	0.0100000	0.97				
Total New Charges		123.45				

# Appendix - Protocol fees - Proof of payment

### Transaction hash:

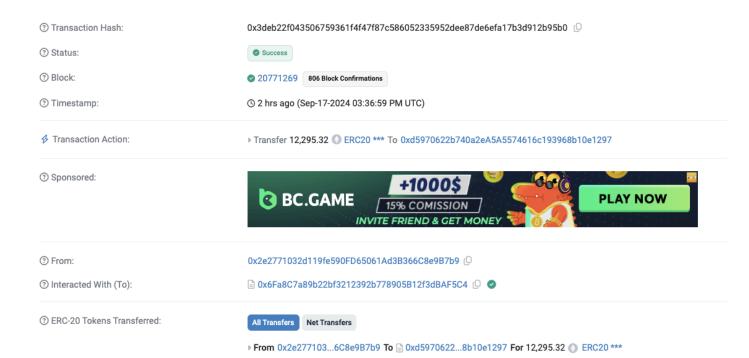
0x3deb22f043506759361f4f47f87c586052335952dee87de6efa17b3d912b95b0

#### Etherscan link:

https://etherscan.io/tx/0x3deb22f043506759361f4f47f87c586052335952dee87de6efa17b3d912 b95b0

### Amount paid: 12,295.32 USDG

### Date of payment: Sep-17-2024 03:36:59 PM UTC



# Appendix - Evidences Obtained From Solar Farm Owner

The GCA has successfully completed a thorough review and verification process for the following critical documents:

- 1. Residential Solar Energy System Purchase Agreement
- 2. Planset
- 3. Mortgage Statement
- 4. Two recent Utility Bills
- 5. City Permit
- 6. Inspection Document

The owner of the solar farm has chosen not to seek the Permission To Operate (PTO) from the city of Salt Lake. This decision was made after assessing the jurisdictional risks involved. Obtaining the PTO is not a requirement for the farm to participate in the Glow ecosystem. The homeowner has executed a waiver confirming that the farm is operational without the PTO.

- The absence of a PTO does not prevent the solar farm from being part of the Glow ecosystem, as it does not infringe on any fundamental operational requirements set by Glow.
- The GCA's role is not to verify compliance with the city's regulations.
- The homeowner is aware of any potential consequences or risks associated with operating without a PTO.

# Appendix - Drone Footage

To ascertain the additionality of the solar farm, the GCA procured drone footage BEFORE the solar panels were installed. This step was vital to confirm that the farm had not previously produced power, aligning with Glow's strict requirement that only new solar farms are eligible for incentives.

The drone footage before installation was obtained by Jared Morgan on August 14th 14th, 2024.

After the solar panels were installed, the GCA acquired new drone footage. This subsequent step ensured that the panels were correctly installed and that their quantity matched the specifications outlined in the plansets.

The drone footage after installation was obtained by Jared Morgan on September 17th, 2024.

## **Appendix - Cost of Power Verification**

The determination of the protocol fee involves the homeowner submitting a utility bill, which outlines their power expenses. To ensure the integrity of this fee calculation, the GCA cross-reference the utility bill with publicly available data from the utility provider regarding local power rates.

The GCA accessed the Standard Residential Rates from Rocky Mountain Power Utilities, applicable in Utah. For the protocol fee calculation, the rate of \$0.1360 per kWh, was applied.

Appendix - Assumptions document

# **Assumptions Documentation**

This document outlines the assumptions and methodologies employed in the audit of solar farms. It is intended to provide a clear basis for the procedures and findings reported in the audit report. This document should be referred to for a deeper understanding of the audit findings and the underpinning rationale for the audit procedures.

# **Testing Methodologies**

### Nature of tests performed

Туре	Description
Inquiry	Engaged with relevant personnel to gather information and corroborated the details
On-site verification (Observation)	Conducted a thorough observation to verify the application and performance, as well as the physical existence of the solar farm's components
Inspection	Performed a detailed examination of documents, records, or tangible assets to validate their authenticity and relevance to the audit
Calculation	Performed calculations to ascertain various metrics pertinent to the audit scope

# Assumptions

## Protocol fees

Introduction: When a solar farm joins the Glow network, a protocol fee in USDC is required. This fee is distributed as rewards to carbon credit producers over four years.

Assumption: It's necessary to compute the cost of the protocol fee over a 10-year span. This calculation must encompass potential variations in electricity pricing and consider the long-term financial implications for the solar farm.

### Methodology:

First Year Electricity Price Calculation: Begin by calculating the first year of electricity price using the following formula: Previous Electricity Price in kW × Hours of Sunlight Per Day × Power Output (MW) Per Hour × number of days.

Present Value Calculation: Next, extrapolate this first-year electricity price over a 10-year period, accounting for potential escalations in electricity prices. The escalation rate is dependent on the state in which the farm is located, with data sourced from reliable industry insights. This approach assumes that electricity prices will increase over time, which is a significant factor in the economics of solar energy.

Cash Discount Application: Apply a cash discount of 11% to the present value calculation. This rate is derived from doubling the current federal rate (estimated at 5.5%), with the rationale being the relative ease of surpassing this federal rate under current economic conditions. This 11% rate is specifically for the beta period of Glow, incentivizing early solar farm onboarding. After the beta phase, the standard federal rate will be used for discount calculations.

References

• https://www.solarreviews.com/blog/average-electricity-cost-increase-per-year

### Disaster Risk Assessment

Assumption: A conservative failure rate of 1% is assumed for solar farms within the first 10 years of operation in the United States.

Methodology: Extensive research on historical failure rates of solar farms in the United States within the first 10 years has been conducted, with a conservative multiplier applied. Furthermore, professional surveys have been conducted. Despite discussions with solar professionals indicating a failure rate far below 1% over the lifetime of the solar farm, a conservative estimate of 1% was chosen to account for unforeseen circumstances. The per-year rate is 0.17%.

## Carbon Credit Estimation Calculation

Assumption: WattTime's historical data is reliable and accurate for conducting calculations related to carbon credit production.

Methodology: Calculations were conducted based on the specifications of the solar panels and using historical data from WattTime. WattTime, a reputable non-profit organization in the emissions reduction domain, provides robust technology solutions for such assessments. Additionally, the methodology incorporates data from NASA's API to determine the expected number of sunlight hours for a solar panel in a specific location. This data is crucial for accurately estimating the average hours of sunlight per day and the average carbon offset per MWh.

To calculate the expected lifetime carbon credit production, the power capacity of the solar panels is multiplied by the sunlight hours, integrating both WattTime's and NASA's data. The script iterates over historical data from the WattTime API, combined with NASA's sunlight data, to estimate the number of credits a panel would have produced annually.

A 35% discount is then applied to the final carbon production value. This conservative approach is designed to account for any uncertainties in the calculations, ensuring that the results are within safety margins. This not only enhances the credibility of the protocol and methodology but also positions the analysis positively, especially when subjected to detailed reviews.

Real-Time Monitoring: It should be noted that for real-time monitoring of power output, NASA data is not utilized; instead, this monitoring relies on the installed equipment at the solar farm. This data can be cross-referenced with NASA's data if any discrepancies or suspicions arise, providing an additional layer of verification and accuracy.

Reference:

 <u>https://github.com/glowlabs-org/gca-backend/blob/main/watttime-scripts/carbon\_</u> <u>credits\_per\_kw.py</u>

### Carbon Footprint Assessment

Assumption: Considering the inherent variability in life cycle assessment (LCA) results for solar technologies as per ISO 14040 and 14044 standards, we have selected the highest value from NREL's harmonized data set for our conservative approach. This decision acknowledges the ISO standards' provision of a flexible framework for LCA, which can lead to a broad range of outcomes depending on the practitioner's choices. By adopting the highest value, we aim to account for the upper bound of potential environmental impacts, thereby ensuring that our audit conclusions are robust against the variability in LCA practices.

Methodology: The methodology involves utilizing the harmonized LCA results, which are refined by NREL to enhance precision and reduce variability. By adhering to a consistent set of methods and assumptions, harmonization narrows the range of greenhouse gas (GHG) emissions estimates, allowing us to base our audit on a more reliable and standardized benchmark.

It is important to note the specific harmonized greenhouse gas (GHG) emissions medians identified in our assessment. For monocrystalline Silicon (mono-Si), the harmonized GHG median is 40 g CO2-eq/kWh, and for multi-crystalline Silicon (multi-Si), it is 47 g CO2-eq/kWh. These values are calculated based on assumptions of ground-mount application, solar irradiation of 2,400 kWh/m²/yr, a performance ratio of 0.8, and a panel lifetime of 30 years. By integrating these specific medians into our assessment, we ensure a comprehensive and precise understanding of the potential environmental impacts of these solar technologies.

A 35% adjustment is then applied to the total carbon debt. This conservative approach is designed to account for any uncertainties in the calculations, ensuring that the results are within safety margins. This not only enhances the credibility of the protocol and methodology but also positions the analysis positively, especially when subjected to detailed reviews.

Detailed calculations:

### Initial Calculation:

40 grams CO2 per kWh (emissions rate). Multiplied by 2400 hours per year (operational hours). Multiplied by 0.8 (performance ratio). Multiplied by 30 years (lifespan of the panels).

### Adjusted Carbon Debt:

Calculated by adding a 0.17% annual interest rate. The total carbon debt is multiplied by 1.0017^10 to account for 10 years.

### Weekly Debt Payment:

Determined by dividing the final carbon debt by 520 weeks (which accounts for 10 years, considering 52 weeks per year).

Reference:

- <u>NREL harmonized life cycle assessments (LCAs)</u>
- Methodology Guidelines on Life Cycle Assessment of Photovoltaic Electricity
- https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc\_wg3\_ar5\_annex-iii.pdf p.7
- <u>https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1530-9290.2011.00423.x</u> p.9
  - Research base on solar irradiation of of 2,400 kilowatt-hours per square meter per year (kWh/m2/yr) and lifetime = 30 years
- https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1530-9290.2011.00439.x

• The harmonized GHG medians decline to 40 g CO2-eq/kWh for mono-Si and 47 g CO2-eq/kWh for multi-Si.

# CGA Disclosure and Declaration Document

### CGA Personal and Professional Information

Name: Fatima Khaziyeva

Nationality: Canada

### Declarations

1. No Ownership of Solar Farms: I hereby declare that I do not own or operate more than one solar farm.

2. Glow Tokens Holding:

I declare that I do not own any Glow tokens, unless staked in accordance with company policies.

3. Carbon Credits:

I confirm that I do not own any unretired carbon credits.

4. Stocks and Tokens Ownership:

I declare that I do not own stocks or tokens, except for those within broad market exposure index funds.

### 5. Conflict of Interest:

I confirm the absence of any business conflicts of interest that could affect my impartiality as an auditor.

6. Code of Conduct Compliance:

I acknowledge having read, understood, and agreed to adhere to the Glow International Code of Conduct.

7. Community Presence and Popularity Clause:

I acknowledge that as a Glow Certified Auditor (GCA), it is imperative to maintain a low profile within the community to ensure unbiased and fair auditing processes. I agree that:

- If I previously expressed thoughts or opinions publicly, I understand these should not influence my role as a GCA.
- I will not leverage my position or knowledge gained as a GCA to become a known figure within the Glow ecosystem, recognizing the importance of an unbiased and impartial audit process.

## Signature

The undersigned hereby agrees to the above terms and confirms that all statements made are true and accurate to the best of my knowledge.

Name: Fatima Khaziyeva

Signature: Patima Khaziyeva

Date: September 17th, 2024