Audit Report - Solar Farm #435	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 #435

### Overview

GCA: Fatima Khaziyeva

Location: 3768 Market St, West Valley City, UT 84119, USA **Coordinates**: 40.69030627324985, -111.96002547517456

Solar Panels: Quantity: 24

Brand and Model: CS6R-395MS by Canadian Solar

Warranty: 25 years

System Wattage Output: 9.48 kW-DC | 6.96 kW-AC

Installation and Operations:

Installation Date: After March 18, 2024

PTO Date: N/A **Short ID: 435** 

Carbon Footprint & Production:

Average Sunlight per day: 4.8216 hours **Adjusted Weekly Carbon Credits = 0.1398 Weekly Total Carbon Debt = 0.0577** 

**Net Carbon Credit Earnings Weekly = 0.0822** 

**Protocol Fees:** \$16,789.78

# 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 #435	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.	40.69030627324985, -111.96002547517456	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.	9.48 kW-DC   6.96 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.	3768 Market St, West Valley City, UT 84119, 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 four rows of panels. Each row has 6 panels, for a total of 24 panels.  The house is a duplex with 2800 W 3785 S, which also has solar panels as part of the Glow Ecosystem.	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	CS6R-395MS by Canadian Solar	Planset [p.10]
model of the solar panels installed		Audit pictures
Inspected the Manufacturer Warranty Document to verify the warranties provided for the solar panels	25-year warranty by Canadian Solar	Planset [p.10]
Conducted on-site verification to confirm the installation method of the solar panels	Installed professionally.	Audit pictures

### 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 'Assumption Documentation'.

**Coordinates**: 40.69030627324985, -111.96002547517456

**Average Sunlight per day:** 4.8216 hours **Carbon Credit Production per MWh:** 0.6723

#### Calculations:

http://95.217.194.59:35015/api/v1/geo-stats?latitude=40.69030627324985&longitude=-111.9600 2547517456

# **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	The solar farm owner's signature authorizing the	Residential Solar

farm owner's signature authorizing the list of information permitted for online publication	list of information for online publication has been inspected and confirmed.	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	The carbon payment plan is an automated process, subtracted directly from the farm's weekly carbon credit production. This system does not involve any actual monetary transfers. Additionally, a crucial safeguard is in place whereby an owner cannot default on these carbon payments, as auditors will not certify any farm whose debt payments exceed its capacity to offset.  Adjusted Weekly Carbon Credits = 0.1398 Weekly Total Carbon Debt = 0.0577 Net Carbon Credit Earnings Weekly = 0.0822	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 'Assumption Documentation'.

### **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 'Residential Solar Energy System Purchase Agreement'.

### 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 'Auditor Disclosure and Declaration Document'. 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 17th, 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)	0.00948	based on solar production (see planset doc)	total carbon debt adjusted (KWh)	3.1104	calculated above
Hours of Sunlight Per Day	4.8216	based on NASA data API	Power Output (MWh)	0.00948	based on solar production (see planset doc)
Weekly Power Production (MWh)	0.3200		convert to KW	9.4800	conversion
Carbon Offsets per MWh	0.6723	based on WattTime data API	Total Carbon Debt produced	29.4866	
Weekly Carbon Credits	0.2151		disaster risk assessement per year	0.0017	see assumption document
adjustment due to uncertainty	0.3500	see assumption document	Commitment (y)	10.0000	see assumption document
Adjusted Weekly Carbon Credits	0.1398		Adjusted Total Carbon Debt	29.9827	
			Weekly Total Carbon Debt	0.0577	
NET Carbon Credit Earnings weekly	0.0822				

Year Electricity Old Price tricity Price (paid by user) (in kW) mW	value	Protocol fees calculations  details	Address: Coordinates:	3768 Market St, West Valley City, UT 84119, US 40.69030627324985, -111.96002547517456	JA
tricity Price (paid by user) (in kW)					
		see electrical usage bill (August 2024)	API Link:	http://05.217.104.50:35015/api/s1/goo.stats2lati	itude=40.69030627324985&longitude=-111.9600254751745
		conversion	input average_sunlight	4.8215814794521	.tude=40.69050627524965&i0figitude=-111.9600254751745
ight Per Day		based on NASA data API	input average_carbon_certificates		
(MWh)		based on solar production (see planset doc)	system size	9.48 kW-DC   6.96 kW-AC	
(WWWII) /S	365.25			9.46 KW-DC   6.96 KW-AC	
	\$2,548.30		# of panels	24	
ciricity Old Price	\$2,548.30				
	value	details			
ctricity Old Price	\$2,548.30	calculated above			
		see escalator reference for UT: https://www.solarreviews.com/blog/average-electricity-cost-increase-per-	rear		
	\$28,509.29				
ocol Cash Requirements	value	details			
count	11.00%	see assumption document			
years)	10				
	\$28,509.29	Calculated above			
	\$16,789.78				
9S	\$16,789.78				
	Detailed	d Energy Cost Calculation - August 2024			
ge	1774		details		
2 kWh	0.103725				
k 2 kWh	0.11721		Out of the 4 charges from Rocky I in efforts to not under estimate the	Mountain Power, block 2 is also the higher charge. e fee.	That was used to calculate the protocol fee
e per kWh	0.11047		To calculate the most accurate co used, here is the link for Rocky M	st of power over the course of a year, the average ountain Power charges: https://www.rockymountai	of winter block 2 and summer block 2 was nower.
			net/content/dam/pcorp/documents	s/en/rockymountainpower/rates-regulation/utah/rate	es/001_Residential_Service.pdf
usane (usane y Averane Price)	105 060				
usage (usage X Average Filice)	193.909				
	Fee amount				
neray Adiusment					
-					
	11.08				
	74.81				
se Price + Total fees)	270.779				
er kWh (total cost / Total kWh use)	0.1526				
	rage of the block 2	summer and winter charge and multipying the block 2 usage.			
Detailed Account Activity					
TEM 1 - ELECTRIC SERVICE					
METER SERVICE PERIOD	ELAPSE	O METER READINGS METER AMOUNT USED			
lext scheduled read date: 09-20. Date r	nay vary due to sche	duling or weather.			
IEW CHARGES - 08/24		UNITS COST PER UNIT CHARGE			
asic Charge-1p (multi-family)		6.00			
nergy Charge Summer Block 1		00 kwh 0.0902790 36.11			
	1,3				
EW CHARGES - 08/24 - CONTINUED		UNITS COST PER UNIT CHARGE			
nergy Balancing Account		0.1988000 39.20			
ustomer Efficiency Services		0.0384000 9.06			
	ge  2 kWh  x 2 kWh  wage (usage x Average Price)  ber kWh  usage (usage x Average Price)  bergy Adjusment cing Account ciency Service e Infrustructure rgy Sales/Use Tax  x  asse Price + Total fees)  ber kWh (total cost / Total kWh use)  cis based off of the avarage of the su usage is calculated by taking the average of the su us	Image   Imag	Value   Valu	inter Old Electricity Value  \$2,948.30  \$2,948.30    100% see assate intervention for LTT. Interventions controlling intervention accombing intervention accombi	inter Died Electricity Value

=.00 . 000	
Home Electric Lifeline Program	0.16
Municipal Energy Sales/use Tax 0.0600000	15.11
Utah Sales Tax 0.0440000	11.08
Late Payment Charge 0.0100000	1.75
Total New Charges	279.88
Total How Undigot	275.00

# Appendix - Protocol fees - Proof of payment

### **Transaction hash:**

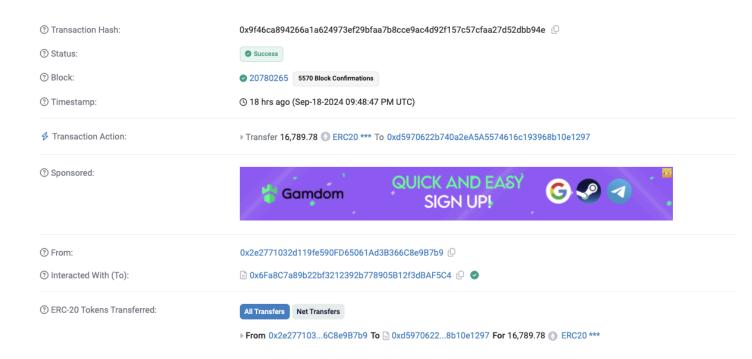
0x9f46ca894266a1a624973ef29bfaa7b8cce9ac4d92f157c57cfaa27d52dbb94e

### **Etherscan link:**

https://etherscan.io/tx/0x9f46ca894266a1a624973ef29bfaa7b8cce9ac4d92f157c57cfaa27d52dbb94e

Amount paid: 16,789.78 USDG

Date of payment: Sep-18-2024 09:48:47 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

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 the GCA on March 18th, 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 \$0.1526 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:

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

### 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:

- NREL harmonized life cycle assessments (LCAs)
- 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
- https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1530-9290.2011.00423.x 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

0	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: Tatima Khaziyeva

Date: September 19, 2024