CONNECTICUT
GREEN BANK ℠

Board of Directors

Meeting Date

April 22, 2022

Board of Directors

April 15, 2022

Dear Connecticut Green Bank Board of Directors:

We have a meeting of the Board of Directors scheduled on Earth Day for **Friday, April 22, from 9:00-11:00 a.m.**

Please take note that this will be an online meeting.

For the agenda, we have the following:

- **Consent Agenda** – we have several items on the consent agenda, including a few items requiring resolutions, including:

  ▪ Meeting Minutes for March 25, 2022
  ▪ Less than $500,000 and No More in Aggregate than $1,000,000 – C-PACE transaction of approximately $115,000
  ▪ Extension to close request for C-PACE project in Hartford
  ▪ Request to extend Groton Subbase Fuel Cell Park project through June 30, 2022

  You will note that I have also included the Green Bank's progress to targets memo through Q3 of FY22. We will provide more detailed updates further on in the agenda.

- **Investment Updates and Recommendations** – through Green Bank Capital Solutions, Bert will present two (2) exciting investment opportunities, including battery storage financing for vulnerable communities (i.e., low- to moderate-income single family), and small business energy efficiency financing as a service [Note – materials are coming COB on Tuesday, April 19].

- **Financing Program Updates and Recommendations** – Mackey will provide an update on progress to targets for Financing Programs.

- **Incentive Program Updates and Recommendations** – Eric will present a 3-year contract to Guidehouse through a competitive request for proposals ("RFP") for evaluation, measurement, and verification ("EM&V") services for the Energy Storage Solutions Program [Note – materials are coming COB on Tuesday, April 19], and Sergio will provide an update on progress to targets for Incentive Programs.

- **Environmental Infrastructure Program Update** – I will provide a quick update on the status for stakeholder engagement and our up-coming offsite strategic retreat. I included a sample stakeholder engagement and research report for "land conservation" so you can see how we are assembling this feedback.

- **Lawrence Berkeley National Laboratory** ("LBNL") – I am still working out the details, but we may have the US Department of Energy present a study conducted by LBNL on the "Long-Term Performance of Energy Efficiency Loan Portfolios," which includes the Smart-E Loan. I have included the report through the State Energy Efficiency Action (SEE Action) Network for your perusal.

This is an exciting agenda given the Green Bank Capital Solutions proposals, the updates on programs, and the possibility of LBNL joining us!

Also, for those of you interested in purchasing Green Liberty Notes, you can do so at www.greenlibertynotes.com

Until then, enjoy the long holiday weekend.

Sincerely,

Bryan Garcia
President and CEO

CONNECTICUT GREEN BANK℠

AGENDA

Board of Directors of the
Connecticut Green Bank
75 Charter Oak Avenue
Hartford, CT 06106

Friday, April 22, 2022
9:00 a.m.– 11:00 p.m.

Dial (669) 224-3412
Access Code: 710-095-013

Staff Invited: Sergio Carrillo, Mackey Dykes, Brian Farnen, Bryan Garcia, Bert Hunter, Jane Murphy, and Eric Shrago

1. Call to order

2. Public Comments – 5 minutes

3. Consent Agenda – 5 minutes

4. Investment Updates and Recommendations – 45 minutes

    a. Green Bank Capital Solutions – PosiGen and Generac
    b. Green Bank Capital Solutions – Budderfly

5. Financing Programs Updates and Recommendations – 10 minutes

    a. Progress to Target Updates

6. Incentive Programs Updates and Recommendations – 10 minutes

    a. Evaluation, Measurement and Verification for Energy Storage Solutions – Guidehouse
    b. Progress to Target Updates

7. Environmental Infrastructure Updates – 10 minutes

8. Lawrence Berkeley National Laboratory – 30 minutes

9. Adjourn

Join the meeting online at
https://global.gotomeeting.com/install/710095013

Or call in using your telephone:
Dial (669) 224-3412
Access Code: 710-095-013

Next Regular Meeting: Friday, June 24, 2022 from 9:00-11:00 a.m.
Colonel Albert Pope Room at the
Connecticut Green Bank, 75 Charter Oak Avenue, Hartford

RESOLUTIONS

Board of Directors of the
Connecticut Green Bank
75 Charter Oak Avenue
Hartford, CT 06106

Friday, April 22, 2022
9:00 a.m.– 11:00 p.m.

Dial (669) 224-3412
Access Code: 710-095-013

Staff Invited: Sergio Carrillo, Mackey Dykes, Brian Farnen, Bryan Garcia, Bert Hunter, Jane Murphy, and Eric Shrago

1.   Call to order

2.   Public Comments – 5 minutes

3.   Consent Agenda – 5 minutes

Resolution #1

Motion to approve the meeting minutes of the Board of Directors form March 25, 2022.

Resolution #2

WHEREAS, on January 18, 2013, the Connecticut Green Bank (the "Green Bank") Board of Directors (the "Board") authorized the Green Bank staff to evaluate and approve funding requests less than $300,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Green Bank Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $500,000 from the date of the last Deployment Committee meeting, on July 18, 2014 the Board increased the aggregate not to exceed limit to $1,000,000 ("Staff Approval Policy for Projects Under $300,000"), on October 20, 2017 the Board increased the finding requests to less than $500,000 ("Staff Approval Policy for Projects Under $500,000"); and

WHEREAS, Green Bank staff seeks Board review and approval of the funding requests listed in the Memo to the Board dated April 22, 2022 which were approved by Green Bank staff since the last Deployment Committee meeting and which are consistent with the Staff Approval Policy for Projects Under $500,000;

NOW, therefore be it:

1

RESOLVED, that the Board approves the funding requests listed in the Memo to the Board dated April 22, 2022 which were approved by Green Bank staff since the last Deployment Committee meeting. The Board authorizes Green Bank staff to approve funding requests in accordance with the Staff Approval Policy for Projects Under $500,000 in an aggregate amount to exceed $1,000,000 from the date of this Board meeting until the next Deployment Committee meeting.

Resolution #3

WHEREAS, pursuant to Conn. Gen. Stat. 16a-40g (the "Act") the Connecticut Green Bank ("Green Bank") is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy ("C-PACE");

WHEREAS, pursuant to the C-PACE program, the Connecticut Green Bank Board of Directors (the "Board") or the Connecticut Green Bank Deployment Committee ("DC"), as may be applicable, approved and authorized the President of the Green Bank to execute financing agreements for the C-PACE projects described in the Memo submitted to the Board on April 14, 2022 (the "Finance Agreements");

WHEREAS, the Finance Agreements were authorized to be consistent with the terms, conditions, and memorandums submitted to the Board or DC, as may be applicable, and executed no later than 120 days from the date of such Board or DC approval; and

WHEREAS, due to delays in fulfilling pre-closing requirements the Green Bank will need more time to execute the Finance Agreements.

NOW, therefore be it:

RESOLVED, that the Board extends authorization of the Finance Agreements to no later than 120 days from April 22, 2022 and consistent in every other manner with the original Board authorization for the Finance Agreement.

WHEREAS, in accordance with (1) the statutory mandate of the Connecticut Green Bank ("Green Bank") to foster the growth, development, and deployment of clean energy sources that serve end-use customers in the State of Connecticut, (2) the State's Comprehensive Energy Strategy ("CES") and Integrated Resources Plan ("IRP"), and (3) Green Bank's Comprehensive Plan (the "Comprehensive Plan") in reference to the CES and IRP, Green Bank continuously aims to develop financing tools to further drive private capital investment into clean energy projects;

Resolution #4

WHEREAS, FuelCell Energy, Inc., of Danbury, Connecticut ("FCE") has used previously committed funding (the "Bridgeport Loan") from Green Bank to successfully develop a 15 megawatt fuel cell facility in Bridgeport, Connecticut (the "Bridgeport Project"), and FCE has operated and maintained the Bridgeport Project without material incident, is current on payments under the Bridgeport Loan;

WHEREAS, FCE has requested financing support from the Green Bank to develop a 7.4 megawatt fuel cell project in Groton, Connecticut located on the U.S. Navy submarine base and

supported by a power purchase agreement ("PPA") with the Connecticut Municipal Electric Energy Cooperative ("CMEEC") (the "Navy Project");

WHEREAS, staff has considered the merits of the Navy Project and the ability of FCE to construct, operate and maintain the facility, support the obligations under the Loan throughout its 20-year term, and as set forth in the due diligence memorandum (the "Board Memo") dated December 18, 2020, recommended this support be in the form of a term loan not to exceed $8,000,000, secured by all project assets, contracts and revenues as well as a pledge of revenues from an unencumbered project as explained in the Board Memo (the "Credit Facility");

WHEREAS, on the basis of that recommendation, the Green Bank Board of Directors ("Board") approved of the Credit Facility, in an amount not to exceed $8,000,000 with the provision that the Credit Facility be executed no later than 315 days from the date of authorization by the Board (June 16, 2021), which was further extended by the Board in July 2021 to October 29, 2021, which was further extended by the Board in October 2021 to December 31, 2021, which was further extended by the Board in December 2021 to January 31, 2022, which was further extended by the Board in January 2022 to March 31, 2022, and which was further extended by the Board in March 2022 to May 31, 2022;

WHEREAS, Green Bank staff has further advised the Board that the closing for the Credit Facility may close in early June 2022 and to accommodate the additional time that might be needed to execute the Credit Facility requests the permitted time to execute the credit facility be increased from not later than 529 days from the original date of authorization by the Board (May 31, 2022) to not later than 559 days from the date of authorization by the Board (i.e., to June 30, 2022);

NOW, therefore be it:

RESOLVED, that the Green Bank Board hereby approves the extension of time for the execution of the Credit Facility to not later than 559 days from the original date of authorization by the Board (i.e., not later than June 30, 2022);

RESOLVED, that the President of the Green Bank and any other duly authorized officer is authorized to take appropriate actions to provide the Credit Facility to FCE (or a special purpose entity wholly-owned by FCE) in an amount not to exceed $8,000,000 with terms and conditions consistent with the memorandum submitted to the Board dated December 18, 2020 (the "Memorandum"), and as he or she shall deem to be in the interests of the Green Bank and the ratepayers; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the Term Loan and participation as set forth in the Memorandum.

4.   Investment Updates and Recommendations – 45 minutes

a. Green Bank Capital Solutions – PosiGen and Generac

Resolution #5

WHEREAS, the Connecticut Green Bank ("Green Bank") has an existing partnership with PosiGen, Inc. (together with its affiliates and subsidiaries, "PosiGen") to support PosiGen in delivering a solar lease and energy efficiency financing offering to LMI households in Connecticut;

WHEREAS, PosiGen is planning to expand its offerings to LMI households in Connecticut to include an affordable battery energy storage system ("BESS") option that will provide the customer backup power during a power outage and will reduce peak demand on the electric distribution system, as more fully explained in a memorandum dated April 15, 2022 to the Green Bank Board of Directors (the "Board Memo");

NOW, therefore be it:

RESOLVED, that the Green Bank may advance a working capital line to PosiGen for the purchase of battery energy storage systems not to exceed $2 million on the terms substantially similar to those described in the Board Memo;

RESOLVED, that the Green Bank may further advance up to $6 million in term loan financing to PosiGen by periodically converting such working capital advances (or any cash purchased eligible collateral owned by PosiGen or its subsidiaries that is backed by customer contracts for BESS systems) on terms substantially similar to those described in the Board Memo; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

b. Green Bank Capital Solutions – Budderfly

Resolution #6

RESOLVED, that the Connecticut Green Bank ("Green Bank") is authorized to enter into a six (6) year subordinated term loan agreement with Budderfly, Inc. in a maximum cash advanced amount of $5,000,000 together with any ancillary documentation in respect of same, as more fully explained in the memorandum to the Green Bank Board of Directors (the "Board") dated April 18, 2022; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

5. Financing Programs Updates and Recommendations – 10 minutes

    a. Progress to Target Updates

6. Incentive Programs Updates and Recommendations – 10 minutes

a. Evaluation, Measurement and Verification for Energy Storage Solutions – Guidehouse

Resolution #7

WHEREAS, the Public Utilities Regulatory Authority (PURA) ordered the Green Bank, Eversource, and United Illuminating to co-administer a battery storage incentive program and as program co-administrators, the three are jointly responsible for the Evaluation, Measurement and Verification (EM&V) of the Energy Storage Solutions Program;

WHEREAS, the co-administrators need EM&V consulting support to independently assess the program's impact and ensure that it is achieving the established benefit-cost analyses; and

WHEREAS, the three co-administrators issued a joint request for proposal for partners and received 4 responses and ultimately selected the consultant as the EM&V partner for the program for the first three-year program cycle (2022-2024);

NOW, therefore be it:

RESOLVED, that the Green Bank Board of Directors authorizes staff to enter into a three-year contract with Guidehouse, Inc. for Evaluation, Measurement, and Verification Services related to the Energy Storage Solutions Program in an amount not to exceed $1 million; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the Term Loan and participation as set forth in the Memorandum.

b. Progress to Target Updates

7. Environmental Infrastructure Updates – 10 minutes

8. Lawrence Berkeley National Laboratory – 30 minutes

9. Adjourn

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PLEASE USE BOARD EFFECT

ANNOUNCEMENTS

- **Mute Microphone** – in order to prevent background noise that disturbs the meeting, if you aren't talking, please mute your microphone or phone.

- **Chat Box** – if you aren't being heard, please use the chat box to raise your hand and ask a question.

- **Recording Meeting** – we continue to record and post the board meetings.

- **State Your Name** – for those talking, please state your name for the record.

Board of Directors Meeting

April 22, 2022

Online Meeting

Board of Directors

Agenda Item #1
Call to Order

Board of Directors

Agenda Item #2
Public Comments

Board of Directors

Agenda Item #3
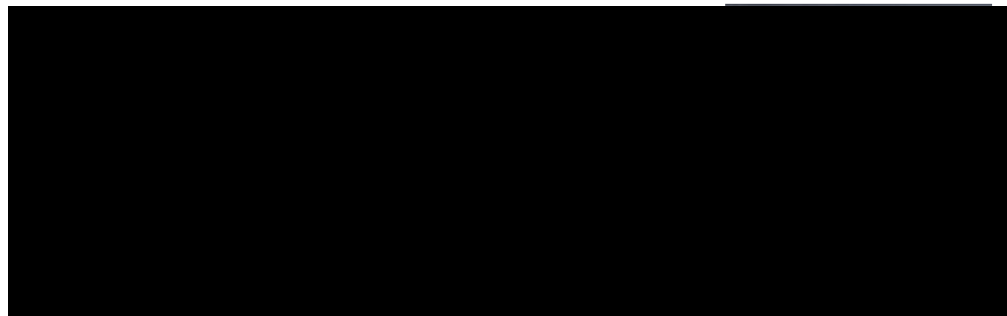Consent Agenda

Consent Agenda
Resolutions #1 through #4

1. **Meeting Minutes** – approve meeting minutes of March 25, 2022

2. **Less than $500,000 and No More in Aggregate than $1,000,000** – staff approval of 3 C-PACE transactions totaling approximately $460,000

3. **C-PACE Project in Hartford** – extension of time to close the project by additional 120 days from April 22, 2022

4. **Groton Subbase FuelCell Energy Project** – extension of time to close the project by June 30, 2022

■ **Progress to Targets** – update on Green Bank progress to targets through Q3 of FY22

Board of Directors
Agenda Item #4a
Investments
Green Bank Capital Solutions
PosiGen and █████████

PosiGen <> ████████
Strategic Partnership LMI Solar + Storage

CONNECTICUT GREEN BANK

SOLAR + STORAGE FOR ALL!

Save Money with Solar and EE and Improve Resiliency with Battery Storage

PosiGen®
Solar Energy and Energy Efficiency

Overview

- 9-year declining incentives – Goal of 580 MW behind-the-meter storage for residential and non-residential end-use customers

- Statewide goal of 1000 MW, including front-of-the-meter

CUSTOMER CLASS	2022-2024	2025-2027	2028-2030	TOTAL
Residential	50 MW	100 MW	140 MW	290 MW
Commercial and Industrial	50 MW	100 MW	140 MW	290 MW
Total	**100 MW**	**200 MW**	**280 MW**	**580 MW**

Benefits

1. **<u>Cost-Effectiveness</u>** – ensure there is net benefit to electric customers

2. **<u>Resilience</u>** – maximize the deployment of battery storage to improve the overall resilience of the participants and the grid

3. **<u>Serve Vulnerable Communities</u>** – deploy no less than 40 percent of residential installations in vulnerable communities (e.g., low income, distressed, affordable housing)

4. **<u>Economic Development</u>** - foster the sustained orderly development of a local battery storage industry

Residential Incentive Levels

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Upfront Incentive Levels (Installed 2022-2024)

Capacity Block (MW)	Standard	Underserved	Low-Income	Weighted Average
Participation Level	*60%*	*30%*	*10%*	
10	$200/kWh	$300/kWh	$400/kWh	
15	$170/kWh	$255/kWh	$340/kWh	$196.55/kWh
25	$130/kWh	$195/kWh	$260/kWh	

Performance Incentive Levels (Installed 2022-2024)

Summer, Years 1-5	Winter, Years 1-5	Summer, Years 6-10	Winter, Years 6-10
$200/kW	$25/kW	$115/kW	$15/kW

PosiGen <> ███████ Strategic Partnership

- **PosiGen's RSIP + future customers**
- ███████ kWh battery … ███████ product
- Focus on Affordable Backup Solution for its Customers
- PosiGen will pay for the purchase, installation, and maintenance of the battery (with ███████ warranty service)
- Customer pays nothing upfront with either a small / no increase in pmt
- Incentives that make this possible:
  - Upfront incentive offered through the Energy Storage Solutions Program
  - Federal Investment Tax Credit (currently available when storage is paired with solar)
  - Incentive payments through the ESS Program - passive and active dispatch activities
- ███████ guarantees active dispatch incentive payments to PosiGen, regardless of actual performance - within 30 days of pmt from program

Capital Solutions Facility

- **<u>$2 million working capital line</u>** to support the purchase of hardware
    - Purchase of hardware, including the ▮▮▮▮▮▮ storage systems (will not be used to pay for soft costs so will be **fully collateralized via the inventory purchased**)
    - Not to exceed $2 million
    - Allows PosiGen to purchase approximately **150 ▮▮▮▮▮▮ systems at a time**, which should coincide with projected near-term sales volume as the program rolls out
    - Fixed 2% interest rate per annum
    - Allowed to revolve for a **2-yr draw** period (subject to extension by PosiGen in Green Bank's sole discretion), but specific assets purchased under the facility **must convert to collateral for the Term Loan within 180 days** or be repaid at the end of such 180-day advance period.

Capital Solutions Facility

- **$6 million term loan** sized to future dispatch incentive payments, which (from a performance perspective) are guaranteed by ███████

  - 100% advance against the present value (at 4.5%) of the ███████ guaranteed payments and any customer payments (**1st lien ~ our PBI LOC**)

  - ███████ is the credit counterparty, and the guaranteed payments limit PosiGen's exposure to performance risk

  - Most, if not all, of the revenues will come from ███████

  - Anticipated to cover an estimated 1,000 installations over 2 year period

  - Amortizes fully over 10 years, which is tied to the EUL of underlying asset

  - Fixed interest rate per annum as follows:

    - LMI / Distressed Communities Portion (up to $6,000,000): 4%

    - Non-LMI / Distressed Communities Portion (not to exceed lesser of (a) $2,400,000 or (b) $6,000,000 less LMI Portion advanced): 5%

- **PosiGen is an established borrower – 7 year history – current on existing credit facilities ($1.8m 2nd lien facility & $8.8m 1st lien PBI facility)**

Resolution #5

NOW, therefore be it:

RESOLVED, that the Green Bank may advance a working capital line to PosiGen for the purchase of battery energy storage systems not to exceed $2 million on the terms substantially similar to those described in the Board Memo;

RESOLVED, that the Green Bank may further advance up to $6 million in term loan financing to PosiGen by periodically converting such working capital advances (or any cash purchased eligible collateral owned by PosiGen or its subsidiaries that is backed by customer contracts for BESS systems) on terms substantially similar to those described in the Board Memo; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

Board of Directors
Agenda Item #4b
Investments
Green Bank Capital Solutions
Budderfly

Budderfly
CT-Based Energy Efficiency as a Service Company

The average building in the U.S. wastes 30% of the energy it consumes[1]

- Inefficient lighting
- Outdated or poorly maintained HVAC equipment
- Equipment and lighting left on overnight
- Unoptimized equipment start-up and sequencing
- Lack of occupancy sensors

- Lack of automated load controls
- Unnecessary vending machine cooling & lighting
- Improperly operating dampers
- Excessive refrigeration
- No centralized energy management system

$45 Billion annually in avoidable expense[2]

43% More greenhouse gas emissions

$150 Billion of additional investment required in renewables[3]

(1) US Environmental Protection Agency Promoting Energy Efficiency with ENERGY STAR.
(2) Assumes 30% of 1,325 TWh of commercial electricity consumption at an average billed rate of $0.112/KWh in 2021 as reported by the EIA was wasted.
(3) Based on 150 GW of additional renewables required to replace 1,325 TWh of fossil generation. Assumes an average capital cost and capacity factor for wind and solar of $1,000 per kW and 30%, respectively.

Budderfly
CT-Based Energy Efficiency as a Service Company

CONNECTICUT GREEN BANK

BUSINESSES WANT TO ELIMINATE WASTE AND BE MORE SUSTAINABLE, BUT...

...don't always know the magnitude of the problem/opportunity	...don't have inhouse expertise to identify and implement solutions	...won't risk investing in upgrades they aren't sure will deliver savings
• No individual load measurement • No regular energy auditing • No comparison to peer data	• Typically no dedicated energy management function • Hundreds of offerings and vendors • Constantly evolving technology	• Savings require upfront investment • Risky to make investments without inhouse expertise • Competing capital priorities

Budderfly
CT-Based Energy Efficiency as a Service Company

Budderfly's Business Model
## CT-Based Energy Efficiency as a Service Company

Budderfly pays for the energy efficiency upgrades and owns the equipment

- Specify upgrades to achieve desired savings
- Select contractors and manage installation
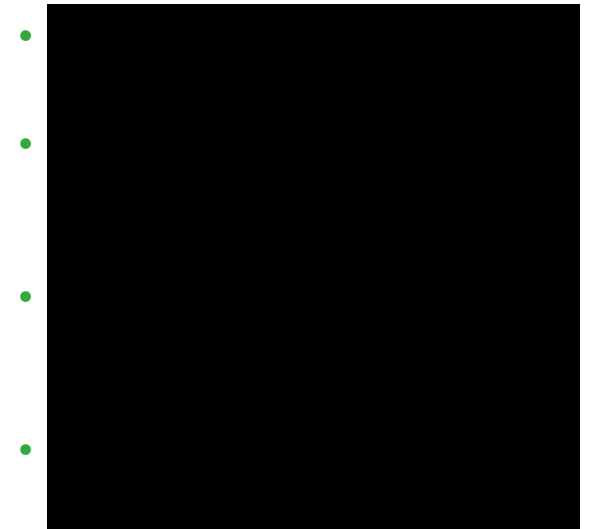- Install submeters to measure usage
- Maintain the equipment

Customer signs EaaS contract with Budderfly and we assume the location's utilities

- ████ contracts with an automatic renewal
- ████
- ████
- ████
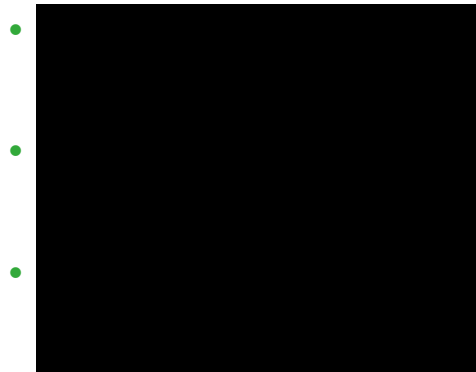
Customer makes recurring monthly payments to Budderfly through the contract term

- ████
- ████
- ████
- ████

One payment for energy that delivers savings, sustainability and reporting

CONNECTICUT **GREEN BANK**

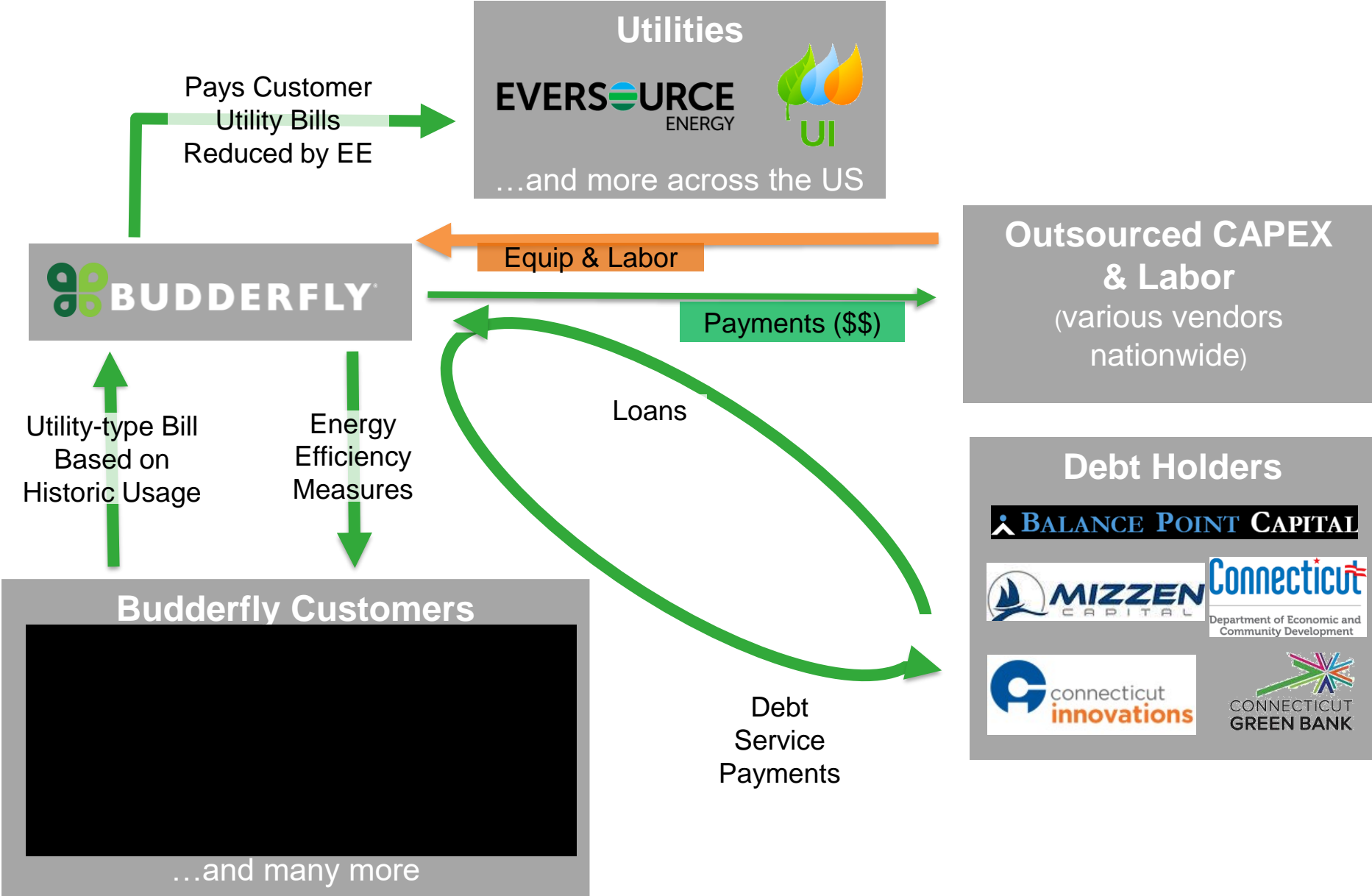| History	• Founded in 2017 by Al Subbloie, CEO • Shelton, CT HQ
Business Model	• • •
Customer Base	• •
Energy Impact	**CT: 5,814 MWh savings projected in 2022** US: 51,815 MWh savings projected in 2022
Job Creation	CT: **76** jobs, paying average salary of $105k (DECD Goal: **259**) US: 114 total jobs in 2021
Investment in EE	**CT: ~15% (circa** **)** Rest of US: ~85% (circa
Growth Targets	**EBITDA:** **Locations**

Budderfly's Analytics & Reporting

Monitor energy usage, reduce energy consumption, lower operating and maintenance costs, and realize economic and environmental benefits

**Customized Energy Portal & Reporting**

Budderfly Capital Flow

CONNECTICUT GREEN BANK

Utilities

EVERSOURCE ENERGY · UI

…and more across the US

Pays Customer Utility Bills Reduced by EE

BUDDERFLY

Equip & Labor

Payments ($$)

Outsourced CAPEX & Labor
(various vendors nationwide)

Utility-type Bill Based on Historic Usage

Energy Efficiency Measures

Loans

Debt Service Payments

Budderfly Customers

…and many more

Debt Holders

BALANCE POINT CAPITAL

MIZZEN CAPITAL

Connecticut Department of Economic and Community Development

connecticut innovations

CONNECTICUT GREEN BANK

Client Market & Ownership

These ▮ states account for ▮▮▮ of Budderfly's billing volume, with ▮▮▮ of volume in CT, NY, NJ, MA & RI (See Appendix C: December 2021 billing volume):
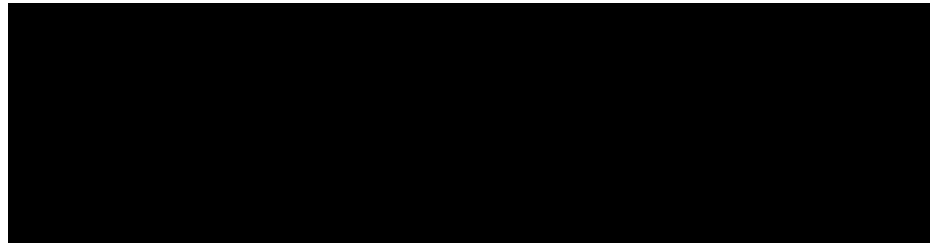
Equity by Investor
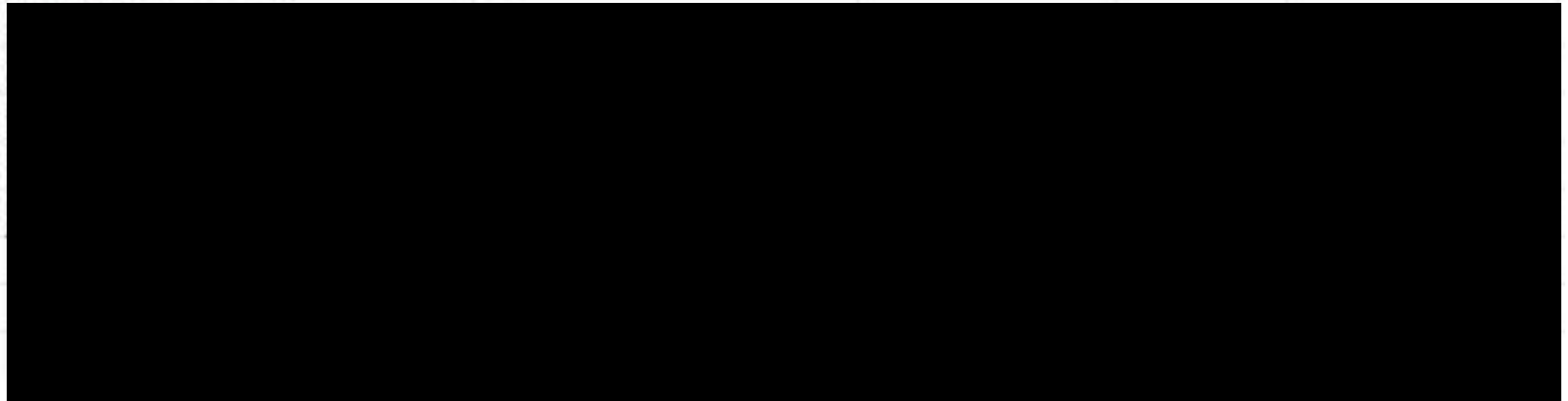
Management

Al Subbloie · 1st
President, CEO and Founder at Budderfly

Thomas Flynn · 2nd
Vice President Corporate Strategy & General Counsel

Peter J. Dacey · 2nd
Chief Financial Officer at Budderfly

Chris DeBenedictis (He/Him) · 2nd
Vice President, Technology
Budderfly LLC

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Summary Balance Sheet

Budderfly, Inc.			
Balance Sheet			
Period Ended December 31, 2021	**Dec-21**	**Dec-20**	**Dec-19**
Current Assets			
Cash	$		
Accounts Receivable			
Inventory			
Prepaids			
Other			
Total Current Assets			
Fixed Assets, net			
Total Other Assets			
TOTAL ASSETS	$		
Current Liabilities			
Accounts Payable	$		
Other Current Liabilities	$		
Total Current Liabilities			
Long Term Liabilities			
Total LIABILITIES			
Common/Pref/Paid in Capital			
Other Comprehensie Loss			
Retained Earnings (Deficit)			
Total Equity			
TOTAL LIABILITIES & EQUITY	$		

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CONNECTICUT **GREEN BANK**

Budderfly, Inc.						
Profit & Loss Statement	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
	AUDITED	**AUDITED**	**UNDER AUDIT**	**FORECAST**	**FORECAST**	**FORECAST**
EMO Revenue						
Incentive & Other Revenue						
MaaS Revenue						
ESA Revenue						
Total Gross Revenue						
Utility/EMO Expense						
Net Revenue						
Net Revenue Margin						
Gross Profit (Loss)						
Sales & Marketing						
R&D Development						
G&A (including product mgmt)						
Total Operating Expense						
Income (Loss) from Operations						
Operating Margin						
One Time Expenses						
Other Income						
Interest Expense						
Net Income (Loss) Before Taxes						
Income Taxes						
Net Income (Loss)						
CAPEX						
EBITDA Addbacks						
Operating Income (Loss)						
Depreciation						
Amortization						
Stock Comp						
Adjusted EBITDA						
EBITDA Margin						

Deal Structure: $5mm Loan Facility

Capital Stack	<u>Senior Debt</u> • ███████████████████████████████ • ███████████████████████████████ <u>Junior Debt – Pari Passu</u> • ████████████████████ • ███████████████████ • ████████████████████
Deal Structure	• Interest Rate: ██████████████████████████████ • Facility Fee: ███████████████████████ • ████ PIK interest in first 12 months, minimum cash pay of ██████ (I-O) • Budderfly pays CGB's legal costs
Amortization	Amortize principal plus PIK beginning after 12 months, over a 5-year term i.e. 60 equal monthly payments beginning in month 13
Warrant Coverage	██

Resolution #6

RESOLVED, that the Connecticut Green Bank ("Green Bank") is authorized to enter into a six (6) year subordinated term loan agreement with Budderfly, Inc. in a maximum cash advanced amount of $5,000,000 together with any ancillary documentation in respect of same, as more fully explained in the memorandum to the Green Bank Board of Directors (the "Board") dated April 18, 2022; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

Board of Directors

Agenda Item #5a
Financing Programs
Progress to Targets Update

Financing Programs
FY 2022 Update

Product/ Program	Projects			Capital Deployed			Capacity (MW)		
	Closed	Target	% to Target	Closed	Target	% to Target	Closed	Target	% to Target
Commercial PPA	7	37	19%	$1,783,146	$17,652,000	10%	0.8	11.0	7%
CPACE	11	30	37%	$9,520,570	$22,838,680	42%	1.5	6.3	24%
CPACE Solar PPA	1	0	0%	$491,502	$0	0%	0.3	0.0	0%
SBEA	502	614	82%	$8,190,216	$9,260,800	88%	0.0	0.0	0%
MFH H&S	0	1	0%	$0	$600,000	0%	0.0	0.0	0%
MFH Pre-Dev	0	0	0%	$0	$0	0%	0.0	0.0	0%
MFH Term	3	2	150%	$2,060,000	$300,000	687%	0.9	0.2	450%
Strategic Investments	0	0	0%	$0	$0	0%	0.0	0.0	0%
Total	**522**	**679**	**77%**	**$20,951,480**	**$48,951,480**	**41%**	**2.6**	**16.5**	**15%**

Financing Programs
FY 2022 Update – C-PACE

	Actual	Goal	Actual	Goal
	Number of Projects	Number of Projects	Total Capital Deployed	Total Capital Deployed
CGB	4	10	$ 3,688,801.00	$ 3,400,000.00
CPACE backed PPA	1	4	$ 491,502.00	$ 1,500,000.00
Total CGB CPACE	**5**	**14**	**$ 4,180,303.00**	**$ 4,900,000.00**
Total 3rd Party CPACE	**7**	**19**	**$ 5,831,769.00**	**$ 10,300,000.00**
Total CPACE	**12**	**33**	**$ 10,012,072.00**	**$ 15,200,000.00**

Financing Programs
FY 2022 Update – PPA

	Closed	Pipeline		Total	Goal	% of Goal
		SAP	MAP			
Projects	8	12	11	31	37	84%
Capital Deployed	$ 2,274,648	$ 20,498,000	$3,121,119	$ 25,893,767	$ 22,838,680	113%
Capacity Deployed (MWs)	1.1	9.977	1.843	12.92	11	117%

Board of Directors

Agenda Item #6a
Incentive Programs
Guidehouse EM&V for Energy Storage Solutions

Energy Storage Solutions
EM&V

- **<u>PURA Order</u>** – requires the program administrators to engage a partner to conduct Evaluation, Measurement, & Verification for the program. This includes establishing metrics, producing dashboards, annual reports, and other tasks as ordered by PURA (Emissions Optimization).

- **<u>Competitive RFP</u>** – the Program Administrators issued an RFP to 64 qualified partners and received 4 responses and, with input from OCC & DEEP, selected Guidehouse.

- **<u>5%</u>** – PURA has ordered that EM&V costs not exceed 5% of the total program costs (Estimated at $77.7 Million for the first 3-year cycle). This puts an upper limit on the costs at $3.9 Million, which Guidehouse is coming in well under (estimate is $873K).

Resolution #7

NOW, therefore be it:

RESOLVED, that the Green Bank Board of Directors authorizes staff to enter into a three-year contract with Guidehouse, Inc. for Evaluation, Measurement, and Verification Services related to the Energy Storage Solutions Program in an amount not to exceed $1 million; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the Term Loan and participation as set forth in the Memorandum.

Board of Directors

Agenda Item #6b
Incentive Programs
Progress to Targets

Incentive Programs
FY 2022 Update

Product/ Program	Projects			Capital Deployed			Capacity (MW)		
	Closed	Target	% to Target	Closed	Target	% to Target	Closed	Target	% to Target
RSIP + RSIP-E	1,625	1,732	94%	$59,345,242	$62,969,713	94%	15.8	16.8	94%
Smart-E	644	800	81%	$10,029,991	$11,200,000	90%	0.2	0.8	27%
Solar for All	353	96	368%	$9,924,610	$2,478,528	400%	2.4	0.7	363%
Total	**2,520**	**2,734**	**92%**	**$75,782,387**	**$79,969,713**	**95%**	**17.7**	**20.1**	**88%**

Board of Directors
RSIP Closeout Update

RSIP and RSIP-E
Status Update

CGB Program	Approved Capacity (MW-DC)	Completed Capacity (MW-DC)	Class 1 Approved/ *In Progress*
RSIP	350.0	350.0	350.0
RSIP-E	30.9	24.8	*22.9*
Total	**380.9**	**374.8**	**372.9**

- RSIP has achieved statutory target of 350 MW of deployed projects

- RSIP-E approved incentives for projects through December 2021, with 725 projects or 6.1 MW approved but not yet completed

- Utility-administered tariff program began in January 2022

RSIP and RSIP-E
SHREC and non-SHREC REC updates

Program	REC Type	Capacity (MW-DC)	Project Count	$/REC	Estimated # RECs (1st Year)
RSIP	Non-SHREC RECs	48.8	6,679	various	52,552
RSIP	SHREC T1 (2017)	49.2	6,796	50	53,012
RSIP	SHREC T2 (2018)	59.8	7,258	49	64,433
RSIP	SHREC T3 (2019)	39.3	4,818	48	42,345
RSIP	SHREC T4 (2020)	59.3	6,957	47	63,895
RSIP	SHREC T5 (2021)	61.9	7,264	35	66,696
RSIP	SHREC T6 (2022)	31.6	3,501	34	34,048
RSIP-E	Non-SHREC RECs *in progress*	22.9	2,457	various	24,667
RSIP-E	Non-SHREC RECs *not yet completed or submitted*	8.0	975	various	8,611
	Total	**380.9**	**46,705**		**410,371**

RSIP and RSIP-E
Step Breakdown

Program	Incentive Step	# Projects	Capacity (MW-DC)
RSIP	Step 1	206	1.4
RSIP	Step 2	843	6.0
RSIP	Step 3	1,834	13.1
RSIP	Step 4	2,564	19.1
RSIP	Step 5	1,699	13.0
RSIP	Step 6	1,491	11.6
RSIP	Step 7	2,528	18.9
RSIP	Step 8	3,400	26.9
RSIP	Step 9	3,252	25.9
RSIP	Step 10	3,865	29.8
RSIP	Step 11	2,198	18.1
RSIP	Step 12	1,974	15.9
RSIP	Step 13	2,127	17.5
RSIP	Step 14	8,862	75.9
RSIP	Step 15	6,430	56.9
RSIP Total		**43,273**	**350.0**
RSIP-E	Step 16	1,329	9.9
RSIP-E	Step 17	2,103	21.0
RSIP-E Total		**3,432**	**30.9**
Grand Total		**46,705**	**380.9**

Board of Directors
Energy Storage Solutions (ESS) Update

Energy Storage Solutions

Available Capacity as of 04/18/2022

CONNECTICUT
GREEN BANK

Residential

RESIDENTIAL

668.2 kW SUBMITTED

0 kW APPROVED

As of 04/18/2022, there are 73 applications totaling 668.2 kW of unapproved projects in the residential queue. The current step has 10 MW of capacity

Non-Residential

NON-RESIDENTIAL

56.1 MW SUBMITTED
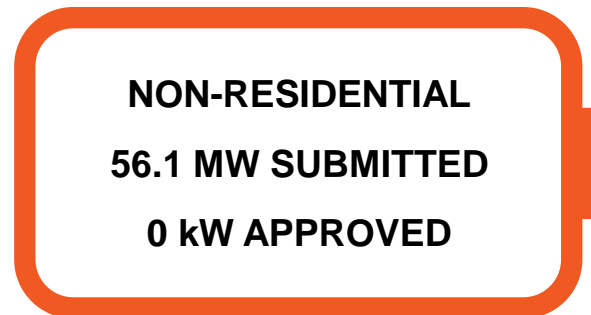
0 kW APPROVED

As of 04/18/2022, there are 35 applications totaling 56.1 MW of unapproved projects in the non-residential queue. The current step has 50 MW of capacity

Board of Directors
Revenue Grade Meter (RGM) Replacement

RGM Replacement Project
Available Capacity as of 04/18/2022

Number of Meters				
	PSA	**Invoiced**	**Installed**	**Remaining**
C-TEC	1,081	506	562	519
ENCON	1,267	626	758	509
SST	2,571	364	675	1,896
Total	**4,919**	**1,496**	**1,995**	**2,924**

Board of Directors

Agenda Item #7
Environmental Infrastructure Programs
Update

Environmental Infrastructure
Comprehensive Plan Timeline and Deliverables

CONNECTICUT GREEN BANK

DEEP Engagement

Governance Amendments

Bond Potential

Stakeholder Engagement

Strategic Retreat

Comp Plan

JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL

2021 ⟶ 2022 ⟶
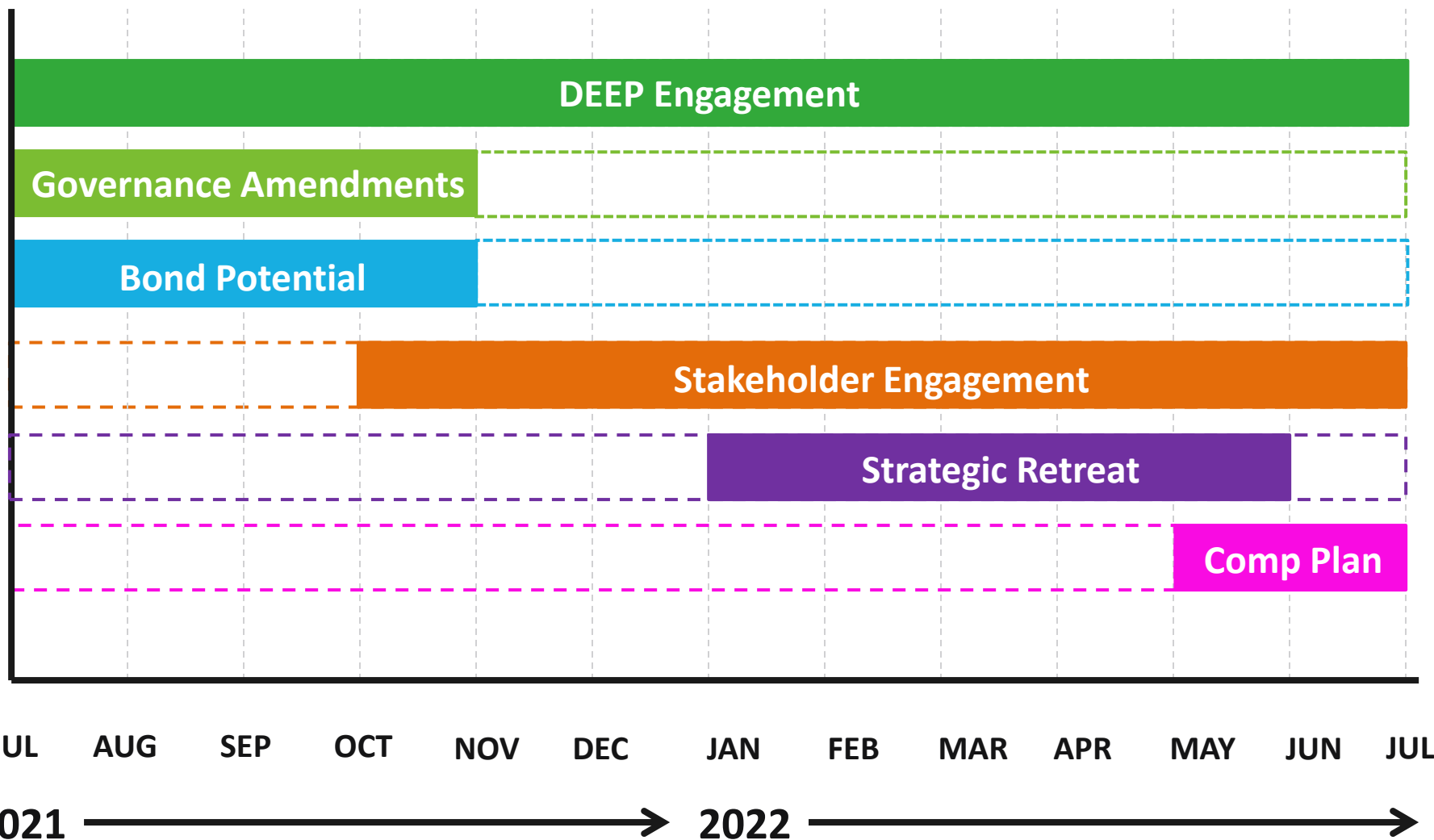
Stakeholder Engagement
One-On-One Meetings

Environmental Infrastructure
Stakeholder Engagement to Comprehensive Plan
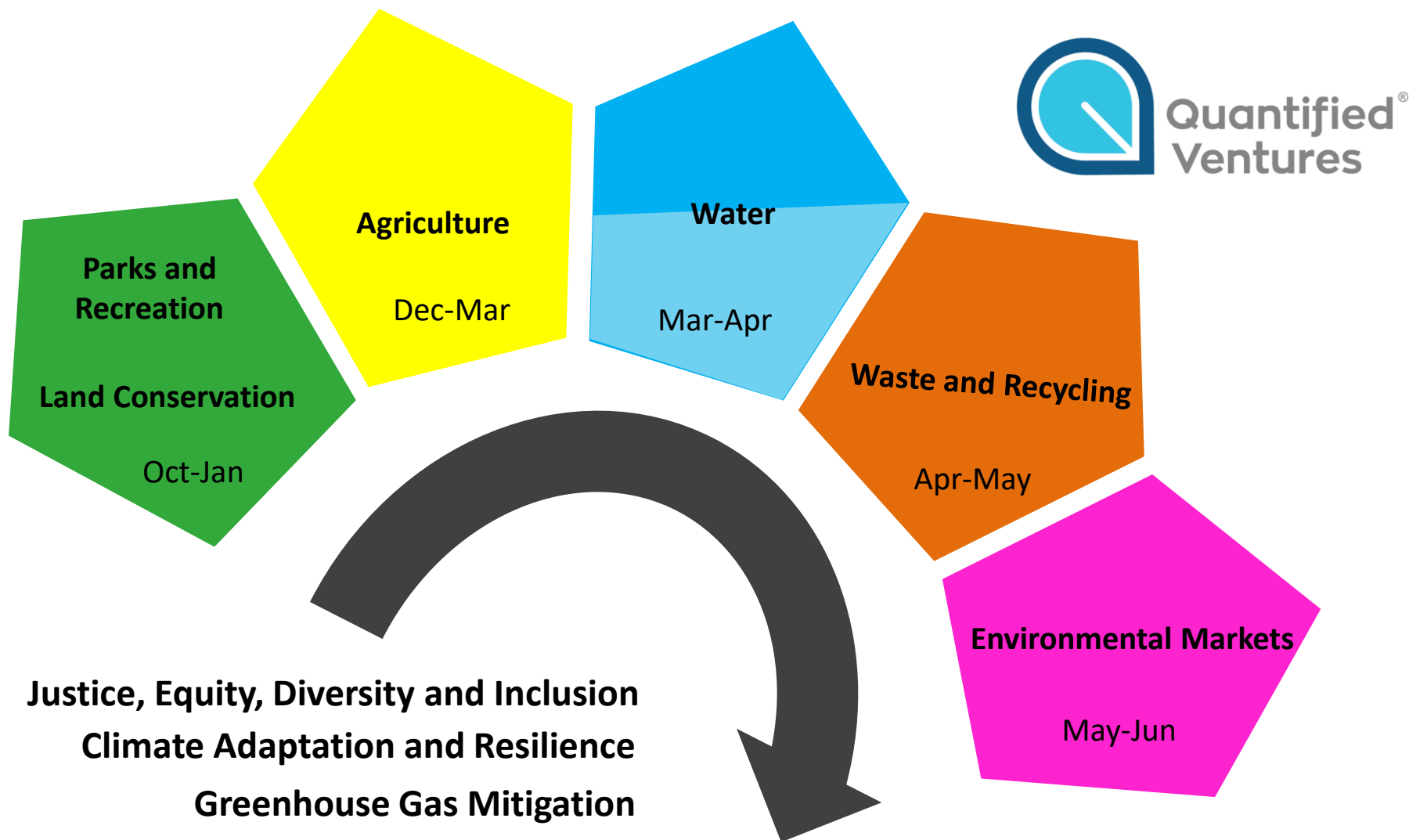
Environmental Infrastructure
Strategic Retreat – Pocantico Center (April 27-28)

- **Logistics** – Pocantico Center of the Rockefeller Brothers Fund (April 27-28, 2022) from 10:00 a.m. on April 27th through 3:00 p.m. on April 28th

- **Facilitators** – Dr. Jonathan Raab (Lead Facilitator) and Monica Eager (Graphic Facilitator)

- **Participants** – diverse participants (i.e., gender, POC), including professional expertise (e.g., Federal Reserve Bank, Trust for Public Lands, American Farmlands Trust, Sustainable CT, PURA, DoAg, DEEP, CIRCA)

- **Program** – extensive 1.5-day program with tours and motivational speaker, including:

  - ❑ Session 1 – Introductions
  - ❑ Session 2 – Incorporation of Resilience into the Mission
  - ❑ Session 3 – Ensuring Equitable Community Participation
  - ❑ Session 4 – Environmental Infrastructure to Confront Climate Change
  - ❑ Session 5 – Public and Private Entity Needs on Environmental Infrastructure
  - ❑ Session 6 – Measuring Success
  - ❑ Session 7 – Envisioning Our Future – #Headlines2025 and # Headlines 2050
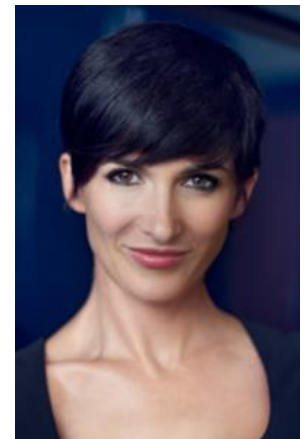
Board of Directors

Agenda Item #8

Lawrence Berkeley National Laboratory

Long-Term Performance of Energy Efficiency

Loan Portfolios

Introductions
Department of Energy

Greg Leventis

Program Manager in
Electricity Markets and Policy
Department
LBNL

Jeff Deason

Program Manager and EE
Team Leader in Electricity
Markets and Policy
Department
LBNL

Sean Murphy

Senior Scientific
Engineering Associate in
Electricity Markets and
Policy Department
LBNL

Long-Term Performance of Energy Efficiency Loan Portfolios

Greg Leventis

Sean Murphy

Jeff Deason

Briefing for Connecticut Green Bank Board of Directors

April 22, 2022

ENERGY TECHNOLOGIES AREA | ENERGY ANALYSIS AND ENVIRONMENTAL IMPACTS DIVISION | ELECTRICITY MARKETS & POLICY

Agenda

- Project overview

- Descriptive statistics for loans and borrowers

- Loan performance analysis (delinquencies and losses)

- Performance comparison with other loan products

Project overview

☐ **Motivation:** Capital market stakeholders are generally unfamiliar with efficiency loans. No comprehensive, loan-level analyses of the financial performance of energy efficiency loans are available.

☐ **Objective:** Make available, for the first time, a comprehensive analysis of energy efficiency loan performance data (e.g., rate of nonpayment and delinquency) from multiple state programs.

☐ **Expected impact:** Increase investor confidence in energy efficiency loans and increase availability of capital at better terms for efficiency financing programs.

Portfolios studied

- Connecticut Smart-E loan—*Energy efficiency loans only*
  - Total loans: 3,160
  - Years of data: 2013-2020
- Pennsylvania Keystone HELP loan
  - Total loans: 14,753
  - Years of data: 2006-2017
- Michigan Saves—*Energy efficiency loans only*
  - Total loans: 16,042
  - Years of data: 2010-2020
- NYSERDA On-Bill Recovery Loan and Smart Energy Loans—*Energy efficiency loans only*
  - Total loans: 18,555
  - Years of data: 2010-2020

- Total observations: 52,510
  - For some data points (e.g., income), there are fewer observations available

Descriptive statistics:
Loan characteristics

Program volumes by vintage

Chart: "Number of loans" (y-axis, 0 to 4500) vs "Year of loan start" (x-axis, 2006–2019). Legend: CT Smart-E (blue), Keystone (orange), Michigan Saves (gray), NYSERDA (yellow).
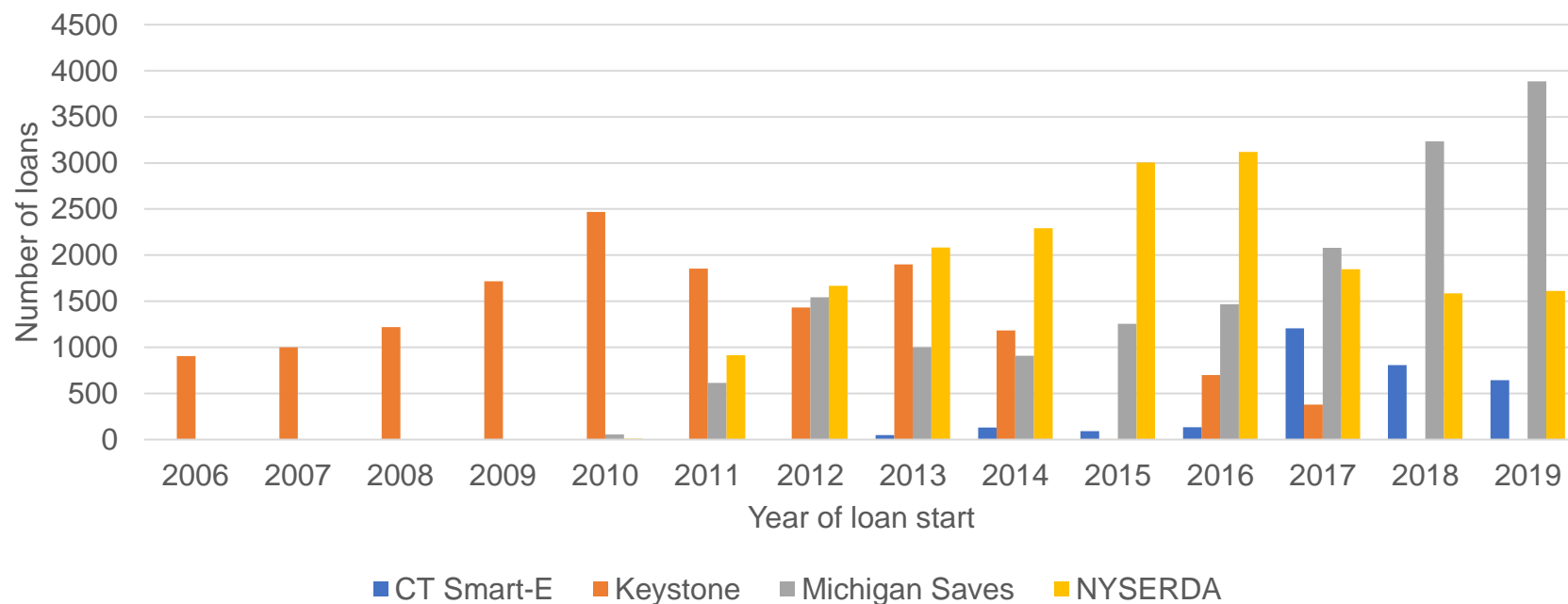
- Keystone spans an economic cycle
- With the exception of Keystone, the programs have done most of their volume in recent years

60

Descriptive statistics—principal amount
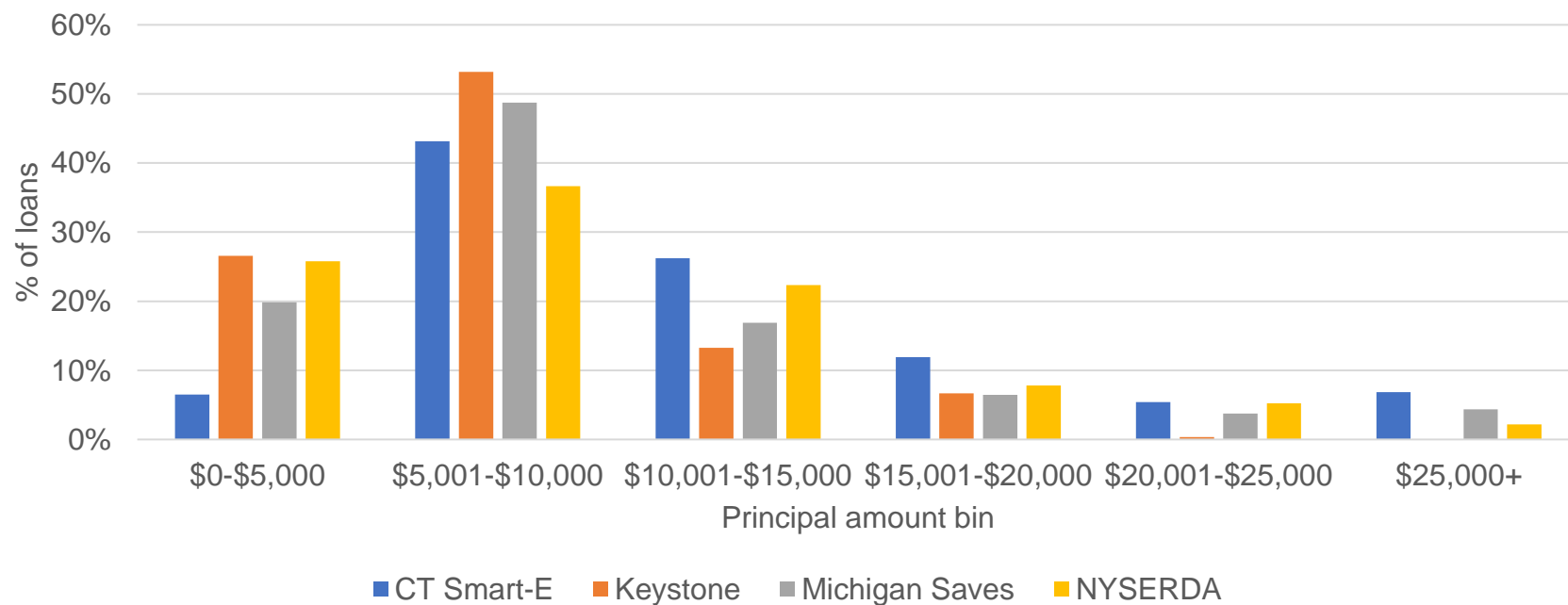
- Average loan across all programs: $9,137
- Median loan across all programs: $7,661

Descriptive statistics—loan term
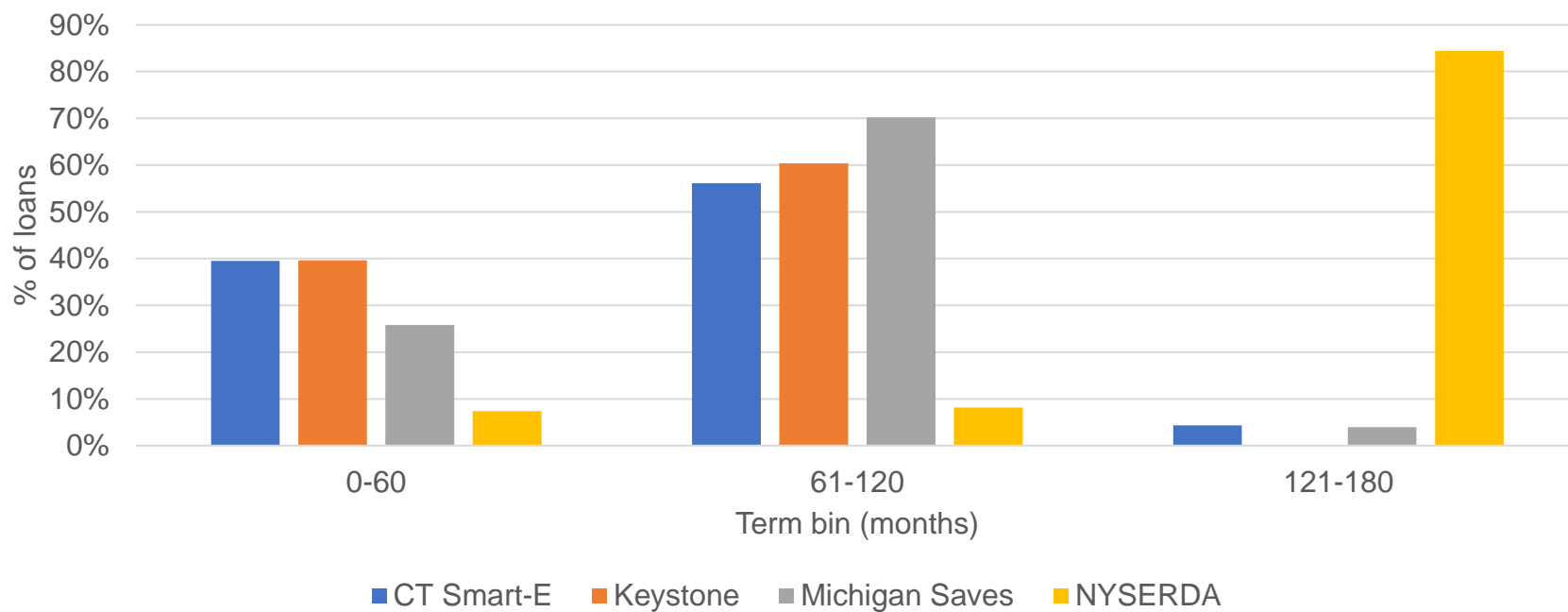
□ Mean and median term is 10 years

Descriptive statistics—interest rate
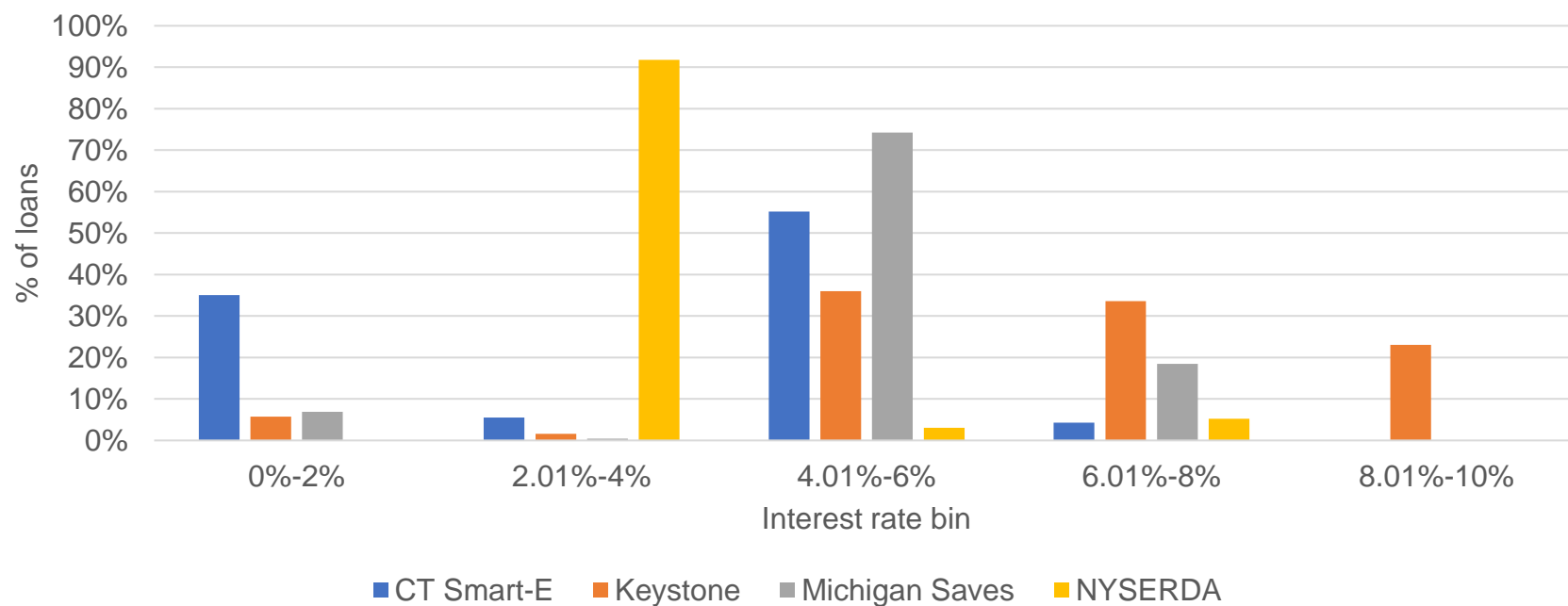
- Average and median interest rate across programs is 5%
- Across programs, interest rates range from 0% to 8.99%

Descriptive statistics—monthly payments
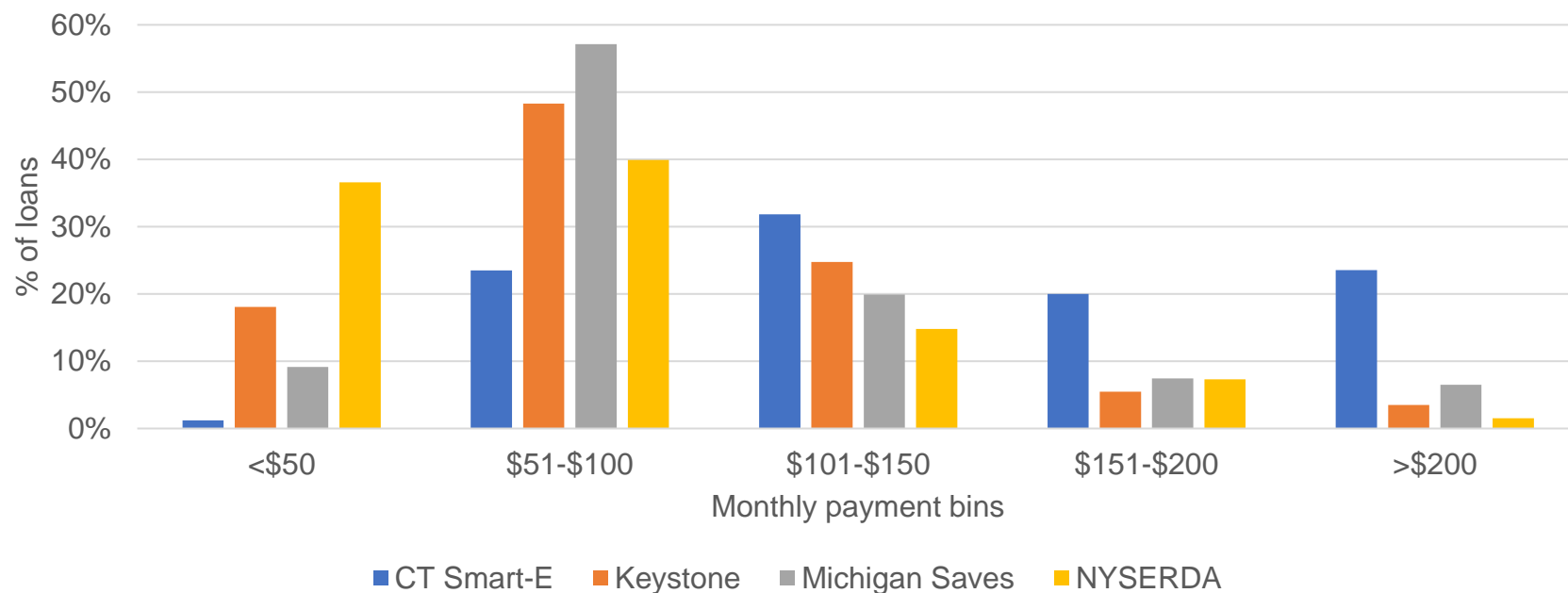
- Average monthly loan payment across programs is $93
- Median monthly loan payments across programs is $80

Descriptive statistics:
Borrower characteristics

Descriptive statistics—Participant Income
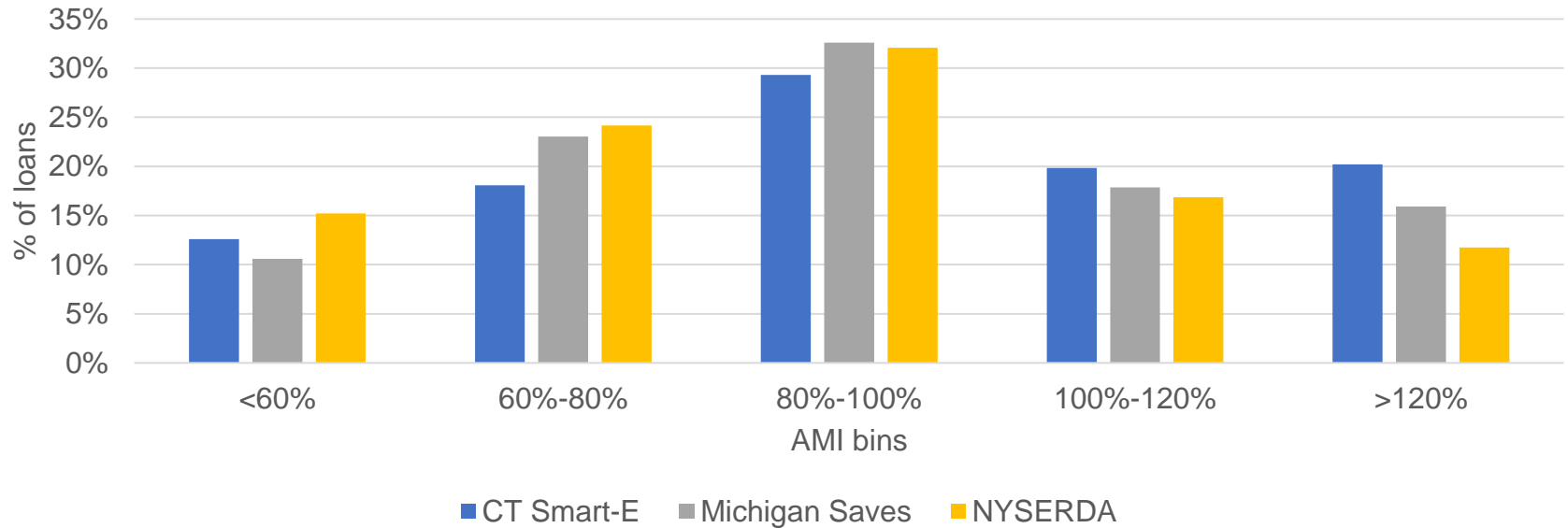
- Average tract income to average AMI for all programs is 91%
- Median tract income to median AMI for all programs is 88%

Descriptive statistics—credit scores
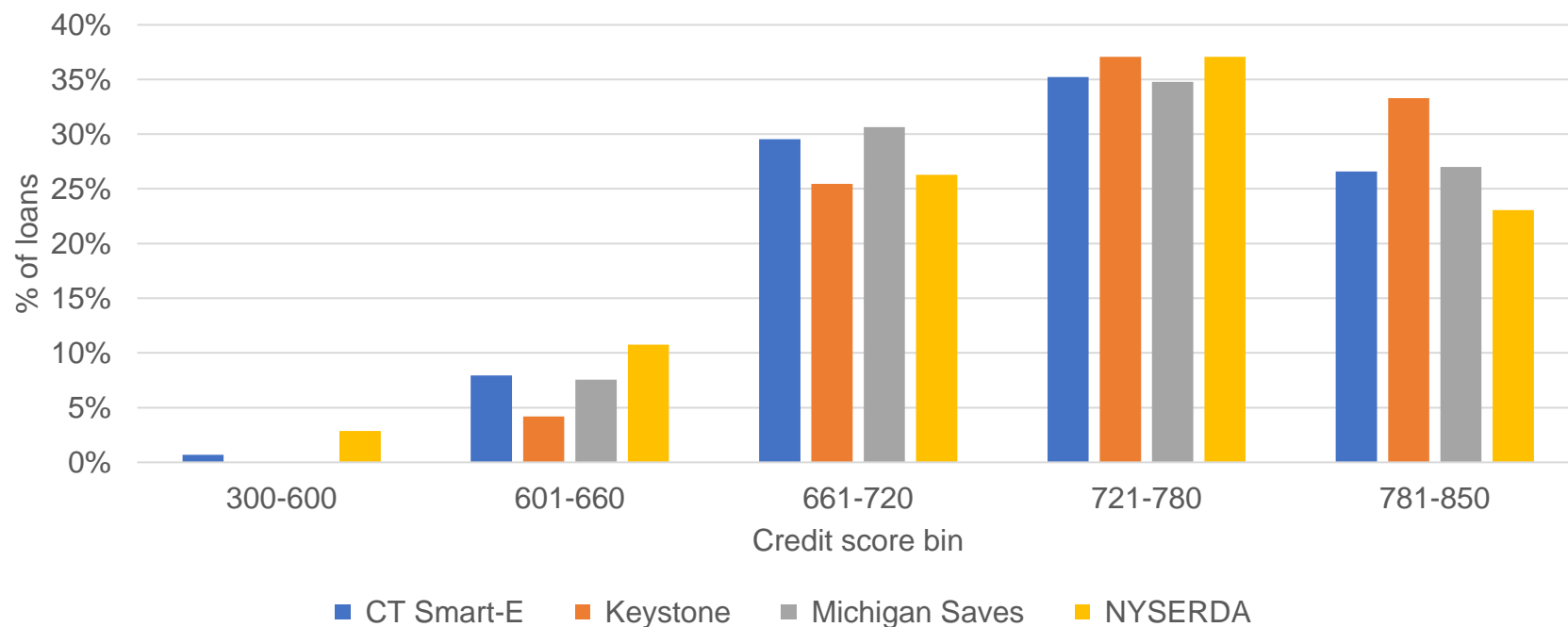
- Average credit score across all programs: 734
- Median credit score across all programs: 745

Loan performance analysis

30-120 day delinquencies

- Figure shows the share of active (not charged off and not paid off) loans that are 30-120 days behind on payments
  - Loans more than 120 days delinquent are considered charged off, to ensure a consistent definition
  - ~17,000 of our ~52,000 loans are paid off, and ~2000 are charged off, leaving ~33,000 active loans
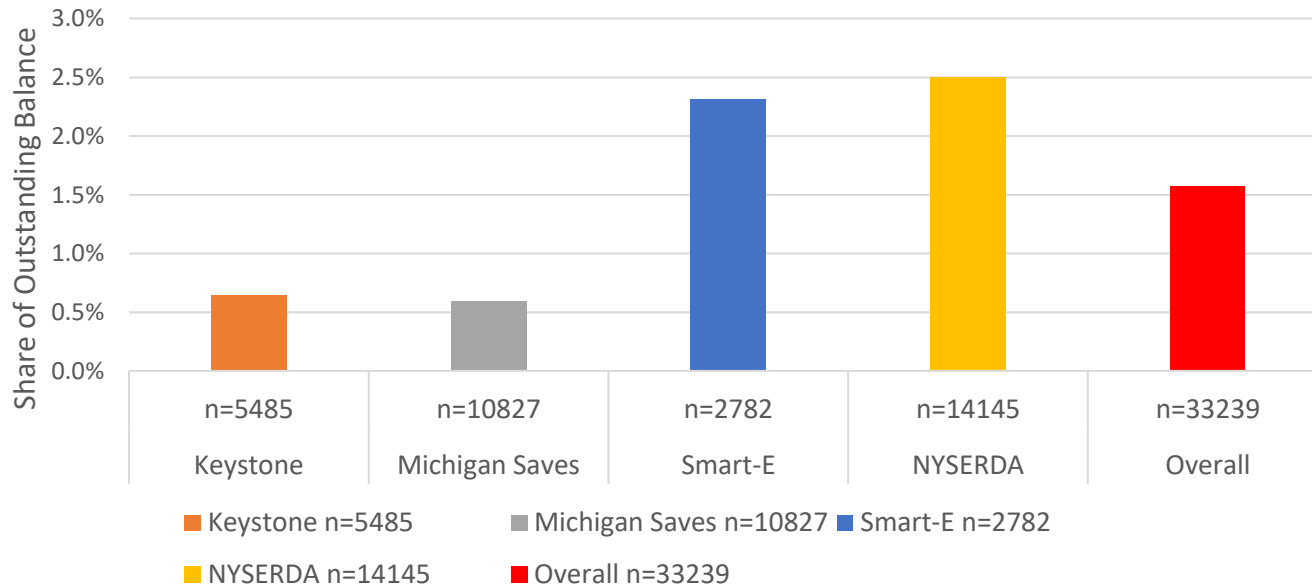
Cumulative gross loss rate

□ The share of loan principal charged off after some number of years of loan seasoning
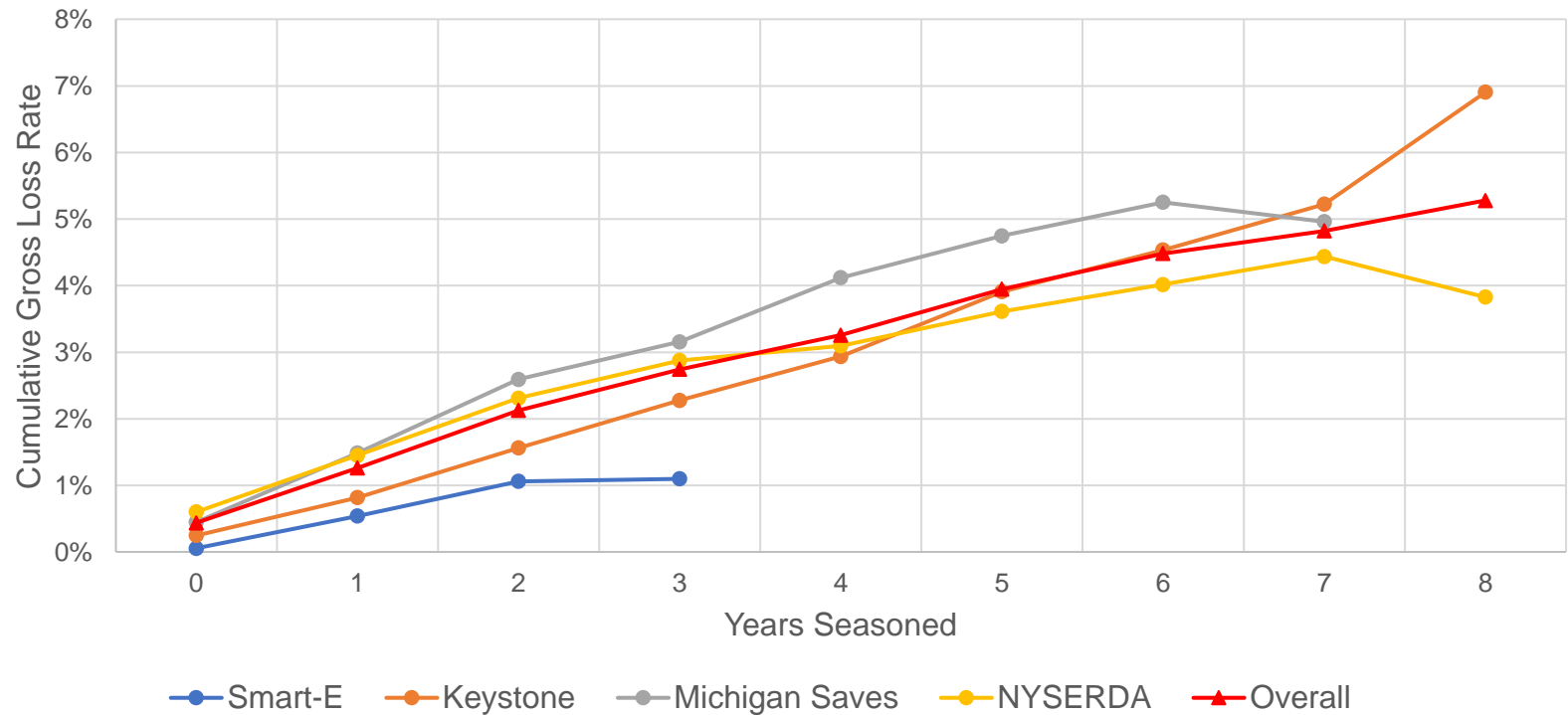
30-120 day delinquencies by credit score bin
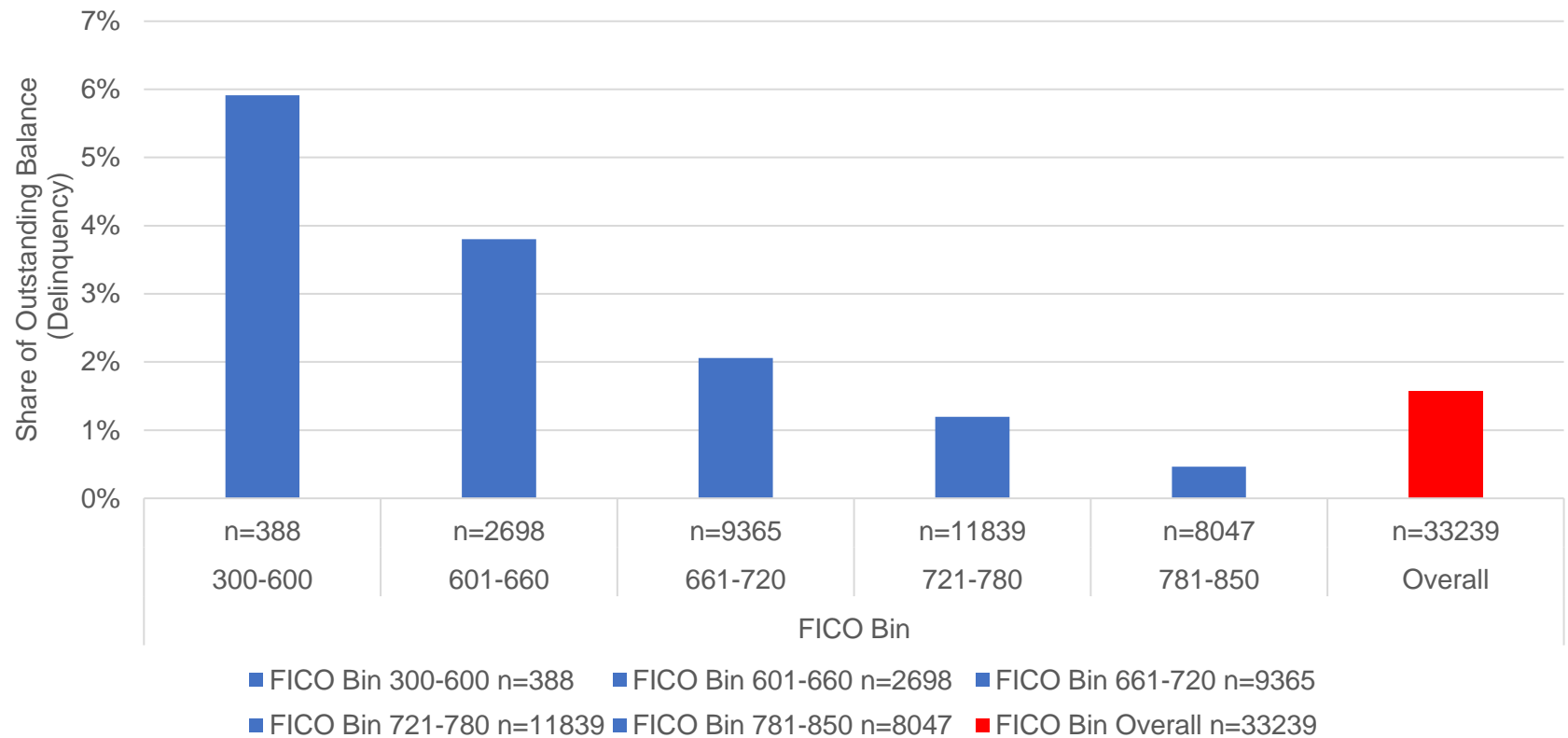
30-120 day delinquencies by Area Median Income (AMI) bin
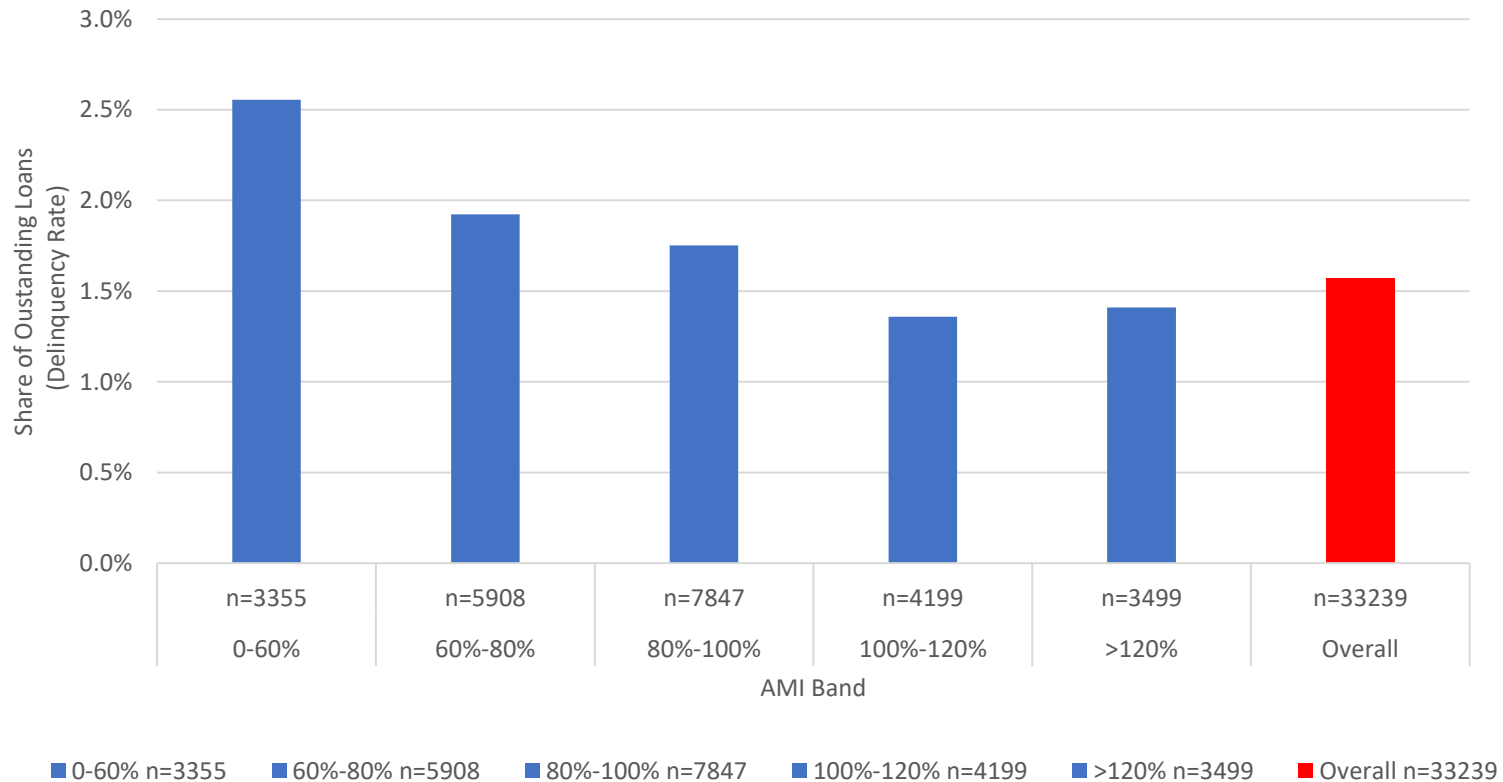
Cumulative gross loss by credit score bin
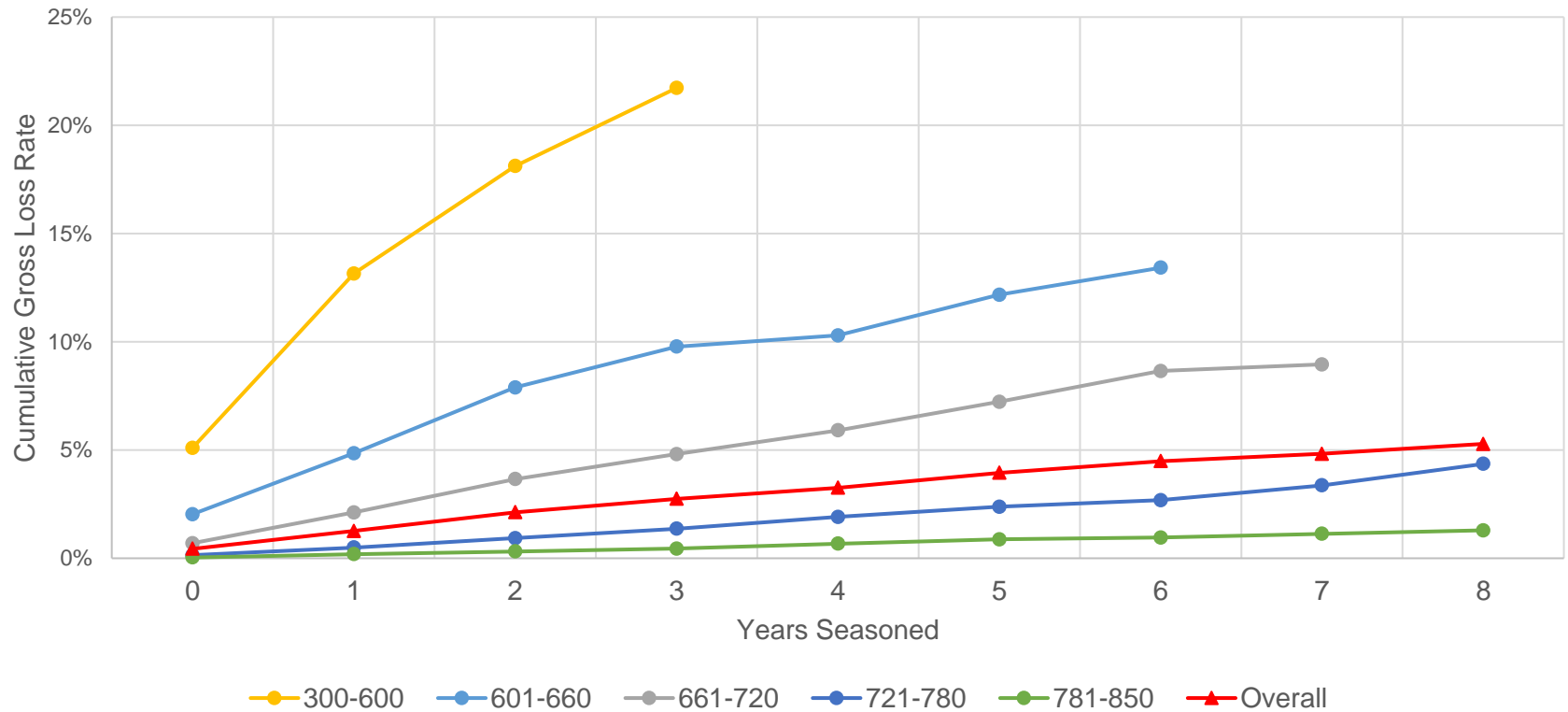
Cumulative gross loss rate by AMI band
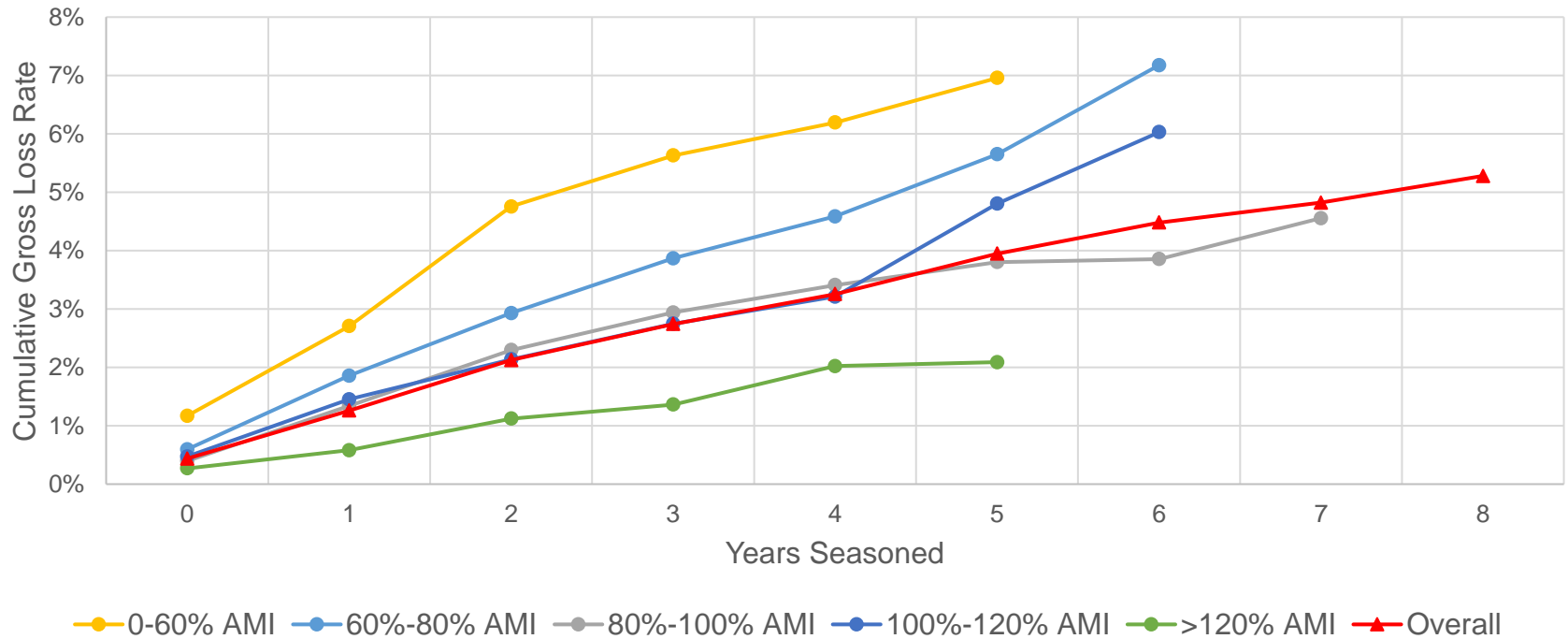
Regression analysis

Key results:

☐ Credit score is a statistically significant predictor of both delinquencies and losses: lower credit score customers are *more likely* to go delinquent and *more likely* to be charged off. All else equal, increasing borrower credit score by 100:

   ▫ lowers the odds that a loan is 30 days delinquent by 1.06 percentage points
   ▫ lowers the odds that a loan is charged off by 5.81 percentage points

☐ AMI income band is also associated with delinquency and loss rates, but not as strongly as credit score, and the differences are not always statistically significant. All else, equal, relative to customers in tracts in the lowest AMI band (<60% of AMI), customers in tracts in the highest AMI band (>120% AMI) are:

   ▫ 0.5 percentage points less likely to be delinquent
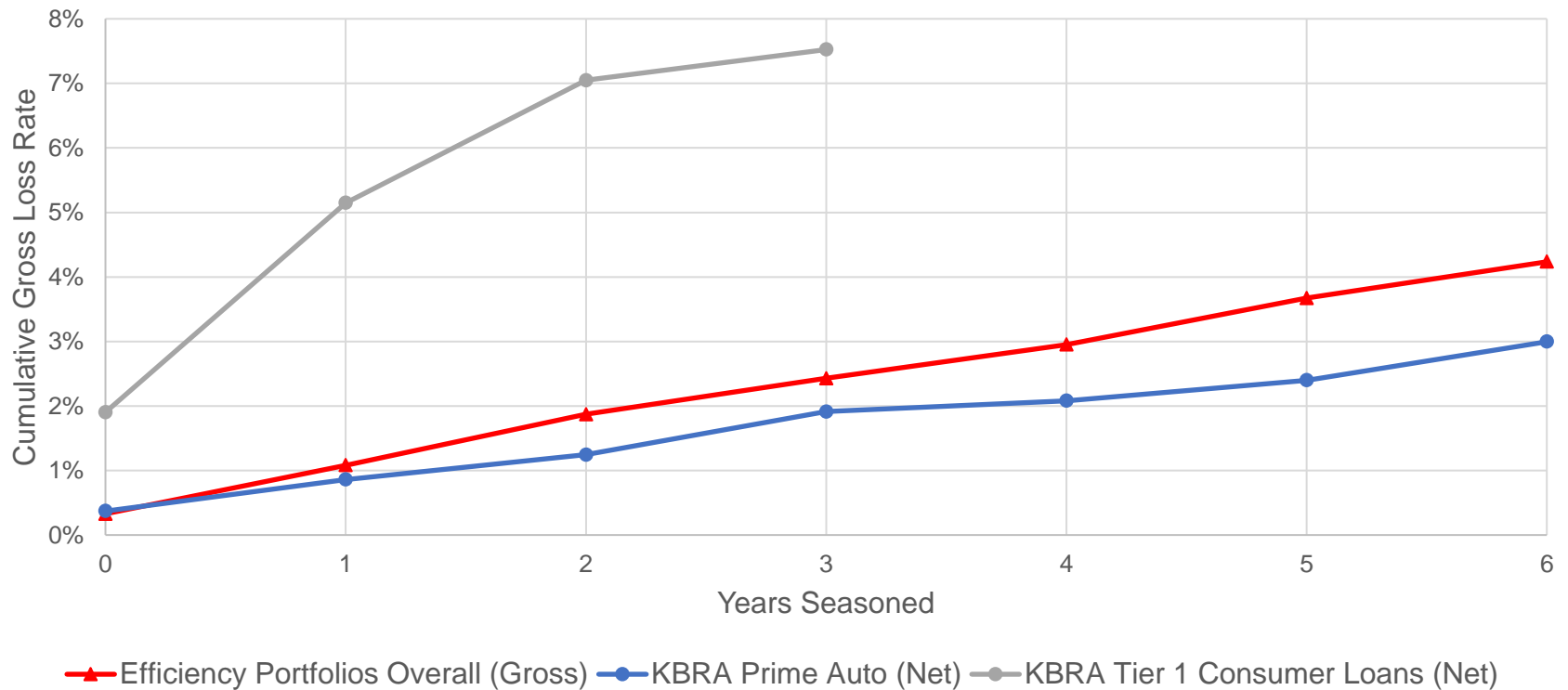   ▫ 2 percentage points less likely to be charged off

Performance comparison with other loan products

# 30-120 day delinquency rates: energy efficiency loans and comparators
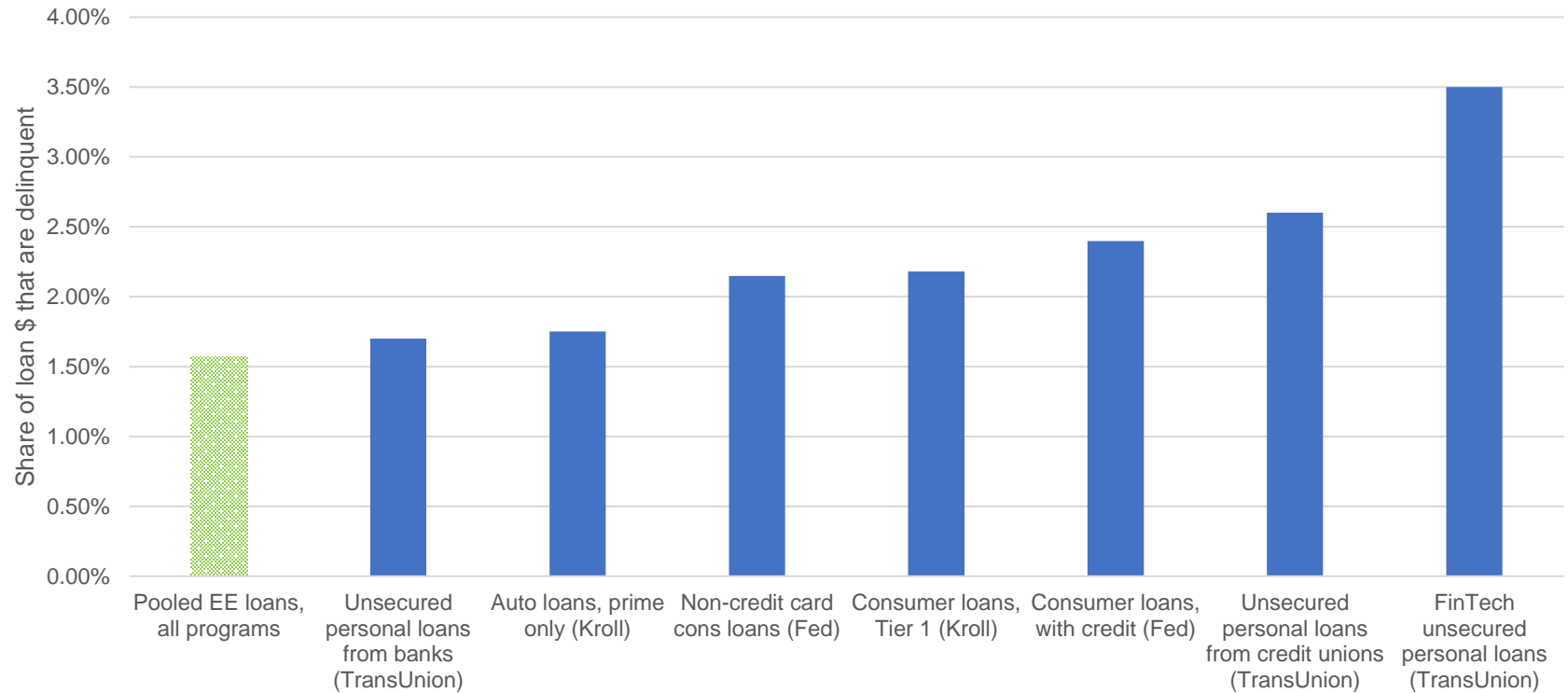
Cumulative loss rates for programs and comparators

Annualized loss rates, energy efficiency loans and comparators

☐ Expected share of principal lost per year across a portfolio

  ◾ Our annualization method for the energy efficiency loans is approximate, but allows comparison to additional loan types
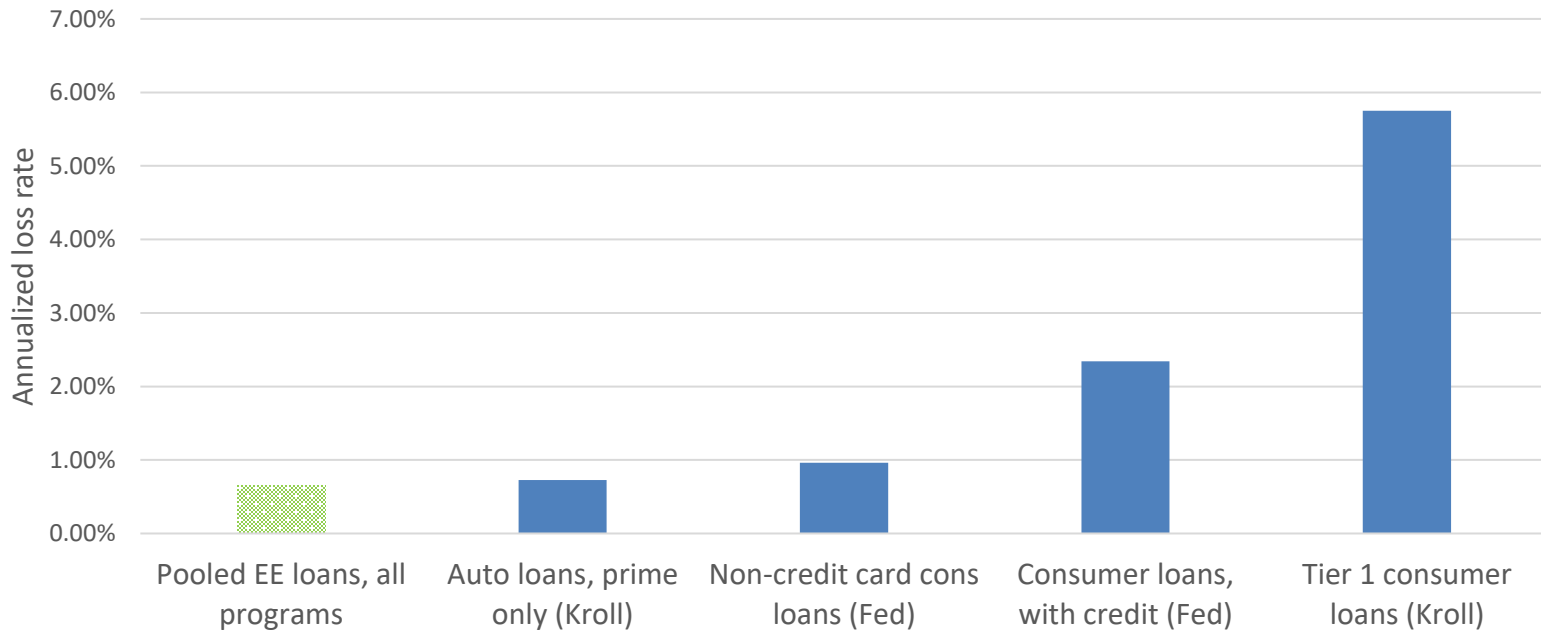
Conclusions

- Energy efficiency borrowers are often high credit and middle income
  - Average participant credit scores are 734, with most falling between 670 and 799
  - Few borrowers have very low (<580) credit scores
  - Average borrower is from a census tract with a median income just under the area median income

- Energy efficiency delinquency and loss rates are low
  - 30-day delinquencies are 1.57% pooled across programs
  - Approximately 2.1% of the principal is lost by year 2, 3.3% by year 4, 4.5% by year 6, and 5.1% by year 8
  - Credit scores are a major driver of performance
  - Income also matters but not as much as credit score

- Pooled across the 4 programs, efficiency loans outperform most logical comparators:
  - Outperform creditworthy unsecured consumer loans
  - Perform similarly to prime auto loans, which are secured by the vehicles

Implications

- Energy efficiency loans represent an opportunity for capital providers and lenders to lend at low risk while creating a more efficient building stock

- Capital for energy efficiency lending may currently be overpriced

- High-credit households in lower-income areas can be expected to repay their loans at a strong rate
  - As such, energy efficiency lending can support policy goals related to equitable access to capital

- Our analysis of loan performance determinants could be used to design credit enhancement mechanisms to encourage lending to underserved households by estimating the likely repayment performance of various market segments

ELECTRICITY MARKETS & POLICY

Contacts

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Sean Murphy: smurphy@lbl.gov, 510-486-5923

For more information

Download publications from the Electricity Markets & Policy: https://emp.lbl.gov/publications
Sign up for our email list: https://emp.lbl.gov/mailing-list
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Acknowledgements

Extra slides

Program details

Program	Smart-E	Keystone HELP	Michigan Saves	Green Jobs Green New York
Program administrator (PA)	Connecticut Green Bank (CGB) and Inclusive Prosperity Capital (IPC)	AFC First[a]	Michigan Saves	NYSERDA
Description of PA	Quasi-governmental green bank increasing flow of private capital to markets that energize the green economy	Private energy efficiency financing company	Nonprofit green bank funding clean energy	State authority advancing clean energy innovation and investments
Lender (entity extending program loans)	13 local financial institutions[b]	AFC First[a]	7 local financial institutions[b]	NYSERDA
Underwriting criteria	CGB/IPC ask lenders to use their standard practice: FICO (min. 640 or 580), Debt-to-income (DTI) (max. 50% or 45%), no bankruptcy in last 4 to 7 years, income verification[c]	Min. credit 640 Max. DTI 50% (42% for loans >$25K), no bankruptcy for 5 years	Min. credit 600 Max. DTI 50%, no bankruptcy for 12 months; for on-bill, 12 months on-time utility bill payment	Min. credit score 540 Max. DTI depends on credit score, no bankruptcy for 2 years, 12 months on time mortgage payments
Loan underwriter	13 local financial institutions[b]	AFC First[a]	7 local financial institutions[b]	Slipstream
Structure (on- vs off-bill, secured[d] or unsecured)	Unsecured, off-bill loans	Unsecured, off-bill loans	Unsecured, on- and off-bill loans	Unsecured, on- and off-bill loans
Credit enhancements (CE) to lenders (does not include CEs for secondary market loan sales)	Loan loss reserve (second loss, at the portfolio level)	Loss reserves were provided through various Pennsylvania state agencies and grants	Loan loss reserve, and utility capital from one publicly-owned utility	None
Source of capital	Local financial institutions	Pennsylvania Treasury, AFC First, securitization proceeds, local bank loan pool	Local financial institutions, municipal utility capital (for Holland on-bill program)	Regional Greenhouse Gas Initiative funds[e], securitization proceeds
Federal funds used	American Recovery and Reinvestment Act (ARRA) funds for loan loss reserve and interest rate buydowns at different points in the program	ARRA funds provided loss reserves and rate buydown funds for some of the program years	ARRA funds provided the loan loss reserve	None

[a] The program administration changed in 2015 upon AFC First's acquisition by Renew Financial. AFC First was also lender and underwriter for the program. The National Energy Improvement Fund (NEIF), a successor run by AFC First's management, is now providing administration services for a portion of the portfolio.

[b] For residential program participants.

[c] Participating lenders can use standard or credit-challenged term sheets; underwriting thresholds depend on which is used.

[d] In some on-bill lending programs (including both Michigan Saves' and NYSERDA's on-bill programs), nonpayment could result in disconnection of the participant's power service. Although some may refer to disconnection as "security" for these loans since it could incentivize repayment, technically secured loans carry the potential loss of some form of collateral (e.g., a car or a home); this both incentivizes repayment and also helps to make the lender whole in case of a loss. Disconnection would not help make a lender whole after a loss.

[e] See: https://www.rggi.org.

Logistic regression results

Dependent Variable	30-120 Day Delinquency			Charge-off		
	Average Marginal Effects	Standard Error	P Value	Average Marginal Effects	Standard Error	P Value
Credit Score	-1.06E-04	8.09E-06	2.06E-39	-5.81E-04	1.76E-05	8.82E-240
Seasoning (Days)	-3.12E-06	5.77E-07	6.20E-08	2.07E-05	1.01E-06	4.71E-93
Interest Rate	-5.87E-02	3.36E-02	8.00E-02	2.29E-01	6.45E-02	3.75E-04
Principal Amount ($)	4.29E-08	6.72E-08	5.23E-01	4.61E-07	1.61E-07	4.23E-03
Smart-E	7.85E-03	1.73E-03	6.04E-06	-1.23E-02	6.01E-03	4.00E-02
NYSERDA On-Bill Recovery	1.91E-02	1.65E-03	2.88E-31	6.09E-03	3.84E-03	1.13E-01
NYSERDA Smart-Energy	3.54E-03	1.37E-03	9.50E-03	1.37E-02	2.63E-03	2.13E-07
Keystone	5.00E-04	1.84E-03	7.86E-01	2.06E-03	2.79E-03	4.61E-01

Board of Directors
Agenda Item #9
Adjourn

**BOARD OF DIRECTORS OF THE
CONNECTICUT GREEN BANK**
Regular Meeting Minutes

Friday, March 23, 2022
9:00 a.m. – 11:00 a.m.

A regular meeting of the Board of Directors of the **Connecticut Green Bank (the "Green Bank")** was held on January 21, 2022.

Due to COVID-19, all participants joined via the conference call.

Board Members Present: Binu Chandy, Matthew Dayton, Thomas Flynn, Dominick Grant, Victoria Hackett, John Harrity, Adrienne Houël, Lonnie Reed, Sarah Sanders, Brenda Watson

Board Members Absent: Laura Hoydick, and Matthew Ranelli

Staff Attending: David Beech, Sergio Carrillo, Shawne Cartelli, Catherine Duncan, Mackey Dykes, Bryan Garcia, Sara Harari, Bert Hunter, Alex Kovtunenko, Alysse Lembo-Buzzelli, Cheryl Lumpkin, Jane Murphy, Ariel Schneider, Eric Shrago, Dan Smith

Others present: Claire Sickinger, Joe Buonannata from IPC, Vijay Gopalakrishnan, Bob Maddox, Guilia Bambara, Chris Meister, Jim Barrett, Saty Moray, Robert Edwards Jr from the Loan Programs Office, Brian Mahar

1.   Call to Order

- Lonnie Reed called the meeting to order at 9:03 am.

2.   Public Comments

- No public comments.
- It should be noted that Bob Maddox wanted to provide public comment, but was unable to unmute himself to do so. He is in direct contact with Mr. Garcia.

Lonnie Reed introduced the newest Board member, Matthew Dayton.

3.   Consent Agenda

Bryan Garcia reviewed the proposals and changes for items on the Consent Agenda.

a. Meeting Minutes of January 21, 2022

Resolution #1

Motion to approve the meeting minutes of the Board of Directors for January 21, 2022.

b. FuelCell Energy Project

Resolution #2

 WHEREAS, in accordance with (1) the statutory mandate of the Connecticut Green Bank ("Green Bank") to foster the growth, development, and deployment of clean energy sources that serve end-use customers in the State of Connecticut, (2) the State's Comprehensive Energy Strategy ("CES") and Integrated Resources Plan ("IRP"), and (3) Green Bank's Comprehensive Plan (the "Comprehensive Plan") in reference to the CES and IRP, Green Bank continuously aims to develop financing tools to further drive private capital investment into clean energy projects;

 WHEREAS, FuelCell Energy, Inc., of Danbury, Connecticut ("FCE") has used previously committed funding (the "Bridgeport Loan") from Green Bank to successfully develop a 15 megawatt fuel cell facility in Bridgeport, Connecticut (the "Bridgeport Project"), and FCE has operated and maintained the Bridgeport Project without material incident, is current on payments under the Bridgeport Loan;

 WHEREAS, FCE has requested financing support from the Green Bank to develop a 7.4 megawatt fuel cell project in Groton, Connecticut located on the U.S. Navy submarine base and supported by a power purchase agreement ("PPA") with the Connecticut Municipal Electric Energy Cooperative ("CMEEC") (the "Navy Project");

 WHEREAS, staff has considered the merits of the Navy Project and the ability of FCE to construct, operate and maintain the facility, support the obligations under the Loan throughout its 20-year term, and as set forth in the due diligence memorandum (the "Board Memo") dated December 18, 2020, recommended this support be in the form of a term loan not to exceed $8,000,000, secured by all project assets, contracts and revenues as well as a pledge of revenues from an unencumbered project as explained in the Board Memo (the "Credit Facility");

 WHEREAS, on the basis of that recommendation, the Green Bank Board of Directors ("Board") approved of the Credit Facility, in an amount not to exceed $8,000,000 with the provision that the Credit Facility be executed no later than 315 days from the date of authorization by the Board (June 16, 2021), which was further extended by the Board in July 2021 to October 29, 2021, which was further extended by the Board in October 2021 to December 31, 2021, which was further extended by the Board in December 2021 to January 31, 2022, and which was further extended by the Board in January 2022 to March 31, 2022;

 WHEREAS, Green Bank has further advised the Board that the Credit Facility is now expected to close by the end of May 2022 and to accommodate the additional time needed to execute the Credit Facility requests the permitted time to execute the credit facility be increased from not later than 468 days from the original date of authorization by the Board (March 31, 2022) to not later than 529 days from the date of authorization by the Board (i.e., to May 31, 2022);

NOW, therefore be it:

RESOLVED, that the Green Bank Board hereby approves the extension of time for the execution of the Credit Facility to not later than 529 days from the original date of authorization by the Board (i.e., not later than May 31, 2022); and

RESOLVED, that the President of the Green Bank and any other duly authorized officer is authorized to take appropriate actions to provide the Credit Facility to FCE (or a special purpose entity wholly-owned by FCE) in an amount not to exceed $8,000,000 with terms and conditions consistent with the memorandum submitted to the Board dated December 18, 2020 (the "Memorandum"), and as he or she shall deem to be in the interests of the Green Bank and the ratepayers; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to affect the Term Loan and participation as set forth in the Memorandum.

c. Staff Approvals of C-PACE Transactions

Resolution #3

WHEREAS, on January 18, 2013, the Connecticut Green Bank (the "Green Bank") Board of Directors (the "Board") authorized the Green Bank staff to evaluate and approve funding requests less than $300,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Green Bank Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $500,000 from the date of the last Deployment Committee meeting, on July 18, 2014 the Board increased the aggregate not to exceed limit to $1,000,000 ("Staff Approval Policy for Projects Under $300,000"), on October 20, 2017 the Board increased the finding requests to less than $500,000 ("Staff Approval Policy for Projects Under $500,000"); and

WHEREAS, Green Bank staff seeks Board review and approval of the funding requests listed in the Memo to the Board dated March 25, 2022 which were approved by Green Bank staff since the last Deployment Committee meeting and which are consistent with the Staff Approval Policy for Projects Under $500,000;

NOW, therefore be it:

RESOLVED, that the Board approves the funding requests listed in the Memo to the Board dated March 25, 2022 which were approved by Green Bank staff since the last Deployment Committee meeting. The Board authorizes Green Bank staff to approve funding requests in accordance with the Staff Approval Policy for Projects Under $500,000 in an aggregate amount to exceed $1,000,000 from the date of this Board meeting until the next Deployment Committee meeting.

Upon a motion made by John Harrity and seconded by Brenda Watson, the Board of Directors voted to approve the Consent Agenda which contains Resolutions 1-3. None opposed or abstained. Motion approved unanimously.

4.   Investment Updates and Recommendations
    a. Green Liberty Notes Issuance

- David Beech summarized the update about the Green Liberty Notes issuance which closed January 13, 2022. He stated the next round is slated to launch on April 13, 2022 and has a $250,000 goal. A rating with S&P Global is also being sought.
  - John Harrity asked if the $100 notes needed a broker. David Beech responded that no, as it wasn't desirable as a barrier of entry.
  - Lonnie Reed asked if investors need to give their social security number, and David Beech responded yes which is part of the regulations. Bert Hunter also commented with the procedure that the IRS requires for tracking payments of interest income which is reported on Form 1099 to noteholders which requires the social security number.

    b. Late Fees and Penalties Forgiveness Process

- Bert Hunter reviewed the Loan Loss Decision and writing-off process, parameters, and proposal to clarify the process for late fees, penalties, and forgiveness of those fees. The existing process does not specifically address situation in which a transaction has accrued default interest, penalties, or fees which need to be either enforced, modified, or waived pursuant to the applicable transaction documents and restructuring negotiations with the borrower.
  - Thomas Flynn asked if in certain instances, if payment assurances are made in line with real estate taxes. Bert Hunter answered that in relation to C-PACE transactions, those have default interest and possibly fees that could be levied, and this proposal is one of the reasons that clarification is needed. Without the ability to clarify the process, the Green Bank is unable to restructure those amounts.
  - Thomas Flynn asked how many customers fall under this situation. Bert Hunter responded that it is a very small number of customers. The principal amounts are generally very low, but the penalties and accrued interest can add up.
  - Thomas Flynn asked if a restructuring is done, or it is written-off, is there an obligation to disclose which customers did not pay their loans, given that there are public funds being used, and at what point is that information required to be disclosed. Bert Hunter responded that once the loan or write-off is complete, there is no reason not to disclose the information, as at that point it is public record (for example – on the land records of the various towns which are open to public inspection). He stated it wouldn't necessarily be posted overtly on the website, but it could be presented to the Board quarterly, included in regular Green Bank reports, and would be added to public record for any individual to find through standard channels. Victoria Hackett added that she would support the side of transparency as public funds are being used and they deserve to know. Lonnie Reed agreed.

Resolution #4

   WHEREAS, On June 13, 2018 the Connecticut Green Bank ("Green Bank") Board of Directors ("BOD") authorized and approved a framework and process for funding the provisional loss reserve, restructuring, and writing-off transactions on the Green Bank balance sheet, the

process was amended by the BOD on April 24, 2020, and on June 26, 2020 it was approved by the BOD for transactions on the balance sheet of Green Bank's subsidiaries (taken together, all such BOD approvals being the "Loan Loss Decision Process";

WHEREAS, the Staff of the Green Bank propose in a memorandum to the BOD dated March 18, 2022 (the "Memorandum") an amendment to the Loan Loss Decision Process to address the process for modifying or waiving default interest, penalties and fees.

NOW, therefore be it:

RESOLVED, that the BOD approves of the Staff proposed amendment to the Loan Loss Decision Process to address the process for modifying or waiving default interest, penalties and fees, as more particularly described in the Memorandum; and

RESOLVED, that the BOD authorizes Green Bank staff to evaluate and approve the modification or waiver of default interest, penalties, and fees in accordance with the process and limits set forth in the Memorandum.

Upon a motion made by Thomas Flynn and seconded by Adrienne Houël, the Board of Directors voted to approve Resolution 4. None opposed or abstained. Motion approved unanimously.

5. **Finance Programs Updates and Recommendations**
   a. **SBEA Facility Renewal**

- Mackey Dykes summarized the state of the SBEA Loan Purchase Facility, including the details of the opportunity, terms, rate, the Green Bank's participation, exposure, and strategic selection parameters. Through the partnership with Eversource, much cheaper capital was able to be sourced and access to capital was able to be expanded. The preliminary agreement has finished, and so now there is a proposal to renew for another 3 years, as well as make some changes. Mackey Dykes then summarized the details and changes for the renewal request.

Resolution #5

WHEREAS, the CEFIA Holdings LLC (a Connecticut Green Bank subsidiary), Eversource Energy and Amalgamated Bank Small Business Energy Advantage (SBEA) financing facility, pursuant to that certain Second Amended and Restated Master Purchase and Servicing Agreement dated September 30, 2020 (as amended, the "MPA"), expired on March 20, 2022; and

WHEREAS, the parties have agreed on terms set forth in a memorandum to the Green Bank Board of Directors (the "Board") dated March 18, 2022 (the "MPA Memo") to renew and extend the MPA and expand the availability of financing for energy efficiency.

NOW, therefore be it:

RESOLVED, that the Board authorizes the Green Bank to renew and extend the MPA to December 31, 2024 substantially in accordance with the terms of the existing MPA with modifications as set forth in the MPA Memo; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to affect the above-mentioned legal instruments.

Upon a motion made by John Harrity and seconded by Victoria Hackett, the Board of Directors voted to approve Resolution 5. None opposed or abstained. Motion approved unanimously.

b. C-PACE for New Construction Program Update

- Mackey Dykes briefly introduced the C-PACE New Construction Program and pilot history. Alysse Lembo-Buzzelli summarized the details of the pilot history and the final recommendation proposal. The initial pilot was very successful with $27 million in capital raised. She reviewed the initial recommendation, Board and public comments, and the final recommendation proposal. She reviewed the amendments and new additions, including a comparison between a whole building energy model and HERS index multifamily plan. Vijay Gopalakrishnan reviewed the LEED certification scoring parameters, methodology, and reasoning to not use it. Mackey Dykes added that it was initially investigated to simply the process, but statute demands clear energy savings which can only be determined by comparing building performance to code.
  - Thomas Flynn asked if it is a fair statement to say whether the funds should be lent to a customer based mostly on their financial stability, since the variants about how much they may save in the future and other projections are too varied to effectively calculate initially. Mackey Dykes answered yes.
  - Thomas Flynn asked if it's possible, within the new standard and staying within the statute, to state to customers that they could be lent money if they follow through with certain energy-savings installations. As opposed to coming up with an artificial, custom estimation. Mackey Dykes answered that some of that had been incorporated into the final recommendation but breaking out individual technology savings measurements hadn't been incorporated because of the workload needed to calculate that. As well, most developers did not seem to think of the individual energy-consuming pieces, which may make the barrier to entry into the program too high. Thomas Flynn stated that for the purposes of new construction, he has concerns about quantifying the actual savings that would take place. Instead, he is suggesting a statement like "For the purposes of new construction, we have been able to ensure green energy that was deployed, and here is what it is," which may make the conversation easier with developers. Mackey Dykes responded that, especially on the retrofitting side of the program, that has been incorporated a bit, but the statute has certain demands which the modelling satisfies. They discussed the point more as well as potential opportunities to change things in the future. Saty Moray supported Mackey Dykes's statements and discussed building code requirements and the challenges around them.
  - John Harrity asked how being in a period of high inflation, and raising interest rates, impacts a program like this. He expressed concern that if this kind of program becomes more costly then the delta of savings may be reduced. Mackey Dykes responded that this is the administration framework, but the lending decisions he couldn't speak on currently. He also stated that on the C-PACE lending side, the rates are fixed for 25 years, so there is some risk. Bert

Hunter responded that increased interest rates could generally put upward pressure on costs for this program, but there are other factors that come into play which could positively affect it or balance it out. He suggested, for example, that the way we estimate energy savings might be increased to reflect the recent trends in higher energy costs that would be offset with solar or energy efficiency measures. He also reviewed some interest rate reductions that had been made as of January 1 to benefit small businesses and smaller projects to help them mitigate some of the impact of increases in project costs. Mackey Dykes agree that these needed to be evaluated further.

o Victoria Hackett commented that these points may be worth raising in the Joint Committee with the Energy Efficiency Fund in order to be consistent between the programs. Mr. Garcia agreed.

Resolution #6

WHEREAS, Conn. Gen. Stat. Section 16a-40g (the "Authorizing Statute") authorizes what has come to be known as the Commercial Property Assessed Clean Energy Program ("C-PACE"), the Authorizing Statute designates the Connecticut Green Bank ("CGB") as the state-wide administrator of the program;

WHEREAS, the Authorizing Statute charges CGB to develop program guidelines (the "Program Guidelines") governing the terms and conditions under which state and third-party financing may be made available to C-PACE;

WHEREAS, CGB staff drafted proposed changes to the Program Guidelines, which among other things, would supersede the New Construction Program Pilot which was approved by the Board on January 26, 2018 (the "New Construction Pilot"); and

WHEREAS, the proposed changes to the Program Guidelines went through a thirty-day public comment period in accordance with Conn. Gen. Stat. Section 1-120 et seq, and staff has made further changes to the Guidelines to address certain public comments which were received, as more particularly described in that memorandum to the Board dated March 22, 2022 (the "Memorandum").

NOW, therefore be it:

RESOLVED, the CGB Board of Directors (the "Board") approves the proposed changes to Program Guidelines, substantially in the form of attached to the Memorandum. The updated Program Guidelines shall supersede the New Construction Pilot;

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to affect the above-mentioned Program Guidelines.

Upon a motion made by John Harrity and seconded by Victoria Hackett, the Board of Directors voted to approve Resolution 6. None opposed or abstained. Motion approved unanimously.

6. **Incentive Programs Updates and Recommendations**
   a. **Energy Storage Solutions**

- Sergio Carrillo reviewed the Energy Storage Solutions deployment targets, history, roles and responsibilities, and program process. He stated that at this time, the ESS program response has exceeded expectations. Of the 50 MW available for Residential, 487 kW of applications have been submitted but not approved, which is about 1% of the target. But of the 50 MW for Non-Residential customers, 53.3 MW of projects were submitted within 60 days, and thus the capacity is essentially depleted. As new battery technologies are reviewed and approved, CGB will start issuing Reservation of Funds (ROF) letters.
  - Victoria Hackett asked if the dividers between programs can be broken down a bit, especially to make other programs, such as those for heat pumps, more attractive, and how to better view the programs wholistically to coordinate more. Sergio Carrillo stated that the Green Bank has been working with the utility companies (as administrators of the Conservation and Load Management Programs, Residential Renewable Energy Solutions, and co-administrators of Energy Storage Solutions) more and will be sure to bring the idea up to them at the next meeting. Bryan Garcia noted that the Green Bank strongly advocated for Home Energy Solutions and Home Energy Solutions – Income Eligible in the PURAS dockets being required as part of the Residential Renewable Energy Solutions and Energy Storage Solutions programs, so that energy efficiency can be built into the programs and cross-marketing of measures be included. Victoria Hackett agreed but commented about how there are still some barriers to heat pump deployment, but it may be mitigated if the customer participated in other programs already.
  - Adrienne Houël asked, in the chat, how flexible the targets are for capacity. Sara Harari responded in the chat that the target for each block is set, but there will be several blocks for both residential and non-residential customers to achieve the total of 580 MW by 2030.
  - Adrienne Houël asked, in the chat, if the Green Bank can apply for or request additional capacity. Sergio Carrillo responded in the chat that the team will go to PURA for additional guidance, but at the current time, the capacity is depleted, even though there is a desire to increase it for the non-residential customers based on the response. There is a meeting scheduled with PURA in mid-April.

b. Smart-E Loan – ARRA Restructuring from Loan Loss Reserves to Interest Rate Buydowns

- Bert Hunter summarized the history of the ARRA funds and proposal to seek a relocation of those funds. Joe Buonannata from IPC summarized the Smart-E program parameters, history, and noted that it is a very healthy program and popular with contractors, lenders and borrowers. Bert Hunter stated that previously the Board had approved ARRA funds to be used for various programs, which has nearly been fully used, and so the proposal today is to use the remaining funds by relocating it for various Smart-E program uses, such as loan losses but mainly for interest rate buydowns as explained in the memo to the Board.

Resolution #7

WHEREAS, at a Special Meeting of the Connecticut Green Bank's ("Green Bank") Deployment Committee ("the Deployment Committee") held on November 30, 2012, the Deployment Committee passed **resolutions** to approve the Smart-E Loan Program (originally

called the "CT HELPs Program");

WHEREAS, in February of 2013, the Connecticut Department of Energy and Environmental Protection released the Comprehensive Energy Strategy ("CES") for Connecticut that includes developing financing programs that leverage private capital to make clean energy investments more affordable, including the pilot Smart-E Loan residential financing program;

WHEREAS, in May of 2013, the Green Bank launched the Smart-E Loan program, operating statewide, with nine local lenders providing low cost and long-term financing for measures that are consistent with the state energy policy and the implementation of the CES;

WHEREAS, in October of 2013, the Green Bank's Board of Directors ("Board") approved full use of $8,361,620 of American Recovery and Reinvestment Act State Energy Program ("ARRA-SEP") funds across a mix of Loan Loss Reserves, Interest Rate Buydowns, and Third Party Insurance Products – credit enhancements for the Green Bank's newly developed residential financing products;

WHEREAS, in March of 2017, the Board approved the Green Bank's request to repurpose ARRA-SEP funds across loan loss reserves and interest rate buydowns ("Credit Enhancements") for the Green Bank's Cozy Home Loans, Smart-E Loans, CT Solar Lease, CT Solar Loan, and LIME Loan programs (the "Programs") in amounts materially consistent with the Memorandum presented to the Board dated March 3, 2017;

WHEREAS, in March of 2017, the Board approved replacing ARRA-SEP funds with Green Bank balance sheet funds for certain program Loan Loss Reserves in amounts materially consistent with the Memorandum presented to the Board dated March 3, 2017;

WHEREAS, staff request that $300,000 of the $600,000 in ARRA-SEP funds currently allocated to loan loss reserves be repurposed with Green Bank balance sheet funds and that ARRA-SEP funds be reallocated to Smart-E loan loss reserves and for future interest rate buydowns, as more fully explained in the memorandum to the Board dated March 18, 2022;

WHEREAS, the Deployment Committee recommended approval by the Board of this request at their February 23, 2022 meeting.

NOW, therefore be it:

RESOLVED, that the Board approves payment of approximately $164,927.82 in ARRA-SEP funds to Smart-E lenders for loan losses.

RESOLVED, that the Board approves repurposing $300,000 in ARRA-SEP funds currently allocated to the LIME Loan program's loan loss reserves with Green Bank funds.

RESOLVED, that the Board of approves reallocating ARRA-SEP funds from various programs to the Smart-E Loan program to be deployed and expended through loan loss reserves and interest rate buydowns that support the state's clean energy policy, as more fully explained in the memorandum to the Board dated March 18, 2022.

Upon a motion made by Dominick Grant and seconded by John Harrity, the Board of Directors voted to approve Resolution 7. None opposed or abstained. Motion approved unanimously.

Note that the meeting presentation and recording erroneously stated this was Resolution #5.

c. Smart-E Loan – Expansion to include Environmental Infrastructure Measures

- Bert Hunter summarized the proposed expansion of the Smart-E program to include environmental infrastructure measures in its underwriting term sheet. He noted the Deployment Committee also recommended it, but not fully until the Deployment Committee approves measures by segment, so the Board would delegate back to the Deployment Committee if approved today. As well, he reviewed the increases to the maximum loan amounts and Green Bank approval thresholds as it applies to "clean energy projects."
  - o Victoria Hackett commented that DEEP would like to be involved in the process to determine which measures are eligible. Bryan Garcia stated that the Green Bank agrees with that and when speaking with Commissioner Dykes the day prior expressed as much that collaboration makes sense and that active DEEP staff engagement is needed. Bert Hunter suggested an addition to the resolutions to reflect that commitment previously discussed with the Commissioner.

Resolution #8

WHEREAS, at a Special Meeting of the Connecticut Green Bank's (Green Bank) Deployment Committee ("the Deployment Committee") held on November 30, 2012, the Deployment Committee passed **resolutions** to approve the Smart-E Loan Program (originally called the "CT HELPs Program");

WHEREAS, in February of 2013, the Connecticut Department of Energy and Environmental Protection released the Comprehensive Energy Strategy ("CES") for Connecticut that includes developing financing programs that leverage private capital to make clean energy investments more affordable, including the pilot Smart-E Loan residential financing program;

WHEREAS, in May of 2013, Green Bank launched the Smart-E Loan program, currently operating statewide, with nine local lenders providing low cost and long-term financing for measures that are consistent with the state energy policy and the implementation of the CES;

WHEREAS, in March of 2014, the Deployment Committee approved revisions to the Smart-E lender term sheet regarding program loan amounts and loan duration, and certain incremental program upgrades from Smart-E's first 15 months;

WHEREAS, in October of 2015 and January 2017, the Board of Directors (Board) approved an alternate underwriting term sheet which expanded the Smart-E Loan applicant pool beyond the standard underwriting criteria, so as to include credit-challenged borrowers;

WHEREAS, program staff request that the term sheet be further enhanced to allow for the addition of environmental infrastructure measures to the list of "eligible improvements" and to increase the maximum loan amount from $45,000 to $75,000 to accommodate larger projects and to raise the Green Bank approval threshold from $40,000 to $50,000, as it applies to "clean energy" projects, as more fully explained in a memorandum to the Board dated March 18, 2022.

NOW, therefore be it:

RESOLVED, that the Board approves amending the Smart-E "eligible improvements" category to include residential "environmental infrastructure" improvements as defined in Public Act 21-115 and authorizes the Deployment Committee to determine, in consultation with the Department of Energy and Environmental Protection, the specific measures by segment (e.g., water, waste and recycling, etc.) to be supported through the Smart-E program; and

RESOLVED, that the Board approves amending the Smart-E maximum loan amount from $45,000 to $75,000 and raising the Green Bank approval threshold from $40,000 to $50,000, as it applies to "clean energy" projects.

Upon a motion made by Victoria Hackett and seconded by Brenda Watson, the Board of Directors voted to approve Resolution 8 with the amendment to the first Resolved statement. None opposed or abstained. Motion approved unanimously.

Note that the meeting presentation and recording erroneously stated this was Resolution #6.

7.   Infrastructure Investment and Jobs Act Opportunity: Department of Energy Loan Programs Office

- Bryan Garcia introduced Robert Edwards Jr from the Loan Programs Office, who is the new Director of Outreach and Business Development. Robert Edwards Jr reviewed the LPO's division of Outreach and Business Development history, purpose, and direction. He described it as the bridge to bankability between proven innovative technology and full market acceptance through the use of key deployment milestones and by providing capital. He summarized the application activity report for the LPO, other key metrics, and how the Infrastructure Investment and Jobs Act now allows the LPO to work with State Green Banks. Robert Edwards Jr then summarized the details of the program application process and eligibility.
    - o John Harrity commented that it is very exciting to see the activity from the LPO to fund renewables.

Victoria Hackett left the meeting at 11:00 am.
Brenda Watson left the meeting at 11:08 am.

8.   Adjourn

Upon a motion made by John Harrity and seconded by Binu Chandy, the Board of Directors Meeting adjourned at 11:16 am.

Respectfully submitted,

_____
Lonnie Reed, Chairperson

Memo

To: Board of Directors of the Connecticut Green Bank – Deployment Committee of the Connecticut Green Bank

From: Bryan Garcia (President and CEO)

CC:

Date: April 22, 2022

Re: Approval of Funding Requests below $500,000 and No More in Aggregate than $1,000,000 – Update

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At the October 20, 2017 Board of Directors (BOD) meeting of the Connecticut Green Bank ("Green Bank") it was resolved that the BOD approves the authorization of Green Bank staff to evaluate and approve funding requests less than $500,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $1,000,000 from the date of the last Deployment Committee meeting. This memo provides an update on funding requests below $500,000 that were evaluated and approved. During this period, 3 projects were evaluated and approved for funding in an aggregate amount of approximately $459,740. If members of the board or committee would be interested in the internal documentation of the review and approval process Green Bank staff and officers go through, then please request it.

80 Republic Drive: A C-PACE Project in North Haven, CT

Address	80 Republic Drive, North Haven, CT 06473			
Owner	Burmco, Inc.			
Proposed Assessment	$153,844			
Term (*years*)	25			
Term Remaining (*months*)	Pending construction completion			
Annual Interest Rate	5.45%			
Annual C-PACE Assessment	$11,342			
Savings-to-Investment Ratio	1.29			
Average DSCR	██████			
Lien-to-Value	██████			
Loan-to-Value	██████			
Projected Energy Savings (mmBTU)		EE	RE	Total
	Per year	-	177	177
	Over term	-	4,168	4,168
Estimated Cost Savings (incl. ZRECs and tax benefits)	Per year	-	$14,884	$14,884
	Over term	-	$372,088	$372,088
Objective Function	28.37 kBTU / ratepayer dollar at risk			
Location	North Haven			
Type of Building	Commercial			
Year of Build	1968			
Building Size (*sf*)	9,502			
Year Acquired by Owner	1998			
As-Complete Appraised Value[1]	██████			
Mortgage Outstanding	██████			
Mortgage Lender Consent	████████			
Proposed Project Description	44.1 kW rooftop solar PV			
Est. Date of Construction Completion	Pending closing			
Current Status	Awaiting Staff Approval			
Energy Contractor	██████			

1696 Post Rd E: A C-PACE Project in Westport, CT

Address	1696 Post Rd E, Westport, CT 06880		
Owner	Westport Tennis Club Inc.		
Proposed Assessment	$190,302		
Term (*years*)	20		
Term Remaining (*months*)	Pending construction completion		
Annual Interest Rate[2]	5.25%		
Annual C-PACE Assessment	$15,483		
Savings-to-Investment Ratio	1.64		
Average DSCR	▉▉▉▉▉		
Lien-to-Value	▉▉▉▉▉		
Loan-to-Value	▉▉▉▉▉		
Projected Energy Savings (mmBTU)			Total
	Per year		254
	Over EUL		5,988
Estimated Cost Savings (incl. ZRECs and tax benefits)	Per year		$9,636
	Over EUL		$328,090
Objective Function	31.47 kBTU / ratepayer dollar at risk		
Location	Westport CT		
Type of Building	Warehouse		
Year of Build	1962		
Building Size (*sf*)	26,640		
Year Acquired by Owner	1977		
As-Complete Appraised Value[3]	▉▉▉▉▉		
Mortgage	▉▉▉▉▉▉▉▉▉▉▉		
Proposed Project Description	60.75 kW Solar PV		
Est. Date of Construction Completion	Pending Closing		
Energy Contractor	▉▉▉▉▉▉▉		

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[2] Nominal rate unadjusted for actual/360 calculation

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922 New Harwinton Rd: A C-PACE Project in Torrington, CT

Address	922 New Harwinton Rd, Torrington, CT 06033
Owner	Traub Bros Inc.
Proposed Assessment	$96,796
Term (*years*)	15
Term Remaining (*months*)	Pending construction completion
Annual Interest Rate[4]	5.5
Annual C-PACE Assessment	$8,765
Savings-to-Investment Ratio	1.46
Average DSCR	███████
Lien-to-Value	███████
Loan-to-Value	███████

Projected Energy Savings (mmBTU)			Total
	First year		127
	Over EUL		2,428
Estimated Cost Savings (incl. ZRECs and tax benefits)	First year		$3,897
	Over EUL		$102,308

Objective Function	25.08 kBTU / ratepayer dollar at risk
Location	Torrington
Type of Building	Industrial
Year of Build	1985
Building Size (*sf*)	9,150
Year Acquired by Owner	1991
As-Complete Appraised Value[5]	███████
Mortgage	███████
Proposed Project Description	31 kW Solar PV
Est. Date of Construction Completion	Pending Closing
Energy Contractor	███████████

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[4] Nominal rate unadjusted for actual/360 calculation

███████████████████████████

Resolution

WHEREAS, on January 18, 2013, the Connecticut Green Bank (the "Green Bank") Board of Directors (the "Board") authorized the Green Bank staff to evaluate and approve funding requests less than $300,000 which are pursuant to an established formal approval process requiring the signature of a Green Bank officer, consistent with the Green Bank Comprehensive Plan, approved within Green Bank's fiscal budget and in an aggregate amount not to exceed $500,000 from the date of the last Deployment Committee meeting, on July 18, 2014 the Board increased the aggregate not to exceed limit to $1,000,000 ("Staff Approval Policy for Projects Under $300,000"), on October 20, 2017 the Board increased the finding requests to less than $500,000 ("Staff Approval Policy for Projects Under $500,000"); and

WHEREAS, Green Bank staff seeks Board review and approval of the funding requests listed in the Memo to the Board dated April 22, 2022 which were approved by Green Bank staff since the last Deployment Committee meeting and which are consistent with the Staff Approval Policy for Projects Under $500,000;

NOW, therefore be it:

RESOLVED, that the Board approves the funding requests listed in the Memo to the Board dated April 22, 2022 which were approved by Green Bank staff since the last Deployment Committee meeting. The Board authorizes Green Bank staff to approve funding requests in accordance with the Staff Approval Policy for Projects Under $500,000 in an aggregate amount to exceed $1,000,000 from the date of this Board meeting until the next Deployment Committee meeting.

Memo

To: The Connecticut Green Bank Board of Directors

From: Alysse A. Lembo-Buzzelli, Associate Director, Financing Programs; Mackey Dykes, Vice President, Financing Programs;

CC: Bryan Garcia, President & CEO; Alex Kovtunenko, Associate General Counsel, Financing Programs; Brian Farnen, General Counsel and CLO

Date: April 14, 2022

Re: Extending timeline for closing certain C-PACE transactions

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Summary

The Connecticut Green Bank Board of Directors (the "Board") or the Connecticut Green Bank Deployment Committee ("DC"), as may be applicable, has previously approved and authorized C-PACE financing for the following property:

Project Address	Approved	Expired	Project Amount
1200 Park Street, Hartford, CT 06106	9/22/21 by DC	1/20/2022	$892,926

The financing agreement(s) listed above (the "Financing Agreements") were authorized to be consistent with the terms, conditions, and memorandums submitted to the Board/DC and made no later than 120 days from the date of Board/DC approval.

Due to delays in fulfilling pre-closing requirements, including lender consent, the C-PACE program staff requests more time from the Board to close and execute the Financing Agreements. The staff requests an additional 120 days from the date of this Board meeting to execute the Financing Agreements for the transaction(s) listed above.

Resolutions

WHEREAS, pursuant to Conn. Gen. Stat. 16a-40g (the "Act") the Connecticut Green Bank ("Green Bank") is directed to, amongst other things, establish a commercial sustainable energy program for Connecticut, known as Commercial Property Assessed Clean Energy ("C-PACE");

WHEREAS, pursuant to the C-PACE program, the Connecticut Green Bank Board of Directors (the "Board") or the Connecticut Green Bank Deployment Committee ("DC"), as may be applicable, approved and authorized the President of the Green Bank to execute financing agreements for the C-PACE projects described in the Memo submitted to the Board on April 14, 2022 (the "Finance Agreements");

WHEREAS, the Finance Agreements were authorized to be consistent with the terms, conditions, and memorandums submitted to the Board or DC, as may be applicable, and executed no later than 120 days from the date of such Board or DC approval; and

WHEREAS, due to delays in fulfilling pre-closing requirements the Green Bank will need more time to execute the Finance Agreements.

NOW, therefore be it:

RESOLVED, that the Board extends authorization of the Finance Agreements to no later than 120 days from April 22, 2022 and consistent in every other manner with the original Board authorization for the Finance Agreement.

Submitted by: Bryan Garcia, President & CEO; Alex Kovtunenko, Associate General Counsel, Financing Programs; Brian Farnen, General Counsel and CLO

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Connecticut Municipal Electric Energy Cooperative (CMEEC)

& US Naval Submarine Base – Groton, CT Fuel Cell Project

A Fuel Cell Debt Financing Strategic Selection
Green Bank Term Loan Facility Extension Request
April 22, 2022

Document Purpose: This document contains background information and due diligence on a proposed credit facility for the FuelCell Energy, Inc. ("FCE" and NASDAQ: FCEL) fuel cell project under a power purchase agreement between FCE and the Connecticut Municipal Electric Energy Cooperative ("CMEEC") and located at the US Naval Submarine Base – Groton, CT. The information herein is provided to the Connecticut Green Bank Board of Directors for the purposes of reviewing and approving recommendations made by the staff of the Connecticut Green Bank.

In some cases, this package may contain, among other things, trade secrets and commercial or financial information given to the Connecticut Green Bank in confidence and should be excluded under C.G.S. §1-210(b) and §16-245n(D) from any public disclosure under the Connecticut Freedom of Information Act. If such information is included in this package, it will be noted as confidential.

Strategic Selection Financing Extension Memo

To:	Connecticut Green Bank Board of Directors
From:	Bert Hunter, EVP & CIO
Cc:	Bryan Garcia, President & CEO; Brian Farnen, General Counsel & CLO; Sergio Carrillo, Director, Incentive Programs; Jane Murphy, EVP of Finance and Administration
Date:	April 22, 2022
Re:	FuelCell Energy / US Navy / CMEEC / Groton Fuel Cell Project
	Term Loan Facility Update & Extension Request

At the March 2022 meeting of the Connecticut Green Bank ("Green Bank") Board of Directors (the "Board"), the Board approved an extension to complete the financing for a term loan facility to finance the 7.4 megawatt FuelCell Energy, Inc. ("FCE") fuel cell at the US Naval Submarine Base, Groton, CT (the "Navy Project") in partnership with and subordinated to loans (the "Senior Loans" and together with Green Bank's loan, the "Term Loans") from two bank lenders: Liberty Bank and Amalgamated Bank (the "Senior Lenders" and together with Green Bank, the "Lenders").

The senior lenders and FCE have entered into a commitment for the financing, subject to finalization of diligence and credit approval, both of which are in progress. The project financing is now expected to close by mid-May and legal meetings between the lenders have commenced. However, in an abundance of caution in case the closing date slips into early June before the June Board meeting, staff requests the original approval "execute by date" be extended to 559 days from its original approval date (to June 30, 2022).

Resolutions

WHEREAS, in accordance with (1) the statutory mandate of the Connecticut Green Bank ("Green Bank") to foster the growth, development, and deployment of clean energy sources that serve end-use customers in the State of Connecticut, (2) the State's Comprehensive Energy Strategy ("CES") and Integrated Resources Plan ("IRP"), and (3) Green Bank's Comprehensive Plan (the "Comprehensive Plan") in reference to the CES and IRP, Green Bank continuously aims to develop financing tools to further drive private capital investment into clean energy projects;

WHEREAS, FuelCell Energy, Inc., of Danbury, Connecticut ("FCE") has used previously committed funding (the "Bridgeport Loan") from Green Bank to successfully develop a 15 megawatt fuel cell facility in Bridgeport, Connecticut (the "Bridgeport Project"), and FCE has operated and maintained the Bridgeport Project without material incident, is current on payments under the Bridgeport Loan;

WHEREAS, FCE has requested financing support from the Green Bank to develop a 7.4 megawatt fuel cell project in Groton, Connecticut located on the U.S. Navy submarine base and supported by a power purchase agreement ("PPA") with the Connecticut Municipal Electric Energy Cooperative ("CMEEC") (the "Navy Project");

WHEREAS, staff has considered the merits of the Navy Project and the ability of FCE to construct, operate and maintain the facility, support the obligations under the Loan throughout its 20-year term, and as set forth in the

due diligence memorandum (the "Board Memo") dated December 18, 2020, recommended this support be in the form of a term loan not to exceed $8,000,000, secured by all project assets, contracts and revenues as well as a pledge of revenues from an unencumbered project as explained in the Board Memo (the "Credit Facility");

WHEREAS, on the basis of that recommendation, the Green Bank Board of Directors ("Board") approved of the Credit Facility, in an amount not to exceed $8,000,000 with the provision that the Credit Facility be executed no later than 315 days from the date of authorization by the Board (June 16, 2021), which was further extended by the Board in July 2021 to October 29, 2021, which was further extended by the Board in October 2021 to December 31, 2021, which was further extended by the Board in December 2021 to January 31, 2022, which was further extended by the Board in January 2022 to March 31, 2022, and which was further extended by the Board in March 2022 to May 31, 2022;

WHEREAS, Green Bank staff has further advised the Board that the closing for the Credit Facility may close in early June 2022 and to accommodate the additional time that might be needed to execute the Credit Facility requests the permitted time to execute the credit facility be increased from not later than 529 days from the original date of authorization by the Board (May 31, 2022) to not later than 559 days from the date of authorization by the Board (i.e., to June 30, 2022);

NOW, therefore be it:

RESOLVED, that the Green Bank Board hereby approves the extension of time for the execution of the Credit Facility to not later than 559 days from the original date of authorization by the Board (i.e., not later than June 30, 2022); and

RESOLVED, that the President of the Green Bank and any other duly authorized officer is authorized to take appropriate actions to provide the Credit Facility to FCE (or a special purpose entity wholly-owned by FCE) in an amount not to exceed $8,000,000 with terms and conditions consistent with the memorandum submitted to the Board dated December 18, 2020 (the "Memorandum"), and as he or she shall deem to be in the interests of the Green Bank and the ratepayers; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the Term Loan and participation as set forth in the Memorandum.

Submitted by: Bryan Garcia, President and CEO; Bert Hunter, EVP and CIO;

Memo

To: Connecticut Green Bank Board of Directors

From: Eric Shrago, Managing Director of Operations

CC: Bryan Garcia (President and CEO), Sergio Carrillo (Director of Incentive Programs), and Mackey Dykes (VP of Financing Programs and Officer)

Date: April 22, 2022

Re: Fiscal Year 2022 Progress to Targets through Q3

The following memo outlines Connecticut Green Bank (CGB) progress to targets for Fiscal Year (FY) 2022 as of March 31, 2021[1].

Table 1. Incentive Programs FY 2022 Progress to Targets

Product/Program	Projects			Capital Deployed			Capacity (MW)		
	Closed	Target	% to Target	Closed	Target	% to Target	Closed	Target	% to Target
RSIP	1,625	1,732	94%	$59,345,242	$62,969,713	94%	15.8	16.8	94%
Battery Storage	0	202	0%	$0	$5,800,000	0%	0.0	2.5	0%
Smart-E	644	800	81%	$10,029,991	$11,200,000	90%	0.2	0.8	27%
Solar for All	353	96	368%	$9,924,610	$2,478,528	400%	2.4	0.7	363%
Total	**2,520**	**2,734**	**92%**	**$75,782,387**	**$79,969,713**	**95%**	**17.7**	**20.1**	**88%**

Table 2. Smart-E Channels

Smart-E Loan Channels	Closed	% of Loans
EV	0	0%
Home Performance	59	9%
HVAC	563	87%
Solar	18	3%
(blank)	1	0%
Total	**644**	**100%**

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[1] Power BI data source: https://app.powerbi.com/groups/289235dd-d77d-4043-8dae-d232a51a116a/reports/b24ec66b-a2c1-49f0-9a62-3f7443077b3f/ReportSection13c15e79a907a30b650e

Table 3. Financing Programs FY 2022 Progress to Targets

Product/Program	Projects			Capital Deployed			Capacity (MW)		
	Closed	Target	% to Target	Closed	Target	% to Target	Closed	Target	% to Target
Commercial Solar PPA	5	37	14%	$1,157,166	$17,652,000	7%	0.5	11.0	4%
CPACE	11	30	37%	$9,520,570	$22,838,680	42%	1.5	6.3	24%
CPACE backed Commercial Solar PPA	1	0	0%	$491,502	$0	0%	0.3	0.0	0%
SBEA	502	614	82%	$8,190,216	$9,260,800	88%	0.0	0.0	0%
Multi-Family H&S	0	1	0%	$0	$600,000	0%	0.0	0.0	0%
Multi-Family Pre-Dev	0	0	0%	$0	$0	0%	0.0	0.0	0%
Multi-Family Term	3	2	150%	$2,060,000	$300,000	687%	0.9	0.2	450%
Strategic Investments	0	0	0%	$0	$0	0%	0.0	0.0	0%
Total	**520**	**679**	**77%**	**$19,420,452**	**$48,951,480**	**40%**	**2.3**	**16.5**	**14%**

Table 4. Multi-Family Units

MFH # of Units	Closed
Affordable	102
Market Rate	82
Total	**184**

Table 5. CGB Totals FY 2022 Progress to Targets

Segment	Projects			Capital Deployed			Capacity (MW)		
	Closed	Target	% to Target	Closed	Target	% to Target	Closed	Target	% to Target
Incentive Programs	2,520	2,734	92%	$75,782,387	$79,969,713	95%	17.7	20.1	88%
Financing Programs	520	679	77%	$19,420,452	$48,951,480	40%	2.3	16.5	14%
Total	**3,040**	**3,413**	**89%**	**$95,202,839**	**$128,921,193**	**74%**	**19.9**	**36.6**	**54%**

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PosiGen

Working Capital Line and Term Loan Request

April 15, 2022

SOLAR + STORAGE FOR *ALL!*

Save Money with Solar and EE and Improve Resiliency with Battery Storage

Document Purpose: This document contains background information and due diligence for the creation of a working capital line for the purchase of battery energy storage systems and associated term loan for PosiGen Inc. ("PosiGen") backed by the future incentive payments PosiGen will earn from the deployment and operation of these storage systems with low-income residents and residents of Distressed Communities in Connecticut. The information herein is provided to the Connecticut Green Bank Board of Directors for the purposes of reviewing and approving recommendations made by the staff of the Connecticut Green Bank.

In some cases, this package may contain, among other things, trade secrets and commercial or financial information given to the Connecticut Green Bank in confidence and should be excluded under C.G.S. §1-210(b) and §16-245n(D) from any public disclosure under the Connecticut Freedom of Information Act. If such information is included in this package, it will be noted as confidential.

Investment Memo

To: Connecticut Green Bank Board of Directors
CC: Bryan Garcia, President and CEO; Jane Murphy, Executive Vice President of Accounting and Financial Reporting; Brian Farnen, General Counsel and CLO; Eric Shrago, Managing Director of Operations; Sergio Carrillo, Director of Incentive Programs
From: Bert Hunter, EVP and CIO
Date: April 15, 2022
Re: PosiGen BESS Working Capital and Term Loan Facility

Background

The Energy Storage Solutions Program, ordered by the Connecticut Public Utilities Regulatory Authority ("PURA") in July of 2021, is designed to expand the development of battery energy storage systems across the state. Amongst the goals for the initiative that PURA identified in its decision, the program must prioritize delivering resilience benefits to low- and moderate-income ("LMI") customers and customers in environmental justice and economically distressed communities – with a focus of no less than 40 percent of installations being installed in such communities. PosiGen, Inc. and its subsidiaries (collectively, "PosiGen"), are currently launching an affordable storage offering targeting these traditionally underserved customers.

To support PosiGen in providing an affordable storage offering, staff is recommending to the Board of Directors (the "Board") that the Connecticut Green Bank ("Green Bank") provide a working capital line and term loan to the company. As the Board is well aware, the Green Bank has a longstanding relationship with PosiGen, including an existing 2nd lien credit facility that supports PosiGen's solar and energy efficiency offerings and a 1st lien facility against PBI payments under the RSIP. As of March 1, 2022, PosiGen had approximately $1.8 million remaining balance on the 2nd lien facility, after successfully paying down over $12.7 million of the balance in September 2021, and about $8.8 million against the PBI, which is fully drawn and amortizing over the next 5 years or so (in line with PBI payments). The proposed working capital line and term loan, as detailed further in this memo, will build on the Green Bank's successful partnership with PosiGen and will advance the state's goals to expand storage adoption in underserved communities.

PosiGen's Storage Offering

PosiGen plans to provide an 18 kWh battery that will be paired with both existing and new rooftop solar installations to provide a clean backup solution for its residential customers. PosiGen has partnered with

████████████, to provide their ████████product as the primary initial offering to its customer base. Appendix A includes the product specification.

PosiGen's goal for this program, similar to the company's traditional solar + EE offering, is to focus on affordability in providing a backup solution to its customers. As with its existing solar lease offering, PosiGen will pay for the purchase, installation, and maintenance of the asset. The customer will not pay

anything upfront and will either see a small increase in their solar lease payment or may not see any increase at all (which is PosiGen's goal wherever possible), depending on the final product pricing.

In addition to the upfront incentive offered through the Energy Storage Solutions Program (the "ESS Program"), PosiGen can keep the storage offer affordable to the customer by monetizing the Federal Investment Tax Credit (currently available when storage is paired with solar) and by earning incentive payments through the ESS Program, including through both passive and active dispatch activities.

- **Passive Dispatch:** Participants in passive dispatch are required to set the storage system to automatically store and dispatch energy to reduce demand during summer peak periods. The proposed incentive rate through 2024 is $200/kWh for standard customers, $300/kWh for customers in underserved communities, and $400/kWh for low-income customers. Total incentives per system cannot exceed the lesser of 50% of the total installed cost or $7,500.

- **Active Dispatch:** The utility may call on the asset to dispatch differently than the passive dispatch schedule. The asset will be paid based on the average discharge capacity across all active events during a given season. Assets can participate in active dispatch for up to 10 years. The proposed incentive rate for assets participating in summer events is $200/kW for the first 5 years and $115/kW for years 6-10. Th proposed incentive rate for assets participating in winter events is $25 for the first 5 years and $15 for years 6-10.

As a part of its offering, PosiGen will work with ████████ to operate the assets in accordance with the requirements of the ESS Program. ████████ will guarantee active dispatch incentive payments to PosiGen, regardless of actual performance, in return for a small haircut on the incentive payments. ████████ will pay PosiGen within 30 days of receiving payment from the program administrator.

In terms of program rollout, PosiGen will initially target several hundred existing low-income solar customers in Distressed Communities who have an existing solar ease. From there, the company will expand to its other 2,000+ customers living in Distressed Communities.

Proposed Congressional Bank Facility and Green Bank Positioning

To expand the Green Bank's continued partnership with PosiGen and enable the launch of their affordable storage product, staff is proposing to provide a $2 million working capital line to support the purchase of hardware and a $6 million term loan sized to future dispatch incentive payments, which (from a performance perspective) are guaranteed by ████████ to PosiGen.[1] A summary of the proposed working capital line terms follows below:

- Provide capital for the purchase of hardware, including the ████████ storage systems. This credit line will not be used to pay for soft costs so will be fully collateralized via the inventory purchased
- Not to exceed $2 million
    - This will allow PosiGen to purchase approximately 150 ████████ systems at a time, which should coincide with projected near-term sales volume as the program rolls out

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[1] Should any battery system performance failure result in a loss of active dispatch incentive payments that would have been paid by the utility (but for such failure), the ████████ guarantee will cover such shortfall. See Appendix B.

- Fixed 2% interest rate per annum
- Allowed to revolve for a [2-yr] draw period (subject to extension by PosiGen in Green Bank's sole discretion), but specific assets purchased under the facility must convert to collateral for the Term Loan within [180] days or be repaid at the end of such 180-day advance period unless modified or waived by Green Bank in Green Bank's sole discretion).

A summary of the term loan terms follows below:

- $6 million term loan facility that provides 100% advance against the present value (at 4.5%) of the ▮▮▮▮▮▮ guaranteed payments and any customer payments
  - ▮▮▮▮▮ is the credit counterparty, and the guaranteed payments limit PosiGen's exposure to performance risk
  - Customer payments are expected to be a nominal portion of the revenues if PosiGen decides to charge a lease fee at all. Most, if not all, of the revenues will come from ▮▮▮▮▮.
  - The loan at this size is anticipated to cover an estimated 1,000 installations over a targeted 2 year period
- Amortizes fully over 10 years, which is tied to the life of the underlying asset, with an option for an Interest Only period (to be approved by Green Bank in Green Bank's sole discretion, but in any event not to exceed 12 months from date of the corresponding conversion to term status)
- Fixed interest rate per annum as follows:
  - LMI / Distressed Communities Portion (up to $6,000,000): 4%
  - Non-LMI / Distressed Communities Portion (not to exceed lesser of (a) $2,400,000 or (b) $6,000,000 *less* LMI Portion advanced): 5%
- Projects to be owned by various PosiGen-managed tax equity funds, with this new structure running through the company's existing master back-leverage facility
  - The collateral approach will mirror the Green Bank's existing 1st lien credit facility against PBI cash flows where such PBI cash flows (in this case – the BESS cash flows) are "carved out" from the collateral pool which benefits the 1st and 2nd lien lenders. Using the PURA approved direct payment structure, the utilities make active dispatch incentive payments directly to PosiGen's solar fund structure (the owners of the BESS assets).

Recommendation

The Green Bank's ongoing partnership with PosiGen has brought the benefits of solar and energy efficiency to low-income customers and residents of Distressed Communities across the state. By providing a working capital line and a term loan to support PosiGen's new battery storage offering, the Green Bank can expand on this successful investment and bring resiliency benefits to these underserved communities, as well. Furthermore, the Green Bank's exposure to performance risk is limited through the direct payment arrangement by the utilities to PosiGen's solar fund structure, our secured collateral position, and PosiGen's guaranteed revenue agreement with ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮▮ ▮▮▮▮▮▮▮▮▮▮▮▮ (see Corporate Overview at Exhibit B). For these reasons, staff recommends proceeding with an investment as outlined herein.

Resolutions

WHEREAS, the Connecticut Green Bank ("Green Bank") has an existing partnership with PosiGen, Inc. (together with its affiliates and subsidiaries, "PosiGen") to support PosiGen in delivering a solar lease and energy efficiency financing offering to LMI households in Connecticut;

WHEREAS, PosiGen is planning to expand its offerings to LMI households in Connecticut to include an affordable battery energy storage system ("BESS") option that will provide the customer backup power during a power outage and will reduce peak demand on the electric distribution system, as more fully explained in a memorandum dated April 15, 2022 to the Green Bank Board of Directors (the "Board Memo");

NOW, therefore be it:

RESOLVED, that the Green Bank may advance a working capital line to PosiGen for the purchase of battery energy storage systems not to exceed $2 million on the terms substantially similar to those described in the Board Memo;

RESOLVED, that the Green Bank may further advance up to $6 million in term loan financing to PosiGen by periodically converting such working capital advances (or any cash purchased eligible collateral owned by PosiGen or its subsidiaries that is backed by customer contracts for BESS systems) on terms substantially similar to those described in the Board Memo; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

Submitted by: Bert Hunter, EVP and CIO
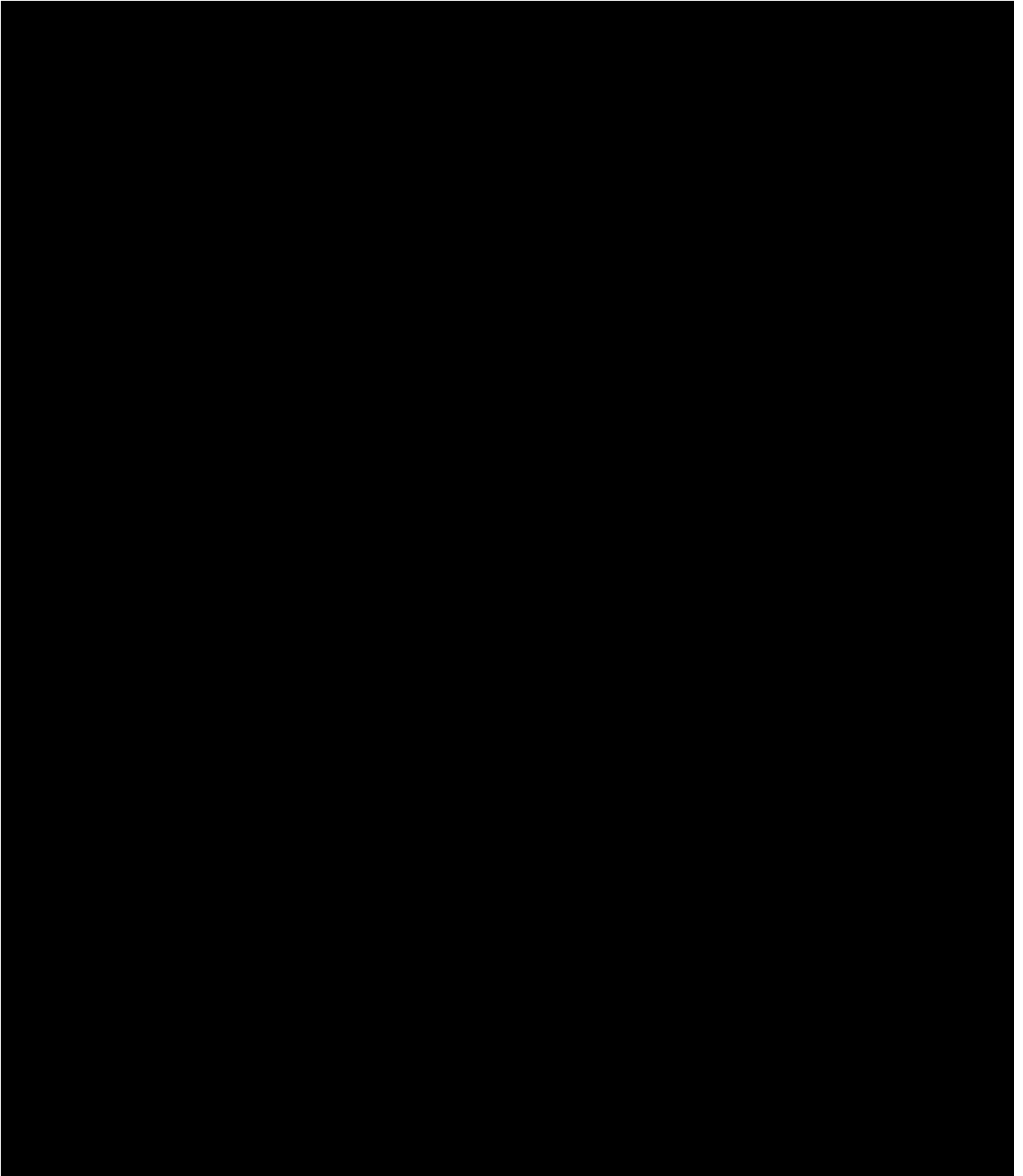
APPENDIX A

APPENDIX B
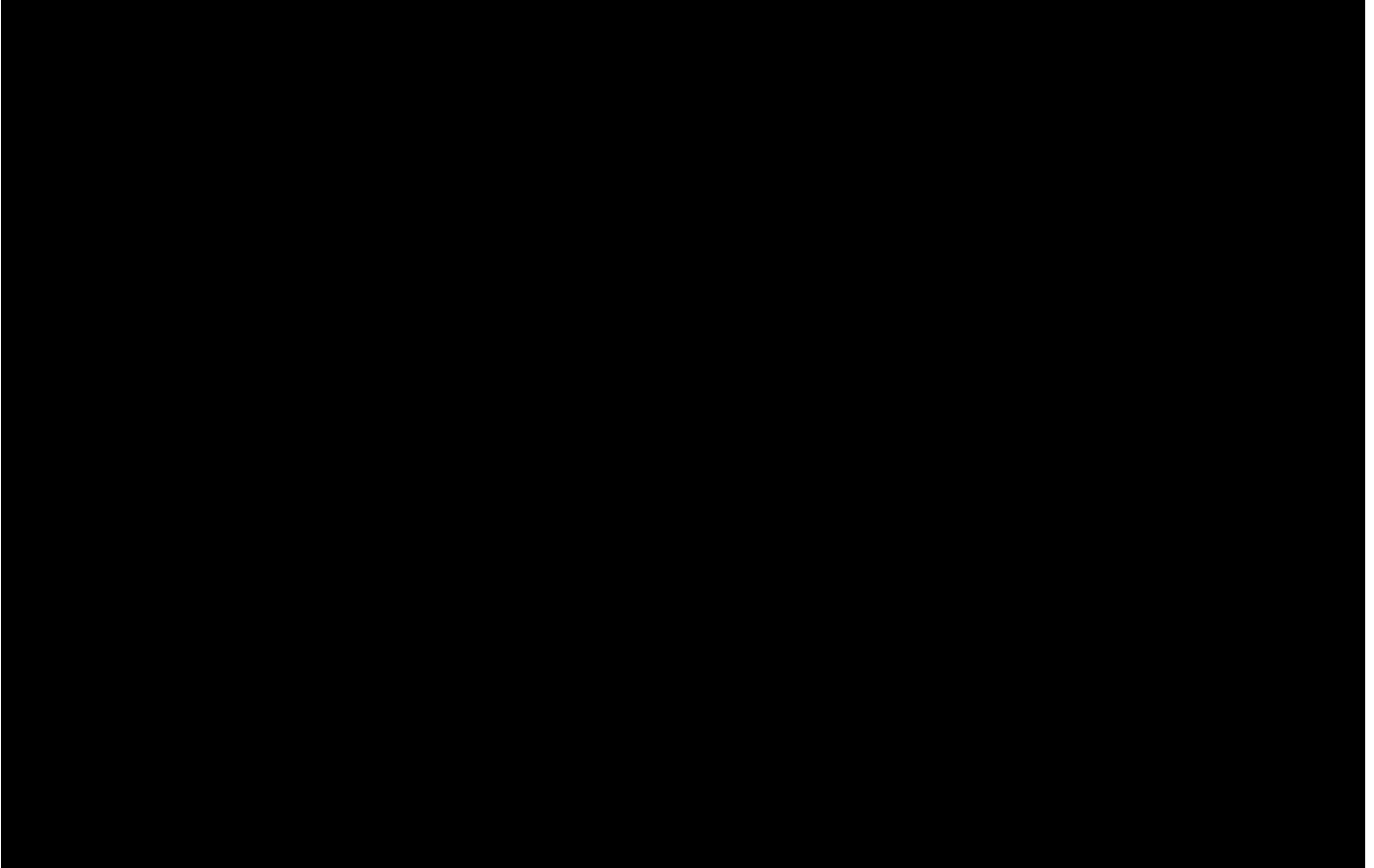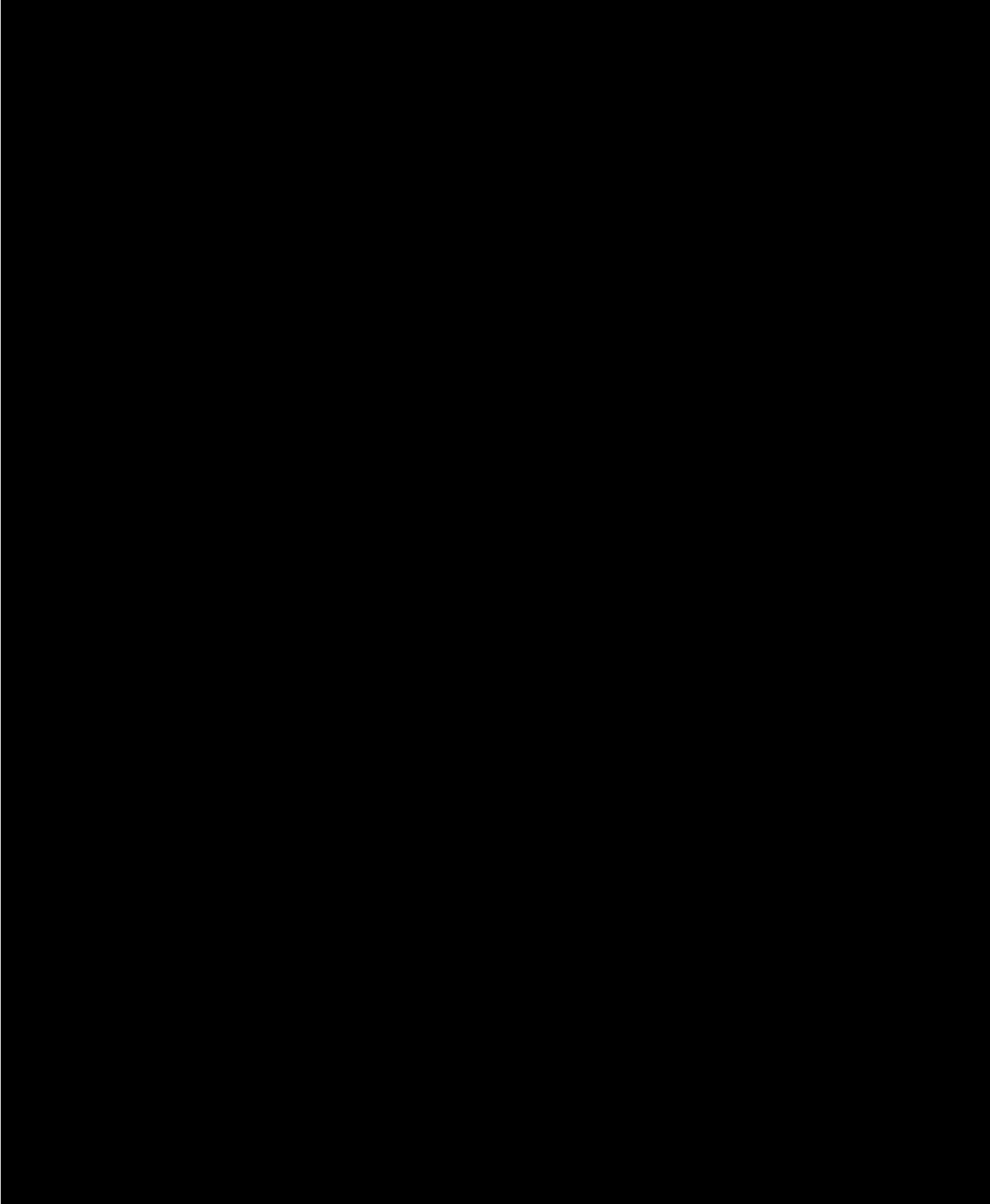
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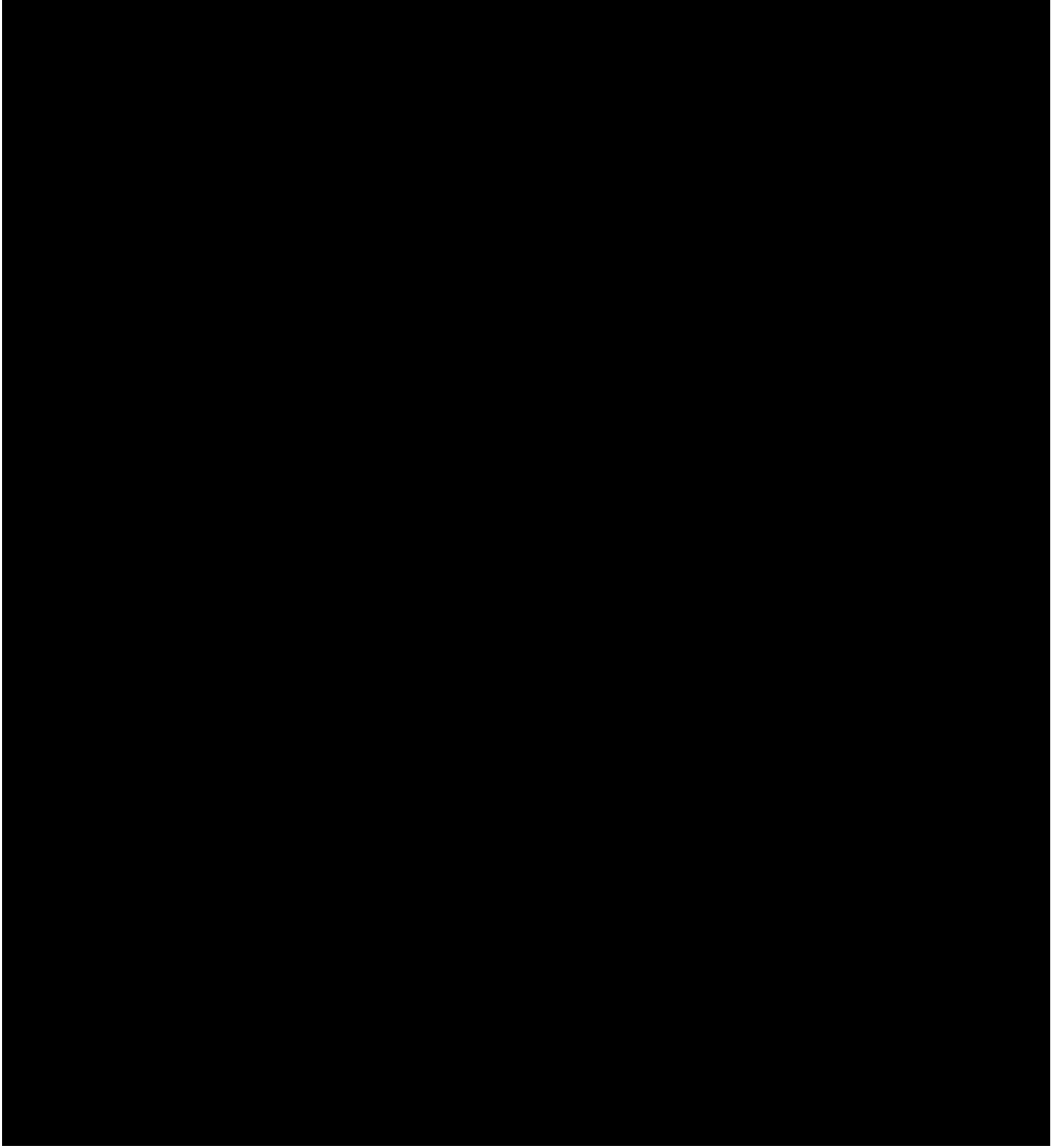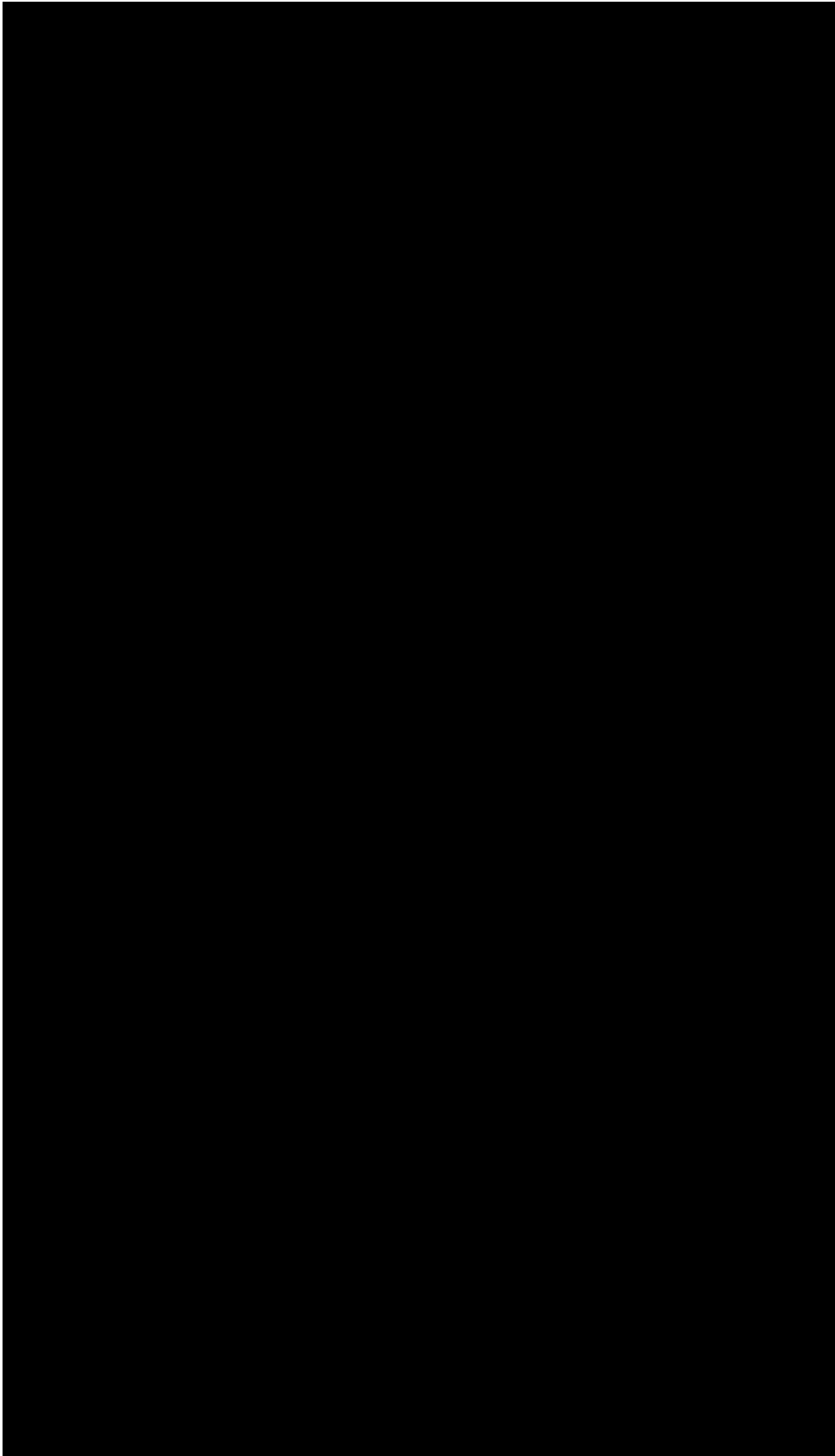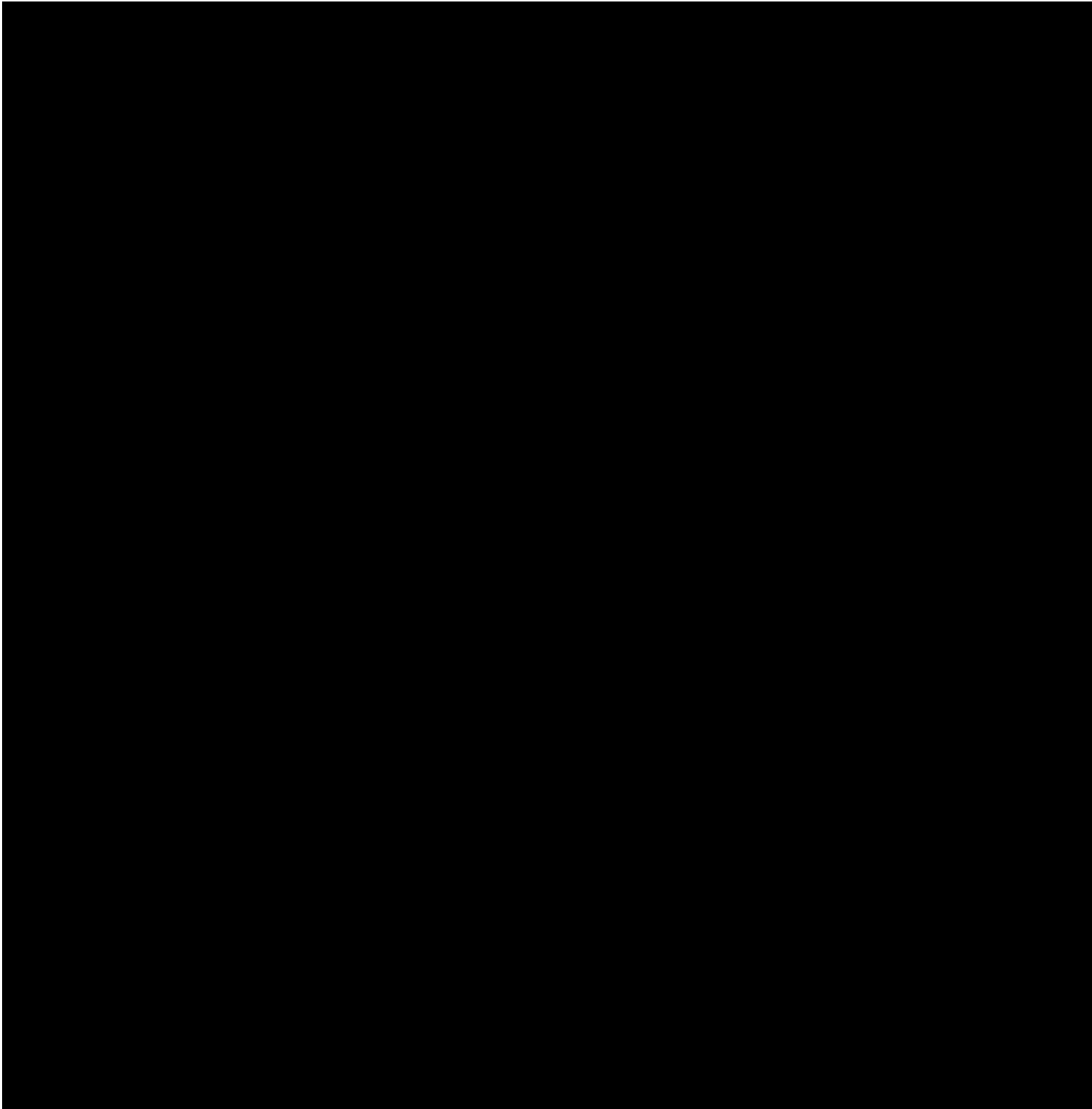
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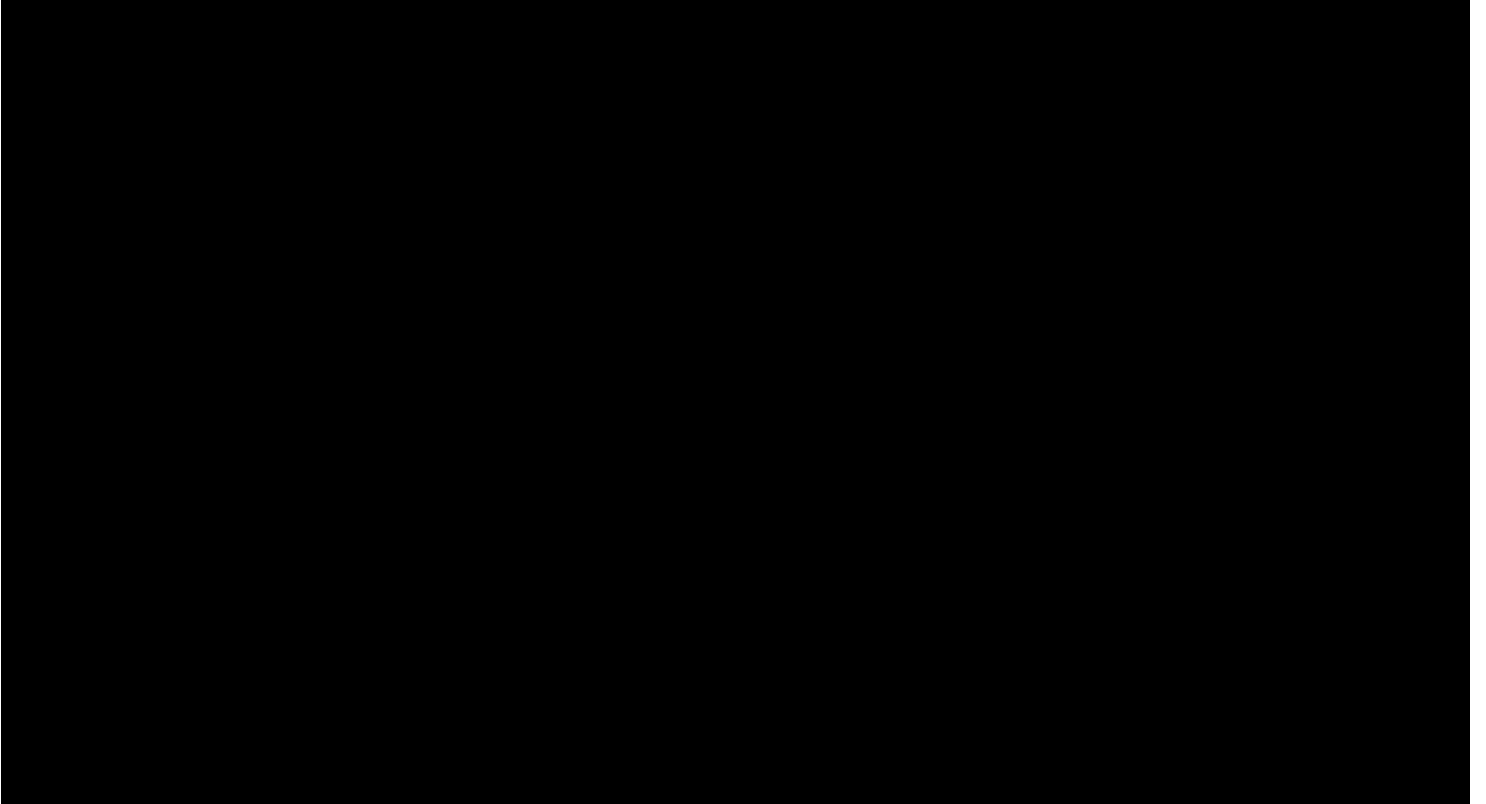
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Capital Solutions RFP

A Funding Facility for Budderfly, Inc.

Subordinated Secured Term Loan Facility

April 18, 2022
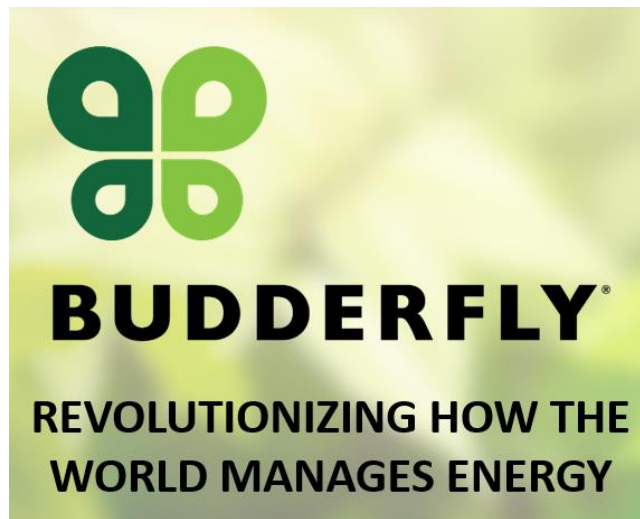
Document Purpose: This document contains background information and due diligence on a proposed $5.0 million funding facility for Budderfly, Inc. created through the Connecticut Green Bank's Capital Solutions Open RFP program. The information herein is provided to the Connecticut Green Bank Board of Directors for the purposes of reviewing and approving recommendations made by the staff of the Connecticut Green Bank.

In some cases, this package may contain, among other things, trade secrets and commercial or financial information given to the Connecticut Green Bank in confidence and should be excluded under C.G.S. §1-210(b) and §16-245n(D) from any public disclosure under the Connecticut Freedom of Information Act. If such information is included in this package, it will be noted as confidential.

Memo

To: Connecticut Green Bank Board of Directors

From: Bert Hunter, EVP and CIO; Desiree Miller, Senior Manager, Clean Energy Finance

Cc: Bryan Garcia, President and CEO; Brian Farnen, General Counsel and CLO; Mackey Dykes, VP Financing Programs and Officer; Jane Murphy, EVP Finance & Administration

Date: April 18, 2022

Re: Budderfly, Inc. Capital Solutions RFP Proposal

Summary

Budderfly, Inc., a Connecticut based company ("Budderfly"), has submitted a request for funding which is being presented to the Connecticut Green Bank ("Green Bank") Board of Directors (the "Board") through the Green Bank's Capital Solutions Open RFP (approved by the Board in July 2021).

Budderfly, with its corporate headquarters and central operations in Shelton CT, was founded in September 2017 with the goal to revolutionize how the commercial and industrial sector acquires, implements and manages energy efficiency solutions, energy efficient lighting and other services to lower their consumption of energy, realize savings with no upfront investment, and manage their energy use through a user-friendly and proprietary cloud-based technology platform. Budderfly's Energy as a Service (EaaS) offering (meaning that Budderfly is the installer, owner, operator and manager of the labor and capital expenditures (CAPEX) required for the EaaS benefits) incorporates a variety of solutions including patented Budderfly devices to reduce energy use. The Internet of Things (IoT) devices include ultra-smart light switches and outlets which micrometer energy use, sub-panel meters and site power management equipment. Budderfly's Energy Management Systems (EMS) software provides comprehensive automation, visibility, management and control. Budderfly's technology-enabled platform leverages its patented and proprietary hardware and software to monitor and analyze energy use and provide solutions that enables its clients (the overwhelming majority of which are small franchise operators in the quick serve restaurant industry) to understand their energy usage, reduce their energy consumption, lower their operating and maintenance costs, and realize economic and environmental benefits. The company is growing rapidly, with nearly ▮▮▮▮ contracts from Connecticut to California, and a revenue growth of ▮▮▮ in 2021 (to more than ▮▮▮ million in top line revenues). The company has benefitted from more than ▮▮▮ million in funding from such notable investors as Balance Point Capital (domiciled in Connecticut), Edison Ventures, Mizzen Capital (a CT-based woman-owned SBIC), CT Innovations, DECD and its own executive management. Currently, Budderfly is working with its investment bankers on a further equity raise and has approached the Green Bank for an intermediate term loan through the Green Bank's Capital Solutions Open RFP program.

Summary Financing Proposal

Budderfly seeks a $5 million 6-year term loan facility to supplement and complement other existing debt facilities provided by the entities shown below. Green Bank would be subordinated to all senior funding and pari-passu with other subordinated facilities:

Name	Facility Type	Maximum	Outstanding 3/31
Balance Point & CT Innovations	First Lien Senior Secured		
DECD	First Lien Senior Secured		
Mizzen Capital	Second Lien Secured Creditor		
CT Innovations	Second Lien Secured Creditor		
CT Green Bank	**Second Lien Secured Creditor**		
Vendors (long term pay)	Unsecured and no retained interest in equipment		
Others	Unsecured		

Business Model Highlights

Budderfly provides guaranteed energy savings through its EaaS solution primarily for quick service restaurants, convenience stores as well as other commercial facilities. At no cost to the customer, Budderfly installs energy efficiency upgrades that reduce the customer's energy usage. Budderfly receives recurring payments from the customer and the customer receives immediate and progressive energy savings as well as a reduced carbon footprint.

According to the EPA, most businesses waste more than 30% of the energy they consume. Wasted energy is usually the result of outdated or poorly maintained HVAC equipment, lack of automated controls to manage lighting and plug loads and using incandescent lighting instead of LEDs. If commercial and industrial loads were reduced by 30%, U.S. businesses would save over $20 billion and cut carbon emissions by more than 80 million metric tons annually. Budderfly's model helps to achieve this transition in a way that is highly scalable. The following are some of the key highlights of the Budderfly value proposition:

- Turnkey energy savings and sustainability solutions that reward customers and Budderfly
  - Customers make no upfront investment and save ▮▮▮▮▮▮▮ on their energy costs and reduce their carbon footprint by ▮▮▮▮▮
  - Budderfly generates asset-level returns on invested capital in excess of ▮▮▮

- Unique and compelling business model that eliminates the traditional pitfalls of energy-as-a-service businesses (high customer acquisition costs and long sales cycles) by ▮▮▮▮▮▮▮▮▮▮▮▮▮▮

○ [redacted]

○ [redacted]

○ [redacted]

• [redacted]

○ [redacted]

○ [redacted]

○ [redacted]

○ [redacted]

• Tech-enabled customer onboarding, billing and servicing that facilitates rapid growth

○ [redacted]

○ [redacted]

Key Company Metrics

• [redacted]
• [redacted]
• [redacted]
• [redacted]

Business Overview

While the tremendous savings and environmental benefits that can be achieved by reducing waste have been well understood and validated for many years, relatively few businesses have made the investments required to improve their energy efficiency. It is well understood that the slow adoption of energy efficiency measures by businesses is primarily the result of two factors: first, many businesses are unwilling to commit the capital required to upgrade their buildings because they do not want to take the risk that the improvements will not deliver sufficient energy savings to offset the upfront investment, and second, they lack the knowledge to analyze, procure and implement energy efficiency improvements.

Over the past several years, specialized EaaS providers have emerged who specify, pay for and install energy efficiency improvements (e.g. new lighting, HVAC, controls, etc.) in return for

contracted monthly payments from the host customer. The host customer benefits from the difference between their old energy bill and their new energy bill and the payment to EaaS provider. The EaaS provider benefits by earning an attractive return on their investment in equipment through the payments from the host customer.

Most EaaS providers have focused on upgrading large office buildings. EaaS providers that focus on offices have experienced relatively slow growth because of the long sales cycles involved with corporate office space and modest returns on capital because of the relatively high cost of acquiring customers given the significant amount of customization required.

Budderfly has a very different billing model ███████████████████████████████████
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Budderfly targets ██
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The combination of Budderfly's billing model and focus on ████████ enables faster growth and higher returns on capital than other EaaS companies in addition to greater environmental impact.

Growth Strategy & Customer Experience

Budderfly's success is routed in its ████████████ model" which they divide into three phases:

- Marketing

██
██
██
██
██
██

- ○ ██

- Engage with ████████████████████████████████████
  - ○ ██
  - ○ ██
  - ○ ██
  - ○ ██
  - ○ ██
  - ○ ██

  - ○ ██
  - ○ ██

- Rapid Scaling
  - ○ ██
  - ○ ██

  - ○ ██
  - ○ ██
  - ○ ██
  - ○ ██

An example of this franchise sales model approach is summarized here with ████████████ shops:
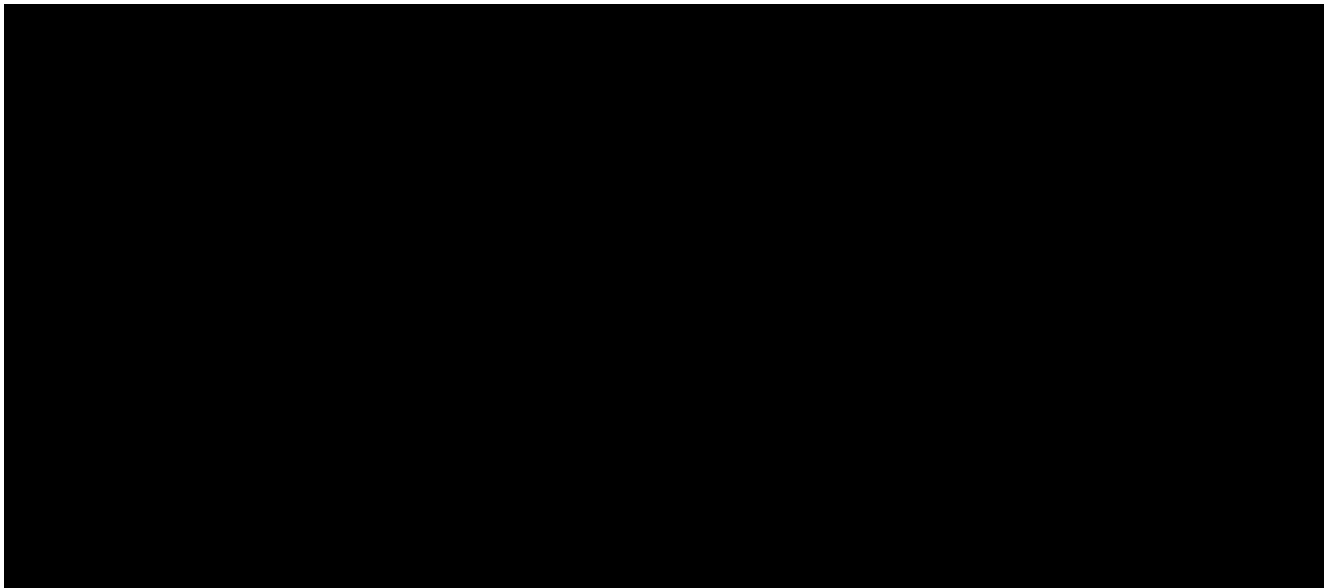
Once onboarded – the franchise participant has access to its unique "franchise branded" energy management system:
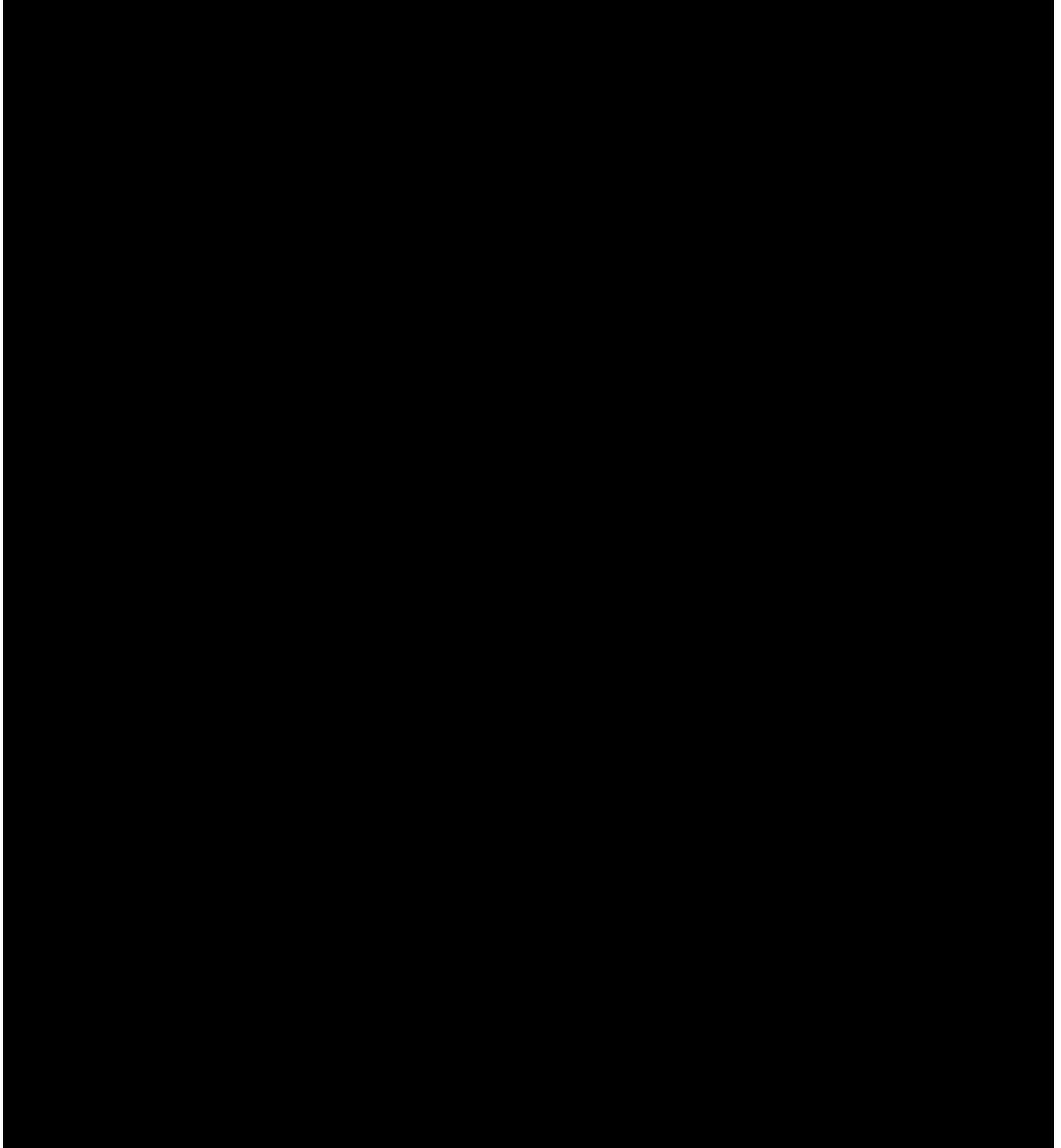
On a monthly basis – the franchise participant receives "one bill" which summarizes energy use, savings and billings:
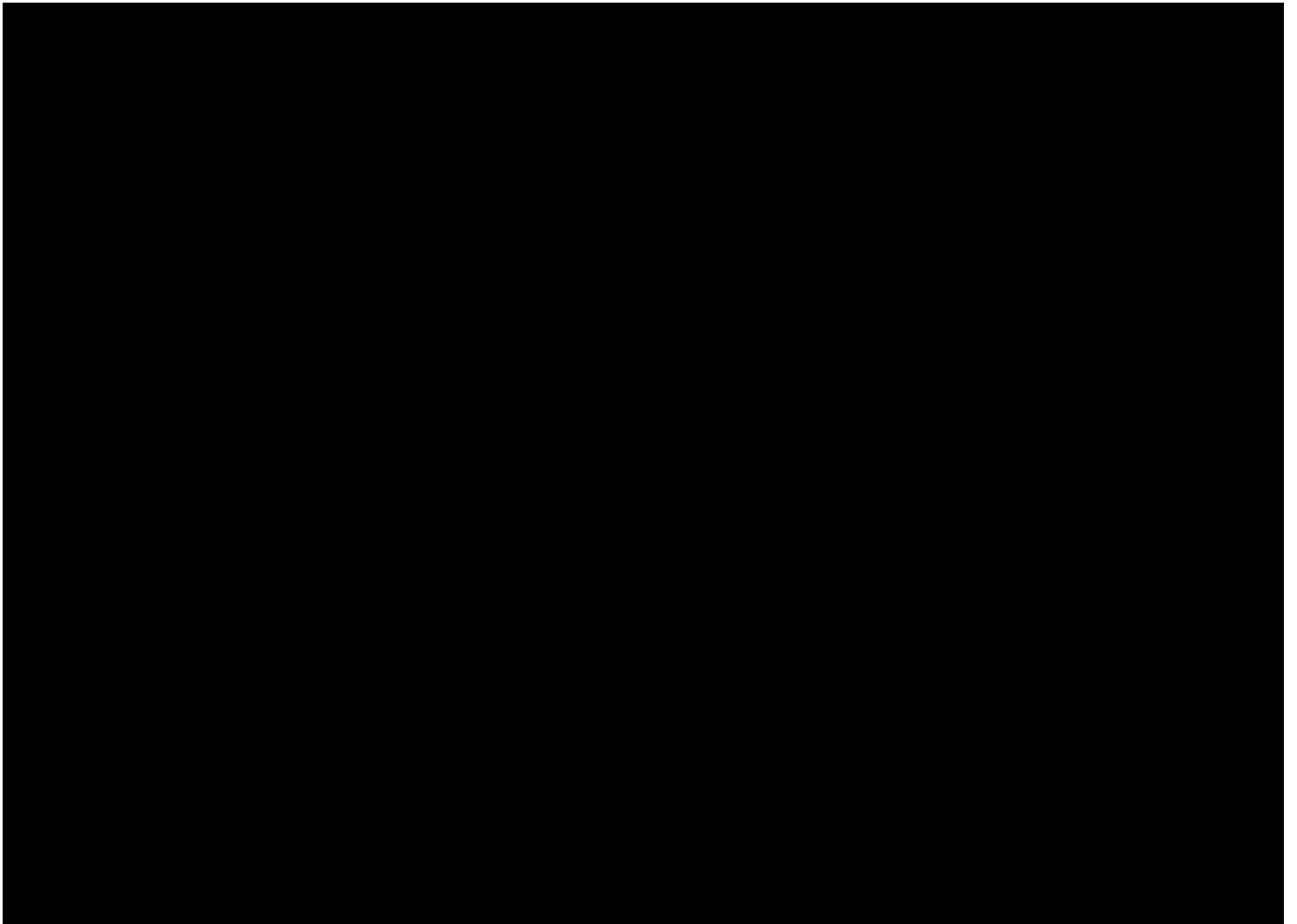
Customer Economics & Data Analytics Process

In the typical arrangement – the unit economics translate into the following metrics and billings:
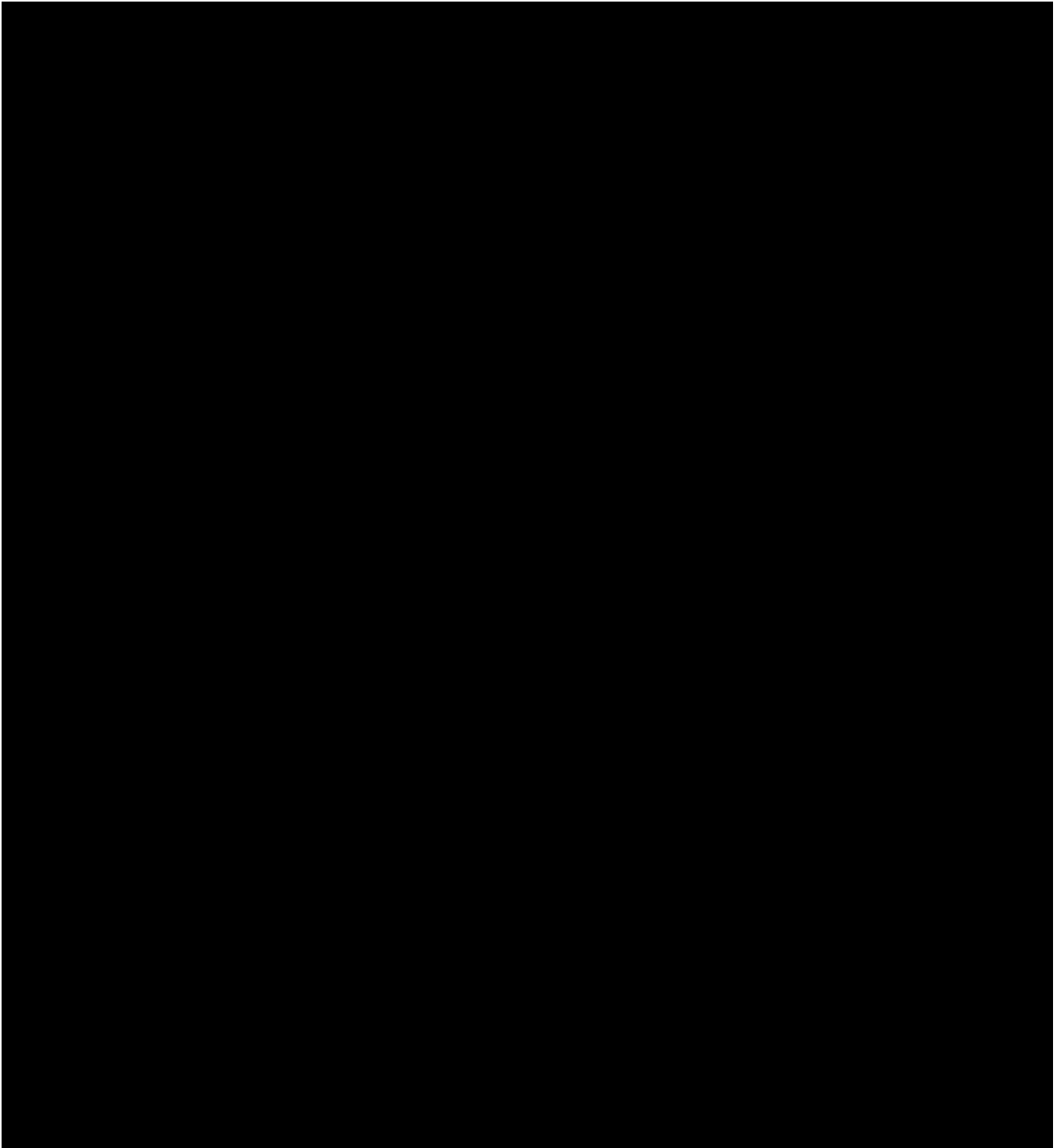
Together, the customer payments create a revenue stream of that will repay the first lien and second lien (including Green Bank) lenders. In the future, as the Budderfly's contracted revenue streams expand, Green Bank intends to finance thousands of these contracts with commercial bank lending partners under a master facility (similar in structure to the SBEA facility) which should reduce Budderfly's cost of capital by at least 50%. The excellent collections experience of the portfolio combined with the highly efficient operational model and exceptional data analytics platform shown below makes the Budderfly business model a prime candidate for efficient securitization.
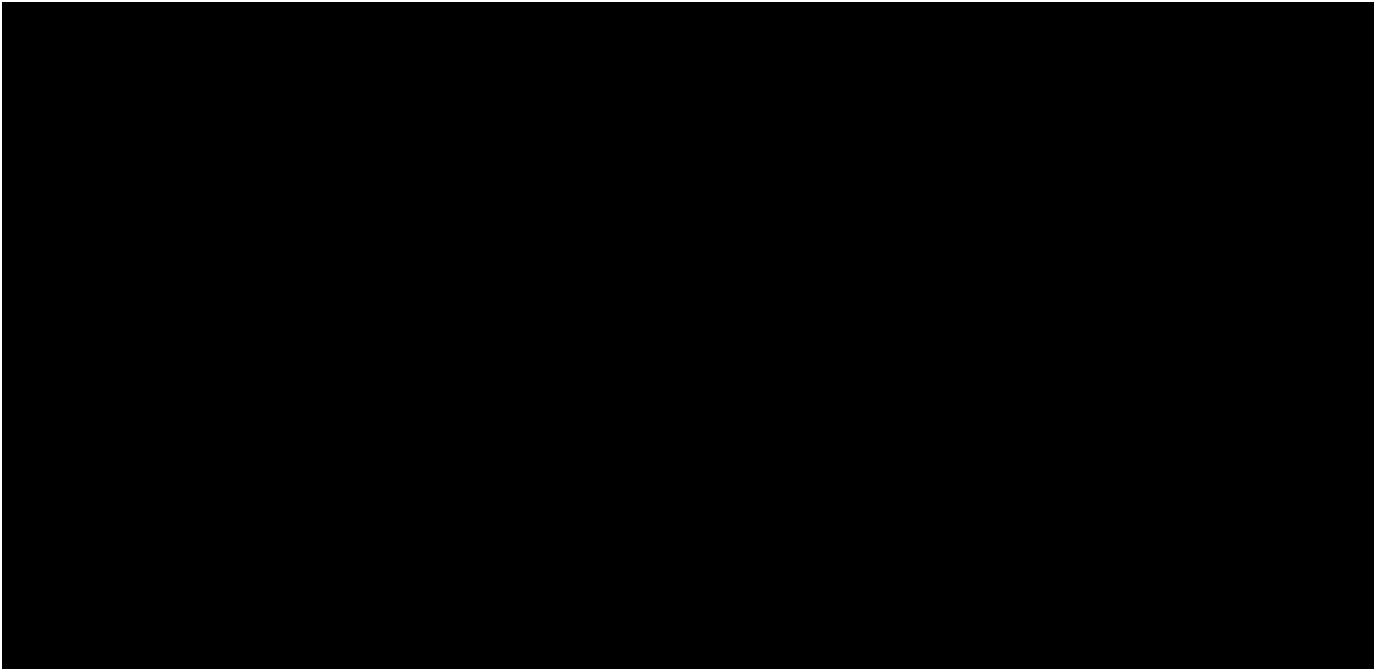
Implementation of Energy Conservation Measures (ECMs) & Follow-on Operation & Maintenance

Budderfly implements ECMs at thousands of disparate locations nationwide. ██████████████
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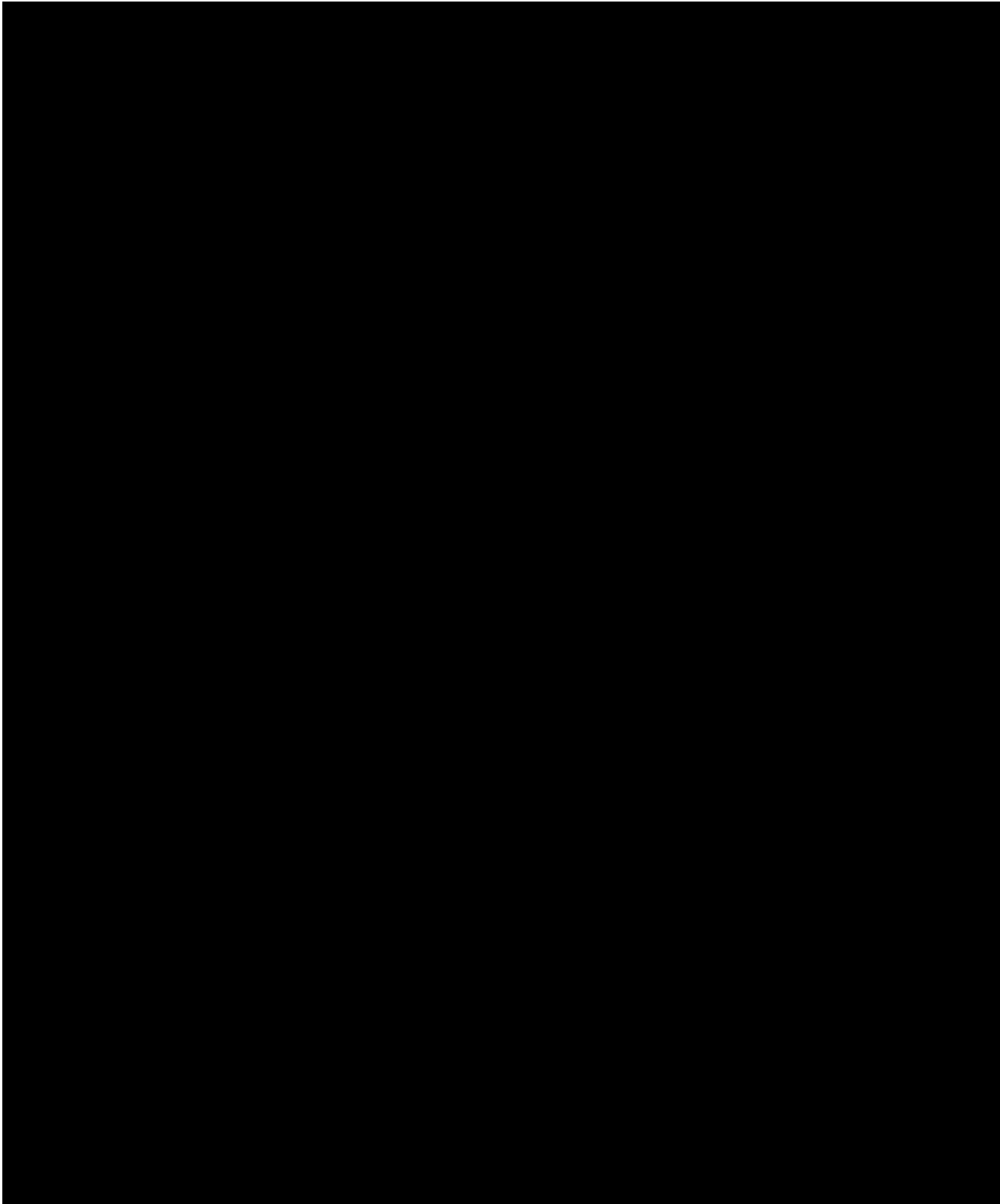
Financial Statement Review and Forecast P&L

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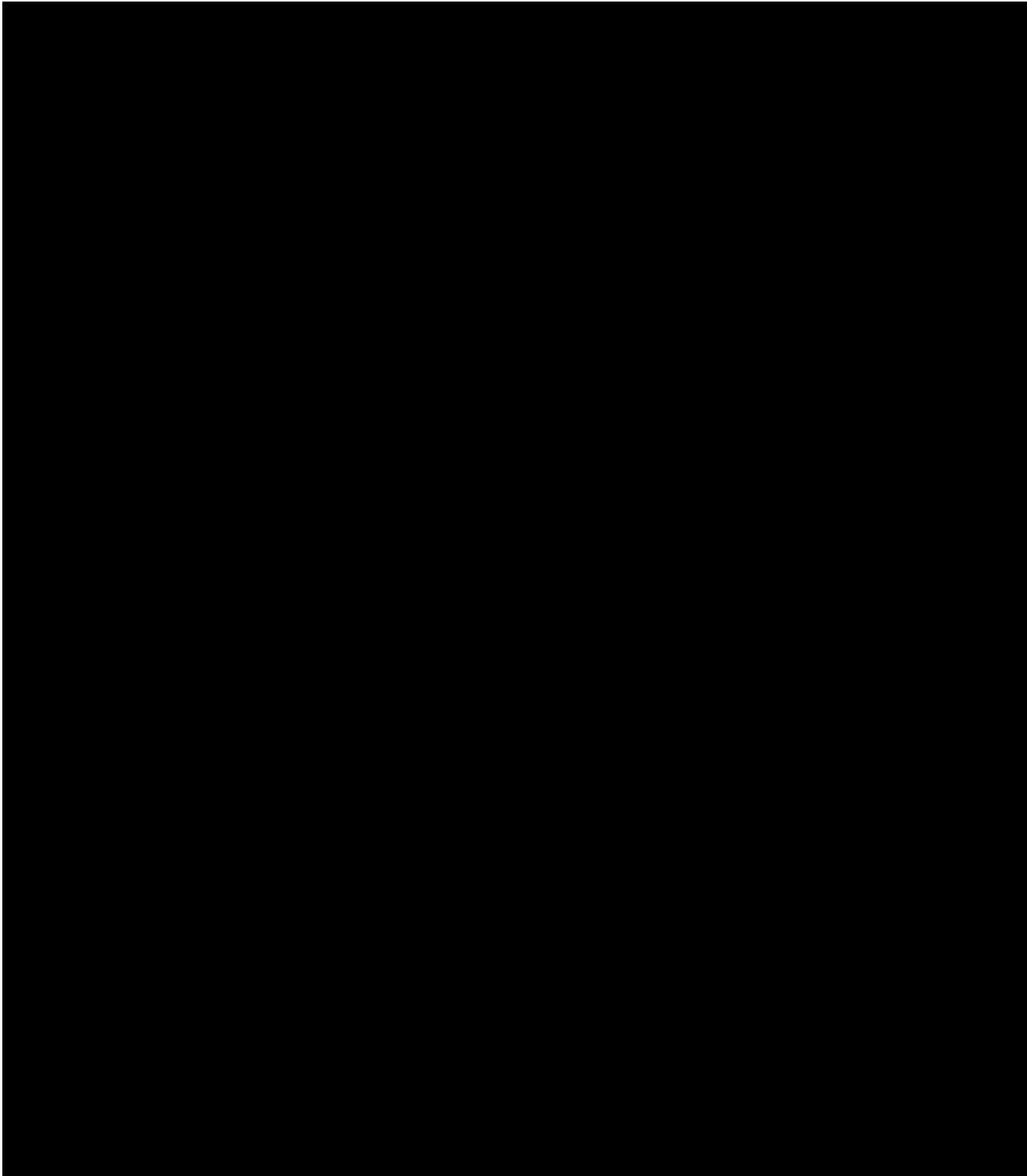
[1] EBITDA = Earnings Before Interest, Taxes, Depreciation and Amortization

Budderfly, Inc.

Balance Sheets
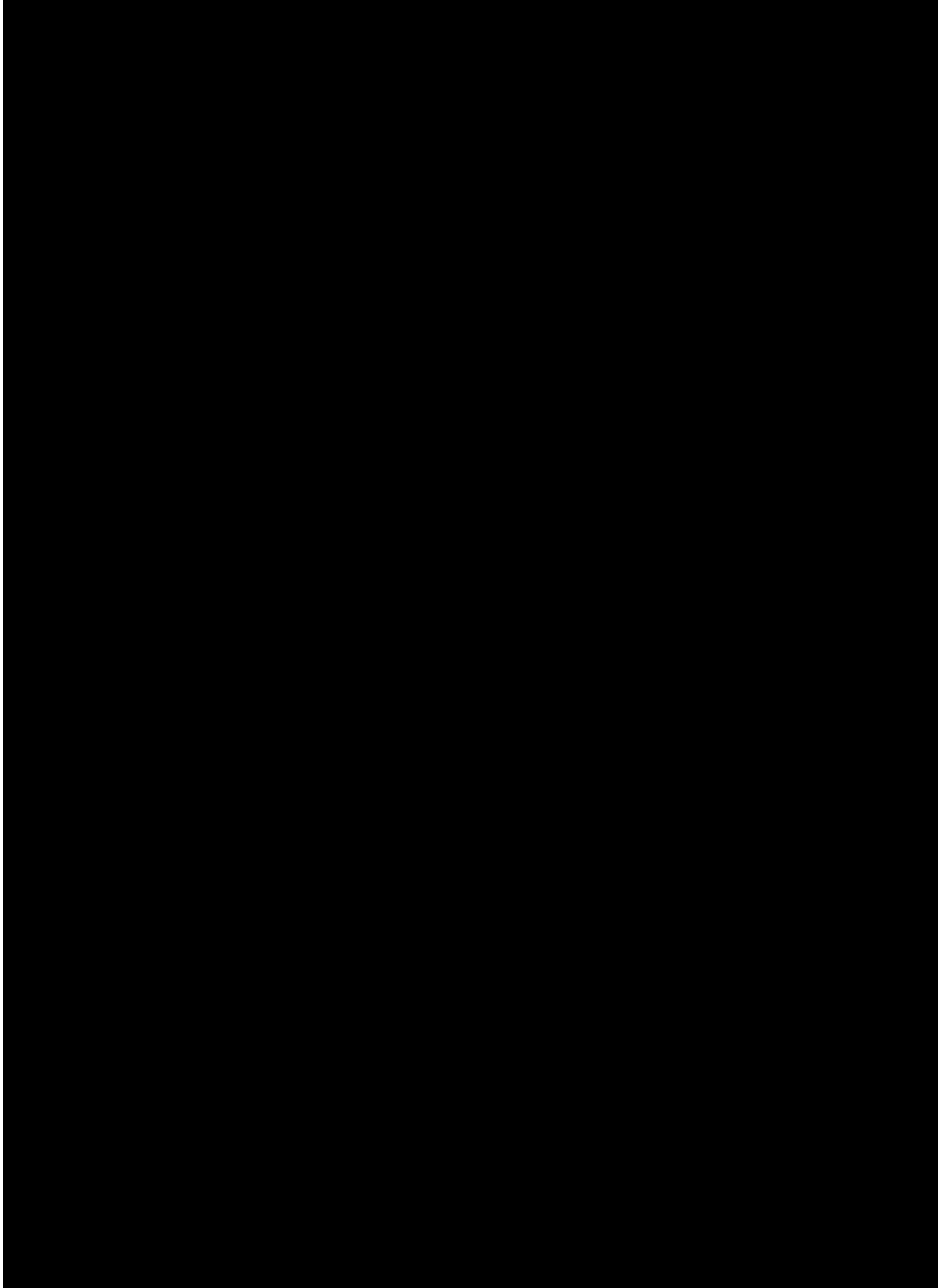
Budderfly, Inc.

Consolidated Statements of Operations

(2020 & 2019 Audited by RSM – 2021 under audit

2022 YTD & Forecasts as presented by Management)
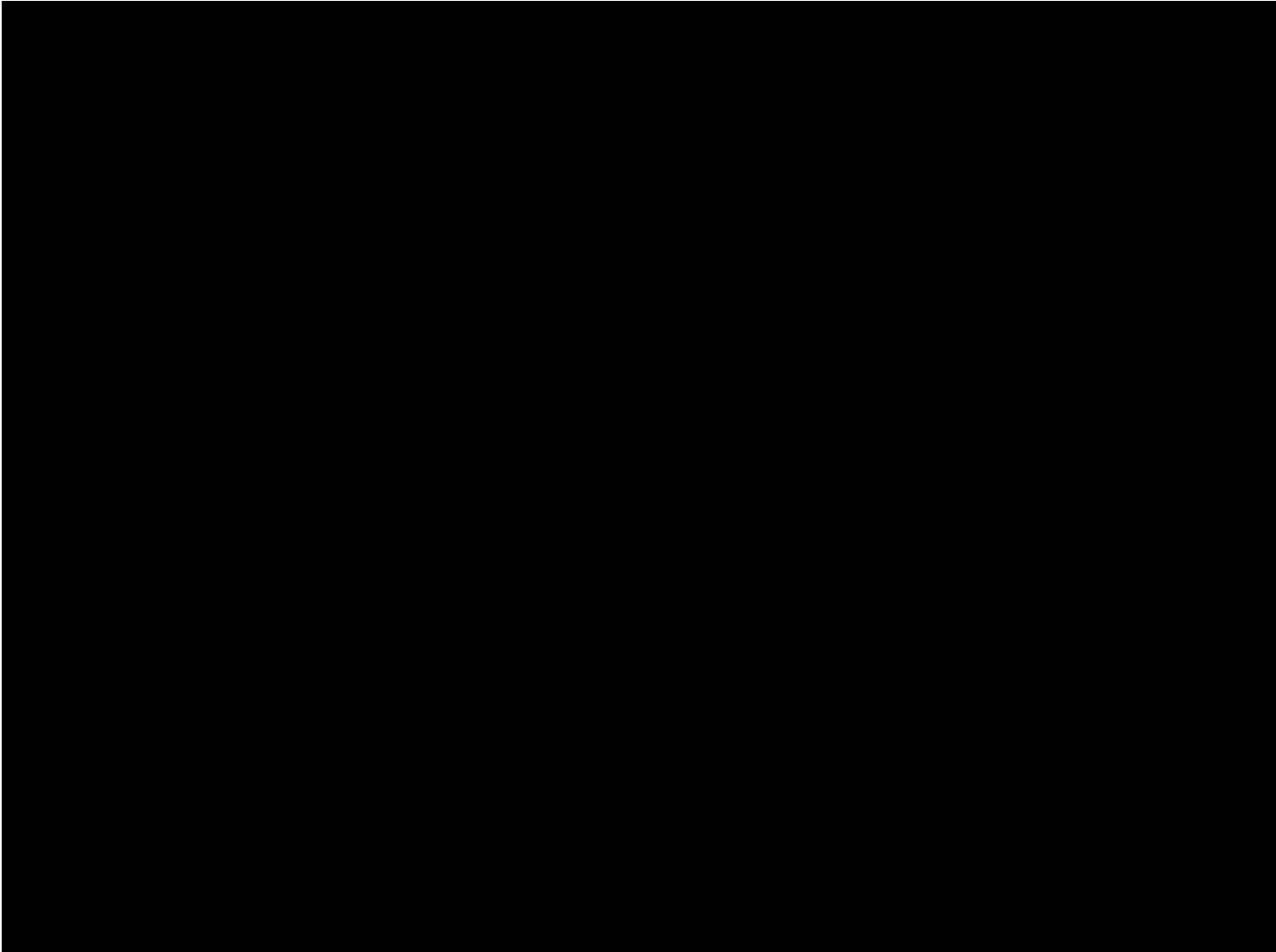
Schedule of Notes Payable (1ˢᵗ & 2ⁿᵈ Liens)
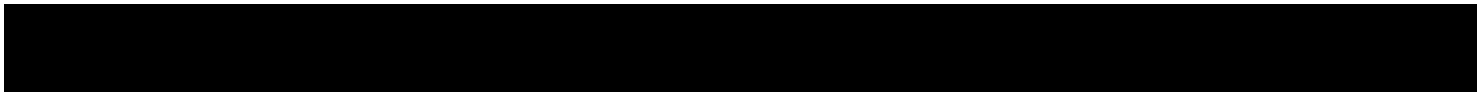
Green Bank Term Loan Proposal

Exhibit A contains the proposed Indicative Summary of Terms and Conditions to Budderfly, Inc. for a subordinated secured loan facility up to $5,000,000 with a six (6) year maturity. Budderfly would have up to 3 months to request advances under the facility for working capital purposes (subject to a $1,000,000 maximum) and/or customer upgrade costs for projects located in and outside the state of CT. The latitude to use funds both inside and outside of Connecticut follows on the PosiGen model where Green Bank is secured with various residential contracts (and in the Budderfly instance, commercial contracts) where a sufficient value of existing contracts to Connecticut projects (approximately $6,000,000 on a present value basis) as well as Connecticut being Budderfly's largest customer base nationally (~14% by revenue) substantiates the $5,000,000 value of the credit facility. Moreover, Budderfly is prepared to add to our agreements a covenant with regard to placing special efforts on targeting CT locations in its sales and marketing. For example, Budderfly could dedicate a sales resource to the CT market, develop with our Financing Programs team a marketing campaign targeted at CT locations of brands Budderfly is expanding within. Staff will work with Budderfly to fashion appropriate CT emphasis. This is all in addition to DECD investments targeting job growth (See Section A of the Evaluation segment of this memo) as well as CT Innovations investment. The funds from the facility shall not be used to refinance existing creditors or for distribution to owners of Budderfly.

All obligations to Green Bank will be secured by a blanket lien on the entirety of Budderfly's tangible and intangible assets (the security that the existing senior and existing subordinated lenders possess). Our security would be subordinated to Balance Point Partners ▮▮▮▮▮▮ and CT DECD ▮▮▮▮▮▮ and on the same level security-wise (i.e., "pari passu") on a second position with Mizzen Capital ▮▮▮▮▮ and CT Innovations ▮▮▮▮▮▮. Security and collateral to be further defined in the definitive documentation for the loan facility.

Our fixed interest rate would have a sliding scaled based on facility usage – from ▮▮▮▮▮▮ calculated on a 360-day basis. It is expected that Budderfly will fully use the facility and staff would expect the ▮▮ interest rate to apply. The interest has a deferral of interest in excess of ▮▮ during the first year of the facility, with this interest being capitalized until commencement of repayment (maximum one year) with repayment in level monthly installments of principal and interest.

No facility fee will be payable provided the average balance outstanding under the Loan Facility during the first twelve (12) months from the closing date is at least ▮▮▮▮▮▮, otherwise, a facility fee of ▮▮▮▮▮ will be apply, subject to a credit for all interest actually earned in year 1 (including deferred interest). The facility can be prepaid at any time without prepayment premium, subject to any resulting first year facility fee.

Evaluation

Capital Solutions RFP Proposals are evaluated on the following criteria:

A. Meeting Green Bank Goals

    Based on the success Budderfly has had to date (circa ▮▮▮▮ installations and growing with ▮▮▮▮ of top line revenue derived from Connecticut-based contracts – see Appendix C), staff believes the Budderfly model will continue to scale in the attainment of energy efficiency deployment and offer additional clean energy opportunities for rooftop solar, energy storage, EV charging in addition to making Budderfly an ideal conduit for ancillary services such as demand response or virtual power plants (so called "VPPs"). Per the Green Bank's Comprehensive Plan, the organization has several goals relevant to this transaction, including:

    ▪ To strengthen Connecticut's communities, especially vulnerable communities, by making the benefits of the green economy inclusive and accessible to all individuals, families, ***and businesses***; and

    ▪ To pursue investment strategies that advance market transformation in green investing while supporting the organization's pursuit of financial sustainability.

    ▪ While Budderfly has a nationwide (48 states) client base, Budderfly is very committed to maintaining and expanding its Connecticut base of operations in accordance with DECD job attainment goals as follows:

        o 59 jobs ($71k, pa avg) ▮▮▮▮▮▮▮▮ f debt forgiven
        o 109   ▮▮▮▮▮▮▮▮ "
        o 159   ▮▮▮▮▮▮▮▮ "
        o 209   ▮▮▮▮▮▮▮▮ "
        o 259   ▮▮▮▮▮▮▮▮ "

    ▪ Moreover, as noted earlier, Budderfly is prepared to add to Green Bank agreements a covenant with regard to placing special efforts on targeting CT locations in its sales and marketing (see discussion under "Green Bank Term Loan Proposal").

    ▪ These 8 states account for 50% of Budderfly's billing volume, with ▮▮▮▮ of volume in CT, NY, NJ, MA & RI (See Appendix C: December 2021 billing volume):

B. Green Bank Essentiality – to what extent is participation by the Green Bank essential to the success of the project?

Green Bank staff sees its participation as supplementary and complementary to the existing financial support from other CT government funding (i.e., CT Innovations and DECD) for a CT-based company that is in the process of achieving significant scale in the energy as a service sector in a segment of the C&I sector ███████████████████████ which has been difficult to penetrate.

The $5 million facility will:
   a) Enable Budderfly to continue deploying additional energy efficiency improvements while it pursues additional equity capital to fund growth (the details of which will be explained during the meeting of the Board on April 22nd); and
   b) Give Green Bank and Budderfly time to perfect a financing model with one or more commercial bank lenders that will enable Budderfly to transform its financing mechanism, lowering its cost of capital dramatically while enabling the company to further expand its CT-based operations.

C. Project Feasibility – How feasible is the project to achieve its stated goals?

While not yet EBITDA positive due to the steep growth curve which has required investment in its proprietary technology and core operations, in addition to investment in the labor and CAPEX necessary for the EaaS model, as well as the setbacks presented by COVID which have largely been overcome, Budderfly has achieved ███ million in contract value as of 12/31/2021. Of this contract value, Green Bank staff has estimated the CT revenue content (on a present value basis) to be in excess of $6 million, which substantiates our $5 million facility.

D. Project Replicability – Could a similar project be replicated in Connecticut or elsewhere, or is this a unique opportunity?

Budderfly is in the process of scaling and fundamental to its business model is replicating the installation of similar energy efficiency and conservation measures across an entire platform dedicated to ██████████████████████████.

E. Project timetable – total development and construction timeline.

Green Bank and Budderfly expect to complete documentation of the facility within the current fiscal year (i.e., by June 30, 2022). Funds are expected to be deployed immediately for the purposes identified in the term sheet attached as Exhibit A. This investment will enable Budderfly to sustain its investments in energy conservation measures for its clients while pursuing additional equity round investors.

F. Relevant Experience – Does the proposer offer relevant and sufficient experience for the type of project being proposed?

Yes. Budderfly is in its 5th year of operation with significant contract value (noted above) and is led and managed by a group of four executives with (collectively) over 100 years of experience in disciplines from management consulting, engineering, technology-based solutions, expense management software, finance and the law.

G. References

Green Bank staff has spoken with senior and subordinated lenders to Budderfly who have spoken highly of management and Budderfly's business operations, this includes conversations with transaction managers at CT Innovations and DECD.

H. Pending Litigation

None.

I. Budderfly management and character review

Items of interest noted concerning the CEO, Albert Subbloie, Jr.
Staff does not consider these matters disqualifying. See Appendix B.

Conclusion

This proposal offers a unique opportunity for the Green Bank to dramatically increase our ability to scale energy efficiency in a sector in the state that, thus far, has proven elusive to market penetration efforts due to the idiosyncratic nature of ███████████████████t operations. In addition, the Green Bank could replicate its success with small business energy efficiency deployment by dramatically reducing Budderfly's cost of capital – achieving market transformation and enabling Budderfly to expand and scale its model in CT as well as beyond CT's borders which would accrue to the benefit of job growth at the central operations center in Shelton, CT. While there is a clear degree of either refinancing or repayment risk, Green Bank staff is encouraged by the success of Budderfly's funding rounds to date and its ability to attract investment capital from some of the most prominent private equity firms in the nation. Furthermore, given our success in securitizing small business credits under the SBEA program with a commercial bank and Green Bank participation, staff has reasonable confidence that Budderfly's operational management would enable a similar securitization of existing and future contracts in amounts sufficient to retire Budderfly's obligations to the senior secured lender. Approval is recommended.

Resolutions

RESOLVED, that the Connecticut Green Bank ("Green Bank") is authorized to enter into a six (6) year subordinated term loan agreement with Budderfly, Inc. in a maximum cash advanced amount of $5,000,000 together with any ancillary documentation in respect of same, as more fully explained in the memorandum to the Green Bank Board of Directors (the "Board") dated April 18, 2022; and

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and negotiate and deliver all other documents and instruments as they shall deem necessary and desirable to effect the above-mentioned legal instruments.

Submitted by: Bert Hunter, EVP and CIO & Desiree Miller, Senior Manager, Clean Energy Finance

Appendix A

Proposed Term Sheet
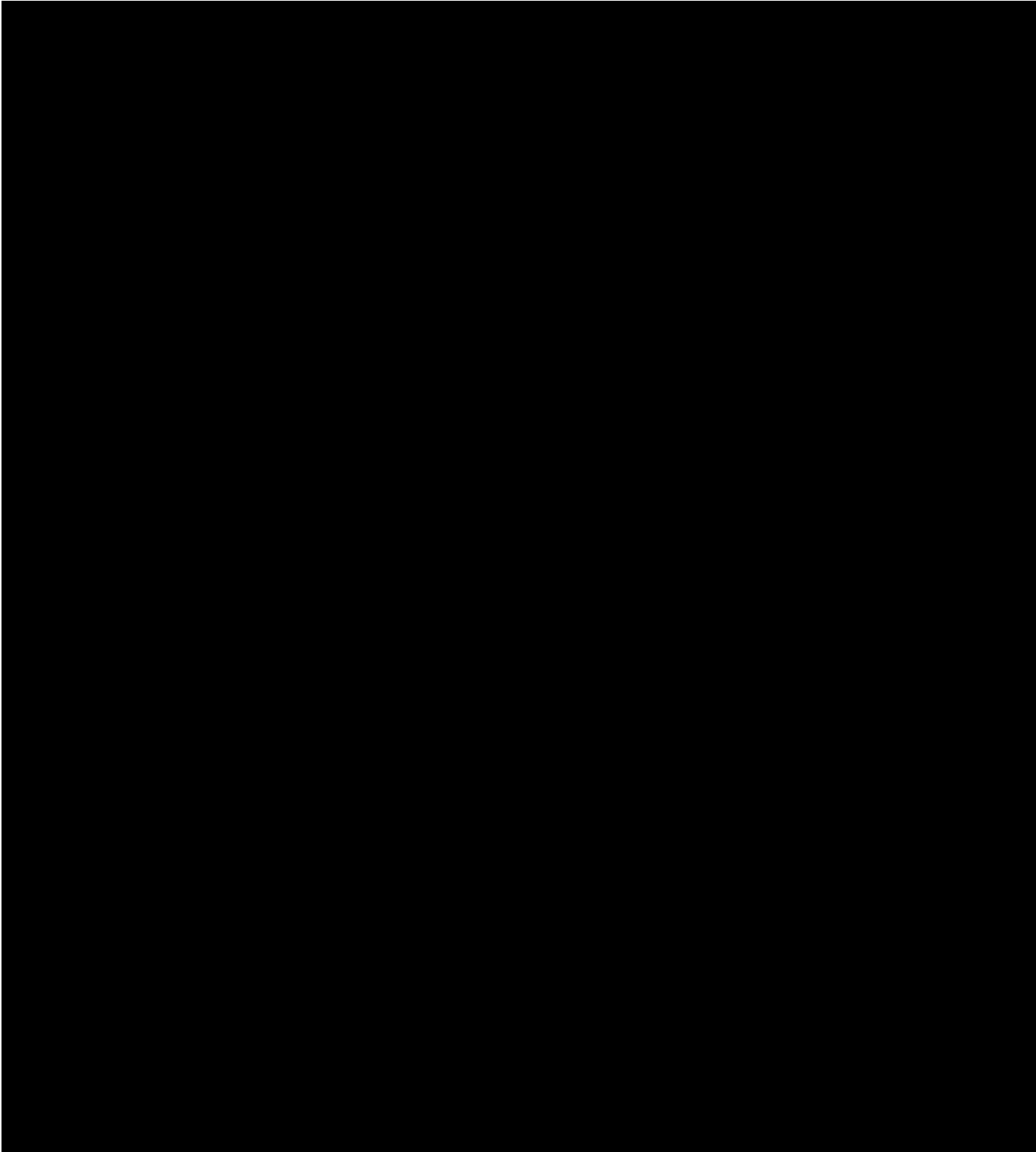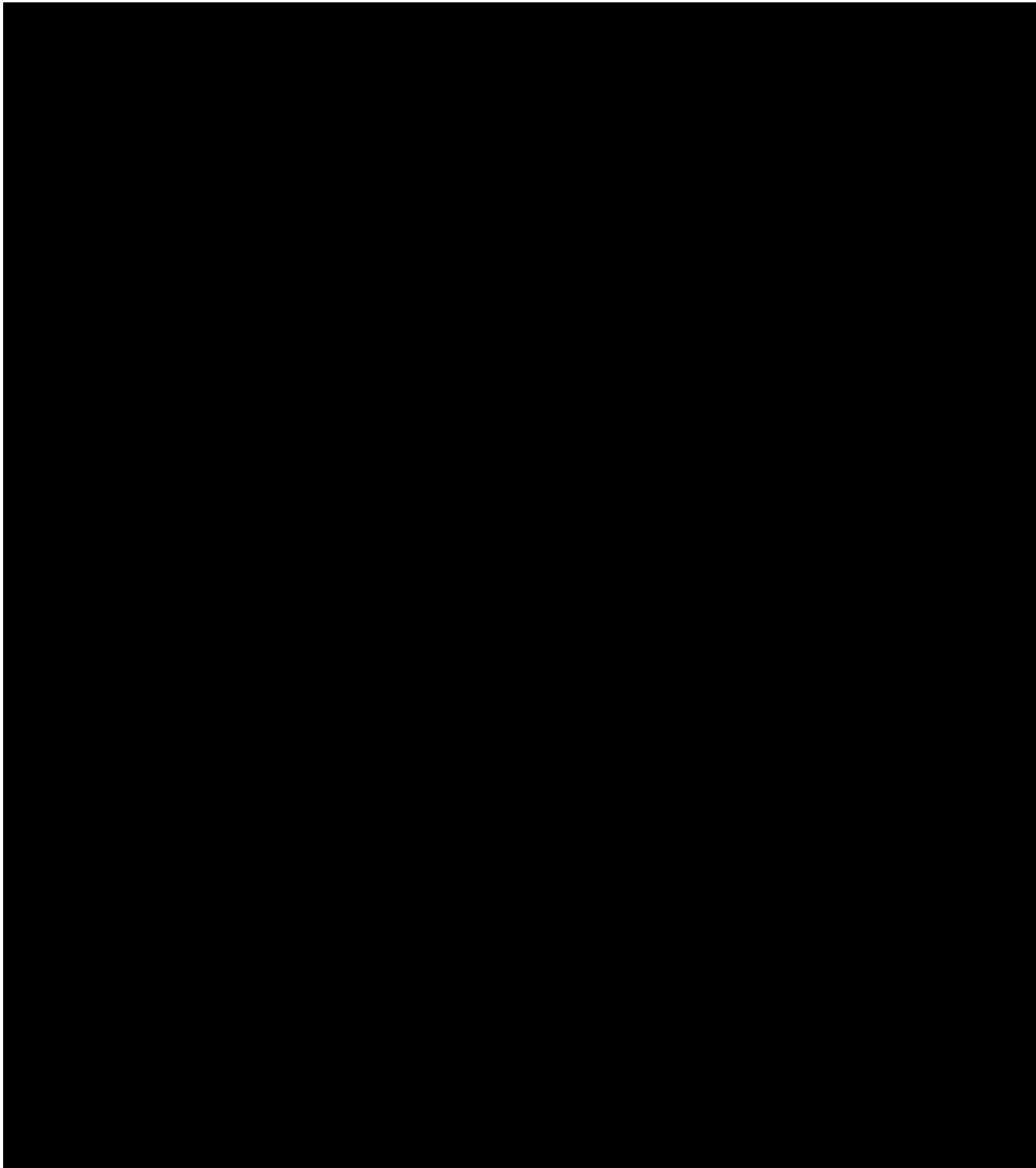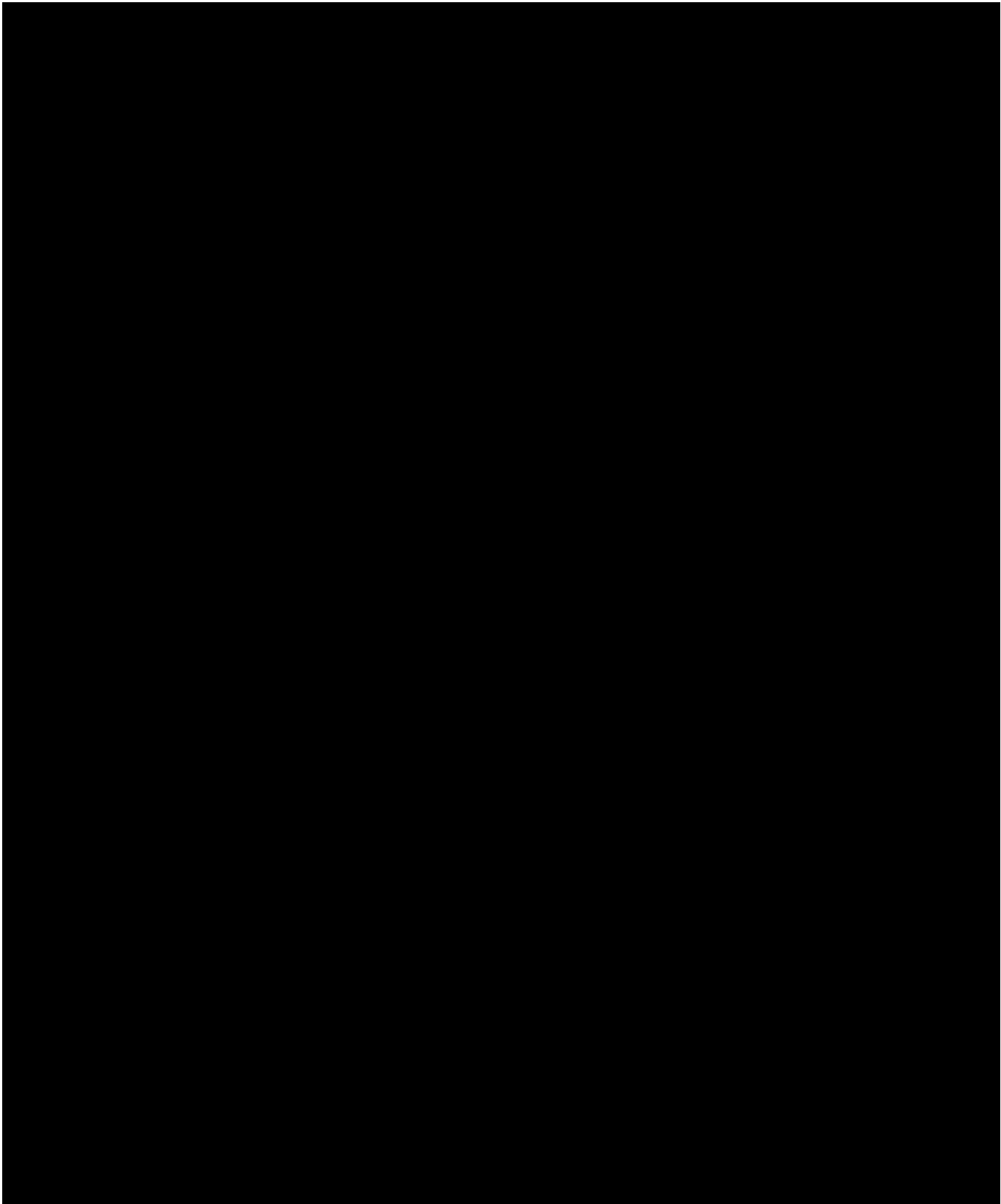
Appendix B-1

Budderfly Management & Character Review
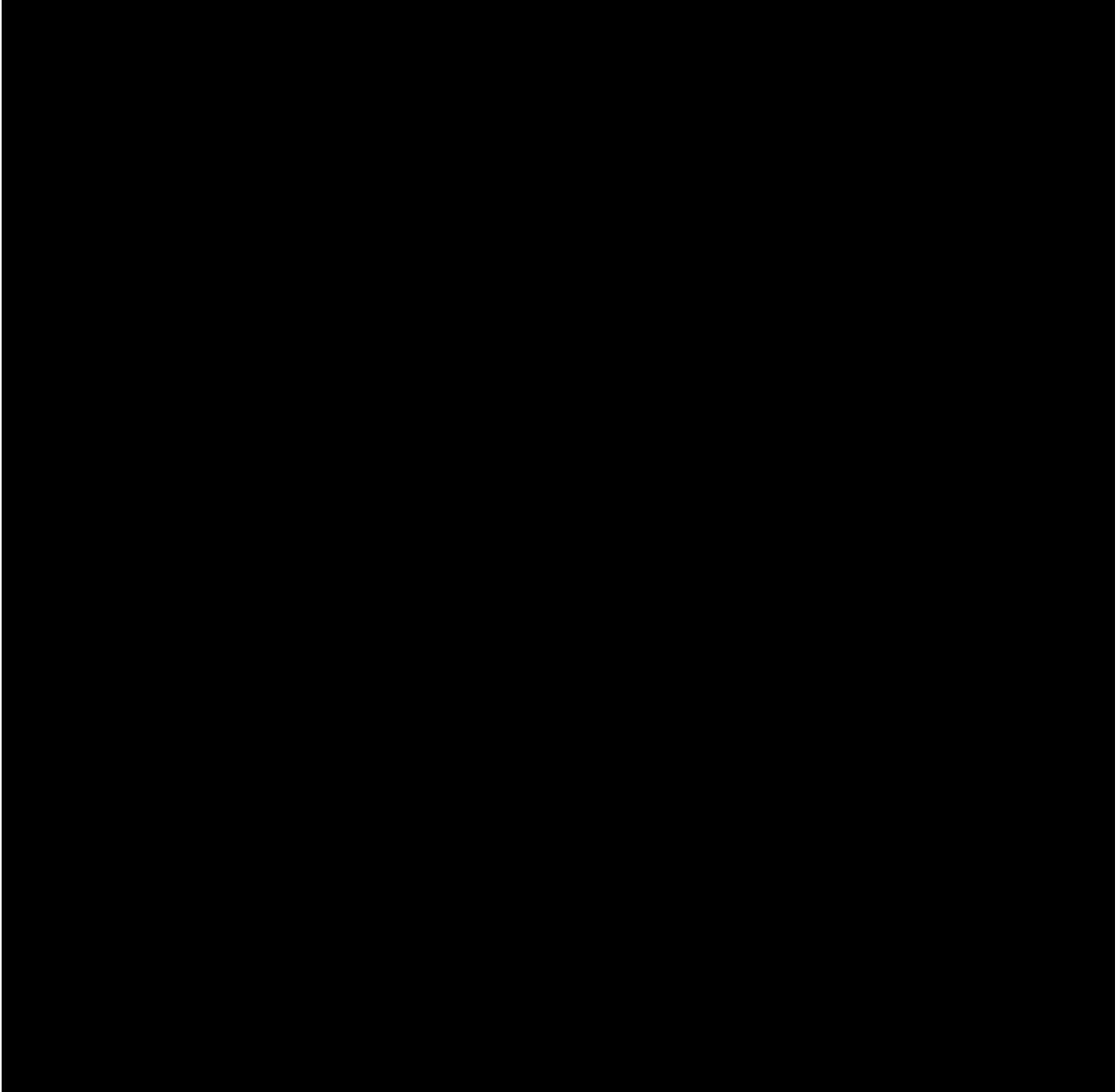
Attachment to Appendix B-1
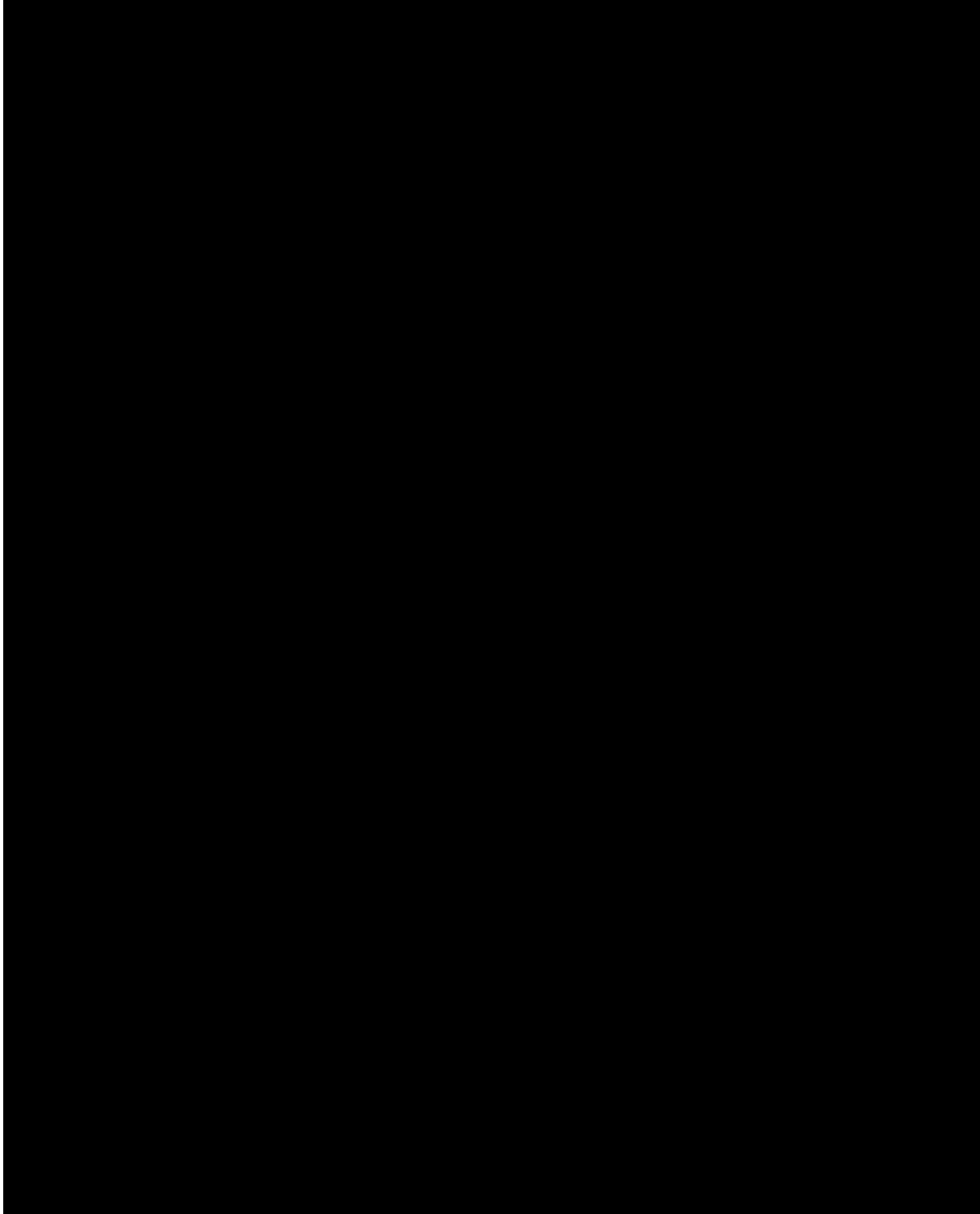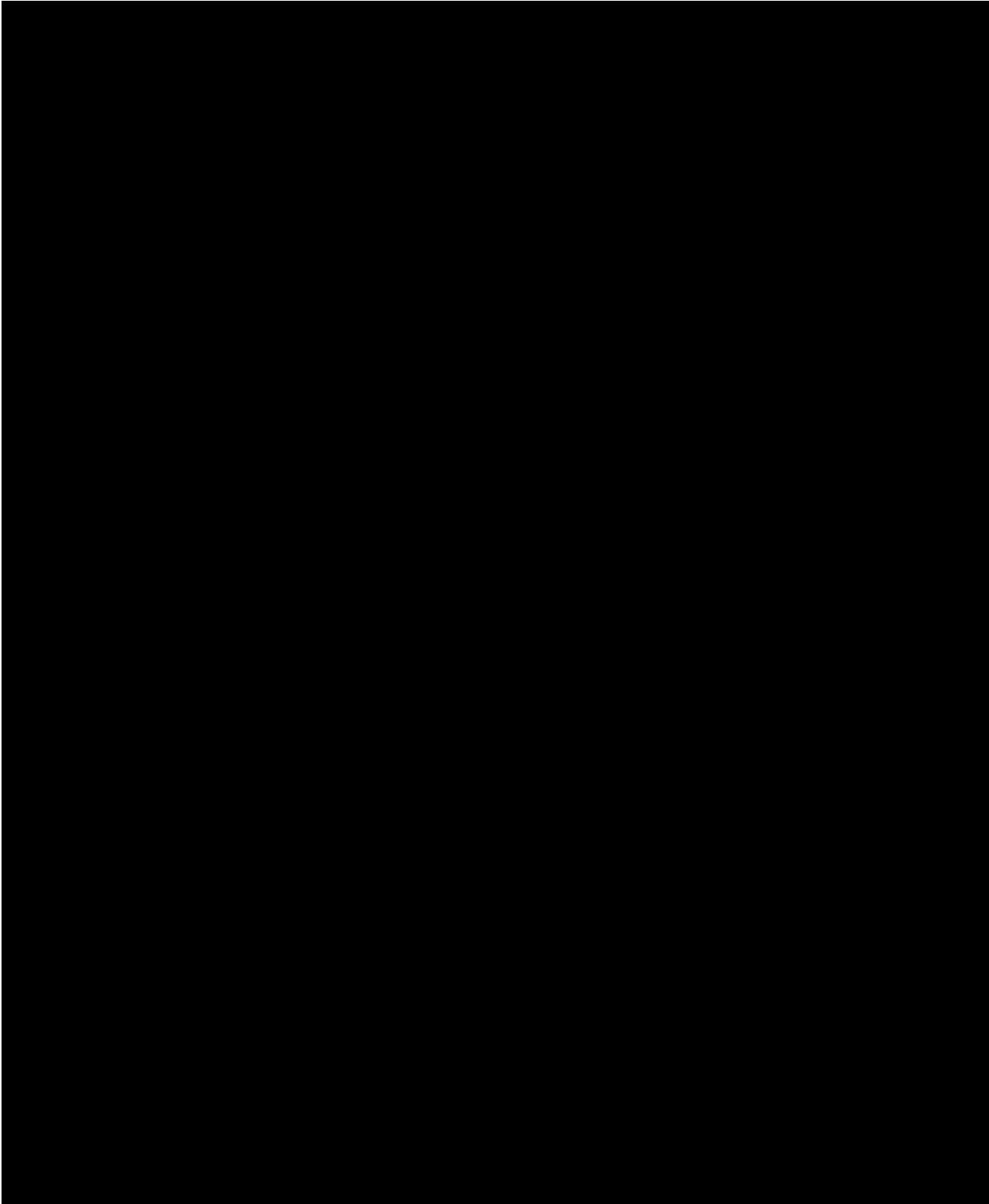
Appendix B-2

Management Experience Dossier

Al Subbloie · 1st

President, CEO and Founder at Budderfly

New York City Metropolitan Area · Contact info

Budderfly, Inc.

Trinity College-Hartford

Experience

President and CEO
Budderfly, Inc.
Oct 2017 - Present · 4 yrs 7 mos
Shelton, Connecticut

Board Member
ZippyYum · Part-time
Sep 2016 - Present · 5 yrs 8 mos
Orange County, California, United States

Board Member
Budderfly
Jan 2016 - Oct 2017 · 1 yr 10 mos
Shelton, Connecticut

Board Member
Operative
May 2007 - Dec 2016 · 9 yrs 8 mos
Greater New York City Area

CEO
Tangoe
Oct 2000 - May 2016 · 15 yrs 8 mos
Orange, Connecticut

Education

Trinity College-Hartford
Bachelor's Degree, Economics
1979 - 1982

Tangoe Inc:

Tangoe (now owned by Marlin) a global provider of communications lifecycle management, or CLM, software and services to a wide range of enterprises, including large and medium-sized businesses and other organizations. CLM encompasses the entire lifecycle of an enterprise's communications assets and services, including planning and sourcing, procurement and provisioning, inventory and usage management, invoice processing, expense allocation and accounting, and asset decommissioning and disposal. Our on-demand Communications Management Platform is a suite of software designed to manage and optimize the complex processes and expenses associated with this lifecycle for both fixed and mobile communications assets and services. Our customers can engage us through our client services group to manage their communications assets and services using our Communications Management Platform.

Our solution can provide a significant return on investment by enabling an enterprise to identify and resolve billing errors, to optimize communications service plans for its usage patterns and needs, and to manage used and unused communications assets and services. Our solution allows enterprises to improve the productivity of their employees by automating the provisioning of communications assets and services, and to reduce costs by controlling and allocating communications expenses. It also allows enterprises to enforce regulatory requirements and internal policies governing the use of communications assets and services.

Thomas Flynn · 2nd

Vice President Corporate Strategy & General Counsel at Budderfly

Shelton, Connecticut, United States · Contact info
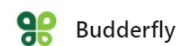
Budderfly

Experience

Vice President Corporate Strategy & General Counsel

Budderfly

Jan 2019 - Present · 3 yrs 4 mos

Shelton, Connecticut

As Vice President Corporate Strategy and General Counsel, Tom serves as a member of the company's executive team with responsibility for corporate strategy, legal, compliance, human resources and   ...see more

Tangoe

7 yrs 1 mo

Chief of Operations

Feb 2018 - Jun 2018 · 5 mos

Connecticut

As Chief of Operations, Tom was responsible for all aspects of the Global Operations organization, which included global service delivery, managed pay, implementation and on-boarding, customer help d ...see more

Chief Administrative Officer, General Counsel & Secretary

Jun 2011 - Feb 2018 · 6 yrs 9 mos

Orange, CT

As General Counsel and Corporate Secretary, then later Chief Administrative Officer of Tangoe, Inc. (NASDAQ: TNGO), Tom was a member of Tangoe's senior leadership team, reported to its CEO and was a trus ...see more

Partner

Shipman & Goodwin LLP

Sep 1989 - Jun 2011 · 21 yrs 10 mos

Tom spent over 20 years with Shipman & Goodwin, and served on the firm's management committee and as chair of its business group. He practiced in the areas of corporate and commercial law, mergers ar ...see more

27

Education

University of Connecticut School of Law
JD
1986 - 1989
Grade: Summa cum laude

University of Connecticut
B.A., Political Science & Spanish
1982 - 1986
Grade: Summa cum laude

Peter J. Dacey · 2nd
Chief Financial Officer at Budderfly

New York City Metropolitan Area · **Contact info**

Budderfly

University of Rhode Island - College of Business

Experience

Chief Financial Officer
Budderfly
Feb 2020 - Present · 2 yrs 3 mos

CEO
Trimino Brands
May 2013 - Dec 2019 · 6 yrs 8 mos
Branford, CT

The Miami Bay Beverage Company is creating the next generation of healthy beverages. Our innovative beverages offer a functional advantage over the current competition. Our new line of beverages, t ...see more

Vice President of Finance and Operations
454 Life Sciences Corporation, A Roche Company
Jan 2000 - May 2012 · 12 yrs 5 mos

Founded in 2000, the company developed and commercialized novel systems for the sequencing of DNA. 454 Sequencing was the first new sequencing platform introduced since traditional Sanger sequencing ...see more

CFO
Stem Cells Inc.
1998 - 2000 · 2 yrs
Lincoln, RI and Sunnyvale, CA

Publicly traded on NASDAQ exchange. Leader in stem cell development technology.

CFO
CytoTherapuetics, Inc
1996 - 2000 · 4 yrs

Publicly traded on the NASDAQ exchange. Developed encapsulated delivery technology for the treatment of chronic pain in cancer patients. Large scale collaborations with Astra AB with products in clinical trials.

29

Education

University of Rhode Island - College of Business
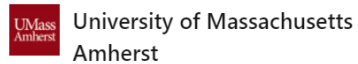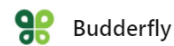BS, Finance and Accounting

Paul Schmidt · 2nd

Vice President Customer Management at Budderfly

Rocky Hill, Connecticut, United States · **Contact info**

500+ connections

4 **mutual connections:** Al Subbloie, Reid Capalino, and 2 others

Budderfly

University of Massachusetts Amherst

Experience

Vice President Customer Management
Budderfly · Full-time
Jan 2020 - Present · 2 yrs 4 mos
Shelton, Connecticut, United States

Vice President Marketing and Business Development
Budderfly Inc.
Feb 2017 - Jan 2020 · 3 yrs
Shelton, CT

SVP Products
Tangoe
2011 - Jan 2017 · 6 yrs 1 mo

Tangoe
11 yrs 1 mo

SVP Marketing, Product Marketing
2007 - 2011 · 4 yrs

VP Product Management
2000 - 2007 · 7 yrs

VP Product Marketing
BuyersEdge
1998 - 2000 · 2 yrs
Redwood Shores, CA

Education

University of Massachusetts Amherst
1978 - 1982

Chris DeBenedictis (He/Him) · 2nd

Experienced technology and software development executive

Branford, Connecticut, United States · **Contact info**

Budderfly LLC

University of Connecticut

Experience

Vice President, Technology
Budderfly LLC
2017 - Present · 5 yrs 4 mos
Shelton, CT

Provide management and P&L oversight of all Technology personnel. As a member of the senior executive team, participate in and present at organizational board and investor meetings and customer sess ...see more

Tangoe, Inc.
14 yrs 1 mo
Orange, CT

Vice President Of Products
2012 - 2017 · 5 yrs

Managed 275 employees in seven countries in oversight of 12 company technology platforms, including CMP; Command; Billing IT; WEM; Bill Tamer; CC6; EMS; MTM; CellEctor; VTM; MDM; and RTEM, ma ...see more

Vice President Of Product Development
2006 - 2012 · 6 yrs

Tasked with overall product management and development responsibilities for CMP and Command platforms. Oversaw launch of Tangoepedia internal wiki used for dissemination of all manner of information, ...see more

Director Of Product Development
2003 - 2006 · 3 yrs

Collaborated with development team to create software solutions from specifications as well as served as initial pre-QA point of contact for user acceptance testing (UAT). Instructed trainer on new system ...see more

Director of Product Management and Product Development
Netkey
2000 - 2003 · 3 yrs
Branford, CT

Education

University of Connecticut
Bachelor of Arts - BA, Economics

Bill Lynch · 2nd

Budderfly's Energy as a Service (EaaS) removes the complexities of managing your energy lifecycle by doing it for you.

Milford, Connecticut, United States · **Contact info**

Budderfly LLC

University of Bridgeport

Experience

VP Business Development
Budderfly LLC
Nov 2017 - Present · 4 yrs 6 mos
Shelton, CT

The Budderfly solution eliminates the technology, capital and resource issues that often times limit the ability of Enterprises to achieve and maximize energy efficiency savings. With Budderfly, you're guarantee ...see more

Regional VP Sales
Tangoe, Inc.
Jun 2003 - Oct 2017 · 14 yrs 5 mos
Orange, CT

Pre-IPO Sales Executive for SaaS and managed service company delivering many significant wins with Fortune 500 companies and fueling company growth to >$230M in annual revenues. Built Northeast into (...see more

Education

University of Bridgeport
Master of Business Administration - MBA, Business, Management, Marketing, and Related Support Services
Sep 1987 - May 1992

Trinity College-Hartford
Bachelor of Arts (B.A.), Economics
1976 - 1980

Activities and societies: Varsity Baseball, Captain 1980, Alpha Chi Rho (AXP)

Lee Kaufman · 2nd

VP of Operations| Worldwide Energy as a Service (EaaS)

Greater Boston · **Contact info**

Budderfly

Northeastern University
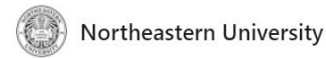
Experience

VP of Operations| Worldwide Energy as a Service (EaaS)
Budderfly
Sep 2018 - Present · 3 yrs 8 mos
Greater Boston Area

As VP of Operations for Budderfly's Energy as a Service division, I lead a Team of highly qualified professionals helping our customers remove the complexities of managing their energy lifecycles.   ...see more

VP Capital Planning
Accruent
Nov 2014 - Aug 2018 · 3 yrs 10 mos
Greater Boston Area

As VP of Capital Planning and holding Federal Top Secret Clearance, I lead the capital planning services organization of 120+ engineers, architects, project managers and directors within Federal, Corpora ...see more

VFA
17 yrs 1 mo

SVP - Professional Services
2009 - 2014 · 5 yrs

A leading provider of facility assessment services, cloud-based facilities capital planning software, and capital planning services.   ...see more

Sr. Solutions Consutant | Sr. Project Manager | Mechanical Engineer
1997 - 2009 · 12 yrs
Greater Boston Area

Joining VFA as a mechanical engineer and project manager, I grew with the company into roles as a Senior Project Director and then as a Senior Solutions Consultant.   ...see more
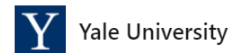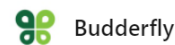
Education

Northeastern University
Bachelor of Science (B.Sc.), Mechanical Engineering

Matthew Nemerson · 2nd

Vice President of Marketing at Budderfly

New Haven, Connecticut, United States · **Contact info**

Budderfly

Yale University

Experience

Vice President Strategic Partnerships
Budderfly · Full-time
Jan 2019 - Present · 3 yrs 4 mos
Shelton, CT 06484

Budderfly is disrupting the energy industry by leading the digital transformation of energy consumption through its unique Energy-as-a-Service model. With no cost to its clients, Budderfly implements pr ...see more

Economic Development Administrator
City of New Haven
Jan 2014 - Dec 2018 · 5 yrs
New Haven, CT

Responsible for the coordination of City departments and department directors who deal with planning, growth, equal rights, permitting, small business development, community development, parking, ...see more

President & CEO
Connecticut Technology Council
Aug 2003 - Dec 2013 · 10 yrs 5 mos

"The Catalyst for Innovation and Growth"
State-wide business trade assocaition serving the technology and innovation community. 1) We cr ...see more

President Board of Directors
Technology Councils of North America (TECNA)
Mar 2009 - Aug 2011 · 2 yrs 6 mos

Chief Operating Officer
Netkey, Inc.
2000 - 2003 · 3 yrs

Groundbreaking early adopter of managed internet kiosk systems and developer of industry-leading, patented development tools to build Internet-connected touch screen kiosk information systems. Developed

Education

Yale University
Certificate in Financing and Deploying Cleaning Energy, Business and the Environment
2019 - 2020

Yale School of Management
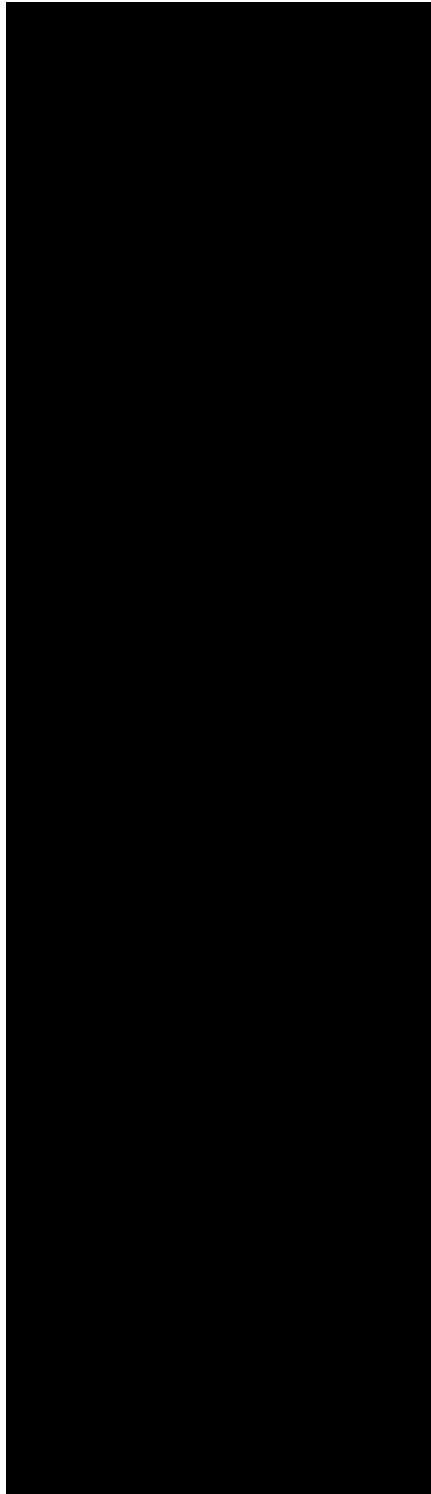MBA/MPPM, finance, marketing, general management
Aug 1979 - May 1981

Columbia College, Columbia University
BA, History, Political Science
1974 - 1978

Appendix C

December 2021 Billing Volumes

To: Connecticut Green Bank Board of Directors
CC: Bryan Garcia, President and CEO; Jane Murphy, Executive Vice President of Accounting and Financial Reporting; Brian Farnen, General Counsel and CLO; Sergio Carrillo, Director of Incentive Programs
From: Eric Shrago, Vice President of Operations
Date: April 18, 2022
Re: Professional Services Agreement with Guidehouse for Evaluation, Measurement, & Verification for Energy Storage Solutions.

Background

The Energy Storage Solutions Program, ordered by the Connecticut Public Utilities Regulatory Authority ("PURA") in July of 2021, is designed to expand the development of battery energy storage systems across the state. As part of the Public Utility Regulatory Authority's decision on Docket No. 17-12-03RE03, the Green Bank, along with our program co-administrators (Eversource and Avangrid), were charged with retaining a partner to produce the program's metrics and to evaluate the program's performance on a regular basis. The selected partner will be responsible for the program's reporting as well. The Evaluation, Measurement, & Verification consultant is a key partner for the co-administrators to ensure the program's impacts are inuring to ratepayers in the intended manner.

Request for Proposal

In the autumn of 2021, the co-administrators of the program jointly issued a request for proposal to a list of 64 EM&V consultants for this scope of work. The consultants approached included those that were previously qualified in by the co-administrators, the Connecticut Energy Efficiency Board, and PURA in their respective processes. 17 firms chose to attend the webinar run by the co-administrators and ultimately, the co-administrators received 4 proposals from consultants.

A review committee that contained representation from the co-administrators as well as the Department of Energy and Environmental Protection as well as the Office of Consumer Counsel weighed the four proposals and selected Guidehouse, Inc. (Guidehouse) as the EM&V partner for the program based on a variety of factors including price, expertise, and the ability to perform the work.

Multi-Year Contract Recommendation

Typically, the Green Bank does not typically enter into multi-year contracts with vendors, as our budgeting process is done on an annual basis, which is why this is coming to the Board for consideration. Due to the nature of the program, which requires us to engage a partner for this role for the entire first three-year program cycle, we find it prudent to contract with Guidehouse for the entire cycle. This commitment by

both parties will allow us to implement the necessary technological infrastructure needed to ensure that the best possible assessment is performed and that all parties are both focused on the program achieving its intended results. Further, the Green Bank, after much back and forth with the other co-administrators, has agreed to directly contract with Guidehouse for these services which will be cost recovered along with the other program expenses from the Electric Distribution Companies.

While the Guidehouse proposal was for $873,000, staff would like to enter into a contract with Guidehouse with a not-to-exceed amount of $1,000,000 which is to allow for additional technical support from Guidehouse with other related items associated with the program including but not limited to optimizing the program to reduce emissions (as ordered by PURA) and other regulatory support such as reviewing the existing program guidelines and incentives.

For these reasons, staff recommends entering into a three-year contract with Guidehouse as the program's EM&V partner.

Resolutions

WHEREAS, the Public Utilities Regulatory Authority (PURA) ordered the Green Bank, Eversource, and United Illuminating to co-administer a battery storage incentive program and as program co-administrators, the three are jointly responsible for the Evaluation, Measurement and Verification (EM&V) of the Energy Storage Solutions Program;

WHEREAS, the co-administrators need EM&V consulting support to independently assess the program's impact and ensure that it is achieving the established benefit-cost analyses;

WHEREAS, the three co-administrators issued a joint request for proposal for partners and received 4 responses and ultimately selected the consultant as the EM&V partner for the program for the first three-year program cycle (2022-2024);

NOW, therefore be it:

RESOLVED, that the Green Bank Board of Directors authorizes staff to enter into a three-year contract with Guidehouse, Inc. for Evaluation, Measurement, and Verification Services related to the Energy Storage Solutions Program in an amount not to exceed $1 million;

RESOLVED, that the proper Green Bank officers are authorized and empowered to do all other acts and execute and deliver all other documents and instruments as they shall deem necessary and desirable to effect the Term Loan and participation as set forth in the Memorandum.
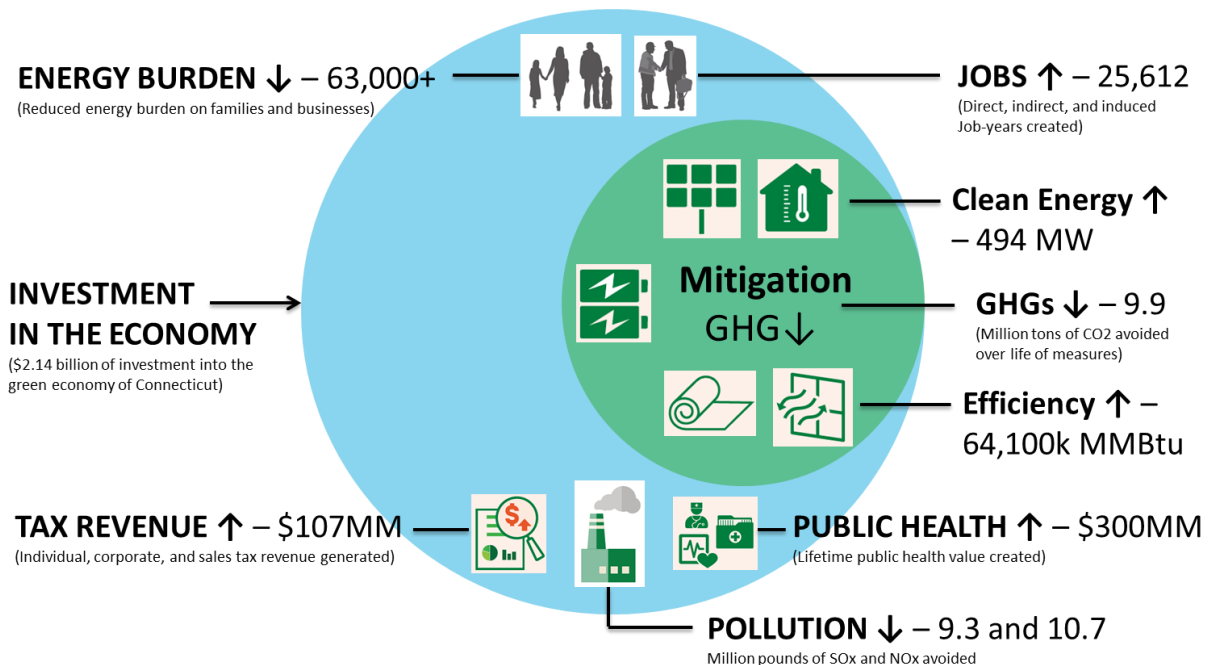
Land Conservation

Stakeholder Engagement and Research
on Environmental Infrastructure

A. OVERVIEW

On July 6, 2021, Governor Ned Lamont signed Public Act 21-115 "An Act Concerning Climate Change Adaptation" ("the Act") into law.[1] The bipartisan-supported public policy was among the sixty-one (61) recommendations made by the Governor's Council on Climate Change ("GC3"),[2] including a recommendation to expand the scope of the Connecticut Green Bank ("Green Bank") beyond "clean energy" to include "environmental infrastructure" (i.e., Recommendation #57).

Since its founding over a decade ago,[3] the Green Bank has focused its efforts on using a limited amount of public resources to mobilize multiples of private investment in Connecticut to increase and accelerate the deployment of "clean energy" to deliver social and environmental impact – see Figure 1.[4]

Figure 1. Decennial Impact of the Green Bank with focus on "Clean Energy" Deployment and Mitigation of GHG Emissions

ENERGY BURDEN ↓ – 63,000+
(Reduced energy burden on families and businesses)

JOBS ↑ – 25,612
(Direct, indirect, and induced Job-years created)

Clean Energy ↑ – 494 MW

Mitigation GHG↓

GHGs ↓ – 9.9
(Million tons of CO2 avoided over life of measures)

INVESTMENT IN THE ECONOMY
($2.14 billion of investment into the green economy of Connecticut)

Efficiency ↑ – 64,100k MMBtu

TAX REVENUE ↑ – $107MM
(Individual, corporate, and sales tax revenue generated)

PUBLIC HEALTH ↑ – $300MM
(Lifetime public health value created)

POLLUTION ↓ – 9.3 and 10.7
Million pounds of SOx and NOx avoided

Given its mission "to confront climate change and provide all of society a healthier and more prosperous future by increasing and accelerating the flow of private capital into markets that energize the green economy," the Green Bank helps the State of Connecticut achieve its ambitious public policy objectives (e.g., GHG emission reductions targets, renewable portfolio standards). In so doing, by 2025, no less

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[1] https://ct-n.com/ctnplayer.asp?odID=18751
[2] https://portal.ct.gov/-/media/DEEP/climatechange/GC3/GC3_Phase1_Report_Jan2021.pdf
[3] CGS 16-245n
[4] https://www.ctgreenbank.com/wp-content/uploads/2021/12/FY12-FY21-CGB-ImpactReport-web.pdf

than 40 percent of investment and benefits from its programs are to be directed to vulnerable communities.[5]

The Act, expands the scope of the Green Bank beyond "clean energy" to include "environmental infrastructure," and includes the following key provisions:

- **Definition** – "environmental infrastructure" means structures, facilities, systems, services and improvement projects related to (A) water, (B) waste and recycling, (C) climate adaptation and resiliency, (D) agriculture, (E) land conservation, (F) parks and recreation, and (G) environmental markets, including, but not limited to, carbon offsets and ecosystem services;

- **Comprehensive Plan** – requirement for the Green Bank to develop a Comprehensive Plan[6] prior to implementing any programs or initiatives related to "environmental infrastructure";

- **Reporting** – inclusion of the Banks Committee and the Environment Committee, alongside the Energy and Technology Committee and Commerce Committee in terms of reporting; and

- **Bonding** – the ability to issue 25-year bonds for "clean energy" and 50-year bonds for "environmental infrastructure" (i.e., no more than the useful life of the projects), supported by the Special Capital Reserve Fund ("SCRF"), for up to 25 years to improve the rating of the bonds issued.

This document attempts to summarize the findings from the research and outreach efforts conducted by the Green Bank[7] on "land conservation" from October 2021 through January of 2022 and includes the following sections: (A) overview, (B) key public policies, (C) market potential, (D) target, (E) funding and financing programs, (F) other programs, (G) stakeholder outreach, (H) findings, (I) opportunities, (J) history of leadership and innovation, (K) references, and (L) definitions.
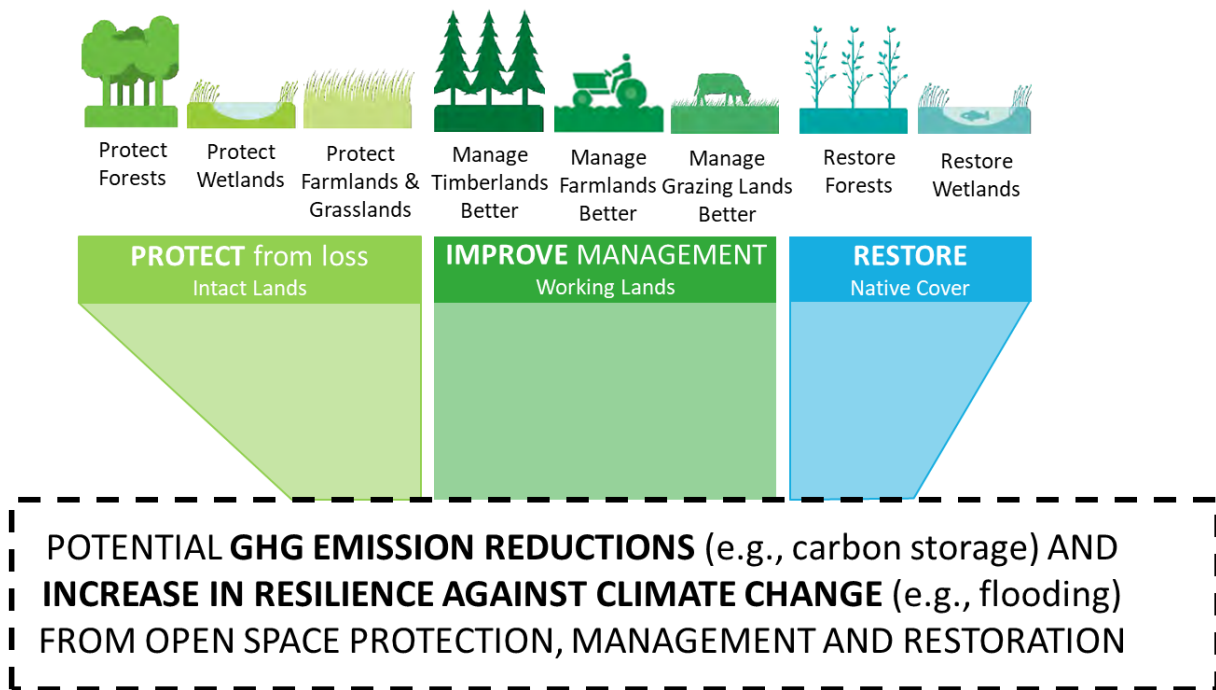
Nature-based solutions (e.g., land conservation) such as protecting intact lands from loss (e.g., forests), improving the management of working lands (e.g., sustainably certified timberlands), and restoring native land cover, including coastlines, can support the Green Bank's mission by both mitigating the GHG emissions that cause climate change (e.g., forest carbon sequestration) and increasing resilience against the impacts of climate change (e.g., flood protection) – see Figure 2.

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[5] "Vulnerable communities" means populations that may be disproportionately impacted by the effects of climate change, including, but not limited to, low and moderate income communities, environmental justice communities pursuant to section 22a-20a, communities eligible for community reinvestment pursuant to section 36a-30 and the Community Reinvestment Act of 1977, 12 USC 2901 et seq., as amended from time to time, populations with increased risk and limited means to adapt to the effects of climate change, or as further defined by DEEP in consultation with community representatives.

[6] https://www.ctgreenbank.com/wp-content/uploads/2021/07/3_Comprehensive-Plan_FY-2020-and-Beyond_Final.pdf

[7] Led by Bryan Garcia (President and CEO) and Ashley Stewart (Consultant)

Figure 2. Nature Based Solutions to Confront Climate Change - Mitigation and Resilience

POTENTIAL **GHG EMISSION REDUCTIONS** (e.g., carbon storage) AND **INCREASE IN RESILIENCE AGAINST CLIMATE CHANGE** (e.g., flooding) FROM OPEN SPACE PROTECTION, MANAGEMENT AND RESTORATION

B. KEY PUBLIC POLICIES

The following are key public policies that advance "land conservation" in Connecticut, including, but not limited to:

1. **State Plan of Conservation and Development** (CGS 16a-24) – is an overarching statement of state policy in matters pertaining to land and water resource conservation and development. The Office of Policy and Management ("OPM") prepares revisions to the State Conservation and Development Plan ("State C&D Plan") on a recurring 5-year cycle and submits it for adoption by the Connecticut General Assembly ("CGA"). Once adopted, the State C&D Plan is then implemented by state agencies whenever they undertake certain actions.[8] The current State C&D Plan (i.e., for 2018-2023), includes the relevant "clean energy" and "environmental infrastructure" items, including, but not limited to:

   A. **Greenhouse Gas Mitigation** – reducing carbon dioxide emissions in the state consistent with the recommendations of the Connecticut Climate Change Preparedness Plan (i.e., 5.10);

   B. **Climate Adaptation and Resilience** – including developing and deploying innovative energy technologies, and promoting distributed generation and microgrids to provide reliable electrical power or energy-dependent community services during outages and peak demand periods (i.e., 1.12) and minimizing the potential risks and impacts from natural hazards by considering potential impacts of climate change on existing and future development (i.e., 1.13); and

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[8] Quasi-publics are not subject to this requirement

C. **Land Conservation** – protecting permanently preserved open space areas, Connecticut Heritage Areas, and archaeological areas of regional and statewide significance (i.e., 4.1), limiting improvements to permanently protected open space areas to those that are consistent with long-term preservation of the natural resource and open space values of the site (i.e., 4.2), expanding the state's open space and greenway network through the acquisition and maintenance of important multi-functional land and other priorities identified in the state's open space plan (i.e., 4.3), encouraging collaborative ventures with municipalities, private non-profit land conservation organizations and other entities to provide a system of appropriately preserved and managed natural areas and resources that allow for a diversity of well-functioning habitats and the sustainable use of resources (i.e., 4.5), and promoting innovative land conservation and banking practices that further local, regional, and state conservation and development objectives, and minimize the need to expand infrastructure to support new development in rural areas (i.e., 4.18).

2. **Open Space Target** (CGS 23-8)[9] – establishes a mandate to conserve 21% (i.e., 673,210 acres) of state land area as held by open space land, with 10% from the state (e.g., forests, parks) and not less than 11% from partners (e.g., municipalities, water companies, or non-profit land conservation organizations). The Comprehensive Open Space Acquisition Strategy (or "Green Plan")[10] is the comprehensive strategy for achieving the state goal by 2023, which includes priorities for strategic acquisitions of open space for climate change resiliency and preserving open space in perpetuity for state lands with high conservation value.

   It should be noted that Connecticut's 2020 Forest Action Plan[11] includes several relevant desired future conditions, including:

   - Connecticut will increase the amount of forest protected from development following priority criteria based on core forest areas, connection, Forest Legacy potential, and vulnerability;

   - People of Connecticut will understand and value the urban forests as essential parts of healthy urban ecosystems;

   - Connecticut forests will support a viable forest products industry that provides marketable products from renewable and diverse forest resources; and

   - Management of Connecticut's forests will use the best available scientific information and the best available data as the basis for sound conservation and management decisions.

3. **Community Investment Act** (Public Act 05-228)[12] – "An Act Concerning Farm Land Preservation, Land Protection, Affordable Housing and Historic Preservation," also known as the Community Investment Act ("CIA"), CIA provides a dedicated and consistent source of funding for state

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[9] https://law.justia.com/codes/connecticut/2012/title-23/chapter-447/section-23-8/
[10] https://portal.ct.gov/DEEP/Open-Space/The-Green-Plan
[11] https://portal.ct.gov/-/media/DEEP/forestry/2020-Approved-CT-Forest-Action-Plan.pdf
[12] https://www.cga.ct.gov/2005/ACT/Pa/pdf/2005PA-00228-R00SB-00410-PA.pdf

preservation of open space (Department of Energy and Environmental Protection or "DEEP"), farmland (Department of Agriculture or "DoAg"), historic sites (Department of Economic and Community Development or "DECD"), and affordable housing (Connecticut Housing Finance Authority or "CHFA"). Through a $40 surcharge on local land recordings (i.e., $1 to Town Clerk, $3 to local government, $10 supplemental income to dairy farmers, and $26 to State Treasurer), about $22 MM is raised each year, which is equally distributed in four (4) parts to the priority funding areas.

4. **Use Value Assessment Law** (Public Act 490 or CGS 12-107a-f)[13] – passed by the CGA in 1963, allows farm, forest, or open space land to be assessed at its use value rather than its fair market or highest and best use value (as determined by the property's most recent "fair market value" revaluation) for purposes of local property taxation. Without the lower use value assessment, most landowners would have to sell the land because they would not be able to afford the property taxes on farm, forest, or open space land. It must be noted that Public Act 490 allows farmers to continue to farm, and other landowners to continue to own forest and open space land without being forced to sell it to pay the local property taxes. When the legislature passed Public Act 490 in 1963, it included in the law's wording that "it was in the public interest to encourage the preservation of farm, forest, and open space land." Studies done across the nation have conclusively proven that property tax revenues generated by farm, forest, or open space land, are far greater than the expenditures by the town to service that land. For example, under the current structure, the residential sector costs a town more to service then the amount of property tax generated from that sector. Thus, farm, forest, and open space land can actually help control and maintain reasonable rates of property taxation for all of a town's taxpayers.

5. **Ten Mill Program** (CGS 12-96) – Ten Mill Program was developed in 1913 and required forest landowners to make a 100-year commitment to maintaining land as forest land in exchange for municipalities holding the property at a 10-mill rate and the valuation of the land at evaluation for 50 years after. The Ten Mill program has not added new propertied since the 1970's, however, both programs provide support to landowners that encourages conservation and open space.

6. **Executive Order 21-3** – On December 16, 2021, Governor Ned Lamont signed Executive Order 21-3 which calls for 23 actions supporting more than thirty recommendations from the Governor's Council on Climate Change, including several recommendations on working lands: [14]

    A. **Forest Climate Resilience and Mitigation Potential** – DEEP engagement of stakeholders to ensure Connecticut's forests continue to be resilient against the impacts of climate change and to maximize forest potential to sequester and store carbon in support of Connecticut's GHG emission reduction goals.

    B. **Agriculture Climate Resilience and Mitigation Potential** – DoAg engagement of stakeholders to ensure Connecticut's working lands and soils continue to be resilient

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[13] https://www.cga.ct.gov/current/pub/chap_203.htm#sec_12-107a
[14] It should be noted that Connecticut is a member of the United States Climate Alliance, and one of the original signatories to the Natural and Working Lands Challenge in 2018 – http://www.usclimatealliance.org/nwlchallenge

against the impacts of climate change and to maximize forest potential to sequester and store carbon in support of Connecticut's GHG emission reduction goals.

C. **Climate Resilience Using Nature-Based Solutions on State Properties** – DEEP and Department of Administrative Services ("DAS") to develop guidance for state agencies to use nature-based solutions for flood and erosion control and stormwater management, integrate coastal marsh migration in state projects in coastal areas, and utilize low impact development and green infrastructure in new state construction and state-funded construction or redevelopment.

In order to identify opportunities to mobilize private investment, it is important to understand the public policy context in which "land conservation" operates. With the focus on the Green Bank's mission (i.e., confront climate change), public policy provides a mechanism to catalyze private investment.

C. MARKET POTENTIAL

The following is the market potential for "land conservation" from the perspective of forest land – see Table 1.

Table 1. Market Potential for Land Conservation in Connecticut based on Forest Land

3,205,762 Acres Land in Connecticut				
1,869,761 Acres Forest Land			1,336,001 Acres Non-Forest Land	
298,994 Acres Protected Core Forests	**568,857 Acres** Unprotected Core Forest	**1,001,910 Acres** Non-Core Forest	**1,130,000 Acres** Urban Area	**206,001 Acres** Other Non-Urban and Non-Forest

Connecticut's forest products industry contributes at least $2.1 billion to the state's economy, while forest-based recreation generates approximately $1.2 billion per year – forest-based employment accounts for 8,200 jobs in Connecticut.[15]

It should be noted that New England is the most forested region in the United States.[16] Approximately 56-61% of Connecticut is forested with approximately two (2) people for every acre of forest land. 191 MMT of carbon is stored in Connecticut's forests, which has increased by 9 MMT over the last decade[17] – approximately 33 MMTCO2 or 3.3 MMTCO2 per year (or nearly 8 percent of annual GHG emissions in Connecticut). [18][19] The urban area of Connecticut includes nearly 90% of the population and trees store about 23 MMT of carbon and continue to sequester at the rate of about 750,000 tons per year. If estimates are accurate of carbon sequestered and stored in forests and related soils, then there are about a decade's worth of emission reductions equivalent to 20% of total emissions – see Figure 3.

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[15] North East State Foresters Association, *The Economic Importance of CT's Forest Based Economy 2015.*

[16] New England Forest Foundation

[17] "Forests Sub-Group Final Report 2020" of the Working & Natural Lands Working Group of the Governor's Council in Climate Change (p. 6)

[18] Atomic weight of carbon is 12 atomic mass units versus carbon dioxide at 44 because 2 oxygen atoms each weigh 16 atomic units, therefore 1 ton of carbon equals 3.7 tons of CO2 or 1 metric ton of carbon equals 4.1 metric tons of CO2

[19] Press Release issued by DEEP on September 7, 2021 entitled "CT Not on Track to Meet Statutory Emissions Targets, New Greenhouse Gas Inventory Finds"

Figure 3. Connecticut Sector-Wide GHG Emissions and Future Emissions Targets, including Carbon Sink Accounting
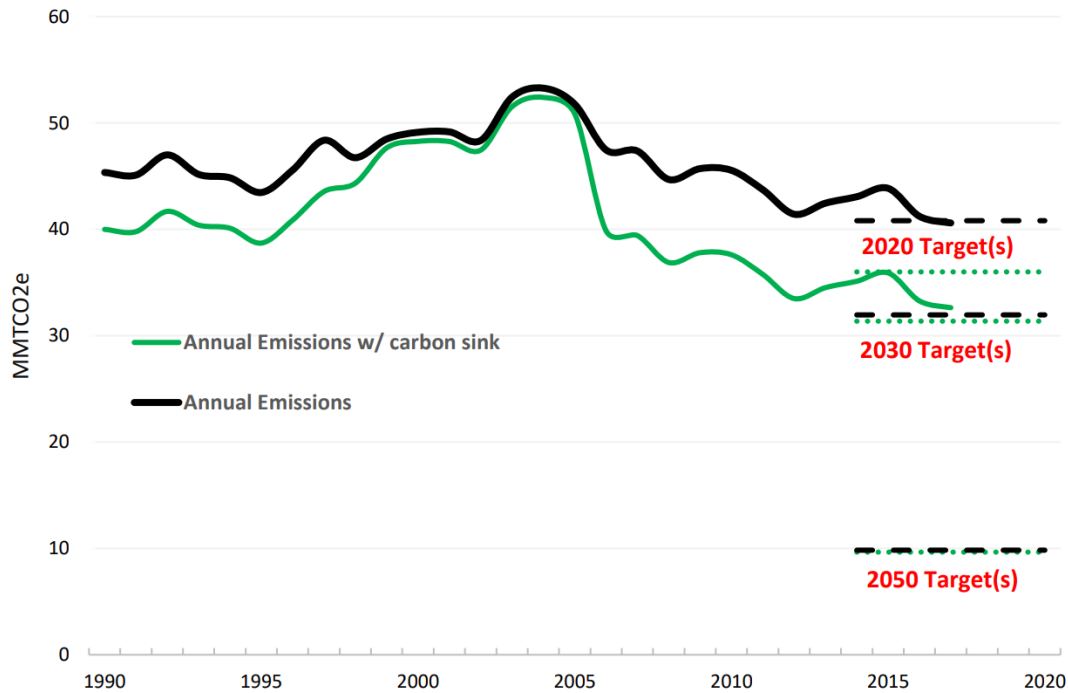
To retain the multiple benefits that forests provide such as carbon storage, biodiversity, clean water, clean air, resiliency, public health, wood products for human use, and green infrastructure, there is a "no net loss of forest" goal. Of Connecticut's forest lands, 71% is owned by private individuals, corporate landholders (e.g., water companies), and nonprofit land trusts, with 17%, 11% and 1% of the remaining forest land owned by the state, municipalities, and federal government, respectively.

From the perspective of wetlands, there are approximately 220,000 acres in Connecticut representing about 7% of land within the state, which includes tidal and inland wetlands. Of the 91 miles of coastline, tidal wetlands are the most vulnerable natural resource in the face of climate change and rising sea levels.[20] These resources are among the most biologically productive resources in the world, provide habitat for wildlife, improve water quality by trapping sediments and filtering contaminants, protect shorelines, and are a source of carbon sinks. Inland wetlands, including the 5,800 miles of rivers and 65,000 acres of lakes,[21] are key resources in terms of stormwater retention and rivers and ponds provide water retention to mitigate flooding, and they are essential to surface and underground fresh water, provide critical habitat to wildlife, and are a source of carbon sinks. As noted above, wetlands provide a number of ecosystem services, including provision services (e.g., food, water), regulating services (e.g., carbon sequestration, moderation of extreme storms), support services (e.g., habitat, biodiversity), and cultural services (e.g., recreation, tourism, physical and mental health).

D. TARGET

The following is a breakdown of the "land conservation" target outlined in the CGS 23-8 – see Table 2.

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[20] "Wetlands Sub-Group Report 2020" of the Working & Natural Lands Working Group of the Governor's Council on Climate Change (p. 6)

[21] "Rivers Sub-Group Report 2020" of the Working & Natural Lands Working Group of the Governor's Council on Climate Change (p. 4)

Table 2. Progress Towards the Open Space Land Target in Connecticut

3,205,762 Acres Land in Connecticut								
320,576 Acres State Goal (@10%)				352,634 Acres Partner Goal (@≥11%)				2,532,552 Acres No Land Conservation (@79%)
175,000 Acres State Forests[22]	**36,000 Acres** State Parks[23]	**46,000 Acres** Wildlife Area and Other[24]	**63,500 Acres** left to achieve target	**84,000 Acres** Cities and Towns	**99,000 Acres** Water Companies	**66,000 Acres** Non-Profit Land Trusts	**104,000 Acres** left to achieve target	

Of the open space goal of 21% by 2023 (i.e., 673,210 acres), approximately 510,249 acres are conserved (as of December 31, 2019), or 76% of the open space goal comprising 261,806 acres of state (i.e., 82% of the 10% state target) and 248,953 acres of partner (i.e., 71% of the partner target) – leaving an estimated 162,451 acres of open space left to achieve.

If the average land acquisition cost is $9,000 per acre, then approximately $1.5 billion of public and private investment in land conservation would be needed to acquire and protect over 160,000 acres of open space in order to achieve the 21% target.[25]

E. FUNDING AND FINANCING PROGRAMS

The following is an alphabetical breakdown of the current funding (i.e., grants) programs in support of "land conservation" in Connecticut, including, but not limited to:

- **Agriculture Conservation Easement Program** ("ACEP") – protects the agriculture viability and related conservation values of eligible land through agricultural land easements that help private and tribal landowners, land trusts, and other entities such as state and local governments protect croplands and grasslands on working farms and ranches by limiting non-agricultural uses of the land through conservation easements.   Under the Land Easement component, the Natural Resources Conservation Service ("NRCS") of the USDA, may contribute up to 50 percent of the fair market value of the agricultural land easement, and up to 75 percent where NRCS determines that grasslands and special environmental significance will be protected. Projects must have non-federal matching funds in hand.

- **Charter Oak Open Space Trust Account** – a defunct program for several years now, which included two accounts to fund new open space purchase programs, including 40% to the Charter Oak State Parks and Forest Account for state acquisition of open space and watershed

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[22] 33 locations

[23] 107 locations

[24] Including wildlife management areas, fish hatcheries, flood control, natural area preserve, water access, wildlife sanctuaries, and other

[25] It should be noted that although the definition of Open Space Land under CGS 12-107(b)(3) includes "…and not excluding farmland…", that farmland was not included in the progress towards the open space target analysis above. If it were to be included, then it would demonstrate more progress towards the protected land goal bringing the state closer to the 21% goal, but still short of the goal. The use of "open space land" refers to public recreational use when farmlands aren't generally accessible to the public.

land, and 60% to the Charter Oak Open Space Grant Program to provide grants to municipalities and nonprofit land conservation organizations to acquire open space or watershed protection land.

- **Community Forest Program** ("CFP") – is a competitive grant program through the US Forest Service that provides financial assistance to tribal entities, local governments, and qualified conservation non-profit organizations to acquire and establish community forests that provide community benefits. Community benefits include economic benefits through active forest management, clean water, wildlife habitat, educational opportunities, and public access for recreation.

- **Connecticut Farmland Preservation Program** (CGS 7-131d) – administered by DoAg to leverage state, local, and private funds to permanently protect farms. Initiated in 1998, is funded by state bonding and the CIA, and has four (4) public policy priorities – open space (i.e., DEEP), agriculture preservation (i.e., DoAg), historic preservation (i.e., DECD), and affordable housing (i.e., CHFA).

  Since 1978, DoAg has permanently protected 386 farms on 46,142 acres by awarding $128 MM in Farmland Preservation Program grant funds (or $2,778/acre).[26] Current law allows the Commissioner the ability to pay up to $20,000 per acre, subject to appraisal.

- **Connecticut Open Space and Watershed Land Acquisition Grant Program** ("OSWA") (CGS 7-131d) – a matching grants program to provide financial assistance to municipalities, land trusts, and water companies to acquire open space and watershed lands. Initiated in 1998, is funded by state bonding and the CIA, provides financial assistance to municipalities and nonprofit land conservation organizations to acquire land for open space, and to water companies to acquire land to be classified as Class I or Class II water supply property, and is administered by DEEP to leverage state, local, and private funds to create a cooperative open space acquisition program.

  Since 1998, DEEP has awarded over $150 MM in open space grant funds to protect over 41,000 acres (or $3,659/acre).

- **Connecticut Wetland Mitigation and In Lieu Fee Program** ("ILF")[27] – Per the Clean Water Act (CWA)—landmark environmental protection legislation passed in 1972 that applies to all waters of the United States—parties seeking to construct projects ("permittees") that will have an impact on wetlands must take all reasonable measures to avoid such impacts, to minimize unavoidable impacts, and to provide mitigation for the remaining unavoidable impacts. On the one hand, permittees could themselves be held responsible for taking on wetland and/or stream mitigation projects, but studies have shown that many mitigation sites in southern New England have a high failure rate because they fail to meet performance standards (Minkin and Ladd, 2003). For this reason, the National Audubon Society, Inc., through its state office, Audubon Connecticut, became the "sponsor" of a Connecticut "In Lieu Fee" program as of 2013. The program allows permittees to pay a fee *in lieu of* taking on mitigation themselves. Instead, local organizations like land trusts, and other environmental nonprofits, are given the opportunity to apply for and receive grant funding to protect and enhance wetlands.

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[26] Status of State PACE Programs by the American Farmland Trust and USDA's Farmland Information Center
[27] https://ct.audubon.org/conservation/in-lieu-fee-program

- **Forest Legacy Program** ("FLP") – DEEP partners with the US Forest Service ("USFS") to implement the FLP. The FLP helps to identify and conserve environmentally important forests. The program protects working forests, those forests that protect water quality and provide habitat, forest products, opportunities for recreation and other public benefits. The program encourages and supports acquisition of conservation easements. Conservation easements are legally binding agreements transferring a negotiated set of property rights from one party to another, without transferring property ownership. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect various environmental values. There are also limited instances under the program where properties are purchased outright for their conservation values. In both instances, the federal government may fund up to 75% of program costs, with at least 25% coming from private, state or local sources.

- **Land and Water Conservation Fund** ("LWCF") – LWCF is a federal program that was established by an Act of Congress in 1965 to provide funds and matching grants to federal, state and local governments for the acquisition of land and water, and easements on land and water, for the benefit of all Americans. The main emphases of the fund are recreation and the protection of national natural treasures in the forms of parks and protected forest and wildlife areas. In August 2020, the President Trump signed the Great American Outdoors Act into law, which requires that the LWCF be funded at $900 million yearly, a significant increase from previous funding levels.

- **Long Island Sound Futures Fund** – National Fish and Wildlife Foundation ("NFWF) and the Long Island Sounds Study's ("LISS") Long Island Sound Futures Fund ("LISFF") provides grant funding for projects that support the restoration and improvement of the health of the Sound. Since 2005, the LISFF has invested $32 MM in projects (i.e., grants ranging from $50,000 to $1 MM) to improve water quality, restore the natural environment, and engage and inform communities about the importance of a healthy Long Island Sound.

- **Recreation and Natural Heritage Trust Program** ("RNHT") – administered by DEEP, is the main program to purchase or conserve state lands for conservation and public use or benefit.

  Since 1998, the State Bond Commission has approved $177 MM to go towards the RNHTP to protect over 49,000 acres (or $3,612/acre).

- **Regional Greenhouse Gas Initiative** ("RGGI") – funded primarily by the proceeds from the sale of RGGI allowance proceeds by energy producers, RGGI funds have been used at times to support forest conservation. In 2020, DEEP invested nearly $1 MM of RGGI funds to support grant programs through the CT Urban Forest Council, UConn, and DEEP's Urban Forestry program to support urban tree planting, improving the management and maintenance of existing trees and/or wooded areas, local educational, outreach or planning efforts, and community organization capacity-building that will lead to improvements in local tree canopy cover with an emphasis on environmental justice communities and tangible climate change benefits.[28]

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[28] "Policy on Resilient Forests for Connecticut's Future (PRFCT Future)" (December 14, 2021)

The following is a breakdown of the current financing (i.e., loans) programs that could support land conservation in Connecticut:

- **State Revolving Fund** ("SRF") – since 1988, Connecticut has received over $650 MM from the federal government through the Clean Water SRF, while providing cumulative assistance (i.e., including state investment) of $2.8 billion of investment primarily in centralized wastewater treatment infrastructure (in comparison to stormwater, energy conservation, and water conservation infrastructure).[29] With the passage of the bipartisan supported "Investing in Infrastructure and Jobs Act" ("IIJA" or Bipartisan Infrastructure Law "BIL") in November of 2021, there were additional resources allocated to the SRF for water quality and drinking water (i.e., $445 million).[30] SRF could be used to invest in green infrastructure projects (e.g., land conservation, nature-based solutions) for both mitigation and adaptation.

Accessing funding or financing resources for land conservation in Connecticut can be difficult, as evidenced by the unlikelihood of Connecticut achieving the open space land target (i.e., 21% by 2023). Identifying new mechanisms to access additional funding and financing resources, especially those that seek to unlock more private capital investment, could provide a catalyst to increase and accelerate investment in land conservation in Connecticut. The IIJA presents an opportunity to access funding and financing resources through formula or competitive grants for "land conservation".

F. OTHER PROGRAMS

The following are other items of note with respect to "land conservation":

- **No Child Left Inside** – launched in 2006, *No Child Left Inside*® is a promise to introduce children to the wonder of nature – for their own health and well-being, for the future of environmental conservation, and for the preservation of the beauty, character and communities of the state.

- **Passport to the Parks** – beginning in 2018, Connecticut offered all residents with Connecticut license plates on their vehicles free entry and parking at all state parks and beaches. Connecticut wants to make state parks, forests, trails, historic sites and beaches more available to residents so they can enjoy the many attractions and beauty they offer.

- **State Natural Heritage, Open Space & Land Acquisition Review Board** – is an independent advisory group of volunteers appointed by the Governor and leadership within the CGA under CGS 7-131(e) to oversee OWSA and RNHT programs.

- **Land Registry** – Public Use and Benefit Land Registry ("Land Registry") pilot portal allows users to browse state lands, determine property ownership, and research, view, and download copies of parcel information, including deeds, surveys, and land management plans. The Land Registry is valuable for many reasons. It provides a public record and notice of title, conservation purpose, funding amounts, and land management plans, when applicable. Furthermore, the Registry can potentially expand public access to open space lands purchased with State conservation funds by highlighting their locations across Connecticut.

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[29] Including Title II and VI funds – https://www.epa.gov/sites/default/files/2021-02/documents/ct.pdf
[30] https://www.whitehouse.gov/wp-content/uploads/2021/08/CONNECTICUT_The-Infrastructure-Investment-and-Jobs-Act-State-Fact-Sheet.pdf

G. STAKEHOLDER OUTREACH

In an effort to understand the public policy and marketplace context for "land conservation" in Connecticut, the Green Bank met with many organizations.[31]

These 23 organizations primarily represent non-profit organizations but include public and for-profit organizations as well.

The objectives of these one-hour conversations included:

- **Introductions** – to get a better understanding of the mission and initiatives of the various public, nonprofit, and for-profit stakeholders operating within the "land conservation" space, and to introduce the Green Bank;

- **Environmental Infrastructure** – inform the various stakeholders about the "environmental infrastructure" policy,[32] process the Green Bank is pursuing to develop a Comprehensive Plan, and to elicit discussion on the following areas:

  - **Relevance** – how relevant "environmental infrastructure" and its components (e.g., land conservation) are to the stakeholder's mission and initiatives;

  - **Policies and Targets** – what local, state, and federal policies (e.g., Community Investment Act), including plans (e.g., Green Plan) are important from the stakeholder's perspective, and what targets (e.g., 21% open space land by 2023) are they seeking to achieve;

  - **Metrics** – what are the key metrics stakeholders believe are important in terms of monitoring and evaluating success from investments in "environmental infrastructure" improvements and "land conservation";

  - **Vulnerable Communities** – how does the stakeholder's organization think about the impacts that must be addressed from climate change to build the resilience of vulnerable communities; and

  - **Stakeholder Identification** – who else should the Green Bank meet with on the topic.

From these conversations, the Green Bank was able to develop a better understanding as to the role it might play in terms of financing "land conservation" from the perspective of its mission – to confront climate change.

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[31] Land Conservation – Audubon Connecticut, Connecticut Audubon, Connecticut Land Conservation Council, Conservation Finance Network, DEEP, Ecosystem Investment Partners, Goldman Sachs, Highstead, New England Forestry Foundation, New England Society of American Foresters, Quantified Ventures, Save the Sound, The Nature Conservancy, TNC's Nature Vest Program, and Yale Forest School
Parks and Recreation – Connecticut Forest and Parks Association, Connecticut Greenways Council, Connecticut Recreation and Parks Association, DEEP, Green Eco Warriors, Keney Park Sustainability Project, Sierra Club, Trust for Public Lands, and Urban Resources Initiative.
[32] Public Act 21-115 – An Act Concerning Climate Change Adaptation"

H. FINDINGS

Based on the various meetings with public, nonprofit, and private stakeholders, the following are key findings with respect to land conservation (it should be noted that additional findings have been generalized in the footnote):[33]

- **Consistent with Mission to Confront Climate Change** – land conservation reduces GHG emissions (e.g., preventing forest conversion to development, better forest management practices, substituting wood for steel in building materials, and storing carbon in new construction) (see Table 3) and increases resilience (e.g., flood protection, stormwater management), and therefore is consistent with the Green Bank's mission to "confront climate change" through the protection, management, and/or restoration of open space land (e.g., forests, wetlands, grasslands, farmlands, timberlands, grazing lands) – see Figure 4.

Table 3. Carbon Emissions, Foregone Sequestration, Total Opportunity from Avoided Deforestation (MMTCO2e/Year/Acre)[34]

	Carbon Emissions		Foregone Sequestration		Total Opportunity	
	1990s	2000s	1990s	2000s	1990s	2000s
CT	0.35	0.42	0.08	0.09	0.43	0.51

Figure 4. Impact of Investment in Land Conservation – Increase Resilience and Reduce GHG Emissions
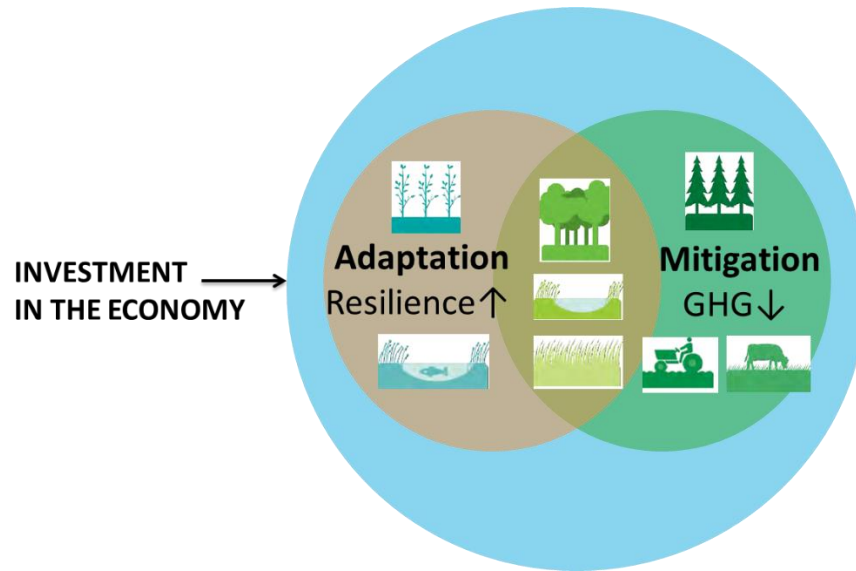
- **Must Access Federal Resources** – leverage Green Bank assets to successfully access formula grant or competitive solicitations from federal sources that can be efficiently and effectively invested by state and local partners (e.g., land trusts, non-profits, etc.).

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[33] Additional findings – land conservation and nature-based solutions are infrastructure, adaptation is community-centered and important for community engagement, Connecticut is along important ecosystem migration routes for wildlife, Nature Vest is a "green bank," policies are important for performance-based environmental outcomes (i.e., pay for performance) environmental markets requires lawyers (i.e., public policy) and scientists (i.e., pre and post project impacts)

[34] Williams CA, Hasler N, Xi L (2021) "Avoided Deforestation: A Climate Mitigation Opportunity in New England and New York", a report prepared for the United States Climate Alliance Natural and Working Lands Research Program, pp.1-42.

It should be noted that although the Green Bank can't access the SRF,[35] that $445 million of additional SRF resources will be received by Connecticut over five years through the IIJA – and SRF resources can be directed towards green infrastructure projects (e.g., land conservation, nature-based solutions) as demonstrated by TNC and Nature Vest.[36]

- **Money is Not Always the Problem** – as important as local, state, federal, and private funding and financing resources are, sometimes not having enough people, having onerous processes, an inability to speak to or monetize co-benefits (e.g., job creation, resilience), or lack of understanding of important tools (e.g., conservation finance) can substantially inhibit progress towards increasing investment in land conservation. There is also an opportunity to prioritize and engage with a broader representation of Connecticut communities in addressing environmental infrastructure that has multiple benefits – it will be important to identify opportunities that enable investment in projects that provide numerous outcomes.

- **Need Mechanisms to Monetize Environmental Markets** – stakeholders recognize that environmental markets (e.g., carbon offsets, ecosystem services, resource certification) may be able to provide additional sources of revenue (e.g., from compliance, voluntary, and/or other markets) to finance projects (e.g., proceeds from revenue bonds). For example, carbon stocks are generally higher in older forests, while the amount of carbon stock added in a given year is higher in younger forests.[37] In Connecticut, the cost of climate mitigation from avoided deforestation is between $10 (i.e., in parts of Litchfield County) to over $500 (i.e., in all of Fairfield County) per MTCO2e.[38] Successful projects require public recognition of environmental commodities (i.e., through public policy and compliance markets, procurement, or other means), significant potential (i.e., private landowners of forests with strong GHG mitigation and/or resilience potential), credible partners (e.g., science-based nonprofit conservation organizations, credit-worthy long-term purchasers of carbon offsets), and reliable monitoring and evaluation.

- **Impact Metrics** – the following is a "high level" breakdown of the types of metrics appropriate for land conservation – see Table 4.

Table 4. Relevant Metrics Identified by Stakeholders on Land Conservation

Inputs	Outputs	Outcomes
o Investment in projects o Sources of public (e.g., local, state, federal) and private funds o Leverage (i.e., public vs. private funds) o Individual investment (e.g., Community Match Fund,	o # of projects o Location of projects o Quantity of land conserved (e.g., acres, restrictions, use, easements) o Quality of land conserved (e.g., ecosystem services)	o GHG emissions reduced or sequestered o Resilience improvement (e.g., # people at reduced risk of flooding, heat exposure) o Comparative benefits between project types (e.g., coastal wetlands vs. inland wetlands)

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[35] Per Public Act 21-115

[36] Cumberland Forest Project conserving 253,000 acres of conservation easement along Central Appalachia from Kentucky to Virginia. https://www.nature.org/en-us/magazine/magazine-articles/cumberland-forest-project/

[37] Williams CA, Hasler N, Xi L (2021) "Avoided Deforestation: A Climate Mitigation Opportunity in New England and New York", a report prepared for the United States Climate Alliance Natural and Working Lands Research Program, pp.1-42.

[38] Ibid (21)

Green Liberty Bonds and Notes) o Funding (i.e., grants) vs. financing (i.e., loans) o Technical assistance (e.g., climate-smart practices) o Protected lands (e.g., conservation easements) supporting local needs o Access to land	o Reduction in land loss to development o Urban tree canopy cover o Renewable energy (e.g., solar PV, wind) on forestland o Increased engagement of BIPOC community to land conservation o Sustainably managed lands o Better and easier access to information o Increase in cash flow to property owners	o Water quality improvement (e.g., stormwater management, nitrogen sediment in streams) o Jobs created o Land use and zoning (e.g., housing vs. land conservation vs. renewable energy siting) o Greater public access o Leadership of BIPOC communities in building resilience for their own communities o Advancements in public policy to recognize the value of land conservation (e.g., tax credits, carbon offsets, ecosystem services, urban conservation, rural development, pay for performance) o Strengthened municipal plans that prioritize "no net loss of core forests" o Increased investments in land conservation and greenspace development viewed as a community necessity and essential component of sustainable community o Health benefits o Wildlife habitat o Timber for building or wood products that store carbon for decades

It is important to note that effective measurement of data on the benefits of environmental commodities (e.g., carbon offsets, ecosystem services) is vital to supporting compliance, voluntary, and other markets (e.g., FSC certification, Connecticut Grown, climate-smart practices).

- **Vulnerable Communities** – not enough nature-based solutions and green spaces in urban communities, which results in investments in gray infrastructure (e.g., wastewater treatment plants) vs. green infrastructure (e.g., nature-based solutions, urban tree canopy cover, parks) thereby increasing, for example, energy usage, urban heat island effects, and air pollution which disproportionately impacts vulnerable communities as a result of climate change. Inequitable access to the benefits of open space results in compounded challenges in vulnerable communities. Benefits include improved health, better air and water quality, and increase in quality of life connected to open space and natural spaces. Increase in development, especially poorly planned development, leads to greater demand on gray infrastructure, which adversely impacts vulnerable communities (e.g., flooding, pollution).

These are the key findings from the stakeholders on land conservation.

I. OPPORTUNITIES

The following is a list of opportunities for consideration by the Green Bank given the broad categories of information and data, environmental markets and conservation finance, funding and financing sources, and other potential opportunities:

1. **Information and Data** – as a foundation, access to high quality information is important from which to base investment decisions. Stimulating further investment in land conservation may require the Green Bank supporting research (e.g., economic value of land conservation) to identify opportunities that advance public policy to create investment opportunities that support target outcomes (e.g. nature-based solutions, urban climate mitigation and resilience) through community-led initiatives. The following is a breakdown of opportunities for consideration with respect to information and data:

    A. **Climate Change Vulnerability Index** ("CCVI")[39] – including Social Vulnerability ("SV") mapping created for Resilient Connecticut,[40] is an index-based spatial model assembled by the Connecticut Institute for Resilience and Climate Adaptation ("CIRCA") that identifies community vulnerability to flood, wind, and heat-related impacts of climate change. The CCVI characterizes areas based on an equation using sensitivity[41] plus exposure[42] minus adaptive capacity.[43] The CCVI can be used to assist with resiliency planning and to make educated decisions about future development and green infrastructure investment. The Green Bank should consider adopting the CCVI, and/or SV mapping, as a component of the "vulnerable communities" definition to (1) identify areas of investment with respect to land conservation, and (2) assess risk from existing investments in infrastructure.

    B. **Pipeline Assessment** – work with CIRCA and DEEP to continuously build and assess the pipeline of potential GHG emission mitigation and climate change adaptation and resilience projects (e.g., type, size, scope, estimated impact, location) related to land conservation and nature-based solutions (e.g., coastal wetlands, forests).

    C. **Yale School of the Environment** – Yale School of the Environment, and its work supporting conservation finance (e.g., partnership with the Conservation Finance Network, Tools for Engaging Landowners Effectively or "TELE")[44] presents a unique opportunity to continuously inform and develop conservation finance practitioners in Connecticut. The Green Bank should consider providing local stakeholders with access to information (e.g., promoting Conservation Finance Network) and professional

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[39] https://resilientconnecticut.uconn.edu/wp-content/uploads/sites/2761/2021/10/CCVI-Fact-Sheet-2.pdf

[40] https://resilientconnecticut.uconn.edu/resources/

[41] The degree to which a built, natural, or human system will be impacted by changes in climate conditions.

[42] The degree of the stress that certain asset is going through with climate variability. This includes changes such as the magnitude and frequency of extreme events.

[43] The ability of a system to adjust to changes, manage damages, take advantage of opportunities, or cope with consequences.

[44] https://www.engaginglandowners.org/ - TELE is a project of the Sustaining Family Forests Initiative, which is a collaboration between the Family Forest Research Center, the U.S. Forest Service, the Center for Nonprofit Strategies, and the Yale School of the Environment, aimed at gaining and disseminating comprehensive knowledge about family forest owners throughout the United States.

development opportunities (e.g., sponsorship of bootcamps on conservation finance) to accelerate the advancement and practice of conservation finance in Connecticut.

D. **Land Value, Carbon and Ecosystem Services Potential** – knowing the average cost of acquiring land (i.e., $ per acre), including those open space lands that are inland, as well as along coasts and rivers, and the carbon storage and sequestration and ecosystem service value and potential of such lands, will help the Green Bank determine how the investment of Green Bank funds while mobilizing private investment can maximize GHG emissions reduced, and resiliency against climate change increased. The Green Bank should consider supporting or conducting such a study to understand the baseline potential for nature-based solutions to confront climate change in Connecticut.

E. **Global Warming Solutions Act** – as recommended by the Policy on Resilient Forests for Connecticut's Future ("PRFCT"), advocate to amend Public Act 08-98 to include definitions for "carbon sink" and "negative emissions", and annual monitoring and reporting of CO2 sequestered, and carbon stored through biological processes alongside the data reported on the transportation, electricity, and other sectors.

2. **Environmental Markets and Conservation Finance** – in terms of identifying potential carbon offset and/or ecosystem services revenue streams within compliance and voluntary markets that can support financing of land conservation projects, the following is a breakdown of opportunities for consideration with respect to environmental markets and conservation finance. It should be noted that there is an important role for public policy and government to encourage the creation of environmental value through measurable outcomes-based performance.

A. **Performance-Based Land Conservation** – whether it be forest carbon markets within compliance (e.g., California cap-and-trade program)[45] or voluntary (e.g., Amazon purchasing offset credits) markets, or ecosystem services markets for "pay for performance" restoration projects (e.g., reducing nitrogen discharge in rivers in Maryland), producing and selling measurable benefits can generate revenues to support private investment in land conservation projects.

B. **Conservation Finance Policy** – modelled after clean energy policy in Connecticut,[46] or proposed Senate Bill 348 (i.e., "Conservation Finance Act" in Maryland), consider "pay for performance" conservation finance policies in Connecticut that reward private investment in green and blue infrastructure projects that deliver measurable and verified environmental outcomes (e.g., carbon offsets, ecosystem services). It is important to put value on the land (e.g., forest carbon, forest certification) instead of always taking it off the land (e.g., timber) by implementing floor prices, guarantees, and hosting auctions for the sale of ecosystem services, allocating public funds for development of investment ready nature-based solutions for land and sea, providing catalytic capital for blended finance.

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[45] https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/arb-offset-credit-issuance

[46] Zero and low emission renewable energy credit programs (i.e., "ZREC" and "LREC") provided performance-based incentives per MWh of Class I renewable energy produced to support Connecticut's implementation of its renewable portfolio standard ("RPS").

For example, research conducted by Earth Economics for Audubon Connecticut, calculated the ecosystem services value of the East River Marsh as the following – see Table 5.[47]

Table 5. Annual, per Acre Benefits from the East River Marsh

Benefit	Low Marsh	High Marsh
Resilience		
Flood Protection	$506	$506
Storm Protection	$5,872	$14,680
Environment		
Carbon Sequestration	$2,203	$4,047
Existence Value[48]	-	$1,748
Habitat Value	$1,232	$1,232
Water Quality	$2,803	$2,803
Community		
Aesthetic Value	$952	$952
Recreation	$382	$382
Annual Total	**$13,951**	**$26,350**

    C. **Forest Carbon Market Partnerships** – partner with land conservation non-profit organizations (e.g., American Forestry Foundation, TNC-Nature Vest, New England Forestry Foundation) to invest Green Bank capital (i.e., debt and/or equity) into structures (e.g., Family Forest Carbon Program, Exemplary Forestry Investment Fund) that support small landowner participation in forest carbon markets and other ecosystem services in Connecticut (e.g., Pawcatuck Borderlands, Quabbin Corridor, and Berkshire Wildlife Linkage).[49][50][51] Consider adopting the or developing a Verra standard for forest carbon offsets.[52]

3. **Funding and Financing Sources** – identifying additional funding (i.e., grants) and financing (e.g., loans) that can increase and accelerate investment, the following is a breakdown of opportunities for consideration with respect to funding and financing of land conservation:

    A. **Green Liberty Bonds** – leverage the strength of the Green Bank balance sheet, with the award-winning climate bond structure of the Green Liberty Bonds modelled after the War Bonds of the 1940's, to support investments in land conservation:

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[47] East River Marsh – Preserving March Resilience for Coastal Communities by Earth Economics for Audubon (2021)

[48] Existence value if the value that people place on knowing certain ecosystems or species exist, even if they never plan to use or benefit from those ecosystems or species in any direct way.

[49] https://www.forestfoundation.org/what-we-do/increase-carbon-storage/family-forest-carbon-program/

[50] https://newenglandforestry.org/learn/initiatives/efif/

[51] "A Safe Harbor for Nature: New England's Resilient and Connected Network of Lands" by TNC.

[52] https://verra.org/worlds-most-widely-used-standard-for-carbon-offset-credits-strengthened-to-advance-forest-preservation-and-restoration/

i. **Pilot Revolving Loan Fund for Buy-Protect-Sell** – modelling the Conservation Fund's successful $150 MM green bond issuance in 2019 (i.e., 10-year rated A3 by Moody's), which created the Working Forest Fund,[53] working with DEEP, DoAg, and nonprofit land conservation organizations, provide loans to land trust to help them move quickly to permanently protect critical open space from development.

ii. **Infrastructure Modernization** – working with DOAg, to identify opportunities to invest in forestry industry infrastructure modernization projects (e.g., portable mills) that would support climate-smart practices and products to develop and grow in the Connecticut marketplace.

From research conducted by the Green Bank, it can be seen that retail investors in bonds are interested in land conservation, including citizens who are also interested in investing in rooftop solar and home energy efficiency – see Figure 5.

Figure 5. Retail Investor Use of Proceed Interest in Clean Energy and Environmental Infrastructure
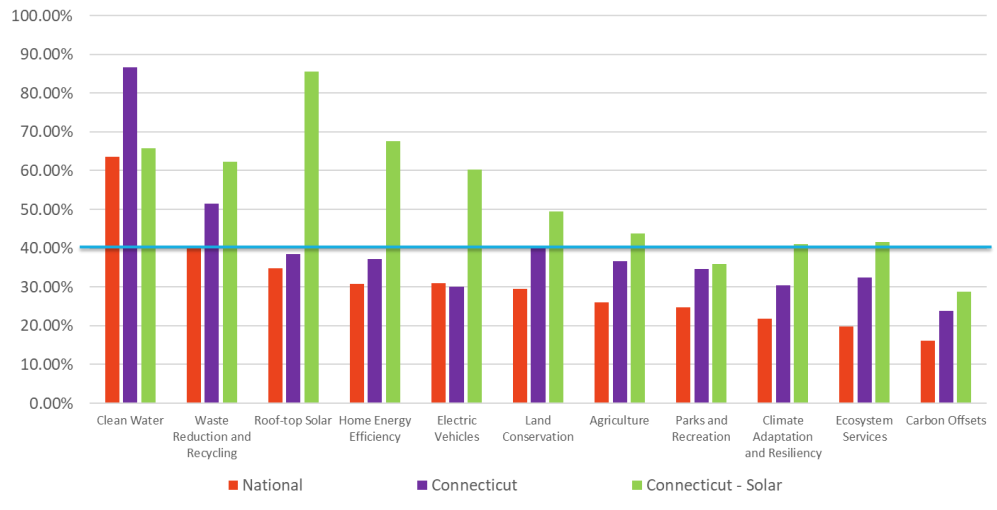
B. **Partnership for Climate-Smart Commodities** – working with DoAg, submit a proposal, matched by a Green Liberty Bond, through the $1 billion competitive solicitation of the United States Department of Agriculture's ("USDA") Commodity Credit Corporation (i.e., USDA-NRCS-COMM-22-NOFO0001139) in response to the climate crisis by supporting actions within the agriculture sector to produce climate-smart commodities.[54] As the lead primary applicant, DoAg would support producers adopt and sustainably implement climate-smart practices, and as the co-lead, the Green Bank, with its expertise from the Residential Solar Investment Program (see Figure 6), would adapt the

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[53] The Working Forest Fund invests green bond proceeds to buy the most at-risk private forests. Once it owns the forest, it protects the land (i.e., easement), develops sustainable harvesting, wildlife, and habitat restoration plans, and then resells the land to private or public buyers to repay the loan. This fund has permanently conserved 500,000 acres, permanently storing over 210 MMTCO2e.

[54] Defined as an agricultural commodity that is produced using agriculture (i.e., farming, ranching, or forestry) practices that reduce greenhouse gas emissions or sequester carbon.

clean energy model to climate-smart agriculture (see Figure 7), and support consumers access climate-smart commodities from such producers.

Figure 6. Residential Solar Investment Program – From SHRECs to Green Liberty Bonds

When panels produce electricity for a home, they also produce **Solar Home Renewable Energy Credits (SHRECs)**. The Green Bank provides upfront incentives through RSIP and collects all the SHRECs produced per statute (i.e., PA 15-194).

Utilities required to enter into **15-year Master Purchase Agreement (MPA) with the Green Bank to purchase the stream of SHRECs produced**. This helps utilities comply with their clean energy goals (i.e., Class I RPS).

Green bonds are created from the SHREC revenues received through the MPA and **sold to institutional** (i.e., pension funds, insurance companies, etc.) and **retail investors** (i.e., friends and family) to **receive proceeds upfront**.

The Green Bank uses the SHREC revenues and green bond proceeds to **support upfront or ongoing performance incentives**, **cover admin costs**, and **financing costs** to achieve **350 MW of solar PV deployment**, **development of local solar PV industry, and inclusion of vulnerable communities**

Figure 7. Climate-Smart Commodities and Green Liberty Bonds - Modernizing and Protecting Connecticut's Farmland and Forestland Infrastructure while Confronting Climate Change

When **farms and forests** are **protected** (e.g., easements, land acquisition), **supported** (e.g., Connecticut Grown), and **sustainably managed** (e.g., FSC certified, CSAF practices), beyond other commodity revenues (e.g., food and wood) they can produce potentially monetizable co-benefits (e.g., **ecosystem services**, **carbon offsets**).

Through **Compliance Markets** (e.g., cap-and-trade in CA), **Voluntary Markets** (e.g., carbon offsets), or other markets (e.g., CT Grown, FSC certified) there is potential to **enter into long-term contracts between purchasers** of CSAF commodities **and farmers or land-owners that produce** such commodities from CSAF practices

The USDA could help support the market by **setting a floor price on such CSAF commodities**. In addition, to bring **low-cost and long-term capital** needed to **protect farmland and forestland**, the Green Bank could **issue bonds** to raise capital for **revolving loan fund** to support **"buy-protect-sell"** strategy and other infrastructure.

State of Connecticut can **achieve "no net loss of farmlands and forestlands" goals**, while **reducing GHG emissions**, **increasing resilience**, **delivering Justice40**, **improving recreation and ecosystems**, **improving water quality**, and supporting local farmers and foresters **build the green economy**.

C. **Community Match Fund** ("CMF") – a program of Sustainable CT, the Community Match Fund provides fast, flexible funding, and support for community engagement on a wide-range of sustainability projects. This societal value uses an innovative, online tool to connect grant contributions from the "crowd," which are matched by various donor

interests, including, but not limited to individuals, foundations, and the State of Connecticut. As of January 1, 2022, the Fund has raised $1.3 MM from nearly 10,000 individual contributors, which was matched by $1.1 MM from various sponsors, and supported 195 projects. The Green Bank could consider working with entities like Sustainable CT, with tools like the CMF, to enable funding for land conservation to be matched by the crowd, while also ensuring that equity and vulnerable communities are front and center in receiving the benefits of such investment.

D. **State Revolving Funds** – although not a Green Bank resource, existing and additional SRF resources could be used by the state to provide low-cost and long-term capital to finance green infrastructure projects (e.g., land conservation) in Connecticut, or in partnership with other states across the Northeast region. The Green Bank could recommend to its state colleagues that a portion of the SRF be used for green infrastructure projects in Connecticut as is being done by other states. For example, the Rhode Island Infrastructure Bank requires municipal borrowers to identify green infrastructure projects for 10% of the value of their clean water loans; the Commonwealth of Virginia invested $20 MM of its SRF in a $130 MM transaction to protect 253,000 acres across three-states to acquire land in Central Appalachia. Regional collaboration on the SRF and land conservation could target focal landscapes in the Berkshire Wildlife Linkage (i.e., 1,579,566 acres in the landscape with 31% protected including lands in MA, NY, and VT), Quabbin Corridor (i.e., 475,864 acres in the landscape with 37% protected including lands in MA and NH), and/or Pawcatuck Borderlands (i.e., 473,397 acres in the landscape with 23% protected including lands in MA and RI) – see Figure 8.[55]

Figure 8. Regional Opportunity for the State Revolving Fund and Nature-Based Solutions to Climate Change
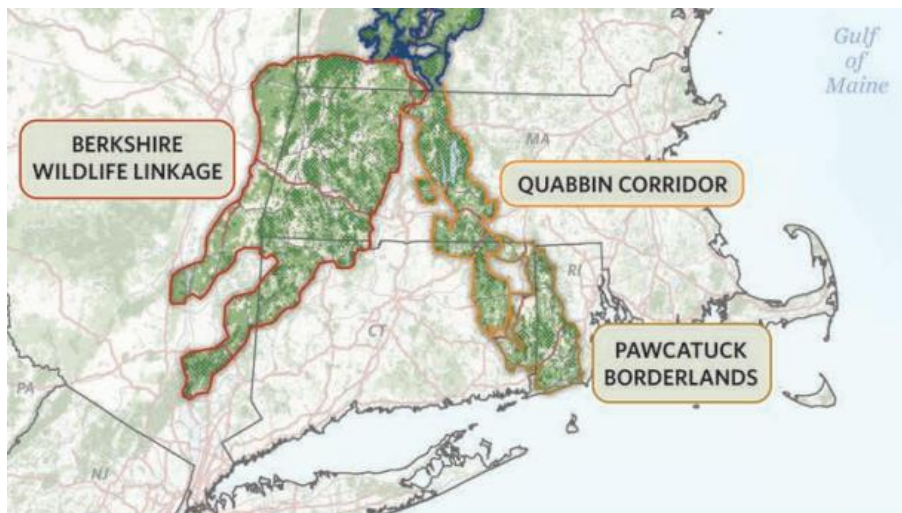
4. **Other Potential Opportunities** – there are a number of other potential opportunities that can support land conservation and the advancement of conservation finance, including:

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[55] "A Safe Harbor for Nature – New England's Resilient and Connected Network of Land" by The Nature Conservancy

A. **Clean Energy and Sustainability Accelerator** – within the climate change programs proposed as part of the Build Back Better Act ("BBBA") is the Clean Energy and Sustainability Accelerator ("CESA"). Modelled after the Connecticut Green Bank, the $29 billion allocated under CESA would provide state and local government with access to capital to finance projects that reduce GHG emissions and increase resilience, including nature-based solutions.

B. **Climate Conservation Corps** – within the climate change programs proposed as part of the BBBA is the Climate Conservation Corps. Modelled after the Civilian Conservation Corps under President Franklin Roosevelt, the climate program centered around equity and environmental justice, could hire hundreds of thousands of young people to help restore forests and wetlands. The Green Bank could include within its investment activity, the requirement for developers to include Climate Conservation Corps members. If Climate Conservation Corps is passed through the BBBA, then Connecticut should prioritize the involvement of BIPOC[56] populations and hire a leader from the BIPOC community to run it.

C. **30% by 2030 Goal** – to continue to increase the role land conservation has on mitigating GHG emissions and making Connecticut more resilient to the impacts of climate change, consideration could be given to increase the open space land target policy from 21% by 2023 to 30% by 2030, which would include farmland within the overall open space land target. Supporting the "no net loss of forest" goal and related goals such as increasing urban tree canopy are also important.

These are a few of the opportunities identified by the Green Bank to support its mission and advance land conservation and conservation finance in Connecticut.

Developing a method for prioritizing what opportunities under consideration are ultimately pursued, given the limited human and financial resources, and organizational structure of the Green Bank, is an activity for a later date.

J. HISTORY OF LEADERSHIP AND INNOVATION
The history of leadership and innovation in "clean energy" technology in Connecticut is marked, including those like:

- **Daniel Halladay** – an entrepreneur who lived in Coventry, CT who invented the self-regulating wind pump in the mid- to late-1800's, which enabled the transcontinental railroad;[57][58]

- **Albert Pope** – an entrepreneur who manufactured thousands of electric vehicles in the early 1900's in Hartford, CT, including one that transported President Roosevelt in the first presidential motorcade;[59] and

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[56] Black, Indigenous, or People of Color
[57] https://en.wikipedia.org/wiki/Daniel_Halladay
[58] https://en.wikipedia.org/wiki/Albert_Augustus_Pope
[59] https://whereilivect.org/made-in-connecticut-albert-popes-amazing-automobiles/

- **Bernard Baker** – an entrepreneur who lived in Bethel, CT who invented and manufactured fuel cells, which provide high reliable power.[60]

Beyond technology, Connecticut is also marked by leadership in society, including:

- **Freeman Sisters** – entrepreneurs who lived in Bridgeport, CT whose historic landmark homes once served as a destination in the Underground Railroad, and now stand in the shadows of a coal-fired power plant demonstrating environmental injustice in our society; and

- **Gina McCarthy** – an innovator who served as Connecticut's Commissioner of the Department of Environmental Protection under Governor Rell, to later become the Administrator of the USEPA under President Obama, and National Climate Advisor under President Biden.

The history of leadership and innovation in "environmental infrastructure" in Connecticut is also significant, especially when it comes to "land conservation" including:

- **Gifford Pinchot** – an innovator who was born in Simsbury, CT who established the Society of American Foresters, served as the first Chief of the US Forest Service, and endowed the Yale Forest School, which today stands as the Yale School of the Environment.[61][62]

It is this history of leadership and innovation in "clean energy" and "environmental infrastructure" that makes the Constitution State a special place from which to initiate and launch unique ideas that transform technology and society.

K. REFERENCES

In addition to the conversations with stakeholders, the Green Bank reviewed the following documents to support its findings and opportunities:

- **Green Plan** – Comprehensive Open Space Acquisition Strategy (2016-2020 Green Plan)

- **Forest Action Plan** – Connecticut's 2020 Forest Action Plan

- **Governor's Council on Climate Change** – Taking Action on Climate Change and Building a More Resilient Connecticut for All (January 2021)

- **Working and Natural Lands Working Group** – reports by Forests, Rivers, and Wetlands Subgroups of the Governor's Council on Climate Change (November 2020)

- **WAP** – 2015 Connecticut Wildlife Action Plan

L. DEFINITIONS

The following are important definitions when it comes to land conservation in Connecticut:

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[60] https://en.wikipedia.org/wiki/Bernard_S._Baker
[61] https://en.wikipedia.org/wiki/Gifford_Pinchot
[62] Check with Doris Johnson at DEEP to see if there are other historical land conservation leaders, including present BIPOC leaders.

- **Conservation Easement** – is a deed restriction or deed covenant that landowners voluntarily place on part or all of their land. The easement limits development in order to protect the land's natural resources.

- **Conservation Restriction** (CGS 47-42a)[63] – conservation restriction means a limitation, whether or not stated in the form of a restriction, easement, covenant or condition, in any deed, will or other instrument executed by or on behalf of the owner of the land described therein, including, but not limited to, the state or any political subdivision of the state, or in any order of taking such land whose purpose is to retain land or water areas predominantly in their natural, scenic or open condition or in agricultural, farming, forest or open space use.

- **Core Forest** – forests that are at least 300 feet from non-forest development (e.g., roads, bridges, farms), and are classified as core forests.[64] Small, medium and large core forests are patches that are 250 acres, 250-500 acres, and 500+ acres respectively.

- **Environmental Infrastructure** – means structures, facilities, systems, services and improvement projects related to (A) water, (B) waste and recycling, (C) climate adaptation and resiliency, (D) agriculture, (E) land conservation, (F) parks and recreation, and (G) environmental markets, including, but not limited to, carbon offsets and ecosystem services.

- **Forest Land** (CGS 12-107(b)(3))[65] – forest land means any tract or tracts of land aggregating twenty-five acres or more in area bearing tree growth that conforms to the forest stocking, distribution and condition standards established by the State Forester pursuant to subsection (a) of section 12-107d, and consisting of (A) one tract of land of twenty-five or more contiguous acres, which acres may be in contiguous municipalities, (B) two or more tracts of land aggregating twenty-five acres or more in which no single component tract shall consist of less than ten acres, or (C) any tract of land which is contiguous to a tract owned by the same owner and has been classified as forest land pursuant to this section.

- **Open Space Land** (CGS 12-107(b)(3))[66] – open space land means any area of land, including forest land, land designated as wetland under section 22a-30 and not excluding farm land, the preservation or restriction of the use of which would (A) maintain and enhance the conservation of natural or scenic resources, (B) protect natural streams or water supply, (C) promote conservation of soils, wetlands, beaches or tidal marshes, (D) enhance the value to the public of abutting or neighboring parks, forests, wildlife preserves, nature reservations or sanctuaries or other open spaces, (E) enhance public recreation opportunities, (F) preserve historic sites, or (G) promote orderly urban or suburban development.

- **Preservation Restriction** (CGS 47-42a)[67] – preservation restriction means a limitation, whether or not stated in the form of a restriction, easement, covenant or condition, in any deed, will or other instrument executed by or on behalf of the owner of land, including, but not limited to,

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[63] https://www.cga.ct.gov/current/pub/chap_822.htm
[64] http://clear.uconn.edu/projects/landscape/v2/forestfrag/measuring/core_explained.htm
[65] https://www.cga.ct.gov/current/pub/chap_203.htm#sec_12-107b
[66] https://www.cga.ct.gov/current/pub/chap_203.htm#sec_12-107b
[67] https://www.cga.ct.gov/current/pub/chap_822.htm

the state or any political subdivision of the state, or in any order of taking of such land whose purpose is to preserve historically significant structures or sites.

- **Preserved Open Space** – any area of land that has been acquired and is used for open space purposes, including DEEP's State Parks, State Forests, Wildlife Areas, and Class I and II watershed lands.

- **Protected Open Space** – any area of land with a restriction that would limit its use to open space, including lands subject to conservation restrictions, deed restrictions, or certain reserved rights.

- **Resilience** – means the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from deliberate attacks, accidents or naturally occurring threats or incidents, including, but not limited to, threats or incidents associated with the impacts of climate change.

- **Vulnerable Communities** – means populations that may be disproportionately impacted by the effects of climate change, including, but not limited to, (1) low and moderate income communities, (2) environmental justice communities pursuant to section 22a-20a, (3) communities eligible for community reinvestment pursuant to section 36a-30 and the Community Reinvestment Act of 1977, 12 USC 2901 et seq., as amended from time to time, (4) populations with increased risk and limited means to adapt to the effects of climate change, or (5) as further defined by the Department of Energy and Environmental Protection in consultation with community representatives.

STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK

SEE Action

Long-Term Performance of Energy Efficiency Loan Portfolios

March 2022

Acknowledgments

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Executive Summary

This report reviews and documents the financial performance of four large and long-running residential energy efficiency financing programs. The analysis presented will inform potential capital providers, lenders, and program administrators and help them assess the likely outcomes and risks associated with energy efficiency lending. Anecdotally, performance of energy efficiency lending is generally understood to be strong, but data on energy efficiency loan performance has not been readily available. The data made available in this report significantly expand the public evidence base.

This report reviews loan performance data from four programs:

- The Connecticut Green Bank (CGB)'s Smart-E Loan program, which began issuing loans in 2013;

- The Keystone HELP program run through the Pennsylvania Treasury, which began issuing loans in 2006;

- The Michigan Saves loan program, which began issuing loans in 2010; and

- The New York State Energy Research and Development Agency (NYSERDA)'s loan programs, which began issuing loans in 2010.

Loan and borrower characteristics

The average loan across the four studied portfolios (52,511 energy efficiency-only loans) has the following characteristics:

- A principal amount of $9,137;

- A loan term of 121 months (just over ten years);

- An average seasoning (i.e., time since a loan was issued) of 4.5 years;

- An interest rate of 5.0%;

- A monthly payment amount of $93; and

- Is unsecured.[1]

While there is some variation across programs, in general the loans are relatively similar along these parameters.

Borrowers in these programs have relatively high credit scores, concentrated in the 660-780 range with an average of 740. The average borrower lives in a census tract with a median household income between 80% and 100% of the median income in its metropolitan statistical area. Borrower characteristics are also comparable across the four programs.

Loan performance

Our data document each pool's delinquency and loss status as of a specific date (March 2020 for NYSERDA and Smart-E, December 2019 for Michigan Saves, and September 2017 for Keystone HELP). Across the four portfolios:

- The 30-day delinquency rate – the share of outstanding loan dollars that are at least 30 days delinquent – is 1.57% (the 60-day delinquency rates is 0.62%, and the 90-day delinquency rate is 0.21%).

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[1] In some on-bill lending programs (including both Michigan Saves' and NYSERDA's on-bill programs), nonpayment could result in disconnection of the participant's power service. Although some may refer to disconnection as "security" for these loans since it could incentivize repayment, technically secured loans carry the potential loss of some form of collateral (e.g., a car or a home); this both incentivizes repayment and also helps to make the lender whole in case of a loss. Disconnection would not help make a lender whole after a loss. On-bill loans comprise only a small subset of the loans in the portfolios.

- Losses (charge offs) are highest early in loan lifetimes and decline later, a common finding for consumer loans. The pooled portfolios lost 2.1% of the principal by year 2, 3.3% by year 4, 4.5% by year 6, and 5.1% by year 8.

Regression analysis identifies features of loans and borrowers that are associated with strong loan performance:

- Borrower credit scores stand out: all else equal (e.g., same interest rate, loan age, and borrower income), increasing borrower credit score by 100 lowers the odds that a given loan is 30 days delinquent by 1.06 percentage points and the odds that a given loan is charged off by 5.81 percentage points.

- Income metrics (the income of the census tract in which the borrower lives, as well as household income available for one portfolio) are also associated with loan performance; however, this association is not nearly as strong as that with credit score, demonstrating that credit score is a better predictor of loan performance than income.

Performance compared to other financial products

The delinquency and loss rates of loans in the studied energy efficiency loan portfolios are low compared with unsecured consumer loans and are comparable to the rates for prime auto loans, which are secured by the vehicles (see Figure ES1). This strong performance may be supported by utility bill savings resulting from the financed efficiency projects or also may in part reflect differences in borrower and loan characteristics between the efficiency loans and comparators. Regardless, the data provide the most comprehensive evidence to date that lenders and capital providers can expect energy efficiency loans—at least those from well-designed and administered programs such as those studied here— to perform well.

These findings show that financial institutions can market energy efficiency improvements to their customers and lend them the money they need for those projects at low risk, while creating a more efficient building stock. The data show that households from low- and moderate-income areas participate in these programs and that high-credit borrowers in these areas repay at a strong rate, suggesting efficiency financing could support policy goals related to equitable access (e.g., Justice 40 goals and Community Reinvestment Act compliance requirements). This analysis can inform the design of credit enhancement mechanisms, such as loan loss reserves, at the federal or state level—for example, by setting loan performance expectations to help size financial outlays — that could help encourage financial institutions to increase energy efficiency lending.
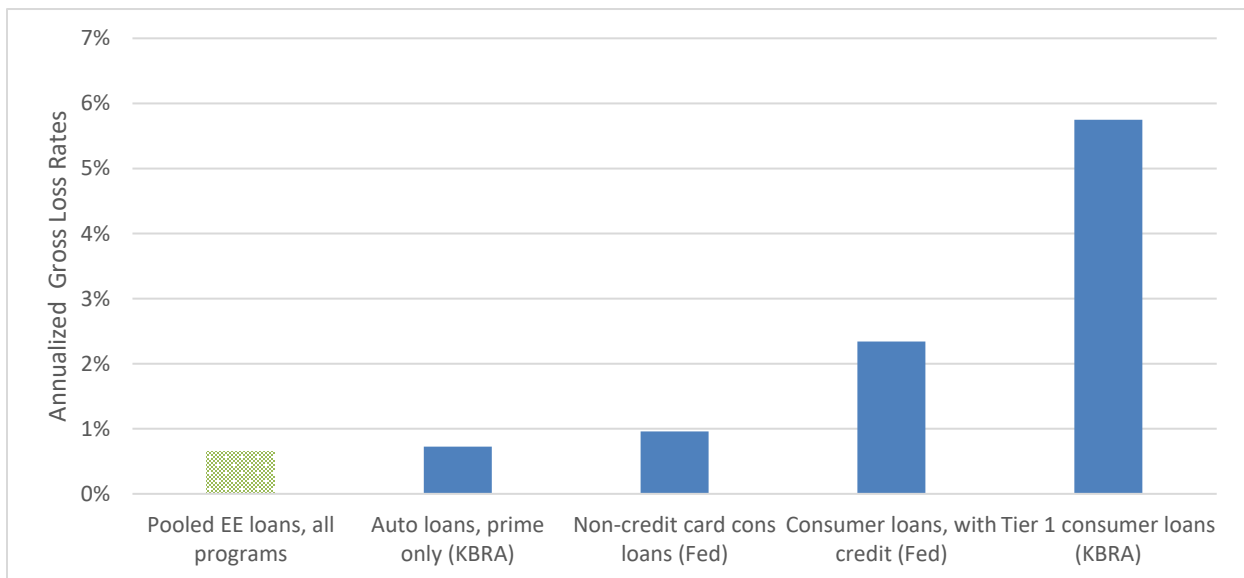

Figure ES1. Delinquency rates, energy efficiency loans, and comparators

1. Introduction

This report presents a detailed analysis of energy efficiency loan performance data from four large and long-running residential programs. Although smaller-scale energy efficiency financing programs have operated for many years, several larger programs were operating by 2010. These programs have now accrued enough historical data to be of sufficient volume and maturity for substantive analysis.

Energy efficiency stakeholders have long theorized that borrowers in energy efficiency loan programs may have low delinquency and loss rates. These loans might perform strongly because the projects being financed reduce energy consumption and save borrowers money, leaving them with additional resources to repay the loans. Another explanation may be because the types of households that participate in these programs may be low risk in ways that traditional loan underwriting may not capture. For example, these households are investing in their properties, thereby demonstrating that they value them, and are identifying and pursuing relatively small savings opportunities, thereby demonstrating their careful attention to their expenditures (Zimring et al. 2013). The analysis presented here is a first step toward testing this theory.

Capital market stakeholders are generally unfamiliar with energy efficiency loans.[2] Prior to this report, no comprehensive, loan-level analyses of the financial performance of energy efficiency loans were publicly available. If lenders and capital providers lack data regarding the true risks of these loans, they may ration credit (Palmer et al. 2012), offering less desirable terms than they would if they had better information. This report provides investors, lenders, and program administrators with data regarding the attributes of energy efficiency loans and their performance.

Section 2 reviews the four energy efficiency programs studied and presents a detailed description of the loan portfolios. Section 3 reviews the performance of these portfolios in terms of delinquency rates, charge-off rates, and prepayment. Section 4 compares their performance to that of other financing asset classes to put the report's findings in context. Section 5 concludes.

2. Studied energy efficiency loan portfolios

Berkeley Lab obtained loan-level data for four residential energy efficiency financing portfolios: Keystone HELP, Michigan Saves, the New York State Energy Research and Development Authority's (NYSERDA) On-bill Recovery Loan and Smart Energy Loan programs, and the Connecticut Green Bank's Smart-E Loan program.

All of these programs except for Keystone HELP make loans for both energy efficiency and solar projects. Because this report addresses loans for energy efficiency, loans that included solar PV were excluded. Furthermore, loans made for the two technologies may not perform comparably. Berkeley Lab will address the performance of solar loans in these portfolios in future work.

In total, the data include 52,511 loans. Due to occasional missing data, some data elements presented in this report have fewer observations.

For three of the portfolios, Berkeley Lab was able to obtain data from program inception through the end of 2019 or beginning of 2020 (see Table 1 for specific dates for each portfolio). Notably, all data sets end before the financial impacts of the Covid-19 pandemic began.

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[2] This differentiates energy efficiency loans from solar loans, which are more established in securities markets.

Table 1. Description of the loan portfolios studied

Program	State	Years of data	Total non-PV loans
Keystone HELP	PA	February 2006—September 2017	14,753
Michigan Saves	MI	October 2010—December 2019	16,042
NYSERDA	NY	December 2010—March 2020	18,556
Smart-E	CT	May 2013—March 2020	3,160

Figure 1 shows the different program volumes by vintage, i.e., the year in which each loan was made.
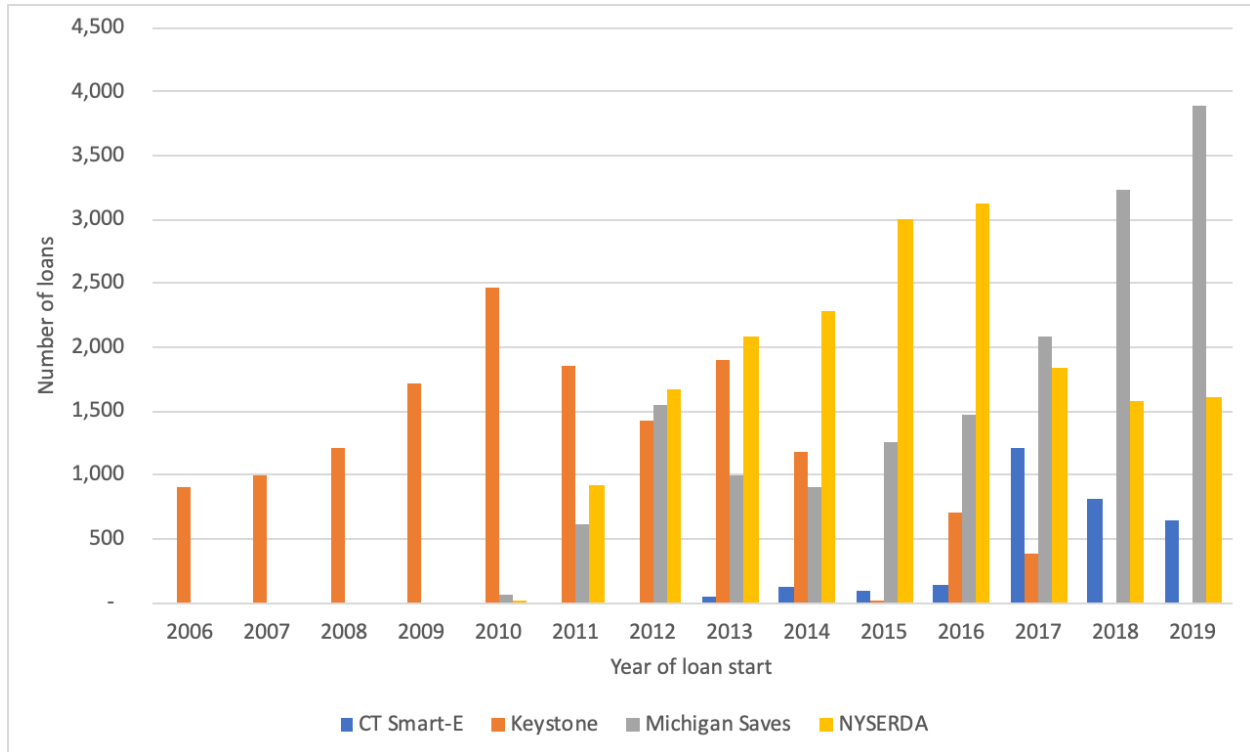

Figure 1. Loan volumes by program and vintage

For Keystone HELP, data were only available on loan status as of September 2017. Since this program began in 2006, this still represents 11 years of program loans. Keystone HELP is also the one program analyzed with significant activity prior to the 2008 recession, and thus has navigated an economic cycle. The other programs began after the recession. The Michigan Saves and Smart-E programs made the bulk of their loans in the last three years of the analysis period.

2.1. Program overviews

The loan portfolios included in the analysis come from four energy efficiency loan programs: the Connecticut Green Bank's Smart-E Loan program, Pennsylvania's Keystone HELP program, Michigan Saves' programs, and the Green Jobs, Green New York programs (comprised of the On-bill Recovery Loan and Smart Energy Loan) of the New York State Energy & Research Development Authority (NYSERDA). See Table 2.

Table 2. Program portfolios included in this analysis

Program	Smart-E	Keystone HELP	Michigan Saves	Green Jobs Green New York
Program administrator (PA)	Connecticut Green Bank (CGB) and Inclusive Prosperity Capital (IPC)	AFC First[a]	Michigan Saves	NYSERDA
Description of PA	Quasi-governmental green bank increasing flow of private capital to markets that energize the green economy	Private energy efficiency financing company	Nonprofit green bank funding clean energy	State authority advancing clean energy innovation and investments
Lender (entity extending program loans)	13 local financial institutions[b]	AFC First[a]	7 local financial institutions[b]	NYSERDA
Underwriting criteria	CGB/IPC ask lenders to use their standard practice: FICO (min. 640 or 580), Debt-to-income (DTI) (max. 50% or 45%), no bankruptcy in last 4 to 7 years, income verification[c]	Min. credit 640 Max. DTI 50% (42% for loans >$25K), no bankruptcy for 5 years	Min. credit 600 Max. DTI 50%, no bankruptcy for 12 months; for on-bill, 12 months on-time utility bill payment	Min. credit score 540 Max. DTI depends on credit score, no bankruptcy for 2 years, 12 months on time mortgage payments
Loan underwriter	13 local financial institutions[b]	AFC First[a]	7 local financial institutions[b]	Slipstream
Structure (on- vs off-bill, secured[d] or unsecured)	Unsecured, off-bill loans	Unsecured, off-bill loans	Unsecured, on- and off-bill loans	Unsecured, on- and off-bill loans
Credit enhancements (CE) to lenders (does not include CEs for secondary market loan sales)	Loan loss reserve (second loss, at the portfolio level)	Loss reserves were provided through various Pennsylvania state agencies and grants	Loan loss reserve, and utility capital from one publicly-owned utility	None
Source of capital	Local financial institutions	Pennsylvania Treasury, AFC First, securitization proceeds, local bank loan pool	Local financial institutions, municipal utility capital (for Holland on-bill program)	Regional Greenhouse Gas Initiative funds[e], securitization proceeds
Federal funds used	American Recovery and Reinvestment Act (ARRA) funds for loan loss reserve and interest rate buydowns at different points in the program	ARRA funds provided loss reserves and rate buydown funds for some of the program years	ARRA funds provided the loan loss reserve	None

[a] The program administration changed in 2015 upon AFC First's acquisition by Renew Financial. AFC First was also lender and underwriter for the program. The National Energy Improvement Fund (NEIF), a successor run by AFC First's management, is now providing administration services for a portion of the portfolio.

[b] For residential program participants.

[c] Participating lenders can use standard or credit-challenged term sheets; underwriting thresholds depend on which is used.

[d] In some on-bill lending programs (including both Michigan Saves' and NYSERDA's on-bill programs), nonpayment could result in disconnection of the participant's power service. Although some may refer to disconnection as "security" for these loans since it could incentivize repayment, technically secured loans carry the potential loss of some form of collateral (e.g., a car or a home); this both incentivizes repayment and also helps to make the lender whole in case of a loss. Disconnection would not help make a lender whole after a loss.

[e] See: https://www.rggi.org.

2.2. Descriptive statistics

This section describes several characteristics of the studied efficiency loan program portfolios: four properties of the loans themselves (loan tenors, principal amounts, monthly payment amounts, and interest rates) and two characteristics of the participants (incomes and credit scores). Each of the characteristics could impact loan repayment performance; Section 3 explores their relationships with loan performance.

2.2.1. Loan characteristics

Figure 2 summarizes the principal amounts of loans issued by each program. The amounts participants are borrowing through these portfolios is concentrated in the $5,000 to $10,000 range (see averages and medians in Table 3).
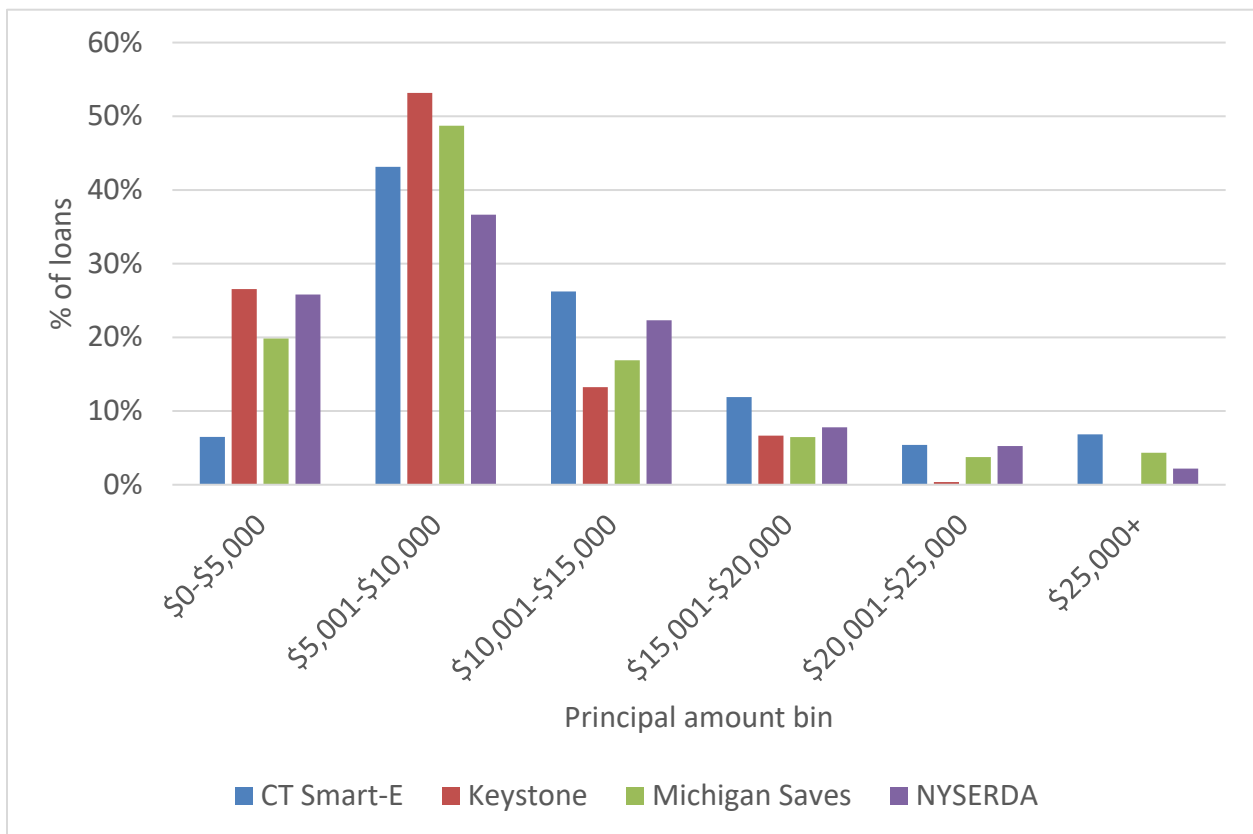

Figure 2: Participation by principal amount bin

Table 3. Average and median principal amounts, monthly payments, terms, and interest rates

	Smart-E	Keystone	Michigan Saves	NYSERDA	All programs
Average principal amount	$12,239	$7,594	$9,679	$9,366	$9,137
Median principal amount	$10,094	$7,000	$7,801	$7,971	$7,661
Average monthly payment	$160	$90	$101	$76	$93
Median monthly payment	$139	$80	$85	$65	$80
Average term (months)	92	93	100	166	121
Median term (months)	84	120	120	180	120
Average interest rate	3.5%	6.7%	5.1%	3.8%	5.0%
Median interest rate	4.5%	7.0%	5.0%	3.5%	5.0%

Maintaining loan program data to facilitate performance analysis

To expand the public evidence base on the performance of energy efficiency loans, Berkeley Lab approached a number of energy efficiency loan programs for this analysis. The four programs that shared data were very cooperative, and several other programs were willing but ultimately unable to share.[3]

A common issue that makes data access challenging is that all the necessary loan data are often not maintained by a single entity. It is common for different entities to perform different functions – e.g., project approval, loan origination/underwriting, loan servicing. In some cases, the data on each function reside in different systems. While there is generally some common identifier (such as a loan ID) that could be used to associate the data, the level of effort to do so can be significant. By proactively integrating these systems where possible to maintain consolidated data for analysis, program administrators can help educate and motivate capital providers and lower the cost of capital for these programs in the future.

Moreover, some programs – including Michigan Saves, Smart-E, and many others – partner with local lenders (most often credit unions and banks) that make their own loans and maintain their own data. Michigan Saves and the Connecticut Green Bank demonstrate that some programs gather and consolidate data from multiple lenders to enable analysis. Where possible, other programs that use many local lenders can help facilitate additional analysis by gathering their loan data in one central system.

Finally, most if not all programs do not maintain their data in a manner that easily enables time series analysis. This report studies delinquency and charge-off rates at one moment in time for each program. Programs that can assemble and maintain a monthly time series of loan status could support more detailed and powerful statistical analysis.

Berkeley Lab's report *Energy Efficiency Finance Programs: Use-case Analysis to Define Data Needs and Guidelines* provides recommendations on maintaining data to facilitate loan performance analysis; see SEE Action Network (2014a).

Monthly payments demonstrate the ongoing cash flow burden that a loan presents for participants. Figure 3 presents monthly loan payments for each program. Across the portfolios included in the study, monthly payments mostly fall into the $51 to $100 per month range. The distribution of monthly payment sizes between Michigan Saves and Keystone varies little. Compared to the other portfolios, the NYSERDA portfolio has a higher share of

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[3] The four programs analyzed are among the largest and oldest in the U.S. There are dozens of other energy efficiency financing programs in the U.S., but few programs offer the high-volume, long-term data (and were willing to share their data), that the four programs provided.

loans with monthly payments under $50 per month (37%). The CT Smart-E portfolio has a higher share of loans with monthly payments above $150 per month (44%). Smart-E principal amounts and area median incomes are also higher than other programs, suggesting that (1) Connecticut is likely the highest-cost market and (2) Connecticut borrowers may qualify for larger loans due to their incomes.
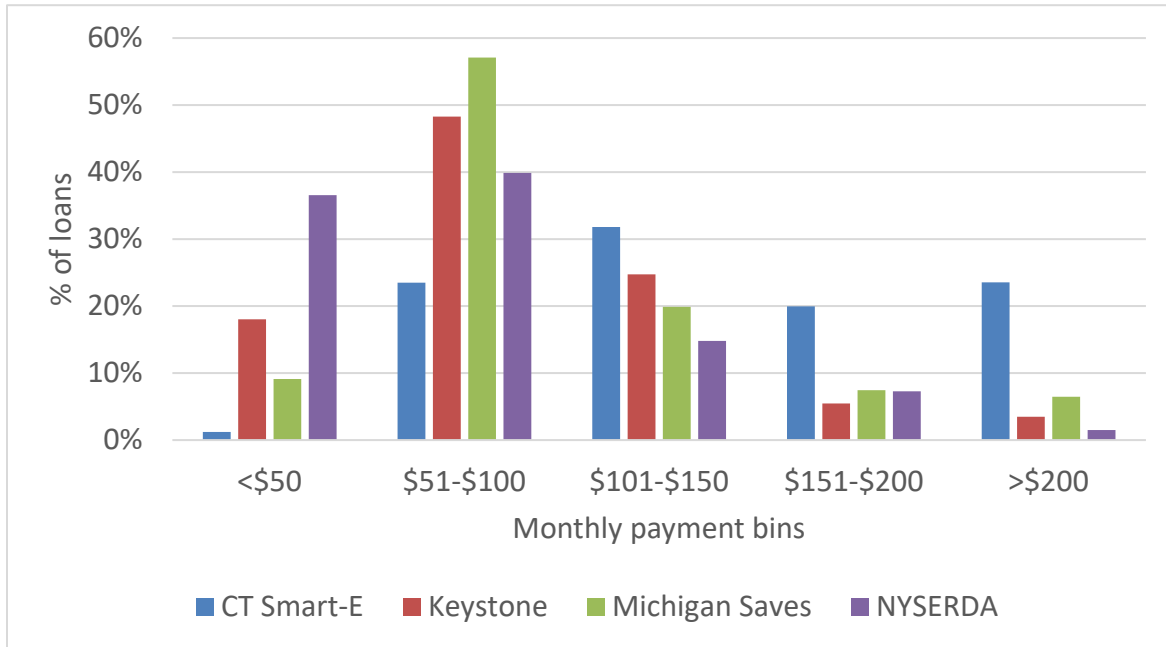

Figure 3. Participation by monthly payment amount

Loan term (or tenor) refers to the amount of time until a loan matures. Longer term loans are riskier for lenders but result in lower monthly payments for borrowers because the repayment is spread over a longer period. Programs generally offer a limited number of terms (e.g., five years, seven years) and the terms offered may change over time. Program administrators provided terms for each loan. Loan terms for Keystone, Michigan Saves, and CT Smart-E are almost entirely ten years (120 months) or less, with terms for over half of loans in each of those portfolios falling between 61 and 120 months. NYSERDA is the outlier: 84% of their loan terms are 15 years (180 months), which explains the relatively small monthly payments for NYSERDA loans in Figure 3. The median loan term across all four portfolios is ten years (120 months) (see Table 3).
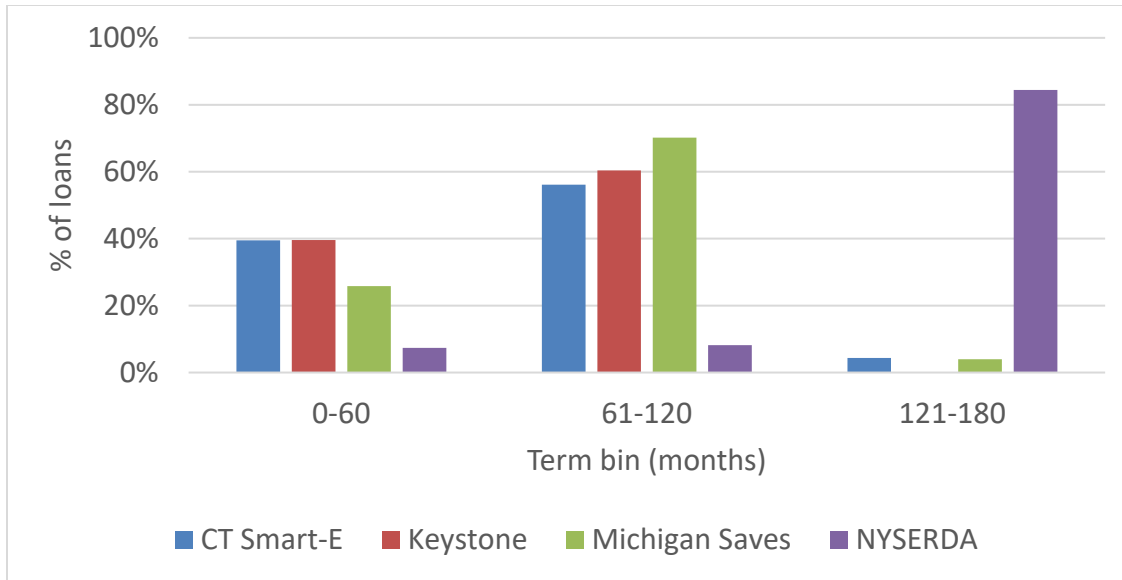
Figure 4. Share of portfolio participants with different loan terms

Another factor that impacts payment amounts is the interest rate charged on a loan. Interest rates vary within and across the four programs. Rates ranged from a low of 0% to a high of 8.99%. Most fall between 4% and 6% with most NYSERDA loans at 3.49% or 3.99% (see Figure 5). Several factors explain the differences in interest rates across programs:

- Credit enhancements: Programs that benefit from more generous credit enhancements (such as larger loan loss reserves) can charge lower interest rates.

- Lender requirements: Different lenders require different returns to participate in these programs. "Pure" private capital providers generally require higher returns than mission-driven lenders, and programs that lend public or utility customer dollars have more freedom to set their own rates.

- Timing: Prevailing market interest rates have been low since the Great Recession, but were at times much higher in the past; this in part explains the higher interest rates charged by Keystone HELP.

- Promotional rates: The Smart-E program offered very low interest rates for a period of time to attract interest in the program, which explains the large share of Smart-E loans in the first bin.
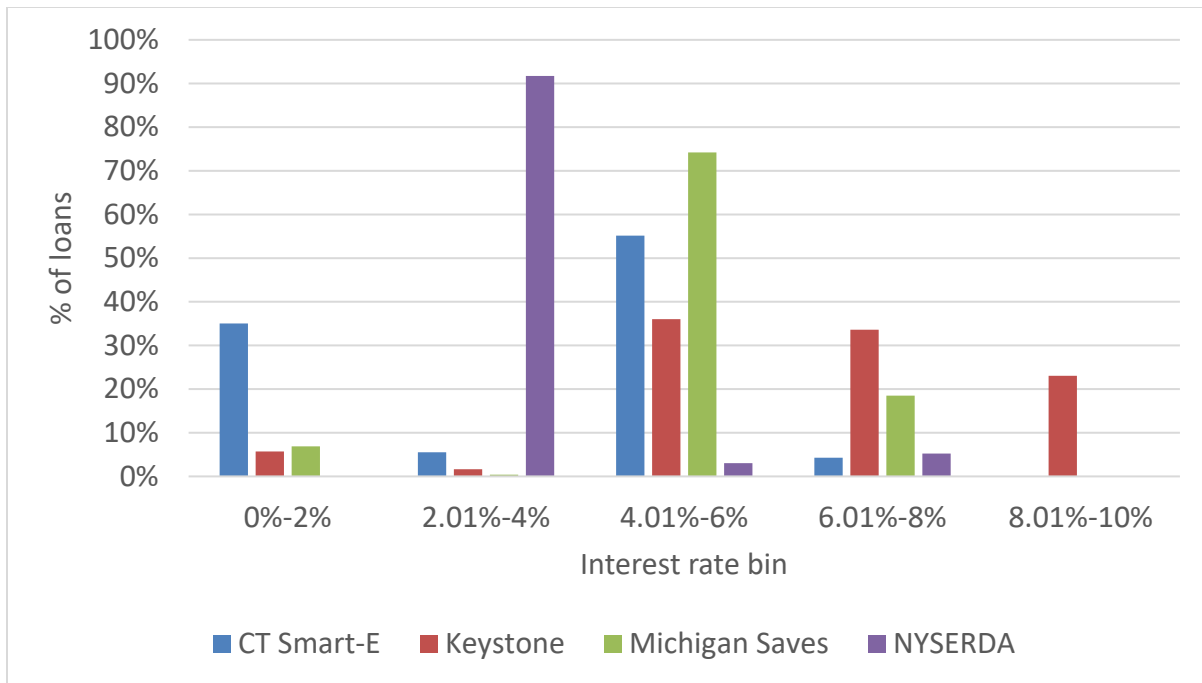
Figure 5. Participation by interest rate

2.2.2. Borrower characteristics

Participant income could impact repayment performance since households with more income have more financial resources available to make loan payments. Each program collected participant income data differently. Keystone HELP did not have participant income data (and this portfolio is therefore not included in any analyses that use income data). NYSERDA reported a debt-to-income-ratio, but not a household-level income metric. The Connecticut Smart-E Loan program reported a ratio of the median income of a household's census tract to the area median income (AMI). Only Michigan Saves reported actual household income. However, every program except Keystone HELP reported the census tract in which each borrower lives. Berkeley Lab therefore was able to calculate a common metric – the ratio of median census tract income to AMI – for all programs except Keystone HELP (see Table 4).[4] Note that this metric describes the income of the census tract in which the home resides but is not a household-level value.

Overall, about two-thirds of participants in these programs are from census tracts where incomes are 80% of the AMI or higher. The greatest share of participants falls into the 80%-100% AMI bin (see Figure 6). The three portfolios have a similar distribution across the AMI bins. Overall, across programs the majority of borrowers are from census tracts with median incomes less than the median income of their statistical area.[5] Relatively few

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[4] To assess the impact of income across programs in a consistent fashion, Berkeley Lab calculates census tract AMI bands for each program. This metric is the ratio of census tract-level median household income estimates from the American Community Survey (ACS) to area median income as defined by the Department of Housing and Urban Development (HUD). This method is consistent with Smart-E's in the use of census-tract level median household incomes, but differs in the source of the area median income. Smart-E used ACS Metropolitan and Micropolitan Statistical Areas, which provided full geographic coverage for Connecticut. New York and Michigan, however, have tracts that are outside these two types of statistical areas. The HUD area median incomes address this gap and provide county-level incomes alongside statistical area data incomes. This analysis matches HUD and ACS vintages to the year of loan issuance to account for changes in tract and area incomes over time.

ACS income data can be found at https://www.census.gov/programs-surveys/acs/data.html. HUD income data can be found at https://www.huduser.gov/portal/datasets/il.html. In this analysis, HUD and ACS incomes are aligned by data release year. HUD data draw on three-year old ACS estimates for each data release (e.g., 2018 HUD data is based on 2015 ACS data). Given that the ACS incomes cover five years (e.g., 2014-2018 for the 2018 release), they still overlap with the window of HUD incomes.

[5] To see participant incomes by AMI broken into income bins used for the purposes of the Community Reinvestment Act, see Appendix B.

borrowers (10-15%) in each program live in census tracts with median incomes below 60% of area median; between 30 and 40% of borrowers in each program live in census tracts with median incomes below 80% of area median.[6]

Table 4. Average and median borrower characteristics. (Keystone HELP did not have sufficient data to determine income metrics.)

	Smart-E	Keystone	Michigan Saves	NYSERDA	All programs
Median tract income	$89,858		$63,425	$68,593	$67,152
Median AMI	$95,260		$72,842	$75,736	$74,507
Median tract income / median AMI	92.6%		88.8%	85.3%	87.5%
Average tract income	$93,210		$67,478	$77,529	$74,134
Average AMI	$98,042		$72,637	$87,404	$81,262
Average tract income / average AMI	95.2%		93.0%	87.3%	90.8%
Average FICO	739	751	741	729	734
Median FICO	741	754	744	740	745

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[6] Definitions of low-income households and areas vary, so there is no single way to characterize the share of borrowers in these programs that are low- and moderate-income (LMI). In the energy sphere, the Low-Income Home Energy Assistance Program uses a household-level eligibility criterion of 60% of state median income, and the Weatherization Assistance Program also relies on this criterion in some states. 10-15% of households in the data meet this definition per area (as opposed to state) median income. HUD considers households with incomes less than 80% AMI to be low income and those less than 50% to be very low income for rental housing assistance programs and the HOME program (see https://www.hud.gov/topics/rental_assistance/phprog and https://www.huduser.gov/portal/datasets/home-datasets/files/2021-HOME-IncomeLmts-Memo.pdf). The Community Redevelopment Act (CRA) designates less than 80% AMI as moderate income and less than 50% as low income. Per Appendix B, 5-8% of borrowers in each program live in census tracts considered low income by the CRA or very low income by HUD, while about 30-40% would be considered either low- or moderate-income by CRA and low income by HUD.
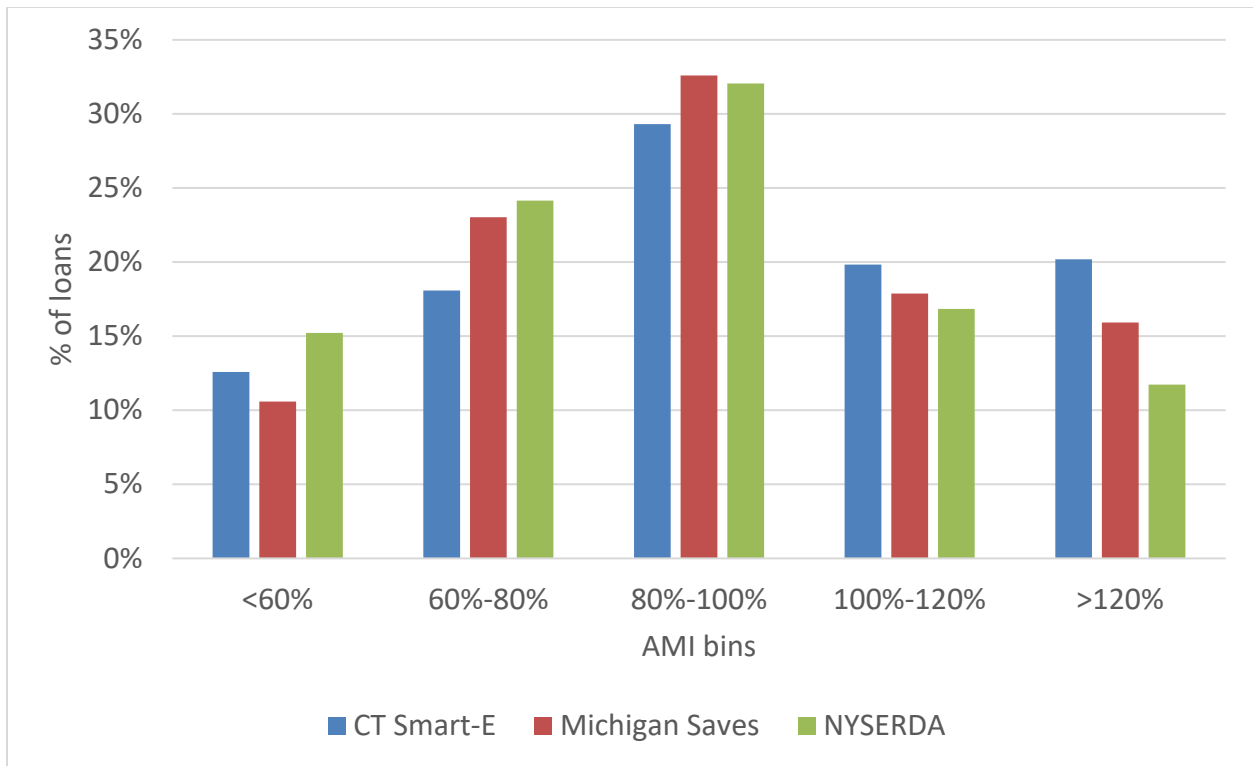
Figure 6. Participant incomes (by AMI bin) for three portfolios

A credit score is a number designed to measure a consumer's creditworthiness, i.e., it is used to predict the likelihood that a borrower will fully repay their loan. The most commonly used credit score is the Fair Isaac Corporation (or FICO) score which ranges from 300 to 850, higher numbers suggesting the borrower is more creditworthy (see Figure 7 for more).[7] Across the four portfolios, most credit scores are high: the average credit score is 734 with a median credit score of 745. Importantly, these programs are only available to homeowners, who as a customer segment have higher credit scores than renters (Li 2016). These scores suggest that the likelihood that borrowers participating in these programs repay their loans in full is high.

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[7] Although Berkeley Lab believes that most of the reported scores are FICO scores, Michigan Saves identified one lender that reported Vantage Scores instead. It is possible that other lenders did so as well.
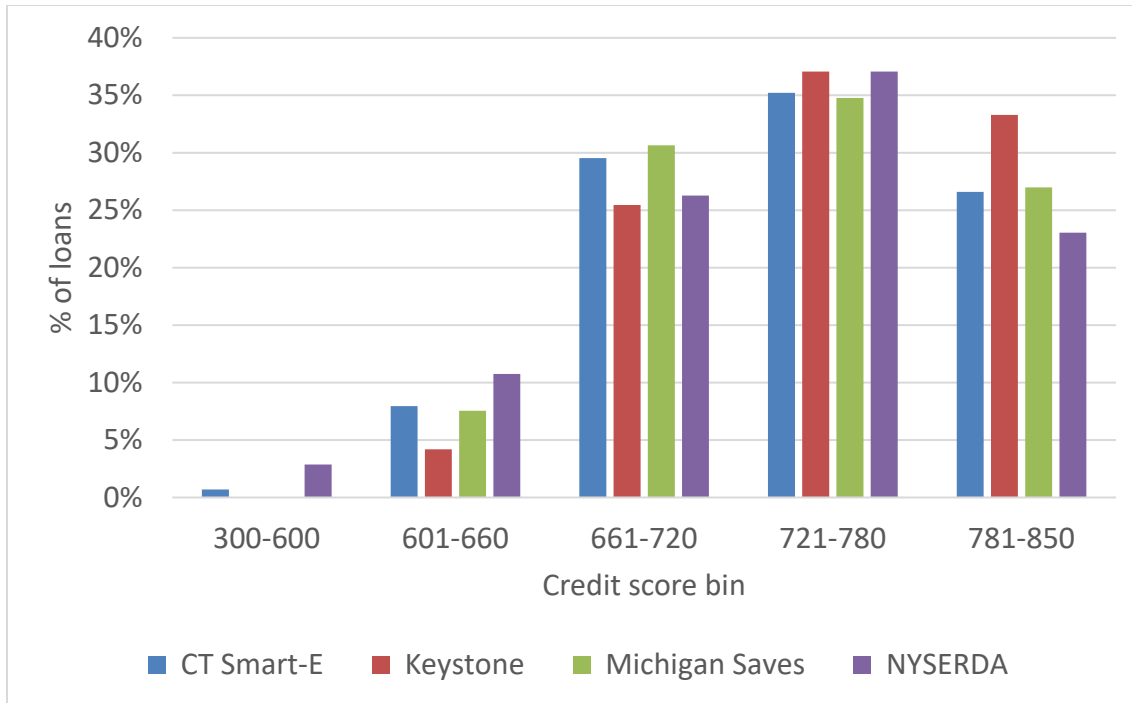
Figure 7. Participation in four efficiency financing programs by credit score bin

3. Performance analysis

3.1. Methodology

To analyze the data from all portfolios, each loan is assigned a status as either paid-off, delinquent, charged off, or current.

The definition of **charge-offs** can vary across loan providers, depending on how they decide when to declare a loan as a loss.[8] Such determinations may be made if the loan becomes seriously delinquent, but also for other reasons (e.g., bankruptcy, death of a borrower, etc.). Many lenders automatically declare a loan as charged off if it reaches a certain delinquency status, often 120 days. This study considers a loan charged off if either (a) the program identified a loan as charged off or (b) the loan was 120 days or more delinquent. This definition of charge-off is consistent with those used by comparator products later in this study (auto loans and consumer loans – see Section 4), to the extent that they specify clear definitions.

Loan providers generally report **delinquencies** in bins that denote the number of days that have passed without payment since a payment due date (e.g., 30, 60, 90, 120 days). Since the definition of charge-off covers loans 120 days or more delinquent, delinquent loans are those that have not been paid 30-120 days after the payment due date.

Customers may pay their loans off at or before the original maturity date. A loan is **paid-in-full** if a program identifies it as such or the remaining balance is zero.

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[8] When a lender declares a loan to be charged off, it declares the loan as a loss on its accounts and often transfers collection responsibilities to a collection agency. If the collection agency reports to credit bureaus, the loan will now appear as a charge-off on a borrower's credit report. The borrower is still obliged to repay the loan.

A loan is **current** if it is neither charged off, delinquent, nor paid-in full. Current loans are actively in repayment but not in any form of distress.

Delinquency rates presented in this report are the share of active (not charged off and not paid off) loans that are 30-120 days behind on payments. The **delinquency rate** can be expressed both in terms of the total remaining balance of loans that are delinquent and the number of delinquent loans.

$$Delinquency\ rate_{dollars} = \frac{\sum Remaining\ balance_{loans\ delinquent\ 30-120\ days}}{\sum Remaining\ balance\ _{loans\ not\ charged\ or\ paid\ off}}$$

$$Delinquency\ rate_{count} = \frac{Count\ of\ loans_{loans\ delinquent\ 30-120\ days}}{Count\ of\ loans_{loans\ not\ charged\ or\ paid\ off}}$$

For example, if a loan portfolio has $1,000,000 in outstanding principal balance from 1,000 active loans and 60 of those loans with a total of $50,000 in outstanding principal balance are 30-120 days delinquent, then the portfolio would have a dollar-based delinquency rate of 5% ($50,000/$1,000,000) and count-based delinquency rate of 6% (60/1,000).

The **cumulative gross loss rate**[9] is the total dollars charged off after some number of years for loans originated at least that long ago (but not past their term) as a share of the original balance of those loans. The cumulative gross loss rate can be calculated for each year of seasoning (i.e., how much time has passed since the program issued the loan). Loans that have seasoned for five years, then, are part of the loss rate for years one through five but not for years after five.

$$Cumulative\ gross\ loss\ rate = \frac{\sum Dollars\ charged\ off\ _{loans\ originated\ at\ least\ X\ years\ ago}}{\sum Principal\ Amount\ _{loans\ originated\ \ at\ least\ X\ years\ ago}}$$

In the hypothetical portfolio with $1,000,000 in outstanding principal balance from 1,000 loans, assume that the original loan pool was 1,050 loans (i.e. 50 have already charged off). If the original principal balance of those 1,050 loans was $2,000,000 and the 50 which were charged off totaled $40,000, then the cumulative gross loss rate would be 2% ($40,000/$2,000,000).

Regression analyses determine the drivers of delinquency and charge-off and unpack differences in performance across the portfolios (see Section 3.2.3 for details).

3.2. Findings

3.2.1. Delinquency and loss analysis

Figure 8 presents 30-120-day delinquency rates for each program. The sample sizes in this figure differ from those in Figure 10 because the delinquency rate calculation only considers current loans and excludes any paid-off or charged-off loans. Overall, the 30-120-day delinquency rate for loans in the four portfolios is 1.57%.

NYSERDA delinquency rates for the On-Bill Recovery Loan – an on-bill loan – are much higher than those for its Smart Energy Loan product, explaining its high overall delinquency rate. Due to the structure of the program, any delinquency on a utility bill also results in a delinquency on the on-bill loan. When NYSERDA on-bill loans – which are somewhat atypical – are removed from the pool, the 30-day delinquency rate drops to 1.14% Notably, NYSERDA on-bill *loss* rates are not higher than those of the off-bill Smart Energy Loan, indicating that most of these delinquencies do eventually cure. Section 3.2.3.3 discusses this issue further. As also noted in Section 3.2.3.3, the difference in delinquency rate between Smart-E loans and the lower-delinquency programs is not statistically significant (Smart-E has the smallest loan count of the programs in this study).

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[9] As discussed in Section 4, most loan performance indices look at net losses, e.g., losses minus recoveries (any monies recovered after a loan is charged off). Because no recovery data was available for these portfolios, this analysis reports gross losses instead of net losses.
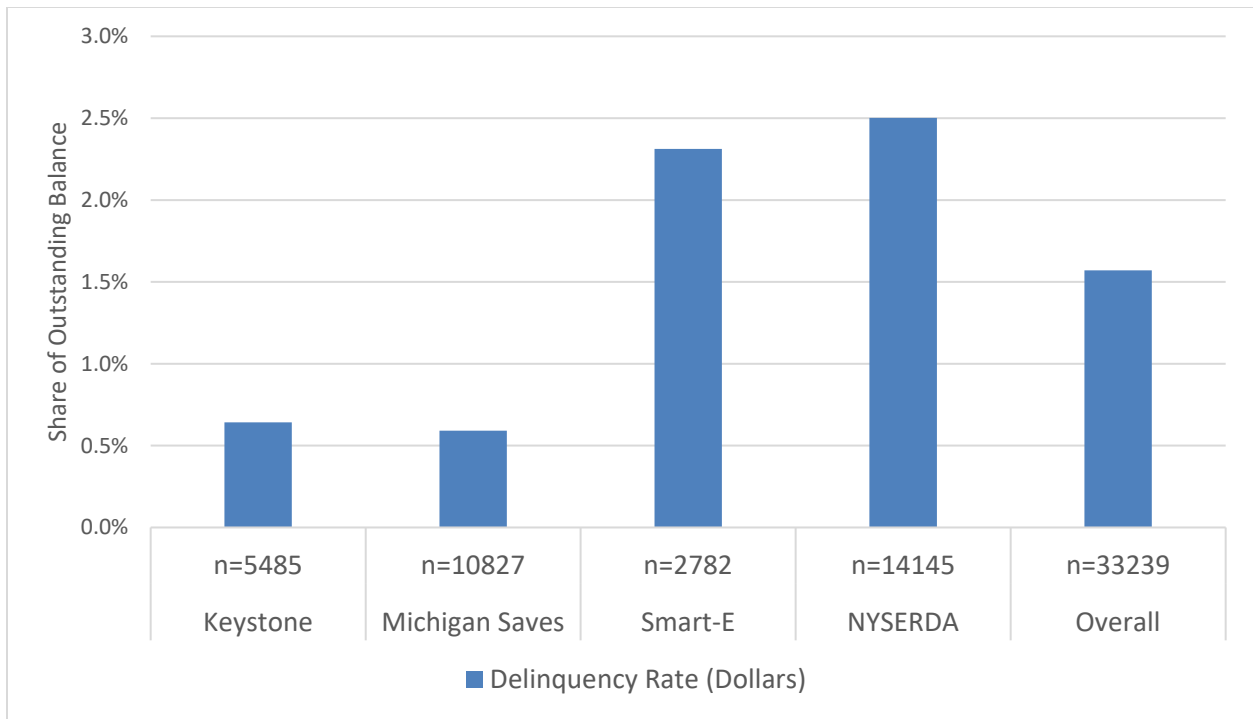
Figure 8. 30-120-day delinquency rates by program

To understand how losses depend on loan seasoning, Figure 9 presents cumulative gross loss rate over time for each program with respect to years of loan seasoning. Each data point in this figure shows the cumulative gross loss rate since initial loan closing. Since the loss rates are cumulative, they increase over time for all four portfolios. The loss rates are sensitive to both vintage effects and small loan pools. The number of loans that have seasoned eight years, for example, is much smaller than the number that has seasoned two. This figure addresses this issue by excluding loan vintages with total principal amounts under $5M, which is why some curves do not extend as far as others. Vintage effects, such as higher loss rates for loans issued before the 2008 financial crisis could affect Keystone loans in particular.
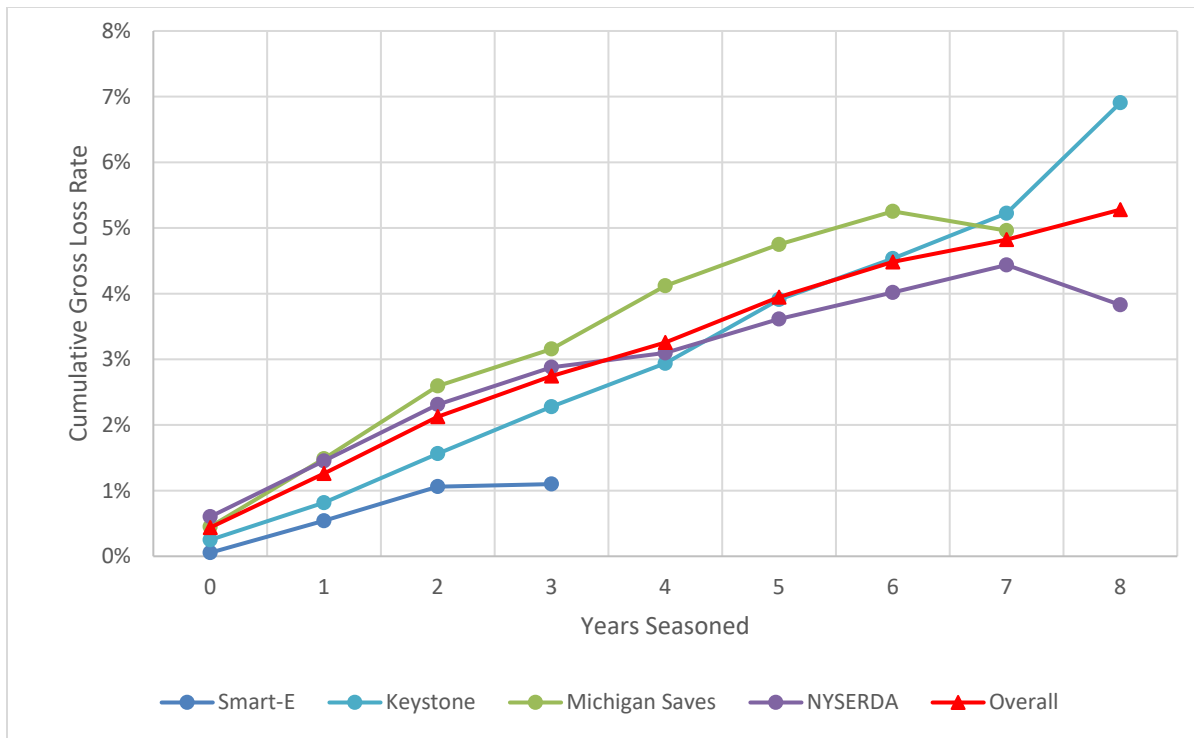
Figure 9. Cumulative gross loss rates by program and years of seasoning

Close examination of Figure 9 shows that more losses occur in the early years after loan issuance than in later years. For example, looking at the overall cumulative loss curve, losses in year 8 are 5.3%. If the loss rate was constant over time, losses in years 2, 4, and 6 would be 1.3%, 2.6%, and 4.0% respectively. In fact, those loss rates are 2.1%, 3.3%, and 4.5%, showing that the loss curve is somewhat concave (bowed downward). This behavior is visually apparent for all the individual portfolios except Keystone, which again may be affected by vintaging (i.e., a loan's issue year) effects of the financial crisis – meaning that loans with a good deal of seasoning (which are the ones that date to before the crisis) have higher loss rates than if the financial crisis had not occurred. Since a large share of the more seasoned loans in the pooled portfolios are Keystone loans (consistent with Figure 9), this may also affect the latter years in the overall curve.

Figures 10 and 11 show the relationship between loan performance and credit score across the pooled portfolios. Figure 10 shows how delinquency rates decline as credit score increases; Figure 11 demonstrates how cumulative gross loss rates increase as credit score declines. Loans to customers in the highest credit score bin have one-third of the delinquencies of the combined portfolios as a whole. Figure 11 shows a similar relationship between cumulative gross losses and credit score: the higher the credit score, the lower the losses. Differences are apparent in the first year of seasoning and grow as the loans mature. After three years of seasoning, loans issued to customers with the lowest credit scores (300-600) have cumulative gross loss rates more than 21 percentage points higher than customers with the highest credit scores (781-850). For loans issued to customers in the two highest credit score bins, cumulative gross losses are less than 5% after eight years.
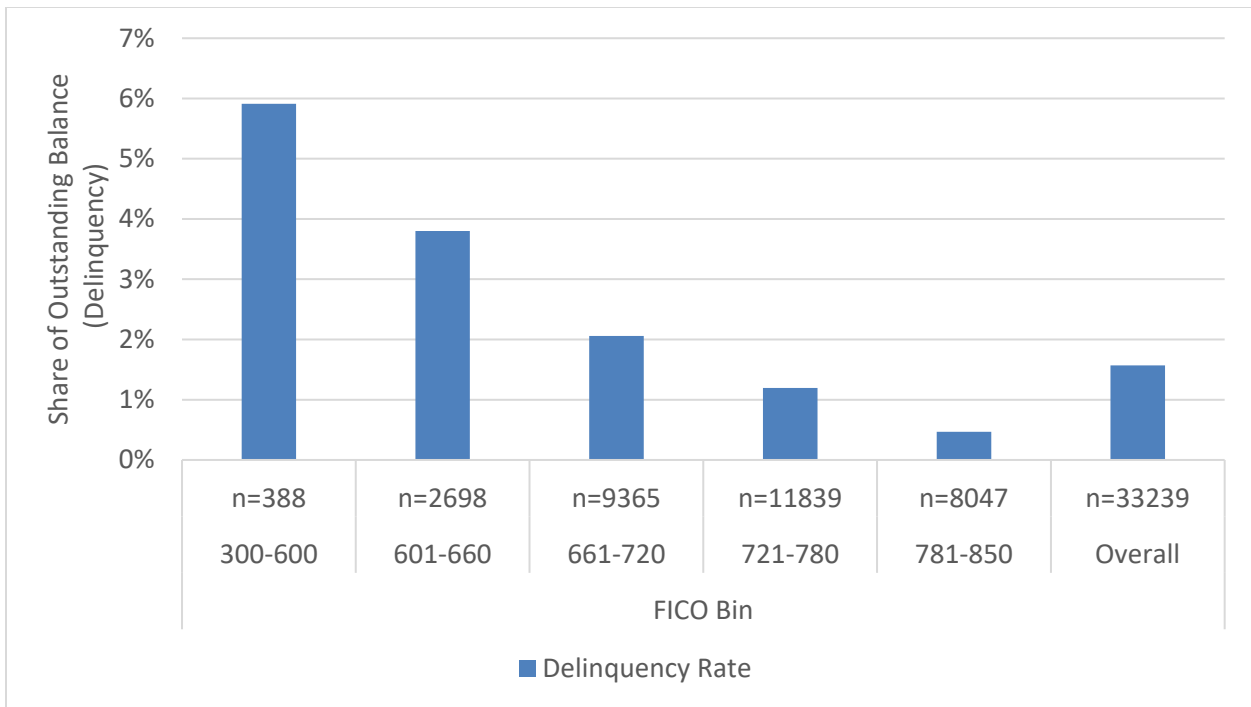
Figure 10. Delinquency (share of outstanding loans) by credit score bin
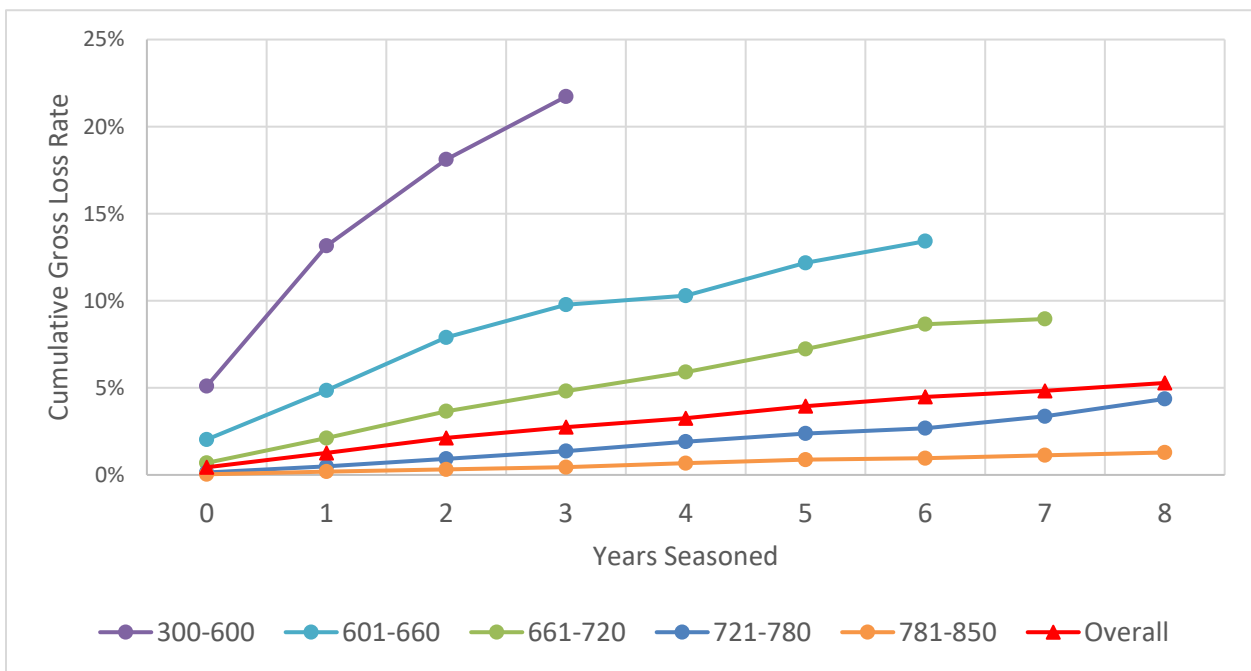
Figure 11. Cumulative gross loss by credit score bin

Loan performance does not show the same degree of sensitivity to census tract income, as shown by AMI bands in Figures 12 and 13. Delinquency and loss rates decline as income increases, but not to as great an extent as they do with credit score increases. For example, delinquency rates in the lowest credit score bin (300-600, Figure 10) are about 12 times higher than the delinquency rates in the highest credit score bin (781-850), but delinquency rates in the lowest AMI band (0-60%, Figure 12) are only 1.9 times as high as in the highest AMI band (>120%). As shown

in Figure 13, cumulative gross loss rates are highest in the lowest AMI band (0-60%) but are only higher than the loss rate in the highest AMI band by five percentage points after five years.[10]

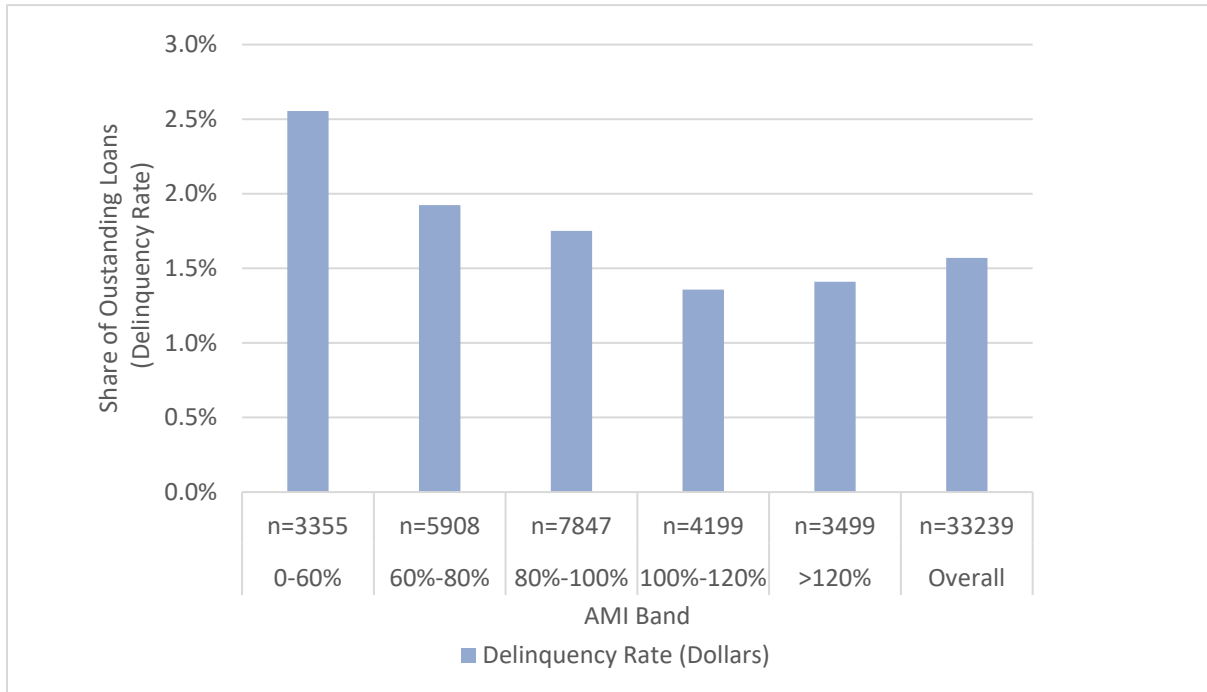**Figure 12. Delinquency (share of outstanding loans) by program and AMI band**

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[10] The cumulative gross losses by income band do not include loans from Keystone due to the lack of census tract data in that dataset. Since Keystone has some of the oldest loans in the dataset, its absence in this figure contributes to the loss rates not extending to year eight as they do for most credit score bins in Figure 11.
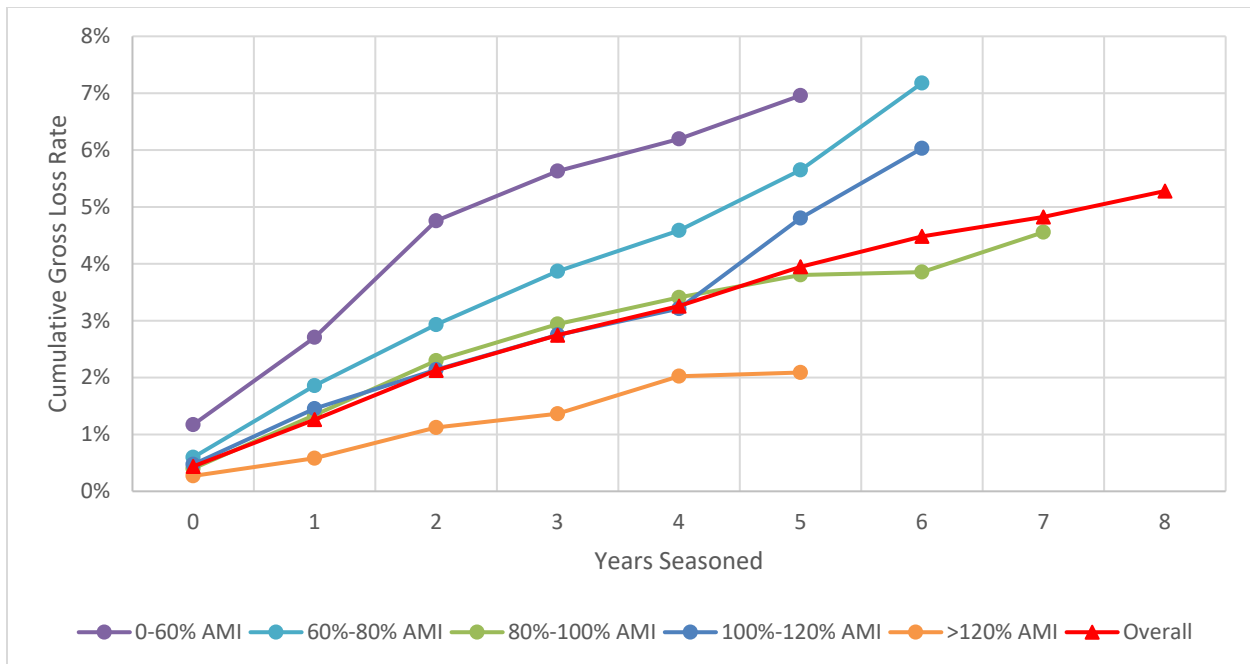
Figure 13. **Cumulative gross loss rates by AMI band**

The relationship between income and credit, and implications for programmatic lending

It is commonly believed that high-income households also have high credit scores. In fact, there is generally a small positive correlation between income and credit score, but this correlation is lower than might be expected. In the pooled data, the correlation[11] between the median household income of the census tract where borrowers live and their credit scores is only 0.11 – meaning that census tract median income explains only about 11% of the variation in credit scores and vice versa. Moreover, this low correlation does not appear to be due to use of a census tract-based income. In Michigan, the correlation between census tract median income and credit score is similar at 0.10; the correlation between household income and credit score is considerably *lower*, at 0.015.

These findings do not suggest that income *per se* is not important to understanding loan performance. All the programs in this analysis generally include a debt-to-income threshold in their loan underwriting. (The partial exception is NYSERDA, which allows higher than traditional DTI ratios with satisfactory mortgage payment history under its "Tier 2" underwriting option, and in January 1, 2019 eliminated maximum DTI ratios for applicants with FICO scores greater than 780). Rather, the findings suggest that, *for households that pass the debt-to-income screens implemented by the programs* (see Table 2), income matters relatively little – and less than credit – for understanding delinquencies and losses. These DTI ratios may screen out many low-income households; this analysis does not explore whether alternative DTI thresholds could be set.

This report finds that credit score predicts delinquencies and charge-offs far better than income. Figures 10 through 13 demonstrate this finding in the raw data, and the regression analysis in Section 3.2.3 confirms that the association between performance and credit is much stronger than that between performance and income. These findings suggest that lenders can expect strong payment performance from households in lower-income areas that (1) have strong credit and (2) meet debt-to-income screens similar to those in these programs. Many households in the data fit this description. Of participating households in census tracts below 100% AMI, 48% had credit scores above 740 – similar to the share of participating households in census tracts above 100% AMI with credit scores above 740 (56%).

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[11] "Correlation" refers to Pearson's correlation coefficient.

3.2.2. Prepayment

This section briefly discusses prepayment rates in the studied portfolios. Prepayment occurs when a borrower pays the loan in full prior to the scheduled loan maturity.[12] All values in this section exclude Smart-E loans, since Smart-E program data did not include the date loans were prepaid.

Most loans in the studied portfolios are still active. Among loans that have come to term (loans whose scheduled maturity was prior to the end date of each portfolio's dataset), borrowers reach about 70% of the loan term on average before paying in full. This average combines loans prepaid at various points in the term with loans carried to the full term. It should be noted that the average term of these loans is 56 months; most of these loans are Keystone loans with five-year terms. These loans are not representative of the larger pool of loans since very few longer-term loans or loans from other programs have come to term.

The cumulative prepayment rate is the share of the original loan balance that has been prepaid after a period of time. For example, the cumulative prepayment rate for loans that have seasoned for at least three years is the value of loans that has been fully prepaid through those three years as a share of original balance for those loans. In the pooled loans, after three years, about 17% of the original loan balance has been fully prepaid. After six years, that cumulative prepayment rate is about 32%. The data do not provide enough information for us to include partial prepayments in these calculations, so the figures above are underestimates of the true prepayment rate in these portfolios.

3.2.3. Regression analysis

This regression analysis builds on the high-level program, credit, and income trends in the previous section by parsing the impact of the various determinants of loan performance discussed above. The logistic regression measures the change in the likelihood of delinquency and charge-off depending on borrower and loan characteristics: principal amount, income bin, credit score, loan seasoning, interest rate, and which program issued the loan. The regression demonstrates the impact of each factor while holding all the others constant. See Appendix A for more details on the regressions.

Our analysis splits out two subprograms in NYSERDA, On-Bill Recovery and Smart Energy, to account for differences in program design and customer characteristics in these programs. Note that the regression models presented here include income as a variable, and therefore exclude Keystone HELP due to lack of income data. When removing income and adding Keystone HELP back to the analysis, results for the other variables are similar to those presented here. For regression tables, see Appendix A.

3.2.3.1 Credit score regression results

Credit score stands out as a consistent, statistically significant predictor of delinquency and charge-off. Higher credit scores are associated with lower chances of delinquency and charge-off for every portfolio. Considering Figure 10, this is not a surprise.

The association between credit score and charge-off is larger than the association between credit score and delinquency (see Table A-1). For charge-offs, a 100 point increase in credit score is associated with a 5.81 percentage point decrease in the chances a loan is charged off.[13] A 100-point increase in credit score is associated with only a 1.06-percentage point reduction in the chance of delinquency. Still, both relationships have strong statistical significance.[14] Program-specific regressions show similar impacts; while the magnitude of the

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[12] Lenders generally prefer for loans to be carried to term. If a loan is prepaid, then the investor will not receive part of the interest payments that they may have been expecting.

[13] The term 'percentage point' is used to distinguish a *difference* in percentages from a "percent of a percent" change; "percentage points" refers to the former. For example, a change from 1% to 2% is a change of one percentage point.

[14] Note that the positive correlation between borrower credit score and loan performance is not unique to energy efficiency loans.

relationships varies somewhat, in all cases higher credit scores are associated with lower chances of delinquency and charge-off, and in all cases the relationships are statistically significant at conventional levels of significance.

3.2.3.2   Income regression results

Across all portfolios combined, relative to loans in the 0-60% AMI band, the chance of charge-off decreases for loans in the three highest income bands (80-100% AMI, 100-120% AMI, > 120% AMI). These differences are statistically significant. Holding all else equal, households in the > 120% AMI band have a charge-off rate 1.98 percentage points lower than those in the < 60% AMI band. When examining delinquency, loans in the two highest income bands (100-120% AMI, > 120% AMI) show statistically significantly lower rates of delinquency than loans in the lowest income band. Both the high-income bins show a rate lower by 0.50 percentage points relative to the rate in the <60% AMI band (see Table A-2).

In single-portfolio regressions, the impacts of income on charge-off were often, but not always, statistically significant. The impact of income on delinquency were almost never statistically significant. This difference between pooled and single-portfolio results suggests that the scale of the study – in these regressions (which do not include Keystone HELP), about 25,000 loans – is important to demonstrate a relationship between income and loan performance, especially in the case of delinquency. When pooling the programs, the relationships emerge; however, single portfolios do not have adequate sample size to clearly demonstrate them. This stands in contrast to credit score, where associations with both delinquency and charge-off are clear and large even in single-portfolio regressions.

One possible explanation for the relatively weak relationship between income and loan performance (also shown in Figure 12) is that the income variable is based on the median income of the census tract, rather than the income of the household itself. Census tract income is a blunt signal of actual household-level income. However, the data do not suggest that use of census tract incomes, rather than household incomes, is consequential for these results. For Michigan Saves – the one program with available household-level income data – the correlation between household income and census tract median income is relatively weak (0.20). However, the relationships between household income and charge-off/delinquency are not clearly different than those using census tract median incomes. Regression analysis on the Michigan Saves data shows that household incomes – like census tract median incomes – are associated with charge-offs, with a $10,000 increase in income decreasing the chance of charge-off by 0.26 percentage points. Household income is not a statistically significant predictor of delinquency in the Michigan Saves data. Both results are similar to the results of regression analysis on the Michigan Saves program using census tract incomes.

3.2.3.3   Program regression results

The regression analysis generally confirms the differences in overall program delinquency and loss rates presented in Section 3.2.1. Connecticut Smart-E has the lowest charge-off rates when controlling for the other factors discussed in this section, and NYSERDA's Smart Energy loans have the highest.[15] Smart-E and both NYSERDA programs have the highest delinquency rates, while Keystone and Michigan Saves have the lowest. It is beyond the scope of this study to consider program-specific features that might explain these differences in performance. Overall, while some of these differences are statistically significant, they are relatively small in magnitude.

3.2.3.4   Other regression results

In addition to credit score and income, the regression analysis also estimates the impact of principal amount, interest rate, and seasoning on loan performance. This section reviews only the results for regressions on the combined portfolios.

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[15] This study observes higher chances of delinquency in NYSERDA's on-bill loans relative to its Smart Energy loans, consistent with the findings in Deason (2015) several years earlier in the program's lifespan. However, Deason (2015) did not study charge-offs. The results in this report show that NYSERDA's on-bill loans are not charged off more often than its Smart Energy loans; in fact, controlling for other factors, they are charged off less often, though the difference is not statistically significant.

Principal amounts have a statistically significant association with charge-offs, but not with delinquencies. Even for charge-off, the effect is relatively small: a $10,000 increase in principal amount only increases the chance of charge-off by 0.46 percentage points.

A 1-percentage point increase in interest rate increases the chance of charge-off by 2.29 percentage points for all programs combined. Interest rate does not have a statistically significant impact on delinquency.

Loan seasoning does have clear associations with loan performance. A loan's chance of charge-off *increases* by 0.76 percentage points for each year it has seasoned, while the chance of delinquency *decreases* by 0.11 percentage points for each year of seasoning. Seasoning can only increase the chances a loan becomes charged off, since charge-off can occur only once. On the other hand, loans can and do go in and out of delinquency. The fact that the relationship is reversed for delinquency suggests that borrowers who have trouble repaying their loans tend to get in trouble relatively quickly – which is consistent with the shape of the loss curves in Figures 9, 11, and 13.

4. Comparators

A key purpose of this research is to help assess whether energy efficiency loans perform differently than other comparable financial products. Observers have long theorized that energy efficiency loans may carry a performance premium. If so, there may be a number of potential reasons:

- These loans generate their own cash flow (through energy cost savings) to help service the debt.
- Participating borrowers have particular characteristics that make them likely to repay, whether easily observable (e.g., credit scores) or not (e.g., adoption of energy efficiency measures may be a sign that a borrower tends to be frugal or pay close attention to costs, so these products might select for borrowers with an otherwise unobservable tendency to repay reliably).
- Participants see clean energy improvements as an investment in their home and treat that investment similar to the way they would a loan that is secured by the home.
- Borrowers may seek these loans out because they believe they are doing something beneficial for the environment and would see failing to make payments as undermining their good deed.
- Program structures and safeguards (e.g., careful contractor vetting and approval as well as well-executed project approval and underwriting processes) help forestall predatory lending and otherwise avoid abusive lending practices that may be present to a greater extent in other loan pools.

To contextualize these results, this section compares the delinquency and charge-off performance of the energy efficiency loans in this study with several indices of loan performance. These comparisons cannot specifically determine whether efficiency loans carry a performance premium relative to otherwise similar non-efficiency loans, but they do help situate their performance relative to better-known asset classes.

4.1. Methodology

The analysis first identifies several relevant comparator financial products. There is no one perfect comparator to residential energy efficiency loans. In a sense, energy efficiency loans are a specialized type of home improvement loan; however, most home improvement loans are for more expensive renovation projects and may be secured by the home. Instead, Berkeley Lab chose general consumer loans and auto loans as comparators.[16] Consumer loans are broadly similar to energy efficiency loans in that they are generally unsecured loans made to individuals, although consumer loans are made without regard to dwelling ownership (or rental) status. While different types of consumer loans (and consumer loans to different customers) vary substantially, in general these loans have similar principal amounts on shorter terms (and therefore higher monthly payments), and carry considerably

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[16] While mortgages are another potential comparator, the fact that mortgages are secured by the home, and the much longer loan terms of many mortgages, make them less suitable for comparison.

higher interest rates than the studied energy efficiency loans.[17] Auto loans differ in that they are secured by the vehicle, meaning that one might expect somewhat stronger repayment performance. Average auto loan amounts and monthly payments are higher than residential energy efficiency loans and average terms are shorter, while interest rates are similar for new cars and higher for used cars. Average credit scores for new car loan borrowers are similar to the energy efficiency loan borrowers, while average credit scores for used car borrowers are considerably lower.[18] Most importantly, both consumer loans and auto loans have very large markets and are well-characterized by public loan indices.

Comparator loan performance data comes from three sources:

- Data maintained by the Federal Reserve ("Fed"). The Fed data[19] cover loans reported by brick-and-mortar banks, including credit card loans as well as non-credit card personal loans.

- Loan performance indices maintained by Kroll Bond Rating Agency (KBRA). The KBRA Marketplace Consumer Loan indices cover securities comprised of loans made by online lenders (often known as FinTech loans), separated into three tiers by the average credit quality served by each lender. The analysis uses data for Tier 1 loans in the KBRA index, which include deals with average credit scores from 710 to 740 (and are therefore the appropriate comparator for energy efficiency loans). KBRA also reports two auto loan indices, one for prime auto loans and one for non-prime auto loans. While there is no universal division between the two, non-prime loans are generally loans to borrowers with credit scores in the mid-600s and below. The analysis therefore focuses on the prime auto loan index.

- Loan data sampled from credit reports by TransUnion. While TransUnion data cover auto loans, bankcard loans, and unsecured personal loans, the analysis only includes their data on unsecured personal loans here. TransUnion usefully subdivides these loans further by type of lender (e.g., banks vs. credit unions), providing greater resolution on personal loans than the other indices.

The comparisons focus on the same two performance metrics used elsewhere in this report: 30-day delinquencies and cumulative gross losses. All indices define 30-day delinquencies in the same way that this report has defined them.

In terms of losses, earlier sections of this report show loss curves over time. For most comparators the data to support these curves are not available, though KBRA helpfully supplied us with the requisite data for two of their loan indices. Most comparators instead report an annualized loss rate, which indicates the share of the portfolio that would be expected to be lost in a year. Annualized losses are readily calculated for large portfolios that can be assumed to be at "steady state," meaning that loans of many different maturities are present and the overall seasoning of the portfolio is not changing significantly over time. In the energy efficiency loan data, this is not the case: the majority of loans are still relatively unseasoned. In this situation a common ratings agency practice is to "gross up" cumulative losses to the loss rate expected at loan maturity. However, few loans in the portfolios studied here have reached maturity (nearly none in some portfolios). Instead of attempting to forecast losses at maturity, the annualization method employed here divides losses at the time they are observed by the average seasoning of the loans. This method essentially assumes losses occur at a constant rate over time, which is not consistent with Figure 9; however, there is no ready alternative. Since loss rates do decline somewhat with seasoning, this method likely overestimates the loss rates in a mature portfolio of these efficiency loans.

Even setting aside this difference in annualization method, this annualized loss calculation differs from the comparators in two other respects:

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[17] See the following sources regarding unsecured consumer loans: https://www.lendingtree.com/personal/personal-loans-statistics/; https://www.fool.com/the-ascent/research/personal-loan-statistics/; https://fred.stlouisfed.org/series/TERMCBPER24NS; https://www.chamberofcommerce.org/personal-loan-statistics.

[18] See https://www.experian.com/content/dam/noindex/na/us/automotive/finance-trends/state-of-auto-finance-q2-2021.pdf for data on auto loans and auto loan borrowers.

[19] See https://www.federalreserve.gov/releases/chargeoff/

- Gross rather than net charge-offs. KBRA reports net charge-off rates that include revenues from recoveries.[20] This analysis could not access data on recoveries from energy efficiency loans, as discussed above, so the calculated charge-off rates are gross rates. Since gross charge-off rates are an upper limit on net charge-off rates (only reached if recoveries are zero), these rates may be overestimates of the net charge-off rates from the programs studied. Thus, this report's comparisons to net charge-off indices may underestimate the true relative performance of energy efficiency loans included in this report.

- Berkeley Lab annualizes charge-offs differently. The Fed and KBRA indices draw from a large volume of loans and calculate loss rates solely within the month or quarter that are reported, then multiply (by 12 or 4, respectively) to extrapolate those losses to annual values. The energy efficiency loan pools are much smaller, resulting in a good deal of random variance month-to-month and year-to-year. Therefore, as discussed in Section 3.2.1, the method used here annualizes in the reverse direction: it calculates the net loss rate of each portfolio across its entire lifetime, and then annualizes that value by dividing by the average seasoning of each portfolio.

4.2. Findings

The Fed data are reported quarterly, while KBRA indices are calculated monthly. To generate the comparators to the energy efficiency loan data, Berkeley Lab averages the rates reported by each index in the months/quarters of each of the four program datasets (see Table 1).
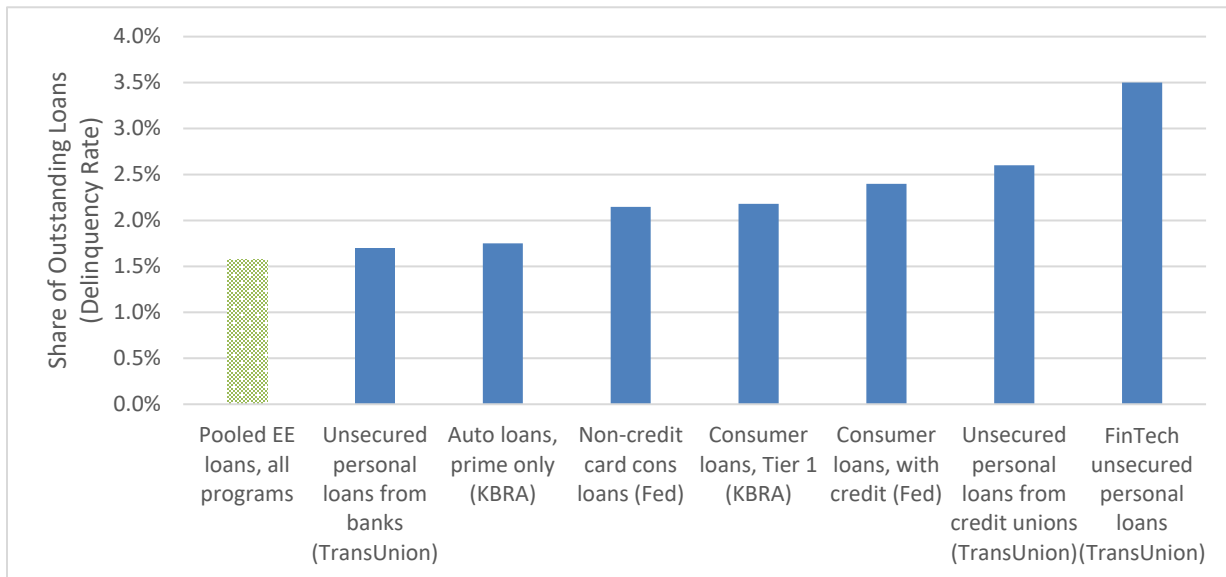

Figure 14. Delinquency rates, energy efficiency loans and comparators

The pooled 30-day delinquency rate across all four energy efficiency loan portfolios is lower than all comparators, including secured prime auto loans (see Figure 14). The energy efficiency loan delinquency rate is 1.57%, a fair bit lower than the 2.15% rate of non-credit card consumer loans (from the Fed data), as well as the 1.75% rate for unsecured personal loans from banks and the 2.6% rate for unsecured loans from credit unions.

Figure 15 presents the equivalent data for charge-offs (gross charge-offs for the energy efficiency loans; net charge-offs for comparators) for two KBRA indices for which KBRA shared data on losses over time to facilitate this analysis. The comparator loss rates in this graphic are principal-weighted averages of KBRA's loss rates by annual

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[20] Recoveries are money that a lender has been able to recover from a loan that has been charged off, e.g., through a collection agency or sale of the vehicle in the case of auto loans.

loan vintage from 2006-2019, in the case of auto loans, and from 2016-2019 for consumer loans (as the index began in 2016).
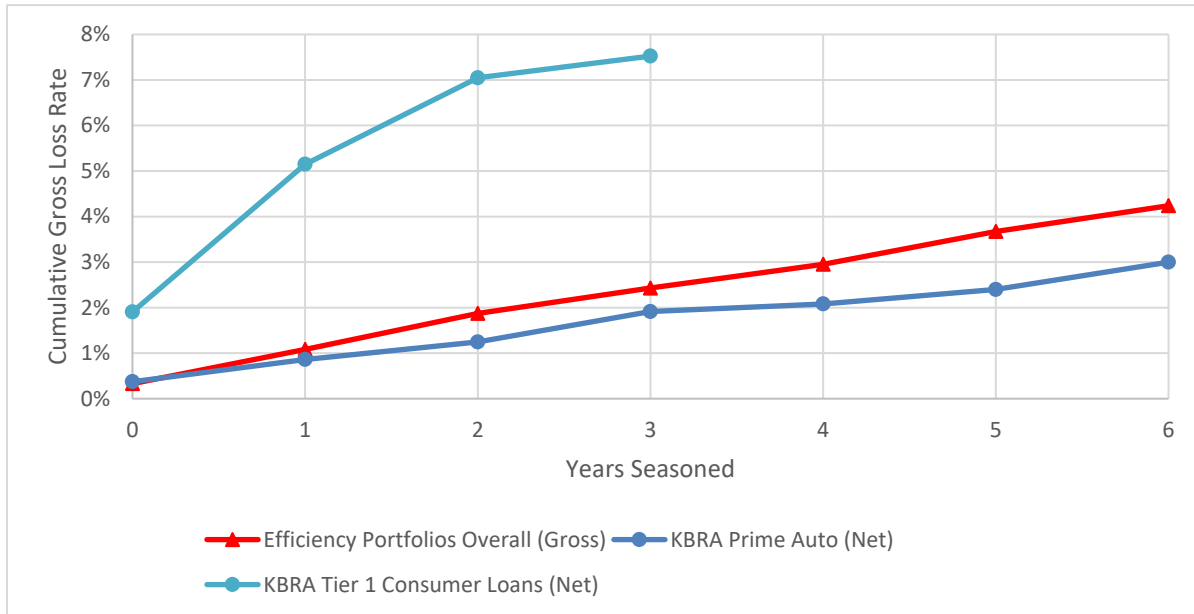

Figure 15. Cumulative loss rates for, energy efficiency loans (gross), KBRA Prime Auto (net), and Tier 1 Consumer Loans (net)

Losses for energy efficiency loans are comparable to prime auto losses and are much lower than Tier 1 consumer loan losses, despite the fact that the energy efficiency loan losses are gross rather than net. After three years of seasoning, the pooled energy efficiency loans have a cumulative gross loss rate of 2.4%, while the KBRA prime auto loans and Tier 1 consumer loans have cumulative net loss rates of 1.9% and 7.5% respectively.

Finally, Figure 16 shows a comparison between the annualized loss metric for the energy efficiency loans – again, an imperfect metric as described above – and annualized loss rates for comparators. In the same manner as the delinquency comparisons, the comparator loss rates are calculated by averaging the rates reported by each index in the months/quarters of each of the program datasets. Given this annualization method, one could argue that comparator rates should in some way average delinquency and loss rates across the portfolios' lifetimes. In practice, with the notable exception of the 2008/09 recession (which affected only early loans in the Keystone program), comparator delinquency and loss rates have been very stable during the period of observation, so the simple approach suffices.
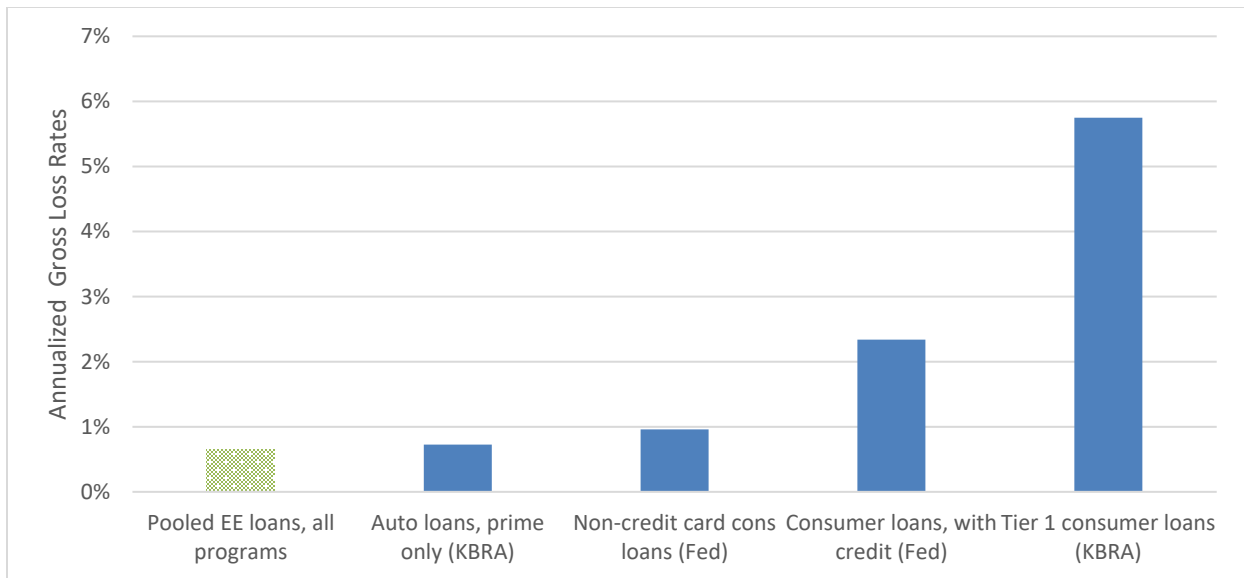
Figure 16. Annualized loss rates, energy efficiency loans and comparators

In this comparison, charge-off rates for the pooled energy efficiency portfolios are lower than those for all comparators including prime auto loans, despite the fact that the energy efficiency loan charge-off rates are gross rather than net. The pooled energy efficiency loans have a gross annualized charge-off rate of 0.65%, while prime auto loans show 0.73% and the Fed data on non-credit card consumer loans shows a net annualized charge-off rate of 0.96%. The fact that the energy efficiency loans show slightly lower annualized losses than auto loans in Figure 16, but slightly higher losses in Figure 15, likely relates to differences in the construction of the comparators in terms of their performance over time; overall, loss performance of the studied efficiency loans is very similar to that of prime auto loans.

5. Conclusions

This report documents and analyzes four large and (in most cases) long-running energy efficiency loan programs to characterize their financial performance. The energy efficiency loans in this analysis exhibit strong repayment performance, outperforming other creditworthy unsecured consumer loans and performing comparably to prime auto loans.

Taking the four studied energy efficiency portfolios together, the overall 30-day delinquency rate of these loans is 1.57%. Losses are highest early in loan lifetimes and decline later, a common finding for consumer loans. The pooled portfolios lost 2.1% of the principal by year 2, 3.3% by year 4, 4.5% by year 6, and 5.1% by year 8.

Regression analysis on loan-level data shows that credit scores are strongly associated with loan performance, for both 30-day delinquency and charge-off. Income is also correlated with loan performance; however, this effect is not as strong as the effect of credit score. Other features of the loans – like loan amounts and interest rates – have small effects on charge-off rates and no clear relationship with loan delinquency. These results are in line with the findings of other loan-level analyses of energy efficiency loan and solar PV financing performance (Deason 2015; Deason, Leventis and Murphy, 2021).

One implication of these regression findings is that borrowers from low-income areas who have strong credit and pass household-level debt-to-income screens are likely to repay loans or other extended financing at a reasonable rate. Such borrowers are not uncommon. Lending to low- and moderate-income households requires careful consideration of factors unique to these borrowers. See Leventis et al. (2017) for discussion of energy efficiency financing for low- and moderate-income households.

When pooled across all four studied programs, energy efficiency loans outperform their most logical comparators – creditworthy unsecured consumer loans – and overall perform comparably to prime auto loans, which are secured. This is despite the charge-off comparisons between loans analyzed in this report and these other products that disadvantage the energy efficiency loans in two senses: this analysis does not include data on recoveries after charge-off, and in some cases the annualization methods employed likely slightly overestimate the charge-off rates these programs would achieve when more fully seasoned. These findings are the most comprehensive evidence yet that energy efficiency loans perform strongly relative to other similar forms of lending.

Our results fall short of proving a relationship between financial performance and either the projects financed by these programs or the customers of the programs. To do this properly would require loan-level data for the comparators as well, to adequately control for other potentially relevant differences. While the energy efficiency loan data are granular, the comparison indices are highly aggregated. Although Berkeley Lab carefully reviewed and discussed the definitions of the metrics these indices draw on, some inconsistencies in definitions and reporting surely exist. Some of the indices considered as comparators do not provide any information on the average creditworthiness of the borrowers; the relatively high credit scores in the energy efficiency programs (or other factors Berkeley Lab cannot observe in the comparators) may or may not explain some of the differences in performance between the energy efficiency loans and the comparators.

Regardless of the explanation, the data speak for themselves: the loans made by these four programs, in aggregate, have performed well. These loans were made by four carefully designed and carefully administered programs, and one should not assume that other energy efficiency loans would necessarily perform as well if program design and administration differ. Nevertheless, when considering these programs and other similar programs, capital providers might wish to take note of this performance. A useful heuristic for capital providers might be that these energy efficiency loans perform more like prime auto loans than like unsecured consumer loans. If energy efficiency loans reliably exhibit stronger performance than other similar loans – as these results suggest – capital providers and lenders should offer better terms (lower interest rates, longer tenors, or both) on these products as their performance is further proven.

This analysis demonstrates that financial institutions can market efficiency upgrades to their customers and provide them with the capital they need to make such improvements at low risk, increasing the efficiency of their homes in the process. Furthermore, our data show that some households from low- and moderate- income areas take up energy efficiency loans, and that high-credit borrowers in these areas repay financing at a strong rate. Thus, energy efficiency lending can help support policy goals related to equitable access to capital, such as the Biden Administration's Justice 40 goals and Community Reinvestment Act compliance requirements.

6. Areas for future work

This study presents the most comprehensive evidence on energy efficiency loan performance that is publicly available to date. That said, additional work could advance understanding of energy efficiency loan performance further. Additional work on loan performance could include:

- Studying additional energy efficiency loan portfolios to expand sample size and test how generalizable the results of this study are.

- Accessing loan-level data on comparator loans and including those loans in the dataset. This would permit controlling for factors (for example, credit scores) that may systematically differ between the loans in this analysis and comparator loans, more directly revealing whether the energy efficiency loans carry a performance premium.

- Adding household incomes, or estimates of same, for additional programs to the data to see if household income has a notably different relationship with loan performance than census tract metrics. (As discussed in Section 3.2.3.2, results thus far suggest that this may not yield very different results.)

- Studying whether realized energy savings materially affect loan performance. Deason (2015) found that *projected* savings were not a statistically significant predictor of delinquency in early NYSERDA loans. However, projected savings do not always correspond to actual savings.

Above and beyond loan performance itself, additional research to support potential program administrators looking to offer or expand residential energy efficiency lending programs could include:

- Assessing the size of the addressable market for these products.

- Considering the most cost-effective way to offer financial support to expand programs offering these loans, likely through various forms of credit enhancement (such as loan loss reserves, subordinate capital, or loan guarantees). Zimring et al. (2013) outlines some preliminary considerations in this regard. This analysis could inform the design of a support facility (for example, a national loan loss reserve or state-level facility) by leveraging the energy efficiency loan data analyzed here to set performance expectations for different types of borrowers, thereby helping to size required financial outlays to expand lending.

- Estimating the potential impact of such financial support, or of other types of support to programs, on the availability and uptake of energy efficiency loan products and on deployment of energy efficiency measures.

- Identifying programmatic design elements and credit enhancements that might be best able to extend capital for energy efficiency to markets that are currently underserved by existing financing options. This effort could help to promote equitable access and tailor suitable loan products (or other financing products) to underserved households. Leventis et al. (2017) reviews a number of key considerations in this regard. The analysis in this paper could serve as a starting point for understanding the level of credit enhancement needed to reach lower-income or low-credit borrowers.

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Appendix A: Regression results

The table below summarizes the regression results used in Section 3.2.3. The average marginal effects for credit score, seasoning, interest, and principal amount all measure the change in likelihood of the outcome variable (e.g., charge-off) for a unit increase in each variable. For categorical variables like AMI band or program, the average marginal effects represent the change in likelihood for some outcome relative to some base case. For the four AMI bands in the table, the base case is the 0-60% AMI band. For program comparisons, Michigan Saves serves as the base case.

Table A-1. Regression output for all loan portfolios combined (n=51,041)

Dependent Variable	30-120 Day Delinquency			Charge-off		
	Average Marginal Effects	Standard Error	P Value	Average Marginal Effects	Standard Error	P Value
Credit Score	-1.06E-04	8.09E-06	2.06E-39	-5.81E-04	1.76E-05	8.82E-240
Seasoning (Days)	-3.12E-06	5.77E-07	6.20E-08	2.07E-05	1.01E-06	4.71E-93
Interest Rate	-5.87E-02	3.36E-02	8.00E-02	2.29E-01	6.45E-02	3.75E-04
Principal Amount ($)	4.29E-08	6.72E-08	5.23E-01	4.61E-07	1.61E-07	4.23E-03
Smart-E	7.85E-03	1.73E-03	6.04E-06	-1.23E-02	6.01E-03	4.00E-02
NYSERDA On-Bill Recovery	1.91E-02	1.65E-03	2.88E-31	6.09E-03	3.84E-03	1.13E-01
NYSERDA Smart-Energy	3.54E-03	1.37E-03	9.50E-03	1.37E-02	2.63E-03	2.13E-07
Keystone	5.00E-04	1.84E-03	7.86E-01	2.06E-03	2.79E-03	4.61E-01

Table A-2. Regression output for all loan portfolios with income (n+36,288)

Dependent Variable	30-120 Day Delinquency			Charge-off		
	Average Marginal Effects	Standard Error	P Value	Average Marginal Effects	Standard Error	P Value
Credit Score	-1.281E-04	1.054E-05	5.828E-34	-5.264E-04	1.919E-05	1.106E-165
Seasoning (Days)	-4.178E-06	8.405E-07	6.669E-07	1.956E-05	1.202E-06	1.479E-59
Interest Rate	-5.838E-02	5.209E-02	2.624E-01	3.106E-01	8.606E-02	3.068E-04
Principal Amount ($)	8.638E-08	8.786E-08	3.255E-01	4.376E-07	1.587E-07	5.820E-03
60%-80% + AMI	7.537E-04	1.579E-03	6.332E-01	6.521E-04	2.667E-03	8.069E-01
80%-100% + AMI	-1.911E-04	1.505E-03	8.990E-01	-5.883E-03	2.634E-03	2.553E-02

100%-120% + AMI	-4.987E-03	2.061E-03	1.553E-02	-8.617E-03	3.380E-03	1.080E-02
120%+ AMI	-5.030E-03	2.288E-03	2.788E-02	-1.985E-02	4.309E-03	4.075E-06
Smart-E	1.037E-02	2.272E-03	5.065E-06	-9.057E-03	5.632E-03	1.078E-01
NYSERDA On-Bill Recovery	2.469E-02	2.175E-03	7.198E-30	6.040E-03	3.826E-03	1.145E-01
NYSERDA Smart-Energy	4.453E-03	1.783E-03	1.251E-02	1.200E-02	2.740E-03	1.198E-05

Table A-3. Regression output for Michigan Saves (n=14,905)

	30-120 Day Delinquency			Charge-off		
Dependent Variable	Average Marginal Effects	Standard Error	P-Value	Average Marginal Effects	Standard Error	P-Value
Credit Score	-7.445E-05	1.460E-05	0.000E+00	-4.000E-04	3.280E-05	0.000E+00
Seasoning (Days)	-1.933E-06	7.730E-07	1.200E-02	2.092E-05	1.580E-06	0.000E+00
Interest Rate	-5.620E-02	4.400E-02	1.990E-01	1.443E-01	7.400E-02	5.200E-02
Principal Amount ($)	-3.665E-08	1.010E-07	7.160E-01	6.573E-07	1.930E-07	1.000E-03
60%-80% + AMI	-2.400E-03	2.000E-03	1.820E-01	-1.400E-03	4.000E-03	7.100E-01
80%-100% + AMI	-1.500E-03	2.000E-03	3.750E-01	-1.130E-02	4.000E-03	4.000E-03
100%-120% + AMI	-4.100E-03	2.000E-03	6.000E-02	-9.000E-03	4.000E-03	4.400E-02
120%+ AMI	-6.100E-03	3.000E-03	2.500E-02	-2.450E-02	6.000E-03	0.000E+00

Table A-4. Regression output for CT Smart-E (n=3,166)

	30-120 Day Delinquency			Charge-off		
Dependent Variable	Average Marginal Effects	Standard Error	P-Value	Average Marginal Effects	Standard Error	P-Value
Credit Score	-2.133E-04	4.894E-05	1.306E-05	-2.320E-04	4.974E-05	3.093E-06
Seasoning (Days)	-2.126E-06	5.097E-06	6.767E-01	1.337E-05	3.700E-06	3.015E-04
Interest Rate	2.313E-02	1.138E-01	8.389E-01	4.486E-02	9.989E-02	6.534E-01

Dependent Variable	Average Marginal Effects	Standard Error	P-Value	Average Marginal Effects	Standard Error	P-Value
Principal Amount ($)	5.859E-07	2.801E-07	3.647E-02	1.406E-07	2.904E-07	6.282E-01
60%-80% + AMI	1.413E-02	9.366E-03	1.313E-01	-3.760E-03	6.567E-03	5.670E-01
80%-100% + AMI	1.751E-02	8.914E-03	4.949E-02	5.252E-03	5.460E-03	3.361E-01
100%-120% + AMI	1.052E-02	9.760E-03	2.810E-01	-4.285E-03	6.877E-03	5.332E-01
120%+ AMI	1.103E-02	9.835E-03	2.621E-01	-1.418E-02	1.014E-02	1.622E-01

Table A-5. Regression output for Keystone HELP (n=14,753)

Dependent Variable	30-120 Day Delinquency			Charge-off		
	Average Marginal Effects	Standard Error	P-Value	Average Marginal Effects	Standard Error	P-Value
Credit Score	-5.646E-05	1.320E-05	1.903E-05	-7.247E-04	4.099E-05	5.766E-70
Seasoning (Days)	-8.444E-07	4.786E-07	7.767E-02	2.240E-05	2.110E-06	2.420E-26
Interest Rate	-3.102E-02	2.279E-02	1.736E-01	2.803E-01	1.146E-01	1.442E-02
Principal Amount ($)	7.119E-08	1.331E-07	5.927E-01	1.143E-06	5.896E-07	5.261E-02

Table 5. Regression output for NYSERDA Smart Energy (n=14,176)

Dependent Variable	30-120 Day Delinquency			Charge-off		
	Average Marginal Effects	Standard Error	P-Value	Average Marginal Effects	Standard Error	P-Value
Credit Score	-1.236E-04	1.544E-05	1.205E-15	-6.703E-04	3.265E-05	1.114E-93
Seasoning (Days)	-3.555E-06	1.122E-06	1.535E-03	2.134E-05	2.289E-06	1.132E-20
Interest Rate	-9.784E-02	9.953E-02	3.256E-01	3.829E-02	2.536E-01	8.800E-01
Principal Amount ($)	1.615E-07	1.484E-07	2.764E-01	-1.833E-07	3.359E-07	5.853E-01

| Debt-to-Income Ratio (DTI) | | 7.455E-04 | 1.205E-01 | 1.781E-03 | 3.402E-03 | |
| | 1.157E-03 | | | | | 6.006E-01 |

Table 6. Regression output for NYSERDA On-Bill Recovery (n=3,849)

	30-120 Day Delinquency			Charge-off		
Dependent Variable	**Average Marginal Effects**	**Standard Error**	**P-Value**	**Average Marginal Effects**	**Standard Error**	**P-Value**
Credit Score	-2.773E-04	5.653E-05	9.335E-07	-5.525E-04	5.872E-05	4.939E-21
Seasoning (Days)	-1.094E-05	5.773E-06	5.821E-02	-2.164E-07	6.048E-06	9.715E-01
Interest Rate	-1.994E-01	6.060E-01	7.421E-01	-4.326E-01	7.105E-01	5.426E-01
Principal Amount ($)	-1.972E-07	4.661E-07	6.723E-01	1.414E-06	4.400E-07	1.313E-03
Debt-to-Income Ratio (DTI)	4.248E-03	1.652E-02	7.971E-01	-1.087E-04	1.669E-02	9.948E-01

Appendix B: Participation by Community Reinvestment Act income bin

The Federal Reserve Board, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency (OCC) enforce regulations to implement the Community Reinvestment Act (CRA) of 1977. The CRA "encourages insured depository institutions to help meet the credit needs of the communities in which they are chartered" (FFIEC, 2012), including low- and moderate-income neighborhoods. For purposes of the CRA, the OCC defines low-income as household income that is less than 50% of AMI, moderate-income is 50% to 80% of AMI, middle-income is 80% to 120% of AMI, and upper-income is 120% or more of AMI.[21] Figure 17 shows participation in the studied programs by those CRA bins.
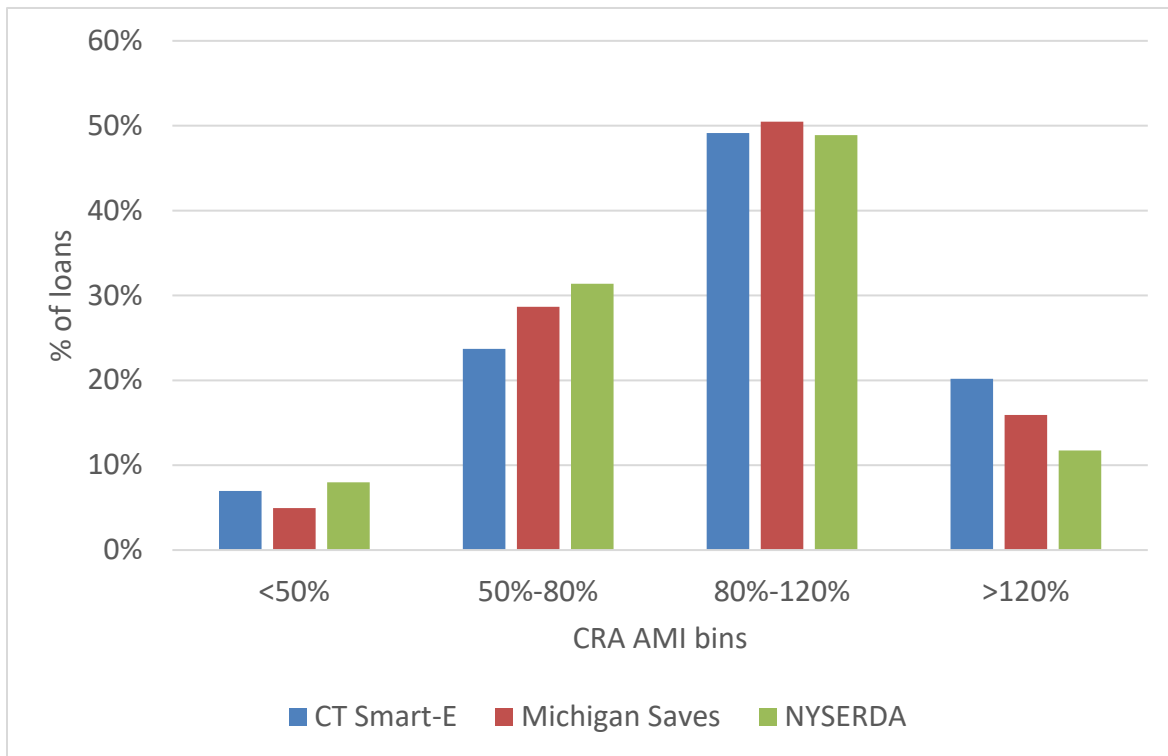

Figure 17. Participation by CRA income bin

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[21] See https://www.federalregister.gov/documents/2020/06/05/2020-11220/community-reinvestment-act-regulations.

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