



**California Energy Commission
April 12, 2023 Business Meeting
Backup Materials for Agenda Item No 14b:
Next Energy Technologies Inc.**

The following backup materials for the above-referenced agenda item are available in this PDF packet as listed below:

1. Proposed Resolution.
2. Grant Request Form.
3. Scope of Work.

STATE OF CALIFORNIA
STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION: Next Energy Technologies, Inc

RESOLVED, that the State Energy Resources Conservation and Development Commission (CEC) adopts the staff CEQA findings contained in the Agreement or Amendment Request Form (as applicable); and

RESOLVED, that the CEC approves Agreement EPC-22-011 with Next Energy Technologies Inc. for a \$2,997,395 grant to accelerate commercialization of their innovative power-generating window technology by meeting market-entry production requirements. The thin-film, organic PV technology is applied as a transparent coating directly to windowpanes that provide buildings with onsite clean electricity and protection from solar heat gains. Under this agreement, the recipient will develop and demonstrate manufacturing capabilities that achieve low-rate initial production levels, from their current pilot-scale production tools and processes; and

FURTHER BE IT RESOLVED, that the Executive Director or their designee shall execute the same on behalf of the CEC.

CERTIFICATION

The undersigned Secretariat to the CEC does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the CEC held on April 12, 2023.

AYE:
NAY:
ABSENT:
ABSTAIN:

Dated:

Liza Lopez
Secretariat



GRANT REQUEST FORM (GRF)

A. New Agreement Number

IMPORTANT: New Agreement # to be completed by Contracts, Grants, and Loans Office.

New Agreement Number: EPC-22-011

B. Division Information

1. Division Name: ERDD
2. Agreement Manager: Rachel Salazar
3. MS-:51
4. Phone Number: 916-776-0806

C. Recipient's Information

1. Recipient's Legal Name: Next Energy Technologies, Inc.
2. Federal ID Number: 27-2894903

D. Title of Project

Title of project: Accelerating the Manufacturing of Energy Generating Windows for Zero-Emission Buildings Leveraging Pilot Scale Innovations

E. Term and Amount

1. Start Date: 5/1/2023
2. End Date: 3/31/2027
3. Amount: \$2,997,395.00

F. Business Meeting Information

1. Are the ARFVTP agreements \$75K and under delegated to Executive Director? No
2. The Proposed Business Meeting Date: 4/12/2023 .
3. Consent or Discussion? Discussion
4. Business Meeting Presenter Name: Michael Ferreira
5. Time Needed for Business Meeting: 5 minutes.
6. The email subscription topic is: EPIC (Electric Program Investment Charge).

Agenda Item Subject and Description:

Next Energy Technologies Inc. Proposed resolution approving Agreement EPC-22-011 with Next Energy Technologies Inc. for a \$2,997,395 grant to accelerate commercialization of their innovative power-generating window technology by meeting market-entry production requirements, and adopting staff's determination that this action is exempt from CEQA. The thin-film, organic PV technology is applied as a transparent coating directly to windowpanes that provide buildings with onsite clean electricity and protection from solar heat gains. Under this agreement, the recipient will develop and demonstrate manufacturing capabilities that achieve low-rate initial production levels, advancing from their current pilot-scale production tools and processes.

G. California Environmental Quality Act (CEQA) Compliance

1. Is Agreement considered a "Project" under CEQA?
Yes



If yes, skip to question 2.

If no, complete the following (PRC 21065 and 14 CCR 15378) and explain why Agreement is not considered a “Project”:

Agreement will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because:

2. If Agreement is considered a “Project” under CEQA answer the following questions.

a) Agreement **IS** exempt?

Yes

Statutory Exemption?

No

If yes, list PRC and/or CCR section number(s) and separate each with a comma. If no, enter “None” and go to the next question.

PRC section number: None

CCR section number: None

Categorical Exemption?

Yes

If yes, list CCR section number(s) and separate each with a comma. If no, enter “None” and go to the next question.

CCR section number: Cal. Code Regs., tit. 14, § 15301 ;

Common Sense Exemption? 14 CCR 15061 (b) (3)

No

If yes, explain reason why Agreement is exempt under the above section. If no, enter “Not applicable” and go to the next section.

Cal. Code Regs., tit. 14, Section 15301 Existing Facilities provides an exemption for the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing structures, facilities, mechanical equipment or topographical features involving negligible or no expansion of use beyond that existing. This project will conduct research, development, and manufacturing within already existing facilities. While the existing laboratory prototype manufacturing space may be expanded to allow for the scale-up to a low-rate initial production manufacturing line, it will occur within the current industrial warehouse space located adjacent or within close proximity of the original laboratory space for which this project is cited. There will be negligible or no expansion of existing use. Therefore, the project falls within Section 15301 and will not have a significant effect on the environment.

b) Agreement **IS NOT** exempt.

IMPORTANT: consult with the legal office to determine next steps.

No

If yes, answer yes or no to all that applies. If no, list all as “no” and “None” as “yes”.

Additional Documents	Applies
Initial Study	No



Negative Declaration	No
Mitigated Negative Declaration	No
Environmental Impact Report	No
Statement of Overriding Considerations	No
None	Yes

H. Subcontractors

List all Subcontractors listed in the Budget (s) (major and minor). Insert additional rows if needed. If no subcontractors to report, enter “No subcontractors to report” and “0” to funds. **Delete** any unused rows from the table.

Subcontractor Legal Company Name	CEC Funds	Match Funds
No subcontractors to report	\$	\$

I. Vendors and Sellers for Equipment and Materials/Miscellaneous

List all Vendors and Sellers listed in Budget(s) for Equipment and Materials/Miscellaneous. Insert additional rows if needed. If no vendors or sellers to report, enter “No vendors or sellers to report” and “0” to funds. **Delete** any unused rows from the table.

Vendor/Seller Legal Company Name	CEC Funds	Match Funds
No vendors to report	\$	\$

J. Key Partners

List all key partner(s). Insert additional rows if needed. If no key partners to report, enter “No key partners to report.” **Delete** any unused rows from the table.

Key Partner Legal Company Name
No key partners to report

K. Budget Information

Include all budget information. Insert additional rows if needed. If no budget information to report, enter “N/A” for “Not Applicable” and “0” to Amount. **Delete** any unused rows from the table.

Funding Source	Funding Year of Appropriation	Budget List Number	Amount
EPIC	21-22	301.0011	\$ 2,997,395

TOTAL Amount: \$ 2,997,395

R&D Program Area: EDMFB: EDMF

Explanation for “Other” selection Not applicable



Reimbursement Contract #: Not applicable

Federal Agreement #: Not applicable

L. Recipient’s Contact Information

1. Recipient’s Administrator/Officer

Name: Bruno Caputo

Address: 600 Ward Dr Ste C

City, State, Zip: Goleta, CA 93111-2300

Phone: 757-553-2140

E-Mail: bruno@nextenergytech.com

3. Recipient’s Project Manager

Name: Brenton Taylor

Address: 600 Ward Dr Ste C

City, State, Zip: Goleta, CA 93111-2300

Phone: 805-222-4537

E-Mail: brenton@nextenergytech.com

M. Selection Process Used

There are three types of selection process. List the one used for this GRF.

Selection Process	Additional Information
Competitive Solicitation #	GFO-21-304
First Come First Served Solicitation #	Not applicable
Other	Not applicable

N. Attached Items

1. List all items that should be attached to this GRF by entering “Yes” or “No”.

Item Number	Item Name	Attached
1	Exhibit A, Scope of Work/Schedule	Yes
2	Exhibit B, Budget Detail	Yes
3	CEC 105, Questionnaire for Identifying Conflicts	Yes
4	Recipient Resolution	Yes
5	Awardee CEQA Documentation	Yes

Approved By



STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

Grant Request Form
CEC-270 (Revised 9/2022)

Individuals who approve this form must enter their full name and approval date in the MS Word version.

Agreement Manager: Rachel Salazar

Approval Date: 3/2/2023

Office Manager: Anthony Ng

Approval Date: 3/2/2023

Deputy Director: Anthony Ng for Jonah Steinbuck

Approval Date: 3/2/2023

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

1 **I. TASK ACRONYM/TERM LISTS**

2 **A. Task List**

Task #	CPR ¹	Task Name
1		General Project Tasks
2		LRIP Tool Specifications and Ordering
3		Build and Install LRIP Assembly Tools
4		Assemble Window-PV Units
5	X	Test Assembled Window-PV Units
6		Fabricate Representative Commercial Façade
7		Validate and Update Market Costs and Assumptions
8		Full-Rate Production Line Strategy
9		Evaluation of Project Benefits
10		Technology/Knowledge Transfer Activities

3

4

B. Acronym/Term List

Acronym/Term	Meaning
BIPV	Building Integrated Photovoltaic
BOS	Balance of Systems
CAM	Commission Agreement Manager
CAO	Commission Agreement Officer
CEC	California Energy Commission
CPR	Critical Project Review
CRL	Commercial Readiness Level
DAC	Disadvantaged Communities
GFF	Geometric Fill Factor
GHG	Greenhouse Gasses
IGU	Insulated Glass Unit
IOU	Investor-Owned Utility
LCOE	Levelized Cost of Energy
LRIP	Low-Rate Initial Production
MRL	Manufacturing Readiness Level
MPPT	Maximum Power Point Tracker
OPV	Organic Photovoltaic
PCE	Power Conversion Efficiency
Pilot Line	A pre-commercial production line
Pilot Test	Small scale testing in the laboratory or testing on a small portion of the production line
PV	Photovoltaic
ROI	Return on Investment
TRL	Technology Readiness Level

5

6

7

II. PURPOSE OF AGREEMENT, PROBLEM/SOLUTION STATEMENT, AND GOALS AND OBJECTIVES

¹ Please see subtask 1.3 in Part III of the Scope of Work (General Project Tasks) for a description of Critical Project Review (CPR) Meetings.

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

1
2 **A. Purpose of Agreement**

3 The purpose of this Agreement is to fund the scale-up of a Low-Rate Initial Production
4 (LRIP) line for the assembly of solution-processed Organic Photovoltaics (OPV) on architectural
5 window glass into window-PV modules that are ready for integration into commercial Insulated
6 Glass Units (IGUs). The work in this agreement contains the subsequent steps in the window-
7 PV manufacturing process after the OPV coating process itself that is the subject of the Bringing
8 Rapid Innovation Development to Green Energy (BRIDGE) grant with CEC (EPC-20-014). This
9 window-PV system can make a significant contribution to a commercial building's on-site energy
10 generation with minimal incremental cost over existing installed window system costs, and this
11 proposal moves the manufacturing process forward substantially relative to the BRIDGE project.
12

13 **B. Problem/ Solution Statement**

14
15 **Problem:**

16 Buildings account for 41 percent of U.S. energy use, representing the single largest
17 variable operating expense for commercial buildings. A growing number of developers are
18 building to green/sustainability standards, and regulatory regimes are increasingly driving toward
19 net zero energy buildings. Under the California Efficiency Strategic Plan, all new commercial
20 buildings in California are to be designed to zero net energy standards by 2030. Additionally, the
21 California solar mandate requires new construction homes to have solar installed as an energy
22 generation method as of January 1, 2020. In light of these mandates, substantial progress has
23 been made towards making buildings more energy efficient. However, the missing link to meeting
24 the goals remains the lack of options for onsite clean energy generation, particularly for
25 commercial buildings. For example, multilevel commercial buildings often don't have enough, free
26 rooftop space for conventional solar panels to offset their energy consumption. The Recipient
27 seeks to address this issue by developing power generating lites² that can be incorporated into
28 IGUs for installation on the vertical façade of commercial buildings. This solution will allow
29 significantly more power generating capacity per building than rooftop photovoltaic systems alone.
30

31 **Solution:**

32 The Recipient provides a key solution to reach zero- or negative carbon emission buildings, by
33 developing windows that generate energy using fully solution processed methods on commercial
34 grade architectural glass. The façade of a building has considerable surface area. For widespread
35 adoption of building integrated photovoltaic (BIPV) windows the market demands the exceptional
36 aesthetics of a standard window and a good return on investment. Current technologies on the
37 market do not meet all of the critical requirements of aesthetics, high transparency, suitable power
38 conversion efficiency (PCE), long lifetimes, and low cost. In contrast to all other technologies, the
39 Recipient's photovoltaic (PV) windows fully meets these requirements. The Recipient's
40 technology is based on solution processed organic semiconductors, which have the unique ability
41 to absorb infrared light, but have increased transmission in the visible spectra. Along with
42 excellent aesthetics, low capital cost equipment along with solution processing methods allows
43 for an onsite window integrated photovoltaic module that integrates seamlessly in an IGU
44 fabrication line.
45

46 The Recipient's energy generating windows are an excellent fit with both the energy and cost
47 requirements of commercial buildings as well as the existing supply chain and infrastructure of

² Window lites are the sections in glass windows. They are the separately framed panes of glass.

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

1 the window industry. In this project, the manufacturing tools and processes required to perform
2 that assembly process are advanced from pilot scale, where the processes are carried out by
3 hand on laboratory equipment, to a LRIP scale where the processes are carried out in a semi-
4 automated manufacturing line where each process step utilizes a dedicated manufacturing tool
5 capable of full rate production. These manufacturing tools are similar to tools utilized in the PV
6 industry and need to be adapted and implemented to suit the variable sizes encountered in the
7 commercial window supply chain. The PV lite produced through the Recipient's proprietary
8 solution-based coating process must be properly assembled (sealed, merged, and packaged) to
9 be ready for incorporation into an IGU by the window manufacturing supply chain. By advancing
10 the manufacturing state from the laboratory to a manufacturing line, this project will move the
11 Recipient's window-PV system much closer towards commercialization.

12
13 **C. Goals and Objectives of the Agreement**

14
15 **Agreement Goals**

16 The goals of this Agreement are to:

- 17 • Specify, build, and install assembly tools for the fabrication and qualification of window-
18 PV modules capable of handling commercially fabricated window glass for PV use.
- 19 • Utilize LRIP tools to assemble previously coated lites into PV modules of high aesthetic
20 quality and performance suitable for window and PV applications.
- 21 • Scale up and test a full module assembly with commercially relevant techniques at
22 commercially relevant sizes, effectively moving from prototype pilot scale to LRIP
23 including metrics such as quality, yield and cycle time.
- 24 • Build and test a window-PV module with commercially relevant assembly techniques at
25 commercially relevant sizes in-house and with commercial partners on an installed
26 window façade.
- 27 • Outline a plan for full rate production with outcomes from LRIP installations.

28
29 **Ratepayer Benefits:**³ This Agreement will result in the ratepayer benefits of greater electricity
30 reliability, lower costs, increased health and safety, and greater solar PV supply chain
31 diversification by accelerating the commercialization of energy generating windows. Greater
32 reliability will be achieved by enabling net zero energy buildings by providing onsite energy
33 generation to buildings. This will allow ratepayers, pursuant to the new California building code,
34 to have reliable energy in all new buildings equipped with on-site energy generation and energy
35 storage, even during rolling blackouts, and will reduce demand on California's energy grid. The
36 Recipient's unique approach also allows for lower cost through much lower module and balance
37 of system (BOS) costs compared to other photovoltaic technologies by utilizing substantial costs
38 that are already being paid for in conventional windows by building owners. This innovation will
39 have a profound impact on CEC EPIC goals to achieve an affordable pathway to meeting
40 California's climate targets by lowering cost to a levelized cost of energy (LCOE) of \$0.03/kWh
41 by 2030.

42

³ California Public Resources Code, Section 25711.5(a) requires projects funded by the Electric Program Investment Charge (EPIC) to result in ratepayer benefits. The California Public Utilities Commission, which established the EPIC in 2011, defines ratepayer benefits as greater reliability, lower costs, and increased safety (See CPUC "Phase 2" Decision 12-05-037 at page 19, May 24, 2012, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF).

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

1 The Recipient’s product will also help increase the health and safety of California ratepayers by
2 significantly reducing greenhouse gas (GHG) emissions. Buildings are responsible for about 25
3 percent of California’s total GHG emissions.⁴ The Recipient’s technology will address the
4 missing ingredient for zero- and negative emission generation buildings of clean onsite energy
5 generation. Moreover, the shift to all-electric buildings already underway in California will allow
6 the State to boost its reliance on clean electricity coming from solar and other renewable energy
7 sources; the Recipient’s product can be a valuable new distributed energy resource for
8 transitioning new homes and buildings off of fossil fuels like natural gas in favor of pollution-free,
9 all-electric affordable housing run on 100 percent clean energy.

10
11 The Recipient’s energy-producing windows are made regionally, ensuring domestic
12 manufacturing, diversifying the solar supply chain, and as a result, protecting California
13 ratepayers from price escalations and extended timelines for solar deployment, creating
14 numerous new jobs and reducing the carbon footprint of solar panels.

15
16 Technological Advancement and Breakthroughs:⁵ This Agreement will lead to technological
17 advancement and breakthroughs to overcome barriers to the achievement of the State of
18 California’s statutory energy goals by rapid innovation of low-cost energy generating windows.
19 This breakthrough technology converts infrared light into electricity allowing windows to look and
20 function as high performance Low-Emissivity windows, while also generating significant clean
21 energy. The accomplishments of this project will remove some last barriers between current
22 pilot scale and LRIP. This project will accelerate commercialization of the Recipient’s window
23 product and help to meet the state’s statutory energy goals. The technology will be key part of
24 the solution to decarbonize the electricity sector, expand the use of renewable energy, increase
25 the resiliency of the electric system and cities to the impacts of climate change, and ultimately
26 assist the State of California in meeting its statewide carbon neutrality goal.

27
28 **Agreement Objectives**

29 The objectives of this Agreement are to:

- 30 • Transfer Recipient’s optimized, demonstrated pilot scale processes to a LRIP process
31 that is compatible with commercial deployment. Quantitative Milestones for these
32 processes include:
- 33 ○ Build/Order a semi-automated bus bar, edge seal, and interlayer packaging tool
34 suitable for both solar module fabrication and commercial window fabrication.
 - 35 ○ Demonstrate fabrication of the module packaging on glass with increasing sizes,
36 to prove ability to provide devices with comparable quality at commercially
37 relevant sizes
 - 38 ○ Evaluate aesthetics, uniformity, and performance of window–PV lites assembled
39 from the new assembly equipment to ensure that devices comply with applicable
40 industry standards
- 41 • Integrate modules fabricated using the LRIP processing techniques into IGUs that meet
42 identified performance metrics. Quantitative milestones for these modules include:
- 43 ○ Consult with building window system manufacturers to fabricate IGUs that pass
44 applicable safety and durability tests.
 - 45 ○ Collaborate with a commercial integrator to fabricate and install a demonstration
46 system using the IGUs from the previous step

⁴ Vukovich and Delforge, NRDC, 2018.

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

- 1 • Plan for upcoming Full-Rate Production
- 2 o Provide a plan for full-rate production manufacturing.
- 3
- 4

5 **III. TASK 1 GENERAL PROJECT TASKS**

6

7 **PRODUCTS**

8 **Subtask 1.1 Products**

9 The goal of this subtask is to establish the requirements for submitting project products (e.g.,
10 reports, summaries, plans, and presentation materials). Unless otherwise specified by the
11 Commission Agreement Manager (CAM), the Recipient must deliver products as required below
12 by the dates listed in the **Project Schedule (Part V)**. All products submitted which will be
13 viewed by the public, must comply with the accessibility requirements of Section 508 of the
14 federal Rehabilitation Act of 1973, as amended (29 U.S.C. Sec. 794d), and regulations
15 implementing that act as set forth in Part 1194 of Title 36 of the Federal Code of Regulations. All
16 technical tasks should include product(s). Products that require a draft version are indicated by
17 marking “**(draft and final)**” after the product name in the “Products” section of the task/subtask.
18 If “(draft and final)” does not appear after the product name, only a final version of the product is
19 required. With respect to due dates within this Scope of Work, “**days**” means working days.

20

21 **The Recipient shall:**

22 For products that require a draft version, including the Final Report Outline and Final Report

- 23 • Submit all draft products to the CAM for review and comment in accordance with the
24 Project Schedule (Part V). The CAM will provide written comments to the Recipient on
25 the draft product within 15 days of receipt, unless otherwise specified in the task/subtask
26 for which the product is required.
- 27 • Consider incorporating all CAM comments into the final product. If the Recipient
28 disagrees with any comment, provide a written response explaining why the comment
29 was not incorporated into the final product.
- 30 • Submit the revised product and responses to comments within 10 days of notice by the
31 CAM, unless the CAM specifies a longer time period, or approves a request for
32 additional time.

33

34 For products that require a final version only

- 35 • Submit the product to the CAM for acceptance. The CAM may request minor revisions or
36 explanations prior to acceptance.

37

38 For all products

- 39 • Submit all data and documents required as products in accordance with the following:

40

41 Instructions for Submitting Electronic Files and Developing Software:

- 42 o **Electronic File Format**
- 43

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

- Submit all data and documents required as products under this Agreement in an electronic file format that is fully editable and compatible with the California Energy Commission’s (CEC) software and Microsoft (MS)-operating computing platforms, or with any other format approved by the CAM. Deliver an electronic copy of the full text of any Agreement data and documents in a format specified by the CAM, such as memory stick.

The following describes the accepted formats for electronic data and documents provided to the CEC as products under this Agreement, and establishes the software versions that will be required to review and approve all software products:

- Data sets will be in MS Access or MS Excel file format (version 2007 or later), or any other format approved by the CAM.
- Text documents will be in MS Word file format, version 2007 or later.
- Project management documents will be in Microsoft Project file format, version 2007 or later.

○ **Software Application Development**

Use the following standard Application Architecture components in compatible versions for any software application development required by this Agreement (e.g., databases, models, modeling tools), unless the CAM approves other software applications such as open source programs:

- Microsoft ASP.NET framework (version 3.5 and up). Recommend 4.0.
- Microsoft Internet Information Services (IIS), (version 6 and up) Recommend 7.5.
- Visual Studio.NET (version 2008 and up). Recommend 2010.
- C# Programming Language with Presentation (UI), Business Object and Data Layers.
- SQL (Structured Query Language).
- Microsoft SQL Server 2008, Stored Procedures. Recommend 2008 R2.
- Microsoft SQL Reporting Services. Recommend 2008 R2.
- XML (external interfaces).

Any exceptions to the Electronic File Format requirements above must be approved in writing by the CAM. The CAM will consult with the CEC’s Information Technology Services Branch to determine whether the exceptions are allowable.

MEETINGS

Subtask 1.2 Kick-off Meeting

The goal of this subtask is to establish the lines of communication and procedures for implementing this Agreement.

The Recipient shall:

- Attend a “Kick-off” meeting with the CAM, the Commission Agreement Officer (CAO), and any other CEC staff relevant to the Agreement. The Recipient will bring its Project Manager and any other individuals designated by the CAM to this meeting. The administrative and technical aspects of the Agreement will be discussed at the meeting. Prior to the meeting, the CAM will provide an agenda to all potential meeting participants. The meeting may take place in person or by electronic conferencing (e.g., WebEx), with approval of the CAM.

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

1
2 The administrative portion of the meeting will include discussion of the following:

- 3 ○ Terms and conditions of the Agreement;
4 ○ Invoicing and auditing procedures;
5 ○ Administrative products (subtask 1.1);
6 ○ CPR meetings (subtask 1.3);
7 ○ Match fund documentation (subtask 1.7);
8 ○ Permit documentation (subtask 1.8);
9 ○ Subcontracts (subtask 1.9); and
10 ○ Any other relevant topics.

11
12 The technical portion of the meeting will include discussion of the following:

- 13 ○ The CAM's expectations for accomplishing tasks described in the Scope of Work;
14 ○ An updated Project Schedule;
15 ○ Technical products (subtask 1.1);
16 ○ Progress reports (subtask 1.5);
17 ○ Final Report (subtask 1.6);
18 ○ Technical Advisory Committee meetings (subtasks 1.10 and 1.11); and
19 ○ Any other relevant topics.

- 20
21 ● Provide *Kick-off Meeting Presentation* to include but not limited to:
22 ○ Project overview (i.e. project description, goals and objectives, technical tasks,
23 expected benefits, etc.)
24 ○ Project schedule that identifies milestones
25 ○ List of potential risk factors and hurdles, and mitigation strategy
26
27 ● Provide an *Updated Project Schedule, Match Funds Status Letter, and Permit Status*
28 *Letter*, as needed to reflect any changes in the documents.
29

30 **The CAM shall:**

- 31 ● Designate the date and location of the meeting.
32 ● Send the Recipient a *Kick-off Meeting Agenda*.
33

34 **Recipient Products:**

- 35 ● Kick-off Meeting Presentation
36 ● Updated Project Schedule (*if applicable*)
37 ● Match Funds Status Letter (subtask 1.7) (*if applicable*)
38 ● Permit Status Letter (subtask 1.8) (*if applicable*)
39

40 **CAM Product:**

- 41 ● Kick-off Meeting Agenda
42

43 **Subtask 1.3 Critical Project Review (CPR) Meetings**

44 The goal of this subtask is to determine if the project should continue to receive CEC funding,
45 and if so whether any modifications must be made to the tasks, products, schedule, or budget.
46 CPR meetings provide the opportunity for frank discussions between the CEC and the
47 Recipient. As determined by the CAM, discussions may include project status, challenges,
48 successes, advisory group findings and recommendations, final report preparation, and
49 progress on technical transfer and production readiness activities (if applicable). Participants

Exhibit A
Scope of Work
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1 will include the CAM and the Recipient and may include the CAO and any other individuals
2 selected by the CAM to provide support to the CEC.
3

4 CPR meetings generally take place at key, predetermined points in the Agreement, as
5 determined by the CAM and as shown in the Task List on page 1 of this Exhibit.
6 However, the CAM may schedule additional CPR meetings as necessary. The budget will be
7 reallocated to cover the additional costs borne by the Recipient, but the overall Agreement
8 amount will not increase. CPR meetings generally take place at the CEC, but they may take
9 place at another location, or may be conducted via electronic conferencing (e.g., WebEx) as
10 determined by the CAM.
11

12 **The Recipient shall:**

- 13 • Prepare and submit a *CPR Report* for each CPR meeting that: (1) discusses the
14 progress of the Agreement toward achieving its goals and objectives; and (2) includes
15 recommendations and conclusions regarding continued work on the project.
- 16 • Attend the CPR meeting.
- 17 • Present the CPR Report and any other required information at each CPR meeting.
18

19 **The CAM shall:**

- 20 • Determine the location, date, and time of each CPR meeting with the Recipient's input.
- 21 • Send the Recipient a *CPR Agenda* with a list of expected CPR participants in advance of
22 the CPR meeting. If applicable, the agenda will include a discussion of match funding
23 and permits.
- 24 • Conduct and make a record of each CPR meeting. Provide the Recipient with a
25 schedule for providing a Progress Determination on continuation of the project.
- 26 • Determine whether to continue the project, and if so whether modifications are needed
27 to the tasks, schedule, products, or budget for the remainder of the Agreement. If the
28 CAM concludes that satisfactory progress is not being made, this conclusion will be
29 referred to the Deputy Director of the Energy Research and Development Division.
- 30 • Provide the Recipient with a *Progress Determination* on continuation of the project, in
31 accordance with the schedule. The Progress Determination may include a requirement
32 that the Recipient revise one or more products.
33

34 **Recipient Products:**

- 35 • CPR Report(s)
36

37 **CAM Products:**

- 38 • CPR Agenda(s)
- 39 • Progress Determination
40

41 **Subtask 1.4 Final Meeting**

42 The goal of this subtask is to complete the closeout of this Agreement.
43

44 **The Recipient shall:**

- 45 • Meet with CEC staff to present project findings, conclusions, and recommendations. The
46 final meeting must be completed during the closeout of this Agreement. This meeting will
47 be attended by the Recipient and CAM, at a minimum. The meeting may occur in person
48 or by electronic conferencing (e.g., WebEx), with approval of the CAM.

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

1
2 The technical and administrative aspects of Agreement closeout will be discussed at the
3 meeting, which may be divided into two separate meetings at the CAM’s discretion.

- 4 ○ The technical portion of the meeting will involve the presentation of findings,
5 conclusions, and recommended next steps (if any) for the Agreement. The CAM will
6 determine the appropriate meeting participants.
- 7 ○ The administrative portion of the meeting will involve a discussion with the CAM and
8 the CAO of the following Agreement closeout items:
- 9 ▪ Disposition of any procured equipment.
 - 10 ▪ The CEC’s request for specific “generated” data (not already provided in
11 Agreement products).
 - 12 ▪ Need to document the Recipient’s disclosure of “subject inventions”
13 developed under the Agreement.
 - 14 ▪ “Surviving” Agreement provisions such as repayment provisions and
15 confidential products.
 - 16 ▪ Final invoicing and release of retention.
- 17 ● Prepare a *Final Meeting Agreement Summary* that documents any agreement made
18 between the Recipient and Commission staff during the meeting.
 - 19 ● Prepare a *Schedule for Completing Agreement Closeout Activities*.
 - 20 ● Provide copies of *All Final Products* on a USB memory stick, organized by the tasks in
21 the Agreement.
- 22

23 **Products:**

- 24 ● Final Meeting Agreement Summary (*if applicable*)
 - 25 ● Schedule for Completing Agreement Closeout Activities
 - 26 ● All Final Products
- 27

28 **REPORTS AND INVOICES**

29 **Subtask 1.5 Progress Reports and Invoices**

30 The goals of this subtask are to: (1) periodically verify that satisfactory and continued progress
31 is made towards achieving the project objectives of this Agreement; and (2) ensure that invoices
32 contain all required information and are submitted in the appropriate format.

33

34 **The Recipient shall:**

- 35 ● Submit a monthly *Progress Report* to the CAM. Each progress report must:
 - 36 ○ Summarize progress made on all Agreement activities as specified in the scope of
37 work for the preceding month, including accomplishments, problems, milestones,
38 products, schedule, fiscal status, and an assessment of the ability to complete the
39 Agreement within the current budget and any anticipated cost overruns. See the
40 Progress Report Format Attachment for the recommended specifications.
 - 41 ● Submit a monthly or quarterly *Invoice* that follows the instructions in the “Payment of
42 Funds” section of the terms and conditions, including a financial report on Match Funds
43 and in-state expenditures.
- 44

45 **Products:**

- 46 ● Progress Reports
 - 47 ● Invoices
- 48

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1 **Subtask 1.6 Final Report**

2 The goal of this subtask is to prepare a comprehensive Final Report that describes the original
3 purpose, approach, results, and conclusions of the work performed under this Agreement.

4 When creating the Final Report Outline and the Final Report, the Recipient must use the CEC
5 Style Manual provided by the CAM.

6
7 **Subtask 1.6.1 Final Report Outline**

8
9 **The Recipient shall:**

- 10 • Prepare a *Final Report Outline* in accordance with the *Energy Commission Style Manual*
11 provided by the CAM.

12
13 **Recipient Products:**

- 14 • Final Report Outline (draft and final)

15
16 **CAM Product:**

- 17 • Energy Commission Style Manual
18 • Comments on Draft Final Report Outline
19 • Acceptance of Final Report Outline

20
21 **Subtask 1.6.2 Final Report**

22
23 **The Recipient shall:**

- 24 • Prepare a *Final Report* for this Agreement in accordance with the approved Final Report
25 Outline, Energy Commission Style Manual, and Final Report Template provided by the
26 CAM with the following considerations:
27 ○ Ensure that the report includes the following items, in the following order:
28 ▪ Cover page (**required**)
29 ▪ Credits page on the reverse side of cover with legal disclaimer (**required**)
30 ▪ Acknowledgements page (optional)
31 ▪ Preface (**required**)
32 ▪ Abstract, keywords, and citation page (**required**)
33 ▪ Table of Contents (**required**, followed by List of Figures and List of
34 Tables, if needed)
35 ▪ Executive summary (**required**)
36 ▪ Body of the report (**required**)
37 ▪ References (if applicable)
38 ▪ Glossary/Acronyms (If more than 10 acronyms or abbreviations are used,
39 it is required.)
40 ▪ Bibliography (if applicable)
41 ▪ Appendices (if applicable) (Create a separate volume if very large.)
42 ▪ Attachments (if applicable)
- 43 • Submit a draft of the Executive Summary to the TAC for review and comment.
44 • Develop and submit a *Summary of TAC Comments on Draft Final Report* received on
45 the Executive Summary. For each comment received, the recipient will identify in the
46 summary the following:
47 ○ Comments the recipient proposes to incorporate.
48 ○ Comments the recipient does propose to incorporate and an explanation for why.

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- 1 • Submit a draft of the report to the CAM for review and comment. The CAM will provide
- 2 written comments to the Recipient on the draft product within 15 days of receipt.
- 3 • Incorporate all CAM comments into the *Final Report*. If the Recipient disagrees with any
- 4 comment, provide a *Written Responses to Comments* explaining why the comments
- 5 were not incorporated into the final product.
- 6 • Submit the revised *Final Report* electronically with any Written Responses to Comments
- 7 within 10 days of receipt of CAM's Written Comments on the Draft Final Report, unless the
- 8 CAM specifies a longer time period or approves a request for additional time.

9
10 **Products:**

- 11 • Summary of TAC Comments on Draft Final Report
- 12 • Draft Final Report
- 13 • Written Responses to Comments (*if applicable*)
- 14 • Final Report

15
16 **CAM Product:**

- 17 • Written Comments on the Draft Final Report

18
19 **MATCH FUNDS, PERMITS, AND SUBCONTRACTS**

20 **Subtask 1.7 Match Funds**

21 The goal of this subtask is to ensure that the Recipient obtains any match funds planned for this
22 Agreement and applies them to the Agreement during the Agreement term.

23
24 While the costs to obtain and document match funds are not reimbursable under this
25 Agreement, the Recipient may spend match funds for this task. The Recipient may only spend
26 match funds during the Agreement term, either concurrently or prior to the use of CEC funds.
27 Match funds must be identified in writing, and the Recipient must obtain any associated
28 commitments before incurring any costs for which the Recipient will request reimbursement.

29
30 **The Recipient shall:**

- 31 • Prepare a *Match Funds Status Letter* that documents the match funds committed to this
- 32 Agreement. If no match funds were part of the proposal that led to the CEC awarding
- 33 this Agreement and none have been identified at the time this Agreement starts, then
- 34 state this in the letter.

35
36 If match funds were a part of the proposal that led to the CEC awarding this Agreement,
37 then provide in the letter:

- 38 ○ A list of the match funds that identifies:
 - 39 ■ The amount of cash match funds, their source(s) (including a contact name,
 - 40 address, and telephone number), and the task(s) to which the match funds
 - 41 will be applied.
 - 42 ■ The amount of each in-kind contribution, a description of the contribution type
 - 43 (e.g., property, services), the documented market or book value, the source
 - 44 (including a contact name, address, and telephone number), and the task(s)
 - 45 to which the match funds will be applied. If the in-kind contribution is
 - 46 equipment or other tangible or real property, the Recipient must identify its
 - 47 owner and provide a contact name, address, telephone number, and the
 - 48 address where the property is located.
 - 49 ■ If different from the solicitation application, provide a letter of commitment

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1 from an authorized representative of each source of match funding that the
2 funds or contributions have been secured.

- 3 • At the Kick-off meeting, discuss match funds and the impact on the project if they are
4 significantly reduced or not obtained as committed. If applicable, match funds will be
5 included as a line item in the progress reports and will be a topic at CPR meetings.
- 6 • Provide a *Supplemental Match Funds Notification Letter* to the CAM of receipt of
7 additional match funds.
- 8 • Provide a *Match Funds Reduction Notification Letter* to the CAM if existing match funds
9 are reduced during the course of the Agreement. Reduction of match funds may trigger
10 a CPR meeting.

11
12 **Products:**

- 13 • Match Funds Status Letter
- 14 • Supplemental Match Funds Notification Letter (*if applicable*)
- 15 • Match Funds Reduction Notification Letter (*if applicable*)

16
17 **Subtask 1.8 Permits**

18 The goal of this subtask is to obtain all permits required for work completed under this
19 Agreement in advance of the date they are needed to keep the Agreement schedule on track.
20 Permit costs and the expenses associated with obtaining permits are not reimbursable under
21 this Agreement, with the exception of costs incurred by University of California recipients.
22 Permits must be identified and obtained before the Recipient may incur any costs related to the
23 use of the permit(s) for which the Recipient will request reimbursement.

24
25 **The Recipient shall:**

- 26 • Prepare a *Permit Status Letter* that documents the permits required to conduct this
27 Agreement. If no permits are required at the start of this Agreement, then state this in the
28 letter. If permits will be required during the course of the Agreement, provide in the letter:
 - 29 ○ A list of the permits that identifies: (1) the type of permit; and (2) the name,
30 address, and telephone number of the permitting jurisdictions or lead agencies.
 - 31 ○ The schedule the Recipient will follow in applying for and obtaining the permits.

32
33 The list of permits and the schedule for obtaining them will be discussed at the Kick-off
34 meeting (subtask 1.2), and a timetable for submitting the updated list, schedule, and
35 copies of the permits will be developed. The impact on the project if the permits are not
36 obtained in a timely fashion or are denied will also be discussed. If applicable, permits
37 will be included as a line item in progress reports and will be a topic at CPR meetings.

- 38 • If during the course of the Agreement additional permits become necessary, then
39 provide the CAM with an *Updated List of Permits* (including the appropriate information
40 on each permit) and an *Updated Schedule for Acquiring Permits*.
- 41 • Send the CAM a *Copy of Each Approved Permit*.
- 42 • If during the course of the Agreement permits are not obtained on time or are denied,
43 notify the CAM within 5 days. Either of these events may trigger a CPR meeting.

44
45 **Products:**

- 46 • Permit Status Letter
- 47 • Updated List of Permits (*if applicable*)
- 48 • Updated Schedule for Acquiring Permits (*if applicable*)

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- 1 • Copy of Each Approved Permit (*if applicable*)
2

3 **Subtask 1.9 Subcontracts**

4 The goals of this subtask are to: (1) procure subcontracts required to carry out the tasks under
5 this Agreement; and (2) ensure that the subcontracts are consistent with the terms and
6 conditions of this Agreement.
7

8 **The Recipient shall:**

- 9 • Manage and coordinate subcontractor activities in accordance with the requirements of
10 this Agreement.
11 • Incorporate this Agreement by reference into each subcontract.
12 • Include any required Energy Commission flow-down provisions in each subcontract, in
13 addition to a statement that the terms of this Agreement will prevail if they conflict with
14 the subcontract terms.
15 • If required by the CAM, submit a draft of each *Subcontract* required to conduct the work
16 under this Agreement.
17 • Submit a final copy of each executed subcontract.
18 • Notify and receive written approval from the CAM prior to adding any new
19 subcontractors (see the discussion of subcontractor additions in the terms and
20 conditions).
21

22 **Products:**

- 23 • Subcontracts (*draft if required by the CAM*)
24

25 **TECHNICAL ADVISORY COMMITTEE**

26 **Subtask 1.10 Technical Advisory Committee (TAC)**

27 The goal of this subtask is to create an advisory committee for this Agreement. The TAC should
28 be composed of diverse professionals. The composition will vary depending on interest,
29 availability, and need. TAC members will serve at the CAM's discretion. The purpose of the
30 TAC is to:

- 31 • Provide guidance in project direction. The guidance may include scope and
32 methodologies, timing, and coordination with other projects. The guidance may be based
33 on:
34 ○ Technical area expertise;
35 ○ Knowledge of market applications; or
36 ○ Linkages between the agreement work and other past, present, or future projects
37 (both public and private sectors) that TAC members are aware of in a particular area.
38 • Review products and provide recommendations for needed product adjustments,
39 refinements, or enhancements.
40 • Evaluate the tangible benefits of the project to the state of California, and provide
41 recommendations as needed to enhance the benefits.
42 • Provide recommendations regarding information dissemination, market pathways, or
43 commercialization strategies relevant to the project products.
44 • Help set the project team's goals and contribute to the development and evaluation of its
45 statement of proposed objectives as the project evolves.
46 • Provide a credible and objective sounding board on the wide range of technical and
47 financial barriers and opportunities.

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- 1 • Help identify key areas where the project has a competitive advantage, value
- 2 proposition, or strength upon which to build.
- 3 • Advocate, to the extent the TAC members feel is appropriate, on behalf of the project in
- 4 its effort to build partnerships, governmental support, and relationships with a national
- 5 spectrum of influential leaders.
- 6 • Ask probing questions that insure a long-term perspective on decision-making and
- 7 progress toward the project’s strategic goals.

8
9 The TAC may be composed of qualified professionals spanning the following types of
10 disciplines:

- 11 • Researchers knowledgeable about the project subject matter;
- 12 • Members of trades that will apply the results of the project (e.g., designers, engineers,
- 13 architects, contractors, and trade representatives);
- 14 • Public interest market transformation implementers;
- 15 • Product developers relevant to the project;
- 16 • U.S. Department of Energy research managers, or experts from other federal or state
- 17 agencies relevant to the project;
- 18 • Public interest environmental groups;
- 19 • Utility representatives;
- 20 • Air district staff; and
- 21 • Members of relevant technical society committees.

22
23 **The Recipient shall:**

- 24 • Prepare a *List of Potential TAC Members* that includes the names, companies, physical
- 25 and electronic addresses, and phone numbers of potential members. The list will be
- 26 discussed at the Kick-off meeting, and a schedule for recruiting members and holding
- 27 the first TAC meeting will be developed.
- 28 • Recruit TAC members. Ensure that each individual understands member obligations and
- 29 the TAC meeting schedule developed in subtask 1.11.
- 30 • Prepare a *List of TAC Members* once all TAC members have committed to serving on
- 31 the TAC.
- 32 • Submit *Documentation of TAC Member Commitment* (such as Letters of Acceptance)
- 33 from each TAC member.

34
35 **Products:**

- 36 • List of Potential TAC Members
- 37 • List of TAC Members
- 38 • Documentation of TAC Member Commitment

39
40 **Subtask 1.11 TAC Meetings**

41 The goal of this subtask is for the TAC to provide strategic guidance for the project by
42 participating in regular meetings, which may be held via teleconference.

43

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1 **The Recipient shall:**

- 2 • Discuss the TAC meeting schedule with the CAM at the Kick-off meeting. Determine the
3 number and location of meetings (in-person and via teleconference) in consultation with
4 the CAM.
5 • Prepare a *TAC Meeting Schedule* that will be presented to the TAC members during
6 recruiting. Revise the schedule after the first TAC meeting to incorporate meeting
7 comments.
8 • Prepare a *TAC Meeting Agenda* and *TAC Meeting Back-up Materials* for each TAC
9 meeting.
10 • Organize and lead TAC meetings in accordance with the TAC Meeting Schedule.
11 Changes to the schedule must be pre-approved in writing by the CAM.
12 • Prepare *TAC Meeting Summaries* that include any recommended resolutions of major
13 TAC issues.
14

15 **The TAC shall:**

- 16 • Help set the project team's goals and contribute to the development and evaluation of its
17 statement of proposed objectives as the project evolves.
18 • Provide a credible and objective sounding board on the wide range of technical and
19 financial barriers and opportunities.
20 • Help identify key areas where the project has a competitive advantage, value
21 proposition, or strength upon which to build.
22 • Advocate on behalf of the project in its effort to build partnerships, governmental support
23 and relationships with a national spectrum of influential leaders.
24 • Ask probing questions that insure a long-term perspective on decision-making and
25 progress toward the project's strategic goals.
26 • Review and provide comments to proposed project performance metrics.
27 • Review and provide comments to proposed project Draft Technology Transfer Plan.
28

29 **Products:**

- 30 • TAC Meeting Schedule (draft and final)
31 • TAC Meeting Agendas (draft and final)
32 • TAC Meeting Back-up Materials
33 • TAC Meeting Summaries
34

35 **Subtask 1.12 Project Performance Metrics**

36 The goal of this subtask is to finalize key performance targets for the project based on feedback
37 from the TAC and report on final results in achieving those targets. The performance targets
38 should be a combination of scientific, engineering, techno-economic, and/or programmatic
39 metrics that provide the most significant indicator of the research or technology's potential
40 success.
41

42 **The Recipient shall:**

- 43 • Complete and submit the project performance metrics from the *Initial Project Benefits*
44 *Questionnaire*, developed in the Evaluation of Project Benefits task, to the CAM.
45 • Present the draft project performance metrics at the first TAC meeting to solicit input and
46 comments from the TAC members.

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- 1 • Develop and submit a *TAC Performance Metrics Summary* that summarizes comments
2 received from the TAC members on the proposed project performance metrics. The *TAC*
3 *Performance Metrics Summary* will identify:
4 ○ TAC comments the Recipient proposes to incorporate into the *Initial Project*
5 *Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
6 ○ TAC comments the Recipient does not propose to incorporate with and
7 explanation why.
8 • Develop and submit a *Project Performance Metrics Results* document describing the
9 extent to which the Recipient met each of the performance metrics in the *Final Project*
10 *Benefits Questionnaire*, developed in the Evaluation of Project Benefits task.
11 • Discuss the *Project Performance Metrics Results* at the Final Meeting.

12
13 **Products:**

- 14 • TAC Performance Metrics Summary
15 • Project Performance Metrics Results
16
17

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1
2 **IV. TECHNICAL TASKS**
3
4

5 **TASK 2 LRIP TOOL SPECIFICATIONS AND ORDERING**

6 The goals of this task are to 1) document all of the LRIP tool requirements and specifications for
7 the tool design partners, 2) specify and order the assembly tools for the fabrication and
8 qualification of window-PV modules capable of handling commercially fabricated window glass
9 for PV use, 3) ensure proper consumables for assembly are identified, and 4) develop a plan for
10 proper installation and success of LRIP assembly equipment.
11

12 **The Recipient shall:**

- 13 • Collate the specifications and performance metrics of both low-emissivity (low-E)
14 windows as well as traditional PV module assemblies with a high-level plan to merge the
15 established methods in a *Window-PV Test Plan*.
- 16 • Specify and order a glass washer tool.
 - 17 ○ Identify risks of incoming glass and plan mitigation efforts.
 - 18 ○ Collaborate with glass, window, and equipment fabricators to specify a tool that
19 can clean commercially relevant glass sizes with and without low-emissivity hard
20 coatings.
- 21 • Specify and order a bus bar applicator tool that is capable of LRIP with commercial glass
22 and for use with window-PV units.
 - 23 ○ Identify supply chain partners and detail relationships for bus bar material supply.
24 Define acceptance testing parameters and quality requirements.
 - 25 ○ Leverage PV industry experience to order an appropriate bus bar applicator for
26 reliable and high-performance application.
- 27 • Specify and order an edge seal applicator tool that is capable of LRIP with commercial
28 glass and for use with window-PV units.
 - 29 ○ Identify supply chain partners and detail relationships for edge seal material
30 supply. Define acceptance testing parameters and quality requirements.
- 31 • Specify and order a packaging tool that is capable of LRIP with commercial glass and for
32 use with window-PV units.
 - 33 ○ Scale up current packaging methods used at pilot scale to a commercially
34 relevant size.
 - 35 ○ Interlayer cutting.
 - 36 ○ Cover glass merging.
- 37 • Specify and order an inspection tool that is capable of LRIP with commercial glass and
38 for use with window-PV units.
 - 39 ○ Identify a defect analysis tool to quantify defects in the assembly process that
40 meets industry requirements.
- 41 • Specify and order a conveyance and integration method that is capable of LRIP with
42 commercial glass and for use with window-PV units.
- 43 • Finalize and summarize material selection for all critical assembly with relevant suppliers
44 in a *Material Selection and Supply Chain Summary* including, but not limited to:
 - 45 ○ High level summary of materials selected and specifications for each item.
 - 46 ○ High level summary of supply chain partners and management plan.
- 47 • Prepare and submit a *Tool Specification Summary* for all the tools included.
- 48 • Prepare and submit a *Tool Order Summary Report* for each of the tools included.

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- 1 • Prepare a *Manufacturing Line Layout and Integration Plan Summary Report* (draft and
2 final versions) that includes a detailed plan to set up equipment in a strategic method
3 suitable for LRIP goals for all of the tools.
- 4 • Submit a draft copy of the Manufacturing Line Layout and Integration Plan Summary
5 Report to the CAM for feedback and incorporate changes as requested into the final
6 version of said Report.

7
8 **Products:**

- 9 • Window-PV Test Plan
- 10 • Material Selection and Supply Chain Summary
- 11 • Tool Specification Summary
- 12 • Tool Order Summary Report
- 13 • Manufacturing Line Layout and Integration Plan Summary Report (draft and final)

14
15
16 **TASK 3 BUILD AND INSTALL LRIP ASSEMBLY TOOLS**

17 The goal of this task is to build and install the fabrication tools specified in Task 2 to enable the
18 fabrication and qualification of window-PV units.

19
20 **The Recipient shall:**

- 21 • Build, assemble, and install tools ordered in Task 2.
- 22 • Prepare a *Tool Installation & Qualification Plan Summary* (draft and final versions) that
23 includes, but is not limited to, all tools outlined previously in the Scope of Work and as
24 listed below:
 - 25 ○ Glass washer tool.
 - 26 ○ Bus bar applicator tool.
 - 27 ○ Edge seal applicator tool.
 - 28 ○ Packaging tool.
 - 29 ○ Inspection tool.
 - 30 ○ Conveyance tool.
- 31 • Submit a draft Tool Installation & Qualification Plan Summary to the CAM for feedback
32 and incorporate changes as requested into the final version of the said Plan Summary.
- 33 • Test tool performance according to the plan and capture results.
- 34 • Prepare a *Tool Installation & Qualification Test Report Summary* (draft and final
35 versions) of the tools. The summary will include, but not be limited to the following:
 - 36 ○ A high-level description of what was completed, a comparison of the actual tool
37 performance results against expected results outlined in the Tool Installation &
38 Qualification Plan Summary, and a discussion of lessons learned.
 - 39 ○ The tools mentioned previously in the Scope of Work, including but not limited to:
 - 40 ▪ Glass washer tool.
 - 41 ▪ Bus bar applicator tool.
 - 42 ▪ Edge seal applicator tool.
 - 43 ▪ Packaging tool.
 - 44 ▪ Inspection tool.
 - 45 ▪ Conveyance tool.
- 46 • Submit a draft Tool Installation & Qualification Test Report Summary to the CAM for
47 feedback, and incorporate changes as requested into the final version of the said Test
48 Report Summary.

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1
2 **Products:**

- 3 • Tool Installation & Qualification Plan Summary (draft and final)
4 • Tool Installation & Qualification Test Report Summary (draft and final)
5
6

7 **TASK 4 ASSEMBLE WINDOW-PV UNITS**

8 The goals of this task are to 1) utilize the tools from Task 3 to assemble modules with high
9 aesthetic quality and performance suitable for window-PV applications, 2) develop a high-level
10 plan to build modules of increasing size and throughput while maintaining performance metrics,
11 and 3) summarize the results for assembly validation.
12
13

14 **The Recipient shall:**

- 15 • Acquire appropriate glass substrates from commercial partner.
16 • Fabricate PV films on substrates using the Recipient's Large Area Research &
17 Development (R&D) Coater (for assembly use and baselining metrics) utilizing
18 established formulations developed externally for the Recipient's in-house R&D coating
19 line as needed to support agreement goals.
20 • Fabricate, characterize, and test films and devices using Recipient's existing Benchtop
21 R&D Coaters as needed to meet agreement goals (for assembly use and baselining
22 metrics).
23 • Modify materials, process conditions, and/or devices as needed to maintain or improve
24 performance, aesthetics, uniformity, or reproducibility including but not limited to
25 development, testing, and characterization of pilot scaled devices.
26 • Assemble devices by hand to support LRIP goals and for comparison.
27 • Prepare and submit an *Assembly Validation Plan* that includes but is not limited to the
28 following:
29 ▪ Number of units to be assembled.
30 ▪ Size of modules.
31 ▪ Assembly step performance and quality targets.
32 ▪ Recipes and procedures for achieving high quality units on pilot sized tools.
33 • Prepare an *Assembly Validation Report* that summarizes, without limitation:
34 ○ Assembly validation of the bus bar, edge seal, interlayer and cover glass
35 application on glass substrates and/or window PV units using LRIP tools.
36 ○ Demonstration of high-quality window-PV modules using inspection tools to be
37 compliant with accepted industry performance standards and metrics.
38 ○ Demonstration of high-quality window-PV modules measuring color uniformity
39 within window industry standards using a spectrophotometer and accepted
40 industry measurement techniques.
41 ○ Comparison of aesthetic quality of units of increasing substrate size assembled on
42 LRIP equipment.
43 ○ Comparison of results to window-PV's assembled on benchtop equipment and
44 demonstration of PCE within 10 percent of larger LRIP sized modules assembled
45 on LRIP equipment with all other conditions being equal.
46 ○ Comparison of the expected results with the actual results.
47

48 **Products:**

- 49 • Assembly Validation Plan

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- 1 • Assembly Validation Report
2
3

4 **TASK 5 TEST ASSEMBLED WINDOW-PV UNITS**

5 The goal of this task is to test the assembly process against the established performance
6 metrics. This task focuses on performance metrics such as aesthetic quality, yield, and cycle
7 times. The project team will take a baseline of these metrics using LRIP tools and improve the
8 process to achieve relevant goals validated by window industry partners and customer
9 specifications.

10
11 **The Recipient shall:**

- 12 • Assemble LRIP sized modules (ranging in size up to 40"x60") with LRIP techniques
13 reaching commercially relevant metrics (aesthetic quality, yield and cycle time).
14 • Prepare and submit a *Commercially Scalable Baseline Assembly Report* to the CAM
15 outlining, without limitation:
16 ○ Summary discussion of what improvements were made during validation.
17 ○ Fabrication process and active throughput.
18 ○ Industry accepted defects and identification.
19 ○ Testing methods.
20 ○ Integration application.
21 ○ Baseline aesthetic quality, yield and cycle time for each individual assembly step
22 compared to benchtop methods.
23 • Improve process from baseline results on pilot sized modules to achieve the high target
24 performance metric of yield greater than 90 percent based on industry standards and
25 defect tolerances and current leakage.
26 • Improve process from baseline results on LRIP sized units to achieve an industry accepted
27 cycle time (with the exception of final packaging) for each individual assembly step
28 including:
29 ○ Bus bar application.
30 ○ Edge seal application.
31 ○ Interlayer cutting and layup.
32 ○ Cover glass merging.
33 ○ Final packaging (the goal for this is packaging tools built in parallel to reduce cycle
34 time in the future).
35 • Improve process parameters from baseline results on LRIP sized units to achieve a
36 yielded (greater than 90 percent) cycle time of 7 units per hour (with the exception of final
37 packaging) for each individual assembly step including:
38 ○ Bus bar application.
39 ○ Edge seal application.
40 ○ Interlayer cutting and layup.
41 ○ Cover glass merging.
42 ○ Final packaging (the goal for this is packaging tools built in parallel to reduce cycle
43 time in the future).
44 ○ Pass Wet Leakage test as per International Electrotechnical Commission (IEC)
45 61730 or similar, commercially recognized standard.
46 • Prepare and submit a *Commercially Scaled Assembly Report* outlining the results of the
47 process improved scalability of LRIP Techniques. This report will summarize, without
48 limitation:

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- Improvement of baseline on pilot sized units with regards to aesthetic quality, yield and cycle time.
- Improvement of baseline on LRIP sized units with regards to aesthetic quality, yield and cycle time.
- Comparison of the cycle time results with expected results for substrate size and discussion of the results and lessons learned.
- Prepare a *CPR Report* in accordance with subtask 1.3 (CPR Meetings).
- Participate in a CPR meeting.

Products

- Commercially Scalable Baseline Assembly Report
- Commercially Scaled Assembly Report
- CPR Report

TASK 6 FABRICATE REPRESENTATIVE COMMERCIAL FAÇADE

The goal of this task is to demonstrate successful integration with supply chain partners and building systems by fabricating window-PV units into IGUs at one or more commercial partner sites and installing them into a representative commercial façade.

The Recipient shall:

- Prepare a *Façade Build Plan Summary* (draft and final versions) detailing, without limitation, the following criteria:
 - Window framing design and specification with commercial glazier.
 - Façade size, orientation, performance requirements, layout and IGU quantity to be installed.
 - Identification of key supplier tasks and timelines with glass fabricators and glazing partners.
- Build completed window-PV units into IGUs with commercial window fabricator.
- Submit a draft Façade Build Plan Summary to the CAM for feedback and incorporate changes as requested into the final version of the Façade Build Plan Summary.
- Build window framing system with commercial glazier.
- Prepare and submit a *Façade Glazing Report Summary* outlining work done to:
 - Determine the siting location.
 - Determine the type of mounting system and bite.
 - Finalize the number of units to be installed and orientation in order to finalize framing dimensions based on the siting location.
 - Finalize all electronics, including, but not limited to:
 - Inverters.
 - Maximum Power Point Tracker (MPPT).
 - Data collecting units.
 - Finalize wiring diagram and junction box location for all modules to be wired.
 - Match aesthetics of glazing system with current architecture including mounting and painting.
- Prepare and submit a *Façade Test Plan* detailing the following criteria:
 - Energy Generation of each window-PV module.
 - Energy Generation of the entire Façade System.

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

- 1 • Prepare and submit a *Façade Test Report* detailing the results identified from the testing
2 conducted according to the Façade Plan including but not limited to:
3 ○ Summary of MPPT with reference to a calibrated photodiode.
4 ○ Comparison of the performance of functional LRIP façade unit to agreed upon
5 commercial product specifications.
6 ○ Report on the expectation of performance compared to the outcome.
- 7 • Prepare a *Façade Build Report* that includes but is not limited to the following:
8 ○ Construction for installation
9 ○ Electrical wiring of façade
10 ○ Pictures of installed façade
- 11 • Submit a draft Façade Build Report to the CAM for feedback and incorporate changes
12 as requested into the final version of the said Report.

Products:

- 15 • Façade Build Plan Summary (draft and final)
- 16 • Façade Glazing Report Summary
- 17 • Façade Test Plan
- 18 • Façade Test Report
- 19 • Façade Build Report (draft and final)

TASK 7 VALIDATE AND UPDATE MARKET COSTS AND ASSUMPTIONS

23 The goal of this task is to use the data and experience gained in previous tasks to examine and
24 update market assumptions and costs. Work completed during the project tasks with key
25 customers and key suppliers will be incorporated into the appropriate models to ensure up-to-
26 date information.

The Recipient shall:

- 29 • Prepare and submit an updated *Unit Level Cost Model Report* based on updated quotes
30 from vendors, suppliers, and partners since the previous Report developed under the
31 previous CEC BRIDGE agreement (EPC-20-014). The report will summarize high level
32 findings from the model, including but not limited to the following:
33 ○ Summary of the cost breakdown for the IGU containing the Recipient's window-
34 PV on a cost per square foot basis. Costs related to fabrication steps performed
35 by parties other than recipient will be gathered via email, conference calls,
36 meetings, etc.
37 ○ Summary of the energy generation of the entire Façade System, which will be
38 modeled using information from the performance metrics gathered in Tasks 2-6.
- 39 • Prepare and submit a *System Level Cost Model Report* (based on information from
40 external parties gathered via email, conference calls, meetings, etc.) that builds on the
41 Unit Level Cost Model Report to include the full BOS costs for full installation of the BIPV
42 window. The System Level Cost Model Report should include, but is not limited to, the
43 following information:
44 ○ Summary of the system level cost model in the context of a return to building
45 owner model that demonstrates the value proposition to the end-user/customer
46 of Recipient's BIPV windows.
47

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

- 1 ○ Summary of a net present value analysis from the building-owner’s perspective
- 2 as well as a simple payback and environmental impact (carbon emissions
- 3 reduction) calculations. This will be based on specific energy production
- 4 estimates, utility rates, and will take into account energy generation along with
- 5 accelerated depreciation and any available federal investment tax credit.
- 6 ○ Summary of what was done, whether the results were as anticipated, and any
- 7 lessons learned.
- 8 • Prepare and submit a *Stakeholder Engagement Summary* that provides a high-level
- 9 overview of the engagement with direct stakeholders (fabricators) as well as end-
- 10 customers (architects and building owners) and key supply chain partners (glaziers) to
- 11 validate, gauge stakeholder interest, and get feedback on the cost model as well as the
- 12 identified market, and the developed solution.
- 13 • Prepare a *Ratepayer Benefits Report* (draft and final versions) that includes, but is not
- 14 limited to, the following:
 - 15 ○ Quantification of the energy benefits (energy savings, PV generation, consumer
 - 16 return on investment) and non-energy benefits (emissions reduction) of
 - 17 Recipient’s technology.
 - 18 ○ Description of improvements of calculations based on data collected in previous
 - 19 tasks.
 - 20 ○ Verification that a simple payback of 10 years or less is achievable for an
 - 21 average California commercial building.
 - 22 ○ Summary of the incremental cost for the Recipient’s BIPV window fully installed
 - 23 compared to a standard commercial window fully installed.
 - 24 ○ Validation of a potential projected LCOE of \$0.03/kWh by 2030.
 - 25 ○ High level summary of what was done, whether the results were as anticipated,
 - 26 and any lessons learned.
- 27 • Submit the draft Ratepayer Benefits Report to the CAM for feedback and incorporate
- 28 changes as requested into the final version of the said Report.

Products:

- 31 • Unit Level Cost Model Report
- 32 • System Level Cost Model Report
- 33 • Stakeholder Engagement Summary
- 34 • Ratepayer Benefits Report (draft and final)

TASK 8 FULL-RATE PRODUCTION LINE STRATEGY

38 The goal of this task is to outline a high-level plan to progress the technology from LRIP to full
39 rate production and commercial readiness, that achieves TRL and MRL levels higher than 8.

The Recipient Shall:

- 42 • Using internal, commercial, and partner feedback from LRIP assembly tools and window
- 43 PV units, generate a full rate production line strategy and submit a *Full Rate Production*
- 44 *Line Strategy Report* which details, without limitation:
 - 45 ○ Supply chain agreements.
 - 46 ○ Purchase orders.
 - 47 ○ Future line integration with commercial window partners to meet scaling demands
 - 48 of the marker opportunity.
 - 49 ○ Updated pricing to include materials costs, labor costs, processing costs.

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

1
2 **Products:**

- 3 • Full Rate Production Line Strategy Report
4
5

6 **TASK 9: EVALUATION OF PROJECT BENEFITS**

7 The goal of this task is to report the benefits resulting from this project.
8

9 **The Recipient shall:**

- 10 • Complete the *Initial Project Benefits Questionnaire*. The Initial Project Benefits
11 Questionnaire shall be initially completed by the Recipient with 'Kick-off' selected for the
12 'Relevant data collection period' and submitted to the CAM for review and approval.
13 • Complete the *Annual Survey* by January 31st of each year. The Annual Survey includes
14 but is not limited to the following information:
15 ○ Technology commercialization progress
16 ○ New media and publications
17 ○ Company growth
18 ○ Follow-on funding and awards received
19 • Complete the *Final Project Benefits Questionnaire*. The Final Project Benefits
20 Questionnaire shall be completed by the Recipient with 'Final' selected for the 'Relevant
21 data collection period' and submitted to the CAM for review and approval.
22 • Respond to CAM questions regarding the questionnaire drafts.
23 • Complete and update the project profile on the CEC's public online project and recipient
24 directory on the Energize Innovation website (www.energizeinnovation.fund), and
25 provide *Documentation of Project Profile on EnergizeInnovation.fund*, including the
26 profile link.
27 • If the Prime Recipient is an Innovation Partner on the project, complete and update the
28 organizational profile on the CEC's public online project and recipient directory on the
29 Energize Innovation website (www.energizeinnovation.fund), and provide
30 *Documentation of Organization Profile on EnergizeInnovation.fund*, including the profile
31 link.
32

33 **Products:**

- 34 • Initial Project Benefits Questionnaire
35 • Annual Survey(s)
36 • Final Project Benefits Questionnaire
37 • Documentation of Project Profile on EnergizeInnovation.fund
38 • Documentation of Organization Profile on EnergizeInnovation.fund
39
40

41 **TASK 10 TECHNOLOGY/KNOWLEDGE TRANSFER ACTIVITIES**

42 The goal of this task is to ensure the learning that resulted from this project is captured and
43 disseminated so that similar efforts build on the lessons learned.

44 **The Recipient shall:**

- 45 • Develop and submit a *Project Case Study Plan* (draft and final versions) that outlines,
46 without limitation, how the Recipient will document the planning, establishment, and
47 operation of the project. The Project Case Study Plan should include, without limitation:

Exhibit A
Scope of Work
NEXT Energy Technologies, Inc.

- 1 ○ An outline of the objectives, goals, and activities of the case study.
- 2 ○ The organization that will be conducting the case study and the plan for conducting it.
- 3 ○ A list of professions and practitioners involved in the project's development.
- 4 ○ Specific activities the recipient will take to ensure the learning that results from the
- 5 project is disseminated to those professions and practitioners.
- 6 ○ Presentations/webinars/training events to disseminate the results of the case study.
- 7 ● Present the Draft Project Case Study Plan to the TAC for review and comment.
- 8 ● Develop and submit a *Summary of TAC Comments* that summarizes comments
- 9 received from the TAC members on the draft Project Case Study Plan. This document
- 10 will identify, without limitation:
- 11 ○ TAC comments the recipient proposes to incorporate into the Final Project Case
- 12 Study Plan.
- 13 ○ TAC comments the recipient does not propose to incorporate and explanation
- 14 why.
- 15 ● Submit the final Project Case Study Plan to the CAM for approval.
- 16 ● Execute the final Project Case Study Plan and develop and submit a *Project Case Study*
- 17 *(draft and final)*
- 18 ● When directed by the CAM, develop presentation materials for a CEC sponsored
- 19 conference/workshop(s) on the project.
- 20 ● When directed by the CAM, participate in annual EPIC symposium(s) sponsored by the
- 21 CEC.
- 22 ● Provide at least (6) six *High Quality Digital Photographs* (minimum resolution of
- 23 1300x500 pixels in landscape ratio) of pre and post technology installation at the project
- 24 sites or related project photographs.

Products:

- 27 ● Project Case Study Plan (draft and final)
- 28 ● Summary of TAC Comments
- 29 ● Project Case Study (draft and final)
- 30 ● High Quality Digital Photographs

V. PROJECT SCHEDULE

34 Please see the attached Excel spreadsheet.